



**EXECUTIVE CHAMBERS**

HONOLULU

BENJAMIN J. CAYETANO  
GOVERNOR

October 27, 1999

TO: The Honorable James J. Nakatani, Chairperson  
Board of Agriculture

SUBJECT: Acceptance of the Final Environmental Impact Statement for the Lower Hamakua  
Ditch Watershed Project

With this memorandum, I accept the Final Environmental Impact Statement for the Lower Hamakua Ditch Watershed Project in the Hamakua and North Kohala districts on the island of Hawaii as satisfactory fulfillment of the requirements of Chapter 343, Hawaii Revised Statutes. The economic, social and environmental impacts, which will likely occur should this project be built, are adequately described in the statement. The analysis, together with the comments made by reviewers, provides useful information to policymakers and the public.

My acceptance of the statement is an affirmation of the adequacy of that statement under the applicable laws.

I find that the mitigation measures proposed in the environmental impact statement will minimize the negative impacts of the project. Therefore, I direct the Board of Agriculture and/or its agents to perform these, or alternative and at least equally effective, mitigation measures at the discretion of the permitting agencies. The mitigation measures identified in the environmental impact statement are listed in the attached document.

  
BENJAMIN J. CAYETANO

Attachment

c: Honorable Bruce S. Anderson, Ph.D., M.P.H.  
Office of Environmental Quality Control

1999 FEIS HAWAII

SEP 23 1999

HAMAKUA LOWER DITCH WATERSHED PROJECT

FILE COPY

USDA  
Natural  
Resources  
Conservation  
Service

WATERSHED PLAN AND

FINAL ENVIRONMENTAL IMPACT

State of Hawaii  
Department of  
Agriculture

STATEMENT

'99 SEP -9 P2:33

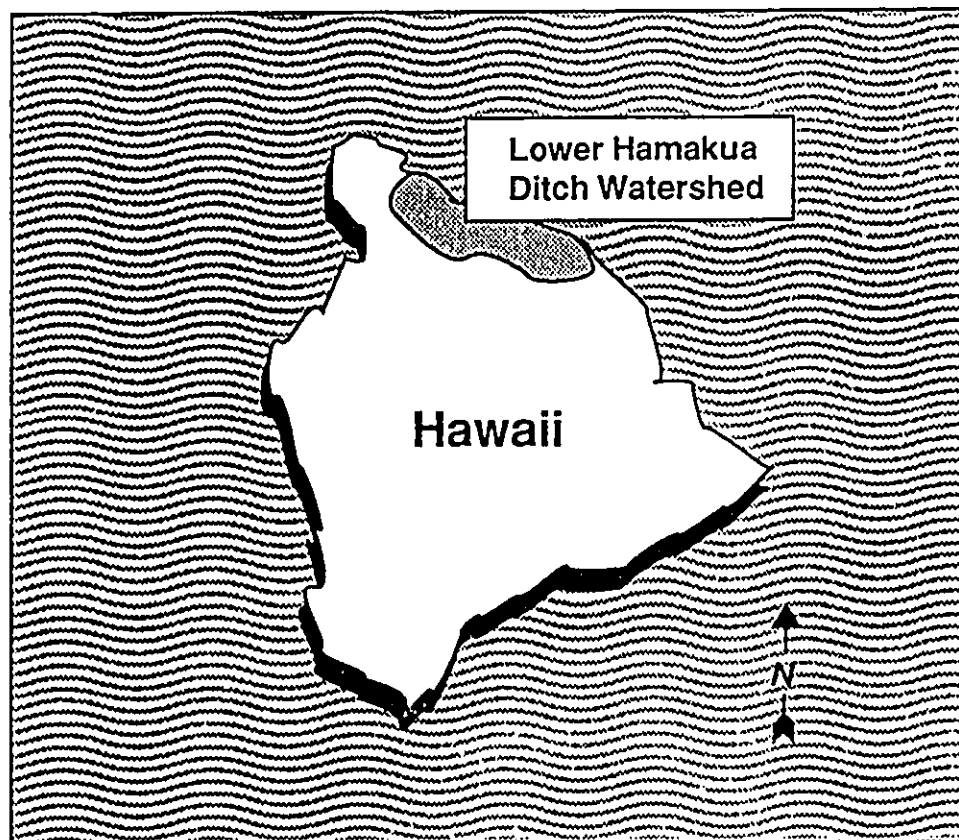
Hamakua Soil  
and Water  
Conservation  
District

U.F.C. QUALITY IMPROVEMENT

Lower Hamakua Ditch Watershed  
Hawaii County, Hawaii

Mauna Kea Soil  
and Water  
Conservation  
District

September 1999



FINAL  
WATERSHED PLAN AND ENVIRONMENTAL IMPACT STATEMENT  
LOWER HAMAKUA DITCH WATERSHED

LOCATION: Hamakua and North Kohala Districts  
Hawaii County, Hawaii

TAX MAP KEYS: 3rd Division: 4-3 var, 4-4 var, 4-5 var,  
4-6 var, 4-7 var, 4-8 var, and 6-3 var


PROPOSING AGENCY: State of Hawaii Department of Agriculture

ACCEPTING AUTHORITY: Governor, State of Hawaii

PREPARED BY: USDA Natural Resources Conservation  
Service

This statement and all ancillary documents were prepared under the direction and supervision of the State of Hawaii Department of Agriculture. All information submitted, to the best of our knowledge addresses document content requirements set forth in Section 11-200-17, HRS.

RESPONSIBLE OFFICIAL:

  
James J. Nakatani, Chairperson  
Board of Agriculture

9/2/99  
Date

INFO QUALITY UNIT

99 SEP -9 P2:26

RECEIVED

**FINAL**  
**WATERSHED PLAN-ENVIRONMENTAL**  
**IMPACT STATEMENT**

**Lower Hamakua Ditch Watershed**  
**Hawaii County, Hawaii**

**Responsible Agencies:**

**Hamakua Soil and Water Conservation District**

**Mauna Kea Soil and Water Conservation District**

**State of Hawaii, Department of Agriculture**

**United States Department of Agriculture**  
**Natural Resources Conservation Service**  
**(Lead Agency)**

**Lead Agency Contact:**

**Kerneth Kaneshiro, State Conservationist**  
**USDA Natural Resources Conservation Service**  
**300 Ala Moana Blvd., Room 4316**  
**P.O. Box 50004**  
**Honolulu, Hawaii 96850-0050**  
**Telephone: (808) 541-2600, extension 105 FAX: (808) 541-1335**

**September 1999**

The Lower Hamakua Ditch Watershed project planning was conducted under the authority of the Watershed Protection and Flood Prevention Act, Public Law 83-566 (PL 83-566), as amended (16 U.S.C. 1001-1008). Project planning was conducted and this Watershed Plan-EIS was prepared to fulfill the requirements of the following: 1) the National Environmental Policy Act of 1969 (NEPA), as amended, Public Law 91-190, 42 U.S.C. 4321- et seq. ; 2) the requirements of the Hawaii environmental review process as defined in Chapter 343, HRS (HRS), including Act 241, SLH 1992 revisions, and Title 11, Chapter 200, Hawaii Administrative Rules, Department of Health; 3) the Water Resources Council's Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies; and 4) the NRCS's National Watershed Manual.

The United States Department of Agriculture (USDA) prohibits discrimination in its programs on the basis of race, color, national origin, sex, religion, age, disability, political beliefs and marital or familial status. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means of communication of program information (Braille, large print, audiotape, etc.) should contact the USDA Office of Communications at (202) 720-2600 (voice and TDD).

To file a complaint, write the Secretary of Agriculture, U. S. Department of Agriculture, Washington, D. C., 20250, or call 1-800-245-6340 (voice) or (202) 720-1127 (TDD). USDA is an equal employment opportunity employer.

## TABLE OF CONTENTS

	<u>Page</u>
TABLE OF CONTENTS.....	i
LIST OF FIGURES.....	vi
LIST OF PHOTOS.....	vi
LIST OF TABLES.....	vii
GLOSSARY OF ABBREVIATIONS.....	ix
METRIC CONVERSION TABLE.....	x
SUMMARY OF WATERSHED PLAN-EIS.....	xi
1. INTRODUCTION.....	1
1.1 GENERAL.....	1
1.2 READER'S GUIDE.....	5
2. PROJECT PURPOSE AND NEED.....	9
2.1 PROJECT PURPOSE.....	9
2.1.1 Closure of Hamakua Sugar Company.....	9
2.1.2 Poor Present Condition of the Lower Hamakua Ditch.....	10
2.1.3 Present and Future Condition of Farming Activity.....	11
2.1.3.1 Projection of Future Farming Activity and Acreage.....	12
2.1.3.2 Cropland Water Needs.....	17
2.1.3.3 <i>Aquaculture</i> .....	18
2.1.3.4 <i>Ranching</i> .....	18
2.2 PROBLEMS AND OPPORTUNITIES.....	19
2.2.1 Lower Hamakua Ditch.....	19
2.2.2 Lower Hamakua Ditch Management.....	21
2.2.3 System Losses.....	22
2.2.4 Hakalaoa Falls.....	22
2.2.5 Non-Agricultural Use of Water.....	23
2.2.6 Waipio Valley.....	23
3. FORMULATION AND COMPARISON OF ALTERNATIVES.....	25
3.1 FORMULATION OF ALTERNATIVES.....	25
3.1.1 Land Treatment Measures.....	26
3.1.2 Catchments.....	26
3.1.3 Hawaii County Department of Water Supply.....	27
3.1.4 Structural Measures.....	27
3.1.4.1 Hamakua Area Streams.....	27
3.1.4.2 Wells.....	28
3.1.4.3 Repair and Rehabilitation of the LHD.....	28
3.1.4.4 Pipeline.....	29
3.1.4.5 Relocation of Hamakua Farmers.....	30
3.1.4.6 <i>Storage Reservoirs</i> .....	30

3.2 ALTERNATIVE PLANS.....	30
3.2.1 Alternative 1 - No Action.....	31
3.2.2 Alternative 2 - Wells.....	32
3.2.3 Alternative 3 - Repair and Restoration of Lower Hamakua Ditch...	37
3.2.4 Alternative 4 - Replacement of Open Ditch with Pipeline.....	43
3.3 OPERATION, MAINTENANCE, AND REPLACEMENT (OM&R)....	47
3.4 RISK AND UNCERTAINTY.....	48
3.4.1 Hydrologic Analysis.....	48
3.4.2 Land Use Analysis.....	48
3.4.3 Economic Analysis.....	49
3.4.4 Environmental Analysis.....	49
4. SELECTED PLAN.....	55
4.1 RATIONALE FOR PLAN SELECTION.....	55
4.2 PROPOSED WORKS OF IMPROVEMENT.....	56
4.2.1 Flume Replacement and Repair.....	56
4.2.2 Ditch Lining Repair and Sediment Removal.....	56
4.2.3 Reservoirs.....	57
4.2.4 Lateral Pipeline Systems.....	57
4.2.4.1 Screening and Filtration.....	57
4.2.4.2 Pipeline Systems and Pressure Regulation.....	57
4.2.4.3 Meters.....	58
4.2.5 Intakes.....	58
4.2.6 Hakalaoa Falls.....	61
4.2.7 SCADA.....	63
4.2.8 Operation.....	63
4.3 COSTS.....	64
4.4 INSTALLATION AND FINANCING.....	66
4.4.1 Sequence of Installation.....	66
4.4.2 Responsibilities.....	70
4.4.3 Permits and Compliance.....	72
4.4.3.1 County of Hawaii Requirements.....	72
4.4.3.2 State of Hawaii Requirements.....	72
4.4.3.3 Federal Requirements.....	73
4.4.3.4 Compliance With Federal Environmental Laws.....	73
4.4.4 Contracting.....	74
4.4.5 Real Property Acquisition and Relocations.....	74
4.4.6 Cultural and Historic Resources.....	75
4.4.7 Financing.....	76
4.4.8 Conditions for Providing Assistance.....	76
4.4.9 Civil Rights Impact Analysis.....	77
4.4.10 Water Rights.....	78
4.5 OPERATION, MAINTENANCE, AND REPLACEMENT.....	78
4.6 TABLES.....	79

<b>5. PROJECT SETTING.....</b>	<b>85</b>
5.1 LOCATION AND SIZE.....	85
5.2 GEOLOGY.....	85
5.3 CLIMATE.....	89
5.4 SOILS.....	90
5.5 LAND USE.....	99
5.5.1 Crop Suitability.....	100
5.6 LAND OWNERSHIP.....	102
5.7 POPULATION AND DEMOGRAPHY.....	105
5.8 ECONOMY, INCOME AND EMPLOYMENT.....	105
5.9 AGRICULTURE.....	108
5.10 WATER USE AND DEVELOPMENT.....	111
5.10.1 Lower Hamakua Ditch.....	111
5.10.2 County Department of Water Supply.....	113
5.10.3 Wells.....	113
5.10.4 Other Water Systems in the Lower Hamakua Ditch Watershed...	114
5.11 SOCIAL AND ENVIRONMENTAL RESOURCES AND CONCERNS.....	114
5.12 RELATED PROJECTS IN REGION.....	115
<b>6. EFFECTS OF THE SELECTED PLAN.....</b>	<b>117</b>
6.1 GENERAL.....	117
6.2 ECONOMIC EFFECTS.....	117
6.2.1 Agricultural Activity.....	117
6.2.2 Estimated Agricultural Water Charges to Users.....	118
6.2.3 Projected Water Demand.....	118
6.3 ENVIRONMENTAL EFFECTS.....	119
6.3.1 Prime and Unique Farmland.....	119
6.3.2 Erosion and Sedimentation.....	120
6.3.3 Flooding.....	121
6.3.4 Wildlife.....	123
6.3.5 Threatened and Endangered Species.....	125
6.3.6 Surface Water Quality and Quantity.....	127
6.3.7 Groundwater Quality and Quantity.....	130
6.3.8 Air Quality.....	132
6.3.9 Visual Resources.....	133
6.3.10 Cultural and Historic Resources.....	134
6.3.11 Wetlands.....	136
6.3.12 Water Rights and Traditional Uses of Water.....	138
6.3.13 Social Effects.....	140
6.3.14 Aquatic Habitat / Natural Stream Flows.....	141
6.3.15 Waipio Valley Taro Production.....	145



6.3.16 Hakalaoa Falls.....	149
6.3.17 Hazardous Materials and Hazardous Waste Sites.....	151
6.4 RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY.....	151
6.5 IRREVERSIBLE OR IRRETRIEVABLE COMMITMENT OF RESOURCES.....	152
6.6 UNRESOLVED ISSUES AND AREAS OF CONCERN.....	153
6.7 RELATIONSHIP TO OTHER PLANS, POLICIES, AND CONTROLS.....	154
6.7.1 State Land Use Districts.....	154
6.7.2 The Hawaii State Plan and State Agricultural Functional Plan.....	154
6.7.3 Hawaii County General Plan.....	157
6.7.4 Hawaii County Agriculture Development Plan.....	157
6.7.5 Hawaii County Water Use and Development Plan (WUDP).....	158
6.7.6 Hawaii County Code.....	158
6.7.7 Hilo-Hamakua Economic Development Plan.....	161
6.7.8 Hawaii Coastal Zone Management Program.....	161
6.7.9 Special Management Area.....	162
6.7.10 Ceded Lands Trust.....	162
6.7.11 National Flood Insurance Program.....	163
6.7.12 <i>State Water Code</i> .....	164
6.7.13 Permits and Compliance.....	164
6.7.14 <i>Waimea-Paauilo Watershed Project</i> .....	164
6.8 PROBABLE ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED.....	165
<b>7. CONSULTATION AND PUBLIC PARTICIPATION.....</b>	<b>166</b>
7.1 GENERAL.....	166
7.2 1995 DEIS .....	166
7.2.1 1995 DEIS Review.....	167
7.2.1 1995 DEIS Comment Letters.....	170
7.2.3 1995 DEIS Public Meeting.....	184
7.3 1998 DEIS .....	185
7.3.1 1998 DEIS Review.....	186
7.3.2 1998 DEIS Comment Letters.....	190
7.3.3 1998 DEIS Public Meeting .....	191
7.4 FINAL EIS.....	200

8. PLAN PREPARERS.....	201
9. REFERENCES.....	203
10. GLOSSARY OF TERMS.....	207
11. INDEX.....	213
APPENDIX A - COMMENTS AND RESPONSES TO DEIS.....	A
APPENDIX B - INVESTIGATION AND ANALYSIS.....	B
APPENDIX C - HAWAII COASTAL ZONE MANAGEMENT ASSESSMENT.....	C
APPENDIX D - COMMENTS RECEIVED DURING 1995 REVIEW PERIOD.....	D

## LIST OF FIGURES

	<u>Page</u>
Figure 1 Timeline of Significant Events .....	1
Figure 2 Lower Hamakua Ditch Planning Area.....	3
Figure 3 Map of Projected Irrigated Cropland .....	15
Figure 4 Alternative 2 - Map of Works of Improvement.....	35
Figure 5 Typical Wooden Flume Section .....	37
Figure 6 Works of Improvement to LHD Intake No.1 Kawainui Stream.....	40
Figure 7 Alternative 3 - Map of Works of Improvement.....	41
Figure 8 Alternative 4 - Map of Works of Improvement.....	45
Figure 9 <i>HSC Lateral System</i> .....	59
Figure 10 Geology Map .....	87
Figure 11 Map of Soil Series .....	93
Figure 12 Map of Prime Farmland.....	95
Figure 13 Map of Highly Erodible Land.....	97
Figure 14 Land Ownership Map .....	103
Figure 15 Stream Intake Diversion and Stream Flow.....	144
Figure 16 State Land Use District Map.....	155
Figure 17 County Land Use District Map.....	159

## LIST OF PHOTOS

	<u>Page</u>
Photo A Wooden Flume .....	62
Photo B Corrugated Metal Pipe .....	62
Photo C Kawainui Intake.....	62
Photo D <i>Detail of Midpoint of Hakalaoa Falls.</i> .....	62

## LIST OF TABLES

	<u>Page</u>
<b>Summary Tables:</b>	
Table i Current Land Use.....	xiv
Table ii Economic Effects.....	xv
Table iii Environmental Effects. ....	xvi
 <b>Text Tables:</b>	
Table A Projected Irrigated Cropland with Project Implementation.....	14
Table B Daily Irrigation Water Need Per Acre of Cropland for Reference Crop....	17
Table C Lower Hamakua Ditch Reservoirs.....	21
Table D Alternative 2 - Wells.....	34
Table E Alternative 3 - Repair and Restoration of the Lower Hamakua Ditch .....	39
Table F Alternative 4 - Replacement of Open Ditch with Pipeline .....	44
Table G Estimated Annual Operation, Maintenance, and Replacement Costs .....	47
Table H Summary and Comparison of Alternative Plans .....	51
Table I Sequence of Installation and Schedule of Obligations. ....	68
Table J Compliance With Designated Federal Environmental Laws.....	73
 <b><u>Economic Efficiency and Allocation of Funding:</u></b>	
TABLE 1 Estimated Installation Cost .....	81
TABLE 2 Estimated Cost Distribution Structural Measures.....	82
TABLE 3 not applicable	
TABLE 4 Estimated Average Annual NED Costs.....	83
TABLE 5 not applicable	
TABLE 6 Comparison of NED Benefits and Costs .....	84
 Table K Land Use and Agricultural Operations .....	 99
Table L Crop Suitability.....	101
Table M Socio-Economic Characteristics of Resident Population .....	106
Table N Ethnic Composition of Resident Population .....	107
Table O Diversified Crop Farming Areas .....	109
Table P Evaluation of Identified Concerns .....	116
Table Q Lower Hamakua Ditch Water Demand .....	119
Table R Compliance With Designated Federal Environmental Laws.....	165
Table S Plan Preparers and Their Qualifications .....	201
 <b>Appendices Tables:</b>	
Table B-1 Watershed Land Use.....	B - 3
Table B-2 Intensification Benefits.....	B - 4
Table B-3 Rainfall Analysis .....	B - 7
Table B-4 Drought Analysis.....	B - 9
Table B-5 Crop Water Demand Summary .....	B - 11
Table B-6 Crop Water Demand Analysis .....	B - 12
Table B-7 Daily Irrigation Water Requirement.....	B - 24
Table B-8 Peak Daily Water Usage.....	B - 24
Table B-5 Average Daily Water Usage .....	B - 24

## GLOSSARY OF ABBREVIATIONS

CDUA	Conservation District Use Application
CMP	corrugated metal pipe
CWRM	State of Hawaii, Commission on Water Resources Management
DEIS	Draft Environmental Impact Statement
DLNR	State of Hawaii, Department of Land and Natural Resources
DOA	State of Hawaii, Department of Agriculture
DWS	Hawaii County Department of Water Supply
EQIP	Environmental Quality Incentives Program
FEIS	Final Environmental Impact Statement
FEMA	Federal Emergency Management Agency
gpm	gallons per minute
HCPC	Hilo Coast Processing Company
HELCO	Hawaiian Electric Light Co.
HNHAC	Hamakua/North Hilo Agricultural Cooperative
HRS	Hawaii Revised Statutes
HSC	Hamakua Sugar Company
IIFS	Interim Instream Flow Standard
KSBE	Kamehameha Schools/Bishop Estate
LHD	Lower Hamakua Ditch
MG	million gallons
MGD	million gallons per day
MGY	million gallons per year
NED	National Economic Development (Plan)
NEPA	National Environmental Policy Act of 1969
NRCS	Natural Resources Conservation Service
OM&R	operation, maintenance, and replacement
PL 83-566	Public Law 83-566
Plan-EA	Watershed Plan and Environmental Assessment
Plan-EIS	Watershed Plan and Environmental Impact Statement
psi	pounds per square inch
RTU	remote terminal unit
SCADA	Supervisory Control and Data Acquisition
SWCD	Soil and Water Conservation District
TMK	Tax Map Key
U.S.C.	United States Code
USDA	U. S. Department of Agriculture
USFWS	U. S. Fish and Wildlife Service
WTFA	Waipio Taro Farmers Association
WUDP	Water Use and Development Plan
WVCA	Waipio Valley Community Association

## METRIC CONVERSION TABLE

The following conversion factors may be used to convert the U.S. customary measuring units, used in this report, to System International d'Unites (SI) measuring units.

Multiply U.S. customary units	By	To obtain SI units
<b>Length:</b>		
inch (in.)	25.4	millimeter (mm)
foot (ft.)	0.3048	meter (m)
mile (mi.)	1.609	kilometer (km)
<b>Area:</b>		
square foot (ft <sup>2</sup> )	0.09294	square meter (m <sup>2</sup> )
acre (ac.)	0.4047	hectare (ha)
<b>Liquid Volume:</b>		
gallon (gal.)	3.785	liter (L)
million gallons (MG)	3785.0	cubic meter (m <sup>3</sup> )
<b>Discharge:</b>		
gallon per minute (gpm)	0.06309	liter/second
million gallons per day (MGD)	0.4381	cubic meter/second

# SUMMARY OF WATERSHED PLAN AND ENVIRONMENTAL IMPACT STATEMENT

## 1. INTRODUCTION

**Project Name:** Lower Hamakua Ditch Watershed

**County, State:** Hawaii County, Hawaii

**Lead Planning Agency:** USDA Natural Resources Conservation Service (NRCS)

**Local Sponsors:**

- State of Hawaii, Department of Agriculture (DOA)
- Hamakua Soil and Water Conservation District
- Mauna Kea Soil and Water Conservation District

**Project Description:** The Selected Plan proposes repairing the existing Lower Hamakua Ditch (LHD) to provide a dependable irrigation water supply to 2,500 acres of irrigated cropland in *diversified agriculture*. Project improvements include *repairs to the flumes and ditch lining in the open ditch section of the LHD*, restoration of Hakalaoa Falls and removal of the temporary flume and diversion, *modification of the stream intakes in Waipio Valley to reduce diversion rates*, *repair or construction of lateral distribution systems to the farmlots*, and *technical and financial assistance to farmers and ranchers, in Hamakua and Waipio, to plan and implement conservation practices*.

**Planning Authorization:** Watershed Protection and Flood Prevention Act, Public Law 83-566 (PL 83-566), as amended (16 U.S.C. 1001-1008).

## 2. PROJECT PURPOSE AND NEED

**Project Purpose:** The purpose of the proposed project is to *alleviate the agricultural water shortage problem in the Hamakua area* and provide a stable, adequate, and affordable supply of agricultural water to farmers and other agricultural producers in the LHD service area. A state-operated agricultural water system will be established under the provisions of Chapters 167 and 168, Hawaii Revised Statutes (HRS).

**Problems and Opportunities:** The lack of adequate maintenance on the nearly 100-year old LHD system since the period preceding the bankruptcy of the Hamakua Sugar Company (HSC) in 1993 has severely compromised the integrity of many of the components of the LHD system and has decreased its efficiency. The poor condition of some components of the LHD and its continued deterioration have resulted in failures disrupting water supply and causing economic losses. It is feared that the loss of a major flume may shut off water to downstream farmers for many months before a repair can be funded, contracted, and constructed.

The uncertainty of the temporary operation of the LHD by the DOA has worried farmers who currently depend on the LHD for agricultural water supply. This concern has prevented fuller investment in agricultural enterprise in this area of the Hamakua coast between Paauilo and Kukuihaele.

The proposed project supports and complements state and county policies and programs intended to provide employment opportunities and economic revitalization for the Hamakua region following the collapse of the sugarcane industry in the early 1990s.

The proposed project takes advantage of opportunities to enhance social and environmental resources in the Hamakua and Waipio Valley areas, including return of water not needed for agriculture in Hamakua back to the Waipio stream sources and restoration of Hakalaoa Falls, one of the twin falls at Hiilawe.

### 3. FORMULATION AND COMPARISON OF ALTERNATIVES

*Alternatives were formulated and evaluated to provide a stable and consistent water supply for the projected future condition of 2,500 acres of irrigated cropland, in addition to livestock drinking water, aquaculture, and community water needs.*

- **Alternative 1 - No Action** discusses the likely scenario if no action is taken to implement a comprehensive project to provide agricultural water to the Hamakua area between Kukuihaele and Paauilo.

The DOA will continue to provide a minimal level of maintenance. Leakage from the ditch components will continue to be high. A less permanent, surface-mounted repair will probably be made to restore Hakalaoa Falls.

- **Alternative 2 - Wells** proposes the upgrade of two existing wells and construction eight new wells. Each well will be connected to a 0.6 MG storage tank that will provide nearly half-day storage during peak use. Connections between neighboring distribution systems will be provided to increase system flexibility and minimize the effects of well failure.

The wells alternative provides modularization of the system. Each well/distribution system can operate independently. Water quality of the groundwater is considerably better than surface sources and may be preferred by some farmers. Both the installation and operation costs (due to pumping energy costs) are high relative to the other alternative plans.

- **Alternative 3 - Repair and Restoration of Lower Hamakua Ditch** proposes the repair, rehabilitation, and/or replacement of components of the LHD system. Alternative 3 provides the highest net economic benefits and is the National Economic Development (NED) Plan.

Those components that are in a condition where failure is imminent and can affect the flow in the ditch will receive highest priority for improvement. Next priority will be given to components with high rates of water loss. Third priority will be given to elements that will reduce maintenance costs. Special priority will be given to features providing environmental and social benefits, including repair of the tunnel at Hakalaoa Falls to restore the twin falls of Hiilawe and Hakalaoa and *modification to the intake structures to allow at least 30 percent of the baseflow to flow past the intakes.*

- **Alternative 4, Replacement of Open Ditch with Pipeline**, proposes the replacement of the open ditch portion of the LHD with pipeline of ductile iron and/or polyethylene. The closed pipeline will extend from the Main Weir at Kukuihaele to the Paauilo reservoir.

Water loss during transmission will be nearly eliminated. Control of sediment and other pollutants into the water system will be improved. Maintenance of the system will be reduced. Remote control of system operations will be simplified. Safety of people and animals along the ditch will be enhanced. The tunnel behind Hakalaoa



Falls will be repaired and the natural flow over Hakalaoa Falls restored. *The intake structures will be modified to allow at least 30 percent of the baseflow to flow past the intakes.* The primary disadvantage of the pipeline alternative is the installation cost.

#### 4. SELECTED PLAN

**Rationale for Plan Selection:** Alternative 3 - Repair and Restoration of the Lower Hamakua Ditch was selected by the project sponsors as the Selected Plan because the alternative effectively addresses the problems of agricultural water uncertainty while minimizing the cost of implementation. Alternative 3 supports and advances state and local objectives of providing economic opportunity to displaced sugar industry workers and revitalization of the Hamakua regional economy. Alternative 3 has been shown to maximize the net economic benefit to the nation and is judged the NED plan.

**Proposed Works of Improvement:** All but two wooden flumes will be replaced with corrugated metal pipe or inverted pipe siphons. Metal I-beams will replace the rotting timber supports. *Two of the flumes will be reconstructed in original materials and construction, to the extent possible.* In the open ditch sections, sediment will be removed and the concrete lining will be repaired. The diversion structures at Kawainui, Alakahi, and Koiawe streams will be repaired and modified to prevent structural failure, reduce maintenance requirements, and restore at least 30 percent of the baseflow to Waipio Valley streams. A 1-MG reservoir will be installed in the Honokaia subarea to provide operational flexibility to HNHAC farmers. The 10 MG Paauilo Reservoir will be lined to eliminate seepage losses. Approximately ten lateral distribution systems will be installed. Hakalaoa Falls will be restored through the repair of the tunnel behind the falls and removal of the temporary flume structure. A Supervisory Control and Data Acquisition system will be implemented to allow remote data collection and operation of key components

**Cost and Benefits:** *The estimated installation cost of Alternative 3 is \$10,592,900, in 1998 dollars. The NRCS will fund approximately \$6,047,500. The DOA and others will fund approximately \$4,545,400. The annual Operation, Maintenance, and Replacement (OM&R) cost is estimated to be \$500,000.*

*The average annual cost, including OM&R, is estimated to be \$1,419,300. The average annual benefit of project implementation is estimated to be \$3,948,200. The benefit to cost ratio is 2.8 : 1.0.*

#### 5. PROJECT SETTING

**Watershed Location:** Northcentral part of the island of Hawaii in the Hamakua and North Kohala Districts in Hawaii County, Hawaii. The planning area is approximately 30 miles northwest of Hilo, the Hawaii county seat. The communities of Honokaa, Waipio Valley, Kukuihaele, Kapulena, Haina, Paauhau, and Paauilo are located within the watershed area boundaries.

**TMK:** 3<sup>rd</sup> Tax Division, 4-3 various, 4-4 various, 4-5 various, 4-6 various, 4-7 various, 4-8 various, 4-9 various, 6-3 various

Size: 38,500 acres

Land Use:

Table i: Current Land Use

Land Use	Recent Past		Current Conditions	
	Acreage	Percent	Acreage	Percent
Sugarcane (idle under current conditions)	21,400	56 %	6,095	16 %
Forest conservation	11,700	30 %	11,700	30 %
Forest commercial	0	0 %	8,700	23 %
Pasture	2,050	5 %	7,750	20 %
Urban	1,300	3 %	1,300	3 %
Macadamia nuts	600	2 %	600	2 %
Diversified crops	500	1 %	1,400	4 %
Wetland (Waipio Valley)	500	1 %	500	1 %
Feedlot	200	<1%	200	<1%
Idle Cropland (Waipio Valley)	170	<1%	170	<1%
Taro (Waipio Valley)	80	<1%	80	<1%
Aquaculture	0	0 %	5	<1%
<b>Total</b>	<b>38,500</b>	<b>100 %</b>	<b>38,500</b>	<b>100 %</b>

Land Ownership: Private.....70%  
 State .....23%  
 County .....7%

Prime farmland: 21,500 acres

Number of farms: 250

Average farm size: 150

Number of minority farmers: 150

Number of limited resource farmers: 225

Population: 5,607 persons (1990 Census data)

Average per capita income:

Project area .....\$11,200

County .....\$16,800

State .....\$22,200

**Agriculture:** Since the closure of the HSC, the number of agricultural operations has increased almost twofold from 77 to 170. The Hamakua/North Hilo Agriculture Cooperative (HNAAC) has a membership of approximately 130 and subleases 1,438 acres to its members for ranching, papaya, coffee, macadamia, other diversified agriculture, and aquaculture.

The major crops being considered in 1998 are orchard crops, mainly coffee and macadamia nut. These crops also increase the opportunity to add value within the Hamakua area through processing, packaging, and marketing. Other crops such as papaya, orchard fruits, foliage and flowers, and truck crops will also be cultivated.

There are farmers and landowners with plans for larger farms or developments. Some have made the investments on the private lands for infrastructure improvement and have taken steps to ensure their supply of water by developing or identifying backup wells. Others are delaying their startup until the certainty of obtaining consistent water supply from the LHD is established.

**Other Existing Water Supply Systems:**

- **Department of Water Supply:** County of Hawaii-owned and operated water system which provides water for domestic and industrial uses. Some farmers use the county system for irrigation water supply, but are discouraged from doing so because of the limited yield at the well source and the high costs of water production and treatment.
- **Wells:** Three wells capable of producing agricultural water supply have been identified in the project service area. The total yield estimated for the three wells is 3.5 MGD.
- **Lalakea Ditch:** A privately-owned system above the project area with an average daily flow of one MGD.

**6. EFFECTS OF THE SELECTED PLAN**

**Economic Effects:**

**Table ii: Economic Effects**

<b>Item</b>	<b>Total value</b>
<b>Benefits:</b>	
Agricultural water benefits	3,948,200
<b>Total average annual benefits</b>	<b>3,948,200</b>
<b>Costs:</b>	
<b>Installation costs</b>	
Federal (PL 83-566) cost-share	6,047,500
Other (Sponsors: DOA)	4,545,400
<b>Total Installation costs</b>	<b>10,592,900</b>
<b>Average annual costs</b>	
Average annual installation costs <sup>1/</sup>	919,300
Average annual OM&R costs <sup>2/</sup>	500,000
<b>Total average annual costs</b>	<b>1,419,300</b>
<b>Average annual benefit:cost ratio</b>	<b>2.8 : 1.0</b>

<sup>1/</sup> Installation costs amortized at 7.125% for 25 years.

<sup>2/</sup> Operation, maintenance, and replacement

**Environmental Effects: Table iii: Environmental Effects**

Item	Effects	Proposed Mitigation Measures
Agricultural Activity	Agricultural activity will expand due to certainty of water supply. Crop suitability of some lands will be upgraded.	None required.
Air Quality	Dust and vehicular exhaust will increase during construction.	Dust control measures to be undertaken or installed. Remaining effects unavoidable.
Historic and Cultural Resources	<ul style="list-style-type: none"> <li>. Hakalaoa Falls restored.</li> <li>. Appearance of LHD will be altered by conversion of wooden flume structures to CMP and metal I-beams.</li> </ul>	<ul style="list-style-type: none"> <li>. None required.</li> <li>. Two wooden flumes will be restored using the methods and materials of the original construction.</li> </ul>
Energy Resources	<ul style="list-style-type: none"> <li>. Energy needed for SCADA system.</li> <li>. <i>Some pumping from wells may be required.</i></li> </ul>	<ul style="list-style-type: none"> <li>. Renewable sources, solar and hydropower, used where possible.</li> <li>. <i>None required.</i></li> </ul>
Erosion and Sedimentation	<ul style="list-style-type: none"> <li>Potential for increased erosion:</li> <li>. by increased farming activity</li> <li>. during repair of LHD and lateral systems</li> <li>. while Waioia River adjusts to greater flow</li> </ul>	<ul style="list-style-type: none"> <li>. Conservation measures applied with technical assistance from NRCS.</li> <li>. County-approved erosion and sediment control plan used during construction.</li> <li>. NRCS and SWCD technical assistance to Waipio Valley farmers/landowners.</li> </ul>
Fish and Wildlife Habitat	<ul style="list-style-type: none"> <li>. Partial restoration of flow in Waipio Streams will expand open water areas.</li> <li>. No significant effect on poor habitat of former sugarcane lands.</li> </ul>	<ul style="list-style-type: none"> <li>. None required. Investigations to confirm benefits of higher flow to aquatic life scheduled to be conducted.</li> <li>. None required.</li> </ul>
Flooding	No significant effect on flooding.	None required.
Groundwater	<ul style="list-style-type: none"> <li>. LHD leakage to Hamakua aquifer reduced to approx. 3 MGD</li> <li>. Increased agricultural activity poses risk of agricultural chemicals and nutrients leaching to the groundwater supply.</li> </ul>	<ul style="list-style-type: none"> <li>. None required.</li> <li>. Project-provided technical assistance will ensure that pesticides and fertilizers are applied using NRCS practice standards for nutrient and pesticide management.</li> </ul>
Hazard Waste and Materials	None identified in planning area. None required for project.	None required.
Land Use	<ul style="list-style-type: none"> <li>. Irrigated cropland will increase to projected 2,500 acres.</li> <li>. Approx. 1 acre of farmland converted to reservoir use.</li> </ul>	<ul style="list-style-type: none"> <li>. None required.</li> <li>. Considered a long-term, irreversible and irretrievable commitment of resources.</li> </ul>
Population	No significant effect on area population.	None required.
Prime/Unique Farmland	Increased certainty of irrigation water supply will support use as farmland.	None required.
Streams	<ul style="list-style-type: none"> <li>. Waipio Valley Stream diversion decreased to an average of 9 MGD.</li> <li>. Nearly all Hamakua area flow in streams resulting from ditch leakage will cease.</li> </ul>	<ul style="list-style-type: none"> <li>. Water management body involving affected parties to monitor appropriateness of diversion rate throughout project life.</li> <li>. None required.</li> </ul>
T&E species	No adverse effect to T&E species. No significant effect on newly discovered stream fly.	None required.
Visual Resources	<ul style="list-style-type: none"> <li>. Rural look of region retained.</li> <li>. Twin falls restored.</li> <li>. Wood flumes of LHD converted to pipe.</li> </ul>	<ul style="list-style-type: none"> <li>. None required.</li> <li>. None required.</li> <li>. 2 flumes maintained in wood construction.</li> </ul>
Water Rights	Partial restoration of streamflow to Waipio Valley.	Water measurement in Waipio Valley streams during installation period.
Wetlands	Artificial wetland area created by ditch leakage will be reduced.	None required.

**Relationship Between Local Short-term Uses and Enhancement of Long-term Productivity:** Short-term uses include:

- fuel and energy requirements for the installation of the improvements;
- fluctuation in LHD water supply to farmers and ranchers during construction;
- potential for soil erosion during construction;
- potential for adverse effects to water quality in construction-affected streams; and
- adjustment of Waipio Valley streams and taro growers to increased streamflow.

Long-term productivity is enhanced by the establishment of a stable source of agricultural water for the Hamakua area farmers and ranchers. The gravity-powered agricultural water system will operate without external energy inputs, such as that needed for the wells alternative. The restoration of streamflow is intended to contribute to the recovery of native stream species in the Waipio Valley streams. The use of the surface water source for agricultural use reserves the groundwater along the Hamakua area for other users, especially those requiring a higher level of water quality.

**Unresolved Issues and Areas of Concern:** A remaining issue is diversion of water at the existing stream intakes in Waipio Valley. *The intakes on the diversion structures on Kawainui, Alakahi, and Koiawe Streams will be modified to allow at least 30 percent of the baseflow to pass over the diversion dam. At baseflow periods approximately 6 MGD will pass over the diversion with the potential of 13 MGD capture for LHD use.* The current average diversion rate varies between 25 and 30 MGD and accounts for nearly all the baseflow in the three streams diverted.

A complaint of waste is under review by the Commission of Water Resource Management (CWRM). The complainant seeks restoration back to the source streams, of all flow that is not used for beneficial purposes, pursuant to Chapter 174C, HRS, in the Hamakua area. The complainant seeks restoration of streamflow to "support taro cultivation, appurtenant and riparian water rights, traditional and customary Hawaiian practices, native species and ecosystems, [and] any other beneficial instream uses in Waipio Valley." The amount of water for this request and its uses have not been quantified by the complainant. The existing system must continue to divert 25 to 30 MGD, in order to meet the agricultural water needs of current users, until the implementation of this watershed project which will eliminate the high rate of leakage from the LHD system.

The desire for a cooperative working relationship among the interested parties of the Waipio Valley stream diversions and Hamakua agricultural water use issues has been universally expressed. A draft Memorandum of Understanding providing a basis for cooperation to evaluate water use needs and to develop streamflow prescriptions for Waipio Valley Streams has been prepared and is being reviewed. The agencies and groups participating are DOA, DLNR Division of Aquatic Resources, Commission on Water Resources Management (CWRM), NRCS, Waipio Taro Farmers Association, Waipio Valley Community Association, and the Hamakua-North Hilo Agricultural Cooperative. The participating agencies and groups will be included in the LHD agricultural water system advisory board once the agricultural water system is formally organized.

**Relationship to Other Plans, Policies, and Controls:**

- **State Land Use Districts:** Modification of the intake structures and repair of the tunnel at Hakalaoa Falls will occur on land designated Conservation. *The performance of the work will require a Conservation District Use Application approval.* The repair and rehabilitation of the ditch system proposed by the Selected Plan between the Main Weir at Kukuihaele and Paauilo will be located on land designated Agricultural. The use of this land for such works of improvement is permitted in Agricultural districts.
- **The Hawaii State Plan and State Agricultural Functional Plan:** Implementation of the Selected Plan supports the objectives, policies, and actions relating to agriculture and water use.
- **Hawaii County General Plan:** Several goals, policies, and courses of action stated in the plan support the implementation of the Selected Plan.
- **Hawaii County Agriculture Development Plan:** Agricultural water, as secured by the Selected Plan, was one of six categories identified as needing county attention.
- **Hawaii County Water Use and Development Plan (WUDP):** The most current update of the WUDP was prepared before the collapse of the sugar industry in Hamakua. Discussion for use of the LHD by the County Department of Water Supply during periods of drought and emergency conditions which interrupt municipal sources indicate the continued need for the LHD water system.
- **Hawaii County Code:** Implementation of the Selected Plan will be in conformance with ordinances contained in the Hawaii County Code.
- **Hilo-Hamakua Economic Development Plan:** Development and expansion of diversified agriculture are key to the Economic Development Plan. Action Item 4 under the objective to "maintain strong and viable agriculture in the district" is "Restore Hamakua Ditch."
- **Hawaii Coastal Zone Management Program:** The Lower Hamakua Ditch Watershed project will have no effect on recreational resources or coastal hazards. All other effects are expected to be positive and/or in compliance with the Program objectives.
- **Special Management Area:** The works of improvement provided by the watershed project will occur beyond the SMA boundaries. On-farm assistance provided to agricultural operators and landowners will probably not be great enough to be classified as "development."
- **Ceded Lands Trust:** The total acreage of the ceded lands within the Hamakua project area is 914 acres in 20 parcels. Most of the ceded land is leased to ranchers and the HNHAC. Lease of the ceded lands to Hamakua area farmers and ranchers provides a public use of the land that returns market-based revenues. The use of ceded lands for project improvements conforms with the eligible purposes set forth in Section 5(f) of the Admissions Act.

- **National Flood Insurance Program:** The selected plan is not expected to affect flooding hazard in the watershed.
- **State Water Code:** Hearings can be help to resolve disputes regarding water resource protection, water permits, constitutionally protected water interests, or where there is insufficient water to meet competing needs.
- **Permits and Compliance:** Installation of the Selected Plan will be performed in full compliance with applicable laws and policies of the county of Hawaii, State of Hawaii, and the federal government. The following permits and approvals may be required for project installation.

County of Hawaii Requirements:

- Grading, Grubbing, Excavating and Stockpiling Permit (Dept. of Public Works)
- Building Permit (Dept. of Public Works)
- Special Management Area Permit Assessment (Planning Department)

State of Hawaii Requirements:

- Conservation District Use Application (Dept. of Land & Natural Resources)
- Interim Instream Flow Standard Amendment (DLNR)
- Stream Channel Alteration Permit (DLNR)
- *Stream Diversion Works Modification Permit* (DLNR)
- *Well Construction and/or Pump Installation Permits* (DLNR)
- State Highways Permit (Dept. of Transportation)
- Coastal Zone Management Federal Consistency Review (Office of Planning)

Federal Requirements

- Department of the Army (404) Permit (U.S. Army Corps of Engineers)

- *Waimea-Paauilo Watershed Project: Interaction between the two projects may extend to sharing of administrative facilities and equipment. Maintenance duties for the two systems are expected to be separate. No water will be transferred between the two projects.*

**Consultation and Public Participation:** Consultation with other agencies and participation of the public with input and review were integral parts of all steps in the planning process. The revised DEIS superseded a version submitted in August 1995 that was produced after no less than six public participation meetings and was sent to more than 90 agencies or individuals. Critical review comments on the DEIS requesting additional and detailed information on the plan and effects on the environment prompted further studies and project reformulation.

The need and purpose for the project have remained unchanged from those expressed through the public participation process earlier. The 1998 consultation with agencies and groups reaffirmed the concerns identified in 1995 and led to discovery of additional concerns. This revised Watershed Plan-DEIS (1998 DEIS) for the Lower Hamakua Ditch Watershed includes information requested during review of the earlier DEIS, discusses concerns recently brought to light, and is intended to supersede the 1995 Watershed Plan-DEIS.

The 1998 DEIS was sent to approximately 120 agencies, organizations and individuals for a concurrent NEPA and Hawaii State review. Copies of the DEIS were available at public libraries; NRCS offices in Honolulu, Hilo, and Kamuela; and on the NRCS Hawaii internet site. Comments letters were received from 34 parties. A copy of the FEIS will be sent to each party providing substantive comments on the DEIS.

A well-publicized public meeting was held in Honokaa on January 11, 1999 at which the Selected Plan and its effects were discussed. Approximately 50 persons attended the meeting. Questions, comments, and responses from the meeting were recorded, sent to attendees, and are included in the Final EIS.

All comments were considered, and modifications, as required, to the 1998 DEIS were made to produce this FEIS. All comments were provided a response in writing and both the comments and responses are included in the FEIS. Notices of availability of the FEIS will appear in both the Environmental Notice and Federal Register.

*After issuance of the FEIS, separate state and federal no action periods must be observed during which objections to the project may be brought up. A decision to proceed with project implementation, will be widely published and will be sent to recipients of the FEIS.*

*This Final Watershed Plan-EIS will be used by NRCS to request funds for the federal share of the installation cost of the Selected Plan and by the Sponsors to obtain the necessary local funding from the state legislature or other sources.*

**Probable Adverse Environmental Effects Which Cannot Be Avoided:** The repair and rehabilitation of some LHD elements, particularly flumes, will require its reconstruction in new construction methods and materials. The need to assure reliability, at reasonable expense, requires the conversion of parts of the historic structure to modern construction. Mitigation will include retention of two exemplar flume structures in near original construction and materials. Photographic documentation of significant features of the LHD which will be modified by the project will also be conducted.

Air pollution and erosion and sedimentation may temporarily increase during repair and rehabilitation activities. Increased agricultural activity in the watershed as a result of the project may also increase air pollution and erosion and sedimentation. Air quality and erosion control plans developed for construction activity and farming will minimize those effects.



# 1. INTRODUCTION

## 1.1 GENERAL

The purpose of the Lower Hamakua Ditch Watershed project is to alleviate the agricultural water shortage and uncertainty problems in the Hamakua area of the island of Hawaii, County of Hawaii. The poor infrastructure condition and uneven areal distribution of water for crop irrigation and livestock drinking cause water shortages for farmers on the Paauilo end of the system, particularly during dry periods. Dependable agricultural water supply is essential for economic revitalization of the area, in part, through diversified agricultural development. A state-operated agricultural water system can be established under the provisions of Chapters 167 and 168, HRS.

The bankruptcy of the Hamakua Sugar Company (HSC) and the neighboring Hilo Coast Processing Company (HCPC) in the early 1990's forced the Hamakua communities, County of Hawaii, and the State of Hawaii to evaluate alternatives to maintain employment and economic activity. Conversion of the surrounding cropland from sugarcane production to diversified agriculture was held as a key to the transition. The State of Hawaii Department of Agriculture (DOA) became responsible to secure the land and infrastructure requirements for the transition to diversified agriculture.

Project planning to secure a stable, consistent supply of agricultural water began in April 1995 with a request to the U. S. Department of Agriculture (USDA) for federal assistance by the DOA. On June 8, 1995, planning assistance for the Lower Hamakua Ditch Watershed (see map Figure 2) was authorized by the Chief of the USDA Natural Resources Conservation Service (NRCS). An accelerated planning process by NRCS and the sponsors resulted in a Watershed Plan and Draft Environmental Impact Statement (DEIS) in October 1995.

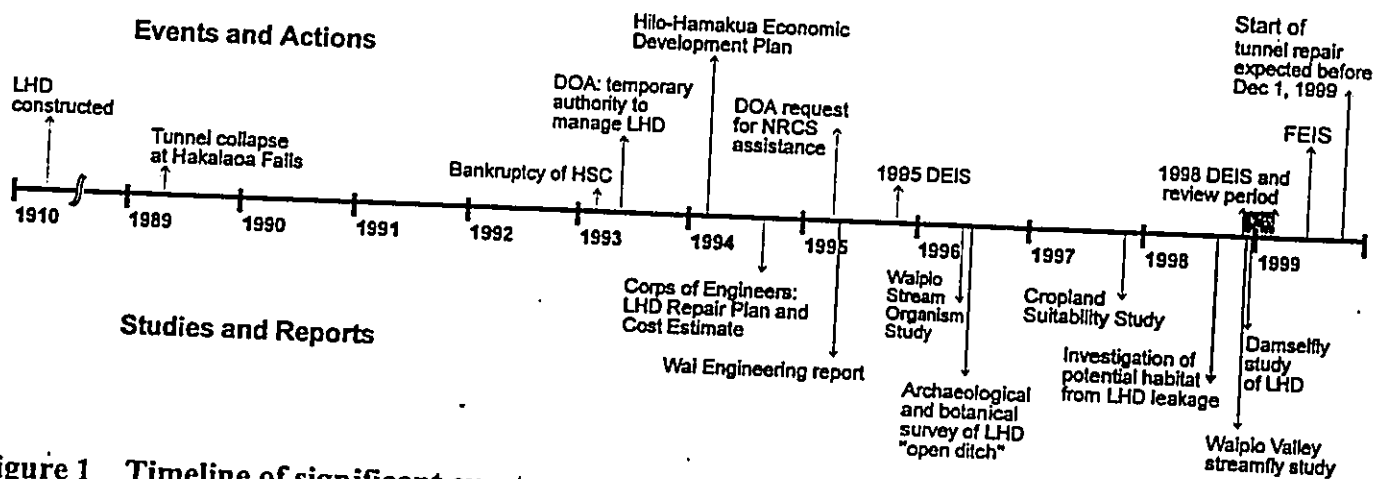


Figure 1 Timeline of significant events

Review comments on the 1995 DEIS, requesting additional information on the project plan and effects on the environment, prompted additional studies and project reformulation. *In December 1998 a revised document which incorporated the requested information was issued as a revised Watershed Plan and Draft Environmental Impact Statement, superseding the 1995 DEIS.*

The Lower Hamakua Ditch Watershed project was undertaken by the NRCS, formerly known as the Soil Conservation Service, at the request of the following local sponsoring organizations (Sponsors):

- State of Hawaii, Department of Agriculture
- Hamakua Soil and Water Conservation District
- Mauna Kea Soil and Water Conservation District

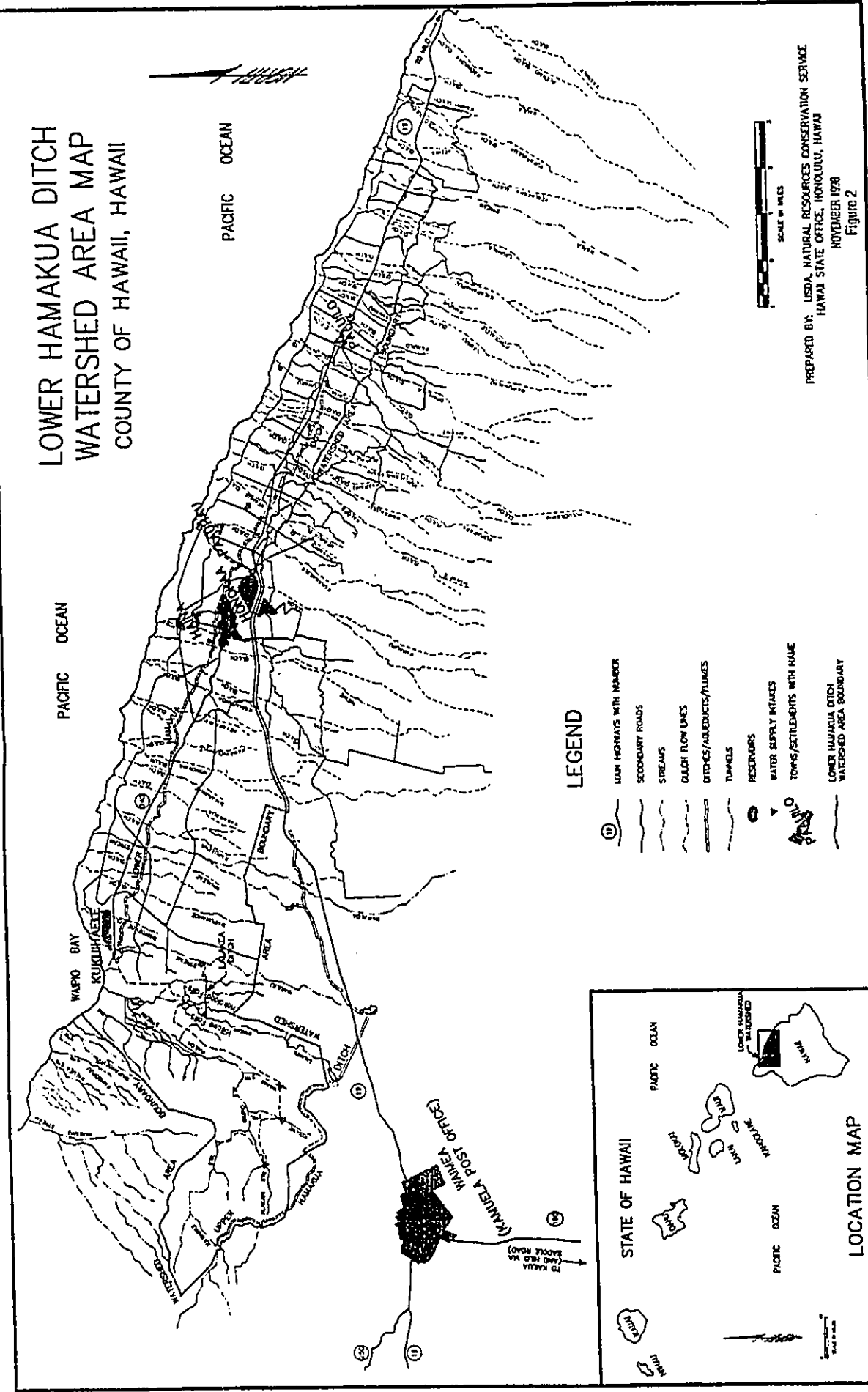
Project planning and the preparation of the Watershed Plan and Environmental Assessment (EA) and Watershed Plan and Environmental Impact Statement (EIS) were led by the NRCS with assistance from the Sponsors. Other federal, state, and county agencies, groups, and individuals also assisted with project planning by providing information and reviewing draft plans.

The Lower Hamakua Ditch Watershed project is planned and implemented under the authority of the Watershed Protection and Flood Prevention Act, Public Law 83-566 (PL 83-566), as amended (16 U.S.C. 1001-1008). *PL 83-566 authorizes federal technical and financial assistance to local sponsoring organizations to address water resource problems, including watershed protection, flood prevention, agricultural water management, nonagricultural water management, groundwater recharge, water quality management, and municipal and industrial water supply. Under the purpose of agricultural water management, irrigation projects can include land treatment practices and structural measures.*

Project planning was conducted and this Final Watershed Plan-EIS was prepared to fulfill the requirements of the:

- 1) National Environmental Policy Act of 1969 (NEPA), as amended, Public Law 91-190, 42 U.S.C. 4321- et seq.;
- 2) Hawaii environmental review process as defined in Chapter 343, HRS, including Act 241, SLH 1992 revisions, and Title 11, Chapter 200, Hawaii Administrative Rules, Department of Health;
- 3) Water Resources Council's Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (U.S. Water Resource Council, 1983); and
- 4) NRCS's National Watershed Manual (USDA, 1992).

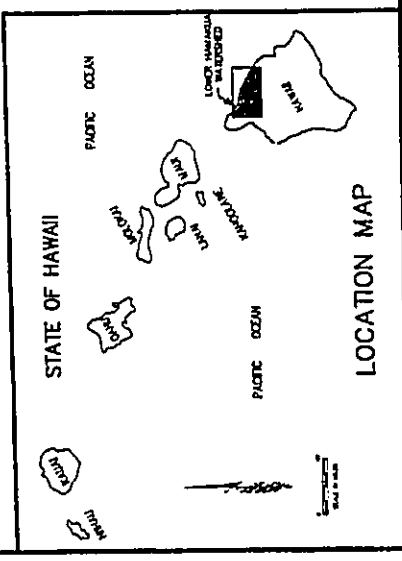
# LOWER HAMAKUA DITCH WATERSHED AREA MAP COUNTY OF HAWAII, HAWAII



## LEGEND

- ⑩ HIGHWAYS WITH NUMBER
- SECONDARY ROADS
- ~ STREAMS
- DITCH FLOW LINES
- DITCHES/AQUEDUCTS/TUNNELS
- TUNNELS
- RESERVOIRS
- ▲ WATER SUPPLY INTAKES
- ▲ TOWNS/SETTLEMENTS WITH NAME
- LOWER HAMAKUA DITCH WATERSHED AREA BOUNDARY

PREPARED BY: USDA, NATURAL RESOURCES CONSERVATION SERVICE  
HAWAII STATE OFFICE, HONOLULU, HAWAII  
NOVEMBER 1978  
Figure 2



The revised 1998 EIS was made available for public review and comment for a 45-day period December 1998 to February 1999. The comment period commenced with the publication of the Notice of Availability for this DEIS in the Federal Register and the Environmental Notice for the federal and state review processes, respectively. The availability of the DEIS was publicized in state and local publications and copies were widely distributed to approximately 120 governmental agencies, organizations, and interested individuals.

Thirty-four comment letters were received during the review period. All comments were provided a response in writing and both the comments and responses are included in this FEIS. All comments were considered, and modifications, as required, to the revised DEIS were made to produce this FEIS. Notices of availability of the FEIS will appear in both the Environmental Notice and Federal Register. A copy will be sent to each individual, agency, or group providing substantive comments on the DEIS.

*After issuance of the FEIS, separate state and federal processes must be completed before project implementation can begin.* Following the acceptance of the FEIS by the Governor of the State of Hawaii, there will be a 30-day no action period during which objections to the project may be brought to the Hawaii Circuit Court. For the federal process, a 30-day no action period following the publication of the Notice of Availability in the Federal Register will be observed after which a Record of Decision (to proceed with project implementation) can be issued by the NRCS. The availability of the Record of Decision will be widely published and will be sent to recipients of the FEIS.

NRCS will use this Final Watershed Plan-EIS to request funds for the federal share of the installation cost of the Selected Plan. The Sponsors will be responsible for obtaining the necessary local funding from the state legislature or other sources. It is anticipated that funding will be requested in increments as installation proceeds. The Sponsors have acquired appropriations of \$1,000,000 in Act 116, SLH 1998 and \$2,290,000 in Act 91, SLH 1999 for implementation of the initial phase of the Selected Plan. Further implementation of the Selected Plan will depend on the availability of both federal and local funding.

## **1.2 READER'S GUIDE**

This reader's guide briefly describes the contents of this Final Watershed Plan-EIS.

*All substantive changes made to the 1998 DEIS in this FEIS have been indicated by italics.*

*This document combines the Watershed Plan for the LHD Watershed with the federal and state Environmental Impact Statements. While this Plan-EIS is generally configured in the suggested format for the EIS, additional information is included to conform its contents to the NRCS Watershed Manual.*

A Table of Contents, List of Tables, List of Figures, Glossary of Abbreviations, and a Metric Conversion Table are provided to make reading and using the Watershed Plan-EIS easier.

The **Summary** describes the plan in brief. Other sections should be consulted if specific details of the project are desired.

**Section 1. INTRODUCTION** provides background information about the Lower Hamakua Ditch Watershed project and includes this Reader's Guide.

**Section 2. PROJECT PURPOSE AND NEED** describes the purpose of the project and demonstrates the need for the watershed project by describing and quantifying the problems that need to be solved as well as the opportunities for enhancing the quality of life in the watershed area, based on public concerns and desires.

**Section 3. FORMULATION AND COMPARISON OF ALTERNATIVES** describes the formulation and comparison of the alternative plans and rationale for the selection of the Selected Plan. Table H, Summary and Comparison of Alternative Plans, presents a tabular comparison of the plans considered as the Selected Plan.

**Section 4. SELECTED PLAN** describes the measures to be installed as proposed by the Selected Plan. The following tables are included in this section (on colored paper for ready reference):

**Table 1 - Estimated Installation Cost**

**Table 2 - Estimated Cost Distribution**

**Table 4 - Estimated Average Annual NED Costs**

**Table 6 - Comparison of NED Benefits and Costs**

**Section 5. PROJECT SETTING** begins the body of the Watershed Plan-EIS. It describes pertinent environmental, social, and economic information about the watershed area.

**Section 6. EFFECTS OF THE SELECTED PLAN** describes the economic, environmental, and social effects of the Selected Plan and any planned mitigation measures.

**Section 7. CONSULTATION AND PUBLIC PARTICIPATION** documents the opportunities provided for public participation and agency consultation throughout the planning process.

**WATERSHED PLAN-EIS PREPARERS** is a table listing the names and qualifications of the persons involved in preparing the various drafts of the Watershed Plan-EIS.

**REFERENCES** list the sources used in preparation of this Watershed Plan-EIS.

**GLOSSARY** defines terms that may be unfamiliar to persons not involved in *water resources*, agriculture or from outside of Hawaii.

**INDEX** is available to make finding information about a particular subject easier.

The Appendices consist of the following:

Appendix A - Comments and Responses to DEIS

Appendix B - Investigation and Analysis

Appendix C - Hawaii Coastal Zone Management Assessment

Separate documentation with additional information regarding the environmental evaluations conducted for the project have been prepared and are available for review by request from the NRCS contact person listed below.

Questions regarding the contents of this Watershed Plan-EIS may be referred to:

Kenneth M. Kaneshiro, State Conservationist  
USDA, Natural Resources Conservation Service

Mailing address: P.O. Box 50004  
300 Ala Moana Blvd., Room 4316  
Honolulu, HI 96850-0050

Telephone number: (808) 541-2600, extension 105

FAX number: (808) 541-1335

Internet: <http://hi.nrcs.usda.gov/index>

## 2. PROJECT PURPOSE AND NEED

### 2.1 PROJECT PURPOSE

The purpose of the proposed project is to *alleviate the agricultural water shortage problems in the Hamakua area and provide a stable, adequate, and affordable supply of agricultural water to farmers and other agricultural producers in the Lower Hamakua Ditch (LHD) service area.* The uncertainty of the temporary operation of the LHD by the DOA has worried farmers who currently depend on the LHD for agricultural water supply. This concern has prevented fuller investment in agricultural enterprise in this area of the Hamakua coast between Paauiilo and Kukuihaele. The decaying condition of some components of the LHD and its continued deterioration have resulted in failures disrupting water supply and causing economic losses.

The proposed project supports and complements state and county policies and programs intended to provide employment opportunities and economic revitalization for the Hamakua region following the collapse of the sugarcane industry in Hamakua in the early 1990s.

The proposed project takes advantage of opportunities to enhance social and environmental resources in the Hamakua and Waipio Valley areas, including *restoration of water not needed for agriculture in Hamakua* to the Waipio stream sources and restoration of Hakalaoa Falls, one of the twin falls at Hiilawe.

#### 2.1.1 Closure of Hamakua Sugar Company

As in most rural areas of Hawaii during its "plantation-era," the Hamakua Sugar Company and its predecessors provided the lifeblood for Kukuihaele, Honokaa, Paauiilo, and other Hamakua coast communities. The bankruptcy filing of the Hamakua Sugar Company (HSC) in March 1993 and its closing in 1994 resulted in the loss of employment for approximately 600 workers and revenue and job losses for area merchants and service workers as well. The HSC closing followed closely the closing of the Hilo Coast Processing Company (HCPC), the other large sugar company on the Hamakua coast. Approximately 600 jobs were also lost with the HCPC closure. Many intangibles of the social organization of the region were also affected by the economic losses.

*The terms of the HSC bankruptcy settlement are contained in the filing of the U.S. Bankruptcy Court, District of Hawaii, Case 92-00865 (Chapter 11), in re Hamakua Sugar Company, Inc.*

The closing of the HSC also idled about 21,400 acres of former sugarcane cropland in the LHD watershed area. Other HSC infrastructure, including the LHD, Haina Mill electric power generator, and community water systems, were abandoned with little planning for their future usefulness.

A number of government-sponsored and self-help efforts were established to assist the former sugar industry workers to regain employment and to revitalize the regional economy. The Hilo-Hamakua Coast Revitalization Effort served as

the umbrella organization for the many programs and activities intended to assist the Hamakua communities. Seven Task Forces—diversified agriculture, employment and training, housing, family and community support, health care, economic development, and Hilo/Hamakua high tech—were organized through the Hilo Coast and Hamakua Sugar Assistance Steering Committees to assist former employees and families and to address economic recovery issues. The Task Forces identified and utilized existing programs and fund sources and promoted the creation of new programs to achieve their objectives.

The Diversified Agriculture Task Force was formed to help the displaced worker to have continued agricultural opportunities. The Task Force fostered the creation of the Hamakua/North Hilo Agricultural Cooperative (HNAHAC). The HNAHAC was initially able to obtain the lease to over 400 acres of state land and allow its members to start up a variety of alternative crops and ventures. The HNAHAC also obtained state legislative appropriation and Department of Defense agricultural grants to assist their members with capital costs of farm startup.

The HNAHAC has a membership of approximately 130 and now subleases 1,438 acres to its members for ranching, papaya, coffee, macadamia, other diversified agriculture, and aquaculture. *Approximately 600 acres are cropland, with the remaining acres in pasture.*

#### **2.1.2 Poor Present Condition of the Lower Hamakua Ditch**

The LHD provides nearly all the irrigation water presently used between Kukuihaele and Paauilo. The system is currently maintained the DOA under the bankruptcy settlement agreement among major creditors in 1993. This authority and funding was extended in 1997 and continues on a year-to-year basis. During this period, the DOA, through a maintenance contractor, is responsible for the continued operation of the LHD to provide agricultural water to start-up farmers on former sugarcane land. An average of approximately \$350,000 per year in state funds have been made available for maintenance activity and to repair service-threatening failures. No funds have been appropriated to perform major preventative repairs on components or to replace components that have served their useful life and are subject to imminent failure.

The LHD was constructed in the early 1900s and was completed in July 1910. The ditch was designed to use the Waipio Valley stream sources to flume cut sugarcane stalks from upland fields to the processing mills located along the Hamakua coastline. In later years as mechanized sugar harvesting and processing and irrigation systems evolved and developed, the LHD was used as a source of irrigation water for sugarcane *and wash water at the sugar mills*. The LHD initially had a delivery capacity of about 40 MGD and currently operates in a 25 to 30 MGD range. The baseflow level is 18 to 19 MGD. (Mink, 1984)

Existing HSC lateral distribution systems are currently used by farmers and are often repaired and extended to their fields using available materials. Vandalism and scavenging have resulted in the loss of some of the lateral systems. The lateral systems accommodate elevation changes of up to 800 feet and require



constant inspection and maintenance of pressure relief systems to prevent pressure-related failures. Hydraulic inefficiency and water leakage are problems on the lateral systems.

A considerable volume of water is lost through leakage and seepage from the open ditch reaches, reservoirs, and laterals. In 1995, it was estimated that 5.5 MGD is lost daily (DEIS, 1995). Recent observations indicate that considerably more water is being lost due to the further deterioration of the ditch infrastructure. While much of the leakage occurs at deteriorating flume sections, water is also lost due to cracking and uplifting of the concrete lining, higher water levels caused by sediment deposition, infiltration and evaporation at reservoirs, and leakage at fittings and valves on laterals.

The hydraulic efficiency of the ditch and its capacity is compromised by sediment deposition. The raised water levels in the ditch as a result of the slowing effect by the deposition increases the loaded weight on flume supports and lateral pressures on flume sidewalls increasing failure rates. Sediment deposition in the open ditch is caused by undiverted runoff into the ditch, broken sidewall linings, collapsed tunnel crowns, and livestock access into the ditch. No regular maintenance has been provided to remove the sediment *which is over a foot deep in places along the ditch.*

There is no authority to assess charges from users for the water during the temporary DOA operation. Water use is declared and recorded, however, as required by the State Water Code. Numerous unrecorded connections to the LHD and its laterals exist due to the lack of a formal irrigation district authority and insufficient maintenance staff.

### **2.1.3 Present and Future Condition of Farming Activity**

Farmers in the HNHAC have received assurances that water from the LHD will continue to be available to their leased parcels. Low lease rates and favorable lease conditions have been offered in the state-owned farming areas. *While the subleases through the HNHAC are month-to-month,* lease termination occurs only with noncompliance with the lease terms. Grants to assist with cropland preparation have also been made available to reduce the initial capital costs of farming. These farmers, mostly former sugar industry workers, have enthusiastically entered into the farming enterprise. Although a few have invested considerable sums of their own funds into their operations, for most of the HNHAC farmers, the investment in farming has been largely sweat equity.

*Small farmers also lease cropland from the Kamehameha Schools/Bishop Estate (KSBE) and other private landowners.* Small farmers on non-state-owned parcels face additional costs and risks to enter into farming. Lease rents and terms are not as favorable for small farmers on the larger estates as it is for state-owned land. While the farmer is responsible for much of the land and infrastructure improvement, the lease can be terminated by the owner at nearly any time as most leases are month-to-month or year-to-year. Small farmers who have leased farm parcels on short-term arrangements have hesitated to install costly improvements.

# CORRECTION

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

constant inspection and maintenance of pressure relief systems to prevent pressure-related failures. Hydraulic inefficiency and water leakage are problems on the lateral systems.

A considerable volume of water is lost through leakage and seepage from the open ditch reaches, reservoirs, and laterals. In 1995, it was estimated that 5.5 MGD is lost daily (DEIS, 1995). Recent observations indicate that considerably more water is being lost due to the further deterioration of the ditch infrastructure. While much of the leakage occurs at deteriorating flume sections, water is also lost due to cracking and uplifting of the concrete lining, higher water levels caused by sediment deposition, infiltration and evaporation at reservoirs, and leakage at fittings and valves on laterals.

The hydraulic efficiency of the ditch and its capacity is compromised by sediment deposition. The raised water levels in the ditch as a result of the slowing effect by the deposition increases the loaded weight on flume supports and lateral pressures on flume sidewalls increasing failure rates. Sediment deposition in the open ditch is caused by undiverted runoff into the ditch, broken sidewall linings, collapsed tunnel crowns, and livestock access into the ditch. No regular maintenance has been provided to remove the sediment *which is over a foot deep in places along the ditch.*

There is no authority to assess charges from users for the water during the temporary DOA operation. Water use is declared and recorded, however, as required by the State Water Code. Numerous unrecorded connections to the LHD and its laterals exist due to the lack of a formal irrigation district authority and insufficient maintenance staff.

### **2.1.3 Present and Future Condition of Farming Activity**

Farmers in the HNHAC have received assurances that water from the LHD will continue to be available to their leased parcels. Low lease rates and favorable lease conditions have been offered in the state-owned farming areas. *While the subleases through the HNHAC are month-to-month,* lease termination occurs only with noncompliance with the lease terms. Grants to assist with cropland preparation have also been made available to reduce the initial capital costs of farming. These farmers, mostly former sugar industry workers, have enthusiastically entered into the farming enterprise. Although a few have invested considerable sums of their own funds into their operations, for most of the HNHAC farmers, the investment in farming has been largely sweat equity.

*Small farmers also lease cropland from the Kamehameha Schools/Bishop Estate (KSBE) and other private landowners.* Small farmers on non-state-owned parcels face additional costs and risks to enter into farming. Lease rents and terms are not as favorable for small farmers on the larger estates as it is for state-owned land. While the farmer is responsible for much of the land and infrastructure improvement, the lease can be terminated by the owner at nearly any time as most leases are month-to-month or year-to-year. Small farmers who have leased farm parcels on short-term arrangements have hesitated to install costly improvements.

There are farmers and landowners with plans for larger farms or agricultural developments. Some have made the investments on the private lands for infrastructure improvement and have taken steps to ensure their supply of water by developing or identifying backup wells. Others are delaying their startup until the certainty of obtaining consistent water supply from the LHD is established.

If the proposed project is not implemented, the DOA will likely continue to try to develop a managed agricultural water delivery system using the LHD. However, with the limitations on the state budget for agricultural development, other prior funding commitments, inability to provide technical assistance, and higher priority areas elsewhere, the likelihood is low that the DOA will be able to allocate planning and design funding and subsequent construction funding to the LHD project. A year-to-year continuation of the present situation is most likely. The minimum level of funding to keep water flowing in the LHD will be continued.

It is likely that failures along the ditch which can curtail flow in the ditch or shut down a lateral for one to two days will occur frequently, such as twice monthly. It is estimated that closures of the ditch lasting between three and fourteen days may take place once every two months. Major failures that close the ditch from two weeks to two months may take place approximately every other year.

If the proposed project is not implemented, farming activity, especially by small start-up farmers, between Paauilo and Kukuihaele will decline. Larger farmers may continue to cultivate crops that are less drought-sensitive, such as orchard crops. Some may invest in development of wells to limit losses during water stoppage periods.

Commercial truck farming, which is very sensitive to effects of drought, will not be viable due to the uncertainty of consistent water supply. High value vegetable, flower, and ornamental crops will not be grown in the project area except with costly municipal or well water sources.

*Unless otherwise directed by the Commission on Water Resources Management (CWRM),* without implementation of the proposed project, no modification of the intake structures to limit diversion of Kawainui, Alakahi, and Koiawe streams will occur. Maintenance of the intakes will continue and sediment boxes will be flushed infrequently by the maintenance contractor. The intakes will continue to divert the streams at current rates that are comparable to that during sugarcane cultivation when the intakes are maintained. Water that is diverted from the streams, but unused for agriculture, will continue to be released at the Main Weir at Kukuihaele, through the numerous system leaks, or at the overflow weirs along the LHD. Successful pursuit of the current complaint to CWRM charging waste of water in the LHD system may require a reduction in diversion rates from Waipio Valley.

#### 2.1.3.1 Projection of Future Farming Activity and Acreage

The 1995 evaluation, for this project, of farming activity in the Hamakua area was conducted shortly after the closure of HSC. The likelihood of diversified

agricultural activity becoming established, successful, and leading the economic revitalization of the area economy was uncertain. Comments during the review of the 1995 DEIS included questions about the feasibility of diversified agriculture in the area, the number of former sugar industry workers available and willing to enter into diversified agriculture, a marketing strategy for the produce, the need for continued state subsidization, and the difficulty of the DOA to operate the water system for which they did not have water and landrights.

During the period between 1995 and 1998, many of the concerns about the project were resolved. The DOA has negotiated an agreement with KSBE to obtain management and control of the ditch portion owned by KSBE for a 35-year period. The successful agricultural sublease program which is in high demand by prospective farmers and the expansion of the total acreage that the HNHAC leases from the state for its members affirms the feasibility of providing former sugar industry workers with diversified agricultural opportunities and of smaller-scale commercial agriculture. The considerable numbers of former sugar industry workers and others who are willing to invest labor and capital on the state-owned agricultural lots signals their commitment to longer-term economic objectives. There has also been a shift in crop types since 1995 providing more stability and marketing potential. While the 1995 crop mix included taro, ginger, dracaena, papaya, and other tropical fruits and vegetables, the major crops being considered in 1998 are orchard crops, mainly coffee and macadamia nut. These crops also increase the opportunity to add value within the Hamakua area through processing, packaging, and marketing. Other crops such as papaya, orchard fruits, foliage and flowers, and truck crops will also be cultivated

To provide an estimate of the projected cropland acreage and approximate cropland location if the watershed plan is implemented, interviews were conducted with HNHAC farmers, other farmers, farm interest groups, landowners, ranchers, and others. Most farmers in all categories responded that they would intensify or expand their farm operations once the LHD water supply is ensured. Many larger farm operators and landowners could not disclose in detail what their plans or those of their agricultural lessees would be with assurance of agricultural water supply. There was general agreement for greater investment and expansion of crop acreage with the repair and rehabilitation of the LHD.

A cropland suitability study for the project area was conducted for the project to identify land areas best suited for six crop types—coffee, macadamia nut, papaya, banana, foliage and flowers, and truck crops. The crop suitability study evaluated slope, topography, depth to bedrock, stoniness, drainage, rainfall, temperature, and soil fertility. Lands in the agricultural parcels of the project area were rated good, fair, and poor for the cultivation of the above crops with and without irrigation.

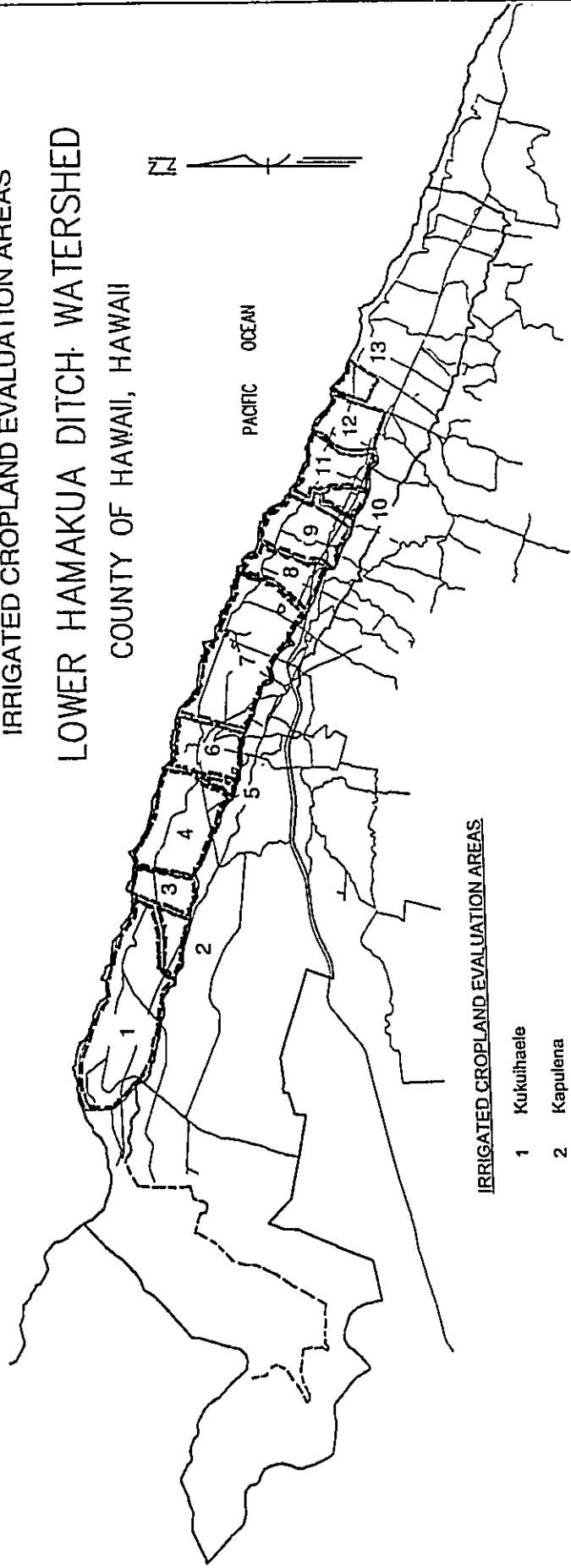
*The suitability study report (Maptech, 1997) shows that the areas best suited for agricultural production are located on the Paauilo-Paauhau side of the service area. The report also documents the need for irrigation water in order to utilize the cropland for most of the crops evaluated.*

Farm interview data, crop suitability analyses, and land ownership were combined in a generalized way to identify 13 sub-areas for present and future crop acreage as depicted in and listed in Table A. While detailed crop acreage could not be determined with the available information, reviews by the farmers and farm groups indicated that the future crop acreage presented a possible and likely scenario. From the current estimate of 600 acres of irrigated cropland, the supply of irrigation water at rates comparable to other state irrigation systems will result in a built-out condition of approximately 2,500 acres of irrigated cropland. *Achievement of the build-out condition is estimated to take place in five to ten years.*

**Table A**  
**Projected Irrigated Cropland with Project Implementation**

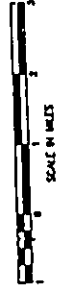
Area no.	Area	No. of Agricultural Parcels (TMK)	Major Landowners	Total Area (acres)	Truck Crops (acres)	Tree Crops (acres)
1	Kukuihaele	15	KSBE	2,449	0	181
2	Kapulena	4	Kapulena Orchards	184	0	109
3	Honokaia	8	State	529	0	286
4	Ahualoa	4	KSBE, State	1,655	0	291
5	Nienie	2	State	117	0	68
6	Haina	2	Tut Bros./Enserch	719	29	279
7	Paauhau	15	KSBE, Kualoa Ranch, State	2,168	36	366
8	Kalopa	35	Small private	482	16	228
9	Pu'u'ala	6	KSBE, Cooper Estate	784	13	152
10	Kaunamano	17	Small private	87	4	53
11	Paauilo West	3	State	552	14	139
12	KSBE Paauilo	6	KSBE	589	10	131
13	HNHAC Paauilo	3	State	157	7	99
<b>Total</b>		<b>120</b>		<b>10,472</b>	<b>129</b>	<b>2,382</b>

IRRIGATED CROPLAND EVALUATION AREAS  
 LOWER HAMAKUA DITCH WATERSHED  
 COUNTY OF HAWAII, HAWAII



IRRIGATED CROPLAND EVALUATION AREAS

- 1 Kukuihaele
- 2 Kapulena
- 3 Honokaia
- 4 Ahualoa
- 5 Nienie
- 6 Haina
- 7 Paauhau
- 8 Kalopa
- 9 Pu'u'ala
- 10 Kaunamano
- 11 Paauilo West
- 12 KSBE Paauilo
- 13 HNHAC Paauilo



PREPARED BY: USDA, NATURAL RESOURCES CONSERVATION SERVICE  
 HAWAII STATE OFFICE, HONOLULU, HAWAII  
 NOVEMBER 1998

Figure 3

### 2.1.3.2 Cropland Water Needs

Irrigation water is necessary for most intensive commercial agricultural activity in the Paauilo to Kukuihaele area below the Hamakua Ditch. (See Appendix B - Investigation and Analysis - Hydrology) The average annual rainfall ranges from 61 inches to 97 inches for the seven rain gage stations in and around the project area. The average annual rainfall for the seven gages is 78 inches. The average annual pan evaporation rate for eight pan evaporation stations in and around the project area ranges from 72 inches to 88 inches. The average annual pan evaporation rate for the eight stations is 79 inches. At Station No. 217.00 at the 400-foot elevation in Paauhau, which is approximately the geographic center of farming activity in the project area, the average annual pan evaporation rate is 86 inches and the average annual rainfall over the past 102 years has been 68 inches.

A very pronounced seasonal variation of rainfall and pan evaporation intensifies the need for irrigation supply during the dry season that extends from May to October. During these six months, on average, less than one third of annual rainfall occurs while 58 percent of the annual pan evaporation takes place.

The irrigation water requirement analysis conducted for this project evaluated monthly and annual water requirements for banana, coffee, macadamia nut, papaya, flowers and foliage, and truck crops grown below 500 feet elevation and above 500 feet elevation (Table B). Monthly and annual rainfall were correlated to frequency at seven stations based on 44 to 102 years of record at each station. The irrigation water requirements for a reference crop with an average water requirement of the six crops evaluated were derived for 50 percent frequency of rainfall, which is the average condition, and 80 percent frequency of rainfall, which is indicative of a dry year that is the second driest of a ten-year period. The objective of the project was to ensure sufficient irrigation water for 80 percent frequency of rainfall.

**Table B**  
**Daily Irrigation Water Need Per Acre of Cropland for Reference Crop**

	50% frequency (average year)		80% frequency (dry year)	
	Average	Peak	Average	Peak
Cropland below 500'	1,500	4,700	2,100	5,300
Cropland above 500'	900	3,500	1,350	4,200
Project area average	1,200	4,100	1,725	4,750



*The project water need is based on the projected acreage of irrigated cropland that will be developed during the mid-term future of five to ten years which has been established at 2,500 acres. The daily peak system demand for crop irrigation was determined by multiplying the project area average daily peak demand during the 80 percent rainfall year, rounded to 5,000 gallons per day, by 2,500 acres. The project objective will be to provide 12.5 MGD, during drought periods to farmers. The average daily water demand for the buildout condition is estimated to be 3 MGD.*

#### *2.1.3.3 Aquaculture*

*One major aquaculture operation and several smaller efforts were identified during the planning period. All of the aquaculture operations cultivate varieties of tilapia. Most raise the white/pink variety of tilapia, often marketed as Hawaiian sunfish or golden perch.*

*The major aquaculture operation is located in HNHAC Paauilo West area. The facility consists of 13 above-ground, 30,000-gallon tanks and a processing building. Each tank was capable of raising 15,000 fish. Water from the LHD is piped directly into the tanks. The water in the tanks is replaced frequently. Effluent from the tanks is used to irrigate papaya.*

*Some farmers are experimenting with aquaculture operations and some expect to enter into the commercial market at some time in the future.*

*While the future level of aquaculture activity in the Hamakua project area is somewhat uncertain, aquaculture appears to be a viable enterprise with a potential for growth. Water use for aquaculture activities has not been well evaluated and quantified. A 1-MGD projected water need for aquaculture operations will be assumed for the future.*

#### *2.1.3.4 Ranching*

*Approximately 6,000 acres of pastureland is expected to remain in the project area. The pastureland will not be irrigated. Cattle will be provided drinking water from the LHD. Presently, cattle have access, in places, directly to the open ditch sections and settling ponds causing sedimentation, water quality degradation, and infrastructure damage. With an agricultural water project, cattle will be excluded from the LHD infrastructure and will be provided water only at troughs.*

*The stocking rate of the pasture in the project area has been assumed to be two acres per animal unit. The daily drinking water demand has been estimated to be 15 gallons per animal unit per day. For the 6,000 acres of pasture, the 3,000 head of cattle will need approximately 45,000 gallons per day.*

## 2.2 PROBLEMS AND OPPORTUNITIES

### 2.2.1 Lower Hamakua Ditch

The lack of adequate maintenance on the nearly 100-year old LHD system since the period preceding the bankruptcy of the Hamakua Sugar Company beginning in the 1980s has severely compromised the integrity of many of the components of the LHD system and has decreased its efficiency.

Of the four intakes and one pump installation that supply water to the LHD, only the Kawainui, Alakahi, and Koiawe stream intakes are functioning at this time. The Waima Stream intake is blocked by rubble and the two 200-hp Waima pumps have not been operated since closure of HSC. While in need of major repair, the existing intakes continue to divert sufficient water for the current Hamakua demand with infrequent flushing of the sediment traps. Deterioration of the intake structures includes bent and broken steel gratings which screen coarse sediment and vegetative debris from the sand traps, damage to and undermining of the spillway and apron structures at Kawainui and Koiawe, and inoperational diversions around the intake structures for use during construction and maintenance. A major cause of damage to the intake structures, and a hazard to the maintenance crews, is rockfall from the tall, steep valley walls. A result of decreased maintenance is a high rate of coarse sediment entering and depositing in the LHD system.

Access to the stream intakes for maintenance activity has become more difficult due to the lack of upkeep of the roads and trails. The intakes have always been accessible only by foot after the second ford of the Wailoa River or by helicopter. In recent years, the fords have been unusable and wading across the Wailoa River and hiking the entire distance has been required of the maintenance crews. During periods of high water, access to the intakes has been limited by the ability to twice cross the Wailoa River. It is estimated that the loss of the vehicular road to the trail head adds an additional 2.5 hours to the round trip.

Constant erosion and earth slippage along the wet and very steep valley walls required continual re-establishment of the trails to the stream intakes. During the planning period, at least three earthquakes occurred which caused slides and spalling of steep valley walls obliterating existing access paths. Trails to Koiawe and Alakahi intakes may have been lost prior to closure of the Hamakua Sugar Company. A recent landslide along Kawainui Stream has rendered access to all three operating diversions limited to the stream bed. Stream bed access is more difficult, more dangerous, and limited to periods of low stream flow.

The ten miles of tunnel set in the valley walls leading from the intakes to the open ditch system at Kukuihaele are in good condition with the exception of the problem at Hakalaoa Falls, sediment accumulation on the tunnel floor, and deterioration of some redwood board weir structures at access tunnels to the cliff wall.

The most pressing repairs are needed along the 14.5 miles of the open ditch system. Half of the 50 flumes along the open ditch system are in need of

immediate repair to stop major leakage from flume sides and bottoms, to replace structural flume components before walls or floors collapse, and to repair or replace support structures to correct sags and to prevent collapse. It is feared that the loss of a major flume may shut off water to downstream farmers for many months before a repair can be funded, contracted, and constructed.

Nine of the 33 open ditch sampling locations evaluated by Wai Engineering in 1995 were rated poor due to siltation, extensive damage to the concrete lining, and vegetative growth in the ditch (Wai Engineering, 1995). At nearly every station, cracking of the concrete lining and sediment deposition was observed. Cracks in the lining contribute to water loss from the ditch system but *is thought to be* not as significant as leakage from flumes. *The leakage through the concrete lining has not been quantified.* Sediment accumulation in the ditch system generally slows flow rates and increases water depth. Increased water depths cause increased leakage from the ditch system.

A major problem along the open ditch is access of cattle and horses to the ditch. Approximately 8 miles of ditch border pasture. While fencing and electric wire are used along 1.9 miles on the upslope side of the ditch and 1.5 miles on the downslope side, cattle and horses freely enter along the remainder of the ditch, often breaking down the concrete lining and creating dirt paths leading into the ditch. These animal entrances allow storm runoff, eroded sediment, and animal waste to enter the ditch lining.

Uncontrolled vegetation along the ditch contributes to cracking of the concrete lining, increased water uptake by extensive root systems intruding into the ditch, and invasion and establishment of plants in the ditch itself. Especially destructive is the explosion of ironwood in the abandoned sugarcane fields, which roots intrude into open ditch side banks and destroy ditch linings.

There are 48 tunnels along the open ditch system, ranging in length from 12 feet to 1,070 feet, totaling 13,400 feet. Except for sediment deposition and occasional fallen ceiling rock, the tunnels are in good condition.

Storm runoff generated uphill of the ditch is transported either under flumed sections or through "storm flumes" which cross over the top of the open ditch. Runoff is excluded from the ditch system to control the amount of sediment entering the ditch. Storm flumes were generally wooden box-framed structures that resemble narrow bridges and convey the concentrated storm runoff over the ditch. Of forty-two storm flumes, only six are constructed of concrete. Nearly two-thirds of the wooden storm flumes are deteriorating and allowing runoff and sediment to enter the ditch. Changes in upper drainage area flow patterns also create a need to relocate some storm flumes.

*The LHD system has a total of four major reservoirs. All are unlined reservoirs with earth embankments on their lower sides. The capacities of the reservoirs range from three to 15 million gallons. The total storage capacity of the system is 31 million gallons. While sedimentation has decreased the capacity of the reservoirs, it does not appear to be a major problem. Leakage from the Paauilo Reservoir has been reported to be a problem. Control of bank vegetation is a*

major maintenance requirement. Numerous sand traps and settling ponds which have insignificant storage capacity are also found along the LHD system.

The condition of the gates used to draw water from the Hamakua Ditch into the lateral systems is variable. Most gate structures are formed concrete side-inlet boxes with a metal, manually operated slide gate. Approximately one-half of the 33 documented gates are not currently being used. The gates open into settling ponds or reservoirs from which the lateral pipeline systems extend.

Much of the lateral systems constructed by the Hamakua Sugar Company during the conversion to drip irrigation systems in the 1970's still exist. While most of the valve and pressure devices that appear above the ground have been broken, vandalized, or disconnected, the buried 6-inch to 12-inch PVC transport pipelines that extend between the settling ponds and screen boxes to the control valve in the field and the buried field mainlines are still thought to be in good condition. The locations of current agricultural activity, however, do not coincide with the sugarcane-period layout.

Other appurtenances such as sand traps, siphons, enclosed gulch crossings, and road crossings are also associated with the function of the LHD and are in various states of repair.

*Table C*  
*Lower Hamakua Ditch Reservoirs*

<i>Reservoir No.</i>	<i>Name</i>	<i>Capacity (MG)</i>	<i>Elevation (Ft. MSL)</i>	<i>Service Areas</i>
1	<i>Haina Mill</i>	3	920	<i>Haina</i>
2	<i>Paauhau</i>	15	712	<i>Paauhau</i>
3	<i>none</i>	3	900	<i>Pu'u'ala, Kaunamano</i>
4	<i>Paauilo</i>	10	840	<i>Paauilo West, KSBE Paauilo, HNHAC Paauilo</i>

### 2.2.2 Lower Hamakua Ditch Management

The temporary nature of the DOA agreement to maintain the LHD and the absence of formal management authority prevents the collection of user fees for the delivery of water and prevents the development of longer ranged plans for system improvements to better serve the water users. While beneficial to the startup farmers, the provision of water without charge has limited the budget for operation and maintenance of the system, has been a disincentive for water conservation, has prevented the development of a system to identify users and quantify usage, and has fostered the proliferation of unrecorded connections to the LHD. Some farmers believe that sporadically poor management of the LHD is due to the free cost of water.

The State of Hawaii has sought federal technical and financial assistance to repair the LHD system to an operational level capable of being converted to a state-

operated irrigation water system through provisions of Chapters 167 and 168, HRS.

The current absence of a formal management body for the LHD limits the avenues for input by the users and others on the operation of the agricultural water system. Long term planning to project future needs and develop strategic planning cannot occur under the current arrangement.

### 2.2.3 System Losses

Presently, a large fraction of the water that is diverted from the Waipio Valley streams by the LHD is lost in transmission, storage, and deliberate disposal. Components of the LHD system are exposed to natural elements that result in deterioration and water losses beyond the control of the system operators. Open ditches and flumes exposed to the sun, unlined flumes and reservoirs, tunnels through volcanic lava flows, and exposed pipelines and siphons are prone to deterioration and damage. *Leakage from the deteriorated wooden flume structures is believed to be the major source of water loss.*

*According to the DOA maintenance contractor, when 25 to 30 MGD presently enter the open ditch at the Main Weir, on the average, only five to seven MGD flows into the terminus reservoir at Paauilo, 14.5 miles distant.*

The LHD currently uses nonvariable intake structures that are intended to divert all flow up to a threshold level. In practice, the intake structures do not capture all of the water due to silt and sediment buildup in the stream channel, debris buildup on the intake grating, seepage through or around the aging concrete dams, or buildup of sediment in the sand trap or ditch section which limits flow capacity. When cleaned, the existing intake structures divert an average of 25 to 30 MGD from the Waipio Valley streams regardless of the demand for the water by users on the Hamakua Coast.

### 2.2.4 Hakalaoa Falls

In May 1989, while under the operation of the HSC, a portion of the Waipio Valley wall failed at Hakalaoa Falls exposing about 30 feet of the LHD transmission tunnel that was originally excavated approximately 15 to 30 feet behind the falls. Hakalaoa Falls comprises one-half of the culturally and scenically important twin falls of Hiilawe. A temporary flume was constructed on the cliff wall and flow in Hakalaoa Stream leading to the falls was diverted to the adjacent Hiilawe Stream to prevent water and rock impact from destroying the hastily constructed temporary flume. The upstream diversion of Hakalaoa Stream effectively erased one of the twin falls at Hiilawe.

HSC correspondence dated 1989 and 1991 indicates that HSC was seeking to repair the LHD tunnel at Hakalaoa Falls in order to restore the falls. In March 1992, a complaint was filed at the CWRM regarding the loss of Hakalaoa Falls. HSC went bankrupt before repair was begun. In 1993, KSBE purchased the land parcel containing the falls. A series of CWRM meetings were held between 1995 and 1998 at which the issue of the restoration of Hakalaoa Falls was discussed.

At their June 17, 1998, meeting, CWRM ruled that the landowner, KSBE, would be required to restore Hakalaoa Falls by December 1, 1999. Through the KSBE-DOA Agreement which grants to the DOA 35-year management of the portion of the LHD on land owned by KSBE, the DOA agreed to repair the LHD tunnel behind Hakalaoa Falls.

#### **2.2.5 Non-Agricultural Use of Water**

*An industry that has been discussed as a prospective user of the LHD water is electric power generation. However, Enserch, Inc., which plans to construct a electricity co-generation plant in Haina, has stated that their power plant will not use LHD water for cooling. The elevation difference within the project area also makes viable hydroelectric power generation. Both uses of LHD water will also allow the water used for power generation to be subsequently used for agricultural use. No plans to use LHD water for power generation currently exist.*

The County Department of Water Supply (DWS) has utilized the LHD as a drought and emergency condition water source for Honokaa and Paauhau until recently when new drinking water standards made the surface source unacceptable. Other non-DWS systems may still depend on the LHD source for domestic and non-agricultural water supply. Areas that may use the LHD for water supply include parts of Kukuihaele and Waipio Valley Rim, including the rest area at the Waipio Valley Lookout.

#### **2.2.6 Waipio Valley**

The water source for the LHD is runoff and groundwater seepage from the Waipio Valley drainage area, which extends into the Kohala Mountains. Without the LHD diversion, diverted water would naturally flow through the streams in Waipio Valley to the ocean. Streamflow in Waipio Valley creates aquatic habitat for environmentally and culturally important native stream organisms and creates habitat for several species of endangered waterfowl. Streamflow in Waipio Valley is also the source of agricultural water for cultivation of approximately 75 to 100 acres of wetland taro. Wetland taro cultivation has significant cultural value in its linkage to early Hawaiian culture.

Habitat conditions for native stream organisms and conditions for wetland taro producers can be improved through an agricultural water management project that correlates Hamakua area water needs with Waipio Valley water management needs. Other problems, such as flooding and sedimentation in Waipio Valley, can also be evaluated.

Some Waipio Valley farmers and residents are concerned that without the LHD diversions, storm flows will cause increased flooding and erosion problems. *While the effect of the LHD diversion of Waipio Valley streams on serious floods should not be significant, the effect of the constant diversion of approximately 25 to 30 MGD provides regulation of Wailoa River against frequent flow variation due to rainfall occurring in the upper watershed.*

*The Waipio Taro Farmers Association states that the inability to perform regular river maintenance to provide flood capacity, bank stability, and proper function of the auwai systems is the most pressing problem and may be exacerbated by the restoration of streamflow. No major maintenance activity on Wailoa River has taken place since 1996 when members of the WTFA were stopped by the Corps of Engineers for the lack of stream activity permits. An additional issue raised by the WFTA is the desire to have recognition of the water management system in Waipio Valley which equitably provides irrigation water to taro lo'i through a system consisting of six auwai. The absence of a management authority compromises the efficiency of the auwai systems.*

### 3. FORMULATION AND COMPARISON OF ALTERNATIVES

Most of the problems identified during the scoping of the project in 1995 and up to the present, relate to the need for a stable, adequate, and reasonably priced agricultural water supply to maintain and expand the diversified agricultural base. Diversified agriculture has begun to develop in the vacuum of the Hamakua Sugar Company collapse in 1993. Approximately 130 farmers, many former sugar workers, have become members of the Hamakua/North Hilo Agricultural Cooperative (HNAAC) and have invested time and capital on farm lots leased from the state. All HNAAC farmers use and depend on water from the LHD. Several larger commercial agricultural concerns have plans for agricultural expansion once the agricultural water supply for the long-term has been assured. These agricultural operations and ancillary processing facilities will provide employment opportunities and expansion of the region's economic base.

Alternative plans were developed and evaluated to address the problem of agricultural water uncertainty and shortage in the LHD Watershed. This section describes the rationale and process for plan formulation which began with evaluation of potential measures and culminated in the selection of an integrated watershed plan.

#### 3.1 FORMULATION OF ALTERNATIVES

The formulation of alternatives began by identifying and evaluating individual measures to solve the agricultural water shortage problem and address other problems and opportunities. The separate measures were evaluated in different combinations as alternative plans. The alternative plans were evaluated in consideration of the extent to which all investments and actions necessary to realize planned results are accounted; the extent to which identified problems are alleviated and opportunities achieved; the extent to which the most cost-effective configuration of each alternative is developed; and the extent to which public acceptance and compatibility with existing laws, regulations, and policies is achieved.

Land treatment practices and structural measures to alleviate the water shortage problem and address other resource problems and opportunities were considered. Land treatment practices are measures planned and installed on individual farms and properties to protect or conserve soil and water resources. Structural measures are improvements that require group and/or government involvement to implement and affect several land parcels, property owners, and/or landusers.

While land treatment measures, including water catchment and water conservation practices, were considered to address the water shortage problem on individual farms, a community-wide agricultural water system is necessary to fully address the problem of undependable agricultural water. Structural measures considered included repair of the LHD and development of other community-wide agricultural water systems.



### 3.1.1 Land Treatment Measures

The most efficient use of available agricultural water and the conservation of other natural resources at the individual farm level are objectives of both the federal and state programs under which this project is planned. The use and proper operation of water-conserving irrigation systems are expected to achieve such objectives. On-farm implementation of trickle irrigation systems and measurement-based irrigation management will be promoted. Conservation measures to reduce evapotranspiration losses, improve irrigation efficiency, and limit wind erosion include primary and field windbreaks, mulch, and cover crops. Fencing and livestock watering practices can be used to improve pasture productivity and cover. Waterways and terraces are always needed in this area of steep topography to control runoff and limit soil erosion on hillside lands. *The standards and specifications for the conservation practices are described in Section IV of the NRCS Field Office Technical Guide.*

The Hamakua SWCD and the NRCS, through the Hilo Field Office, provide assistance to Hamakua area farmers and others to design and implement water and other natural resource conservation practices. The Mauna Kea SWCD and the NRCS Kamuela Field Office provide assistance to Waipio Valley farmers. Several federal financial assistance programs are available to cost-share the installation of some practices. The primary USDA Farm Bill program available to area producers is the Environmental Quality Incentives Program (EQIP) for design and cost sharing the installation of such practices as discussed above. The project area is currently within the Hamakua-Hilo Priority Area, as determined by the Big Island Local Work Group, which allows targeted EQIP funding for the priority area to eligible agricultural producers. The Local Work Groups are composed of representatives from the SWCD boards and federal, state, and county agencies and organizations with an interest in natural resources. Due to the high rate of response for the EQIP program, funding is expected to continue to lag the demand for financial assistance. Therefore, the PL 83-566 authority will be used to obtain additional federal cost-sharing and technical assistance for the plan and design of conservation measures.

The Wildlife Habitat Incentive Program (WHIP) is another Farm Bill cost-share program for private landowners to enhance and protect wildlife habitat. It has been successfully used to create additional waterbird habitat through restoration of taro lo'i and control noxious weeds in the Hanalei Valley on Kauai. This program could be evaluated for use in Waipio Valley.

### 3.1.2 Catchments

The use of catchment systems to capture and store rainfall for agricultural use was evaluated. Such systems are used in the Hilo and other East Hawaii areas. However, a month by month analysis for various crops shows that for the 80 percent rain, or the second driest year in an average ten-year cycle, the additional water requirement to rainfall will be one-third to one million gallons per acre annually. Approximately one-half acre of impervious catchment area will be required to harvest one million gallons per year. For a ten acre farm, at a

minimum, a three-MG enclosed reservoir connected to one and one-half acres of impermeable catchment area will be required. The financial cost of such an on-farm system will probably far exceed the benefits that may result.

### **3.1.3 Hawaii County Department of Water Supply**

The use of Hawaii County Department of Water Supply (DWS) systems for irrigation water was considered. The combined production of the Honokaa and Paauilo DWS systems is approximately one MGD. Domestic use of the DWS systems at Paauilo and Honokaa is at or near capacity. The DWS has placed a moratorium on agricultural meter sizes and allows one 5/8-inch meter per user. While 10,000 gallons per day, enough to irrigate about two acres during a drought period, is achievable through the 5/8-inch meter, conservation restrictions imposed by the DWS may limit water usage for agriculture during drought periods. The cost of agricultural water from the county system is approximately \$1.90 per 1,000 gallons, which is prohibitive for most farmers.

### **3.1.4 Structural Measures**

Structural solutions to the water shortage problem were evaluated to provide community agricultural water systems to farmers, ranchers, and other users. The agricultural water system will have a source and a transmission and distribution system. To be adequate the system should be able to deliver the required peak water demand to its users. If the water source is insufficient to supply the peak water demand directly, additional water sources and/or reservoir storage will be necessary to carry over surplus supply to meet peak demand.

#### **3.1.4.1 Hamakua Area Streams**

The diversion of water from Hamakua area streams for agricultural use was suggested. Twenty-three streams that are perennial along some reach are identified between Waipio Valley and Paauilo by the Hawaii Stream Assessment (National Park Service, 1990). The perennial stream reaches are generally at higher elevations than the project area and are fed by springs. Nine of the streams flow to the sea year-round and are located closer to Waipio Valley. There has been no gauging of any of the 23 streams.

Two streams that have sizable drainage areas but do not appear on the list of perennial streams, Ahualoa and Honokaia, have crest gages. The peak discharge data show that these streams are dry at their gage locations most of the time.

Successful utilization of farm-scale stream diversions has been reported. The LHD incorporated, at one time, two stream diversions at Kapulena and Ahualoa Streams. Neither diversion is currently in use and do not appear in the CWRM declarations of water use. The Kapulena diversion was reported to have an average yield of 0.3 MGD.

If a liberal average yield of 0.5 MGD per stream is assumed, nearly every perennial stream will need to be diverted in order to supply 10 MGD. A major problem with surface sources in the Hamakua area is the susceptibility of stream

flow to go dry during drought periods. Most of the streams fed by springs on Mauna Kea will cease to flow or will be significantly diminished during extended drought periods. The dike-intensive stratigraphy of the Kohala Mountains is better able to store high elevation water.

The decrease in streamflow will occur when agricultural demand is greatest. Storage of streamflow will be required to provide agricultural water during droughty periods. If the peak project area demand is 14 MGD and the stream diversion rate becomes insignificant during a drought, a 400 million gallon reservoir will be required for a one month supply and over one billion-gallon capacity will be required to weather a three month drought. There are no sites in or near the project area that are appropriate for construction of such reservoirs short of damming a large gulch.

*Any activity to develop Hamakua area streams for water supply will require stream diversion and channel modification permits and amendment to the interim instream flow standard. Extensive consultation with the CWRM and community participation will be required.*

#### 3.1.4.2 Wells

The development of a project area-wide agricultural water system using existing wells and/or new wells was explored. *While there are nearly a dozen wells that were used at one time located in the project area, three wells that could contribute to an agricultural water system were identified by the Wai Engineering report: Paauilo Tunnel, Feedlot Well, and Field 20150 Well (Wai Engineering, 1995). The Paauilo Tunnel is a Maui-type skimming well capable of producing two MGD. The Feedlot Well is a conventional well capable of 1.4 MGD, which is operated sparingly during off-peak hours to supply high quality water to the slaughterhouse. The Field 20150 well has never been fully developed, although it was reportedly tested at 50,000 gpd. There is some debate as to the sustainable yield that can be developed at this site. If a conservative 0.5 MGD is assumed at the Field 20150 well, the total yield of the three wells is 3.5 MGD. The water supply will sustain irrigated crop production on approximately 600 acres of cropland during the second driest year during an average ten year period. The expanded use of the existing wells for irrigation water supply will require modifications and various well permits from the CWRM.*

Basal and perched groundwater appear to exist in fair supply in the project area. New wells to augment the production of the three wells discussed above were considered. An additional 10 MGD capacity would be needed to sustain the projected buildout level of irrigated cropland. The additional water could be provided by seven additional wells with production rates averaging 1,000 gpm.

#### 3.1.4.3 Repair and Rehabilitation of the LHD

Comprehensive repair and rehabilitation of the LHD to assure its continued operation for the long-term future was considered. The present condition of the system, as described in Section 2.1.2, is such that catastrophic failure of components, such as a flume or the repair at Hakalaoa Falls, is imminent. The

failure of a major flume trestle or of the Hakalaoa Falls flume may render the system inoperative for many months while emergency funding is secured, repairs are designed, contracts are let, and construction is completed. A restoration of the LHD will require an assessment of the structural integrity and serviceability of each element of the system and development of repair designs that will provide confident operation for the term of the project.

Two evaluations for the repair and restoration of the LHD have been completed in recent years. In September 1994, the U.S. Army Corps of Engineers, Pacific Ocean Division, completed their Repair Plan and Cost Estimate for the Lower Hamakua Irrigation Ditch for USDA Rural Development (U.S. Dept. of Army, 1994). The repair proposal included replacement of all wooden flumes and 50 percent of existing corrugated metal pipe (CMP) flumes with CMP, replacement of 50 percent of the flume support structures, removal of sediment and other debris along the length of the ditch, repair or replacement of the concrete ditch lining with welded wire cloth reinforced pneumatically applied mortar along 25 percent of the ditch, clearing of trees and vegetation along 25 percent of the ditch, and grading upslope of the banks along 15 percent of the ditch. The 1994 estimate of the project to repair the open ditch portion of the LHD was nearly \$4 million and \$40,000 for annual maintenance. The report did not evaluate the diversions, tunnel system, reservoirs, or lateral systems.

In May 1995, Wai Engineering, Inc. completed its engineering evaluation of the LHD with recommendations and cost estimates for the maintenance and operation of the system for the State Department of Business, Economic Development, and Tourism (Wai Engineering, 1995). The study scope was to identify the actions needed and the estimated cost to keep the LHD operating for five years. The report recognized the immediate need to repair the tunnel at Hakalaoa Falls. The report identified six flumes in need of emergency repair, five flumes in need of replacement within five years, and 14 flumes requiring repair within five years. Repair of lateral distribution systems was also identified. Other maintenance and repair items and costs were consolidated in the annual maintenance cost. The repair cost at Hakalaoa Falls was estimated to exceed \$1 million. The total repair cost for flumes and lateral systems for five year service was estimated to be \$916,982. Annual maintenance costs were estimated to be \$468,080.

#### 3.1.4.4 Pipeline

An alternative to repairing the LHD open ditch structures is the installation of a new pipe conveyance system to replace the aged open ditch system. The pipeline system can be appropriately sized to the water demand of the projected diversified agricultural activity which will be much less than the full capacity of the LHD. The closed pipeline system can be routed along an alignment different from that of the LHD. Sediment problems in the conveyance can be treated at the inlet to the pipeline system, eliminating the need for sand traps and settling ponds at each lateral. Maintenance will be greatly reduced over the open ditch system. Unregistered taps into the system will be more difficult to install and easier to detect.

#### 3.1.4.5 Relocation of Hamakua Farmers

The relocation of agricultural users closer to the upstream end near Kukuihaele to shorten the required open ditch portion and to eliminate much of the leakage loss was suggested. Such a plan would require the state and the HNHAC to obtain exchange or leases to KSBE or other private land for HNHAC members. The cropland suitability study conducted for this project (Maptech, 1997) indicated that the suitability of the soils and other conditions were better near Paauilo than near Kukuihaele. More highly erodible soils were near Kukuihaele than near Paauilo.

#### 3.1.4.6 Storage Reservoirs

*The development of storage reservoirs to store water available during the rainy periods from either Hamakua area streams or the LHD for use during dry periods was evaluated. As stated earlier, if the reservoirs are assumed to be the only water supply source during drought periods, a 400 million gallon reservoir will be required for a one month supply and over one billion-gallon capacity will be required to weather a three month drought at full farm buildout.*

*Smaller amounts of reservoir storage can be used to augment reduced LHD supply during dry periods and provide flexibility during temporary shutdowns of the LHD. If LHD stream diversion is reduced by one-half and seven MGD is required from reservoir sources, a one-month capacity of 200 million gallons or three-month capacity of 600 million gallons of storage will be required.*

*Reservoir construction costs, including excavation, embankment structure, lining, and appurtenances, are estimated to be \$0.5 to \$1 million per 10 MG. Therefore, the development of 200 million gallons of storage will cost between \$10 and \$20 million.*

### 3.2 ALTERNATIVE PLANS

Three structural alternative plans were developed to address agricultural water shortage and uncertainty in Hamakua. The major distinguishing features of the three plans are: 1) use of wells to supply agricultural water to the projects, 2) repair and rehabilitation of the LHD, and 3) replacement of the open ditch system with pipeline. The alternative plans provide enough detail to be able to compare effectiveness in solving the identified problems, impacts to cultural and environmental resource concerns, and estimated costs. A "No Action" alternative is also discussed in this section to allow comparisons to conditions without implementation of a project.

The structural alternatives were configured to provide adequate agricultural water for the approximately 2,500 acres of irrigated cropland that is expected to be eventually established, livestock drinking water for 3,000 animal units, and for other identified non-agricultural uses of the LHD. Water need for both average rainfall conditions and drought periods were evaluated.

*The average daily irrigation requirement per acre for the average reference crop is 1,200 MGD. The average daily demand for 2,500 acres of irrigated cropland,*

*over a long term, is estimated to be 3.0 MGD. The peak daily irrigation requirement for the same crop during a drought period (80% rainfall frequency) is approximately 5,000 MGD per acre. The peak demand period can be expected two of ten years and may last from days to months. Peak daily water demand irrigation is estimated to be 12.5 MGD.*

*In addition to irrigation needs, 1.0 MGD for aquaculture, 0.1 MGD for the feedlot and slaughterhouse, 0.05 MGD for livestock water, and 0.05 MGD for the Kukuihaele community are also considered in the alternatives.*

*Alternatives based on catchments and diversion of Hamakua area streams were not developed due to prohibitive storage reservoir requirements. Alternatives based on relocation of farmers to the Kukuihaele side of the project area were not pursued due to unacceptability to the farmers.*

Each of the three structural alternatives includes use of communications systems to remotely monitor and operate project components. Supervisory Control and Data Acquisition (SCADA) systems have proven their reliability and have been adapted to small and large systems. Such a system can gather and store system performance data such as flow rate, pressure, and water quality. It can also integrate monitoring of rainfall and soil moisture. Remote control of valves and other devices is also made possible. Most communication in the system will be wireless. *Provisions against vandalism, such as fencing and enclosures, will be incorporated into each station design.*

### **3.2.1 Alternative 1 - No Action**

This alternative discusses the likely scenario if no action is taken to implement a comprehensive project to provide agricultural water to the Hamakua area between Kukuihaele and Paauilo.

The existing agricultural activity in the project area is estimated to use two MGD on an average basis and as much as seven MGD during high demand periods. While the existing farming activity consists mostly of HNHAC members and other small farmers, the other benefits of diversified agriculture to provide income opportunities to many former sugar industry workers, maintain rural lifestyles, and continue to keep the rural look and character of the project area is very important. The Hamakua community has insisted the continual operation of the LHD as long as some level of economic benefit is derived.

Currently the DOA is providing minimal repair and management to keep the LHD in operation on a year to year basis, dependent on legislative appropriation of funding. It is expected that the state will continue to provide a minimal level of maintenance to keep the LHD operational. However, comprehensive repair of all the components that are likely to fail soon will not be undertaken. Components will be only be repaired or replaced as they fail or become troublesome. The repairs themselves will often made without permanence in mind. Uncertainties about the continued operation of the LHD and the need to stretch the appropriated maintenance funding will result in a "band aid" approach to repairs on the ditch.

Leakage from the ditch components may continue to be as high as 25 MGD, but will probably be reduced to an more acceptable level through efforts of the DOA.

The DOA budget for maintenance of the LHD has averaged \$350,000 during the past five years.

*The DOA has indicated that they plan to establish an irrigation district even if federal financial assistance does not materialize. As the irrigation district is required by state statute to be self-funding through fee revenues, its economic viability will be questionable.*

No significant action will be taken at the four stream diversions. Maintenance cleaning of the Kawainui stream intake grates and sand trap will continue to be performed on a nearly weekly basis and following intense storms. Maintenance activity at Alakahi and Koiawe Stream intakes will take place at less frequent intervals. The Waima intake has been abandoned. While intake grates and concrete facing that are continually damaged by falling rocks will be repaired, no modification of the intake structures will be performed unless ordered to do so by the Commission on Water Resources Management in settlement of the pending complaint regarding water waste on the LHD.

If the watershed project is not implemented, a permanent repair of the LHD at Hakalaoa Falls will probably not be pursued by the DOA. A less permanent, surface-mounted repair will probably be made to restore Hakalaoa Falls. *The unpermitted diversion above the falls will be removed and the Hakalaoa Falls will be restored by December 1, 1999.*

### 3.2.2 Alternative 2 - Wells

This alternative assumes all agricultural water is supplied by wells pumping from the basal aquifer and the LHD is abandoned. As most of the cropland service area lies between 200 and 800 feet, the average total dynamic pumping head was assumed to be 500 feet for the analysis. Based on an evaluation of existing wells, a sustainable pumping rate of 1,000 gpm was assumed per well. Salinity increase will limit the sustainable pumping rate. Due to the agricultural use of the water, however, salinity concentration exceeding 250 mg/l is acceptable.

Ten wells will eventually be required to provide the peak irrigation water requirement for the projected 2,500 acres of irrigated cropland. Two of the existing wells—Paauilo Shaft and the Feedlot well—will be upgraded and incorporated into the system. Eight new wells, including the Field 20150 well, situated near the concentrations of farming activity will be developed. Each well will be connected to a 0.6 MG storage tank that will provide nearly half-day storage during peak use. Connections between neighboring distribution systems will be provided to increase system flexibility and minimize the effects of well failure. Before modifications and new installations are made a well construction permit and/or pump installation permit will be obtained from the CWRM.

In addition to the cost of well installation, a major cost will be pumping energy. Two Hawaiian Electric Light Co. (HELCO) electric rates were evaluated. The G, General Service, rate is for 24-hour use at \$0.17/kW-hr plus a \$50 monthly rate

per installation. The U, time-of-use, rate is available only from 9 PM to 7 AM at \$0.035/kW-hr and a \$200 monthly charge. Use of the less expensive U rate would require nearly 23 wells pumping during the night to meet peak demand. Use of the U rate was calculated to be more costly overall than using the G rate. The average pumping cost was estimated to be approximately \$0.45 per 1,000 gallons. For the projected 2,500 acres of irrigated cropland the total average annual pumping energy cost was estimated to be \$493,000 which will rise to nearly \$800,000 during dry years. *The average annual pumping energy cost will be rounded to \$500,000 for this analysis.*

The use of wells offers some advantages over the other alternatives. The wells alternative provides modularization of the system. Each well/distribution system can operate independently. Systems can be installed as the need develops. The total project cost at one-half buildout of the irrigated cropland is roughly one half of the system cost at full buildout, while the other structural alternatives will require nearly the full installation cost to service less than full buildout. Another advantage is the ability to provide water to domestic water customers without extensive treatment. Water quality of the groundwater is considerably better than surface sources and may be preferred by some farmers.

Approximately one-half acre of agricultural land will be needed for each well and reservoir installation.

The estimated installation cost for Alternative 2 is \$25.5 million. Annual operation and maintenance costs are estimated to be \$0.8 million. (Table D)

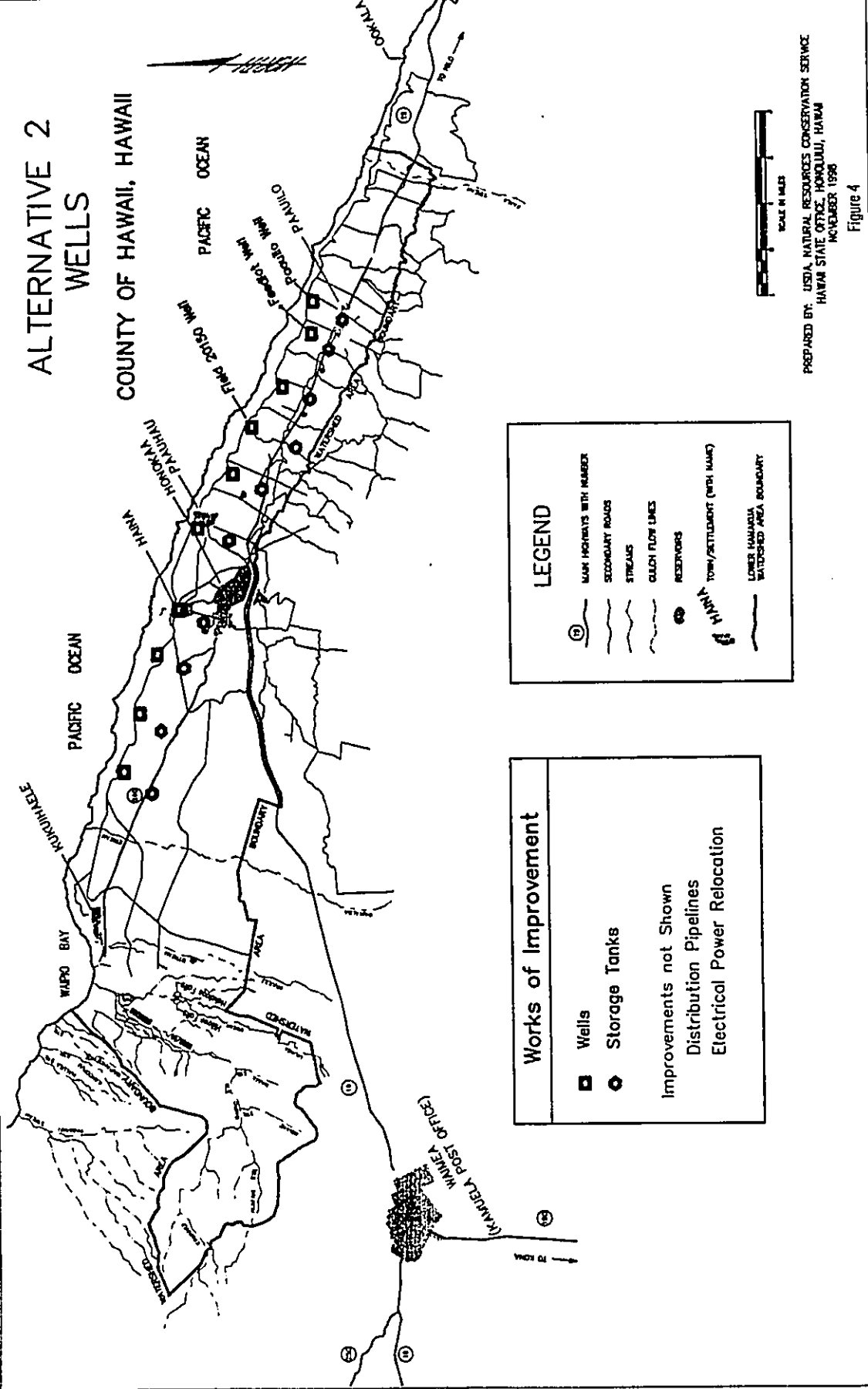


**Table D**  
**Preliminary**  
**ALTERNATIVE 2 - WELLS**  
**(1998 Dollars)**

Item	No. Units	Units	Unit Cost	Item Cost	Federal Funds	Other Funds
<b>Land Treatment</b>						
Conservation Practices	50	farm	20,000	1,000,000	650,000	350,000
Technical Assistance	4	staff yr.	50,000	200,000	200,000	0
Waipio Valley Assistance	4	year	25,000	100,000	100,000	0
<b>Total Land Treatment</b>				<b>1,300,000</b>	<b>950,000</b>	<b>350,000</b>
<b>Structural</b>						
Well Upgrade	2	each	100,000	200,000	100,000	100,000
1,000 GPM Well	8	each	1,000,000	8,000,000	4,000,000	4,000,000
Electrical Connection	10	each	100,000	1,000,000	500,000	500,000
0.6 MG Storage Tank	10	each	500,000	5,000,000	2,500,000	2,500,000
Distribution Pipeline	10	each	100,000	1,000,000	500,000	500,000
Contingency (20%)				3,040,000	1,520,000	1,520,000
<b>Total Construction</b>				<b>18,240,000</b>	<b>9,120,000</b>	<b>9,120,000</b>
Engineering (20%)				3,648,000	3,648,000	0
Project Administration (12%)				2,188,800	722,300	1,466,500
Landrights				75,000	0	75,000
<b>TOTAL INSTALLATION</b>				<b>25,451,800</b>	<b>14,440,300</b>	<b>11,011,500</b>
<b>Annual OM&amp;R</b>						
Pumping Energy Cost				500,000	0	500,000
Staff, equipment, material				300,000	0	300,000
<b>TOTAL ANNUAL OM&amp;R</b>				<b>800,000</b>	<b>0</b>	<b>800,000</b>
<b>Annual Cost</b>						
Amortized installation cost (25-years, 7.125%)				2,208,700	1,253,100	955,600
OM&R				800,000	0	800,000
<b>AVERAGE ANNUAL COST</b>				<b>3,008,700</b>	<b>1,253,100</b>	<b>1,755,600</b>

# ALTERNATIVE 2 WELLS

COUNTY OF HAWAII, HAWAII



### Works of Improvement

- Wells
- Storage Tanks
- Improvements not Shown
- Distribution Pipelines
- Electrical Power Relocation

### LEGEND

- ① MAIN HIGHWAYS WITH NUMBER
- SECONDARY ROADS
- ~ STREAMS
- GULCH FLOW LINES
- RESERVOIRS
- ⊙ TOWN/SETTLEMENT (WITH NAME)
- LOWER MAHUKAUA WATERSHED AREA BOUNDARY



PREPARED BY: USDA, NATURAL RESOURCES CONSERVATION SERVICE  
HAWAII STATE OFFICE, HONOLULU, HAWAII  
NOVEMBER 1998

Figure 4

### 3.2.3 Alternative 3 - Repair and Restoration of Lower Hamakua Ditch

This alternative proposes the repair, rehabilitation, or replacement of components of the LHD system to ensure dependable operation for the life of the project. Those components that are in a condition where failure is imminent and can affect the flow in the ditch will receive highest priority. Next priority will be given to components with high rates of water loss. Third priority will be given to elements that will reduce maintenance costs. Special priority will be given to features providing environmental and social benefits, including repair of the tunnel at Hakalaoa Falls to restore the twin falls of Hiilawe and Hakalaoa and implementation of variable diversion structures at the stream intakes.

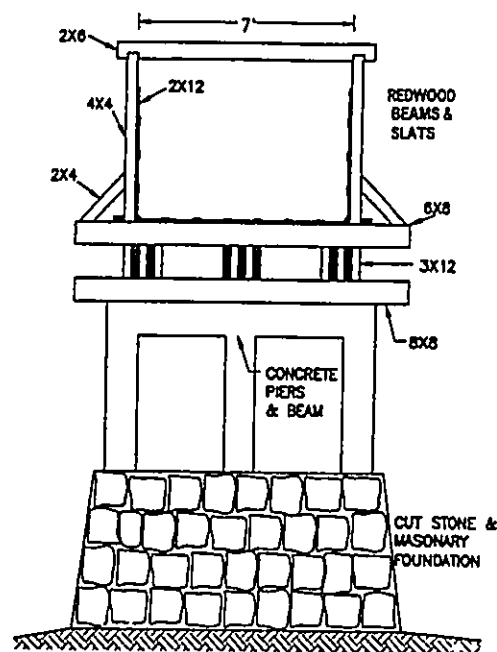


Figure 5 Typical Wooden Flume Section  
(From Wai Engineering, Inc., 1995)

The elements of the LHD that pose the greatest threat of failure are the flumes and support structures such as depicted in Figure 5 and (section 4.2, page 62). An examination of the 50 flumes between the Main Weir and Paauilo Reservoir indicated that 24 wooden flumes still existed. All the wooden flumes were in need of repair. Replacement of all wooden flumes, except two, with corrugated metal pipe (Photo B) or with inverted pipe siphons is proposed. Support structures for nearly every flume replacement will also be required. Metal I-beams will replace the rotting timber supports. Two wooden flumes that are exemplary of the craft and construction methods used by the original builders will be repaired with original materials and construction as much as possible.

A one-time removal of sediment from the open ditch sections is proposed. Sediment in flumes and tunnels will not be removed unless very accessible. The sediment is estimated to average one-foot in depth throughout the system.

The concrete lining of the open ditch sections will be repaired using welded wire fabric and pneumatically-applied or hand-troweled mortar. While cracking of the lining is extensive throughout the LHD, only those sections with broken and missing lining, upheaval, intrusion of roots, significant leakage, and open to sediment sources will be repaired. It is estimated that ten percent of the channel lining will be repaired.

The tunnel behind Hakalaoa Falls will be reconstructed to allow restoration of the twin falls in accordance with the CWRM order. If the tunnel cannot be completed by the December 1, 1999, deadline, a temporary protective structure will be constructed over a surface-mounted flume to allow Hakalaoa Falls to be restored without a high probability of damage to the LHD.

The three operating diversion structures at Kawainui, Alakahi, and Koiawe streams will be repaired and modified to prevent structural failure, reduce maintenance requirements, and restore stream flow to Waipio Valley streams. *Plates will be installed along the outer edges of the intake grates to pass 30 percent of the streamflow over the diversion structures. Some normal maintenance work will be conducted to reopen existing access paths blockages.*

The diversion structure on Kawainui Stream will be repaired to fill the void beneath the apron. (Figure 6) The intake grating will be modified to shed trash and debris and to use standard grating sizes to simplify replacement after impact damage. Telemetrically-controlled gates and instrumentation will be used to vary the flow into the tunnel and to flush the sand trap. Flow not diverted into the tunnel will be discharged into the stream. The power source for the gates and telemetric equipment will be a bank of batteries with micro-hydroelectric generators and/or a solar cell array for charging. A telemetric relay station will likely be sited on the valley rim near the Upper Hamakua Ditch between Koiawe and Waima Streams.

Approximately ten lateral distribution systems will be installed. Many of the lateral systems will incorporate existing pipelines and features installed during sugarcane cultivation. Sediment ponds and screen filters will be used at each lateral system.

A 1-MG reservoir will be installed at the Honokaia lateral to provide operational flexibility to HNHAC farmers. The 10-MG Paauilo Reservoir will be lined to eliminate seepage losses.

A SCADA system to monitor and control the entire system will be installed.

Landrights for the crossing of the LHD through private land parcels will be negotiated, documented and recorded. An agreement between DOA and KSBE will transfer the land and water diversion rights to DOA for the life of the project.

Leakage from components of the rehabilitated LHD will continued at a reduced rate. An estimate of leakage from the entire transmission and distribution system of 3 MGD will be used for project analysis.

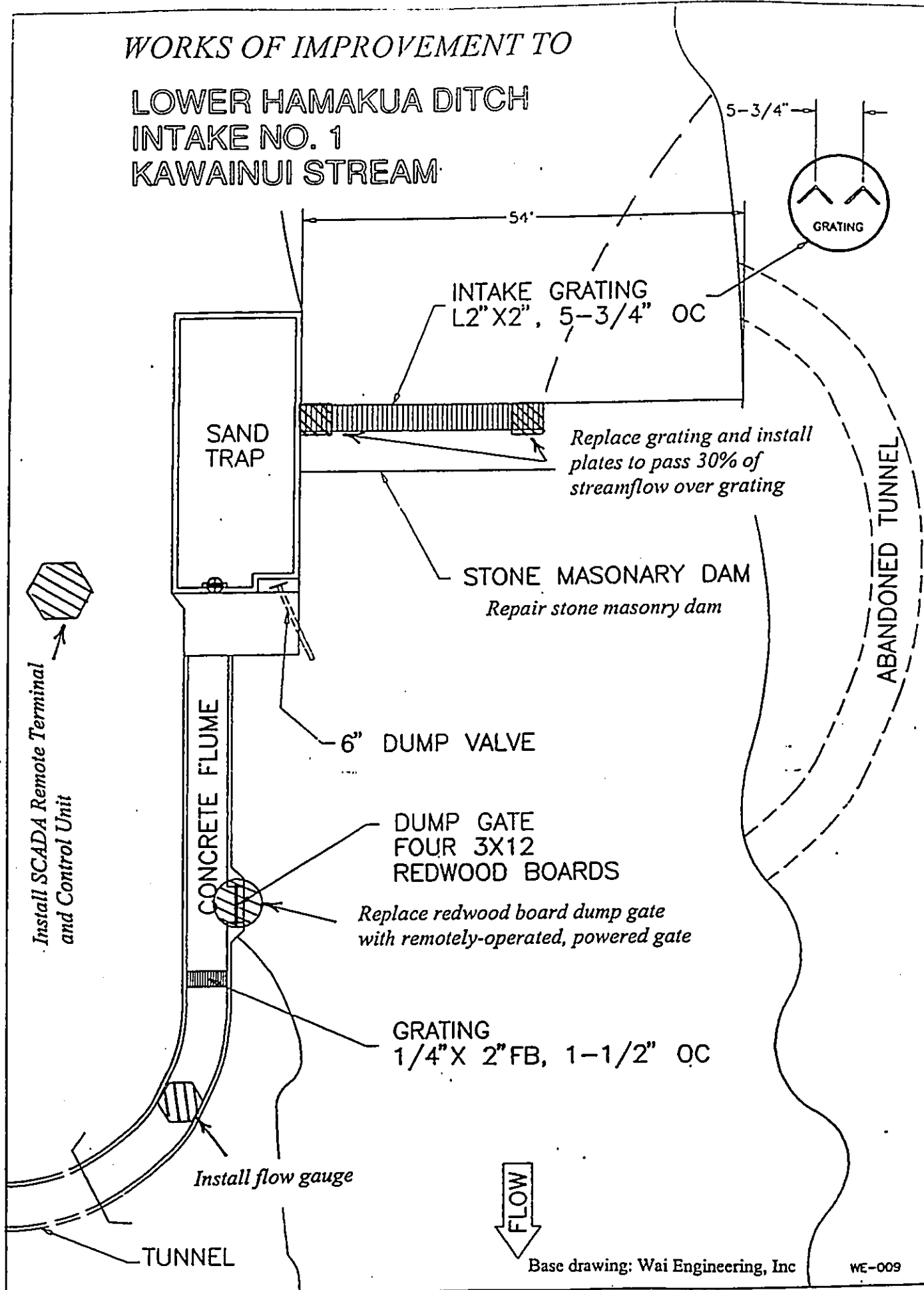
The estimated installation cost for Alternative 3 is \$10.6 million. Annual operation and maintenance costs are estimated to be \$0.5 million. (Table E)

**Table E**  
**Preliminary**  
**ALTERNATIVE 3 - REPAIR AND RESTORATION OF THE LOWER HAMAKUA DITCH**  
**(1998 Dollars)**

Item	No. Units	Units	Unit Cost	Item Cost	Federal Funds	Other Funds
<b>Land Treatment</b>						
Conservation Practices	50	farm	20,000	1,000,000	650,000	350,000
Technical Assistance	4	staff year	50,000	200,000	200,000	0
Waipio Valley Assistance	4	year	25,000	100,000	100,000	0
<b>Total Land Treatment</b>				<b>1,300,000</b>	<b>950,000</b>	<b>350,000</b>
<b>Structural</b>						
Flume Repair	1	ls	1,614,500	1,614,500	807,250	807,250
Sediment Removal	1	ls	191,000	191,000	95,500	95,500
Concrete Lining Repair	1400	cy	500	700,000	350,000	350,000
Hiihawe Falls Repair	1	ls	1,000,000	1,000,000	500,000	500,000
Intakes Modification	1	ls	200,000	200,000	100,000	100,000
Lateral System	1	ls	1,000,000	1,000,000	500,000	500,000
Honokaia Reservoir	1	ls	200,000	200,000	100,000	100,000
Paauiho Reservoir Lining	1	ls	165,000	165,000	82,500	82,500
Exclusion Fencing	17	miles	10,000	170,000	85,000	85,000
SCADA System	1	ls	500,000	500,000	250,000	250,000
Contingency (20%)		all		1,148,100	574,050	574,050
<b>Total Construction</b>				<b>6,888,600</b>	<b>3,444,300</b>	<b>3,444,300</b>
Engineering (20%)				1,377,700	1,377,700	0
Project Administration (12%)				826,600	275,500	551,100
Landrights (approx. 100 affected parcels)				200,000	0	200,000
<b>TOTAL INSTALLATION</b>				<b>10,592,900</b>	<b>6,047,500</b>	<b>4,545,400</b>
<b>Annual OM&amp;R</b>						
Staff, equipment, material				500,000	0	500,000
<b>TOTAL ANNUAL OM&amp;R</b>				<b>500,000</b>	<b>0</b>	<b>500,000</b>
<b>Annual Costs<sup>1/</sup></b>						
Amortized installation cost (25-years, 7.125%)				919,300	524,800	394,400
OM&R				500,000	0	500,000
<b>AVERAGE ANNUAL COST</b>				<b>1,419,300</b>	<b>524,800</b>	<b>894,400</b>

1/ Some totals affected by rounding errors in amortization calculations.  
ls = lump sum  
cy = cubic yard

*WORKS OF IMPROVEMENT TO*  
**LOWER HAMAKUA DITCH**  
**INTAKE NO. 1**  
**KAWAINUI STREAM**



*Install SCADA Remote Terminal and Control Unit*

*Install flow gauge*

*Replace grating and install plates to pass 30% of streamflow over grating*

*Repair stone masonry dam*

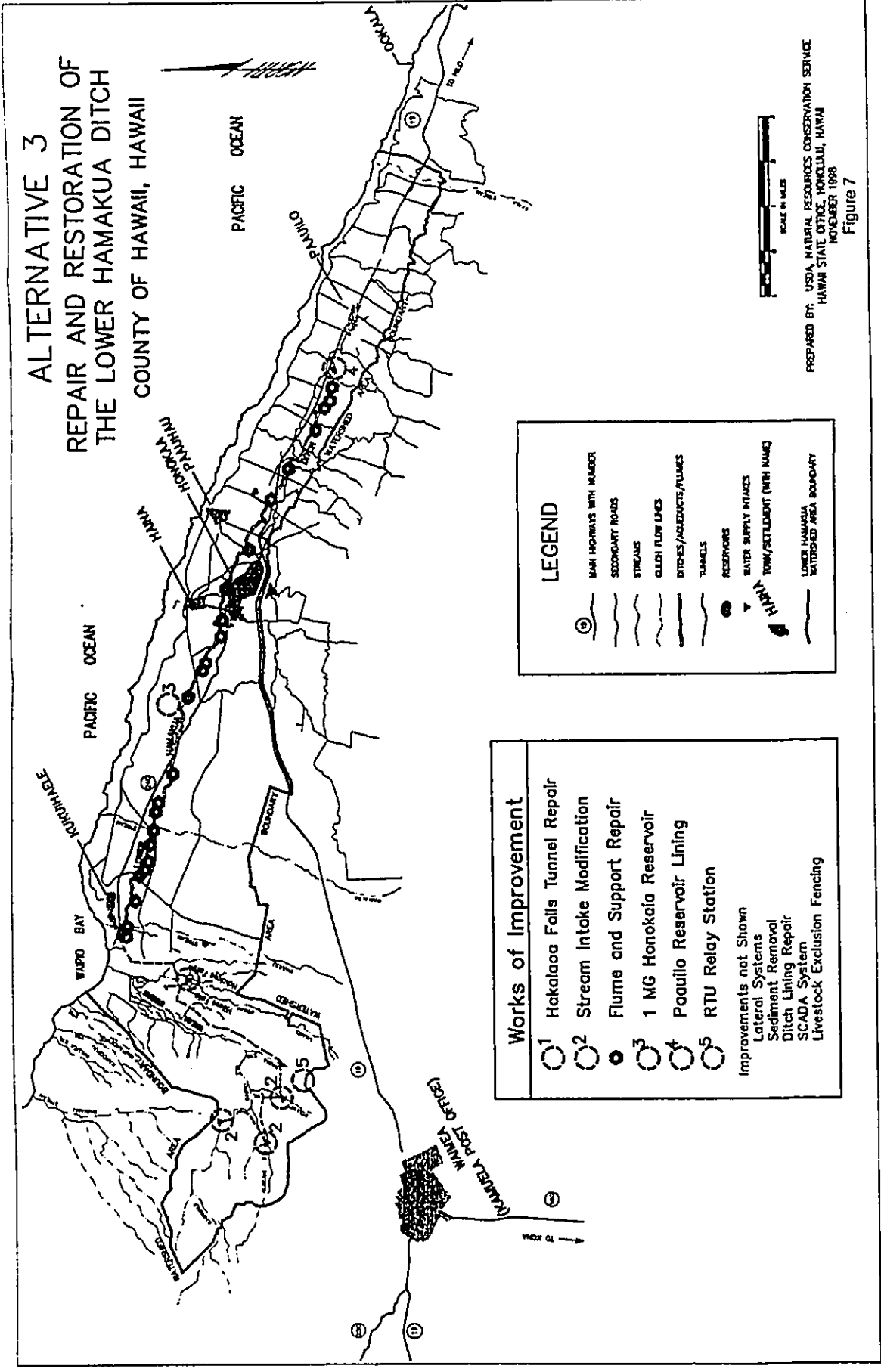
*Replace redwood board dump gate with remotely-operated, powered gate*

**FLOW** ↓

Base drawing: Wai Engineering, Inc

WE-009

# ALTERNATIVE 3 REPAIR AND RESTORATION OF THE LOWER HAMAKUA DITCH COUNTY OF HAWAII, HAWAII



- Works of Improvement**
- 1 Hakalaaa Falls Tunnel Repair
  - 2 Stream Intake Modification
  - Flume and Support Repair
  - 3 1 MG Honokaa Reservoir
  - 4 Paaulio Reservoir Lining
  - 5 RTU Relay Station
- Improvements not Shown
- Lateral Systems
  - Sediment Removal
  - Ditch Lining Repair
  - SCADA System
  - Livestock Exclusion Fencing

- LEGEND**
- ④ MAIN HIGHWAYS WITH NUMBER
  - SECONDARY ROADS
  - ~ STREAMS
  - ~ GULLY FLOW LINES
  - DITCHES/AQUEDUCTS/FLUMES
  - TUNNELS
  - RESERVOIRS
  - ▲ WATER SUPPLY INTAKES
  - ▼ TOWN/SETTLEMENT (WITH NAME)
  - LOWER HAMAKUA WATERSHED AREA BOUNDARY



PREPARED BY: USDA, NATURAL RESOURCES CONSERVATION SERVICE  
HAWAII STATE OFFICE, HONOLULU, HAWAII  
NOVEMBER 1998

Figure 7

#### **3.2.4 Alternative 4 - Replacement of Open Ditch with Pipeline**

This alternative proposes the replacement of the open ditch portion of the LHD with pipeline. The closed pipeline will extend from the Main Weir at Kukuihaele to the Paauilo reservoir. Lateral pipe connections will convey water to service areas. The pipeline will be sized to accommodate the peak agricultural water demand and vary in diameter from 36 inches to 18 inches. The pipeline material will be ductile iron and/or high density polyethylene.

The corridor of the existing LHD open ditch will be used. Other alignments, such as along major roads, were investigated and found to be more costly due to additional costs for road crossings and higher pipe strengths required for higher pressures. A polyethylene pipe with 50 psi strength can be laid in the open ditch sections and pulled through the existing tunnels. Pipe laid in the open ditch will be bedded and buried. All flumes will be replaced with ductile iron or steel pipe laid on the concrete or cut stone foundations that will raise the pipe above the flood flow. Impact protection, such as an I-beam placed parallel to the pipe, may be required for the central span across a stream. An alternative method to cross drainageways will be to bury the pipeline beneath the streambed with protective encasement.

All improvements upstream of the Main Weir will be the same as for Alternative 3 - Repair and Rehabilitation of the LHD. The diversion structures at Kawainui, Alakahi, and Koiawe Streams will be modified to allow low flow release and control over diversion rates. The tunnel behind Hakalaoa Falls will be repaired and the natural flow over Hakalaoa Falls restored.

The lateral systems will be similar as for Alternative 3. However, the lateral pipelines will be connected directly to the main distribution pipeline without settling ponds or screen boxes. Due to pressure in the main distribution pipeline the requirements for pressure relief valves will be somewhat different from Alternative 3.

The use of pipe will provide several distinct advantages. Water loss during transmission will be nearly eliminated. Control of sediment and other pollutants into the water system will be improved. Maintenance of the system will be reduced. Remote control of system operations will be simplified. Safety of people and animals along the ditch will be enhanced.

The primary disadvantage of the pipeline alternative is the installation cost. Another disadvantage, to some, will be the loss of the historic and symbolic character provided by the open ditch.

A SCADA system to monitor and control the entire system will be installed.

Landrights for the crossing of the LHD through private land parcels will be negotiated, documented and recorded. An agreement between DOA and KSBE will transfer the land and water diversion rights to DOA for the life of the project.

The estimated installation cost of Alternative 4 is \$18.3 million. Annual operation and maintenance costs are estimated to be \$0.3 million. (Table F)



Table F  
Preliminary  
**ALTERNATIVE 4 - REPLACEMENT WITH PIPELINE**  
(1998 Dollars)

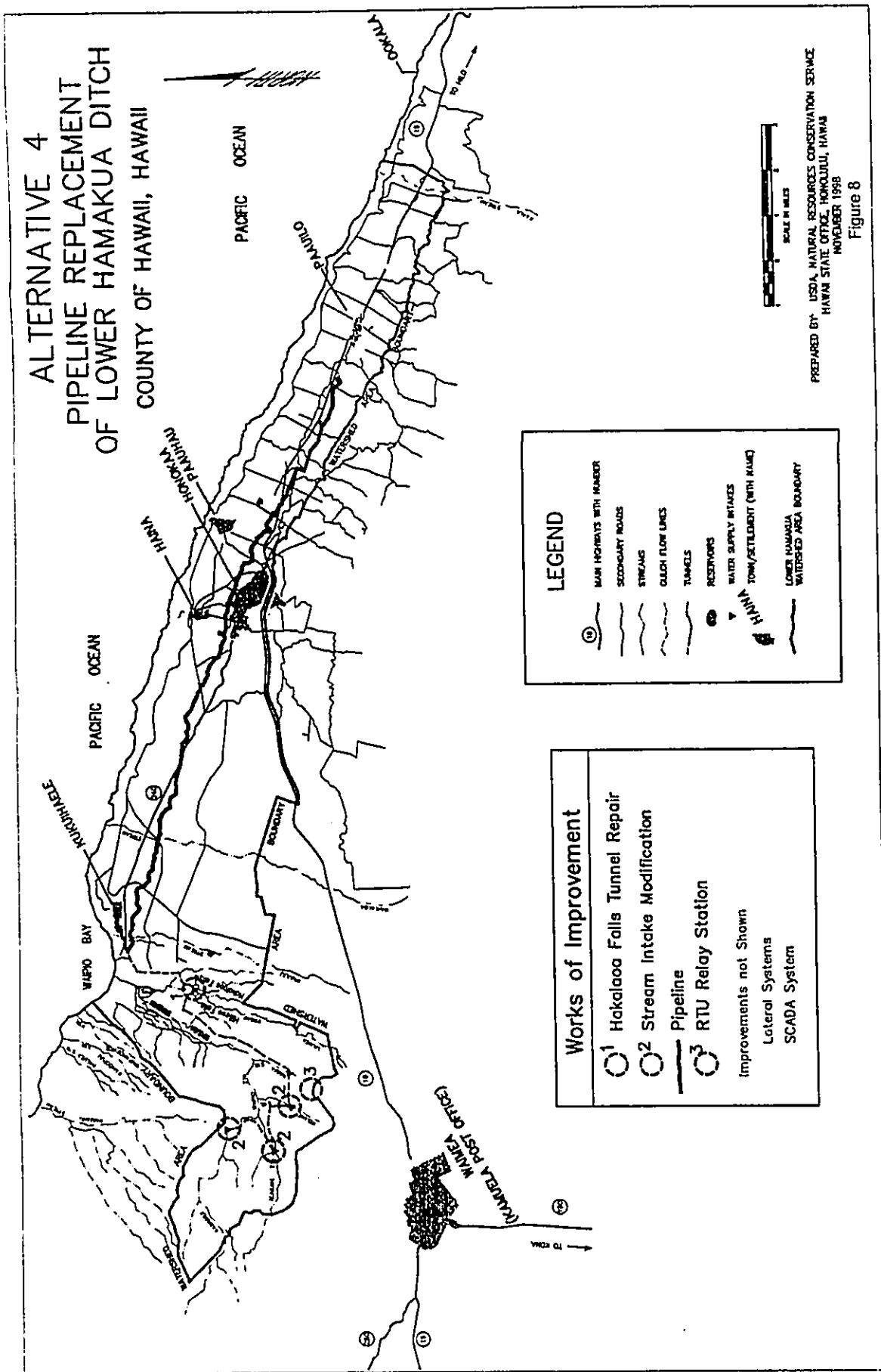
Item	No. Units	Units	Unit Cost	Item Cost	Federal Funds	Other Funds
<b>Land Treatment</b>						
Conservation Practices	50	farm	20,000	1,000,000	650,000	350,000
Technical Assistance	4	staff yr.	50,000	150,000	150,000	0
Waipio Valley Assistance	4	year	25,000	100,000	100,000	0
<b>Total Land Treatment</b>				<b>1,300,000</b>	<b>950,000</b>	<b>350,000</b>
<b>Structural Measures</b>						
36" Dia. HDPE Pipe	27000	lf	126	3,402,000	1,701,000	1,701,000
30" Dia. HDPE Pipe	26900	lf	104	2,797,600	1,398,800	1,398,800
24" Dia. HDPE Pipe	7700	lf	78	600,600	300,300	300,300
20" Dia. HDPE Pipe	5800	lf	56	324,800	162,400	162,400
18" Dia. HDPE Pipe	9600	lf	44	422,400	211,200	211,200
Huilawe Falls Repair	1	ls	1,000,000	1,000,000	500,000	500,000
Intakes Modification	1	ls	200,000	200,000	100,000	100,000
Lateral System	1	ls	1,000,000	1,000,000	500,000	500,000
SCADA System	1	ls	500,000	500,000	250,000	250,000
Contingency (20%)		all		2,049,500	1,024,800	1,024,700
<b>Total Construction</b>				<b>12,296,900</b>	<b>6,148,500</b>	<b>6,148,400</b>
Engineering (20%)				2,459,400	2,459,400	0
Project Administration (12%)				1,475,600	486,900	988,700
Landrights (approx. 100 affected parcels)				200,000	0	200,000
<b>TOTAL INSTALLATION</b>				<b>17,731,900</b>	<b>10,044,800</b>	<b>7,687,100</b>
<b>Annual OM&amp;R</b>						
Staff, equipment, material				300,000	0	300,000
<b>TOTAL ANNUAL OM&amp;R</b>				<b>300,000</b>	<b>0</b>	<b>300,000</b>
<b>Annual Costs <sup>1/</sup></b>						
Amortized installation cost (25-years, 7.125%)				1,538,800	871,700	667,100
OM&R				300,000	0	300,000
<b>AVERAGE ANNUAL COST</b>				<b>1,838,800</b>	<b>871,700</b>	<b>967,100</b>

<sup>1/</sup> Some totals affected by rounding errors in amortization calculations.

lf = linear foot

ls = lump sum

**ALTERNATIVE 4  
PIPELINE REPLACEMENT  
OF LOWER HAMAKUA DITCH  
COUNTY OF HAWAII, HAWAII**



**Works of Improvement**

- <sup>1</sup> Hakalaoa Falls Tunnel Repair
- <sup>2</sup> Stream Intake Modification
- Pipeline
- <sup>3</sup> RTU Relay Station

Improvements not Shown

- Lateral Systems
- SCADA System

**LEGEND**

- ① MAIN ROADS WITH NUMBER
- SECONDARY ROADS
- ~ STREAMS
- ~ CULCH FLOW LINES
- TUNNELS
- RESERVOIRS
- ▽ WATER SUPPLY INTAKES
- ▲ TOWN/SETTLEMENT (WITH NAME)
- LOWER HAMAKUA WATERSHED AREA BOUNDARY

PREPARED BY: USDA, NATURAL RESOURCES CONSERVATION SERVICE  
HAWAII STATE OFFICE, HONOLULU, HAWAII  
NOVEMBER 1998

Figure 8

### 3.3 OPERATION, MAINTENANCE, AND REPLACEMENT (OM&R)

Each structural alternative will require material and effort input to keep the system operational for the life of the project. OM&R costs include water system staff for administration and operations, office and yard facility, trucks and other field equipment, maintenance and repair of the LHD and structures, and replacement of components. The estimated yearly OM&R costs for the various structural elements are shown in Table G.

**Table G**  
**Estimated Annual Operation, Maintenance, and Replacement Costs**

Item	Alternative 2 Wells		Alternative 3 Repair and Restoration of LHD		Alternative 4 Replacement with Pipeline	
	Units needed	Cost \$	Units needed	Cost \$	Units needed	Cost \$
<b>Personnel and facility</b>						
Manager	1	75,000	1	75,000	1	75,000
Crew	2	70,000	3	105,000	2	70,000
Clerical	1	25,000	1	25,000	1	25,000
Office and yard		20,000		30,000		20,000
<b>Equipment (annual cost)</b>						
Pickup Truck	2	8,000	2	8,000	2	8,000
Backhoe	0	0	1	10,000	0	0
Truck-trailer	0	0	1	10,000	0	0
Spray truck	0	0	1	5,000	0	0
Rental		20,000		10,000		20,000
Maintenance and Repair		5,000		10,000		5,000
<b>Supplies</b>						
Herbicide		10,000		100,000		10,000
Office operation		8,000		8,000		8,000
<b>Replacement materials</b>		50,000		100,000		50,000
<b>Pumping energy</b>		493,000		0		0
<b>Total</b>		<b>784,000</b>		<b>496,000</b>		<b>291,000</b>
<b>Estimated OM&amp;R</b>		<b>800,000</b>		<b>500,000</b>		<b>300,000</b>

### 3.4 RISK AND UNCERTAINTY

This Watershed Plan and Environmental Impact Statement has been based on available data, technical judgment of the specialists and preparers, and comments and review by the public. Some information has been developed expressly for this project such as the Cropland Suitability Study (Maptech, 1997), Stream Organism Study (Englund and Filbert, 1997), and Streamfly Study (Englund and Preston, 1999). A degree of uncertainty due to imperfect and incomplete data exists for all the alternatives. Balancing the amount of data needed with an acceptable level risk and uncertainty is a key function of effective planning. The major areas of risk and uncertainty that have been identified for this project are listed below.

#### 3.4.1 Hydrologic Analysis

The flow record of the LHD is based on U.S. Geological Survey and Hawaiian Irrigation Company measurements over the periods 1910-1920, 1945-1959, and 1964-1972 at the Main Weir near Kukuihaele. While a comparative analysis shows the three periods of record to be fairly consistent, the future discharge of the LHD cannot be entirely predicted.

The output of wells along the project area coastline will be variable and can be only determined following well drilling and testing. If salinity levels exceed acceptable limits, the well output will need to be reduced. If pumping of an agricultural well affects DWS wells in the area, pumping will also need to be reduced.

The projected irrigation water demand for crops to be grown on the Hamakua coast was estimated using rainfall and pan evaporation records, crop consumptive use factors, and assumptions regarding irrigation methods and efficiencies. The rainfall was measured at seven gages in and near the project area with recording periods ranging from 44 to 102 years. A log-Pearson III analysis of rainfall and a monthly irrigation water budget was used to determine irrigation requirement for varying frequencies of drought. Pan evaporation records were made at 15 stations with recording periods ranging from one to 19 years. The six major crops used for the consumptive factors analysis were: banana, coffee, macadamia nut, papaya, cut flowers and foliage, and truck crops.

Long term variation in rainfall or evaporation inconsistent with the available record may cause a need for more or less irrigation water need for a typical acre of cropland.

#### 3.4.2 Land Use Analysis

The existing and projected acreage and locations of cropland are based on a crop suitability study (Maptech, 1997) and on interviews with area landowners, farmers, and others familiar with crop cultivation in the project area. There is considerable flux in the planted acreage and crops that are currently being planted. During the period between 1995 and 1998 several dramatic shifts in cropping, such as the ascension of coffee, decline of dracaena, and decline of papaya

planting, have taken place. Such rapid changes in cropping as adjustments to markets, disease, and other such factors are expected to continue into the future.

A crop suitability study (see section 5.5.1 Crop Suitability) assessing the capability of soils and climatic factors to support commercial agriculture was conducted. The study indicated varying acreage of good, fair, and poor areas for the cultivation of truck crops, macadamia nut, foliage and flowers, papaya, coffee, and banana (Maptech, 1997).

Analysis during planning resulted in an informed estimate of 2,500 acres of irrigated cropland in the project area in the future condition with consistent agricultural water supply. The components of the diversion and transmission systems are sized for the projected acreage. If the acreage of irrigated cropland or crop types vary significantly from the projection, project water demand will also vary.

### 3.4.3 Economic Analysis

The estimated economic benefits derived from expanded irrigated agriculture are based on a projected mix of crops evaluated using current market prices and production costs. If the mix or acreage of irrigated crops, market prices, or production costs changes, the actual economic benefits of the project may differ from the estimate.

The cost of implementation of the project and the cost to operate and maintain the LHD are estimated using unit costs from national cost sources, other comparable projects in Hawaii, and those provided by the companies in the industry. The designs contained in this plan are conceptual and preliminary. Costs for installation of the structures may change once a final design is prepared and contracted.

### 3.4.4 Environmental Analysis

Implementation of Alternatives 3 and 4 will decrease diversion from the Waipio Valley streams from an average of 25 to 30 MGD and minimum diversion of 18 to 19 MGD to *an average of approximately 4 to 7 MGD and a maximum diversion of 13 MGD during baseflow periods*. During most periods much of the water once diverted by the LHD can remain in the Waipio Valley streams. During dry periods more agricultural water will be required and may result in the capture *of up to 70 percent* of the streamflow at the diversions during baseflow periods.

The objective of increasing the streamflow in Waipio Valley streams is enhancement of aquatic community resources, particularly increase in the population of native stream organisms, such as the four species of o'opu. Because the data on which this objective is based is scanty, there is a risk that the desired condition of native aquatic populations may not develop *despite the streamflow restoration*.

The reduction in diversion rate will increase the flow in the Waipio Valley streams. The reduced diversion will also increase the frequency of the variability

of stream volume and stage. While some parties favor the increase in streamflow to better irrigate the taro lo'i with more abundant and cooler water, others feel that the higher streamflow and varying water level will make auwai, irrigation ditch, management more difficult and will increase erosion and sediment deposition problems.

The implementation of any of the structural alternatives will increase the mean flow of Wailoa River by nearly 50 percent and may cause changes in Wailoa River channel alignments. Stream dynamics principles for alluvial systems indicate that streams will change meander patterns to adjust to the increased energy in the mean streamflow.

**Table H**  
**SUMMARY AND COMPARISON OF ALTERNATIVE PLANS - Lower Hamakua Ditch Watershed**  
 (Page 1 of 4)

ITEM	ALTERNATIVE 1 No Action	ALTERNATIVE 2 Wells	ALTERNATIVE 3 Repair and Restoration of LHD	ALTERNATIVE 4 Replacement with Pipeline
Proposed Project Improvements	None	2 existing wells upgraded 8 wells developed 10 storage tanks 10 distribution subsystems 10 electrical connections	24 flumes repaired Sediment removed from ditch Concrete lining repaired Hakalaoa Falls tunnel repaired 3 stream intakes repaired/modified 10 (approx.) distribution subsystems 1 reservoir at Honokaia Paauilo reservoir relined 17 miles exclusion fencing SCADA system	14.5 miles of 18-36" dia. pipeline Hakalaoa Falls tunnel repaired 3 stream intakes repaired/modified 10 (approx.) distribution subsystems SCADA system
Baseflow Capacity	18 MGD	14.4 MGD	13 MGD (at diversions)	13 MGD (at diversions)
Future Irrigation Service Area	< 1,250 acres	2500 acres	2500 acres	2500 acres
Future Animal Units Served	2,300 animal units	1,800 animal units aquaculture	1,800 animal units aquaculture	1,800 animal units aquaculture
Other Water Uses				
<b>ECONOMIC EFFECTS</b>				
<b>Benefits</b>				
Agricultural Water Benefits	\$0	\$3,948,200	\$3,948,200	\$3,948,200
Average Annual Benefits	\$0	\$3,948,200	\$3,948,200	\$3,948,200
<b>Costs</b>				
Installation Cost (Federal)	\$0	\$14,440,300	\$6,047,500	\$10,044,800
Installation Cost (State)	\$0	\$11,011,500	\$4,545,400	\$7,687,100
Total Installation Cost	\$0	\$25,451,800	\$10,592,900	\$17,731,900
Annualized Installation Cost	\$0	\$2,208,700	\$919,300	\$1,538,800
Annual OM&R Cost	\$0	\$793,000	\$500,000	\$300,000
Average Annual Costs	\$0	\$3,001,700	\$1,419,300	\$1,838,800
Average Annual Net Benefits	\$0	\$3,948,200	\$3,948,200	\$3,948,200
Benefit to Cost Ratio	N/A	1.3 : 1.0	2.8 : 1.0	2.1 : 1.0
<b>OPERATIONAL CONCERNS</b>				
Irrigation System Mgmt. Establish Billing System Budget for OM&R	Minimal level Uncertain Uncertain	Full management by DOA Yes Funded by revenue	Full management by DOA Yes Funded by revenue	Full management by DOA Yes Funded by revenue

Table H (continued)  
 SUMMARY AND COMPARISON OF ALTERNATIVE PLANS - Lower Hamakua Ditch Watershed  
 (Page 2 of 4)

ITEM	ALTERNATIVE 1 No Action	ALTERNATIVE 2 Wells	ALTERNATIVE 3 Repair and Restoration of LHD	ALTERNATIVE 4 Replacement with Pipeline
<b>ENVIRONMENTAL AND SOCIAL CONCERNS</b>				
Agricultural Activity	Agricultural activity will not increase due to uncertainty about water supply. Farmers and ranchers will sustain losses during system failures.	Agricultural activity will expand due to certainty of water supply. Limited by high cost of agricultural water.	Agricultural activity will expand due to certainty of water supply. Ranchers provided with stable water supply.	Agricultural activity will expand due to certainty of water supply. Ranchers provided with stable water supply.
Air Quality	No effect	Air quality will be affected by the generation of electricity for pumping. Dust and vehicular exhaust during construction.	Dust and vehicular exhaust during construction.	Dust and vehicular exhaust during construction.
Historic and Cultural Resources	No effect	The LHD will be abandoned.	The flumes on the LHD will be replaced with CMP or inverted siphons, except for two flumes that will be restored to original construction to preserve the historic resource of the LHD.	The appearance of the LHD will be altered by filling of open ditch and removal of high flume structures.
Economic Development	No significant economic development anticipated.	Economic development spurred by increased farming activity.	Economic development spurred by increased farming activity.	Economic development spurred by increased farming activity.
Energy Resources	No effect	Approx. 6,300,000 kW-hr needed for 2,500 acres of irrigated land.	Energy needed for SCADA system.	Energy needed for SCADA system.
Erosion and Sedimentation	No effect	Potential for increased erosion during installation of wells and pipelines.	Potential for increased erosion during repair of LHD and lateral pipelines.	Potential for increased erosion during installation of main pipeline and lateral pipelines.
Fish and Wildlife Habitat	No change	Full restoration of flow diverted by LHD at 1,000' level of Kawainui, Alakahi, and Koiawe Streams.	Partial restoration of flow diverted by LHD at 1,000' level of Kawainui, Alakahi, and Koiawe Streams.	Partial restoration of flow diverted by LHD at 1,000' level of Kawainui, Alakahi, and Koiawe Streams.
Flooding and Floodplains	LHD diversions can provide up to 90 cfs reduction in discharge to Waipio Valley.	No reduction in discharge to Waipio Valley.	Modified LHD diversions can provide up to 32 cfs reduction in discharge to Waipio Valley.	Modified LHD diversions can provide up to 32 cfs reduction in discharge to Waipio Valley.



Table H (continued)  
**SUMMARY AND COMPARISON OF ALTERNATIVE PLANS - Lower Hamakua Ditch Watershed**  
 (Page 3 of 4)

ITEM	ALTERNATIVE 1 No Action	ALTERNATIVE 2 Wells	ALTERNATIVE 3 Repair and Restoration of LHD	ALTERNATIVE 4 Replacement with Pipeline
<b>ENVIRONMENTAL AND SOCIAL CONCERNS (continued)</b>				
Groundwater	LHD transfers approximately 25 MGD to Hamakua groundwater supply through system leakage and surplus irrigation.	Water transfer from Waipio Valley to Hamakua Coast will cease. A peak withdrawal of 14.4 MGD by project wells expected.	Water transfer to Hamakua aquifer will be reduced to approximately 3 MGD due to reduction of system leakage and efficient irrigation.	Water transfer to Hamakua aquifer will be reduced to almost 0 MGD due to reduction of system leakage and efficient irrigation.
Hazardous Materials and Hazardous Waste Sites	No effect to possible hazardous materials sites in watershed.	No effect to possible hazardous materials sites in watershed.	No effect to possible hazardous materials sites in watershed.	No effect to possible hazardous materials sites in watershed.
Land Use	Current land use patterns will generally continue. Irrigated cropland will primarily be limited to State land parcels. Conversion of some good agricultural land to other uses will be considered by private owners.	Irrigated cropland will increase to projected 2,500 acres if affordable water rates are implemented. Other uses of poorer agricultural land will be considered by owners.	Irrigated cropland will increase to projected 2,500 acres. Other uses of poorer agricultural land will be considered by owners.	Irrigated cropland will increase to projected 2,500 acres if affordable water rates are implemented. Other uses of poorer agricultural land will be considered by owners.
Population	No significant effect on area population.	No significant effect on area population.	No significant effect on area population.	No significant effect on area population.
Prime/Unique Farmland	Prime and Unique Farmlands will be underutilized for crop production. Some Prime and Unique Farmlands will be lost to commercial and residential use due to low profitability as cropland because of uncertain water supply.	2,500 acres of Prime and Unique Farmland will be used for irrigated crop production. There will be a greater concern for protection of Prime and Unique Farmland. Approximately five acres of farmland will be converted to well and storage tank use.	2,500 acres of Prime and Unique Farmland will be used for irrigated crop production. There will be a greater concern for protection of Prime and Unique Farmland. Approximately one acre of farmland will be converted to reservoir use.	2,500 acres of Prime and Unique Farmland will be used for irrigated crop production. There will be a greater concern for protection of Prime and Unique Farmland. Approximately one acre of farmland will be converted to reservoir use.
Social Effects	Reduced and uncertain farm income may not provide the level of employment to ensure community economic development based on agriculture.	Reduced farm income due to higher cost of water may hinder community economic development based on agriculture.	Higher farm income due to lower cost of water may foster community economic development based on agriculture.	Higher farm income due to lower cost of water may foster community economic development based on agriculture.

Table H (continued)  
**SUMMARY AND COMPARISON OF ALTERNATIVE PLANS - Lower Hamakua Ditch Watershed**  
 (Page 4 of 4)

ITEM	ALTERNATIVE 1 No Action	ALTERNATIVE 2 Wells	ALTERNATIVE 3 Repair and Restoration of LHD	ALTERNATIVE 4 Replacement with Pipeline
<b>ENVIRONMENTAL AND SOCIAL CONCERNS (continued)</b>				
Streams	Three Waipio Valley streams will continue to be diverted at an average rate of 30 MGD. Leakage from the LHD will continue to create perennial flows in Hamakua area streams.	LHD diversions on Waipio Valley streams will be abandoned. All Hamakua area flow in streams resulting from ditch leakage will cease.	LHD diversions on Waipio Valley streams will be modified to decrease diversion rate to an average of 7 MGD. 30% of the baseflow of Waipio Valley streams will be restored. Nearly all Hamakua area flow in streams resulting from ditch leakage will cease.	Waipio Valley Stream diversions will be modified to decrease diversion rate to an average of 4 MGD. 30% of the baseflow of Waipio Valley streams will be restored. Nearly all Hamakua area flow in streams resulting from ditch leakage will cease.
Threatened and Endangered Species	No adverse effect to T&E species.	No known adverse effect to T&E species.	No known adverse effect to T&E species.	No known adverse effect to T&E species.
Visual Resources	No significant change. Abandoned sugarcane with ironwood, guava, kiawe, and other shrubs and grasses dominate. Agricultural land may be converted to residential and commercial uses. LHD will remain generally unchanged.	Approximately 2,500 acres of former sugarcane land will be converted to irrigated agriculture. The LHD will be abandoned and will be dismantled or left to disintegrate.	Approximately 2,500 acres of former sugarcane land will be converted to irrigated agriculture. The wooden flumes on the LHD will be replaced with pipe structures, except for two that will be restored to original construction to preserve the historic resource of the LHD. Hakalaoa Falls will be restored.	Approximately 2,500 acres of former sugarcane land will be converted to irrigated agriculture. The wooden flumes on the LHD will be replaced with pressure pipe structures and the open ditch sections will be filled. Hakalaoa Falls will be restored.
Water Rights	The right of the DOA to operate the LHD system which is situated primarily on KSBE land will remain uncertain without a completed agreement with KSBE. The complaint seeking restoration of streamflow to Waipio Valley streams will be resolved by CWRM.	The DOA will need to evaluate the effect of each well on the underlying aquifer and will be required to obtain well permits for each well installation. All streamflow will be restored to Waipio Valley.	An agreement transfers operation of the diversions and conveyance system to DOA for the life of the project. Partial restoration of streamflow to Waipio Valley and an amendment of the IIFS.	An agreement transfers operation of the diversions and conveyance system to DOA for the life of the project. Partial restoration of streamflow to Waipio Valley and an amendment of the IIFS.
Wetlands	No effect	All artificial wetland areas created by leakage or open storage along the LHD will cease to exist.	Most wetland areas created by leakage will cease to exist. Open storage areas may increase.	All artificial wetland areas created by leakage and most open storage along the LHD will cease to exist.

## 4. SELECTED PLAN

Alternative 3 - Repair and Restoration of the LHD was selected by the sponsors as the Selected Plan to address the agricultural water shortage and uncertainty problems and meet the objective of stable, adequate, and reasonably priced agricultural water supply to maintain and expand the diversified agricultural base in Hamakua and to promote economic revitalization of the Hamakua coast. Alternative 3 has been identified as the National Economic Development (NED) Plan, as defined by the United States Water Resources Council, and, as such, will maximize the net economic benefits to the nation.

The objective of the selected plan is to alleviate the agricultural water shortage problems in the Hamakua area of the island of Hawaii, County of Hawaii as described in Section 2 PROJECT PURPOSE AND NEED. This section provides a description of the actions of the Selected Plan in Section 4.2 Proposed Works of Improvement and the phasing and timing of the action in Section 4.4.1 Sequence of Installation. A historic perspective is provided in Section 2.1.1 Closure of Hamakua Sugar Company, Section 2.2.2 Poor Present Condition of the Lower Hamakua Ditch, Section 2.1.3 Present and Future Condition of Farming Activity, Section 4.4.6 Cultural and Historic Resources, and Section 6.3.10 Cultural and Historic Resources.

### 4.1 RATIONALE FOR PLAN SELECTION

Alternative 3 - Repair and Restoration of the LHD was selected by the project sponsors as the Selected Plan because the alternative effectively addresses the problems of agricultural water shortage and uncertainty. Alternative 3 supports and advances state and local objectives of providing economic opportunity to displaced sugar industry workers and revitalization of the Hamakua regional economy.

Alternative 3 is the National Economic Development (NED) plan as defined by the Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies of the U.S. Water Resources Council. As the NED plan, Alternative 3 has been shown to maximize the net economic benefit to the nation. The net economic benefit is defined as the positive difference between average annual economic cost and average annual economic benefit during the life of the project.

*Alternative 3 provides positive environmental and social benefits without producing adverse impacts which cannot be mitigated*

Alternative 1 - No Action was not selected because it did not provide consistent agricultural water supply, did not contribute to revitalization of the regional economy, and did not address social and environmental concerns, such as the diversion of Hakalaoa Falls and enhancement of Waipio Valley aquatic resources.

Alternatives 2 and 4 were not selected due to their lower net economic benefits when compared to Alternative 3. Alternatives 2 and 4 do not provide significant

additional social or environmental benefits which could be used to justify the higher economic cost.

## **4.2 PROPOSED WORKS OF IMPROVEMENT**

Alternative 3 proposes the repair, rehabilitation, and/or replacement of components of the LHD system to ensure dependable operation for the 25-year life of the project. Those components that are in a condition where failure is imminent and can affect the flow in the ditch system will receive highest priority for action. Next priority will be given to components with high rates of water loss. Third priority will be given to elements that will reduce maintenance costs. Special priority will be given to features providing environmental and social benefits, including repair of the tunnel at Hakalaoa Falls and modification of the Waipio Valley stream diversion structures to partially release streamflow..

### **4.2.1 Flume Replacement and Repair**

The elements of the LHD that pose the greatest threat of failure are the flumes and support structures. (See Photo A) An examination of the 50 flumes between the Main Weir and Paauilo Reservoir indicated that 24 wooden flumes still exist. (Wai Engineering, 1995) The wooden flumes were typically constructed of two-inch thick redwood. The support structures are constructed of four by four and larger redwood. All of the wooden flumes were in need of repair due to rot. Recent repairs to the flumes have been made using plywood and treated Douglas fir or similar lumber which has proven to be inferior to the original redwood. Replacement of all, but two wooden flumes with corrugated metal pipe or with inverted pipe siphons is proposed. (See Photo B) Support structures for nearly every flume replacement will also be required. Metal I-beams will replace the rotting timber supports.

*Two of the wooden flume structures will be repaired with materials and construction that are as close to original as possible. The two flumes will be functioning examples of the craft and ingenuity of the constructors of the LHD system. The two wooden flumes will be selected in consultation with the SHPD during the design stage of flume repair.*

### **4.2.2 Ditch Lining Repair and Sediment Removal**

The concrete lining of severely damaged open ditch sections will be repaired using welded wire fabric and pneumatically-applied or hand-troweled mortar. While cracking of the lining is extensive throughout the LHD, only those sections with broken and missing lining, upheaval, intrusion of roots, significant leakage, or open to sediment sources will be repaired. It is estimated that ten percent of the channel lining will be repaired.

A one-time removal of sediment from the open ditch sections is proposed. Sediment in flumes and tunnels will not be removed unless very accessible. The sediment deposition depth is estimated to average one foot throughout the system.

### 4.2.3 Reservoirs

Storage of water during nighttime periods will be necessary due to the difficulty in controlling diversion rates throughout the day. In short, during the peak demand periods when 14 million gallons per day is needed by farmers and other users, we can expect that most of the demand will take place during the eight to twelve hour work day. Storage equivalent to the volume of twelve to sixteen hours of ditch flow will be required if all-day irrigation cycles are to be avoided. At a minimum, ten million gallons of storage volume is needed. *Additional storage capacity is needed if shutdown of the LHD for more than a day is to be accommodated. During the period of repair by the project, stoppage of flow to sections of the ditch is anticipated.*

*Presently, the four reservoirs on the LHD have a combined storage capacity of 31 MG. However, the location of the reservoirs leaves much of the project area without water-leveling or storage capability. The four reservoirs are located on the Paauilo side of the service area. The HNHAC farmlots at Honokaia is a rapidly developing agricultural area without reservoir capacity.*

The four existing reservoirs will be used by the agricultural water system. A new one-MG reservoir will be installed by the project at Honokaia to serve the HNHAC farmers. The Paauilo Reservoir will be lined to eliminate seepage losses. No project improvement of the other three existing reservoirs is anticipated.

Water users will be encouraged to develop reservoir capacity on the farm to ensure continuous supply when it is needed.

### 4.2.4 Lateral Pipeline Systems

Approximately ten lateral distribution systems will be repaired or installed by the watershed project. Many of the lateral systems will incorporate existing pipelines and features installed during sugarcane cultivation. Sediment ponds and screen filters will be used at each lateral system.

*Sixteen lateral systems from the LHD were used by Hamakua Sugar Company for irrigation of their fields. The lateral systems and the filter and screen location are shown on Figure 9 - HSC Lateral Systems.*

#### 4.2.4.1 Screening and Filtration

A screen filter box or other filtration will be provided at each inlet to a lateral system to prevent damaging sediment and floating debris from entering the lateral pipeline system. No representation as to the quality of the delivered water will be made. Some irrigators using fine orifice drip systems may need additional filtration on their farms.

#### 4.2.4.2 Pipeline Systems and Pressure Regulation

Each irrigation subarea will eventually be served by one or more lateral distribution systems which provides water to farmers and ranchers from the LHD

or one of its reservoirs. Most of the lateral pipeline systems that are currently being used require repair or replacement of components to avoid chronic breakdowns and excessive maintenance. New lateral systems for four areas will be needed in the short-term future and should be installed by the project. Other subareas will require more time to be developed and the irrigation lateral systems will be installed at a later time and will be funded separately. Expansion of the *some of the existing lateral systems which are not being currently used* will also take place at a later time and will be funded separately. *A more detailed assessment of the lateral systems and identification of repairs and extension will be made during the design phase.*

*Assessment and design of pressure regulation on the lateral pipelines will be conducted during the design phase. Existing pressure regulation devices are a significant source of leakage from the LHD.*

#### 4.2.4.3 Meters

Meters will be provided by the LHD agricultural water system at the parcel boundary for users connected to the lateral system and at the ditch takeoff for users that are connected directly to the open ditch.

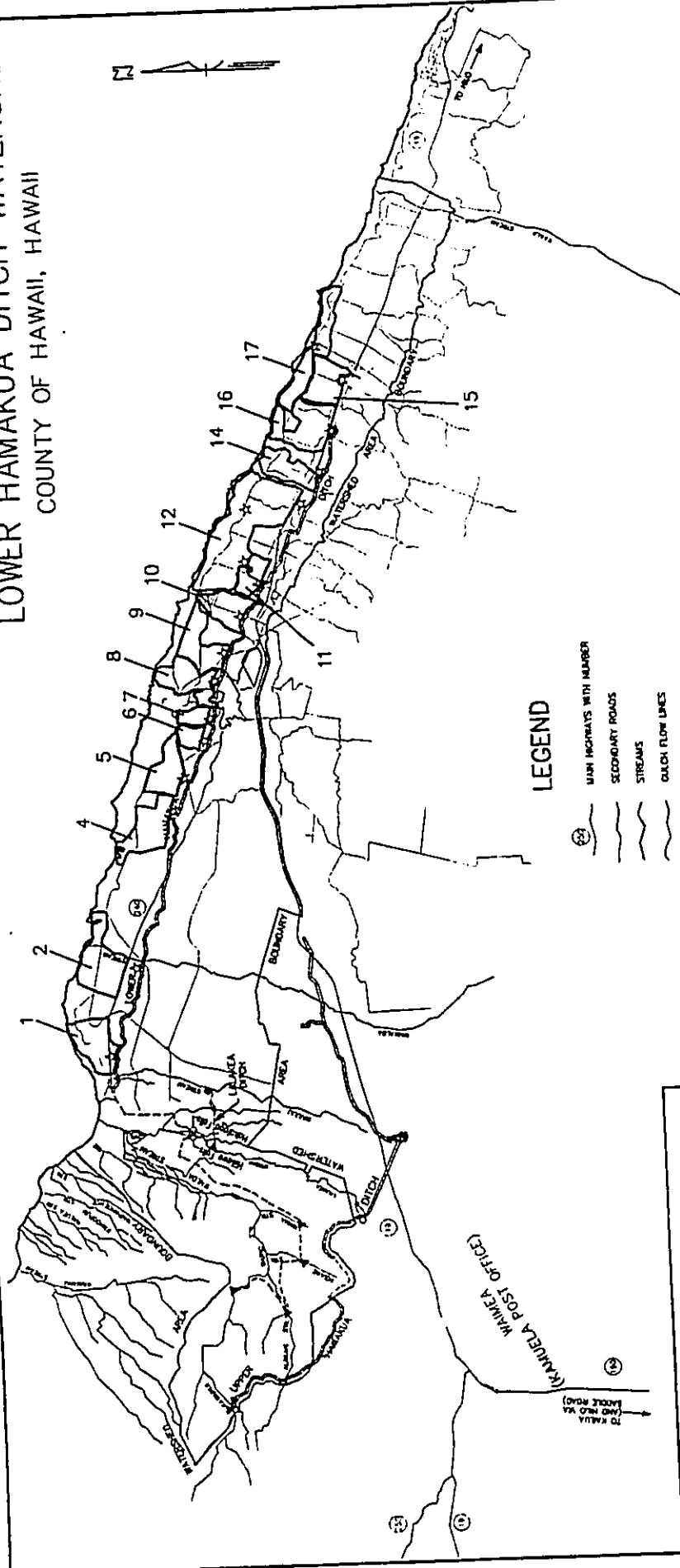
#### 4.2.5 Intakes

Three of the four existing intakes on Waipio Valley streams—Kawainui, Alakahi, and Koiawe—will be reconstructed and used for the improved LHD. The Waima Stream intake is not operational and will not be reconstructed. The reconstructed intakes will be configured and/or controlled to limit the amount of water diverted to the Hamakua area to the water demand plus a fraction to account for seepage, evaporation, and other system losses. *System losses are roughly estimated to be 3 MGD after project repairs to the system are completed.*

*The three diversion structures will also be configured to conform to the recommendation made by the U.S. Fish and Wildlife Service to "pass at least 30 percent of baseflow and prevent entrainment of animal larvae spawned upstream during baseflow." (U.S. Department of Interior DEIS comment letter, January 25, 1999) The design will be based on the recommendation to place iron plates flush with the outer edges of the diversion grates. The iron plates will comprise 30 percent of the flow width of the structure providing the required low flow water passage. (See Figure 6)*

Kawainui Stream (shown in Photo C) is the primary water source for the LHD system. With the proposed modifications, the Kawainui Stream diversion will provide operational control over diversion rates for the LHD. The Kawainui Stream concrete dam structure will be repaired to fill the structurally threatening void that has developed under the concrete apron. The inlet box will be reconstructed to use a commercially available grating that is angled to be self cleaning. *The plates recommended by the USFWS will be installed to assure passage of 30 percent of the baseflow.* The sand trap will be repaired and fitted with a powered gate that is capable of remote control. The dump gate on the concrete flume will be replaced with a remotely controlled powered gate to

LOWER HAMAKUA DITCH WATERSHED  
COUNTY OF HAWAII, HAWAII



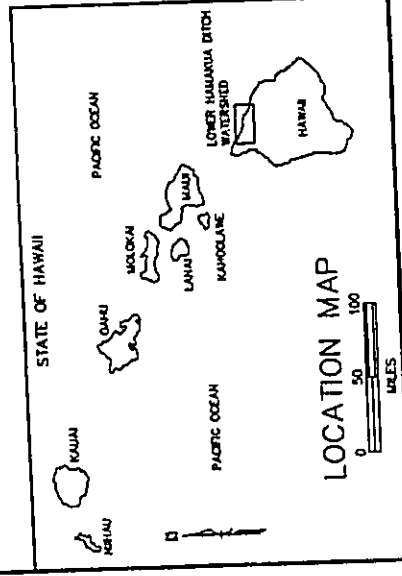
LEGEND

- MAIN HIGHWAYS WITH NUMBER
- SECONDARY ROADS
- STREAMS
- GULCH FLOW LINES
- DITCHES/AQUEDUCTS/FLUMES
- TUNNELS
- RESERVOIRS
- WATER SUPPLY INTAKES
- TOWN/SETTLEMENT (WITH NAME)
- LOWER HAMAKUA WATERSHED AREA BOUNDARY
- FIELD LATERAL SERVICE AREA

FIELD LATERAL SYSTEMS  
HAMAKUA SUGAR COMPANY

PREPARED BY: USDA, NATURAL RESOURCES CONSERVATION SERVICE  
HAWAII STATE OFFICE, HONOLULU, HAWAII  
SEPTEMBER 1989

Figure 9



release flow in excess of the Hamakua area agricultural water need back into Kawainui Stream.

The intakes at Alakahi and Koiawe Streams will be repaired and reconstructed to divert only five and three MGD of base flows, respectively, into the LHD. The diversion structures will be reconfigured to maintain 30 percent of the low flow in the stream *with the alteration to the intake grating recommended by the USFWS. Remedial work on access path blockage will also be conducted at each intake.*

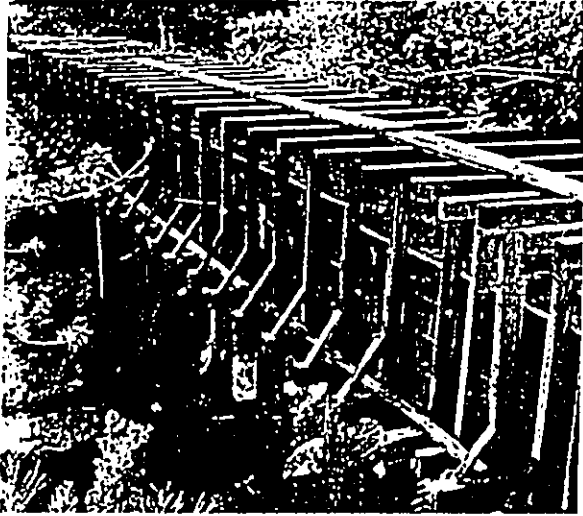
#### 4.2.6 Hakalaoa Falls

The repair of the tunnel around Hakalaoa Falls will be the first project increment to be completed because of the precarious condition of the temporary flume (Photo D) and the CWRM mandate for the December 1, 1999 restoration of Hakalaoa Falls. *The restoration of a seven feet by seven feet by-pass tunnel is required to (1) have continuous access, (2) allow movement of men and repair materials, and (3) provide sufficient room for maintenance work as there is no other method of entering this tunnel section between the Kukaihaele Weir and Koiawe Stream intake except through the tunnel.*

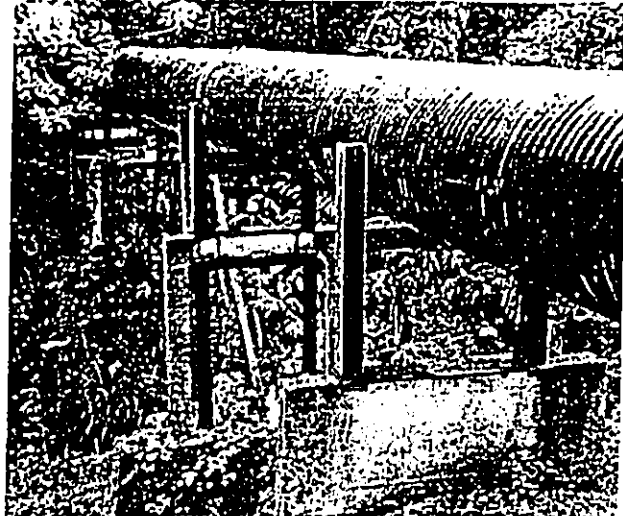
Because of the specialized nature of tunnel construction, the use of a design-build process should be instituted for this phase.

If it appears that the tunnel cannot be completed by the CWRM deadline of December 1, 1999, the DOA will undertake construction of a cliff-surface mounted culvert approximately thirty feet long and protected by concrete encasement. This medium-term repair will allow the removal of the Hakalaoa Stream diversion and restoration of the falls. As a safeguard, rocky debris will be removed from streamflow using a debris basin on Hakalaoa Stream before the waterfall. The basin will be designed to allow cobble and boulder sized rocks to settle. The basin will be cleared of sediment periodically and following storm events. *The interim repair will require a stream alteration permit for the debris basin and a Conservation District Use Application for the activity at the flume.*





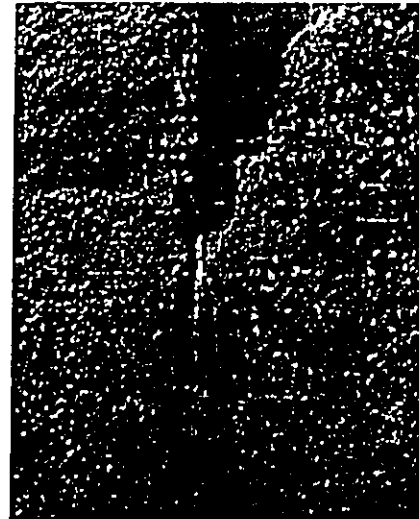
**Photo A** Wooden flume with redwood and concrete supports and cutrock foundations. Two wooden flumes will be repaired with matching materials and construction methods to preserve the historic resource of the LHD.



**Photo B** Corrugated Metal Pipe (CMP) with metal I-beams that has replaced a wooden flume. The original bedrock support remains in most cases. All but two wooden flumes will be replaced in this manner by the Selected Alternative.



**Photo C** Kawainui Intake. Damaged grating in lower right of photo allows moderately large debris to enter and potentially clog system. This nonvariable intake structure will be replaced with a variable device that will allow diversion amount to be varied according to committee recommendations.



**Photo D** Detail of midpoint of Hakalaoa Falls at location of temporary flume. Upstream diversion has eliminated flow to this point. Leakage from the LHD provides the water flowing below this point.

Photos: Wai Engineering, Inc.

#### 4.2.7 SCADA

A Supervisory Control and Data Acquisition (SCADA) system will be implemented to allow remote data collection and operation of key components of the improved LHD system. The data that will be monitored by the SCADA system are flows at the stream diversions, flow at the Main Weir, flows at the lateral systems, storage at the reservoirs, and overflow at dump gates. The components that will be controlled by the SCADA system will include the variable diversion gate and sand trap gate at the Kawainui Stream intake, the dump gate at the Main Weir, inlets to the reservoirs, and main gates on the lateral pipeline systems. *The use of SCADA to monitor diversion rates at Alakahi and Koiawe Streams will also be considered during design to comply with the CWRM requirement for water measurement in the system.*

Locations along the open ditch where SCADA control will be implemented will be connected to the HELCO power supply for valve actuation and remote terminal unit (RTU) function. Monitoring stations will mainly use solar array and battery unless HECO electrical power is immediately available.

The power requirement at the remote Kawainui Stream diversion structure to operate the variable diversion gate, sandtrap gate, flow monitoring gage, and RTU will be provided by a combination of solar array, and/or micro-hydropower generator and storage batteries. The short period of direct sunlight into the incised valley location and the variability of streamflow may require both forms of electrical generation to keep the batteries charged.

A remote relay station will be required for the Kawainui RTU, which does not have line-of-sight access to the Hamakua area. A possible location for the relay station is on the Waipio Valley rim above Waimea, on the ridge between Koiawe and Waima Streams, near the Upper Hamakua Ditch. The relay station will be located within the Conservation District and will be self-powered with a solar array.

The use of SCADA control at the Alakahi and Koiawe intakes was considered but was not included in the project due to *difficulty of installation and transmission*. Manual controls to limit stream diversion and provide sediment flushing will continue to be used at these intakes.

#### 4.2.8 Operation

The DOA will operate and manage the improved LHD system. DOA will use the authority provided by Chapter 167, HRS, to organize an agricultural water system capable of measuring water use; collecting user fees; managing the staff, equipment, and materials to maintain, repair, and replace components; and developing policies and operating guidelines to best serve the agricultural water users while adhering to other constraints imposed on the system.

The close proximity of DOA's Waimea Irrigation System, approximately ten miles to the southwest, creates a unique opportunity to share equipment and capacities. Some of the areas where sharing may be advantageous include heavy equipment, billing and collections, and central systems for SCADA.

The DOA is committed to form a management advisory group consisting of agricultural users, Waipio Valley representatives, and natural resources managers that is able to provide input and advise the manager of the system.

The extreme droughts exceeding the reliability of the LHD to provide adequate water to all of its users may occur once the projected agricultural development conditions are approached or exceeded. Managers of the agricultural water system should utilize groundwater sources or place restrictions on water use when the LHD supply is inadequate to meet the demand of its agricultural and other users during drought. An active program to assure the availability of wells that can be used to augment the LHD supply should be undertaken.

*As the island experiences frequent earthquakes, normal and routine trail and access path clearings should be a requirement as a part of the operations to keep existing access paths free of blockages. Further, with the reduction of diverted flows into the system, the irrigation system rules should allow the installation of small storage reservoirs for those customers whose water use rely on continuous availability of water, such as livestock drinking uses.*

The life of the project is 25 years following implementation of the project improvements. The agreement between DOA and KSBE transferring the rights to the LHD extends 35 years. At the conclusion of the 25 year project life, the sponsors can elect to relinquish control of the then-depreciated system or re-negotiate the lease agreement with KSBE.

#### 4.3 COSTS

This section describes the cost elements of the watershed project, estimates the cost of project activities and components, and displays project costs and benefits in tabular form. The method of calculation of project costs and allocation of costs to the funding sources is directed by the NRCS National Watershed Manual and the Water Resource Council's Principles and Guidelines.

Installation costs include construction, engineering services, project administration, and real property costs for each structural work of improvement. Installation costs also include costs for installation of on-farm conservation measures and assistance from NRCS and other technical specialists. The estimated total installation cost for the Selected Plan is \$10,592,900 in 1998 dollars.

Construction costs include the material, equipment, labor, and any other direct costs of installing or constructing each of the proposed structural improvements. Construction costs are based on quantity estimates and recent unit prices for similar work done in the state. Construction costs associated with providing agricultural water can be cost-shared up to 50 percent with PL 83-566 funds, with the remaining 50 percent to be borne by local sponsors, in this case, the DOA. The estimated construction cost to be funded by PL 83-566 and the DOA is \$3,444,300 each.

Engineering services costs are an estimate of the costs associated with survey, investigation, and final design of the proposed structures; preparation of

specifications and plans; preparation of operation and maintenance plans; and inspection during construction. Engineering services costs have been estimated to be 20 percent of the construction costs. Engineering services costs for irrigation water supply can be cost-shared up to 100 percent with PL 83-566 funds. PL 83-566 will fund the estimated \$1,377,700 in engineering costs.

Project administration costs include costs of preparing invitations to bid, administering contracts, providing government representatives, conducting acceptance inspections, relocation assistance, permit acquisitions, legal opinions, and other overhead costs. Project administration costs have been estimated to be 12 percent of construction costs. Project administration costs will be funded by each agency as they occur. Because the State of Hawaii will be administering design and construction contracts, two-thirds of the administrative costs have been allocated to the DOA. Project Administration costs have been estimated to be \$275,500 for PL 83-566 and \$551,100 for the DOA.

Real property costs include acquisition of land through purchase, permanent and temporary land easements, and rights-of-way needed for the installation of the works of improvement. The major real property cost will be the negotiation and recordation of easement rights for the crossing of the LHD through nearly 100 private land parcels. *Most of the parcels are owned the KSBE. Twenty-two of the parcels are owned by private parties other than KSBE.* Real property costs cannot be cost-shared with PL 83-566 funds and must be funded by local sponsors. The estimated real property cost to be funded by DOA is \$200,000.

Land treatment costs are costs associated with the on-farm installation of those practices necessary to ensure realization of project benefits, including water conserving irrigation systems, perimeter and field windbreaks, and soil conservation measures. Installation costs for land treatment measures are cost-shared by PL 83-566 at the level of other existing national USDA programs, such as the Environmental Quality Incentives Program. The cost-share rate used for this project for enduring practices will be 65 percent by PL 83-566 and 35 percent by the producer. Other conditions of the land treatment program directed by PL 83-566 will also be applied and will be included in the long-term contracts entered by the landowner or operator. NRCS staffing costs to provide accelerated technical assistance to producers are also considered land treatment costs. NRCS assistance for collection of data needed for effective management of the stream diversions is also included under land treatment costs. The estimated land treatment cost for installation of practices is shared \$650,000 by PL 83-566 and \$350,000 by producers. Approximately \$200,000 for four years of accelerated technical assistance will be funded by NRCS. Approximately \$25,000 per year for four years will be used for stream flow measurement in Waipio Valley.

Operation, maintenance, and replacement (OM&R) costs are for materials, equipment, services, and facilities needed to operate the agricultural water system and make the repairs and replacements necessary to maintain the structural measures in sound operating condition during the life of the project. OM&R costs are the responsibility of the sponsors. OM&R costs are estimated to be \$500,000 annually. Water fee revenues are expected to cover the OM&R cost.

#### 4.4 INSTALLATION AND FINANCING

This section describes the framework for implementing the watershed plan. The sequence of installation, responsibilities of NRCS and the Sponsors for installation and financing, and preconditions that need to be met are described.

##### 4.4.1 Sequence of Installation

*It has been estimated that the Selected Plan can be installed in increments over a period of four years, subject to the availability of both federal and local sponsor (DOA) funding by the respective legislative bodies, i.e., Congress and State Legislature, and the allocation of such funding to this project. In certain instances, construction delays of several years may occur depending on release of construction funding by either agency. Also, each installation year's work may overlap into the next installation year depending on the complexity of the construction and time allotted to that phase so, in effect, the schedule outline may extend over several installation years before the next installation year's work may be started.*

During the first year, a design-build contract for the tunnel repair behind Hakalaoa Falls will be executed. Specifications and designs *or performance requirements* for clean-out of sediment from the open ditch, flume repairs, modification of stream intake structures, and repair of the concrete ditch lining will be prepared. Accelerated technical and financial assistance will be provided to farmers and ranchers to plan and implement land treatment measures. Also during the first year, easement rights for the LHD across land parcels will be acquired.

During the second year, sediment removal, repair of flumes and supports, reconstruction of stream intakes, and repair of the concrete ditch lining will occur. Design and specifications *or performance requirements* for the exclusion fencing, SCADA system, and one-half of the lateral systems will be prepared in the second year.

During the third year, installation of the exclusion fencing, SCADA system, and one-half of the lateral systems will take place. Designs and specifications *or performance requirements* for the second half of the laterals, Honokaia Reservoir, and lining of the Paauilo Reservoir will be prepared in the third year. Accelerated technical and financial to farmers and ranchers for implementation of land treatment measures will continue.

During the fourth year, installation of the laterals, construction of Honokaia Reservoir, and lining of the Paauilo Reservoir will be completed. Accelerated land treatment assistance to farmers and ranchers will continue until the end of the fourth year

Accelerated land treatment assistance will be provided during the four year installation period. An additional conservation planner will be placed in the NRCS Hilo or Kamuela Field Office to augment their existing planning efforts in the project area. Approximately 13 producers per year will receive *technical and financial* assistance to install enduring conservation practices that are included in their conservation plans.

Table I -- Sequence of Installation and Schedule of Obligations -- shows the estimated timeline for installation of works of improvement during the four year installation period. Approximate costs for each element of installation by funding source are shown.

**Table I**  
**SEQUENCE OF INSTALLATION AND SCHEDULE OF OBLIGATIONS**  
**Lower Hamakua Ditch Watershed**  
**(Dollars)**

YEAR	COST ITEM	FUND SOURCE			Total
		Federal (PL 83-566)	DOA	Other	
<b>1</b>	<b>Land Treatment</b>				
	Conservation Practices	162,500		87,500	250,000
	Accelerated Technical Assistance	50,000			50,000
	Waipio Valley Assistance	25,000			25,000
	<b>Construction</b>				
	Hakalaoa Falls Tunnel	600,000	600,000		1,200,000
	<b>Engineering Services</b>				
	Hakalaoa Falls Tunnel	240,000			240,000
	Sediment Removal	22,900			22,900
	Flume Repair	193,700			193,700
	Intakes Modification	24,000			24,000
	Concrete Lining Repair	84,000			84,000
	<b>Project Administration</b>				
	Hakalaoa Falls Tunnel	48,000	96,000		144,000
	<b>Landrights</b>		200,000		200,000
	<b>TOTAL YEAR 1</b>	<b>1,450,100</b>	<b>896,000</b>	<b>87,500</b>	<b>2,433,600</b>
<b>2</b>	<b>Land Treatment</b>				
	Conservation Practices	162,500		87,500	250,000
	Accelerated Technical Assistance	50,000			50,000
	Waipio Valley Assistance	25,000			25,000
	<b>Construction</b>				
	Sediment Removal	114,600	114,600		229,200
	Flume Repair	968,700	968,700		1,937,400
	Intake Modification	120,000	120,000		240,000
	Concrete Lining Repair	420,000	420,000		840,000
	<b>Engineering Services</b>				
	Sediment Removal	22,900			22,900
	Flume Repair	193,700			193,700
	Intakes Modification	24,000			24,000
	Concrete Lining Repair	84,000			84,000
	Exclusion Fencing	20,400			20,400
	SCADA	39,600			39,600
	Lateral Systems	79,200			79,200
	<b>Project Administration</b>				
	Sediment Removal	9,200	18,300		27,500
	Flume Repair	77,500	155,000		232,500
	Intake Modification	9,600	19,200		28,800
	Concrete Lining Repair	33,600	67,200		100,800
	<b>TOTAL YEAR 2</b>	<b>2,454,500</b>	<b>1,883,000</b>	<b>87,500</b>	<b>4,425,000</b>

**Table I (Continued)**  
**SEQUENCE OF INSTALLATION AND SCHEDULE OF OBLIGATIONS**  
**Lower Hamakua Ditch Watershed**  
**(Dollars)**

YEAR	COST ITEM	FUND SOURCE			Total
		Federal (PL 83-566)	DOA	Other	
<b>3</b>	<b>Land Treatment</b>				
	Conservation Practices	162,500		87,500	250,000
	Accelerated Technical Assistance	50,000			50,000
	Waipio Valley Assistance	25,000			25,000
	<b>Construction</b>				
	Exclusion Fencing	102,000	102,000		204,000
	SCADA	150,000	150,000		300,000
	Lateral Systems	300,000	300,000		600,000
	<b>Engineering Services</b>				
	Exclusion Fencing	20,400			20,400
	SCADA	39,600			39,600
	Lateral Systems	79,200			79,200
	Honokaia Reservoir	24,000			24,000
	Paauiilo Reservoir Lining	19,800			19,800
	<b>Project Administration</b>				
	Exclusion Fencing	8,200	16,300		24,500
	SCADA	12,000	24,000		36,000
	Lateral Systems	24,000	48,000		72,000
	<b>TOTAL YEAR 3</b>	<b>1,016,700</b>	<b>640,300</b>	<b>87,500</b>	<b>1,744,500</b>
<b>4</b>	<b>Land Treatment</b>				
	Conservation Practices	162,500		87,500	250,000
	Accelerated Technical Assistance	50,000			50,000
	Waipio Valley Assistance	25,000			25,000
	<b>Construction</b>				
	SCADA	150,000	150,000		300,000
	Lateral Systems	300,000	300,000		600,000
	Honokaia Reservoir	120,000	120,000		240,000
	Paauiilo Reservoir Lining	99,000	99,000		198,000
	<b>Engineering Services</b>				
	SCADA	40,800			40,800
	Lateral Systems	81,600			81,600
	Honokaia Reservoir	24,000			24,000
	Paauiilo Reservoir Lining	19,800			19,800
	<b>Project Administration</b>				
	SCADA	12,000	24,000		36,000
	Lateral Systems	24,000	48,000		72,000
	Honokaia Reservoir	9,600	19,200		28,800
	Paauiilo Reservoir Lining	7,900	15,800		23,700
	<b>TOTAL YEAR 4</b>	<b>1,126,200</b>	<b>776,000</b>	<b>87,500</b>	<b>1,989,700</b>
	<b>TOTAL PROJECT COST</b>	<b>6,047,500</b>	<b>4,195,300</b>	<b>350,000</b>	<b>10,592,800</b>



#### 4.4.2 Responsibilities

The NRCS, Hawaii DOA, Hamakua Soil and Water Conservation District, and Mauna Kea Soil and Water Conservation District will be responsible for carrying out the following actions and functions to implement the Selected Plan. Each agency's responsibilities will be specified in the Watershed Agreement and in subsequently executed Project Agreements for each phase of installation.

The Natural Resources Conservation Service (NRCS) will be responsible for the following:

1. Acquiring funds for the installation cost items shown in the tables under "PL 83-566 Funds."
2. Ensuring compliance with federal laws and policies.
3. Designing or providing performance requirements for all works of improvement.
4. Performing construction inspections as necessary.
5. Providing accelerated technical assistance to producers to develop conservation plans and design conservation measures.
6. Assist with streamflow measurement in Waipio Valley during the installation period.

The Department of Agriculture (DOA) will be responsible for the following:

1. Acquiring funds for the installation cost items shown in the tables under "Other Funds - DOA."
2. Acquiring the necessary permits and approvals for modification of the stream intakes and diversion rates, Conservation District Use Application (CDUA) for installation of radio relay stations in the Conservation District, building and grading permits, and roads and highways permits.
3. Ensuring compliance with state and county laws and policies.
4. Acquiring the landrights needed through purchase, easements, or approvals of use of existing rights-of-way and easements for the LHD, lateral systems, and new and existing reservoirs.
5. Performing landrights related tasks such as modification or relocation of existing road and utility infrastructure affected by project installation.
6. Administering *design-build or* construction contracts.
7. Performing construction inspections, as required, during installation of all works of improvement.
8. Accepting, operating, and maintaining all the works of improvement and implementing a managed agricultural water system under HRS 167 authority.

9. Funding operation, maintenance, and replacement (OM&R) activity for the agricultural water system throughout the 25-year project life.
10. Developing an operational policy for the LHD agricultural water system.

The Hamakua Soil and Water Conservation System and Mauna Kea Soil and Water Conservation District will be responsible for the following:

1. Providing opportunities for the public to participate during design and installation by developing and distributing information/articles and conducting meetings as necessary to keep the public informed.
2. Participating in the development of an operational policy for the LHD agricultural water system.
3. Developing and approving conservation plans for producers in the Hamakua project area and Waipio Valley.

The SWCD and NRCS will continue to provide conservation planning assistance to area ranchers and farmers. The implementation of practices on farms and ranches to conserve and protect the natural resource base is needed to complement the expansion of agricultural water supply and to ensure sustainable agricultural activity in the project area. Efforts will be made to have farmers install soil conservation measures and water conserving irrigation systems and practices. The ongoing conservation program offered by the SWCDs, NRCS, and Farm Service Agency (FSA) will continue to provide technical and financial assistance to farmers and ranchers and will be augmented by the accelerated land treatment component of this project.

The DOA will ensure that operators of state-owned agricultural parcels develop and implement conservation plans. The requirement for all users of the LHD agricultural water system to prepare and implement SWCD-approved conservation plans should be considered by the DOA.

Technical and economic analysis to promote implementation of water conservation practices will be developed to assist NRCS conservation planners. The SWCD and the public affairs function of NRCS will publicize, through various media, the need for natural resource conservation and protection and the availability of technical and financial assistance.

A separate Memorandum of Understanding will be approved by NRCS, DOA, DLNR Division of Aquatic Resources, Waipio Taro Farmers Association, HNHAC, and the Waipio Valley Community Association which supports, in principle, participation in a group process to address the issue of stream diversion for the LHD, enhancement of Waipio Valley aquatic habitat, and enhancement of conditions for taro cultivation. It is intended for this group to become the advisory group for the LHD agricultural water system.

#### 4.4.3 Permits and Compliance

Installation of the Selected Plan will be performed in full compliance with applicable laws and policies of the County of Hawaii, State of Hawaii, and the federal government. The following permits and approvals may be required for project installation.

##### 4.4.3.1 County of Hawaii Requirements

###### GRADING, GRUBBING, EXCAVATING AND STOCKPILING PERMIT

Department of Public Works  
25 Aupuni Street, Room 202  
Hilo, Hawaii 96720

###### BUILDING PERMIT

Department of Public Works  
25 Aupuni Street, Room 202  
Hilo, Hawaii 96720

###### *SPECIAL MANAGEMENT AREA PERMIT ASSESSMENT*

Planning Department  
25 Aupuni Street, Room 109  
Hilo, Hawaii 96720

##### 4.4.3.2 State of Hawaii Requirements

###### CONSERVATION DISTRICT USE APPLICATION

Department of Land and Natural Resources  
1151 Punchbowl Street  
Honolulu, Hawaii 96809

###### INTERIM INSTREAM FLOW STANDARD AMENDMENT

Department of Land and Natural Resources  
1151 Punchbowl Street  
Honolulu, Hawaii 96809

###### STREAM CHANNEL ALTERATION PERMIT

Department of Land and Natural Resources  
1151 Punchbowl Street  
Honolulu, Hawaii 96809

###### *STREAM DIVERSION WORKS MODIFICATION PERMIT*

*Department of Land and Natural Resources*  
*1151 Punchbowl Street*  
*Honolulu, Hawaii 96809*

###### *WELL CONSTRUCTION AND/OR PUMP INSTALLATION PERMITS*

*Department of Land and Natural Resources*  
*1151 Punchbowl Street*  
*Honolulu, Hawaii 96809*

STATE HIGHWAYS PERMIT  
Department of Transportation  
869 Punchbowl Street  
Honolulu, Hawaii 96813

COASTAL ZONE MANAGEMENT FEDERAL CONSISTENCY REVIEW  
Office of Planning, DBEDT  
P.O. Box 2359  
Honolulu, Hawaii 96813

#### 4.4.3.3 Federal Requirements

DEPARTMENT OF THE ARMY (404) PERMIT  
U.S. Army Corps of Engineers  
Pacific Ocean Division  
Building 230  
Fort Shafter, Hawaii 96858

#### 4.4.3.4 Compliance With Federal Environmental Laws

Installation of the Selected Plan will be performed in full compliance with applicable federal environmental laws as designated by the Water Resource Council and as shown in the following table.

**Table J**  
**COMPLIANCE WITH DESIGNATED FEDERAL ENVIRONMENTAL LAWS**  
**Lower Hamakua Ditch Watershed**

<b>Federal Law</b>	<b>Applicability</b>
Archeological and Historic Preservation Act, 16 U.S.C. 469, et seq.	Applicable
Clean Air Act, as amended, 42 U.S.C. 1857h-7, et seq.	Applicable
Clean Water Act (Federal Water Pollution Control Act), 33 U.S.C. 1251, et seq.	Applicable
Coastal Zone Management Act, 16 U.S.C. 1451, et seq.	Applicable
Endangered Species Act, 16 U.S.C. 1531, et seq.	Applicable
Fish and Wildlife Coordination Act, 16 U.S.C. 661, et seq.	Applicable
National Environmental Policy Act, 42 U.S.C. 4321, et seq.	Applicable
National Historic Preservation Act, 16 U.S.C. 470a, et seq.	Applicable
Watershed Protection and Flood Prevention Act, 16 U.S.C. 1001, et seq.	Applicable
Farmland Protection Policy Act, 7 U.S.C. 4201, et seq.	Applicable

#### 4.4.4 Contracting

Formal contracts for the *design and/or* construction of the proposed works of improvement will be let by competitive bid *or by design-build contract process*. The DOA will be responsible for administering the construction *or design-build* contracts for the tunnel repair at Hakalaoa Falls, repair and modification of stream intakes, repair of LHD flumes, repair of damaged concrete lining, improvements to the lateral systems, construction of the Honokaia Reservoir, and implementation of the SCADA system. The Department of Land and Natural Resources may provide contract administration services to the DOA through an interdepartmental agreement.

The DOA will also be responsible for coordinating the administration of all contracts with the NRCS.

*The NRCS will provide engineering services to the DOA for construction designs or performance requirements for the works of improvement, preparation of design-build Requests for Proposals, and evaluation of technical proposals.*

The construction contracts involving PL 83-566 funds will be prepared in conformance with OMB Circular A-102 and the National Contracts and Grants and Cooperative Agreements Manual.

#### 4.4.5 Real Property Acquisition and Relocations

The DOA is responsible for acquiring the landrights needed through purchase, easements, or approvals of use of existing rights-of-way and easements, to construct, improve, maintain, and operate the LHD, its reservoirs, and lateral distribution systems.

Acquisition of all lands, easements, or rights-of-way shall be made in compliance with the Uniform Relocation Assistance and Real Property Acquisition policies Act of 1970, Public Law 91-646, and appropriate USDA and federal regulations. These provide that in cases where landrights are not obtained by donation or land exchange, every reasonable effort will be made to acquire real property rights by negotiation. Prior to the initiation of negotiations, an appraisal of the fair market value of the real property interest will be made by a qualified land appraiser. No relocations of houses or businesses are known to be required by this project.

*The DOA lease agreement with KSBE will provide much of the land and infrastructure needed to operate the LHD agricultural water system. Following are the terms of the lease with KSBE covering the ditch facilities:*

- *Lease term - 35 years, commencing July 1, 1999.*
- *Covers land and appurtenances in the watershed areas, ditch lots, tunnels, flumes, reservoirs, and other improvements which comprise the Lower Hamakua Ditch system.*
- *Easement are to be 20 feet wide unless a greater width is specified in the existing tax map key parcels.*

- *Allows the use and purpose to divert, store, transport, operate, maintain, construct, repair/replace, deliver, and administer provisions of chapters 167 and 168 HRS, "Irrigation Systems."*
- *Allows access (ingress/egress) over KSBE lands from any public roadway to the ditch facilities.*
- *There will be assessed a base rent of \$1.00 per year plus an additional rent based on the gross revenues generated minus certain agreed to discounts.*
- *Allows the Federal Watershed Plan of Improvements (as proposed by this FEIS) to be implemented and the Commission of Water Resource Management's Hiilawe Falls violation to be corrected.*
- *Limitations on the performance of lease terms are pending the necessary legislative/congressional authorizations and appropriations of funding for any improvements.*

*The DOA will obtain easements from other landowners through whose parcels the LHD passes.*

*The issue of continued ownership of the LHD infrastructure assets by the Hawaiian Irrigation Company(HIC) beyond the bankruptcy of Hamakua Sugar Company was settled when the HIC was involuntarily dissolved on November 16, 1998 by the State Department of Commerce and Consumer Affairs due to inactivity.*

Both buried and above-ground utility lines exist in the construction areas of the LHD and the lateral systems. Most notable are water, electrical, and telephone lines. Care will be taken during construction to prevent danger to workers and avoid excessive disruption of service. The Sponsors and the installing contractors will be responsible for obtaining the necessary cooperation and assistance from the appropriate utility companies. The Sponsors will also be responsible for costs associated with modification or relocation of road and utility infrastructure.

#### **4.4.6 Cultural and Historic Resources**

An archaeological reconnaissance survey was completed July 1996 for the open ditch portion of the LHD from the Main Weir to the Paauilo reservoir. Except for the LHD itself and a rock platform with modern artifacts, no other cultural resources were observed. The State Historic Preservation Office (SHPO) has determined that the LHD is eligible for the National Register of Historic Places.

NRCS has consulted with SHPO to develop mitigation for effects to the historically significant LHD. The mitigation actions are described in Section 6.3.10. A Memorandum of Agreement (MOA) will be executed between NRCS, DOA, and SHPO to document the mitigation actions and to conform with the Historic Preservation Act (HPA), Section 106, through a review of the MOA by the Advisory Council on Historic Preservation.

*During the 1999 period of consultation, the SHPO suggested that "Hakalaoa Falls itself and the waters it joins to form Hiilawe Falls are eligible for inclusion in the Hawaii and National Registers as a traditional cultural property." Hiilawe and Hakalaoa Falls are significant under criteria "a", association with events that made a significant contribution to the broad patterns of history; "b", association with the lives of significant persons); and "d", has the potential to yield information important in prehistory and history. "Hiilawe is associated with cultural practices and beliefs of the living Hawaiian community that are rooted in this community's history and are important in maintaining the continuing cultural identity of this community."*

*The restoration of Hakalaoa Falls will be required to comply with the provisions of Section 106, HPA. The SHPO requested that the Hakalaoa Falls restoration be included in the MOA and that the SHPO and Hawaiian groups have an opportunity to review the restoration plans before implementation.*

Any changes to design or location of project features will be coordinated with the State Historical Preservation Officer to obtain concurrence.

In the event that any unanticipated sites or remains such as artifacts, shell, bone or charcoal deposits; human burials; rock or coral alignment, pavings, or walls are encountered during construction, work will be stopped and the State Historic Preservation Officer and the U.S. Secretary of the Interior will be contacted in accordance with the procedures outlined in the NRCS General Manual, Title 420, Part 401, October 1983, as amended. NRCS will take actions to protect or recover, or both, any significant cultural resources discovered during construction.

#### **4.4.7 Financing**

Federal assistance for installing the works of improvement as described in this plan will be provided under the authority of the Watershed Protection and Flood Prevention Act, Public Law 83-566, 83<sup>rd</sup> Congress, 68 Stat. 666, as amended.

DOA is a legally constituted agency of state government and will finance their part of the project costs with funds appropriated by state legislature.

#### **4.4.8 Conditions for Providing Assistance**

Financial or other assistance to be furnished by NRCS for installing the Selected Plan is contingent on the fulfillment of the Sponsors' obligations as described in the Watershed Agreement and in Section 4.4.2 of this Watershed Plan-EIS and is contingent on congressional approval of funds for the PL 83-566 program and allocation of those funds to the LHD Watershed by NRCS.

Neither the Watershed Agreement nor this Watershed Plan-EIS constitute documents for the obligation of PL 83-566 or other funds.

The following conditions shall be met before the issuance of invitations to bid:

1. The Project Agreement will be developed and signed.

2. The necessary permits and approvals will be acquired and compliance with federal, state, and county laws and regulations will be obtained. Reasonable evidence of each shall be provided to the mutual satisfaction of all parties.
3. The needed landrights (purchase, easements, and rights-of-way) will be acquired.
4. Funding in the cost-sharing proportions stated in the Watershed Agreement must be provided by the state and federal governments.
5. The Operation, Maintenance, and Replacement Agreement will be developed and signed.

*The conditions for design-build contracts will be alternatively developed.*

#### **4.4.9 Civil Rights Impact Analysis**

A civil rights impact analysis was conducted, in accordance with USDA Departmental Regulation 4300-4, to identify, evaluate, and address the civil rights implications of the implementation of the Selected Plan. The purpose of the impact analysis is to prevent any adverse impact on employees as well as on disadvantaged groups, minorities, women, and persons with disabilities.

In 1993 when the Hamakua Sugar Company filed for bankruptcy and phased out sugarcane production and processing, the impacts on the community were severe. According to the State Department of Labor and Industrial Relations, about 800 people were unemployed. The majority of these people were sugarcane field workers, though area merchants and service workers were also affected.

It is the community's goal to maintain an agricultural-based rural community. The community has identified as a top priority to establish diversified agricultural production in some of the abandoned cane fields.

Accordingly, the implementation of this watershed project will enable the establishment of diversified agricultural production and secondary processing industry. This will provide jobs and benefit socially and economically disadvantaged groups.

The population in the project area is composed of 60 percent Asian-Pacific Islanders, which are the ethnic minorities, 38 percent White, and 2 percent others. (1994 Data Book, County of Hawaii)

Among 3,310 Asian-Pacific Islanders, 1,433 are Filipino which account for 43 percent and 26 percent of the total population in the project area. The Japanese number 931, which account for 28 percent of the Asian-Pacific Islanders and 17 percent of the total population. There are 844 Hawaiians in this area, which account for 26 percent of the Asian-Pacific Islanders and 15 percent of the total population.



Males constitute a slightly higher percentage than females. The composition of the population, 53% male and 47% female, may result from the past recruitment of male workers for the sugar industry.

The median household income in the project area was about \$28,600, which was lower compared with \$29,700 and \$38,800 for Hawaii County and the State, respectively (1990 Census data). As for the respective per capita income, it was \$11,200, \$16,800, \$22,200 for the project area, Hawaii County, and the State (1990 Census data).

Therefore, it was determined that implementation of this LHD Watershed Project will not have adverse civil rights impacts. Instead, it will have beneficial effects on the ethnic minorities, such as the Filipinos, the Japanese, and the Hawaiians, as well as other economically disadvantaged groups.

#### 4.4.10 Water Rights

The State Department of Agriculture will provide assurances that they possess the water rights needed to implement and operate the proposed improvements through the project life. *Water "rights", in the context of this project, means access to the water source and conveyance system and the acquisition of permits and approvals to utilize the water for agricultural use.* KSBE, owner of the land parcels containing the stream intakes and 60 percent of the ditch alignment, has agreed to transfer the land and infrastructure rights needed for the operation of the LHD to the DOA for a period of 35 years.

#### 4.5 OPERATION, MAINTENANCE, AND REPLACEMENT

Operation, maintenance, and replacement (OM&R) will be provided to the works of improvement to ensure that the projected beneficial effects of project installation will continue to occur throughout the 25-year project life. No federal PL 83-566 funds will be used for OM&R.

The DOA, pursuant to authority under Chapter 167, HRS, will be responsible for 1) funding operation, maintenance, and replacement activities on the LHD agricultural water system, including all project improvements and 2) establishing the formal organization and developing an operational policy for the LHD agricultural water system.

The DOA will be responsible to ensure that the agricultural water supply is used for the highest value use. Irrigation of commercial truck, orchard, and flower crops and livestock drinking water have been identified as high value use. Pasture irrigation is not considered to be highest value use and should be allowed only during periods of excess water supply. Non-agricultural uses shall be evaluated only after agricultural demand has been met, *except for emergency as for drought relief or firefighting.*

An OM&R Agreement outlining DOA responsibilities will be prepared and entered into before the issuance of invitations to bid on any portion of construction *or acceptance of a design with a design-build contract.* The OM&R Agreement will include specific provisions for retention and disposal of property

acquired or improved with PL 83-566 financial assistance. The Agreement will be based on the NRCS National Operation and Maintenance Manual and will include an operation and maintenance plan for each structural measure.

All works of improvement will be inspected annually and after unusually severe events or conditions to determine the need for maintenance and/or repair. The inspection party should consist of representatives from each of the Sponsor organizations. An NRCS representative will participate in the annual inspection during the first five years of project operation. The DOA will prepare an annual OM&R report describing the inspection and operation for the year and submit a copy to NRCS.

Following is a description of the essential OM&R responsibilities of the DOA:

1. Operate the LHD agricultural water system in a responsible manner to provide a consistent water supply to farmers and ranchers. Minimize the amount of diverted water supply that is not used for agricultural or other use in the Hamakua project area.
2. Inspect pipelines for leaks, damage, and unauthorized connections. Check appurtenant devices for proper operation.
3. Inspect and clear the LHD intakes and sand traps on a scheduled basis and following storm events.
4. Inspect and assure proper operation of lateral intakes, screens, reservoirs, and storage tanks.
5. Maintain access roads to ensure timely correction of conveyance system problems.
6. Collect and analyze water supply and customer water use to adjust operating policy, identify wasteful water use, and assure efficient delivery with minimal system loss.
7. Disseminate safety information regarding health hazards of cross-connections to the domestic water system and household use of untreated agricultural water.
8. Assess customers a service charge to recover the cost of OM&R.

#### 4.6 TABLES

The tables on the following three pages are to assist the NRCS and Sponsors to evaluate the economic efficiency of the project and allocation of funding.

**TABLE 1 - ESTIMATED INSTALLATION COST**  
**Lower Hamakua Ditch Watershed, Hawaii**  
(Dollars) <sup>1/</sup>

Installation Cost Item	Unit	Number	PL83-566 Funds		Total
			NRCS	Other Funds	
<b>Land Treatment - Accelerated</b>					
Conservation Practices	farm	50	650,000	350,000	1,000,000
Technical Assistance	staff yr.	4	200,000	0	200,000
Waipio Valley Assistance	years	4	100,000	0	100,000
<b>Total Land Treatment</b>			<b>950,000</b>	<b>350,000</b>	<b>1,300,000</b>
<b>Structural Measures</b>					
Flume Repair	lump sum	1	807,250	807,250	1,614,500
Sediment Removal	lump sum	1	95,500	95,500	191,000
Concrete Lining Repair	cubic yd.	1,400	350,000	350,000	700,000
Hiihawe Falls Repair	lump sum	1	500,000	500,000	1,000,000
Intakes Modification	lump sum	1	100,000	100,000	200,000
Lateral System Installation	lump sum	1	500,000	500,000	1,000,000
Honokaia Reservoir Installation	lump sum	1	100,000	100,000	200,000
Paauilo Reservoir Lining	lump sum	1	82,500	82,500	165,000
Exclusion Fencing Installation	miles	17	85,000	85,000	170,000
SCADA System Installation	lump sum	1	250,000	250,000	500,000
Contingency (20% of Construction)	all	N/A	574,050	574,050	1,148,100
<b>Total Construction</b>			<b>3,444,300</b>	<b>3,444,300</b>	<b>6,888,600</b>
Engineering (20% of Construction)	all	N/A	1,377,700	0	1,377,700
Project Admin. (12% of Construction)	all	N/A	275,500	551,100	826,600
Landrights	parcels	100	0	200,000	200,000
<b>TOTAL INSTALLATION COST</b>			<b>6,047,500</b>	<b>4,545,400</b>	<b>10,592,900</b>

<sup>1/</sup> Price base 1997.

October 1998

**TABLE 2 - ESTIMATED COST DISTRIBUTION  
STRUCTURAL MEASURES**

Lower Hamakua Ditch Watershed, Hawaii  
(Dollars)<sup>1/</sup>

Installation Cost Item	Installation Costs - PL83-566 Funds					Installation Costs - Other Funds					TOTAL INSTALLATION COST
	Construction	Engineering	Project Admin.	Project Admin.	Total PL83-566 Funds	Construction	Project Admin.	Land Rights	Total Other Funds		
<b>STRUCTURAL MEASURES</b>											
Flume Repair	807,250	322,900	64,600	1,194,750	807,250	129,200	2/	936,450	2,131,200		
Sediment Removal	95,500	38,200	7,600	141,300	95,500	15,300	2/	110,800	252,100		
Concrete Lining Repair	350,000	140,000	28,000	518,000	350,000	56,000	2/	406,000	924,000		
Hiihawe Falls Repair	500,000	200,000	40,000	740,000	500,000	80,000	2/	580,000	1,320,000		
Intakes Modification	100,000	40,000	8,000	148,000	100,000	16,000	2/	116,000	264,000		
Lateral System Installation	500,000	200,000	40,000	740,000	500,000	80,000	2/	580,000	1,320,000		
Honokaia Reservoir Installation	100,000	40,000	8,000	148,000	100,000	16,000	2/	116,000	264,000		
Paaui Reservoir Lining Install.	82,500	33,000	6,600	122,100	82,500	13,200	2/	95,700	217,800		
Exclusion Fencing Installation	85,000	34,000	6,800	125,800	85,000	13,600	2/	98,600	224,400		
SCADA System Installation	250,000	100,000	20,000	370,000	250,000	40,000	2/	290,000	660,000		
Contingency (20%)	574,050	229,600	45,900	849,550	574,050	91,800	2/	665,850	1,515,400		
<b>TOTAL STRUCTURAL</b>	<b>3,444,300</b>	<b>1,377,700</b>	<b>272,800</b>	<b>5,094,800</b>	<b>3,444,300</b>	<b>553,800</b>	<b>200,000</b>	<b>4,198,100</b>	<b>9,292,900</b>		

1/ Price base 1997.

2/ Landrights costs is a lump sum, not allocable to separate structural measures.

October 1998

**TABLE 4 - ESTIMATED AVERAGE ANNUAL NED COSTS**  
**Lower Hamakua Ditch Watershed, Hawaii**  
**(Dollars) <sup>1/</sup>**

Evaluation Unit	Project Outlays		Total Average Annual NED Costs
	Amortization of Installation Cost <sup>2/</sup>	Operation, Maintenance, and Replacement Cost	
Land Treatment - Accelerated	112,800	0	112,800
Structural Measures - Irrigation	806,500	500,000	1,306,500
<b>GRAND TOTAL</b>	<b>919,300</b>	<b>500,000</b>	<b>1,419,300</b>

1/ Price base 1997.

October 1998

2/ Amortized over 25 years at a discount rate of 7.125%.

**TABLE 6 - COMPARISON OF NED BENEFITS AND COSTS**  
**Lower Hamakua Ditch Watershed, Hawaii**  
(Dollars)<sup>1/</sup>

Evaluation Unit	Total Average Annual NED Benefits <sup>2/</sup>	Total Average Annual NED Costs <sup>3/</sup>	Benefit : Cost Ratio
Land Treatment - Accelerated & Structural Measures - Irrigation	3,948,200	1,419,300	2.8 : 1.0
<b>GRAND TOTAL</b>	<b>3,948,200</b>	<b>1,419,300</b>	<b>2.8 : 1.0</b>

1/ Price base 1997.

October 1998

2/ Agriculture-related intensification benefits.

3/ From Table 4.

## 5. PROJECT SETTING

### 5.1 WATERSHED LOCATION AND SIZE

The LHD Watershed area is located in the Hamakua and North Kohala Districts in Hawaii County, Hawaii. The LHD "watershed" includes the hydrologically significant areas of the LHD, including its source, transmission, and service areas. The planning area is approximately 30 miles northwest of Hilo, the Hawaii county seat. The communities of Honokaa, Waipio Valley, Kukuihaele, Kapulena, Haina, Paauhau, and Paauilo are located within the watershed area boundaries. (See Figure 2.)

The eastern boundary is about 3.6 miles east of Paauilo and follows the eastern side of the Kaala ahupuaa (land division) from the ocean to the 1,200-foot elevation, then northwest along the 1,200-foot elevation contour line to Honokaa. From Honokaa the boundary follows Highway 19 to the 2,400-foot elevation where it then follows the Hamakua and Kohala Forest Preserve boundaries to the west. The boundary follows the Upper Hamakua Ditch from Waimea to its intake on Kawainui Stream near 4,000 feet in elevation. The northwestern boundary begins where Kawainui Stream drops into Waipio Valley and follows the top of the cliffs on the north side of Waipio Valley to the Pacific Ocean on the west side of Waipio Bay. The watershed area is approximately 25 miles long and two to four miles wide and totals approximately 38,500 acres.

Following a preliminary evaluation of project plan alternatives, a project area of approximately 11,000 acres was identified within which the project improvements could provide agricultural water supply. The area is between the LHD and the ocean and is bounded by Paauilo Gulch to the east and Waipio Valley to the west. While LHD intake improvements and tunnel repairs will be made outside the project area, most of the economic benefits of the project will accrue within the project area.

Waipio Valley will be affected by the reduction in average diversion rates from streams for the LHD. The valley is roughly four miles long from the ocean to the area of the stream diversions and one mile across at the ocean mouth. The broad, flat valley floor is approximately 750 acres.

### 5.2 GEOLOGY

The island of Hawaii, which constitutes the entire county, is the largest and youngest island in the Hawaiian group. It was built from the ocean floor by lava from five volcanoes. Portions of the Kohala and Mauna Kea mountains, extinct shield volcanoes, form the watershed area. All of the Waipio drainage lies within the eroded remnants of the Kohala volcano while nearly all of Hamakua is on the slopes of Mauna Kea. The Kohala formations merge with and are covered by younger Mauna Kea rocks just east of Lalakea Stream, near Kukuihaele.

The base Kohala mountain basalts, which are exposed in Waipio Valley, are from the Pololu volcanic series during the Pliocene era. The Pololu series rock located in the back of Waipio Valley includes numerous crater fills of dense lava,

intrusive sills, and basaltic dikes. The Pleistocene era Hawi volcanic series lavas overlaid much of the Pololu lavas and exist in relatively uneroded areas of the Kohala mountains. The base lavas of Mauna Kea are from the Pleistocene era Hamakua volcanic series which have covered the Hawi flows up to Lalakea Stream. Fingers of andesitic and basaltic lava flows from the more recent Laupahoehoe volcanic series have covered the Hamakua lavas to the sea cliffs near Kapulena and Paauilo. (See Figure 10.)

The topography of the island reflects the volcanic activity. The young volcanoes are characterized by conical shields. The stream patterns are generally radial. Where volcanic flows are not recent, the terrain has been deeply eroded by streams and rivers, often exposing the volcanic core. Wave action has eroded the basaltic rock at the ocean interface and formed steep cliffs that extend along the Hamakua coast from Hilo northward to Kohala. These nearly vertical cliffs range from 50 to 350 feet in height.

The streams flowing into Waipio Valley have cut deeply into the basalts of the Pololu series in the rift zone of the Kohala volcano. Dense dike formations block the flow of percolating water, creating numerous perched water reservoirs at elevations well above 1,000 feet above sea level. Many of these high level aquifers form springs that provide the baseflow of the streams diverted by the LHD.

Lavas from Mauna Kea cover the slopes of the original Kohala volcano in the vicinity of Lalakea. The older, more-voluminous and widespread Hamakua basalt, like the other primary basalts associated with each Hawaiian volcano, is highly permeable. The younger Laupahoehoe andesite caps the basalt near Kapulena, Paauilo and Laupahoehoe. Groundwater predominantly occurs in the basaltic aquifer as a basal lens floating on sea water, but some is perched on ash beds with a significant component perched on ash and buried dikes toward Lalakea.

Groundwater conditions within the watershed are extremely variable because of the nature of the volcanic bedrock. Lava flows in the watershed area frequently contain highly fractured zones or lava tubes. These conditions provide extremely high permeability, often reaching the point where entire stream flows discharge into the groundwater system. Other sections of the watershed are underlain with ash deposits and have very slow permeability.

The island of Hawaii is seismically active. Over two-thirds of the earthquakes over 5.0 on the Richter scale recorded in the state occur on or near the island of Hawaii. While most seismic activity is concentrated in the southeast part of the island, two earthquakes exceeding 5.0 on the Richter scale have occurred near the watershed area in the past twenty years.



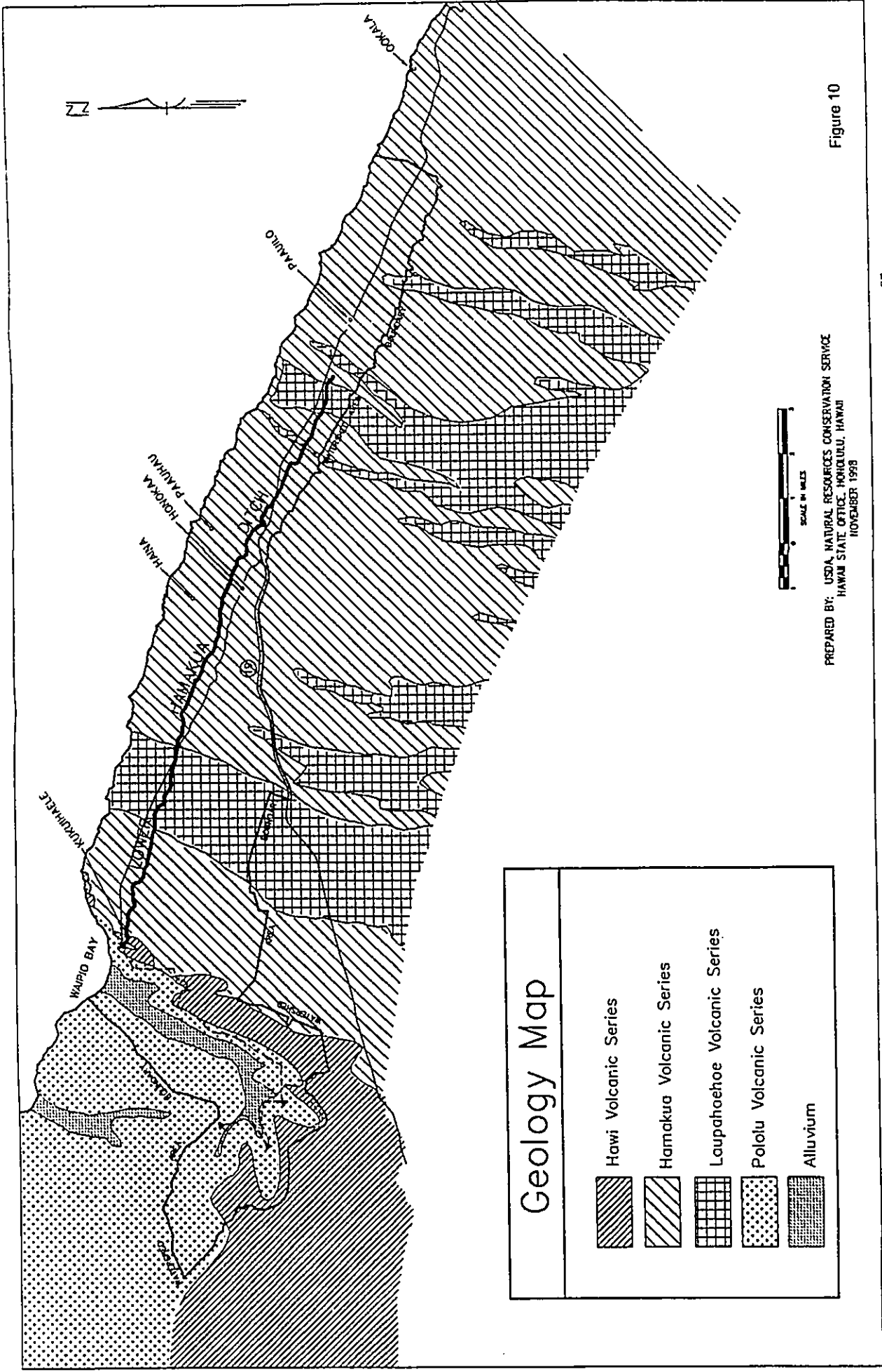


Figure 10

PREPARED BY: USDA, NATURAL RESOURCES CONSERVATION SERVICE  
 HAWAII STATE OFFICE, HONOLULU, HAWAII  
 NOVEMBER 1998

### 5.3 CLIMATE

The climate of the watershed area is characterized by moderate variations in temperature and significant variations in rainfall.

The temperature variation between the average for the coolest month and warmest month in Honokaa is less than eight degrees F°. Elevation is a major factor in temperature variation as average annual temperature varies from 75 degrees F° at the coastline to 40 degrees F° on the upper slopes of Mauna Kea. The summit of Mauna Kea, peaking at 13,796 feet, normally receives an annual blanket of snow that lasts for several months in the winter.

The rainfall in the watershed area varies considerably by location and by season. Waipio Valley receives high average annual rainfall, ranging from about 113 inches in the mid-valley to more than 200 inches in the upper reaches of each tributary canyon. Along the Hamakua project area, average annual rainfall is lowest at the coast near Kukuihaele, approximately 60 inches, and increases toward Paauilo which averages 100 inches per year. Rainfall also increases with elevation from the coastline to approximately the 3,000-foot elevation where rainfall begins to decline with elevation.

Where rainfall amounts are highest, orographic showers occurring throughout the year supply much of the total rainfall. The drier areas, including the project area, receive a proportionally greater contribution from winter storms. Consequently, these areas suffer a dry season in spring, summer, and fall when storms are rare, whereas the wet areas normally enjoy adequate orographic rains during these same months.

Evaporation rates are high in the project area, averaging about 80 inches per year for elevations below 750 feet. Pan evaporation data for stations in or near the project area, tabulated in, "Pan Evaporation in Hawaii 1894-1983," Report R74 published by the State Department of Land and Natural Resources, lists annual pan evaporation at Honokaa as 82 inches, at Paauilo as 80 inches, and at Ookala as 80 inches (Ekern and Chang, 1997).

The water budget analysis conducted as a part of the Cropland Suitability Study emphasized the seasonal need for irrigation of crops in the project area (Maptech, 1997). Evaporative pan data and monthly rainfall data at six weather stations between Kukuihaele and Paauilo at elevations between 300 and 920 feet elevation were analyzed using the Newhall Model for estimating soil moisture status. (Newhall, 1980) All stations exhibited a moisture deficit during the months of July through December. One station, Kawela, exhibited a moisture deficit for ten months of the year.

The water budget analysis conducted for the Cropland Suitability Study did not account for prolonged drought periods which exacerbate the water need during the annually-occurring dry periods. Statistical analysis of drought in the project area indicates that, on average, once every ten years rainfall will drop to approximately one-half the average rainfall that can be expected during periods of three months and twelve months in duration. Crop losses and reductions in farm income can be

considerable during and following such drought periods without consistent agricultural water supply.

#### 5.4 SOILS

There are three major soil associations in the watershed area (Figure 11). The Amalu-Kahua-Kehena association is located in the upper elevations of the Kohala Mountains. These are shallow to deep, gently sloping to steep, poorly drained to somewhat poorly drained soils that have an organic rich surface layer and a fine textured subsoil on uplands.

The Kukaiau-Ainakea-Paauhau association is located in a narrow band that lays along the coastline near Waipio Valley southeast to near Laupahoehoe. These are deep and moderately deep, gently sloping to steep, well drained soils that have a moderately fine textured subsoil on uplands.

The Akaka-Honokaa-Kaiwiki association is located upslope from the Kukaiau-Ainakea-Paauhau association. These are deep, gently sloping to steep, moderately well drained and well drained soils that have a moderately fine textured subsoil on uplands.

The predominant soils for the project area are the Honokaa, Kukaiau, and Paauhau series. The Honokaa series consists of well drained silty clay loams that formed in volcanic ash. These are gently sloping to steep (0 to 35 percent) soils on uplands at an elevation ranging from 1,000 to 3,000 feet. Permeability is moderately rapid except where compacted, runoff is slow to medium and the sheet and rill erosion hazard is slight to moderate. Small gullies can form if traffic pans are present which perch rainfall and cause perched saturation in the Ap horizon. Roots can penetrate to a depth of five feet or more if not limited by traffic pans. This soil is used for sugarcane, pasture, woodland, macadamia nuts and truck crops.

The Kukaiau series consists of well drained silty clay loams that formed in volcanic ash. These are gently sloping to steep (6 to 35 percent) soils on uplands at an elevation ranging from 500 to 1,500 feet. Permeability is moderately rapid unless compacted, runoff is slow to rapid and the sheet and rill erosion hazard is slight to severe. Small gullies can form. Roots can penetrate to a depth of five feet or more unless restricted by a pan. This soil is used for sugarcane, pasture, macadamia nuts and truck crops.

The Paauhau series consists of well drained silty clay loams that formed in volcanic ash. These are gently sloping to steep (6 to 35 percent) soils on uplands at an elevation ranging from near sea level to 1,000 feet. Permeability is moderately rapid unless compacted, runoff is medium to rapid and the erosion hazard is moderate to severe. Roots can penetrate to a depth of three feet or more unless restricted by a traffic pan. This soil is used for sugarcane, pasture, and truck crops.

Generally these soils have a very high continuing phosphorous fixation capacity. High P-requiring, short duration crops may require such high levels of P fertilizer application that it becomes a significant factor in the cost of production. Kukaiau

soils generally only have moderate P fixation. Fertility in terms of calcium, magnesium and potassium levels is typically low although Kukaiau soils have a somewhat better supply of these nutrients. Some are moderate to high in aluminum saturation and may require large amounts of lime for aluminum sensitive crops. Again, this should be considered a capital investment and a cost to be repeated every 3 to 5 years. The Akaka, Paauhau, and Kaiwiki appear to be more susceptible to compaction from tillage operations. This can reduce aeration and root penetration and hasten runoff and rilling or gullyng. This can also lead to water logging and disease unless recognized and avoided or ameliorated through subsoiling.

There are two predominant soils in Waipio Valley. Mixed Alluvial Land is a miscellaneous land type consisting of recent stream deposition that varies widely in texture. It is found at the mouth of the valley and is subject to frequent *flooding of very short duration. The surface is littered with stones and boulders.* Tropaquepts are a miscellaneous land type that consists of deep, poorly to very poorly drained soils forming in recent alluvium. They have a surface layer of dark gray mucky silt loam and a subsoil of silty clay loam. The depth to the water table is less than 20 inches. Tropaquepts are frequently flooded. In Waipio Valley these soils are used for growing taro.

Both federal and state determinations of land that is most suited for cropland exist. Prime farmland is defined as land that having the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops, and is also available for these uses. It has the soil quality, growing season, and moisture supply needed to economically produce high yields of crops when treated and managed, including water management, according to acceptable farming methods. Unique farmlands are other than Prime farmlands that are used to produce specific high value food crops. Other Important Agricultural land is land other than Prime or Unique Agricultural Land that is of state or local importance for production of crops despite having limitations such as seasonal wetness, high erodibility, and limited rooting depth.

USDA-determined prime farmland soil units in the project area are Honokaa silty clay loams, Kukaiau silty clay loams, Ookala silty clay loams at less than 20 percent slopes, and Paauhau silty clay loams at less than 20 percent slopes. (Figure 12)

The Hawaii classification system is called the Agricultural Lands of Importance to the State of Hawaii (ALISH) and was adopted by the State of Hawaii Board of Agriculture in 1988. ALISH determinations are made only on those lands classified as Agriculture by the state Land Use Classification. The ALISH classifications essentially reflect the USDA rating with the exceptions that soils with slopes exceeding 20 percent are downgraded to Other Important Agricultural land. The ALISH mapping also shows a portion of the Tropaquepts soil area in Waipio Valley where taro is grown as Unique Agricultural land.

Soils with a propensity for erosion when disturbed have been identified to limit earth disturbing activity and to apply erosion controlling conservation measures.

Highly Erodible Land (HEL) has been defined by the USDA as a soil map unit with an erodibility index of eight or more. The erodibility index of a soil is determined by dividing the potential erodibility, calculated using the Universal Soil Loss Equation, by the soil loss tolerance (T) value for the particular soil.

Honokaa series soils with slopes exceeding 20 percent and Kukaiiau and Paauhau series soils with slopes exceeding 12 percent are classified as highly erodible (Figure 13).

# Soil Series Map Lower Hamakua Ditch Watershed Area

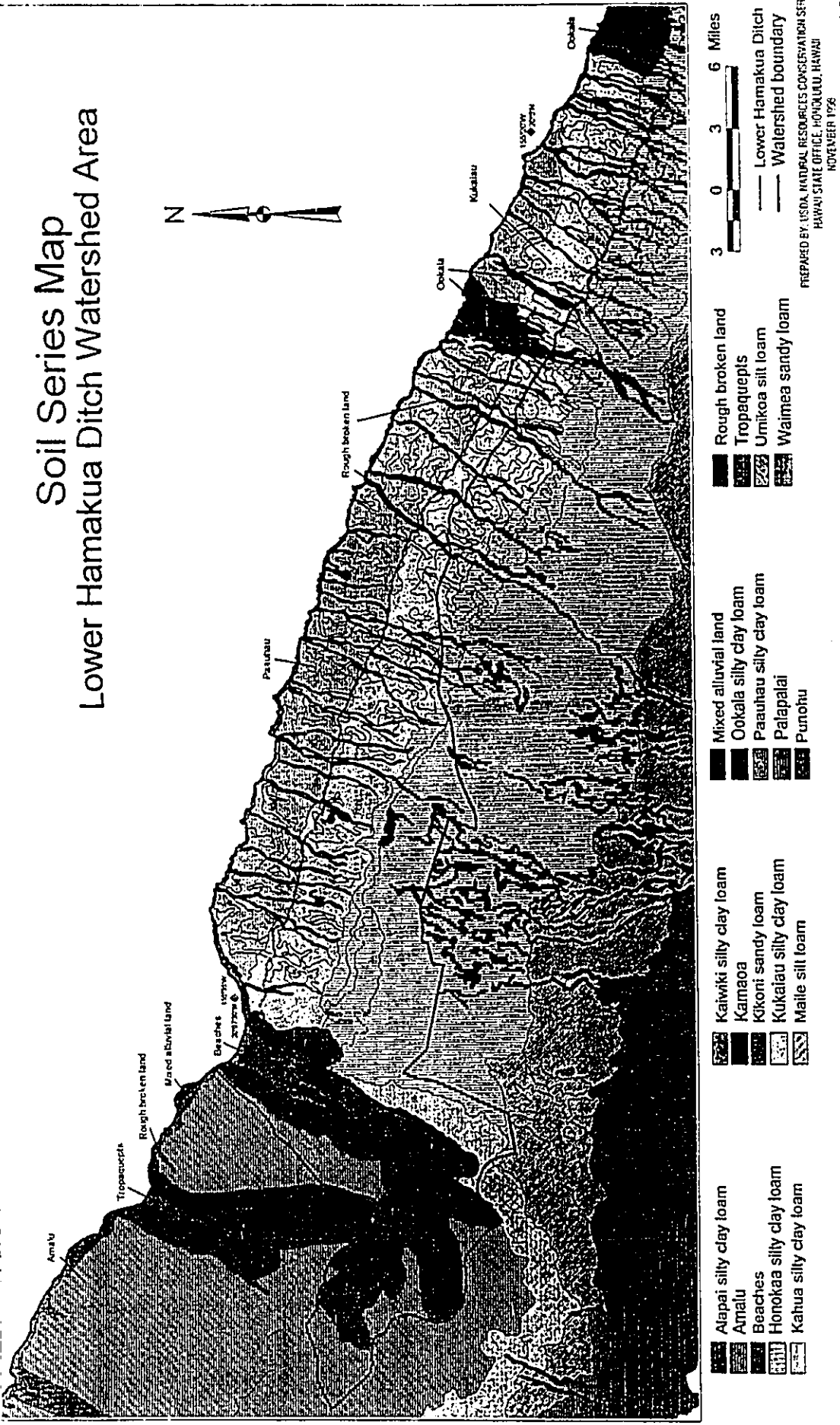


Figure 11

# Prime Farmland Lower Hamakua Ditch Watershed Area

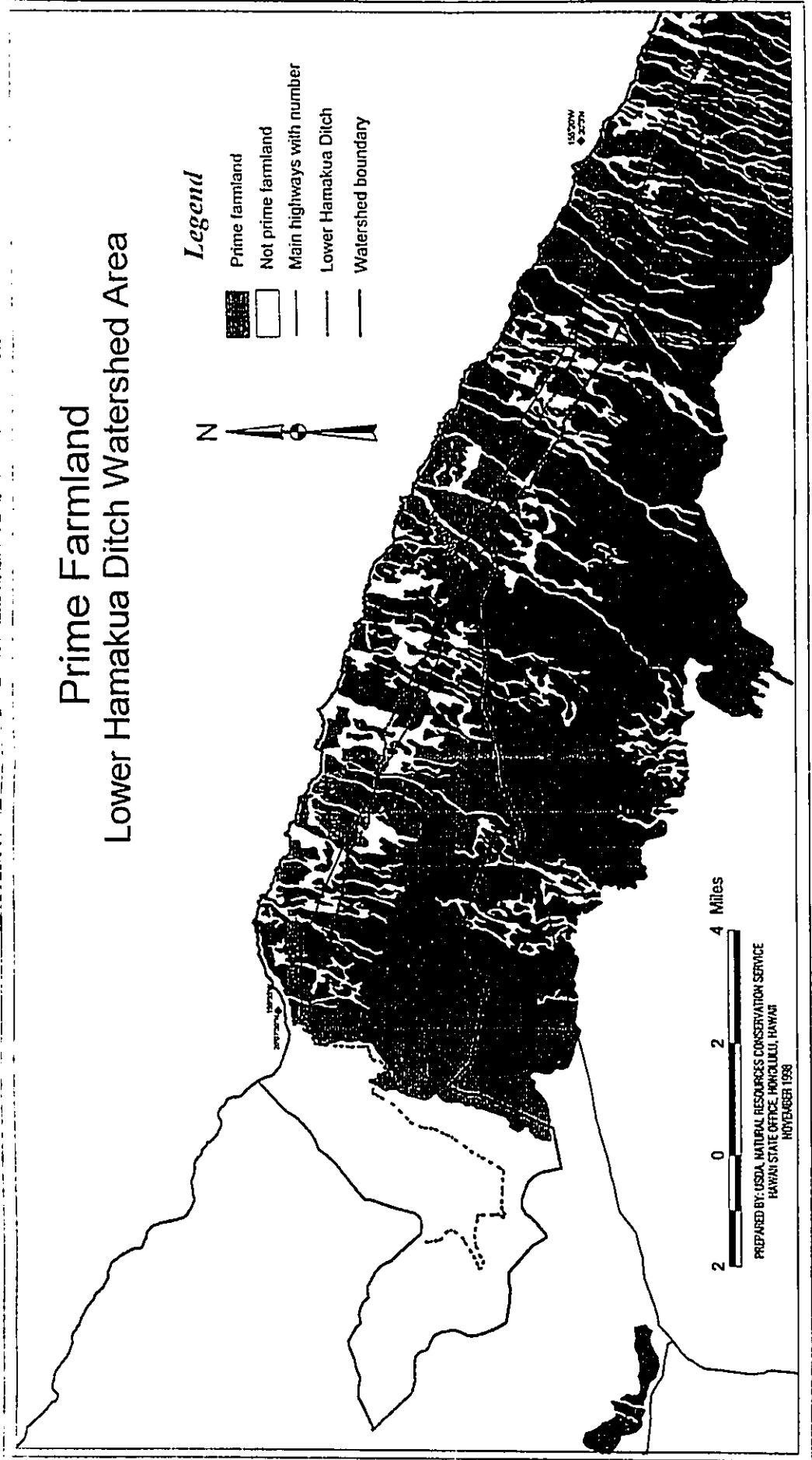
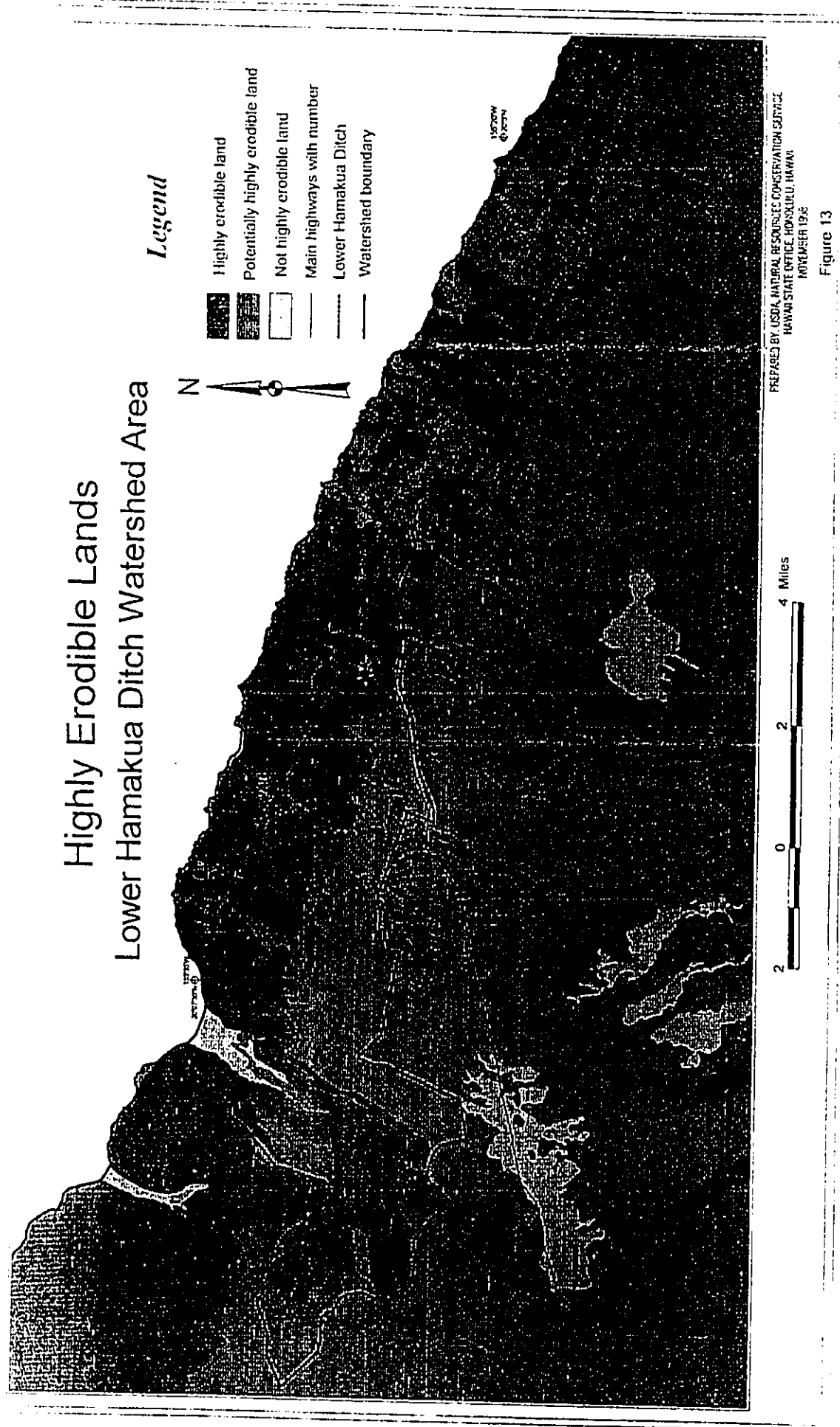


Figure 12

# Highly Erodible Lands Lower Hamakua Ditch Watershed Area





## 5.5 LAND USE

The LHD Watershed totals approximately 38,500 acres (Table K).

Until the 1990s, sugarcane farming was the primary land use in the watershed with over 20,000 acres under production. When Hamakua Sugar Company went bankrupt and closed down operations, the 21,400 acres of sugarcane in the watershed was harvested for the last time or simply abandoned.

Since the closing of HSC, there has been a concerted effort to revitalize the depressed economy in the area by converting the idle sugarcane land to diversified agricultural and agroforestry uses. Approximately 15,500 acres of the idle sugarcane land has been converted to other agricultural uses.

Table K - Land Use and Agricultural Operations

Land Use	Recent Past		Present Condition	
	Acres	# Operations	Acres	# Operations
Sugarcane <sup>1/</sup>	21,400	1	6,095	0
Forest				
Conservation	11,700	N/A	11,700	N/A
Commercial	0	0	8,700	1
Total Forest	11,700	0	20,400	1
Pasture	2,050	7	7,750	16
Feedlot	200	1	200	1
Macadamia Nuts <sup>2/</sup>	600	1	600	1
Diversified Crops <sup>3/</sup>	500	27	1,400	110
Waipio Valley				
Wetland Taro	80	40	80	40
Idle Cropland	170	N/A	170	N/A
Wetland	500	N/A	500	N/A
Total Waipio Valley	750	40	750	40
Aquaculture	0	0	5	1
Urban	1,300	N/A	1,300	N/A
<b>GRAND TOTAL</b>	<b>38,500</b>	<b>77</b>	<b>38,500</b>	<b>170</b>

1/ Idle sugarcane land under present conditions.

2/ Non-irrigated macadamia nuts above the LHD.

3/ Represents gross cropland below the LHD.

N/A Not applicable.

About 8,700 acres of former sugarcane land have been recently converted to commercial forestry. The land has been leased by Prudential Timber from KSBE. Approximately 7,200 acres has been planted in eucalyptus. The remaining acreage will be left in natural vegetation. All of the forestry activity, except for approximately 40 acres below the Paauilo Reservoir, occurs above the LHD. No irrigation is provided for these 40 acres of eucalyptus.

Over 5,000 acres of former sugarcane land is presently being used to graze cattle, bringing the total grazed acreage to an estimated 7,750. The remaining land use change consists of 900 acres of former sugarcane land converted to diversified cropland.

An estimated 6,095 acres of idle sugarcane land remain. Vegetative growth is very dense in the idle sugarcane land, with thick growths of volunteer/old sugarcane, ironwood trees, guava, kiawe, lantana, and other shrubs and grasses. Ironwood trees have been particularly successful invaders.

Other land uses under present conditions remain unchanged from the recent past.

#### 5.5.1 Crop Suitability

A crop suitability study was completed for approximately 13,500 acres from zero to 1,000 feet elevation between Waipio Valley and Paauilo (Maptech, 1997). The study area includes most of the 11,000-acre project area. The area was assessed for suitability for cultivation of six crop types: banana, coffee, macadamia nut, papaya, cut foliage, and truck crops. Land was assessed as good, fair, or poor based on each crop's optimal growing conditions in relation to several soil and site factors including potential erosion rate, equipment trafficability, soil depth, drainage, soil acidity, soil nutrient availability, rainfall, evapotranspiration, temperature, and topography.

Land use in the project area is constrained by several factors, according to the study. Most notably, it was determined that the complex topography and insufficient rainfall makai (in the seaward direction) of the LHD add considerable difficulty to farming and ranching operations. Areas with high soil erosion potential will require intensive land management operations to prevent erosion and to maintain water quality.

For all the crops studied, there is a moisture deficit for several months of the year, especially below 500 feet in elevation. Above 500 feet, there is also moisture deficit, but it is not as severe as the lower areas. Because all the crop types in the study require adequate and consistent moisture, irrigation is necessary to maintain optimal growing conditions. Although most trees can survive droughty summers, fruit development and ripening will be compromised, resulting in decreased yield and quality.

The crop suitability study showed that there would be a substantial number of acres that would be upgraded from fair suitability to good suitability, or from poor suitability to fair suitability, for each crop type with the addition of irrigation. Acreage for each crop (out of 13,520 acres total), for non-irrigated and irrigated conditions, is as follows in Table L.

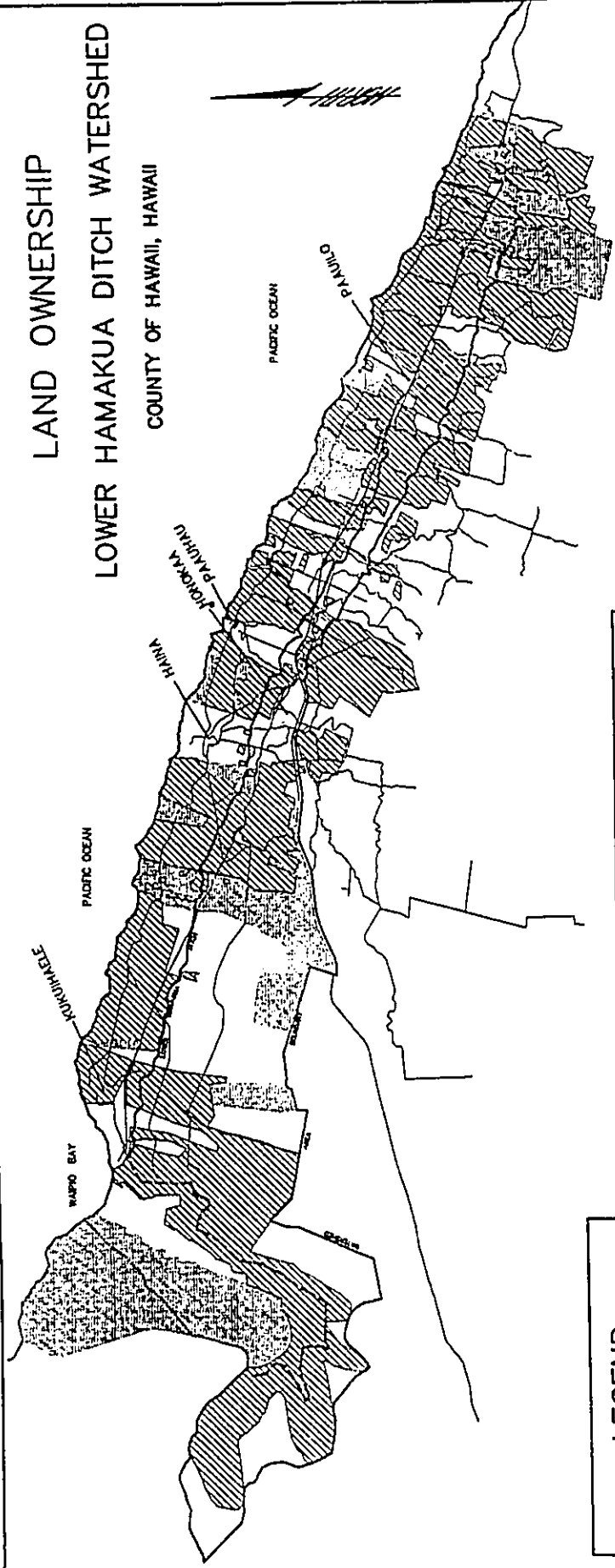
<b>Table L: Crop Suitability</b>			
<b>CROP TYPE</b>	<b>CONDITION</b>		
	<b>GOOD</b>	<b>FAIR</b>	<b>POOR</b>
Banana, non-irr	0 (0%)	1,236 (9%)	12,284 (91%)
Banana, irr	1,197 (9%)	5,805 (43%)	6,518 (48%)
Coffee, non-irr	1,021 (8%)	5,876 (43%)	6,623 (49%)
Coffee, irr	1,197 (9%)	5,805 (43%)	6,518 (48%)
Macadamia nut, non-irr	138 (1%)	6,759 (50%)	6,623 (49%)
Macadamia nut, irr	1,197 (9%)	5,805 (43%)	6,518 (48%)
Papaya, non-irr	135 (1%)	6,762 (50%)	6,623 (49%)
Papaya, irr	832 (6%)	6,169 (46%)	6,518 (48%)
Flowers/foliage, non-irr	0 (0%)	519 (4%)	13,001 (96%)
Flowers/foliage, irr	193 (1%)	2,888 (21%)	10,439 (77%)
Truck crops, non-irr	0 (0%)	2,099 (15%)	11,421 (85%)
Truck crops, irr	0 (0%)	3,069 (23%)	10,451 (77%)

## 5.6 LAND OWNERSHIP

Approximately 8,900 acres or 23 percent of the watershed is owned by the State of Hawaii. Hawaiian Home Lands account for about 650 acres of the state-owned land. The County of Hawaii has approximately 2,650 acres or 7 percent of the watershed. Private lands account for 26,950 acres or 70 percent of the watershed. The major private land owner is Kamehameha Schools/Bishop Estate which owns approximately 16,000 acres in the watershed. The Bishop Museum owns about one-half, approximately 400 acres, of the Waipio Valley floor.

Within the 11,000-acre project area, approximately 65 percent of land is owned by KSBE and 15 percent by the State of Hawaii. Other major landowners in the project area include Cooper Trust, Hamakua Housing Corporation, Randall Estate, and Tut Brothers Farms. Family held farmlots ranging from two to thirty acres are plentiful in the Kaunamano, Kalopa, and Kapulena areas.

LAND OWNERSHIP  
 LOWER HAMAKUA DITCH WATERSHED  
 COUNTY OF HAWAII, HAWAII



**LEGEND**

- MAIN HIGHWAYS WITH NUMBER
- SECONDARY ROADS
- LOWER HAMAKUA DITCH
- RESERVOIRS
- LOWER HAMAKUA DITCH WATERSHED AREA BOUNDARY

**OWNERSHIP KEY**

- ▨ State of Hawaii
- ▩ Kamehameha Schools/Bishop Estate
- Other



PREPARED BY: USDA, NATURAL RESOURCES CONSERVATION SERVICE  
 HAWAII STATE OFFICE, HONOLULU, HAWAII  
 NOVEMBER 1998

Figure 14

## 5.7 POPULATION AND DEMOGRAPHY

The majority of the commercial and residential development in the area is in a corridor ranging from sea level to the 2,000 foot elevation. Honokaa is the major population center in the project area.

Historically the area has been dominated by the presence of the Hamakua Sugar Company and its sugar plantation predecessors. The economic and social fabric of the area has been inherently linked to the sugar industry. Total resident population increased about 8 percent between 1980 and 1990 according to the County of Hawaii 1994 Data Book (County of Hawaii, 1995). The closing of the Hamakua Sugar Company in September 1994, is thought to have had a negative impact on this growth rate, although actual figures are not yet available.

The project area, consisting of Census Tracts 219 and 220, as shown in Table M, has a resident population of approximately 5,600 according to the 1990 census. The median age in the area is 34 years. About 65 percent of the adults over the age of twenty-five have finished high school which is lower than the 78 percent average for the county. Eleven percent of the adults have a college degree.

The population is ethnically diverse. Table N reveals the composition of the population as 60 percent Asian-Pacific Islanders and 38 percent classified as White. Among the Asian-Pacific Islanders, Filipinos are 26 percent of the total population, Japanese are 17 percent and Hawaiians are 15 percent.

## 5.8 ECONOMY, INCOME AND EMPLOYMENT

As shown in Table M, 62 percent of the population was in the labor force, with males accounting for 58 percent and females 42 percent of the labor force. The median family income in this area was about \$28,600 and the average per capita income was \$11,200, which is 82 percent of the county average. Approximately 11 percent of the residents had incomes below the poverty level.

In the project area, home ownership was 51 percent compared to 53 percent for the county. Many of the housing units are still controlled by the Plantation Trustee and are rented to the former workers. With limited new residential development, the aging housing stock is not being replaced and some are in substandard condition.

Due to the gradual demise of the sugar companies since 1990, sugar company employees in the project area have lost their jobs. A number of the displaced workers have been hired by other industries and commute to jobs outside the project area. The area's unemployment rate increased from 4.7 percent in 1990 to 8.6 percent in 1993 (1994 Data Book, County of Hawaii, 1995). According to a personal communication with the Department of Business, Economic Development, and Tourism, in December 1994, the unemployment rate was approximately 12.3% in the project area compared to 8.7% for the Big Island.

The impacts of the sugar mill closure affect not only the sugarcane workers, but also workers in other industries, such as sugar processing, food, medical, and other services. The communities in the area are attempting to transition into different economic activities in order to sustain their economic base.

**Table M - Socio-Economic Characteristics of Resident Population  
Lower Hamakua Ditch Watershed Project**

CATEGORY	Census Tract		Total or Average	% of Total Population
	Tract 219 Honokaa	Tract 220 Paauilo		
<b>Population</b>	3,758	1,849	5,607	
Farm Population	91	159	250	4.5%
<b>Age, Median</b>	34.9	33.8	34.4	
<b>Labor Force</b>				
Persons Over 16 Years Old	2,762	1,401	4,163	74.2%
In Labor Force	1,740	841	2,581	62.0%
Male	971	529	1,500	58.1%
Female	769	312	1,081	41.9%
Unemployed				
1990 Census	100	22	122	4.7%
1993 */	200	50	250	8.6%
<b>Education: Persons over 25 years old</b>				
High School Grad., or Higher	71%	56%	66%	
College Graduate	12%	11%	11%	
<b>Income</b>				
Median Household Income	31,431	25,727	28,579	
Per Capita Income	11,586	10,812	11,199	
Below Poverty Level	5.8%	5.1%	5.5%	
<b>Housing</b>				
Total Units	1,312	646	1,958	
Owner-Occupied Units	762	244	1,006	51.4%
Renter-Occupied Units	447	343	790	40.3%
<b>Employment by Occupation</b>				
Farming, Forestry, & Fishing	170	169	339	13.1%

Source: 1990 Census, Bureau of Census

\*/ 1994 Data Book, Dept. of Research and Development, County of Hawaii

**Table N - Ethnic Composition of Resident Population  
Lower Hamakua Ditch Project Area**

Category	Census Tract				Total	
	Tract 219 Honokaa		Tract 220 Paauilo			
	number	percent	number	percent	number	percent
Asian-Pacific Isl.	2,309	62.7 %	1,001	53.7 %	3,310	59.7 %
Filipino	955	25.9 %	478	25.6 %	1,433	25.8 %
Japanese	686	18.6 %	245	13.1 %	931	16.8 %
Hawaiian	611	16.6 %	233	12.5 %	844	15.2 %
Chinese	49	1.3 %	14	0.8 %	63	1.1 %
Korean	4	0.1 %	9	0.5 %	13	0.2 %
Samoan	1	0.0 %	9	0.5 %	10	0.2 %
Guamanian	1	0.0 %	4	0.2 %	5	0.1 %
Micronesian	0	0.0 %	6	0.3 %	6	0.1 %
Vietnamese	0	0.0 %	1	0.1 %	1	0.0 %
Others	2	0.1 %	2	0.1 %	4	0.1 %
White	1,286	34.9 %	818	43.9 %	2,104	37.9 %
Amer. Indian */	18	0.5 %	16	0.9 %	34	0.6 %
Black	4	0.1 %	4	0.2 %	8	0.1 %
Others	64	1.7 %	25	1.3 %	89	1.6 %
<b>Total</b>	<b>3,681</b>	<b>100.0 %</b>	<b>1,864</b>	<b>100.0 %</b>	<b>5,545</b>	<b>100.0 %</b>

Source: 1994 Data Book, Dept. of Research & Development, County of Hawaii  
\*/ Including Eskimo and Aleutian



## 5.9 AGRICULTURE

Since the closing of Hamakua Sugar Company, the number of agricultural operations has increased over twofold from 77 to 170 in the watershed. Reasons for the increase include the availability of former sugarcane land and economic revitalization programs supporting diversified agriculture.

Prior to 1995, 27 diversified crop operations existed in the watershed with about 497 total farm acres (Table O). Approximately half of the 497 acres were planted. The 27 existing diversified crop operations are located in three main areas: Kaunamano, Kalopa Homestead, and Kapulena. (See Figure 3.)

Kaunamano is located two miles west of Paauilo. This farming area totals 87 acres, all under private ownership. Approximately 40 acres are planted in crops such as macadamia nuts, flowers, and vegetables. Kalopa Homestead is located below Mamalahoa Highway. This farming area totals 226 acres, all in private ownership. Approximately 40 acres are planted in crops such as macadamia nuts, vegetables, orchard fruits, dracaena, and coffee.

The third major area is Kapulena with 184 acres in private ownership. This area is planted in macadamia nuts. This area includes part of the much larger Kapulena Orchards which extends above the LHD.

Diversified agricultural activity has increased greatly since the closure of Hamakua Sugar Company. Two major factors for the increase are the availability of government assistance programs and supply of agricultural water from the LHD through the temporary operating authority given to the State Department of Agriculture. Approximately 6,000 acres of sugarcane was irrigated with water from the LHD in the past.

New diversified agriculture areas include approximately 400 acres State of Hawaii land leased to about 58 farmers through the HNHAC, 250 acres of KSBE land leased to farmers, and 250 acres developed by private landowners. Some of the land has not been planted yet because it has only recently been leased out or developed for diversified crop production. Of the approximate 1,400 acres of diversified cropland below the LHD under present conditions, only about 600 acres are currently planted.

In 1993 and 1994, the State of Hawaii and the federal government offered a number of programs in an attempt to provide farming opportunities to the displaced sugar industry workers. The state owns approximately 1,650 acres below the LHD, of which 719 acres have been leased out for this purpose thus far. The leasing of the state land is administered by the HNHAC. About 400 acres have been leased out to 58 persons for diversified crop production. Lots range in size from two to 25 acres. The agricultural experience and knowledge of these farmers are varied and are reflected in the appearance of their farms. An additional 117 acres of HNHAC-managed land in Nienie are leased for pasture and 200 acres are used for a feedlot/slaughterhouse operation. The HNHAC also leases a 530-acre state parcel to a rancher for grazing cattle in an area of Honokaia located above the LHD.

The major HNHAC areas for diversified crop production are Paauilo, Kalopa, and Honokaia. Approximately 400 acres of irrigated cropland on HNHAC farmlots currently exists. An additional 300 acres of irrigated cropland is expected to be developed on HNHAC land.

The 120-acre Paauilo lots are on Department of Agriculture land immediately north of Paauilo. About 23 farmers cultivate a variety of crops including papaya, coffee, macadamia, vegetables, and foliage plants. The Paauilo lots receive irrigation water through a 12-inch lateral pipeline from the 10 MG Paauilo reservoir. The estimated average water demand from the Paauilo farmlots is 1.5 MGD.

The 70-acre Kalopa farmlots are on Department of Agriculture land and DLNR land. Thirteen farmers currently grow mainly papaya. The 200 acre feedlot/slaughterhouse operation is also located in this area.

The 210 acres in Honokaia are leased to 18 HNHAC farmers who have planted macadamia nut, coffee, fruit, and vegetables. The soil condition of the Honokaia lots is rocky and nutrient-depleted. Another problem with the Honokaia farmlot area is the scattering of smaller KSBE parcels within the state lands' boundaries. A land exchange to eliminate the KSBE in-holdings is being considered.

The farmers in the HNHAC have been assisted with farm startup costs for land clearing, installation of irrigation systems, and other production expenses by a Department of Defense grant.

Demand for the remaining state land is high. The HNHAC is currently considering numerous applications from individuals requesting to lease state land for diversified agricultural production. The HNHAC is planning to continue to lease the state land when the new areas are surveyed and dirt roads are dozed.

Since the demise of Hamakua Sugar Company, the major private landowners in the project area have sought alternative uses for their agricultural land.

**Table O**  
**Diversified Crop Farming Areas**

Existing Before 1995		New Since 1995	
Farming Area	Total Acres	Farming Area	Total Acres
Kaunamano	87	HNHAC	400
Kalopa Homestead	226	KSBE	250
Kapulena	184	Private	250
Total Existing	497	Total New	900
<b>Grand Total</b>		<b>1,400*</b>	

\* Approximate; of which 600 acres planted

The KSBE has let much of their holdings in the project area to ranchers on short-term leases. While KSBE does not intend to enter into farming, KSBE seeks to eventually develop lease agreements for large areas of their holdings with agricultural operators. While KSBE will consider small parcel leases such as five acres, the lease terms for rent and time periods are not favorable compared to DOA and DLNR. It is expected that most of the KSBE land in the project area will remain in grazing leases.

The Cooper Trust owns 546 acres in the watershed with approximately half of that total below the LHD approximately three miles west of Paauilo. Family members of the Cooper estate have formed Pu'u'ala Farms which operates the trust's lands. The farm has developed fifty-five acres of pharmaceutical herbs on the lower part of their holdings. Much of the remainder of the Cooper Trust land is used for cattle grazing.

Tut Brothers, a California-based agricultural company, has purchased through the trusteeship a 500-acre parcel surrounding the Haina Mill site. The company intends to cultivate coffee on approximately one-half of the parcel if a stable supply of agricultural water is made available. The company also intends to both sell and lease smaller agricultural lots.

Prudential Timber has leased approximately 8,700 acres of former sugarcane land in the upper elevations of the watershed for commercial forestry production with 7,200 acres planted in eucalyptus. *Approximately 40 acres of eucalyptus is planted below the LHD in the vicinity of the Paauilo Reservoir. Eucalyptus is not irrigated.*

The detailed identification of crops and crop acreage is extremely difficult in the project area. The lack of agronomic experience, limited investment capital, and availability of other employment opportunities for farmers on the state leases creates relatively high rates of abandonment and turnover. While the experience of the past few years has stabilized the range of crops that can be profitably cultivated, considerable transition between crop types occurs. Some crops, such as papaya, require long-term rotations. The availability of financial or agronomic assistance for some crops has spurred growth during the availability period with a quick decline afterward. The availability of land on short term leases compels some farmers to move their cropland around in the search for the best lease arrangement.

The number of ranches has increased to approximately 16, with a total of 7,750 acres of pasture. The new pasture acreage were former sugarcane lands owned mostly by KSBE and leased to various ranchers and three state-owned lots leased to ranchers through the HNHAC.

While highly variable, an average of 2,600 head of cattle are grazed on the pasture acreage. Generally, cattle are pastured until they reach 800 to 1,000 pounds at which time they are sold to feed operations. Cattle prices have ranged wildly in recent years, having dropped to as low as \$0.19 per pound. It is generally thought that a price of \$0.50 per pound is needed to return a profit to the rancher. Drinking water for cattle in the project area has mainly been the LHD. Many of

the flowing stream reaches created by leaks along the ditch have been used for cattle watering.

The steady water supply provided by the LHD is used by ranchers as a drought-period water source for cattle normally pastured outside of the LHD service area. It is reported that ranchers temporarily crowd their stock from neighboring drought stricken areas into the LHD service area to assure livestock drinking water.

*Approximately 25 to 30 farmers cultivate between 75 and 100 acres of taro and other crops in Waipio Valley. Farm acreage's vary from subsistence-scale to 15 acres. Most of the land in taro production is leased from the Bishop Museum. The current demand for wetland taro is good. There is considerable interest in expansion of taro cultivation. The major hurdles to expansion are the effort required to reopen abandoned and overgrown taro lo'i and the threat of crop loss due to flooding. The taro growers utilize the Wailoa River, which is formed in part by the diverted Waipio Valley streams, as their main source of water supply.*

#### **5.10 WATER USE AND DEVELOPMENT**

The watershed area has both surface and groundwater resources. The surface water comes primarily from the Kawainui, Alakahi, Waima, and Koiawe streams in the Kohala Mountains and Lalakea Stream on the east side of Waipio Valley. Numerous other streams and gulches cross the project area, but few of these are used as water sources because most are intermittent or unreliable during critical water-short periods.

##### **5.10.1 Lower Hamakua Ditch**

There is only one significant irrigation water distribution system in the project area, the LHD.

The 25-mile long LHD was opened by the Hawaiian Irrigation Company in July 1910. Through the years, the ditch has supplied water for irrigation, cane fluming, mill operation, and community water systems.

The upper ten miles of this system consist of an unlined tunnel dug behind the cliffs surrounding Waipio Valley with intakes at Kawainui, Alakahi, Koiawe, and Waima streams.

The record suggests that the dependable delivery capacity of the tunnel lies between and 45 and 50 MGD. In a fully refurbished condition, the tunnel system is capable of conveying 60 MGD. The intakes and tunnel system are on two land parcels owned by KSBE.

The LHD does not collect flow from the Lalakea/Hiilawe Stream. Until 1989, the interior tunnel system bypassed Hiilawe and Hakalaoa Falls. *The tunnel section behind Hakalaoa Falls was exposed by a landslide at the Falls in 1989. The temporary repair to the 1989 tunnel collapse consists of a covered flume attached to the cliff face which connects the intact tunnel sections. Hakalaoa Stream was diverted above the waterfall to Hiilawe Stream to protect the temporary repair.*

The LHD intakes are designed to take advantage of runoff and constant seepage from dikes and high elevation aquifers in the Kohala Mountains. *The structures are concrete or rock-masonry dams across the stream with a grated inlet at the crest. The structures are intended to capture all low flow crossing over the dam.* The average daily capture rate, as measured at the Main Weir at Kukuihaele, is between 25 and 30 MGD. The minimum flow or baseflow into the intakes is about 19 MGD (Mink, 1984).

The open ditch system starts at the Main Weir at Kukuihaele and continues eastward to Paauilo. The open ditch drops from the 985-foot elevation to the 830-foot elevation along its 14.5 mile length providing a near-constant 0.2 percent grade. The ditch varies in width from about ten feet to two feet and in depth from five feet to one foot. Flow velocities average three to four feet per second.

Along the open ditch section there are 50 flumes ranging from less than five feet to 50 feet in height which provide conveyance over gullies and gulches. While most were originally wooden structures, recent replacements have been made using steel supports and corrugated metal culvert pipes. (Wai Engineering, 1995)

There are 48 tunnels along the open ditch system totaling 13,400 feet to maintain grade along hilly sections and to allow vehicular traffic over the ditch.

Surface drainage of storm runoff is routed over the ditch using storm flumes to avoid introduction of sediment-laden storm water into the irrigation water system.

*The LHD system has a total of four major reservoirs. All are unlined reservoirs with earth embankments on their lower sides. The capacities of the reservoirs range from three to 15 million gallons. The total storage capacity of the system is 31 million gallons. Numerous sand traps and settling ponds which have insignificant storage capacity are also found along the LHD system.*

The open ditch system of the LHD crosses *approximately 70* property parcels between the Kawainui Stream intake and the Paauilo Reservoir. Of these, *approximately 33* parcels, which comprise the land corridor for over one-half of the length of the open ditch system, are owned by KSBE. *Thirty-seven parcels are owned by other private land owners.* Easements or rights of way have been formally recorded for less than one-half of the ditch crossings through parcels.

Current LHD agricultural water usage is difficult to assess due to the absence of formal management of the system. There has been no record keeping or charge for water use during the transition period. While most users have declared their water connections and usage to the interim maintenance contractor, surreptitious connections to the ditch and lateral systems are common.

The estimate of current non-drought period water use from the LHD is between two and five MGD. *The estimate is based on the observations of the LHD maintenance contractor and on an analysis of estimated crop acreage.* Major users of the ditch include farmers and an aquaculture operator on state leases in the Paauilo, Kalopa, and Honokaia areas; Pu'u'ala Farm; Kukuihaele Farm; farmers on smaller private parcels in Kalopa and Kaunamano; and ranchers on approximately 2,000 acres of grazing land in the project area. Water loss through

leakage from the ditch, especially at flumes, vandalism, and undocumented users account for a large fraction of the water delivered to the Kukuihaele Main Weir. Anecdotal accounts state that, due to leakage and, less importantly, to other users, 25 MGD must be delivered from the Main Weir in order for water to flow into Paauiilo reservoir.

### 5.10.2 County Department of Water Supply

The county Department of Water Supply provides potable water to all of the communities in the project area. The source of the county water supply are two wells in Paauiilo and Honokaa. The well in Honokaa was developed in 1980 with a capacity of 400 gpm. The well is currently operated at capacity and a moratorium on additional or expanded water supply is in place. The Paauiilo well was brought into service in 1995 with a capacity of 300 gpm. Both sources receive chlorination as water treatment. The Honokaa system also serves the community of Paauihau. While a connection to the LHD at Honokaa is maintained by DWS as an emergency supply, *DWS sources state that LHD will not be used because of requirements of the amended Safe Drinking Water Act.* Once a new well near Honokaa Memorial Hospital is funded and developed, there will be a further reduced future need for LHD water by DWS.

Farmers above the LHD and some farmers below the LHD use the county system for irrigation water supply. Due to the limited yield at the well source and the high cost of water production and treatment, farmers are discouraged from using the water for irrigation mainly by elevated costs for larger meter sizes. The agricultural rate for DWS water is approximately \$1.90 per 1,000 gallons throughout the county.

### 5.10.3 Wells

Groundwater is plentiful in the project area at depths of 300 to 1,000 feet or more depending on the well location. DWS and DLNR have installed several wells for domestic and industrial purposes.

There are at least three other wells that are currently being used or could be used for farm irrigation purposes. One is on state land (Feedlot) and has recently had electric power installed. This well is expected to produce about 2 MGD for use at the packing plant and for on-farm uses.

One of the private wells is the Paauiilo Shaft *capable of* producing about 1.4 MGD with the potential for 6 MGD. The other private well is located at the 300-foot elevation alongside Kalopa Gulch on KSBE-owned land. This basal well has been drilled but not developed at this time, but is expected to produce less than 0.05 MGD at acceptable salinity levels.

A well to provide cooling water for the Hamakua Cogeneration Project is being developed by the Enserch Development Corporation near the former Haina Mill. The well is expected to use a perched water source at the approximately 200 foot elevation. Well production of 1.5 MGD is sought.

#### 5.10.4 Other Water Systems in the Lower Hamakua Ditch Watershed

The Lalakea Ditch is a private system, above the project area, which once provided irrigation water for sugarcane in the Kukuihaele area. The ditch diverts water from Lalakea Stream upstream of Hiilawe Falls at the 2,000-foot elevation and terminates at the 30 MG Lalakea Reservoir, one mile from the first diversion. The system's average daily capacity is one MGD. The Lalakea Ditch system is entirely on land owned by KSBE. KSBE currently leases the reservoir to a startup aquaculture operation.

There are six auwai (community irrigation water systems) in Waipio Valley. Each of these systems serves from three to ten wetland taro farms. These systems draw water from Wailoa River and Hiilawe Stream. Wailoa River is formed from the confluence of Kawainui, Alakahi, Waima, and Koiawe streams in Waipio Valley. The Lalakea Stream is renamed Hiilawe Stream once it plunges into Waipio Valley.

The Upper Hamakua Ditch (UHD) is located at the southwest LHD watershed boundary at an elevation of 4,000 feet. The UHD diverts Kawainui, Alakahi, and Waima Streams before they plunge into Waipio Valley. As the significant flow into the LHD diversion is from springs located below the valley rim, there is little interaction between the stream diversion by the UHD and that by the LHD. *Some taro farmers in Waipio Valley complain that water flowing past the UHD diversion structures contributes to high water levels and flooding in Waipio Valley.*

### 5.11 SOCIAL AND ENVIRONMENTAL RESOURCES AND CONCERNS

A Scoping Process was used early and throughout planning to identify the concerns that might affect the selection of alternatives or be affected by project actions. Concerns may be significant due to public interest, technical or scientific knowledge, or legal or government policy status. Community groups, government agencies, and the scientific community were involved in meetings and discussions to develop a list of concerns that may affect or may be affected by implementation of this project.

Formal scoping was begun at a well-publicized scoping meeting held on May 16, 1995 in Honokaa, attended by over 50 persons, including many from the project area communities. Subsequent meetings were held with government agencies, interested groups, and a Steering Committee formed to facilitate community input to the planning of the LHD project.

A broad array of economic, social, environmental and cultural concerns were identified during the scoping process. The concerns were evaluated and grouped into 25 concern categories and are displayed in Table P. The "significance to decision making" is based on the public or institutional importance of the affected resource, the existence of laws or policies regarding the resource, and whether the authorities of PL 83-566 could be applied to the resource.

## 5.12 RELATED PROJECTS IN REGION

The LHD Watershed improvements are intended to complement other actions taken by government agencies and community groups to ameliorate the economic and social effects caused by the closure of the Hamakua Sugar Company. Many of the initiatives begun through the Hilo-Hamakua Coast Revitalization Effort are continuing and are achieving results. The HNHAC is one such effort. Others include the Paauilo Community Kitchen used for certified processing of local product, vocational retraining programs for former sugar workers and their families, formation of the Hamakua Housing Corporation, and the reopening of the slaughterhouse.

Nonagricultural development projects intended to extend tourism, commercial or industrial activity are not evident in the project area with the exception for the power cogeneration project by Enserch, Inc., at the site of the Haina Mill.

*During the later 1980s and early 1990s a resort project in Kukuihaele was considered. The Aman Project would have included two golf courses. The project is now inactive and the plans probably cannot be revived.*

*Small scale activities to take advantage of the visitor flow through the area have developed. Merchandising, eco-tours, and many bed-and-breakfast have been established. However, many of the operations are not registered with the county making it difficult to quantify the increase in activity.*



Table P - Evaluation of Identified Concerns

Economic, Social, Environmental, and Cultural Concerns	Significance to Decision Making <sup>1/</sup>
Prime / Unique Farmland	High
Economics	High
Erosion / Sedimentation	Medium
Flooding	Medium
Fish / Wildlife Habitat	Medium
Threatened / Endangered Species	Medium
Surface Water Quantity	High
Surface Water Quality	Medium <sup>2/</sup>
Ground Water Quantity	Medium
Ground Water Quality	Medium <sup>2/</sup>
Air Quality	Medium <sup>2/</sup>
Visual Quality	Medium
Recreation	Low
Cultural / Historic Resources	Medium
Wetlands	Medium <sup>3/</sup>
Water Rights / Legal Issues	High
Social Effects	High
Natural Stream Flows	Medium
Traditional Uses of Water	Medium
Waipio Valley Taro Production	Medium
Hiilawe Falls	Medium
Hydropower	Low
Aquaculture	Low
Coastal Zone	Medium <sup>2/</sup>
Hazardous Materials and Waste Sites	Medium <sup>2/</sup>

<sup>1/</sup> High - Must be considered in the analysis of alternative solutions

Medium - May be affected by some alternative solutions, study impacts

Low - Consider, but not too significant

None - No significance to decision making, need not be considered in analysis

<sup>2/</sup> Significance rating changed from Low or None to Medium due to institutional controls.

<sup>3/</sup> Significance rating changed from None to Medium due to identification of potentially significant artificial wetlands created by LHD leakage.

## 6. EFFECTS OF THE SELECTED PLAN

### 6.1 GENERAL

This section describes the effects of the Selected Plan on the identified concerns that were rated as medium or high in their significance to decision making. The effects of the other alternatives are also described where the comparison is important or informative.

Setting discussion provides background information. Beneficial or adverse effects are described in terms of significance and/or whether the effects are temporary/short-term or permanent/long-term. Mitigation actions that will be taken to reduce or eliminate any negative effects caused by the Selected Plan are discussed. The effects of other alternatives are also discussed when important for comparison.

### 6.2 ECONOMIC EFFECTS

#### 6.2.1 Agricultural Activity

The Selected Plan advances the objectives of the Hilo-Hamakua Coast Revitalization Diversified Agriculture Task Force and the Hilo-Hamakua Economic Development Plan. A major objective of both efforts is maintaining strong and viable agriculture within the Hamakua region. The repair and restoration of the LHD and establishment of a management authority that provides consistent, adequate, and affordable agricultural water supply creates the stability required for farmers of various sizes to invest effort and capital into a long-term farming enterprise. It is estimated that approximately 2,500 acres of cropland will eventually be irrigated on land formerly used for sugarcane cultivation or grazing cattle, an increase of approximately 1,550 acres over without project conditions. Economic benefits are estimated at \$3,948,200 on an average annual basis. The benefits would be due to the increased farm income generated by the additional irrigated cropland and also reduced income losses due to water shortages on existing cropland. Additional information regarding the analysis of economic benefits is included in Appendix B: Investigation and Analysis, Economics.

*Alternative 1 - No Action will not result in increased agricultural activity due to continued uncertainty about water supply. Existing farmers and ranchers will continue to sustain economic loss during system failures.*

*Alternative 2 - Wells will allow expansion of agricultural activity. The higher cost of water due to the pumping cost may be a limitation for some farmers.*

*Alternative 4 - Pipeline will allow expansion of agricultural activity. The benefits to farmers and ranchers will be similar to those provided by the Selected Plan.*

### 6.2.2 Estimated Agricultural Water Charges to Users

The cost of water to users will be based largely on the annual operation cost of the agricultural water system. The costs of project repair and rehabilitation will not be reflected in water charges to system users.

Agricultural water users of the proposed LHD agricultural water system can expect to be charged rates similar to those for other state-operated systems such as those at Waimanalo, Hoolehua, and Waimea.

Irrigation water charges will be composed of two components. The water delivery charge is expected to be \$0.32 to \$0.40 per 1,000 gallons. In addition, an acreage charge, assessed on each acre of irrigated cropland, will range from \$2.25 to \$3.00 per acre per month.

Livestock drinking water has not been offered before by state-operated systems and, therefore, no model to follow. The livestock drinking water charge will likely be based on the carrying capacity of the pasture area. For non-irrigation water use, the basic charges will be delivery and hookup.

Alternative 1 - No Action does not assure the continuation of water free of charges to farmers. Mechanisms to allow charges and pooling of resources among users to provide maintenance to the ditch have been recently discussed.

Alternative 2 - Wells will add up to \$0.45 per 1,000 gallons to the cost of water with the Selected Plan to fund the pumping cost.

Alternative 4 - Pipeline will provide water to users at a cost equal to or less than the cost with the Selected Plan due to lower operating costs of the pipeline system.

### 6.2.3 Projected Water Demand

Water demand by farmers, ranchers, and others in the Hamakua area will vary considerably through the seasons and in response to wet and dry years. Estimates for the average daily demand during a normal year and during the peak period of a drought year were made. The total average daily demand during normal climatic conditions is 4 MGD. The total daily demand during the peak drought period is 13.5 MGD. *Water loss of 3.0 MGD is projected for future conditions.* The table below indicates the allocation of the demands for the two periods.

*Alternative 1 - No Action will generally continue current agricultural demand rates which vary between 2 and 5 MGD. Losses in the LHD system will likely be reduced but will remain significant without a major program of repair and rehabilitation.*

*Alternative 2 - Wells will be able to provide exactly the water demand up to the withdrawal capacity of the well. System losses will be negligible.*

Alternative 4 - Pipeline - Full buildout agricultural demand will be similar to that of the Selected Plan. The replacement of the open ditch with pipeline will nearly eliminate losses along the open ditch portion of the LHD. Variability at intake controls and water loss and gain in the tunnel sections will still result in some system losses.

**Table Q**  
**Lower Hamakua Ditch Water Demand**  
**Lower Hamakua Ditch Watershed Project**

Item	Present Condition		Future Condition	
	Average Period	Drought Period	Average Period	Drought Period
<b>Irrigation Need</b>				
Irrigated Acres	600	600	2,500	2,500
x Gal/ac/day	1,200	5,000	1,200	5,000
= Total Irrigation Needed (MGD)	0.72	3.00	3.00	12.5
<b>Water Use (MGD)</b>				
Irrigation	0.72	3.00	3.00	12.50
+ Aquaculture	1.00	1.00	1.00	1.00
+ Livestock Drinking Water	0.05	0.05	0.05	0.05
+ Feedlot / Slaughterhouse	0.10	0.10	1.10	0.10
+ Kukuihaele Community	0.05	0.05	0.05	0.05
= Total Water Use	1.92	4.20	4.20	13.70

### 6.3 ENVIRONMENTAL EFFECTS

This section describes the effects of the Selected Plan on natural resources such as air, water, soil, plants, and animals; social effects which consider effects on human health, safety, and welfare; and also potential or indirect economic effects.

#### 6.3.1 Prime and Unique Farmland

##### Setting

Approximately 54 percent of the land in the watershed and 75 percent of the land in the project area are designated as Prime Farm Land under USDA guidelines. (see also Section 5.4 Soils) The state-declared Agricultural Lands of Importance to the State of Hawaii (ALISH) further divides the area into Prime Agricultural Land and Other Important Agricultural Land for slopes exceeding 20 percent. Approximately 130 acres on the Waipio Valley floor have been designated as Unique Agricultural Land by ALISH.

During the period of sugarcane cultivation, essentially all of the prime farmland was utilized for crop production. In recent years forestry operations in the mauka areas and pasture and diversified agriculture in the lower areas have expanded to utilize over two-thirds of the idled sugar lands. It is estimated that approximately

6,000 acres of former sugarcane land, most of which is prime farmland, is still currently idle.

The federal government through implementation of PL 97-88 Farmland Protection Policy Act requires assessment of impacts of major federal actions on prime farmlands.

#### Effects

The three structural alternatives will encourage, in varying degrees, the maintenance of prime farmland in agricultural use. The consistent supply of agricultural water will contribute to the stable base for agricultural enterprise in the Hamakua area.

*The projected area of irrigated cropland is estimated to be 2,500 acres. Farm roads, farm buildings, farm infrastructure, fallowed fields, and non-irrigated cropland must also be included in the total agricultural land use and may equal or exceed the irrigated cropland acreage.*

Alternative 1 - No Action will not encourage increased agricultural utilization of prime farmland because of the uncertainty of consistent water supply.

#### Mitigation

No mitigation is necessary.

### **6.3.2 Erosion and Sedimentation**

#### Setting

Erosion of cropland, construction sites, streambanks, and other open land reduces soil health and productivity and results in sediment-related problems downstream. Sediment deposition in natural and man-made watercourses reduces capacity and may contribute to flooding. Suspended sediment and sediment deposition degrades water quality and adversely affects aquatic and marine habitats.

Approximately 63 percent of the land in the watershed and over 80 percent of the land in the project area are highly erodible soils. (See also Section 5.4 Soils) Cultivation of these soils require increased care and measures to prevent excessive erosion rates. Construction activity increases the potential for high erosion rates and downstream sediment problems.

#### Effects

Implementation of any of the three structural alternatives will increase farming activity and will require the "opening" of more than 1,000 acres of idle, but now vegetated, former sugarcane land.

Construction of structural components and repairs and replacements proposed by all three structural alternatives will require mobilization, staging, and demobilization of equipment and material. Some excavation and grading that will bare soil surfaces may be required. *A potential for increased erosion during installation of project components exists.*

*Alternative 1 - No Action will continue the current level of agricultural activity which includes frequent repair and replacement activities and will present the potential for erosion from farming and LHD maintenance activities.*

*Alternative 2 will eliminate both construction and repair activity along the LHD and the potential erosion associated with such activity. Installation of wells, storage tanks, and pipeline systems will increase the potential for erosion. Erosion from agricultural activity will be similar to the Selected Plan.*

*Alternative 4 will increase potential erosion during installation of the pipeline system. Erosion from agricultural activity will be similar to the Selected Plan.*

#### Mitigation

Farmers on state-owned land are required by their lease agreement to develop an SWCD-approved Conservation Plan that includes practices to maintain soil erosion rates within tolerable limits. Cost-sharing for USDA assistance programs available to all producers also requires maintenance of erosion rates below tolerable limits set by USDA. Other landowners and producers will be encouraged by the agencies participating in this project to conform to conservation standards requiring control of soil erosion.

The USDA Environmental Quality Incentives Program (EQIP) may be able to provide up to 65 percent cost-sharing on installation of durable practices to reduce soil erosion. The watershed project will also provide additional cost-sharing funding in the event that the EQIP funds are exhausted. Accelerated technical assistance will be provided to increase the NRCS staffing for conservation planning in the watershed area.

All construction activity will be in conformance with Hawaii County's Erosion and Sediment Control codes. A county-approved erosion and sediment control plan will be developed and included in the design for each phase of work. Most of the construction activity will not require any excavation or earth moving, except for site preparation for equipment. Bared areas will be minimized and vegetated immediately following demobilization.

### **6.3.3 Flooding**

#### Setting

The Federal Emergency Management Agency's (FEMA) Flood Insurance Rate Maps (FIRM), panels number 155166 0200C, 155166 0205C, and 155166 1225C (all dated September 16, 1988), shows the areas within the watershed that are subject to flood hazard.

The strands of low-lying land at the base of the Hamakua cliffs are in Zone VE which are subject to inundation by the 100-year coastal flood with velocity hazards and a base flood elevation of 16 to 27 feet above mean sea level.

Seven reaches along drainageways in Honokaa, with base flood elevations between 1,012 and 1,457 feet above mean sea level, have been identified as flood hazard areas inundated by the 100-year flood.

Flooding of the golf course area in Honokaa prompted the evaluation of a flood control project by NRCS in 1980. The relatively low level of benefits in comparison to cost made such a project not feasible.

Storm runoff along the Hamakua coast is concentrated in the many gulches that are incised into the Mauna Kea shield and empty into the ocean. The LHD crosses over 50 gulches and draws with elevated flume or pipe structures. The support structures for the flumes are generally set on cemented cutrock foundations that are taller than the high flow in the gulch. These foundations have prevented damage to the LHD by floodwater.

*The lack of maintenance and obliteration of the many storm diversions and terraces constructed throughout the agricultural area by the sugar companies is worrisome. Without their continued existence and operation, storm runoff may concentrate in the cropland and cause gully erosion, sediment deposition, and crop loss.*

The entire floor of Waipio Valley between the confluence of Waima Stream with Wailoa River and the ocean, a distance of nearly four miles, is designated by the FIRM as 100-year floodplain. Three recent severe floods occurring in 1979, 1986, and 1989 caused considerable damage to taro lo'i, irrigation ditches, roads, stream crossings, and structures. The movement of bedload during the floods rearranges the braided stream channels in the lower part of the valley. NRCS provided emergency relief assistance for stream clearing and sediment removal through the Emergency Watershed Protection program following the 1979 and 1986 floods. Recent requests for EWP assistance following floods in 1987 and 1989 were denied by NRCS due to the recurring nature of the flooding.

While some farmers in Waipio Valley believe that the diversions for the LHD provide flood protection for the valley, the diversions have no discernible effect during severe floods.

#### Effects

The Selected Plan will have no effect on flooding in the Hamakua project area and no significant effect on flooding in Waipio Valley. The repaired LHD will continue to pass the flood flows unimpeded in the gulches and drainages along the Hamakua coast. *The LHD stream intake structures on Waipio Valley streams will not impede flood flows.*

*Flooding will not have significant impacts on the LHD improvements. Potential problems caused by a major flood event can include scour and/or debris damage to concrete and steel diversion structures or flume support structures and entry of floodwater and sediment into the open ditch due to failure of storm ditches. The problems occurring after installation of the project improvements will be addressed and corrected through the Operation, Maintenance, and Replacement program of the agricultural water system.*

*Storm diversions and terraces can be maintained and constructed through the land treatment component of the Selected Plan. The land treatment component*

*extends technical and financial assistance to farmers and ranchers to restore diversions and terraces and with other practices to control storm runoff.*

The reduced diversion rates from Waipio Valley streams with the Selected Plan will be less than the current diversion rate of the LHD. The effect of the reduced diversion and resulting increased stream flow has been shown to not substantially affect flood depths in Waipio Valley. The USGS, in 1997, computed a 0.02 foot (0.24 inch) rise in the average annual peak flood if the 30 MGD diversion was completely stopped. The reduced diversion rate proposed by the project will increase average annual peak flood depths less than 0.02 feet in Wailoa Stream.

The other alternatives will generally have no effect on flooding in Hamakua and have no significant effect on flooding in Waipio Valley.

*Alternative 1 - No Action will have similar effects as the Selected Plan. The rate of diversion from the Waipio Valley streams may remain at current levels or be reduced, but not to the levels projected by the Selected Plan unless extensive repairs are made to the LHD.*

*Alternative 2 - Wells will eliminate the LHD infrastructure and all interaction with flooding in Hamakua area and Waipio Valley streams. The diversion of Waipio Valley streams by the LHD will cease.*

*Alternative 4 - Pipeline will eliminate many of the flooding problems affecting the open ditch. Pipeline can be buried beneath the stream bed or routed to a bridge crossing for problem gulches. The inflow of runoff into the ditch will be eliminated. The pipeline alternative will decrease diversion from Waipio Valley streams by approximately 3 MGD when compared to the Selected Plan.*

The separate issue of control of daily streamflow fluctuation in the Waipio Valley streams and in Wailoa River is discussed in Section 6.3.15 Waipio Valley Taro Production.

#### Mitigation

No mitigation required.

### **6.3.4 Wildlife**

#### Setting

The majority of the project area consists of former sugarcane lands that are either idle or have been planted to introduced species for pasture use. *The abandoned caneland is mostly covered with thick growths of volunteer/old sugarcane, ironwood trees, guava, kiawe, lantana, and other shrubs and grasses. Guinea grass and ironwood are especially invasive in the abandoned canelands.*

*Leaks from the LHD have provided excess water to stream systems along the alignment, in two cases creating artificial wetlands and in some cases creating perennial streams below the leaks where intermittent streams previously existed.*

The project borders the Kohala Forest Reserve which contains native forestland dominated by ohia, olapa and sphagnum.



While the 'Io, Hawaiian hawk (Buteo solitarius) and 'Ope'ape'a, Hawaiian hoary bat (Lasiurus cinereus semotus) are probable visitors and have been sighted in the area, as documented in the Natural Heritage Program database, most of the wildlife occurring below the Forest Reserve are introduced species such as quails, pheasants, doves, and francolins. Feral pigs, sheep, and goats exist throughout the area, but are predominantly located at higher elevations and associated with the forested areas.

#### Effects

The Selected Plan will have no significant effect on native wildlife resources in the LHD watershed. Leakage from the flumes along the LHD will be reduced with implementation of the project resulting in the reduction of ditch water entering into streams and artificial wetlands. *An examination of the wetlands and streams created by leakage from the flumes along the LHD was conducted by NRCS and USFWS on December 2-3, 1998. The survey concluded that no significant wildlife habitat, especially for native damselflies and other invertebrates, was created by the leaking flumes. In fact, alien invasive species are introduced into the stream systems from the ditch leaks. This influx of alien species, such as Tahitian prawns, tilapia, and mosquito fish, may negatively affect any potential native fish/insect habitat below the leaks in the stream systems. The leaks after flume #5 may have particularly negative impacts due to the abundance of tilapia from flumes #5-36.*

The conversion of nearly 1,500 additional acres of former sugarcane land, which is now dominated by guineagrass and ironwood, to cropland will not significantly affect wildlife habitat due to the poor habitat afforded by guineagrass and ironwood. The abandoned can land is no likely nesting habitat or significant habitat for 'Io, Hawaiian hawk (Buteo solitarius) and 'Ope'ape'a, Hawaiian hoary bat (Lasiurus cinereus semotus).

*Alternative 1 - No Action will not result in the conversion of much of the abandoned caneland in the project area to cropland. Leakage from the LHD will continue to flow into natural stream systems and will maintain artificial wetlands.*

*Alternative 2 - Wells will result in conversion of the abandoned caneland to cropland in a manner similar to the Selected Plan. Most leakage from the LHD will continue to flow into natural stream systems and will maintain artificial wetlands.*

*Alternative 4 - Pipeline will result in conversion of the abandoned caneland to cropland in a manner similar to the Selected Plan. Nearly all LHD leakage will be eliminated.*

#### Mitigation

No mitigation is required

### 6.3.5 Threatened and Endangered Species

#### Setting

There are four endangered animal species, seven endangered plant species, and seven species of concern to the U.S. Fish and Wildlife Service that occur within the watershed project boundaries. Endangered animals include: 'Io, Hawaiian hawk (Buteo solitarius); 'Alae ke'oke'o, Hawaiian coot (Fulica alai); Koloa maoli, Hawaiian duck (Anus wyvilliana); and 'Ope'ape'a, Hawaiian hoary bat (Lasiurus cinereus semotus).

Species of concern in the watershed area include the fish 'O'opu alamo'o (Lentipes concolor), and six plants: Pilo kea (Platydesma remyi); Koli'i (Trematolobelia grandifolia); Stenogyne cranwelliae; 'Oha wai (Clermontia drepanomorpha); Anini (Eurya sandwicensis); and Nanu (Gardenia remyi).

A reconnaissance-level botanical survey of the open ditch portion of the LHD was undertaken in July and August 1996. (Herbst, 1996) The survey corridor was approximately 15 miles long and 100 feet wide. In addition, the survey also evaluated the former sugarcane lands that would be accelerated in conversion to cropland with implementation of the watershed project. The survey report stated that no threatened or endangered species or species of concern were seen within the project corridor and that none are historically known within the proposed project boundaries.

In November 1996 and January 1997, surveys of Waipio Valley streams were undertaken to assess the effect of the diversions on native and threatened and endangered aquatic species. (Englund and Filbert, 1997) No threatened or endangered aquatic species was identified in the survey reaches. 'O'opu alamo'o, a species of concern were observed in Lalakea/Hiilawe Stream which will not be affected by the project.

During the aquatic survey a previously undescribed Hawaiian stream fly (Sigmatineurum meaohi) was observed upstream of the Alakahi Stream intake by the team conducting the aquatic assessment of the Waipio Valley streams for this project. (Englund and Filbert, 1997) While the stream fly is not a listed species, the presumed rarity of the insect has prompted the USFWS to request a survey of the extent of the stream fly and a characterization of its habitat.

*In late 1998, assessments on Koiawe, Alakahi, Kawainui, Waipio, and Waimanu Streams were conducted to describe the baseline distribution and abundance of the Hawaiian stream fly (S. meaohi), evaluate habitat quality, assess the effects of the proposed project on the Hawaiian stream fly, and assess aquatic insect fauna below and above the LHD diversions. (Englund and Preston, 1999)*

*The Hawaiian stream fly (S. meaohi) was found in Alakahi and Koiawe Streams at elevations above 960 feet. The stream fly was not found in Waipio, Kawainui, or Waimanu Streams. Its preferred habitat is in 3 to 12-foot high riffle and cascade zones.*

### Effects

No adverse effect to threatened and endangered species is expected by implementation of any of the alternatives. The informal consultation conducted with the U.S. Fish and Wildlife Service indicated three bird and one bat species listed as endangered have been observed within the boundaries of the LHD watershed area. The endangered Hawaiian hawk, Hawaiian duck, and the Hawaiian hoary bat are wide-ranging species that will not normally be adversely affected by specific construction activities. Modification of the Kawainui Stream intake, near which the Hawaiian duck was once observed may cause a short term disturbance. Hawaiian coots have been known to use portions of reservoirs. Lining of the Paauilo reservoir may cause a short term disturbance during construction. Additional reservoirs, including the project funded 1 MG Honokaia reservoir will create additional open water surface area for the Hawaiian coot.

*The Selected Plan will improve aquatic habitat for native species by providing bypass of 30 percent of the flow during baseflow periods. The restored streamflow will be significant for the stream reaches immediately below the LHD diversions, especially on Kawainui Stream where approximately 1,000 feet of the stream channel is left dry before spring contributions reestablish streamflow.*

*The 1998 survey of the distribution of the Hawaiian stream fly (*S. meaohi*) concluded that because the LHD intakes are located at the lowest elevational range of the stream fly adverse impacts to the species from continued operation of the LHD are expected to be minimal. The survey did indicate that the aquatic habitat below all of the LHD diversions had improved since the 1996 survey, in part, due to the unmaintained condition of the intakes allowing considerable flow to bypass the intakes and also, in part, due to the much wetter climatic conditions during the 1998 survey.*

*Alternative 1 - No Action may improve streamflow rates below the diversions if the CWRM requires alteration of the intakes as a result of the WVCA complaint. Due to the poor condition of the LHD a considerable amount of water will still need to be diverted in order to service farmers at the far end of the ditch system.*

*Alternative 2 - Wells will abandon the LHD and intake structures. No diversion of the Waipio Valley streams will be needed. The open reservoir areas in the Hamakua area will cease to exist.*

*Alternative 4 - Pipeline will result in effects similar to those of the Selected Plan.*

### Mitigation

The restoration of 30 percent of the baseflow at the stream diversions by the project to the Waipio Valley streams is expected to enhance aquatic habitat and increase populations of 'O'opu alamo'o (see Section 6.3.14 Aquatic Habitat / Natural Stream Flows).

*NRCS will continue to work with USFWS and the State Division of Aquatic Resources to measure streamflow and to monitor habitat quality and populations of native organisms during the implementation period of the project. Adaptive*

*management techniques can be used to adjust management of the LHD agricultural water system if adverse impacts are identified.*

### 6.3.6 Surface Water Quality and Quantity

#### Setting

Surface fresh water bodies in the Hamakua area consist of scattered perennial reaches of streams and constructed reservoirs. The Hawaii Stream Assessment identifies 23 perennial streams between Waipio Valley and Paauilo Gulch. Seven of the streams flow continuously to the ocean year around. The perennial stream reaches are typically fed by springs in the Hamakua Series lavas.

None of the Hamakua streams, *between Kukuihaele and Paauilo*, have been monitored for water quality information. The Hawaii Water Quality Standards Map (DOH, 1887) classifies the inland waters in the Hamakua area as Class 2 and the marine waters as Class A. Both classifications are the less sensitive classifications. *None of the streams in Hamakua are identified in the Hawaii Stream Assessment as possessing Outstanding Aquatic Resources or as a Candidate Stream for Protection.*

*Runoff from agricultural operations may include sediment, nutrient, and pesticide contaminants. The major soil in the farmland area served by the LHD is Paauhau. The NRCS Field Office Technical Guide states that this soil exhibits a moderate surface soil loss potential with an Universal Soil Loss Equation soil loss tolerance, T, of 4 tons per acre. Fertilizer and pesticide use is dependent on crop type and farmers' level of dependence on agricultural chemicals. Presently the level of fertilizer and pesticide use is low on the HNHAC area. Some pesticides used in the area include herbicides, glyphosate and paraquat; fungicides, mancozeb and copper sulfate; and the insecticides, diazanon and malathion.*

The LHD is designed to divert surface water from four streams in Waipio Valley. While the water quality of the LHD water is generally excellent and has been used as community water supply in the past, the water cannot be used for potable supply without extensive treatment in conformance with federal Safe Drinking Water Act guidance. The Hawaii Water Quality Standards Map classifies the Waipio Valley drainage area upstream from the valley floor as Class 1, which requires that the waters remain in their natural state as nearly as possible with an absolute minimum of pollution from human caused sources. The lower valley area that is developed for taro production and dwellings is classified as Class 2. The marine waters off Waipio are classified as Class A. *The Wailoa/Waipio and Lalakea Streams are identified in the Hawaii Stream Assessment as possessing Outstanding Aquatic Resources and are named as Candidate Streams for Protection.*

The current diversion rate of the LHD is approximately one-half of the natural spring discharge into Waipio Valley during dry periods. The minimum flow in the LHD has been reported to be 18 to 19 MGD. The minimum flow in Wailoa

Stream has been reported to be 22 MGD. The average flow rates are 25 to 30 MGD and 48 MGD for the LHD and Wailoa River, respectively.

A complaint to the CWRM contends that insufficient water supply to Waipio Valley farmers and aquatic communities exists as a result of the LHD diversions. A water quantity and quality problem mentioned during scoping for this project related to the inefficient auwai operation by some farmers resulting in reduced quality and fluctuating water supply to downstream taro farmers.

*The CWRM requires measurement and monthly reporting of water use from ground and surface sources.*

#### Effects

The Selected Plan will have no significant effect on flow rates in the surface streams of the Hamakua coast *except due to the reduction of leakage from the LHD*. Increased agricultural activity in the project area increases the potential for nutrient and pesticide contamination of runoff from agricultural operations. The Selected Plan will provide additional technical and financial assistance for agricultural operators and landowners to address soil erosion problems and nutrient and pesticide management.

The Selected Plan will decrease the amount of surface water transferred from Waipio Valley to the Hamakua area. The average daily water diversion once full agricultural buildout occurs, will be approximately 7 MGD which is less than the current average diversion rate of 25 to 30 MGD. *Modifications to the diversion structures at Kawainui, Alakahi, and Koiawe Streams will ensure the passage of, at least, 30 percent of the streamflow past the LHD diversions under all conditions. Approximately 13 MGD can be diverted by the LHD during baseflow periods. Approximately 6 MGD will flow past the diversions during baseflow periods.*

Leakage loss and intentional disposal of water from the LHD will be reduced considerably. Currently, water not used for agricultural and other beneficial purposes in the Hamakua area can account for up to 90 percent, as much as 22 MGD to 27 MGD. Water loss through leakage, evaporation, and undocumented use, estimated to total 3 MGD, will continue to occur after implementation of the proposed project.

The major effect to surface water quantity in the Hamakua area will be the reduction of flowing stream reaches and wet areas created by leakage from the LHD. Most sustained leakage is much less than 1 MGD. Significant leakage which is about 1 MGD or greater is repaired by the maintenance crew. *The ever-changing volumes and locations of the leaks prevents the permanent establishment of significant ecosystems or other uses of water from leaks.*

Water quality within the LHD will be improved by implementation of the Selected Plan. Access to the ditch by livestock will be prevented by fencing of the LHD through pastures. Existing openings in the concrete lining that animals use to enter the ditch will be repaired. Exclusion of animals will reduce sediment

discharge from the paths into the ditch and reduce the potential of animal waste and pathogens from entering the LHD.

*Glyphosate, paraquat, mancozeb, and diazanon have high runoff potential when adsorbed to soil particles. Glyphosate and paraquat are also highly soluble. The pesticides identified applied on the Paauhau series soils and other area soils have a high potential to be lost due to surface runoff. Due to relatively short persistence in the environment, these pesticides can be controlled from reaching receiving waters by timing of application to avoid periods of rainfall and runoff and by conservation practices that control soil erosion and transport. Nutrient and pesticide management can be addressed in the conservation plans approved by the SWCD. There are no significant concerns or identified problems in the stream and ocean receiving waters.*

The surface water quantity of the Waipio Valley streams and of Wailoa River will increase by the amount by which LHD diversion is reduced. An average of 18 to 23 MGD will be restored to Waipio Valley resulting in an average flow of 66 to 71 MGD in Wailoa River, a 38 to 48 percent increase. During drought periods when agricultural water demand in Hamakua is at its peak the diversions will capture 13 MGD which is 70 percent of the base flow of the three diverted streams. During such periods the Waipio Valley Streams and Wailoa River will have a base stream flow of approximately 30 MGD.

The additional streamflow will generally improve water quality in the Waipio Valley streams. Water temperature will remain cooler with the higher streamflow. There will be greater dilution of contaminants in the effluent from the taro lo'i. *Studies have indicated that increased baseflows will eventually result in improved conditions such as opening the streambed, reducing vegetative encroachment, and reducing overall bank erosion. (Kinzie, 1997)*

An adverse effect that may result from increased baseflow is a period of stream system instability. The stream system will probably adjust to the higher flow by widening and increasing its sinuosity. The increased frequency of flow rate change due to the loss of the leveling effect on rainfall runoff of the existing diversions may result in increased bank instability. A potential problem for taro farmers will be increased management of the auwai in response to stream level fluctuations caused by the daily rainstorms in the upper watershed area. *The length of time before a condition of stability is attained cannot be predicted.*

To prevent the possibility of the leakage of hydraulic and lubrication oils from the remotely controlled gate devices into the Kawainui Stream, which are Class 1 waters, the specifications for the components will include restrictions on use of hydraulic oils and liquid lubricant reservoirs. *Systems using biodegradable vegetable oil may be considered.*

*Measurement of diversion from the Waipio Valley streams and remaining flow in the streams will be conducted as a operational requirement of the agricultural water system. If a SCADA system cannot be used at all locations, other forms of flow measurement and recording will be used.*

Alternative 1 - No Action will generally continue current patterns of surface water quantity and quality. Partial restoration of streamflow to Waipio Valley streams may be ordered by CWRM.

Alternative 2 - Wells will provide full restoration of streamflow to Waipio Valley. The geomorphic adjustments to increased streamflow in Waipio Valley will be most pronounced with this alternative.

Alternative 4 - Pipeline will result in effects similar to the Selected Plan.

#### Mitigation

*The NRCS and the Hamakua SWCD will provide technical assistance to farmers and ranchers to address soil erosion and pesticide and nutrient management concerns. Conservation assistance will also be provided to install or convert water-conserving irrigation systems.*

The NRCS and Mauna Kea SWCD will provide technical and land treatment assistance to farmers and landowners in Waipio Valley to address problems associated with increased streamflow in Waipio Valley. Some possible areas for NRCS and SWCD assistance include improvements to the auwai, erosion control, restoration of taro lo'i, and assistance with permit applications for stream maintenance. Remotely controlled gates at the Kawainui Stream diversion will be designed to eliminate the possibility of leakage of hydraulic or lubricating oil into Class 1 waters.

### **6.3.7 Groundwater Quality and Quantity**

#### Setting

The LHD watershed is located over three Aquifer Systems as defined by the State Water Resources Protection Plan (Yuen, 1992): 80102 (Waimanu), 80201 (Honokaa), and (80202) Paauilo.

The Waimanu System includes Waipio Valley and has an estimated sustainable yield of 110 MGD. Surface expressions of groundwater provide the base flow of the LHD and other ditch systems located on the southern and western sides of the system. Except for the unused Waima Stream pumps, no development of groundwater has taken place in the eastern part of the Waimanu System. While water quality information is not available for this aquifer, it can be assumed to be good due to the lack of activity in the upper catchment area.

The Honokaa and Paauilo Systems have sustainable yields of 31 MGD and 60 MGD, respectively. These systems are located in Hamakua and Laupahoehoe Series lavas. Basal groundwater is the most abundant resource. Some perched water exists, but output is low. Most development has taken advantage of the basal source. Chloride levels for the basal wells are a function of the aquifer head above mean sea level and the depth of the well below mean sea level.

Wells in the area include the Haina Mill, Honokaa A, Kukuihaele, Paauilo Shaft, and Paauilo. The withdrawal by existing and proposed wells in these two systems will not approach the sustainable yield for these aquifers.

Atrazine compounds and Hexazinone, contained in herbicides used by the sugar industry, have been detected in five wells in or near the project area - *Paauilo Shaft, Paauilo Well, Haina Well, Big Island Meat Co. Well, and Waiuliuli Spring. (1997 Groundwater Contamination Maps, Department of Health)* Concentration levels are well below applicable drinking water standards. Elevated salinity concerns due to higher pumping rates exist in the Hamakua area.

*The CWRM requires measurement and monthly reporting of water use from ground and surface sources.*

#### Effects

The Selected Plan will not have a significant impact on groundwater quality or quantity. Most of the current leakage from the LHD, much of which recharges the basal aquifer, will be eliminated. The effect of the reduction in leakage is not significant due to the limited development of the basal aquifer in Hamakua.

*The increase in agricultural activity poses the risk of agricultural chemicals and nutrients leaching to the groundwater supply. The major pesticides in current use are discussed in Section 6.3.6. All of the pesticides have extra-small and small leaching potentials. The Paauhau soil exhibits a slight potential for leaching according to Section II of the NRCS Field Office Technical Guide. The potential for pesticide contamination of groundwater is small.*

The acreage of irrigated cropland in Hamakua be much less than during sugarcane cultivation and the permitted pesticides are shorter-lived. Agricultural producers will be required to use pesticides in compliance with State regulations. Pesticide and fertilizer use will also be addressed in the Nutrient Management and Pesticide Management portions of the Conservation Plans.

A significant amount of leakage from the aged LHD will continue with Alternative 1 - No Action, despite ongoing maintenance efforts. Most of the leakage will augment the groundwater resource.

Groundwater resources will be most affected by implementation of Alternative 2 - Wells. A peak withdrawal rate of 14 MGD is needed from a system of ten wells. Other wells in the project area, used for domestic supply, also have an aggregate capacity of between three and six MGD. While the withdrawal is below the 30 MGD estimate of the sustainable yield of the Honokaa aquifer system, well interference effects may result from the many wells in the relatively thin basal aquifer. The detection of atrazine compounds and hexazinone in area wells at levels below the state and federal drinking water standards will not affect the use of the source for agricultural water supply.

*Measurement and reporting of any groundwater withdrawals to the CWRM will be conducted as an operational requirement of the agricultural water system.*

Alternative 4 - Pipeline will reduce leakage from the LHD even more than the Selected Plan resulting in reduced recharge to the aquifer.

#### Mitigation

No mitigation is required.



### 6.3.8 Air Quality

#### Setting

The environmental attributes associated with air quality are harmful contaminants, visibility, odor, and sound. The Clean Air Act of 1967, as amended, establishes air quality standards for pollutants and are intended to protect the public health and from effects such as visibility reduction, soiling, nuisance, and other forms of damage.

The prevailing tradewinds sweep in over the Pacific Ocean from the northeast and provide a cleansing effect and excellent air quality for the area.

The agricultural nature of the land use in the Hamakua area during sugarcane cultivation, in the recent past, and in diversified agriculture, currently and into the projected future, will continue to affect air quality. Cultivation practices of tillage, harvesting, pesticide application, and transportation will generate dust, vehicular emission, pollutants, and noise when conducting the activity. The level of air quality impact at present and in the future will be considerably less than during the production and processing of sugarcane.

#### Effects

Implementation of the Selected Plan may result in short term air pollution impacts from dust due to construction activity. Engine emissions generated by construction equipment and vehicles may temporarily affect air quality in the vicinity of construction. Noise during construction will be elevated in the immediate vicinity of the construction activity. However, the continued presence of traffic on the area roadways and widespread agricultural activity in Hamakua also are sources of air pollutants and noise. The dust, emission, and noise produced by construction activities should not significantly affect air quality in the project area.

*Alternative 1 - No Action does not include construction or maintenance activity beyond current levels. Farming activity is not projected to increase. Air quality impacts due to construction and farming activity will not increase.*

*Alternative 2 - Wells will require construction or modification of ten wells and installation of distribution pipelines. Farming activity will increase to the level projected with the Selected Plan. Pumping energy will be developed by fuel-powered electrical generation plants. Increased air quality impacts due to construction, farming, and energy generation can be expected.*

*Alternative 4 - Pipeline will require construction activity. Farming activity will increase to the level projected with the Selected Plan. Increased air quality impacts due to construction, and farming can be expected.*

#### Mitigation

Potential air quality impacts will be mitigated by compliance with State Department of Health Administrative Rules, Title 11, Chapter 60, Air Pollution Control. Fugitive dust will be controlled by wetting. Revegetation of bared areas following construction will provide long term dust control. Construction

equipment and vehicles will be maintained by the contractor in good operating condition and with mufflers installed.

### 6.3.9 Visual Resources

#### Setting

Visual resources are those perceived physical elements and processes of the landscape that have value for human use. The landscape settings of both the Hamakua and Waipio Valley areas have significant value in this respect.

The Hamakua area has been characterized by sloping agricultural plains broken by deep, verdant gulches and stands of tall trees. The agricultural character of the area in addition to waterfalls, dense tropical foliage, and views of Mauna Kea and the ocean have been cited by many, including the preparers of the Hilo-Hamakua Economic Development Plan (Hawaii Island Economic Development Board, 1994) as a major resource for residents and visitors.

The LHD crosses the main highways in Hamakua at a number of locations. The views of the agricultural water conveyance, especially the trestled flumes, is significant to many who once worked in the sugar industry.

Waipio Valley is an important landscape resource of the state of Hawaii. The lookout at the top of the road leading to the valley is probably the most important visitor site along the northern route between Hilo and Kona. Within Waipio Valley there are numerous individual visual resources. The view of twin falls at Hiilawe which can be seen from the valley floor is probably one of the most significant. The extensive taro lo'i system in the valley is equally important as a visual and cultural resource.

#### Effects

The Selected Plan will promote diversified agricultural activity in the Hamakua project area and will ensure the rural/agrarian character and landscape of the Hamakua area. Much of the idle sugarcane land near and below the highway will be used for cropland or grazing. Protection of agricultural land and land use through the county zoning process will be better supported by an active agricultural economy.

Most of the existing wooden flume structures along the LHD will be replaced with large diameter culvert pipe and steel supports. Approximately one-half of the 48 flumes have already been reconstructed in the manner proposed by the project. *Two of the flumes will be reconstructed in original materials and construction, as much as possible, to provide examples of the craft of the original constructors of the LHD and to provide a historic and cultural connection for the community to the LHD.*

The major effect to the landscape of Waipio Valley will be the restoration of Hakalaoa Falls, *while maintaining the operation of the LHD.* The partial restoration of streamflow and modification of the intakes should not have a significant effect on the visual aspects of Waipio Valley.

*Alternative 1 - No Action will not result in immediate impacts to visual resources in the project area. If agricultural activity does not engage the use of much of the former sugar land in Hamakua, owners and developers will investigate alternative non-agricultural uses that may result in changes to the visual character of the region.*

*The restoration of Hakalaoa Falls will occur. However, the LHD may be put at risk by the restoration of Hakalaoa Falls if a tunnel repair is not completed before the Hakalaoa Stream diversion dam is breached.*

*Alternative 2 - Wells will retain the Hamakua lands in agriculture. However, this alternative will not maintain the LHD, which will likely be abandoned and dismantled.*

*Alternative 4 - Pipeline will retain agricultural activity in Hamakua. The open ditch portion of the LHD will be changed in character once the pipeline is installed, open ditch portions buried, and flumes converted to pipe crossings.*

#### Mitigation

No mitigation is required.

### **6.3.10 Cultural and Historic Resources**

#### Setting

The major cultural resources of the LHD watershed include native Hawaiian archaeological sites and present-day expressions of native Hawaiian culture in Waipio Valley and historic resources in the Hamakua project area, including the LHD.

Waipio Valley is an important Hawaiian place. The valley was settled early and was the home of several strong rulers since the early 13<sup>th</sup> century. Tradition states that Liloa, the first chief to unite rule over the entire island of Hawaii, was from Waipio. Numerous archaeological sites exist in Waipio Valley.

The twin falls at the back of Hiilawe Valley—Hiilawe and Hakalaoa -- are an important cultural landscape. In addition to their visual beauty, the falls have traditional and cultural significance. The falls are named for demigods of Hawaiian mythology and figure prominently in many Hawaiian chants and legends.

Taro cultivation in the traditional style, as practiced in Waipio Valley, is viewed as an important aspect of Hawaiian cultural tradition. The functioning auwai system, parts of which can be traced back to the precontact period, may be regarded as a traditional cultural property that may be eligible for the National Register of Historic Places.

Because of extensive sugarcane cultivation for over a century, the Hamakua project area offers few opportunities for the detection of Hawaiian archaeological resources. A regional synthesis for the Hamakua area (Cordy, 1994) strongly suggests that archaeological features could still be found in gulches and along the shoreline.

A preliminary archaeological investigation of the 14.5-mile long open ditch portion of the LHD and prospective cropland in the project area was conducted in July 1996. (Kawachi, 1999) A 100-foot wide corridor centered on the LHD was surveyed for pre-sugar cultural resources. Sugar-era structures and earthwork were not considered during the survey.

An isolated rock platform with modern artifacts was found at the ditch's edge in the ahupuaa of Kapoaula, just before the highway crossing of the ditch on the Waipio side of Honokaa. Surface artifacts suggest this platform was probably used in more recent times. Excavation of the site may yield information regarding earlier use. Avoidance of the platform site by project actions is expected.

The survey included gulches and gullies crossed by the LHD. Most of the gulches are very steep and narrow. The plantation practice of pushing rock, soil, and excess vegetation into the gulches and gullies has left the edges abrupt and unstable. Natural flooding in the narrow gulch bottoms would have washed away any evidence of early habitation or cultivation had any early Hawaiians attempted to do so in these gulches.

Many of the structures that were built by the sugar industry during the century that it dominated the Hamakua landscape are eligible for listing on the federal Register of Historic Places. The LHD remains a tangible connection for many area residents to the defunct sugar industry. The communities along the Hamakua coast still consider the LHD to provide the "life blood" for the area. The LHD has many components that are unique and have cultural significance. The cut stone sediment basins and control structures and the elevated flume structures are especially representative of the craft and engineering skill of its builders.

#### Effects

The project improvements proposed by the Selected Plan will alter components of the LHD. The Project proposes to replace all remaining wooden flumes along the open ditch system with CMP culvert or pipe siphons. Nearly all wooden trestle structures will be replaced with steel "I"-beams. The character associated with these flumes will be lost. *Two of the wooden flumes will be repaired in original construction and materials, as much as possible, to retain examples of the craft and engineering of the constructors of the LHD.*

*The rock platform observed at Kapoaula alongside the LHD will be avoided by repair work on the LHD.*

*Hakalaoa Falls will be restored by removing the stream diversion constructed by HSC in 1989 which transferred streamflow in Hakalaoa Stream to the adjacent Hiilawe Stream. The temporary LHD flume constructed on the cliff face at Hakalaoa Falls will be removed. The permanent tunnel repair behind Hakalaoa Falls will be necessary to restore the falls without threat to the continued operation of the LHD.*

*Alternative 1 - No Action would not engender new construction or major repairs. The LHD will generally remain in its current condition. Repairs and modifications will be made when failure occurs or is imminent. The restoration*

*of Hakalaoa Falls will occur. However, the LHD may be put at risk by the restoration of Hakalaoa Falls if a tunnel repair is not completed before the Hakalaoa Stream diversion dam is breached.*

*Alternative 2 - Wells will not maintain the LHD, which will likely be abandoned and dismantled. Hakalaoa Falls will be restored.*

*Alternative 4 - Pipeline will change the character of the open ditch portion of the LHD once the pipeline is installed, open ditch portions buried, and flumes converted to pipe crossings. The tunnel behind Hakalaoa Fall will be repaired and the Falls restored*

#### Mitigation

The State Historic Preservation Division was consulted to develop mitigation measures for the flume conversion *and Hakalaoa Falls restoration*. Two flumes will be repaired in original structural construction and materials and retained as operational components of the LHD. Other flumes with significantly unique features will be recorded through engineering rendering and photography. Original stonework along the open ditch will not be disturbed. *Plans for the restoration of Hakalaoa Falls will be made available to SHPO and native Hawaiian groups prior to implementation.*

A Memorandum of Agreement (MOA) is being executed between NRCS and the State Historic Preservation Division to comply with the requirements of Section 106 of the National Historic Preservation Act (NHPA) of 1966. The stipulations of the MOA include the restoration of two representative wooden flumes along the LHD, as much as possible, in their original structural configuration and in original construction materials; photographic and descriptive documentation of unique or exemplary features of flumes that will be modified or replaced; and that components of cut stone masonry will not be affected by the project. *Stipulations for Hakalaoa Falls restoration include review by SHPO and native Hawaiian groups of restoration plans.* The MOA will be submitted to the National Advisory Council on Historic Preservation for concurrence that the objectives of the NHPA are being met.

#### 6.3.11 Wetlands

##### Setting

The National Wetland Inventory (USFWS, 1977) has mapped all of the bottom of Waipio Valley below the Waima Stream confluence as wetland. Kawainui and Alakahi Streams are also mapped and classified by the USFWS as Riverine perennial wetlands. Along the Hamakua coast the lower reaches of the stream gulches are classified as Palustrine forested wetlands and agricultural reservoirs are classified as Palustrine open water impoundments. The open ditch portion of the LHD is classified as excavated Riverine open water (Cowardin, 1979).

The concern was raised during informal consultation with the USFWS in 1998 that significant wetland habitat may have developed at locations along the Hamakua Ditch where leakage from the ditch and flumes have created artificial

wetlands. In particular, habitat for important native plant and animal species, such as species of the Hawaiian damselfly (*Megalagrion* sp.), may have existed at the leak sites and needed investigation.

#### Effects

*The Selected Plan will increase streamflow in the Waipio Valley streams. An average increase in streamflow of 38 to 48 percent is expected. Most significantly, the stream reaches immediately below Kawainui, Alakahi, and Koiawe stream diversions will flow continually due to passage of 30 percent of the flow past the LHD diversions. Year-round aquatic wetland habitat which connects the reaches of Kawainui, Alakahi, and Koiawe streams below and above the diversions will be ensured. The improved streamflow will enhance habitat for native aquatic insects and provide a migratory path, in all seasons, for o'opu and other native invertebrate species.*

*Some effects of the adjustment of Wailoa River to higher baseflow levels may be bank and stream bottom erosion and change in meander pattern. Other wetland areas lower in Waipio Valley should not be significantly affected.*

*A habitat assessment by NRCS and the USFWS was conducted on December 2 and 3, 1998 to evaluate the streams and wetlands enhanced or created by leakage from the LHD. It was determined that the excess water in the streams and the artificial wetlands created by flume leakage did not provide habitat for significant native species, including native damselflies. In fact, repair of the leaking flumes may prevent further exotic introductions downstream. Invasive species such as Tahitian prawns, mosquito fish, and tilapia introduced by the leaks compete with native species and degrade native habitat.*

Modification of the flumes and intake structures will not significantly affect the riparian areas along streams during the period of construction, since flume replacements are expected to use the existing foundations and no earthwork will be necessary in waters. Modification to intakes will be to the existing structure without additional permanent disturbance to the streams. There may be some temporary effects from construction equipment mobilization and use, but this will be minimized by employment of best management practices.

The construction of the new Honokaia reservoir and lining of the Paauilo Reservoir will increase the area of open water in the Hamakua area by less than one acre.

*Alternative 1 - No Action will not reduce the leakage along the open ditch portion of the LHD as much as the Selected Plan. Excess water into streams and artificial wetlands will continue to exist. The diversion intakes will probably continue to capture most of the baseflow, drying the stream channels below the diversion structures.*

*Alternative 2 - Wells will abandon the LHD. Leaking flumes will be fixed, and excess streamflow and ancillary release of exotic species will be eliminated. All streamflow in the Waipio Valley streams will be restored.*

*Alternative 4 - Pipeline will result in effects to wetlands similar to the Selected Plan. Leaking flumes will be fixed, and excess streamflow and ancillary release of exotic species will be eliminated.*

Mitigation

*Land treatment assistance is available to Waipio Valley farmers to respond to increased flow in Wailou River.*

*A survey of the riparian wetland areas created by leakage from the LHD was conducted by NRCS and USFWS representatives along the Hamakua area on December 2 and 3, 1998. Emphasis was given to surveying for Hawaiian damselfly and analysis of wetland function and values. No significant native habitat created by leakage from the LHD was identified.*

All construction activity in or near wetlands will be reviewed for the need for an U.S. Army Corps of Engineers permit. It is expected that many of the restoration and modification activities for the LHD can be conducted under nationwide permit 3 for maintenance, the maintenance exemption, or General Permit 95-002 Permit for Utility Lines In, Under or Above Waters of the United States, Including Navigable Waters, in the State of Hawaii.

**6.3.12 Water Rights and Traditional Uses of Water**

Setting

Water rights issues are becoming heightened and more politically sensitive as competition for available water resources increases. The State Water Code, enacted by the state legislature in 1987, established the Commission on Water Resource Management and administrative rules for the management of naturally occurring fresh water resources in Hawaii. The State Water Code is based on the trust policy that "all the waters of the State are held for the benefit of the citizens of the State."

Existing uses of water in areas not designated as Water Management Areas are determined partially based on registration of water sources and declarations of water use. This registration and declaration program does not purvey or establish any water rights, per se, but is used by the CWRM to identify actual users. Hamakua Sugar Company filed the registration and declaration of the LHD diversions on TMK 8,4-9-012: 001 during the May 27, 1988, to May 30, 1989, period for declaration of existing uses. The declaration summary contained in Declarations of Water Use, Vol. 1, Circular C-123, CWRM, September 1992 states, "Water for Kawainui, Alakahi, Kaiawe (sic), and Waima Streams is diverted into LHD and supplies approximately 30 MGD on average for irrigation of Sugarcane, hydroelectric power generation, and mill operations."

*The CWRM adopted Interim Instream Flow Standards (IIFS) for all streams in the state without a permanent Instream Flow Standard to protect beneficial instream uses. The IIFS adopted for Big Island streams was the amount of flow, accounting for seasonal variation, existing in the stream on June 15, 1988. All*

*diversions previous to July 1, 1987, including the LHD diversions, were not affected by the IIFS.*

Native Hawaiian rights to water are protected by the State Water Code and are based on domestic water rights for Kuleana lands awarded pursuant to the Kuleana Act of 1850; appurtenant water rights to cultivate traditional products (such as taro) on lands which historically supported such use when the original award was made; protection of streamflow necessary to allow traditional and customary practices such as the propagation of taro and gathering of plants and animals for subsistence, cultural, and religious purposes; and reservations for Hawaiian Home Lands established by the Hawaiian Homes Commission Act.

*In addition, existing correlative and riparian uses are protected by the Hawaii State Constitution and the State Water Code.*

*Measurement and reporting of any surface water diversions or groundwater withdrawals to the CWRM is required by the State Water Code.*

#### Effects

Implementation of the Selected Plan will reduce the amount of water transferred from Waipio Valley streams to the Hamakua coast. An amendment to the Interim Instream Flow Standard can be made to limit the diversion rates to that required for beneficial uses on the Hamakua coast with the remainder restored to Waipio Valley Streams.

The restoration of streamflow into Waipio Valley is opposed by taro growers in the valley that cite the potential for damage to the traditional irrigation auwai and increased cultivation effort due to increase in stream levels and frequent fluctuation in flow rate. The taro growers, many of whom have direct links to earlier native Hawaiian taro culture in Waipio Valley, assert a right to have the water released into the valley controlled to benefit taro cultivation.

*No abridgment of codified native Hawaiian water rights or of riparian or correlative uses is expected as a result of the implementation of the Selected Plan. No complaints have been filed with the CWRM, during or after the period of sugarcane cultivation, regarding insufficient water to satisfy native Hawaiian water rights or other consumptive uses. The Selected Plan will increase streamflow during all seasons to Waipio Valley water users.*

*No Hawaiian Home Lands reservation for water exists in the watershed area.*

*The water rights established by the State Water Code apply to all of the alternatives considered by this project. Except for Alternative 2 - Wells which would cease diversion of Waipio Valley streams, all of the other alternatives will continue to divert water from the Waipio Valley streams for the reasonable beneficial use of irrigation water supply.*

#### Mitigation

No mitigation is required.



### 6.3.13 Social Effects

#### Setting

The concern expressed by the Hamakua community during scoping and reiterated in many of the assistance programs and projects is that the efforts taken following the close of HSC are meant to maintain the social well-being of the residents of the Hamakua communities. Elements of the all-encompassing concern include opportunities for livelihood, continuance of community and family relationships, maintenance of the agrarian setting, and community control over the process of change.

Waipio Valley farmers and residents also have expressed similar concerns as Hamakua residents about change and development in Waipio Valley. The desire to have input and control over changes to Waipio Valley resources is especially important to Waipio Valley taro farmers who feel that externally imposed resource policies and management have left them without the ability to manage water and land in Waipio Valley to cultivate taro.

#### Effects

The Selected Plan and the other structural alternatives provide a part of the economic base, consistent and adequate agricultural water supply, necessary to achieve the social objectives desired by the Hamakua communities.

The Selected Plan will include the Waipio Valley communities in the management of the LHD stream diversion system through participation in an advisory group for the LHD. NRCS and the Mauna Kea SWCD will support other efforts by Waipio Valley taro farmers to manage soil and water resources in Waipio Valley through natural resources conservation programs. *Assistance will be provided to assure that the increased flow resulting from reduced diversion does not create flooding and lo'i and auwai management problems.*

Alternative 1 - No Action will result in continued uncertainty of agricultural water for Hamakua farmers. Many of the other agricultural programs rely on the establishment of a stable water supply.

Alternative 2 - Wells will provide a stable water supply. The higher cost of water due to the need to pump from the basal aquifer will present a hardship to some farmers. The competitiveness of produce will be diminished by the additional cost. The reliance on Waipio Valley water resources will cease.

Alternative 4 - Pipeline will provide a stable water supply and should have generally the same effects on society and community as will the Selected Plan.

#### Mitigation

No mitigation is necessary.

#### 6.3.14 Aquatic Habitat / Natural Stream Flows

##### Setting

The streams that feed into the Wailoa River in Waipio Valley provide valuable habitat for stream communities containing important native aquatic species. The Hawaii Stream Assessment rated the Wailoa/Waipio system as Outstanding in regard to both its aquatic resources and riparian resources. The Stream Assessment indicates that all four of the important native indicator species—o'opu alamo'o, o'opu nakea, o'opu nopili, and hihiwai—are present in the Wailoa/Waipio system.

A survey of native and exotic stream organisms was conducted for Waipio Valley streams in 1996 (Englund and Filbert, 1997). The survey included longitudinal biological assessments of Waipio Stream and three of its tributaries, Koiawe, Alakahi, and Kawainui Streams, and the Lalakea/Hiilawe Stream which is not diverted by the LHD. Waipio Stream is the upper reach of Wailoa River between its confluence with Waima Stream and the confluence of Alakahi and Kawainui Streams.

The survey found Waipio Stream and three streams diverted by the LHD to have low populations of o'opu below the diversions and no observation of o'opu above the diversion. Except for one individual of o'opu nopili (*Sicyopterus stimpsoni*) observed in Koiawe Stream, all other native fish sightings were o'opu nakea (*Awaous guamensis*). All five species of o'opu were observed at the lower reach of Lalakea/Hiilawe Stream. O'opu alamo'o (*Lentipes concolor*), a Species of Concern, was found all along Lalakea/Hiilawe Stream, including the transect above the 1,500-foot tall Hiilawe Falls.

*During the 1996 survey by Englund all five species of native goby were observed in the Hiilawe/Lalakea Stream system which flows into Wailoa River approximately one-half mile before flowing to the ocean. O'opu alamo'o (Lentipes concolor) was found above Hiilawe Falls at 2,000 feet elevation. Climbing of a 1,000-foot tall waterfall is required to reach that elevation. This demonstrates the ability of the species to negotiate difficult barriers during its upstream migration. Movement up Hiilawe Falls is particularly difficulty because the upper third of the falls is often dry up to the Lalakea Ditch diversion located at nearly the 2,000-foot elevation below the sampling station.*

*Only O'opu nakea (Awaous guamensis) and one individual of O'opu nopili (Sicyopterus stimpsoni) were found in the ten transects in the upper part of the Wailoa River and Waipio Valley streams, above 480 feet. No o'opu were found at the four transects above the LHD diversions. Only the dry reach of Kawainui Stream below the diversion structure was characterized as "poor" habitat.*

*The 1998 survey conducted for aquatic insects in the vicinity of the stream diversions showed that restoration of streamflow to the reaches immediately below the diversion structures increased aquatic insect habitat. (Englund and Preston, 1999) The survey compared the dry conditions in the stream reaches below the Kawainui, Alakahi, and Koiawe Stream diversion in 1996 with the*

*flowing conditions in these stream reaches in 1998. The two conditions that are responsible for the difference are wetter climate in 1998 and reduced maintenance of the diversion intakes which reduced streamflow capture.*

*'Opae kala'ole (Atyoida bisulcata) population densities were high and essentially the same below and above the diversions for all tributaries. Hihiwai was not found above the 20-foot elevation in Waipio Valley, despite apparently good habitat conditions. Factors in the lower reaches of Waipio Valley, such as increased temperature, altered water chemistry, physical habitat modification, and introduced species, may be responsible for the lack of hihiwai in the system.*

*While the purpose of the partial restoration of streamflow to Waipio Valley streams is to improve aquatic habitat and increase the population of native stream organisms, there is no agreement by biologists that the objective of increased native species populations can be achieved through the actions of this project alone. Other efforts, such as the modeling of stream hydrology effects on native fish populations and restoration of desirable estuarial habitat for o'opu, will be needed.*

#### Effects

*The implementation of the Selected Plan will provide modification of the Kawainui, Alakahi, and Koiawe Stream diversion structures, as recommended by the USFWS, to limit diversion rates to 70 percent of streamflow. The reduction will be accomplished by closing off 30 percent of the intake grate surface to allow 30 percent of the flow to continue over the structure.*

*The average bypass will be approximately 5.7 MGD, 2.5 MGD, and 1.2 MGD for the Kawainui, Alakahi, and Koiawe Streams, respectively. Springs a short distance below the diversion structures add approximately 5 MGD to both Alakahi and Koiawe Streams.*

*During drought periods, a projected minimum of approximately 2.7 MGD, 1.8 MGD, and 0.9 MGD will be bypassed for the Kawainui, Alakahi, and Koiawe Streams, respectively. Springs a short distance below the diversion structures add approximately 2 MGD to both Alakahi and Koiawe Streams, during drought periods.*

*The greatest effect of the streamflow restoration will be in the 4,000-foot reach of Waipio Stream between the Kawainui intake and the confluence with Alakahi Stream. This reach is generally dry immediately below the diversion and gains only 1 to 2 MGD from groundwater seepage before the Alakahi confluence. With project implementation, a minimum of approximately 3 MGD will continually flow in this once dry reach.*

*During periods of average streamflow a gate on the Kawainui Stream diversion structure will return additional flow that is projected not to be needed in Hamakua back to the stream.*

*Continuous aquatic habitat through the stream systems past the LHD diversion structures will be provided to allow passage of aquatic species during migration. The increased habitat below the diversion structures may increase the range of*

*aquatic insect species that are found in higher gradient riffle and splash zone systems.*

*A combination of widely-held concepts regarding the native gobies and observations of the Waipio Valley stream system indicate that an increase in the release of baseflow at the Lower Hamakua Ditch diversions alone may not reestablish significant populations of o'opu in the upper Wailoa River stream system.*

*Recruitment of post-larval gobies from the ocean into the stream system is triggered by a freshet plume extending into the ocean. Individual gobies do not "home" to a particular stream signature, but can be recruited to any stream system. Gobies that inhabit middle and higher stream reaches are adapted to dry stream conditions that result in cessation of streamflow and in isolation of pools of water along the streambed. Spawning and migration of larvae to the ocean is triggered by high streamflows.*

*The 1997 report recommends that "Because factors other than the Lower Hamakua Ditch appear to be influencing the abundance of native animals in Waipio Stream and its tributaries, mitigation measures aimed at ameliorating effects of the ditch may not result in measurable differences in species composition and abundance of stream organisms. The cost of mitigation measures should be weighed against the potential benefit before any steps are taken."*

Through a process of adaptive management in operation of the agricultural water system, the diversion rates may be modified and other measures taken to improve aquatic habitat conditions and increase the population of native organisms, especially native gobies throughout the Waipio watershed. (Figure 15)

*Alternative 1 - No Action will result in the continuation of high diversion rates from the Waipio Valley streams to overcome high leakage rates and maintain constant flow to the Paauilo end of the LHD. While some reduction in diversion rate from present is expected, the improved aquatic habitat will be less than that provided by the Selected Plan.*

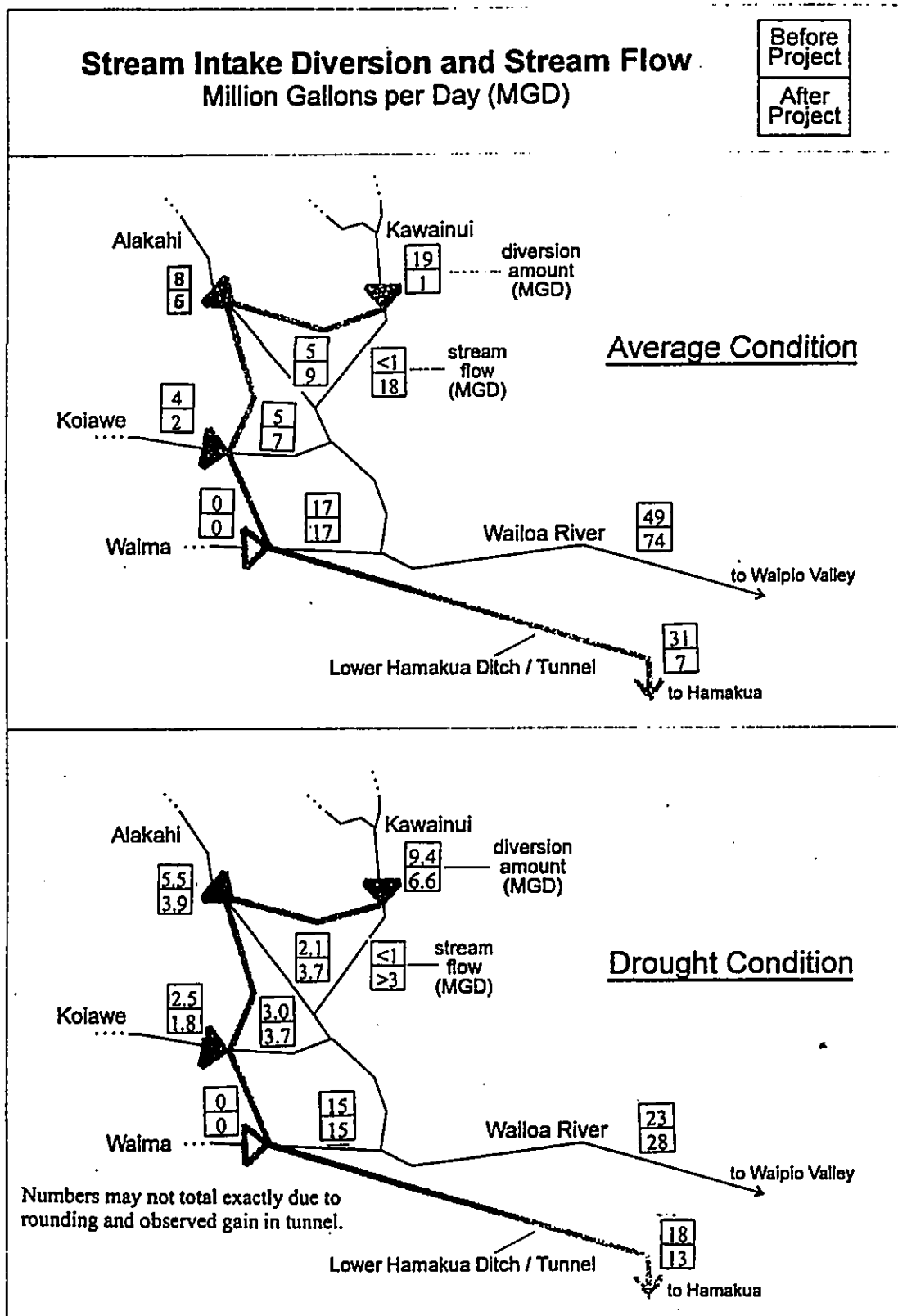
*Alternative 2 - Wells will result in the complete restoration of streamflow to Waipio Valley and will provide the highest level of aquatic habitat restoration.*

*Alternative 4 - Pipeline will result in generally the same level of aquatic habitat restoration. During periods of average streamflow, an additional 3 MGD can be restored to the Waipio Valley Streams.*

#### Mitigation

In addition to the project actions that modify the stream diversions at Kawainui, Alakahi, and Koiawe streams, project assistance to record streamflow below the diversions and on Wailoa River will be provided during the four year installation period. The streamflow records will be used to manage the stream diversions by the advisory group and provided to the CWRM.

Figure 15 Stream Intake Diversion and Stream Flow



Source: Mink, John F. (June 1984). Water Resources and Development for Hamakua Sugar Company. All "After Project" values are estimated.

### 6.3.15 Waipio Valley Taro Production

#### Setting

Approximately 25 to 30 farmers cultivate between 75 and 100 acres of taro and other crops in Waipio Valley. Farm acreage vary from 15 acres to subsistence-scale operations. Annual wetland taro production in Waipio Valley has been approximately one million pounds in recent years.

Bishop Museum is the largest landowner in Waipio Valley, controlling about one-half of the approximately 750 total acres on the valley floor. Many of the farmers lease land from the Bishop Museum, although the lower portion of the valley is checkered with other private holdings.

Most Waipio Valley farmers belong to Waipio Taro Farmers Association (WTFA) and/or the Waipio Valley Community Association (WVCA). The WTFA has approximately 20 members cultivating about 75 acres of taro and accounts for nearly all the commercial taro production in Waipio Valley. This loose association of taro farmers can trace its founding back to nearly 50 years ago and includes three generations of some taro-growing families. A major reason for the formation of the WTFA was to provide oversight and maintenance of the extensive auwai (irrigation ditch) system. *The WTFA has stated that if there is a water shortage that Waipio Valley taro growers should receive water before Hamakua area farmers.*

The WVCA has about 30 members of which six are commercial taro growers. The WVCA has championed the environmental values of Waipio Valley and has taken an active role in the effort to restore Hakalaoa Falls. The WVCA is the complainant to the Commission on Water Resources Management (CWRM) seeking restoration of "waste" flow in the LHD back to the Waipio Valley streams. *The main concern of the WVCA is "that in times of drought, Waipio Valley has priority over the use of water flowing in the Hamakua Ditch for cultivation of taro." (Corresp. Lawrence Miller, 1999)*

*There are also several commercial taro farmers who are not members of either the WTFA or WVCA.*

#### Auwai

Wetland taro cultivation requires large quantities of water flowing through the lo'i (taro paddies). Estimates for water requirement range from 50,000 gallons per acre per day to 100,000 gallons per acre per day. Water is diverted from the streams by an auwai system that regulates the rate of diversion and distributes the water to the taro lo'i. Most of the water passes through the lo'i and returns to the stream or auwai where it is available to downstream users. As water temperature and quality are important considerations for water used in taro cultivation, care must be exercised to maintain the quality of the water released back into the streams.

Six major auwai systems exist in Waipio Valley. Members of the WTFA and others are organized around the auwai system to maintain the auwai through their farm areas and at the waterheads, which are the diversions from the river. Water

intake into the auwai is traditionally controlled by weirs constructed of river rock, which are still used. Coordinated management of the stream resource by all taro growers and parties through whose land the auwai and streams run is necessary to avoid conflicts. In traditional Hawaiian culture, a knowledgeable water manager with chiefly rank would be able to assist taro growers to optimize operation of the auwai and settle water disputes.

A problem cited by the members of the WTFA is resistance by some parties in Waipio Valley to comply with the unwritten, tradition-based water management policy supported by the WTFA. In particular, reaches of auwai are left unmaintained or unrepaired following storm damage by some residents, despite requests by WTFA. Warming, turbidity, and water loss are reported problems. The absence of an operating authority for the auwai system that can ensure maintenance compliance or permit entry onto others' parcels to maintain the water system is reported to affect commercial taro production.

#### Other Waipio Valley Problems

A recurring problem for Waipio Valley farmers is the difficulty in fording the Wailoa River. Crossing the rocky fords across Hiilawe Stream and across several reaches of Wailoa River are necessary to reach most of the properties in Waipio Valley. Rainstorms in the valley and in the Kohala Mountains often swell the river and streams to make the fords impassable, delaying movement for hours and, even, days at a time. The fords are loose stream rock and must be repaired following storm runoff.

The absence of documented roads and easements or right-of-ways has created a problem of access to taro lo'i and transportation of taro out of the farms. Some landowners have closed portions of the long-standing trails that had been used by Waipio Valley farmers and residents.

The inability to maintain the desired flow capacity and characteristic of the Wailoa River due to the difficulty in getting permits and approvals to work in the main stem of the Wailoa River has stymied the Waipio taro farmers. Frequent adjustments to the vegetation and the sandbars on the Wailoa River are necessary for the proper functioning of the waterheads of the auwai system. The data-intensive permit requirements set by the Department of Land and Natural Resources and the federal Clean Water Act have prevented the taro growers from taking communal action to improve the river conditions for taro cultivation.

*Increased stream levels and flooding caused by rainy season bypass of the Upper Hamakua Ditch stream diversions above the valley walls has been cited by some Waipio Valley taro farmers. The WTFA would like to have the Upper Hamakua Ditch diversions operated at full capacity year around.*

Many Waipio Valley farmers believe that the LHD diversions help control the natural fluctuation of Wailoa River and provide a level of flood protection to the taro lo'i. When in good repair, the diversions and tunnel are capable of capturing up to 50 MGD from Kawainui, Alakahi, and Koiawe Streams. The Waima Stream diversion has not been maintained and is not operating. As 18 to 19 MGD

is the spring-fed baseflow of these streams at the LHD diversion structures, the additional approximately 30 MGD of surface runoff due to rainfall that is controlled by the diversion structures significantly reduces the normal day-to-day fluctuation of the flow rate of the Wailoa River. Essentially, the diversions limit flow volume in the Waipio Valley streams and Wailoa River near its baseflow level of 22 MGD, until the 50 MGD threshold of the LHD diversions is exceeded. While the limiting effect will have little noticeable impact during severe storms, the regulating effect for frequently occurring rain events is significant.

The auwai system that has evolved during this century works most efficiently with Wailoa River flows that are controlled by diversion of water for the LHD. The structures operate best when the river level is constant and do not provide good control of water when water levels fluctuate. Restoration of streamflow at the diversions and the resulting variability in stream depth in response to rainfall in the watershed will increase the water and auwai management requirement considerably for taro growers.

The Waipio Taro Farmers Association has stated that they oppose the increase of flow in the Wailoa River. The WTFA cites potential damage to the waterheads and auwai and increased water management for the lo'i. The WTFA wants the LHD diversions to be maintained to divert the full capacity efficiently. The Association would also like to see the Waima diversion made operational once again. The Association has offered to assist with operation and maintenance of the LHD diversions because they are directly affected by the diversion operation, are the closest to the diversions, and are more aware and responsive to changes in rainfall and streamflow. Also, many of the Association members are former Hamakua Sugar Company workers with intimate working knowledge of the diversions and tunnel of the LHD.

The WTFA has expressed the desire to work cooperatively with the project sponsors, the State Division of Aquatic Resources, and other Waipio Valley interests to resolve the issues regarding increased streamflow. The WTFA is requesting assistance to maintain and improve the auwai and roadways systems and to facilitate maintenance of the Wailoa River. The WTFA are agreeable to participate in the proposed advisory group to the management of the LHD agricultural water system.

#### Effects

*The Selected Plan will restore, at least, 30 percent of the streamflow at the Kawainui, Alakahi, and Koiawe Stream diversions during all flow levels. During higher flow periods more than 30 percent of the streamflow will be restored to the Waipio Valley streams, following the objective to divert only the amount of water needed by agricultural consumption in Hamakua. During the mean streamflow period of approximately 31 MGD in the diverted streams, approximately 23 MGD will be restored to the Waipio Valley Streams. The flow in Wailoa River at the top of the valley floor will increase from 49 MGD to 72 MGD, an increase of 47 percent during average conditions.*



*During drought periods the increase is less significant. Of the total drought streamflow at the diversions of approximately 18 MGD, 5.4 MGD will be restored to the Waipio Valley streams. The drought flow in Wailoa River will increase from 22 MGD to nearly 28 MGD. The volume of water is sufficient to irrigate the existing taro acreage and expansion to 280 acres if the higher water requirement of 0.1 MGD per acre is used.*

*The issue of diverting and disposing, outside of the valley, water above a threshold amount needed to enhance aquatic habitat in order to minimize effects to auwai management and inundation of crossings, will be taken up by the advisory committee and the management of the agricultural water system. Excess water can be "dumped" at the Main Weir at Kukuihaele, as is currently done. There appears to be agreement by both the WFTA and WVCA that such control is desirable during high streamflow periods.*

*The community organization process in Waipio Valley to identify issues, develop and obtain data, evaluate alternatives, and identify and pursue actions to resolve problems will be facilitated by members of University of Hawaii Department of Urban and Regional Planning practicum. The members of the practicum will work with all of the communities in Waipio Valley to develop, as much as possible, a shared vision of the future and strategies for concerted actions to achieve identified objectives. While the DOA and NRCS will provide the necessary funds for travel and subsistence to the UH group, the project proponents will not attempt to influence the community organization process.*

*Alternative 1 - No Action will continue the operation of the LHD intakes in generally the same manner as currently. Maintenance of the intakes will be sporadic. Considerable streamflow will pass over the clogged intake grates. No assistance to resolve problems facing the Waipio Valley communities will be offered.*

*Alternative 2 - Wells will abandon the LHD intakes. No regulation of streamflow at the diversions will be possible. All streamflow will flow through Waipio Valley, which, in effect, will double the volume of mean streamflow. Project assistance to Waipio Valley communities will be similar to that of the Selected Plan.*

*Alternative 4 - Pipeline will have effects on the Waipio Valley communities and mitigation responses similar to the Selected Plan.*

#### Mitigation

*NRCS and DOA will provide technical assistance to the Waipio Valley taro farmers to address the problems caused by higher streamflow levels in Wailoa Stream caused by streamflow restoration at the LHD diversions. The DOA will fund, independently, an engineering consultant's study to provide an analysis of the need for stream maintenance and to acquire the permits for the maintenance activity. Land treatment practices that can provide project cost-sharing assistance can be used by the farmers as a group project to perform the work.*

Waipio Valley taro farming concerns will be included in the management of the LHD stream diversions, through their participation in an Advisory Committee to the management of the agricultural water system. The two Waipio Valley groups, project sponsors, State Division of Aquatic Resources, and Hamakua farmers are expected to sign the Memorandum of Agreement that provides for an agreement in principle to manage the Waipio Valley stream resource to provide benefit to all interests. *Any agreement to apportion or allocate water will still be subject to the State Water Code administered by the CWRM.*

NRCS will contribute \$25,000 per year during installation of the project toward monitoring of stream flow in Waipio Valley to provide streamflow data for the Advisory Committee and system manager to develop flow prescriptions which address the requirements of the taro growers, aquatic habitat, and Hamakua area farmers and ranchers.

#### 6.3.16 Hakalaoa Falls

##### Setting

The twin Hiilawe and Hakalaoa Falls are an important scenic and cultural resource in the LHD Watershed. The falls are composed of two distinct streams that cascade over the Waipio Valley rim at the back of Hiilawe Valley, the easternmost tributary valley.

The falls can be viewed from the floor of Waipio Valley near the coastline. The falls drop nearly 1,500 feet in a series of long, thin cascades and plunge pools. In addition to their visual beauty, the falls have traditional and cultural significance. The falls are named for demigods of Hawaiian mythology and figure prominently in many Hawaiian chants and legends.

When the LHD was constructed in 1910, the conveyance tunnel, approximately seven feet wide by seven feet high, was driven through an ash and clinker layer approximately fifty feet behind the Hiilawe and Hakalaoa Falls. In the ensuing years, erosion caused the cliff wall to recede toward the tunnel. In May 1989, a portion of the cliff face at Hakalaoa Falls collapsed, exposing the tunnel and causing loss of all flow in the LHD system. The Hamakua Sugar Company constructed a temporary repair to the 30-foot long collapsed section of tunnel by attaching a flume to the cliff surface. In order to construct the repair and to ensure that damaging streamflow and debris would not destroy the fragile repair, Hakalaoa Stream was completely diverted to the west tributary of Lalakea Stream that led to Hiilawe Falls. In effect, all the water that once fell in two separate waterfalls was combined in Hiilawe Falls as a single waterfall.

A complaint was registered with the CWRM in 1992 seeking to have Hamakua Sugar Company restore Hakalaoa Falls. As Hamakua Sugar Company sought to acquire the stream channel alteration and stream diversion works permits and amendment to the interim instream flow standard to license the temporary repair work, the sugar firm went bankrupt. In October 1994, KSBE purchased portions of the former Hamakua Sugar Company holdings including the land parcel containing the diversion on Lalakea Stream and the temporary repair at Hakalaoa

Falls. On June 4, 1996, the Commission wrote to KSBE advising that it is the successor in Hamakua Sugar Company's applications and petitions. In essence, KSBE was recognized as the responsible party in the Hakalaoa Falls matter.

Since 1995, the DOA has pursued the permanent repair to Hakalaoa Falls with financial assistance from USDA through this watershed project for the purpose of preventing the failure of the temporary flume and ensuring the functioning of the LHD. The DOA has negotiated with KSBE an agreement transferring the land and water rights needed to operate the LHD for a period of 35 years. In light of the programmed repair of the falls by DOA, the Commission, following a series of public hearings, imposed a deadline on KSBE and DOA of December 1, 1999, for the restoration of Hakalaoa Falls.

*The Hiilawe Falls group is considered a traditional historic property eligible for listing on the Hawaii and National List of Historic Properties.*

#### Effects

The repair of the tunnel behind Hakalaoa Falls and the removal of the diversion on Hakalaoa Stream are included as work items in the Selected Plan.

Reconstruction of the tunnel through rock behind the falls is scheduled as the first installation item for the project. The permanent tunnel repair will allow removal of the upstream diversion structure and restore complete and unrestricted flow over Hakalaoa Falls. The existing temporary flume structure will be removed from the face of the cliff wall.

If the permanent tunnel repair cannot be implemented before the December 1, 1999, deadline imposed by the CWRM, a temporary structurally-reinforced culvert will be installed on the cliff wall replacing the existing flume. The diversion of Hakalaoa Stream will be removed and a temporary sediment/debris basin will be installed to prevent damaging cobbles and boulders from being transported over the falls. All temporary improvements will be funded by the state and will be removed once the permanent tunnel repair is completed.

Repair of the tunnel will be accomplished by transporting equipment through approximately two miles of tunnel from the entrance near Kukuihaele or by building a temporary staging platform at one of the portals to the tunnel near Hakalaoa Falls. Helicopters can be used to carry equipment to the staging platform. The method to be used will likely be determined by the contractor selected for a design/construct contract for the tunnel repair.

Implementation of Alternative 1 - No Action will likely result in the installation of a structurally-reinforced culvert replacing the existing flume to allow restoration of Hakalaoa Falls by the December 1, 1999, deadline. It is uncertain whether a longer-term commitment to repair the tunnel will be made by the state.

Alternative 2 - Wells assumes the abandonment of the LHD and its tunnel system. The diversion of Hakalaoa Stream will be removed by the landowner, KSBE. No provision is made by this project to remove the temporary flume structure.

Alternative 4 - Pipeline includes the same work at Hakalaoa Falls as does the Selected Plan.

### Mitigation

A Conservation District Use Application (CDUA) will be required for activity in the Conservation District. Construction activity will be regulated by the conditions of the CDUA and the building and grading codes of the County.

*As a "historic property", consultation with the State Historic Preservation Office has been conducted and mitigation activity included in a Memorandum of Agreement outlining agreed-to activity. Plans for the restoration of Hakalaoa Falls will be reviewed with SHPO and native Hawaiian communities prior to implementation.*

### **6.3.17 Hazardous Materials and Hazardous Waste Sites**

#### Setting

Hazardous materials are defined as any solid, liquid, or contained gas that is ignitable, corrosive, reactive, and/or toxic. Hazardous wastes are hazardous materials that are discarded or being disposed. While small amounts of hazardous materials and hazardous wastes exist in most businesses and homes, concentrations of hazardous materials and high volume hazardous waste streams fall under regulation by the State of Hawaii Department of Health.

There are no known concentrations of hazardous materials or hazardous waste in the watershed area. The area may still contain undocumented hazardous materials utilized, stored, and disposed by the sugar industry.

*Hazardous materials may exist at the abandoned Waima pumping plant. Both the DOA's program to inventory contamination of former sugar cultivation and processing sites and the State Department of Health's Hazard Evaluation and Emergency Response program are assessing the potential hazard sites in the Hamakua Sugar Company area and other abandoned sugar facilities.*

#### Effects

The implementation of the Selected Plan will not require use of hazardous materials nor will hazardous waste be generated. The project should have no effect on hazardous materials or hazardous waste sites. Most of the project activity will take place at presently developed locations that are free of hazardous materials. Construction of lateral distribution systems and the Honokaia Reservoir will utilize former sugarcane fields.

#### Mitigation

No mitigation required.

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

Short-term uses of the social and environmental resources of the project area include the fuel and energy requirements for the installation of the improvements proposed by the project, construction-associated fluctuation in water supply from the LHD to farmers and ranchers, potential for soil erosion during construction,

potential for adverse effects to water quality in construction-affected streams, and adjustment of Waipio Valley streams and taro growers to increased streamflow.

Long-term agricultural productivity is enhanced by the establishment of a stable source of agricultural water for the Hamakua area farmers and ranchers. The establishment of formal management of the agricultural water system under Chapters 167 and 168, HRS, as fostered by this project, will assure those investing in agricultural enterprise the certainty of water supply. The gravity-powered agricultural water system will operate without external energy inputs, such as that needed for the wells alternative. The restoration of streamflow, especially during most periods of low flow, is intended to contribute to the recovery of native stream species in the Waipio Valley streams.

The use of the surface water source for agricultural use reserves the groundwater along the Hamakua area for other users, especially those requiring a higher level of water quality.

#### **6.5 IRREVERSIBLE OR IRRETRIEVABLE COMMITMENT OF RESOURCES**

The use or alteration of nonrenewable resources and the effects on future generations were evaluated. The proposed restoration and repair of the LHD will require the irreversible and irretrievable commitment of a number of resources, including the materials, capital, labor, and energy needed to design, construct, operate, and maintain the project improvements and the LHD agricultural water system for the life of the project. Installation of the Selected Plan will preclude implementation of the other alternatives considered. *However, appropriate elements of the other alternatives can be integrated with the Selected Plan.*

Installation of the Honokaia reservoir will require the commitment of approximately one acre of state-owned agricultural land. Other improvements, as to the flumes and lining, will be made where the LHD infrastructure now exists. The ensured supply of agricultural water will result in the conversion of an additional 1,600 acres of former sugarcane land to diversified agricultural crops requiring the commitment of additional labor and capital resources. The land resource will not be irreversibly affected and may be converted to other uses in the future.

Installation of the project improvements is not expected to irreversibly or irretrievably affect environmental resources.

Installation of the project improvements is not expected to irreversibly or irretrievably affect cultural resources, except for the conversion of most of the wooden flume structures to CMP. The major effect of the project on the cultural resources of Waipio Valley, the restoration of the twin falls at Hiilawe, is expected to be positive.

## 6.6 UNRESOLVED ISSUES AND AREAS OF CONCERN

An significant issue during review of the DEIS was the amount of water diverted by the stream intakes in Waipio Valley.

The DEIS proposed the full diversion for peak agricultural water need in the Hamakua area when full cropland buildout occurred. For the projected buildout of 2,500 acres of irrigated cropland, other agricultural uses, and a fraction to account for leakage, a peak period need of 17 MGD was proposed. The peak diversion would be nearly all of the baseflow of the three Waipio Valley Streams diverted. Full agricultural buildout is expected in five to ten years.

A number of commentors, including the USFWS, during the DEIS review felt that the capture of nearly all of the baseflow during drought periods would negate the positive effects of restoration of streamflow during other periods. While the effects of the nearly full diversion during dry periods to native aquatic organisms are not fully known, the diversion rates for the project were modified to provide a significant flow across the diversion structure at all times, including during dry periods. The modification to the diversion structure suggested by the USFWS will be used. Plates along the bank edges will be used to close off 30 percent of the intake grate to assure overflow of 30 percent of streamflow at all times. Approximately 12.6 MGD, which is 70 percent of the base flow of 18 MGD, can be diverted during drought periods.

The proposed project will divert less than 70 percent of the streamflow in the Kawainui, Alakahi, and Koiawe Streams during most periods. Diverted streamflow exceeding the projected water demand in Hamakua will be returned to Kawainui Stream at a remotely controlled gate near the sand trap. An average of 9 MGD will be diverted from Kawainui, Alakahi, and Koiawe streams in Waipio Valley. The current average diversion rate varies between 25 and 30 MGD.

The complaint to CWRM seeks restoration, to the source streams, of all water that is not used for beneficial purposes in the Hamakua area. The complaint seeks restoration of streamflow to "support taro cultivation, appurtenant and riparian water rights, traditional and customary Hawaiian practices, native species and ecosystems, [and] any other beneficial instream uses in Waipio Valley." The amount of water needed in the Waipio Valley streams to provide the beneficial effects sought by the has not been determined.

The desire for a cooperative working relationship among the interested parties of the Waipio Valley stream diversions and Hamakua agricultural water use issues has been universally expressed. A draft Memorandum of Understanding providing a basis for cooperation to evaluate water use needs and to develop streamflow prescriptions for Waipio Valley Streams has been prepared and is being reviewed. The agencies and groups participating are DOA, DLNR Division of Aquatic Resources, Commission on Water Resources Management, NRCS, Waipio Taro Farmers Association, Waipio Valley Community Association, and the Hamakua-North Hilo Agricultural Cooperative. The participating agencies and groups will be included in the LHD agricultural water system advisory board once the agricultural water system is formally organized.

## **6.7 RELATIONSHIP TO OTHER PLANS, POLICIES, AND CONTROLS**

The Selected Plan will support or complement plans, policies, and controls that exist for the Hamakua and Waipio Valley areas. There appear to be no conflicts or inconsistencies with the implementation of the Selected Plan.

### **6.7.1 State Land Use Districts**

All lands in Hawaii are designated as one of four major land use categories by the State Land Use Commission as directed by Chapter 205, HRS. The intent of the legislation is to provide land use controls at the state level in order to preserve, protect, and encourage best use of lands in the state for the benefit of all the people of the State of Hawaii. The Land Use Districts are Urban, Rural, Agricultural, and Conservation.

Modification of the intake structures, installation of the RTUs, and repair of the conveyance at Hakalaoa Falls will occur on land designated Conservation District. All of the improvements are in the protective subzone, except of the Hakalaoa Falls repair, which is in the limited subzone. Chapter 13-5, HRS allows use of protective and limited subzones of Conservation District land for public purpose uses, including "land uses undertaken by the State of Hawaii or the counties to fulfill a mandated governmental function, activity, or service for public benefit."

The repair and rehabilitation of the ditch system proposed by the Selected Plan between the Main Weir at Kukuihaele and Paauilo will be located on land designated Agricultural. The rehabilitation of the LHD system will support continued agricultural and related activities which are consistent with the project area's Agricultural District classification. (See Figure 16)

### **6.7.2 The Hawaii State Plan and State Agricultural Functional Plan**

The Hawaii State Plan, established by Chapter 226, HRS, provides goals, objectives, policies, and priorities to guide long-range development of the State of Hawaii. Twelve State Functional Plans develop in greater detail the policies and priorities in the twelve subject areas.

The 1991 State Agricultural Functional Plan states the following objectives, policies, and actions, which are directly supported by the implementation of the Selected Plan:

#### **OBJECTIVE H: ACHIEVEMENT OF PRODUCTIVE AGRICULTURAL USE OF LANDS MOST SUITABLE AND NEEDED FOR AGRICULTURE.**

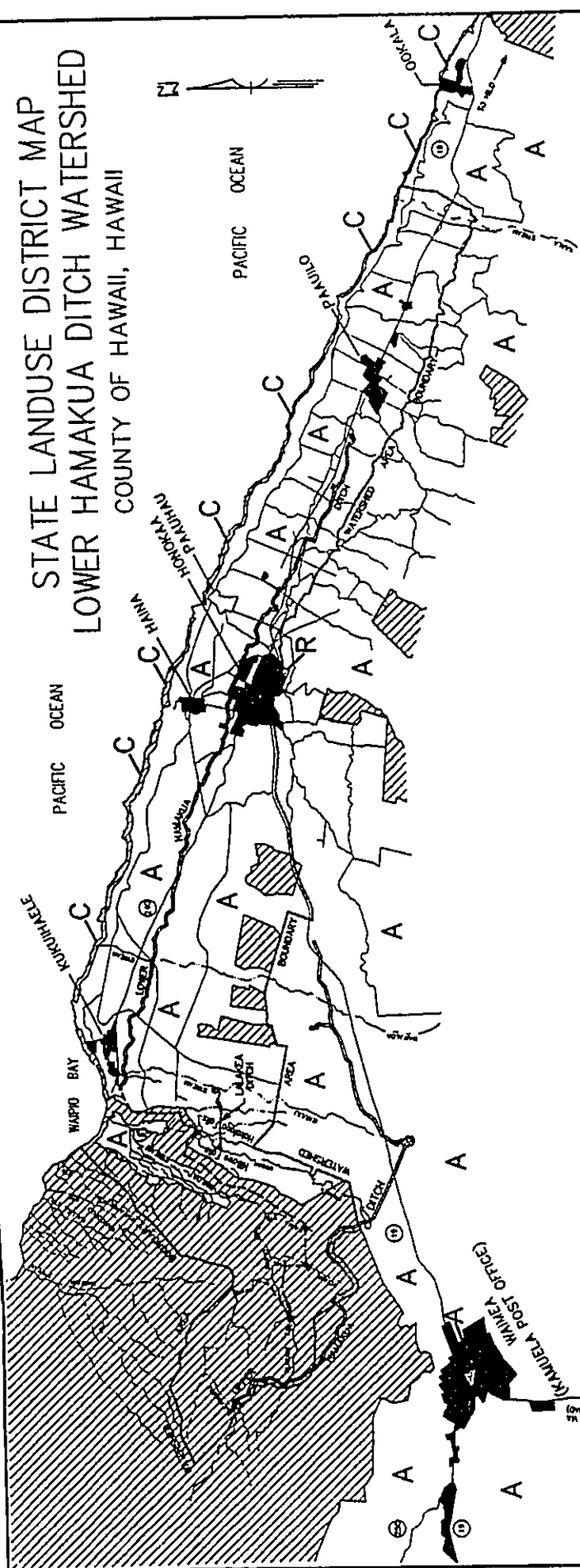
**POLICY H(1):** Provide suitable public lands at a reasonable cost and with long-term tenure for commercial agricultural purposes.

#### **OBJECTIVE I: ACHIEVEMENT OF EFFICIENT AND EQUITABLE PROVISION OF ADEQUATE WATER FOR AGRICULTURAL USE.**

**POLICY I(1):** Expand agricultural water resources statewide.

**ACTION I(1)(a):** Develop new, expanded, or improved water source and delivery systems in support of agriculture and aquaculture, as needed and economically feasible.

# STATE LANDUSE DISTRICT MAP LOWER HAMAKUA DITCH WATERSHED COUNTY OF HAWAII, HAWAII



**LEGEND**

- MAIN HIGHWAYS WITH NUMBER
- SECONDARY ROADS
- STREAMS
- CATCH FLOW LINES
- DITCHES/AQUEDUCTS/TUNNELS
- TUNNELS
- RESERVOIRS
- WATER SUPPLY INTAKES
- TOWN/SETTLEMENT (WITH NAME)
- LOWER HAMAKUA WATERSHED AREA BOUNDARY

**STATE LANDUSE DISTRICT KEY**

- OR A AGRICULTURAL LAND
- OR C CONSERVATION LAND
- OR R RURAL LAND
- OR U URBAN LAND

SOURCE:  
STATE OF HAWAII LAND USE COMMISSION  
RECENT BOUNDARY AMENDMENTS NOT SHOWN

PREPARED BY: USDA, NATURAL RESOURCES CONSERVATION SERVICE  
HAWAII STATE OFFICE, HONOLULU, HAWAII  
OCTOBER 1998  
Figure 16



### **6.7.3 Hawaii County General Plan**

The Hawaii County General Plan, 1989, outlines the goals, policies, and courses of action for the long-range comprehensive physical development of the county with respect to the most desirable use of land within the county. While the Plan was prepared before the closure of the sugar industry in Hamakua, the following items support the implementation of the Selected Plan.

#### ECONOMIC:

**POLICIES:** The County of Hawaii shall assist the expansion of the agriculture industry, especially diversified agriculture, through the protection of important agricultural lands, capital improvements and other programs, and continued cooperation with appropriate state and federal agencies.

#### LAND USE - AGRICULTURE:

**GOAL:** To identify, protect and maintain important agricultural lands on the Island of Hawaii.

**POLICIES:** The County shall assist in the development of basic resources such as water, roads, transportation and distribution facilities for the agricultural industry.

For the Hamakua District, the Plan states the following as courses of action:

#### ECONOMIC:

**Courses of Action:** The County shall assist the further development of diversified agriculture in Hamakua and continue to cooperate with other appropriate agencies to provide the necessary services to assist agriculture.

#### LAND USE - AGRICULTURE:

**Courses of Action:** Encourage large landowners in the district to make surplus important agricultural lands available for diversified agriculture. Assist in the further development of diversified agriculture in the district.

The County General Plan also provides the primary basis for direct control and guidance of public and private land resources through its landuse element. The County Zoning Code and the General Plan Land Use Pattern Allocation Guide Map are the tools to a well-balanced land use pattern capable of meeting future needs of the County. (See Figure 17) The predominantly agricultural landuse of the Hamakua area is demonstrated by the County Landuse Map.

### **6.7.4 Hawaii County Agriculture Development Plan**

In the early 1990s, Hawaii County recognized that their agricultural development was "at a crossroads, having evolved from large-scale sugarcane and ranching activities mixed with secondary smaller scale traditional crops such as coffee and taro, to a more diversified mix of macadamia nut orchards, extensive floral and foliage nursery acreage, bananas, papayas, ginger and other fruits and vegetables." An Agriculture Development Plan was completed in 1992 after an effort that

included considerable participation by the county's farming community. While the shutdown of Hamakua Sugar Company had not yet taken place, many participants were probably aware of the eventuality.

Agricultural water was one of the six categories identified as needing county attention. The first priority for action was the development of a comprehensive plan for agricultural water

#### **6.7.5 Hawaii County Water Use and Development Plan (WUDP)**

The Hawaii County WUDP is part of the Hawaii Water Plan required by the State Water Code (HRS Chapter 174C). The county-prepared plan includes an inventory of water sources, uses, and future water needs. The plan aids the CWRM and county planners in reviewing and granting approvals and permits for development and water use.

The most current update of the WUDP is the unadopted draft dated February 1992. The document was prepared before the collapse of the sugar industry in Hamakua and still includes plans for the now unlikely 3,800-acre Waipio Valley rim resort development. No discussion about the water need for post-sugarcane from the LHD is included, except for the 1.5 MGD from the LHD for the "Hamakua Agricultural Park", which is referred to as Paauilo West in this document.

#### **6.7.6 Hawaii County Code**

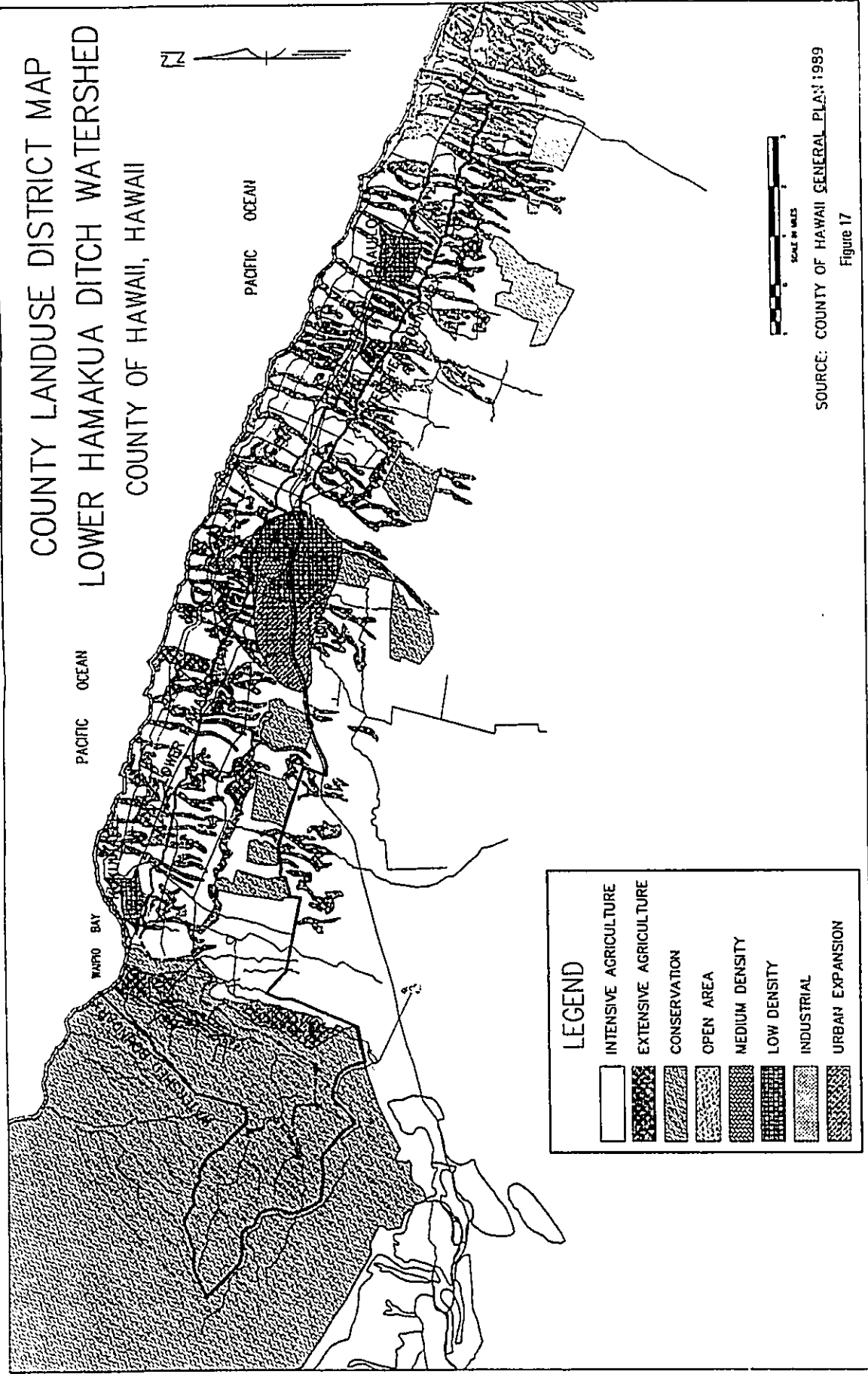
Implementation of the Selected Plan will be in conformance with ordinances contained in the Hawaii County Code (HCC). While the project will fall under the control of several of the chapters of the HCC, including Chapter 5 - Building Code, the primary areas of interaction will be Chapter 10 - Erosion and Sediment Control and Chapter 25 - Zoning Code.

All earthmoving work conducted as a part of the watershed project will be properly permitted and in compliance with HCC Chapter 10. On-farm agricultural activities by Hamakua or Mauna Kea SWCD cooperators may be exempted from the county grading ordinance by development of an SWCD-approved Conservation Plan as allowed by Chapter 10, Section 3(5) Exclusion for Agricultural Work.

The construction involved in repairing and rehabilitating the LHD, repairing or installing lateral distribution pipelines and devices, and construction of a storage reservoir are allowed on lands designated as Agricultural by the County Zoning Code. HCC Chapter 25, Sections 4-11(a) and © state that "communication, transmission, and power lines of public and private utilities and government agencies are permitted uses within any district" and that "public uses, structures and buildings and community buildings are permitted uses in any district."

The Hawaii County Planning Department and the Department of Public Works are the primary agencies responsible for implementing these mechanisms.

COUNTY LANDUSE DISTRICT MAP  
 LOWER HAMAKUA DITCH WATERSHED  
 COUNTY OF HAWAII, HAWAII



SOURCE: COUNTY OF HAWAII GENERAL PLAN 1989  
 Figure 17

### **6.7.7 Hilo-Hamakua Economic Development Plan**

With the closure of the last two sugar mill operations in the Hilo-Hamakua area in 1992 and 1994, and the associated loss of 1,200 jobs and idling of 43,500 acres of land formerly in sugarcane production, an effort was made by the State Department of Business, Economic Development, and Tourism to describe the physical and socio-economic characteristics of the region, facilitate the articulation of community-based visions and goals, evaluate economic activities against opportunities and constraints, and propose an action plan to achieve goals and realize the vision. The Hilo-Hamakua Economic Development Plan report was completed by the Hawaii Island Economic Development Board and issued in March 1994.

The report described the Hilo-Hamakua area as "endowed with rich soil, rainfall, and variable climatic conditions that are suitable for agricultural activities. Soils covering large sections of the study area have been rated 'Prime' and 'Other Important' by the State Department of Agriculture's 'Agricultural Lands of Importance to the State of Hawaii'."

The community vision for economic development of the study area included maintenance of the rural, family/community centered lifestyle; maintaining open space; and pursuing development in a slow, calculated manner.

Development and expansion of diversified agriculture are key to the Economic Development Plan. Some of the proposed activities to promote agricultural growth in the Plan have materialized and provide considerable support to diversified agricultural activities, including startup grants from the Department of Defense Hamakua Project, state-operated agricultural parks, and the HNHAC.

The Plan recognized the opportunity to utilize the LHD by stating, "one of the prime resources is the Hamakua Irrigation Ditch which provides 12 to 30 million gallons per day." Action Item 4 under the objective to "maintain strong and viable agriculture in the district" is "Restore Hamakua Ditch." The State Department of Agriculture is responsible for the acquisition and restoration of the LHD.

### **6.7.8 Hawaii Coastal Zone Management Program**

The Hawaii Coastal Zone Management (CZM) Program is charged to balance marine and coastal resources protection and sustainable economic development. The CZM area encompasses the entire state, including the LHD Watershed. The program is built upon seven policy areas: recreational resources, historic resources, scenic and open space resources, coastal ecosystems, economic uses, coastal hazards, and managing development.

The LHD Watershed project will have no effect on recreational resources or coastal hazards.

Planning of the LHD Watershed project has included historical and archaeological surveys of the affected area and has utilized a public participation process to discuss and raise awareness of resource development issues in the CZM area. The

watershed project will restore Hakalaoa Falls, an important scenic and cultural resource.

The partial restoration of streamflow to the Waipio Valley streams is expected to improve aquatic habitat for native species.

Implementation of the LHD Watershed project will improve agricultural conditions to maintain scenic and open space resources. The project will also result in fuller economic use of agriculturally-zoned lands in agricultural enterprise.

The completed Hawaii CZM Assessment Form and CZM Federal consistency determination are attached as Appendix C and was submitted to the State of Hawaii Department of Business, Economic Development and Tourism for review and approval.

#### **6.7.9 Special Management Area**

Special Management Areas (SMA) are shoreline areas designated by the county governments for more intensive management in conformance with HRS, Chapter 205A. All "developments" on the island of Hawaii within the SMA are required to obtain an SMA permit from the Hawaii County Planning Department.

The SMA boundary in the LHD watershed area extends inland 500 feet from the shoreline along the Hamakua coast and includes the entire Waipio Valley *with the SMA boundary located at the top of the Waipio Valley walls. SMA permits issued by the County Planning Department will be required for the Hakalaoa Falls repair; Kawainui, Alakehi, and Koiawe Streams intake modifications; and construction of the SCADA relay stations.*

#### **6.7.10 Ceded Lands Trust**

When the United States annexed Hawaii in 1898, approximately 1.75 million acres of Government and Crown Lands were ceded to the United States. The Joint Resolution of Congress at the time of annexation and the Organic Act establishing Hawaii as a Territory in 1900, affirmed the trust responsibility to use the ceded lands "for the benefit of the inhabitants of the territory." When Hawaii became a State in 1959, the ceded lands were transferred to the state government.

The state's primary responsibilities with regard to ceded lands are established in Section 5 of the Admissions Act. Section 5(f) of the act provides that these lands and the income and proceeds derived from them are to be held by the state as public trust. The eligible uses of ceded lands are:

1. Support of the public schools and other public educational institutions.
2. Betterment of the conditions of native Hawaiians as defined in the Hawaiian Homes Commission Act of 1920.
3. Development of farm and home ownership on as widespread a basis as possible.
4. Making of public improvements.
5. Provision of land for public use.

The state land parcels owned by the Department of Land and Natural Resources are ceded lands. The total acreage of the ceded lands within the Hamakua project area is 914 acres on 20 land parcels. Most of the ceded land is leased to ranchers and the HNHAC.

The Office of Hawaiian Affairs (OHA) has the institutional responsibility to ensure that the ceded lands are used for the purposes expressed in the Admissions Act. OHA reviews the leases of ceded land to other parties, including the lease of the land parcels in the LHD Watershed. Lease of the ceded lands to Hamakua area farmers and ranchers provides a public use of the land that returns market-based revenues to native Hawaiian programs.

#### **6.7.11 National Flood Insurance Program**

The National Flood Insurance Program (NFIP) is administered by the Federal Emergency Management Agency (FEMA). The NFIP was established by Congress in 1968 (and broadened and modified in 1973 and again in 1994) to reduce future flood damage through community floodplain management, and to provide protection to property owners against possible losses from flooding through an insurance mechanism.

Flood hazards and boundaries are identified and mapped by FEMA, producing Flood Insurance Rate Maps (FIRMs) and Flood Boundary and Floodway Maps (FBFMs). Special Flood Hazard Areas are included on these maps, and are defined as areas of land that have a 1-percent chance of being inundated by a flood in any given year (also referred to as the base or 100-year flood).

The FIRMs are on pages D-11 to D-16. Special Flood Hazard Areas mapped in the watershed include the following:

- Zone A Areas inundated by the 100-year flood, where base flood elevations have not been determined. Most of Waipio Valley is in this zone.
- Zone AE Areas inundated by the 100-year flood with a base flood elevation of 13 feet and 1,091 to 1,423 feet above mean sea level. The project area includes the 1,091- to 1,423- foot elevation in the Honokaa drainage area.
- Zone AH Areas inundated by the 100-year flood with a base flood elevation of 1,012 to 1,457 feet above mean sea level in the Honokaa drainage area.
- Zone VE Areas inundated by the 100-year coastal flood with velocity hazards and a base flood elevation of 16 to 27 feet above mean sea level. This includes several small areas along the coastline, including the mouth of Waipio Valley.

Other areas in the project area are as follows:

- Zone X Areas determined to be outside the 500-year floodplain. Most of the project area is in this zone.

Flooding occurs in Waipio Valley during heavy rainfall events. The average historical diversion of 30 MGD into the LHD represents less than one percent of the estimated peak flows for a two-percent chance storm event. The selected plan is not expected to affect flooding hazard in the watershed.

#### **6.7.12 State Water Code**

*The State Water Code, Chapter 174C, HRS, provides the basis of the state policy that all waters of the state are held for the benefit of its citizens. The State Water Code establishes the Commission on Water Resources Management with jurisdiction over implementation of the State Water Code with the exception of water quality matters. The State Water Code requires the declaration and certification of all water use from wells and streams. In addition to beneficial off-stream uses of water, including domestic, agricultural, and industrial uses, the State Water Code recognizes and protects instream uses of water, which include habitat maintenance, recreation, scenic value, and traditional and customary Hawaiian practices.*

*The CWRM can hold hearings and rule on disputes regarding water resources protection, water permits, constitutionally protected water interests, or where there is insufficient water to meet competing needs for water, whether or not the area involved has been designated as a Water Management Area or not. The area of the LHD Watershed is not designated a Water Management Area.*

#### **6.7.13 Permits and Compliance**

Installation of the Selected Plan will be performed in full compliance with applicable laws and policies of the County of Hawaii, State of Hawaii, and the federal government. *A list of permits and approvals that may be required for project implementation is found in Section 4.4.3 Permits and Compliance.*

##### **6.7.13.1 Compliance With Federal Environmental Laws**

Installation of the Selected Plan will be performed in full compliance with applicable federal environmental laws as designated by the Water Resource Council and as shown in Table Q.

#### **6.7.14 Waimea-Paauilo Watershed Project**

*The Waimea-Paauilo Watershed neighbors the LHD Watershed to the south. The Waimea-Paauilo Watershed is an effort by the DOA, the Department of Hawaiian Home Lands, and the Mauna Kea SWCD, assisted by NRCS, to increase agricultural water supply and reliability to farmers and ranchers in the Waimea plains. The project which is in its implementation phase, having completed planning and environmental review. The project will expand the existing DOA-operated Waimea Irrigation System with the construction of an additional 131-MG reservoir and supply pipeline and extend the agricultural water distribution system to farmers and ranchers in the Department of Hawaiian Home Lands Puukapu ranch and farm lots.*

*Interaction between the two projects may extend to sharing of administrative facilities and equipment. Maintenance duties for the two systems are expected to be separate. No water will be transferred between the two projects.*

**Table R**  
**COMPLIANCE WITH DESIGNATED FEDERAL ENVIRONMENTAL LAWS**  
**Lower Hamakua Ditch Watershed**

<b>Federal Law</b>	<b>Applicability</b>
Archeological and Historic Preservation Act, 16 U.S.C. 469, et seq.	Applicable
Clean Air Act, as amended, 42 U.S.C. 1857h-7, et seq.	Applicable
Clean Water Act (Federal Water Pollution Control Act), 33 U.S.C. 1251, et seq.	Applicable
Coastal Zone Management Act, 16 U.S.C. 1451, et seq.	Applicable
Endangered Species Act, 16 U.S.C. 1531, et seq.	Applicable
Fish and Wildlife Coordination Act, 16 U.S.C. 661, et seq.	Applicable
National Environmental Policy Act, 42 U.S.C. 4321, et seq.	Applicable
National Historic Preservation Act, 16 U.S.C. 470a, et seq.	Applicable
Watershed Protection and Flood Prevention Act, 16 U.S.C. 1001, et seq.	Applicable
Farmland Protection Policy Act, 7 U.S.C. 4201, et seq.	Applicable

**6.8 PROBABLE ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED**

The repair and rehabilitation of some LHD elements, particularly flumes, will require its reconstruction in new construction methods and materials. The need to assure reliability, at reasonable expense, requires the conversion of parts of the historic structure to modern construction. Mitigation will include retention of two exemplar flume structures in near original construction and materials. Photographic documentation of significant features of the LHD which will be modified by the project will also be conducted.

Air pollution and erosion and sedimentation may temporarily increase during repair and rehabilitation activities. Increased agricultural activity in the watershed as a result of the project may also increase air pollution and erosion and sedimentation. Air quality and erosion control plans developed for construction activity and farming will minimize those effects.



## 7. CONSULTATION AND PUBLIC PARTICIPATION

### 7.1 GENERAL

Consultation with other agencies and participation of the public with input and review were integral parts of all steps in the planning process.

Two planning periods have occurred for the LHD Watershed. The first planning period in 1995 involved an accelerated planning process and incorporated intensive public participation to identify community needs and concerns and to obtain agreement on and acceptance of the details of the Watershed Plan. The planning effort in 1995 resulted in a Watershed Plan and DEIS issued in August 1995. Critical review comments on the DEIS requesting additional and detailed information on the plan and effects on the environment prompted further studies and project reformulation. An additional problem concerning the failure to complete the separate Environmental Assessment required by the Hawaii Environmental Review Process in a timely fashion to allow concurrent federal and state review of the DEIS contributed to the decision not to pursue the Final EIS in 1995.

A number of technical studies were completed between 1995 and 1998. The second planning period occurred largely in 1998. The need and purpose for the project have remained unchanged from those expressed through the public participation process earlier. The 1998 consultation with agencies and groups reaffirmed the concerns identified in 1995 and led to discovery of additional concerns. This revised Watershed Plan-DEIS (1998 DEIS) for the LHD Watershed includes information requested during review of the earlier DEIS, discusses concerns recently brought to light, and is intended to supersede the 1995 Watershed Plan-DEIS.

### 7.2 1995 DEIS

An initial meeting to discuss the possibility of using LHD water to provide for diversified cropland, grazing, and other agricultural activities in the Honokaa-Paauilo area was held on December 21, 1994, in Honokaa. Various federal, state, and local agencies and organizations attended. The formal application for federal assistance was submitted by the State of Hawaii Department of Agriculture as sponsor on April 20, 1995. The Hamakua SWCD and Mauna Kea SWCD were also included as sponsors.

Preliminary planning was begun with a public meeting held on May 9, 1995, in Hilo to introduce NRCS planners and familiarize attendees with the PL83-566 program. Twenty-five persons attended.

A widely publicized public scoping meeting was held in Honokaa on May 16, 1995, to determine the significant resource concerns and planning alternatives that would be studied in detail during the planning process. Forty-eight persons attended.

NRCS planners met with several agencies and local groups in May 1995 to begin the consultation process and to obtain public inputs. The groups and agencies included U.S. Fish and Wildlife Service, State of Hawaii Division of Forestry and Wildlife, State of Hawaii State Historic Preservation Division, State of Hawaii Division of Aquatic Resources, Kamehameha Schools/Bishop Estate, HNHAC, Hawaii County Water Department, Waipio Taro Farmers Association, and several knowledgeable local individuals.

Preliminary planning indicated that an economically feasible and environmentally and socially acceptable project existed for the LHD Watershed. A request for planning authorization was submitted to NRCS national office on May 19, 1995, along with the Pre-authorization Planning Report (PAPR) and Plan of Work which included basic background data, preliminary alternative plans, and a description of the tasks and staff required to complete the project plan. The PAPR was sent to all interested federal, state, and local agencies and groups for their review and comments. Planning authorization was granted from NRCS National Headquarters on June 8, 1995 marking the transition from preliminary planning to Watershed Plan and EIS preparation

A formal Notice of Intent to Prepare an Environmental Impact Statement was published in the Federal Register on June 1, 1995. Interested agencies, groups, and individuals were invited to participate in the planning and scoping process.

A local steering committee was formed to assist NRCS planners during the 1995 phase of planning. Membership was open to all interests. The steering committee assisted in gaining input from the public, as well as providing a forum for consensus on planning goals, community shared values, and feedback on preliminary alternatives as they were developed. The steering committee met about twice monthly during the May to August 1995 period during which the 1995 version of the Watershed Plan-DEIS was prepared.

A public meeting was held in Honokaa on June 26, 1995, to present the alternatives and preliminary impacts for public comments and concerns. The three action alternatives that were presented were repair of the LHD, installation of a pipeline replacing the open ditch, and substitution of wells for the LHD. Thirty-seven persons attended. As a result of comments provided at the meeting, the steering committee asked that modifications be made to the alternative plans.

A public meeting was held in Honokaa on July 20, 1995, to present the modified alternatives and to gain consensus for the recommended plan. Thirty-three persons attended. Alternative 2, which proposed repair of the existing ditches and flumes, was selected by the attendees as the preferred alternative plan.

#### **7.2.1 1995 DEIS REVIEW**

In August 1995, the DEIS was circulated for a 45-day federal review and comment period. The Notice of Availability of the DEIS was published in the Federal Register on September 1, 1995. During the same period the an Environmental Assessment required for the Hawaii environmental review process was also reviewed.

The 1995 DEIS was sent to the following agencies, organizations, and individuals for review:

Federal

Department of Agriculture  
Office of Equal Opportunity  
Office of Advocacy and Enterprise  
Agricultural Stabilization and Conservation Service (now Farm Service Agency), Hawaii State Office  
Rural Development (formerly Farmer Home Administration), Hawaii State Office  
Forest Service, Pacific Southwest Region  
Department of the Army  
U.S. Army Corps of Engineers, Honolulu  
Department of Commerce  
National Oceanic and Atmospheric Administration, Ecology and Conservation Division  
National Marine Fisheries Service  
Department of Housing and Urban Development  
Community Planning and Development Division, Honolulu Office  
Department of the Interior  
Office of the Secretary  
Office of Environmental Policy and Compliance  
U.S. Fish and Wildlife Service, Pacific Islands Ecoregion  
U.S. Geological Survey, Hawaii Office  
National Parks Service, Pacific Area  
Environmental Protection Agency  
Office of Federal Activities, Region 9  
Department of Transportation  
Coast Guard  
Hawaii Delegates to the U.S. House of Representatives and Senate

State of Hawaii

Department of Accounting and General Services  
Department of Agriculture  
Board of Agriculture  
Department of Business and Economic Development and Tourism  
Energy Program  
Office of State Planning  
Department of Defense  
Department of Health  
Office of Environmental Quality Control  
Environmental Planning Office  
Department of Land and Natural Resources  
Board of DLNR, Chairperson and State Historic Preservation Officer  
State Historic Preservation Division  
Forestry and Wildlife Division

Division of Water and Land Development  
Division of Aquatic Resources  
Commission on Water Resources Management  
Hamakua Soil and Water Conservation District  
Mauna Kea Soil and Water Conservation District  
Department of Hawaiian Home Lands  
Department of Transportation  
Hawaii Housing Finance and Development Corporation  
Office of the Governor  
University of Hawaii  
Environmental Center  
Water Resources Research Center  
Hamilton Library  
UH Hilo Library  
Hawaii State Archives  
Department of Education  
Hawaii State Public Library System, Hawaii State Library  
Hawaii State Public Library System, Honokaa Library  
Hawaii State Public Library System, Thelma Parker (Waimea) Library  
Representative Dwight Takamine

County of Hawaii

Office of the Mayor  
Hawaii County Council  
Department of Public Works  
Planning Department  
Department of Water Supply  
Fire Department  
Department of Research and Development

Others

Groups:  
Advisory Council on Historic Preservation  
Audobon Society, Hawaii, President  
Conservation Council of Hawaii  
Hamakua-North Hilo Agricultural Cooperative  
Hawaii Sun Press  
Hawaii Tribune-Herald  
Hawaiian Historical Society  
Hawaii's Thousand Friends  
Honolulu Advertiser  
Honolulu Star-Bulletin  
Ka Lahui  
Kamehameha Schools/Bishop Estate  
Life of the Land  
National Wildlife Federation

Natural Resources Defense Council, Inc.  
Nature Conservancy, Hawaii  
Outdoor Circle, Hawaii  
Puu Ala, Inc.  
Sierra Club, Hawaii Chapter

**Individuals:**

Kuulei Badua  
Pearl Batalona  
Jim Cain  
Leonard Cardoza  
George Carvaitto  
Antonio Gomera  
Wally Johnson  
Nalei and Ku Kahakalau  
R. Kamakawiwoole  
Millie Kim  
John Loo  
Ben C. Mahilum  
Victor Miguel  
Christopher Rathbun  
Henry Ross  
Manuel Soares, Jr.  
James Thropp, Jr.  
Patricia Tummons  
Joan Veles  
Thomas Young  
William Yuen

**7.2.2 1995 DEIS Comment Letters**

Twenty-six letters commenting on the 1995 DEIS were received during the review period. In addition, four letters commenting on the Hawaii EIS/Preparation Notice were received by OEQC and forwarded to NRCS for reply. The commentators were:

Michael G. Buck, Administrator, State of Hawaii Division of Forestry and Wildlife  
Tamara Chow, Administrative Coordinator, The Nature Conservancy of Hawaii  
Roger S. Fujioka, Ph.D., Director, University of Hawaii Water Resources Research Center  
Patrick Gardner, Managing Attorney, Legal Aid Society of Hawaii  
Virginia Goldstein, Director, County of Hawaii Planning Department  
Kazu Hayashida, Director, State of Hawaii Department of Transportation

Don Hibbard, Administrator, State of Hawaii Historic Preservation Division

Ray H. Jyo, PE, Director, U.S. Army Engineer District, Honolulu

Clara L. Kakalia, Vice Chair, Ka Lahui Hawaii

Maurice H. Kaya, DBEDT, Energy Program Administrator

Robert K. Lindsey, Manager, Hawaii Island Region, KSBE

Shelley M. Mark, Senior Advisor to Director, State of Hawaii Land Use Commission

Gordon Matsuoka, State Public Works Engineer, Dept. of Accounting and General Services

Lawrence Miike, Director, State of Hawaii Department of Health

Patsy T. Mink, Member of Congress, Second District, Hawaii

Roy S. Oshiro, Director, State of Hawaii Housing Finance and Development Corp.

Milton D. Pavao, Manager, County of Hawaii Department of Water Supply

Roy C. Price, Sr., Vice Director, State of Hawaii Department of Defense

Christopher Rathbun

Henry A. Ross

Manabu Tagomori, Manager-Chief Engineer, State of Hawaii Division of Water and Land Development

William R. Taylor, Director, Office of Environmental Policy and Compliance, U.S. Dept. of the Interior

Deanna Wieman, Director, U.S. Environmental Protection Agency, Region IX, Office of External Affairs

Donna S. Wieting, Acting Director, U.S. Department of Commerce Ecology and Conservation Office

Michael D. Wilson, Director, State of Hawaii Department of Land and Natural Resources

Steven K. Yamashiro, Mayor, County of Hawaii

Comment letters on the Hawaii EIS/Preparation Notice were received from:

Carol Wilcox

Gary Gill, Director, State of Hawaii Office of Environmental Quality Control

John T. Harrison, Environmental Coordinator, University of Hawaii Environmental Center

Patricia Tummons

A consolidated discussion of the comments received during the 1995 review of the Hawaii EIS/Preparation Notice and the federal DEIS were mailed to commentors.

This section contains the consolidated discussion of comments extracted from letters received during the 1995 review of the Hawaii EIS/Preparation Notice and the federal DEIS and responses to those comments.

#### Agricultural Issues

**Comment:** Given the generally wet climate of the region, is irrigation cost-effective or even necessary?

**Response:** Although the project area, between Kukuihaele and Paauilo, receives between 60 and 85 inches of annual precipitation, supplemental irrigation is necessary during the pronounced dry season which typically lasts from May to October. Extended droughts have been experienced in the Hamakua area when trade wind flow is disrupted by global climatic variation. Well-drained soils and high evaporation rates in the project area also diminish the effectiveness of rainfall to meet all the agricultural need. The economic analysis shows that the implementation of the agricultural water project will be cost effective with the derived benefits exceeding installation and operating costs. Rainfall, evaporation, and irrigation benefits are discussed in Section 5 - PROJECT SETTING, subsections Climate and Land Use.

**Comment:** Is the project area truly suitable for agriculture? Concerns include: climate; relatively low level of solar radiation; soil mineralogy; erodibility of land.

**Response:** A cropland suitability study was completed recently for approximately 13,500 acres makai of LHD from Waipio Valley to Paauilo (Maptech, 1997). The area was assessed for suitability for six crop types: banana, coffee, macadamia nut, papaya, cut foliage, and truck crops. Land was assessed as good, fair, or poor based on each crop's optimal growing conditions in relation to several soil and site factors including potential erosion rate, equipment trafficability, soil depth, drainage, soil acidity, soil nutrient availability, rainfall, evapotranspiration, temperature, and topography. The crop suitability study showed that irrigation would allow a substantial number of acres to be upgraded from fair suitability to good suitability, or from poor suitability to fair suitability, with irrigation for each crop type. Approximately 7,000 acres of the study area were rated good or fair for tree crops and approximately 2,000 acres were rated good or fair for flowers and truck crops. Soil fertility analysis showed that most areas will require calcium and magnesium fertilization.

Slopes in the area ranged from 0 to 35 percent. Honokaa series soils with slopes exceeding 20 percent and Kukaiau and Paauhau series soils with slopes exceeding 12 percent are classified as highly

erodible. Such areas will require intensive land management operations to prevent erosion and to maintain water quality.

Accelerated land treatment assistance will be provided for a four year period to design and implement water and other natural resource conservation practices. Project area agricultural suitability is discussed in Section 5 - PROJECT SETTING, subsections Climate, Soils, and Land Use.

#### Environmental Concerns

**Comment:** What is the impact on native stream animals? Support contention that fish and wildlife resources will benefit from stream restoration. How may the LHD suppress stream populations? Identify critical fisheries' habitat, impacts, and mitigation measures. Discuss potential of the project to impact aquatic habitat—siltation, turbidity, O<sub>2</sub>, temperature.

**Response:** NRCS agrees that the operation of the LHD and the amounts of water diverted for sugar production could have had adverse effects to the streams and aquatic biota, including suppression of native populations. In the 1996 aquatic survey, low numbers of species and populations of o'opu were found immediately below the intakes. No o'opu were found above the intakes.

While the working assumption is that increased streamflow to the Waipio Valley streams will improve stream habitat and result in greater populations of native aquatic species, no firm evidence assuring the outcome is available. Investigation linking stream health to streamflow rates in Waipio Valley are scheduled to be conducted by others, including the State Division of Aquatic Resources.

The development of a Waipio streamflow management prescription that meets the needs of all the parties that are affected or are interested will be pursued through the establishment of an advisory group to the LHD agricultural water system. The responsibility of the advisory group will be expanded to include the Waipio Valley issues. An "adaptive management" approach will be used allowing management of the agricultural water system, diversion rates, and streamflow in Waipio Valley to be adjusted as measurement and monitoring provide better information.

Stream habitats and project effects are described in Section 6.3 ENVIRONMENTAL EFFECTS under the subheadings: Aquatic Habitat / Natural Stream Flows, Wildlife, and Threatened and Endangered Species.



**Comment:** Discuss impacts of modified intakes and their function which will continue to dry out the downstream reach during peak demand periods.

**Response:** Reconstruction of the intakes so they are adjustable or modified to release a portion of the baseflow are planned project measures. Kawainui Stream intake will be provided with a remotely controlled gate while the Alakahi and Koiawe Stream intakes will provide two to three MGD baseflow release. Presently, seepage from groundwater sources and through the diversion structure maintains continuous flow below the Alakahi and Koiawe intakes. Kawainui Stream, without appreciable seepage from groundwater below the diversion, does not flow for several hundred feet below the diversion when the intake grates and sand trap are not clogged.

The present condition for Alakahi and Koiawe Streams during low flow periods will not be changed significantly with project modifications. Streamflow in excess of baseflow will remain in the streams. The variable gate at Kawainui Stream, the largest of the Waipio Valley tributaries, will be used to regulate the amount of diverted water to meet the agricultural water need in the Hamakua project area. It will be during the dry season, when streamflow is at its baseflow that the most water will be needed by the Hamakua users. It is anticipated that nearly the entire baseflow of Kawainui Stream, except for a release of one MGD, will be diverted for several days to several weeks during two years in a ten year period.

**Comment:** Design intakes to release planktonic larvae to flow downstream.

**Response:** The entrapment of o'opu larvae in the ditch system does not appear to be a significant issue as there were no populations of o'opu observed upstream of the diversions to produce larvae and due to the prevailing theory that o'opu downstream migration is triggered by freshets when high flows in the streams easily overflow the intakes.

**Comment:** Describe impacts from changes in land use resulting from project. Disturbance of plant and wildlife resources on abandoned cane land. Effects of increased use of chemical and pesticide usage on farms.

**Response:** The effect of project implementation will be to increase the conversion of abandoned sugarcane fields, which are generally tending toward a community of guineagrass and ironwood trees, to irrigated cropland and pasture. The wildlife habitat offered by the abandoned sugarcane lands have been characterized as poor and lacking species diversity. Much of the wildlife habitat that exists in Hamakua is found in the gulch areas which were not utilized for sugar production and which will generally remain intact with implementation of this project.

The increased potential for agricultural chemical and soil runoff will be addressed and managed through state permitting and implementation of SWCD-approved conservation plans for each operation.

**Comment:** Discuss potential effects to surface and groundwater quality. Include section on hydromodification as a cause of non-point source pollution and mitigation measures.

**Response:** The LHD watershed is located over three Aquifer Systems as defined by the State Water Resources Protection Plan -- 80102 (Waimanu), 80201 (Honokaa), and (80202) Paauilo. Atrazine compounds and Hexazinone, contained in herbicides used by the sugar industry, have been detected in five wells in or near the project area. Concentration levels are well below applicable drinking water standards. Elevated salinity concerns due to higher pumping rates exist in the Hamakua area. The increase in agricultural activity poses the risk of agricultural chemicals and nutrients leaching to the groundwater supply. Technical assistance provided by the project will ensure that pesticides and fertilizers will be properly applied according to NRCS practice standards for nutrient and pesticide management.

The Selected Plan will decrease the amount of surface water transferred from Waipio Valley to the Hamakua area. The additional streamflow during nondrought periods will generally improve water quality in the Waipio Valley streams. Water temperature will remain cooler with the higher streamflow. There will be greater dilution of contaminants in the effluent from the taro lo'i.

Discussions of these issues are included in Section 6.3 ENVIRONMENTAL EFFECTS. Subsections are included on Surface and Groundwater Quality and Quantity.

**Comment:** Discuss monitoring programs to be implemented.

**Response:** The project will provide monitoring of both flow in the LHD agricultural water system at numerous points within the system and flow in the Waipio Valley stream system. Measurement of flow within the LHD system will be operated by the system management and will continue throughout the life of the project. Measurement of flow in the Waipio Valley systems will be conducted by the partnership to develop a water management prescription in Waipio Valley. NRCS will fund up to \$25,000 per year for a four-year period to assist with the monitoring effort.

**Comment:** Ecology of Threatened and Endangered species.

**Response:** There are four endangered animal species and seven plant species of concern to the U.S. Fish and Wildlife Service which occur within the project boundaries. Endangered animals include: 'Io, Hawaiian hawk

(Buteo solitarius); 'Alae ke'oke'o, Hawaiian coot (Fulica alai); Koloa maoli, Hawaiian duck (Anus wyvilliana); and 'Ope'ape'a, Hawaiian hoary bat (Lasiurus cinereus semotus).

Threatened and endangered plants that might be found in the area include Phyllostegia floribunda, Pritchardia lanigera, Lobelia hypoleuca, Phyllostegia vestia, Clermontia waimeae, Clermontia calphylla, Cyanea grimesiana ssp. cylindrocalyx, Tetraplasandra oahuensis, and diplazium molokaiense.

No effect to threatened and endangered species is expected by implementation of any of the alternatives. The informal consultation conducted with the U.S. Fish and Wildlife Service indicated that three bird and one bat species that are listed as endangered have been observed within the boundaries of the LHD watershed area. The endangered Hawaiian hawk, Hawaiian duck, and the Hawaiian hoary bat are wide ranging species that will not normally be adversely affected by specific construction activities. Modification of the Kawainui Stream intake, near which the Hawaiian duck was once observed may cause a short term disturbance. Hawaiian coots have been known to use portions of reservoirs. Lining of the Paauilo reservoir may cause a short term disturbance during construction. Additional reservoirs, including the project-funded one-MG Honokaia reservoir will create additional open water surface area for the Hawaiian coot.

#### Economic Concerns

**Comment:** What is the marketing strategy for and expected viability of agricultural production in Hamakua? Will the state be subsidizing and supporting agriculture as it did sugar?

**Response:** The economic benefits of this project were estimated based on the differences in farm net returns as determined by comparing the forecasted condition with the project to the forecasted future without the project. Average annual benefits were estimated by calculating a composite net return for the identified crops and comparing it to the composite net return for the without condition. A summary of the economic evaluation, risk and uncertainty, and marketing strategy for agricultural production in Hamakua is presented in Appendix B: Investigation and Analysis.

From review of secondary reports, interviews with producers in other locations and the input of the steering committee, a potential increase in demand for fresh vegetables is anticipated from the growth of the population, gains in per capital consumption, growth in tourism, as well as expanding Pacific Rim markets. The relative lack of insect and disease problems in the watershed is also a comparative advantage to the foliage and papaya growers.

The potential crops that could be grown in the project area could be marketed competitively with or without state agricultural supports and subsidies.

#### Benefits to the Community

Comment: Address the civil rights of Native Hawaiian, historical and potential future infringement upon those rights and their priority rights to water.

Response: While no special emphasis has been given by the project to benefit native Hawaiians, native Hawaiians receive a substantial share of the benefits provided by the project. Several native Hawaiians operate farms and ranches in the Hamakua benefit area. Most of the native Hawaiians are not members of the HNHAC and operate larger enterprises. The project recognizes the cultural importance of taro cultivation in Waipio Valley and supports the Waipio Taro Farmers Association desire to manage their water supply and auwai system through the valley. Many of the members of the WTFA are native Hawaiian. Consultation for project effects on cultural resources has included an evaluation of Hawaiian archaeology and contacts with native Hawaiian groups. The land in the LHD watershed owned by the State of Hawaii prior to the closure of the Hamakua Sugar Company are ceded lands.

Comment: The Plan/EIS should determine how many former Hamakua Sugar Plantation workers will be available for the newly created jobs by the time the project is completed.

Response: The Selected Plan will meet the community objective of creating jobs and revitalizing the economy by providing additional job opportunities in agriculture and a more stable tax base. The number of jobs created by the project can only be estimated. The HNHAC, alone, has 130 members with over one-half receiving land leases. Additional employment as farm workers or in secondary processing or support industries will develop as larger operations enter the project area after the water situation is settled.

#### Waipio Valley Concerns

Comment: Need careful review of risks posed to Waipio Valley residents. Waipio Valley residents see restoration of Hakalaoa Falls and restoration of minimum flow as essential components of an acceptable plan. Operating assumption appears to be that LHD is first priority and what is left over is given to Waipio Valley. During peak demand, will LHD take all water? Does project prevent full reemergence of taro growing in Waipio Valley?

Response: Restoration of Hakalaoa Falls is a top priority of the Selected Plan. Flow in streams of Waipio Valley will be increased over current levels as a result of Plan implementation. The Waipio Valley taro farmers will provide input in the management of the agricultural water system and stream release rates into Waipio Valley through participation in the advisory board to the LHD agricultural water system. Many of the commercial taro farmers believe that sufficient water flows through Waipio Valley with the LHD diversions in operation to double taro cultivation in the valley. They feel that the lack of the unified management authority over the auwai system creates the current water problems. The project will extend accelerated technical assistance to Waipio Valley farmers for soil and water conservation and management.

#### Historical/Cultural Concerns

Comment: It has been determined that the LHD meets the criteria for nomination to the National Register of Historic Places. The implications of this should be discussed.

Response: The State Historic Preservation Division has been consulted on the archaeological and historical resources that may exist in the LHD watershed. A Memorandum of Agreement has been developed and will be submitted to the National Advisory Council on Historic Preservation for review and concurrence. The MOA provides for the preservation of two wooden flume sections in original construction and materials. Additional photographic and descriptive recordation of other unique or exemplary flume features and avoidance of components constructed of cut stone masonry are also included in the MOA.

Comment: Discuss the historic value of Waipio Valley.

Response: While this project does not propose any work on the systems in Waipio Valley, except for the modifications made to intake structures, the cultural significance of taro cultivation and the auwai system is recognized. Components of the auwai system can probably be traced to early native Hawaiian taro cultivation centuries earlier. The project will provide technical and land treatment assistance to taro growers.

#### Water Budget

Comment: More detail on future crop water requirements needed. The 2,500 acreage projection seems arbitrary. Address issue of potential conflicts over water during drought.

Response: The 1995 buildout estimate of 2,500 acres of intensive irrigated cropland was developed during several consensus planning sessions held with the Steering Committee and reaffirmed at a following public

meeting. The Steering Committee included federal, state, county, and local personnel with vast amounts of experience and knowledge of past, present, and potential future conditions within the local area. Potential factors such as farmer interest, market shifts, land and water rights availability, and general economic conditions could significantly raise or lower this figure.

A separate analysis of potential build-out acreage conducted in 1998 through discussions with farmers, landowners, farm groups, and government agencies and using a cropland suitability study reaffirmed the 2,500 acre estimate. The 2,500 acres represents a combined best estimate of what reasonably can be expected to develop in the near future with the installation of this project. A discussion of projected farming activity is included in Section 2.1.3.1 Projection of Future Farming Activity and Acreage.

The estimated irrigation water need is based on crop consumptive use factors, monthly rainfall, and monthly evaporation for various frequencies of annual rainfall. This information addresses issues such as low flow periods and peak use frequency and duration. The discussion of agricultural water need in Hamakua is included in Section 2.1.3.2 Project Water Needs.

**Comment:** Water might be needed for a forestry nursery operation.

**Response:** A tree nursery operation is compatible with the purposes of this project and could be one of the recipients of project water. There are currently no forestry operations in the project area.

#### Project Development Issues

**Comment:** Who decides how important a concern is?

**Response:** The Consultation and Public Participation section the Plan/EIS details the sponsors and scoping process used throughout the planning of the project. Concerns expressed at meetings, submitted in writing, or other forms of communication were analyzed for content by NRCS planners. Initial determinations of significance made by NRCS planners were reviewed by the steering committee. All interested agencies, groups, and individuals were afforded the opportunity to attend public meetings, be members of the steering committee, or send written comments and concerns to NRCS or the sponsors.

**Comment:** Broader range of alternatives to enhance/restore stream ecosystem in Waipio Valley should be explored.

**Response:** The primary problem identified in the watershed area remains the uncertainty of agricultural water supply in the Hamakua area. The data to support different levels of stream ecosystem enhancement are

not available. As the information is developed through further study and measurement and monitoring, adjustments agreed upon by the advisory committee amount can be made.

**Comment:** Alternative of ditch dismantlement should be considered.

**Response:** In essence, the effects of dismantling the ditch are addressed by Alternatives 1 and 2. In the presentation of Alternative 1, where no project action would be taken, the importance of agriculture to the community and the resultant irrigation needs are discussed. It was concluded, based on extensive discussions among project area members and state agencies, that the state would likely continue to maintain the ditch in a "band-aid" manner. Continued uncertainty as to the availability of dependable cropland irrigation supply in the area would likely prevent further agricultural pursuits and the economic and social benefits they are expected to provide. If the maintenance funding were to end before the execution of an agreement conveying the operations rights for the LHD from KSBE to DOA, KSBE would be responsible for any infrastructure that would be dismantled.

Alternative 2, pumping of agricultural water from wells, would accommodate both the agricultural needs for water and allow for dismantling of the LHD. This alternative was rejected because of the higher costs for both installation and annual operation.

#### Plan Proposal Specifications

**Comment:** Pass base flows and take only surplus flows, reduce water demand to that consistent with surplus flow withdrawal.

**Response:** The Selected Plan accomplishes the community's objectives and maximizes economic benefits. It also would provide, on the average, 22 million gallons a day more flow in the natural streams than has occurred during the last 85 years of sugarcane production and restores Hakalaoa Falls. We believe this plan maximizes economic benefits and provides positive social and environmental benefits while meeting community objectives. The project needs to collect some of the base flow of the streams in order to attain the needed economic benefits. Without diversion of some of the baseflow, the LHD will cease to provide agricultural water during dry periods when the agricultural water is most needed.

**Comment:** Suggest construction of reservoir storage in Hamakua.

**Response:** Additional storage along the ditch was studied, but rejected because of the high cost incurred for each million gallons of water stored.

Comment: Explain better the cost breakdown for local costs, especially OM&R and land treatment.

Response: Local cost-share responsibilities are to be worked out by the local sponsors after the project agreement is signed. Costs shown in Plan/EIS are estimates only. OM&R and real property rights acquisition is a local sponsor responsibility for PL83-566 projects. Land treatment cost-sharing for on-farm practices are normally the responsibility of the landowner or operator.

The cost allocation is discussed in Section 4.3 COSTS, 4.4 INSTALLATION AND FINANCING and 4.5 OPERATION, MAINTENANCE, AND REPLACEMENT. Operation, Maintenance, and Replacement costs are discussed in Section 3.3 OM&R

Comment: Access to diversions may be difficult or impossible due to poor condition of trails.

Response: Access to the diversions will be by helicopter and on foot during construction of the modifications and improvements. For routine operation and maintenance, access will most likely be by foot. Maintenance of the trails to the diversions will be ongoing and is considered a OM&R activity.

Comment: Include flood hazard discussion.

Response: The Selected Plan will have no effect on flooding in the Hamakua project area and no significant effect on flooding in Waipio Valley. This is discussed in the Section 6.3 ENVIRONMENTAL EFFECTS - Flooding.

#### Rights and Ownership Issues

Comment: Indicate ownership/title of ditch itself and water rights. What is the status of the Hawaiian Irrigation Co.? What are Native Hawaiian priority rights of water? How will construction and maintenance crews obtain Right of Access to LHD? Suggest a process be used to address water allocation issue.

Response: The need for resolution of land and water rights issues before implementation of Plan is noted. Until the collapse of the sugar industry, the owner of the ditch system improvements was the Hawaiian Irrigation Company, Ltd (HIC). Since that time, however, the corporation has been inactive. HIC was involuntarily dissolved on November 16, 1998 by the State Department of Commerce and Consumer Affairs due to inactivity.

Access along the entire length of the LHD and to the intake structures is required before any project funds can be spent. It appears that many of the Rights of Way have expired over the years and we have been unable to find out if any or all of these have been renewed. The right



to access can be in the form of permanent easements on rights-of-way or it can be temporary easements which last at least as long as the 25 year life of the project.

Obtaining landrights, including access, is the responsibility of the project sponsors. Some of the methods available to them are negotiated long-term easement, purchase, and eminent domain.

The sponsors' responsibilities are stated in the Plan/EIS in Section 4.4 INSTALLATION AND FINANCING, subsections Responsibilities and Real Property Acquisition and Relocations.

Relationship to Other Plan, Policies, Controls

**Comment:** Discuss compliance with state water quality management plan. Project should be coordinated with County Water Use and Development Plan.

**Response:** The Hawaii County Water Use and Development Plan (WUDP) is part of the Hawaii Water Plan required by the State Water Code (HRS Chapter 174C). The most current update of the WUDP is the unadopted draft dated February 1992. The document was prepared before the collapse of the sugar industry in Hamakua and still includes plans for the 3,800-acre Waipio Valley rim resort development. No discussion about the water need for post-sugarcane from the LHD is included.

The project sponsor is the Hawaii Department of Agriculture. All project planning has been fully coordinated with the State of Hawaii to ensure protection of water quality and maintenance of beneficial uses. All construction activities must comply with State of Hawaii permit requirements and meet local and state water quality management plans and approved water quality standards. The County of Hawaii was represented on the Steering Committee and at public meetings. We have worked with the Planning Department of the County to determine how this project would affect the County's Special Management Area.

Compliance with the Hawaii County Water Use and Development Plan is discussed in Section 6.7 RELATIONSHIP TO OTHER PLANS, POLICIES, AND CONTROLS.

**Comment:** Discuss relationship to General Plan, etc., especially Special Management Area.

**Response:** The County's Special Management Area is a strip of land extending 500 feet inland from the edge of the ocean, extending the length of the LHD Watershed area. The Waipio Valley bottom is included in the Special Management Area. All structural repairs to the LHD would be well out of this Special Management Area.

As cropland comes into greater utilization, there is a slight possibility that chemical and fertilizer waste products could contaminate either the groundwater aquifer or areas of the ocean close to shore. We are mitigating this slight possibility by facilitating improvements in irrigation water management and prevention of floods and soil erosion with related sediment movement. Accelerated land treatment assistance will be provided by the addition of a conservation planner in the NRCS Hilo or Kamuela Field Office. Approximately 13 producers per year will receive financial assistance to install enduring conservation practices that are included in their conservation plans.

Further, the Hamakua SWCD and the NRCS, through the Hilo and Kamuela Field Offices provide assistance to Hamakua area and Waipio Valley farmers and others to design and implement water and other natural resource conservation practices. Several federal financial assistance programs are available to cost-share installation of some practices. The primary USDA program available to area producers is the Environmental Quality Incentives Program (EQIP) for design and cost sharing of such practices as discussed above. Total sediment delivery to streams and near shore coastal areas will be substantially less than during past years of sugarcane production.

**Comment:** Coastal Zone Management consistency determination needed.

**Response:** A Coastal Zone Management consistency determination has been prepared and submitted to the Office of Planning for their review and approval. The Hawaii Coastal Zone Management (CZM) Program is charged to balance marine and coastal resources protection and sustainable economic development. The CZM area encompasses the entire state, including the LHD Watershed. The program is built upon seven policy areas: recreational resources, historic resources, scenic and open space resources, coastal ecosystems, economic uses, coastal hazards, and managing development.

The LHD Watershed project will have no effect on recreational resources or coastal hazards. Planning of the LHD Watershed project has included historic and archaeological surveys of the affected area and has utilized a public participation process to discuss and raise awareness of resource development issues in the CZM area. Implementation of the LHD Watershed project will improve agricultural conditions to maintain scenic and open space resources. The project will also result in fuller economic use of agriculturally-zoned lands in agricultural enterprise. Restoration of greater flow to Waipio Valley streams is expected to have a positive effect on the stream ecosystems.

This information is in Section 6.7 RELATIONSHIP TO OTHER PLANS, POLICIES, AND CONTROLS.

Comment: Discuss compliance with the federal antidegradation policy for the Clean Water Act.

Response: This project conforms to the objectives and policies of the Clean Water Act. Project implementation will result in the improvement of aquatic habitat in Waipio Valley.

Comment: Discuss compliance with EO 12898 Environmental Justice requirement.

Response: The civil rights of the minority and low income populations have been considered throughout planning of this project and will be during its implementation. Native Hawaiian concerns have been represented at all public meetings as have representatives from the Waipio Valley. During the scoping process, the following concerns were identified as important to formulation and evaluation of acceptable project alternatives: cultural and historic resources, water rights and legal issues, social effects, traditional uses of water, Waipio Valley taro production, and Hiilawe Falls.

#### Permits/Regulations

Comment: Interaction with streamflow may require instream flow standard amendment.

Response: The need for an instream flow standard amendment is listed in Section 4.4.3 - INSTALLATION AND FINANCING: Permits and Compliance.

#### Document Format

Comment: Use CEQ-suggested EIS format.

Response: The Plan/EIS has been reformatted to comply with the recommendations of both the Federal CEQ regulations and the State of Hawaii Environmental Impact Statement format, as well as the USDA's National Watershed Manual.

Comment: Summarize references and document conclusions.

Response: The vast majority of the sources cited in the Plan/EIS are public planning documents that are readily available upon request to the responsible agency or in public libraries. All the reference material is on file at the NRCS state office in Honolulu, and can be inspected in person or copies requested.

#### **7.2.3 1995 DEIS Public Meeting**

A public meeting was held in Honokaa on December 14, 1995, to describe the Recommended Plan, discuss comments and concerns expressed during the review period, and identify the actions that will be taken before the issuance of a Final EIS. Approximately 50 people attended the meeting.

The major issues raised at the meeting included the uncertainty over water rights, potential windfall benefits to KSBE, unsubstantiated projection of commercial agricultural activity in Hamakua, inadequate discussion of effects to Waipio Valley stream communities, and the requirement to follow the state EIS review procedure. All the major issues will be addressed in the Final EIS (FEIS). The DOA will negotiate an agreement with KSBE to acquire water rights and to prevent KSBE appropriation of the project improvements. More detail will be provided regarding agricultural activity projections. The additional studies to be completed included cultural and archeological survey, botanical survey, and aquatic survey of Waipio Valley streams.

Since 1995, planning activity has been directed toward addressing those concerns raised earlier during the 1995 scoping process, those formulated by the steering committee, and raised during the federal DEIS review. Consultations with those groups and agencies with interest in specific concerns have been conducted. New concerns have been raised through these consultations and have been addressed in the current DEIS. New concerns which have surfaced include the discovery of a previously undescribed species of skating fly above the LHD intake on Alakahi Stream, questions about potentially significant wetland resources created by leakage from the flumes along the LHD, and the need by the Waipio Taro Farmers Association for Wailoa River flow regulation provided by the LHD intakes. The two issues brought before the CWRM—the restoration of Hakalaoa Falls and the complaint on the waste of water diverted from Waipio Valley streams along the LHD—have involved discussion of the watershed project at public and agency meetings.

### **7.3 1998 DEIS**

The following agencies, organizations, and individuals were consulted from 1996 to 1998 in preparation of the revised 1998 DEIS:

#### Federal

- U.S. Fish and Wildlife Service
- U.S. Environmental Protection Agency

#### State

- Department of Land and Natural Resources
  - Division of Aquatic Resources
  - State Historic Protection Division
  - Forestry and Wildlife Division
  - Commission on Water Resources Management
  - Land Division
- Department of Agriculture
- Department of Health
  - Clean Air Branch
  - Safe Drinking Water Branch
  - Office of Environmental Quality Control
- Department of Business, Economic Development and Tourism

Office of Planning  
State Representative Dwight Takamine

County of Hawaii

Department of Research and Economic Development  
Planning Department  
Department of Water Supply  
Councilperson Dominic Yagong

Others

Groups:  
Waipio Valley Community Association  
Waipio Taro Farmers Association  
Dynatek, Inc.  
Earthjustice Legal Defense Fund  
Hamakua-North Hilo Agricultural Cooperative  
Hamakua Farm Bureau  
Hamakua District Development Council  
Hamakua Soil and Water Conservation District  
Puu Ala, Inc.  
Queen Liliuokalani Children's Trust  
Mauna Kea Soil and Water Conservation District  
Enserch Corporation  
Bishop Museum  
ITC Water Management

Individuals:  
Jerome Akasaki  
Ernest Alfonso  
Paul Arakawa  
Greg Mooers  
Robert Shioji  
Burt Smith  
Mililani Trask  
Merrill Toledo

**7.3.1 1998 DEIS Review**

The revised 1998 DEIS was made available for public review and comment for a 45-day period December 1998 to February 1999. The comment period commenced with the publication of the Notice of Availability for this DEIS in the Federal Register and the Environmental Notice for the federal and state review processes, respectively. The availability of the DEIS was publicized in state and local publications and copies were widely distributed to governmental agencies, organizations, and interested individuals. The DEIS was sent to the following agencies, organizations and individuals for a concurrent NEPA and Hawaii State review.

Federal

Department of Agriculture  
Farm Service Agency, Hawaii State Office  
Forest Service, Pacific Southwest Region  
Office of Advocacy and Enterprise  
Office of Equal Opportunity  
Rural Development, Hawaii State Office  
Department of the Army  
U.S. Army Corps of Engineers, Honolulu  
U.S. Army Directorate of Facilities Engineer  
Department of Commerce  
National Oceanic and Atmospheric Administration, Ecology and  
Conservation Division  
Department of Housing and Urban Development  
Community Planning and Development Division, Honolulu Office  
Department of the Interior  
Office of the Secretary  
Office of Environmental Policy and Compliance  
U.S. Fish and Wildlife Service, Pacific Islands Ecoregion  
U.S. Geological Survey, Hawaii Office  
Department of Navy  
Naval Base, Pearl Harbor (2)  
Department of Transportation  
Coast Guard  
Environmental Protection Agency  
Office of Federal Activities, Region 9  
Pacific Islands Contact Office  
Hawaii Delegates to the U.S. House of Representatives and Senate  
Senator Daniel K. Inouye, U. S. Senate  
Senator Daniel K. Akaka  
Representative Patsy T. Mink, U.S. House of Representatives  
Natural Resources Conservation Service

State of Hawaii

Department of Accounting and General Services  
Department of Agriculture (5)  
Board of Agriculture  
Department of Business and Economic Development and Tourism  
Energy Program  
Office of State Planning  
DBEDT Library  
Land Use Commission  
Department of Defense  
Department of Education  
Hawaii State Public Library System, Hawaii State Library  
Hawaii State Public Library System, Honokaa Library

Hawaii State Public Library System, Thelma Parker (Waimea) Library  
 Department of Hawaiian Home Lands  
 Department of Health (5)  
     Office of Environmental Quality Control (5)  
 Department of Land and Natural Resources (3)  
     Board of DLNR, Chairperson and State Historic Preservation Officer  
     State Historic Preservation Division  
     Forestry and Wildlife Division  
     Division of Water and Land Development  
     Commission on Water Resources Management  
     Division of Aquatic Resources  
     Hamakua Soil and Water Conservation District  
     Mauna Kea Soil and Water Conservation District  
 Department of Transportation (3)  
 Hawaii Housing Finance and Development Corporation  
 Hawaii State Archives  
 Office of the Governor  
 Representative Dwight Takamine  
 University of Hawaii  
     Environmental Center (4)  
     Water Resources Research Center  
     Hamilton Library  
     UH Hilo Library

County of Hawaii

Office of the Mayor  
 Councilperson Dominic Yagong  
 Department of Parks and Recreation  
 Department of Public Works  
 Department of Research and Development  
 Department of Water Supply  
 Planning Department

Libraries

Legislative Reference Bureau  
 Kaimuki Regional Library  
 Kaneohe Regional Library  
 Pearl City Regional Library  
 Hilo Regional Library  
 Wailuku Regional Library  
 Kauai Regional Library  
 Bond Memorial (Kohala) Library

Others

Groups:

Advisory Council on Historic Preservation  
American Lung Association  
Audobon Society, Hawaii, President  
Bishop Museum  
Conservation Council of Hawaii  
Earthjustice Legal Defense Fund  
Enserch Corporation  
Hamakua Farm Bureau  
Hamakua District Development Council  
Hamakua-North Hilo Agricultural Cooperative  
Hawaii Sun Press  
Hawaii Tribune-Herald  
Hawaiian Electric Company  
Hawaiian Historical Society  
Hawaii's Thousand Friends  
Honolulu Advertiser  
Honolulu Star-Bulletin  
ITC Water Management  
Ka Lahui  
Kamehameha Schools/Bishop Estate  
Life of the Land  
National Wildlife Federation  
Natural Resources Defense Council, Inc.  
Nature Conservancy, Hawaii  
Office of Hawaiian Affairs  
Outdoor Circle, Hawaii  
Puu Ala, Inc.  
Queen Liliuokalani Children's Trust  
Sierra Club, Hawaii Chapter  
Waipio Valley Community Association  
Waipio Taro Farmers Association  
West Hawaii Today (Kona)

Individuals:

Jerome Akasaki  
Ernest Alfonso  
Paul Arakawa  
Kuulei Badua  
Pearl Batalona  
Jim Cain  
Leonard Cardozon  
George Carvaitto  
Antonio Gomera  
Wally Johnson  
Nalei and Ku  
Kahakalau  
R. Kamakawiwoole  
Millie Kim  
John Loo  
Ben C. Mahilum  
Victor Miguel  
Greg Mooers  
Christopher Rathbun  
Henry Ross  
Burt Smith  
Manuel Soares, Jr.  
James Thropp, Jr.  
Merrill Toledo  
Mililani Trask  
Patricia Tummons  
Joan Veles  
Carol Wilcox  
Thomas Young



### 7.3.2 1998 DEIS Comment Letters

Thirty-three letters commenting on the 1998 DEIS were received during or immediately following the review period.

*Jo-Anna Nakata, State Executive Director, USDA Farm Service Agency*  
*Esther Ueda, Executive Officer, Land Use Commission, DBEDT*  
*Galen M. Kuba, Division Chief, Department of Public Works, Hawaii County*  
*Leon A. Thevenin*  
*Paul Mizue, Chief, Civil Works Branch, U.S. Army Corps of Engineers*  
*Kazu Hayashida, Director, Hawaii Department of Transportation*  
*William Meyer, District Chief, U.S. Geological Survey*  
*Gordon Matsuoka, Public Works Administrator, Department of Accounting and General Services*  
*Donald K.W. Lau, Executive Director, Housing and Community Development Corporation, DBEDT*  
*Jody Allione, Sr. Project Development Manager, Ecogen Hawaii L.P.*  
*Howard O. Wright, Technology for Earth*  
*Andrew M. Monden, Chief Engineer, Land Division, DLNR*  
*Patricia Sanderson Port, Regional Environmental Director, U.S. Department of the Interior*  
*Don Hibbard, Administrator, Historic Preservation Division, DLNR*  
*C.K. Yokota, Regional Environmental Director, Naval Base Pearl Harbor*  
*James P.D. Thropp, Jr.*  
*Ray Soon, Chairman, Hawaiian Homes Commission Hawaii's Thousand Friends*  
*Jerome Akasaki, Akasaki Farms/Kalopa Kai Orchids*  
*Lawrence Miller, Vice President, Waipo Valley Community Association*  
*Timothy Johns, Chairperson, Board of Land and Natural Resources*  
*Christopher Rathbun*  
*Ed Sakoda, Acting Deputy Director, Commission on Water Resources Management*  
*Manabu Tagomori, Water Resources Manager, Kamehameha Schools Bishop Estate*  
*Yoshito Takamine, President, Hamakua County Farm Bureau*  
*Diane S. Quitiquit, Director, Department of Research and Development, Hawaii County*  
*Henry Curtis, Executive Director, Life of the Land*  
*Bruce Anderson, Director of Health, Department of Health*  
*Marjorie Ziegler, Earthjustice Legal Defense Fund*  
*David J. Farrel, Chief, Federal Activities Office, EPA, Region IX*  
*Colin Kippen, Deputy Administrator, Office of Hawaiian Affairs*  
*John T. Harrison, Environmental Coordinator, Environmental Center*  
*Morgan F. Toledo, President Waipio Taro Growers Association*

*All written comments received during the review were provided written responses. Both comment and response letters are included in Appendix A of this document.*

### **7.3.3 1998 DEIS Public Meeting**

*A well-publicized public meeting was held in Honokaa on January 11, 1999 at which the Selected Plan and its effects were discussed. Approximately 50 persons attended the meeting. Below is the body of the meeting summary which was sent to each of the attendees.*

*QUESTIONS, COMMENTS, AND RESPONSES  
from the Public Meeting for the  
Lower Hamakua Ditch Watershed  
Watershed Plan and Draft Environmental Impact Statement  
January 11, 1999, 7 PM, Honokaa School Cafetorium*

*Question: Who will continue to maintain the ditch until implementation of the project begins?*

*Response: The State Department of Agriculture (DOA) has been providing a minimum level of maintenance to keep the water flowing since the bankruptcy of Hamakua Sugar Company since 1995. The DOA will continue to provide maintenance of the ditch under the temporary authority until an irrigation district is formed and the watershed project is implemented.*

*Question: What about fire protection and other multiple uses of the water?*

*Response: Once the irrigation district is formed administrative rules governing the system's management will be developed. Fire fighting supply and other water uses will be considered at that time. The community will have an opportunity for input during the period when the irrigation system is established and rules developed.*

*Question: How will the project keep the ditch clean? Use of closed pipeline is suggested avoid the cleanout maintenance..*

*Response: The project will provide a one-time clean out of the sediment from the ditch. The maintenance crew from the irrigation district will provide sediment removal for the remainder of the project life. While use of pipeline will reduce the sediment problem, the costs were judged to be higher than the benefits of reduced maintenance.*

*Question: Will landowners along the ditch lose their access to the water?*

*Response: Under management by the irrigation district, all water provided from the LHD will be measured and a water delivery fee assessed to the user.*

*Question: What lands will be provided water and what is the acreage of irrigated cropland serviced by the project?*

*Response: The area that will be served by the Lower Hamakua Ditch Watershed project will be cropland and ranches located between the LHD and the ocean from Kukuihaele to Paauilo. The area is a mixture of State, Bishop Estate, and other privately-owned land. About 600 acres of irrigated cropland presently exists in the area.*

*Through discussions with farmers, landowners (including Bishop Estate), and representatives from government agencies and other organizations and with results of a cropland suitability study conducted for this project, an estimate of future farming activity was made and is found on pages 10-13 in the DEIS.*

*Approximately 2,500 acres of mostly irrigated tree crops, such as coffee, macadamia nut, and fruit trees, are projected to be developed if a stable source of irrigation water is provided. While the cropland is spread throughout the 13 evaluation areas, the highest concentration of cropland, acre for acre, will be in the State and non-Bishop Estate parcels. All of the State lands leased through the Hamakua-North Hilo Agricultural Cooperative are included.*

*The 2,500-acre estimate of irrigated cropland includes those areas that are being actively irrigated. This will exclude fallowed fields, roads, and building sites.*

*Question: Who will control and manage the Lower Hamakua Ditch water system.*

*Response: The DOA will establish an irrigation district like those at Waimea, Hoolehua on Molokai, and Waimanalo on Oahu using the authority of Chapters 167 and 168, Hawaii Revised Statutes. Public notification and hearings will accompany the establishment of the irrigation district. The DOA will provide a management and maintenance staff for the water system. A community-based advisory board, which includes members from the user community, Waipio Valley groups, and public agencies, will also be organized to provide input into the management of the water system. Such an advisory board exists for the Molokai Irrigation System.*

*Question: Once the 2,500 acres of irrigated cropland are established using the maximum supply of 17 MGD, how will additional requests for water be handled. In particular, how will a request by Bishop Estate, who owns 6,000 acres in the project area, be handled?*

*Response: The 2,500 acres of irrigated cropland is an estimate only. Many factors beyond the control of the project sponsors, such as Bishop*

*Estate lease terms and world coffee or kava prices, will determine the number of acres developed for irrigated agriculture. Agricultural lessees of Bishop Estate land will be able to apply for agricultural water service like any other farmer.*

*While it is estimated that 17 MGD will be needed during prolonged droughts to serve 2,500 acres, the true number of acres that the irrigation district can serve will not be known until it is in operation and the actual mix of crops and farm locations is established. It is thought that with more tree crops at slightly higher elevations than estimated, the number of irrigated acres increases considerably. Periodic drought will still occur which may require water conservation restrictions as with all irrigation districts.*

*Through experience gained by operation of the system, the management of the water system will be able to identify the point at which no additional acreage can be irrigated without harm to existing users of the system. At that time management decisions will be made either to expand the source capacity of the system through increased diversion or development of wells or to limit new users to the water system.*

*Question: Does Bishop Estate have a water reserve on the system?*

*Response: No. Bishop Estate has stated that they, themselves, do not have a need for agricultural water. Their agricultural lessees will have the opportunity to apply for water from the irrigation district without any special preference.*

*Comment: People should be concerned about too much water in Waipio Valley rather than not enough. (Former plantation supervisor)*

*Question: Where are the 2,500 acres of cropland addressed in the DEIS and does it include Bishop Estate land?*

*Response: As stated above, except for 600 acres of existing cropland, the remaining acres are presumed, based on discussions with farmers, landowners, and others and cropland suitability evaluation. Generalized acreage estimates for 13 subareas is included in the DEIS. Approximately 1/3 of the 2,500 acres is expected to be on Bishop Estate land leased to independent farmers and ranchers. Bishop Estate owns nearly two-thirds of the land in the 11,000-acre project area. A more detailed breakdown of the areas and acreage is found on pages 12 and 13 of the DEIS.*

*Comment: Don't throw excess water back into Waipio Valley. The project shouldn't worry about acres. The use of water by Hamakua farmers should not be restricted. (Waipio Valley taro farmer)*

*Comment: What authority does the DOA have to control the water system? The water should be left alone and reverted to King Kamehameha's rules.*

*Question: How were the 2,500 acres identified as suitable for irrigation in the DEIS determined?*

*Response: As stated earlier, farmers, landowners, and others were interviewed about the possibilities for expansion if water were not available and if a stable water source was available. There was considerable interest in expansion if water and land were available at affordable rates. Larger farmers, such as the present owners of most of the property around the Haina Mill, are sitting on the sideline until the water issue is settled.*

*The difficulty in farming these Hamakua lands was evaluated in a cropland suitability study for nearly 13,500 acres conducted for this project. The study analyzed soil type, slope, rainfall, rockiness, microtopography, temperature, and soil fertility for banana, coffee, macadamia nut, papaya, cut foliage and flowers, and truck crops. Suitability of cropland was rated good, fair, or poor for unirrigated and irrigated conditions. Generally, nearly one-half of the project area was found to be poor for tree crops and over three-quarters of the project area was poor for foliage, flower, and truck crops even when irrigated. Most of the suitable cropland was in the fair category requiring higher cultivation effort. Most of the better cropland was found to be toward the Paauilo side of the project area. The cropland suitability study can be reviewed at the NRCS State Office in Honolulu and at the NRCS Hilo Field Office.*

*Estimates of the acreage of cropland to be developed in 13 subareas was made by evaluating the interview data through the filter of the cropland suitability study.*

*Question: What is Bishop Museum's position on the project?*

*Response: Bishop Museum is the major landowner of the Waipio Valley floor and has provided leases to taro growers. NRCS met with their management staff with responsibility for the Waipio Valley properties. They are aware of the project and its implications to streamflow in Waipio Valley. While no formal position has been received from the Bishop Museum, its representatives appear to support the project objectives. The project will extend increased*

*technical and financial assistance to Waipio Valley taro farmers for natural resource conservation and protection.*

*Question: Will there be interruptions in flow while repairs and modifications?*

*Response: Effort will be taken to minimize the disruption to farmers and ranchers during repair of the Lower Hamakua Ditch. While repair and modification of many of the flumes will require the shutdown of water in the flume, alternatives such as piped bypass of the repair work, providing additional water storage, utilizing wells, and scheduling repairs during low water use, will be considered.*

*Question: What is the government's goal in the system. Who will share in the water from the system? Will Bishop Estate take over the system? Give the community a chance to participate even if not at the irrigation district hearings.*

*Response: The federal objective in the LHD system is to assist the state and local communities to take advantage of an opportunity where the benefits will exceed the costs. The state objectives include providing agricultural opportunities to former sugar industry workers, maintaining agricultural activity in a agriculturally oriented area, and providing stable and affordable water supply to area farmers and ranchers. In order to provide the latter the state will establish a state-operated irrigation district. As the irrigation district will need to be financially self-supporting, revenue from water tolls will be considered.*

*As long as independent farmers and ranchers operating on state and non-Bishop Estate lands continue to need the LHD system it is inconceivable that Bishop Estate will be able to take control of the system. The initial hearings during the organization of the irrigation district and continued opportunity for input to the system management through a community-based advisory committee will allow the community to express their needs and desires for the system.*

*Question: What is the difference between "personal gain" and "public good?"*

*Response: The objective of the project is to further "public good" or public benefit. As such, the rules by which the irrigation system will operate will favor widespread use of the water (i.e., many users) rather than water supply to a few users. It will also favor agricultural producers over other consumptive uses such as landscaping and hobby farming. When the system is used or*

*constructed to service only a single person or entity who does not derive profit, pay taxes, or create job opportunities, that is "personal gain."*

*Question: How can the project claim \$3,000 per acre benefit when the no action alternative assumes the ditch will continue to function? The no action alternative should reflect failure and loss of the LHD.*

*Response: Alternative 1, the no action alternative, assumes that the LHD will be continued to be kept in operation through a shoestring budget, as it has been for the past four years. The project contends that the uncertainty of long-term water supply and the frequent shutdowns will prevent the investment in an additional 1,900 acres of irrigated cropland to take place in Hamakua. Most of the economic benefit of the project is based on the expansion of agriculture in Hamakua. A much smaller part of the total benefit is derived from the reduction in crop damage due to water stoppages.*

*The assumption that the ditch would continue to operate was formulated in 1998 after interviews with farmers and agency representatives. In 1995 there was considerable doubt whether former sugar industry workers could or would enter into commercial farming. A no action alternative assuming the loss of the LHD was formulated at that time. During the three years between the 1995 planning effort and the present, farming activity has become firmly established, especially on the state-owned parcels. Other farmers on private land have also become dependent on LHD water delivery. The DOA commitment is based on availability of funding to install major improvements and will be contingent on the establishment of an irrigation district to derive water toll revenue to operate.*

*Comment: "Let's not kill the EIS." The water can be shared between the Waipio Valley and Hamakua communities. We've gone too far already to stop. We need to get on with the EIS.*

*Question: Could an alternative which is a combination of three of the alternatives be formulated? It could include use of pipelines and wells.*

*Comment: While the three structural alternatives were generally "stand-alone", using one technology or another, there is nothing keeping the irrigation district from incorporating wells or pipelines into the system once the selected alternative is implemented. As shown by the alternatives comparison, however, it is more costly to develop well water supply or to convert from open ditch to pipeline.*

*The DOA controlled well in the Hamakua Ag Park will be incorporated into the LHD system as a backup source. Additional wells may be considered if the LHD system supply is exceeded by the demand.*

*Question: Will project implementation reduce the size of the ditch?*

*Response: Those parts of the ditch that are repaired or modified, mostly flumes, will be sized to accommodate the projected maximum flow, which is 17 MGD at the beginning of the open ditch. The main reason for reducing size of the elements of the LHD is economic. The present capacity of the ditch is about 30 MGD. Some existing ditch elements have capacities exceeding 40 MGD.*

*Question: Will the state acquire land around the ditch from landowners? Will there be a road along the entire ditch? Will trees be cut down?*

*Response: The state will acquire easements on which the ditch lies and rights-of-way for access and maintenance. The state may use a variety of land transfer methods such as term easements, rights-of-way, and title purchase. The existing maintenance roads will be kept in place. There are relatively inaccessible locations where installation of a maintenance road is not considered.*

*A livestock exclusion fence will be installed along reaches running through pasture. Tree roots and trees, mostly ironwood, will be cut back to reduce water loss and further cracking of the concrete ditch lining.*

*Question: Will Enserch receive LHD water? The display on page 108 of the DEIS shows Enserch receiving water.*

*Response: Enserch has recently indicated that no LHD water will be needed for their power cogeneration plant. The display on page 108 of the DEIS and other references to Enserch use of water from the LHD system will be corrected.*

*Question: Does the project include domestic water supplied by the LHD?*

*Response: An emergency domestic water supply to Honokaa of approximately 150,000 gallons per day is included in the project. Due to stringent EPA requirements for drinking water, the LHD will be used only as a last resort for domestic water supply.*

*Question: What is the status of the Hiilawe Falls restoration?*



*Response: The repair of the tunnel behind Hakalaoa Falls to allow restoration of the twin falls at Hiilawe is the first priority for the project. The DOA has a current appropriation of \$1 million, part of which can be used to fund the repair. Federal matching funds will become available once the EIS is finalized and the implementation of the plan is authorized by the NRCS administration.*

*The DOA will be preparing a request for proposals to conduct geologic investigation of the by-pass tunnel site. The intention is to meet the Commission on Water Resources deadline of December 1, 1999 for the restoration of Hakalaoa Falls.*

*Question: What is the status of the acquisition of landrights for the project.*

*Response: There are approximately 23 landowners, including Bishop Estate, through whose properties the ditch passes. Although contact has been made with most of the owners, acquisition of the landrights will occur after the EIS is accepted and the Watershed Agreement is signed*

*A separate agreement with Bishop Estate for transfer of control of the ditch has been negotiated and will be signed presently.*

*Question: Why is Waipio Valley water use not quantified and displayed in the EIS? Did NRCS check with the Commission on Water Resources Management (CWRM) for record of water use in Waipio Valley?*

*Response: Beyond estimates of the amount of water flowing into Waipio Valley under normal and dry conditions, it is difficult to quantify the amount of water used by taro growers or needed for the aquatic ecosystem. The CWRM, taro farmers, and the State Division of Aquatic Resources (DAR) were consulted to develop such numbers, without success. While the CWRM has a record of water use declarations made by water users in the valley in 1988-1989, the declarations are incomplete and do not provide quantification of the water used in Waipio Valley.*

*According to numerous statements, including a statement from the Waipio Valley Taro Farmers Association, there is no record of water shortage in the valley for taro cultivation.*

*A component of the watershed project is to provide a total of \$100,000 toward streamflow measurement which will assist the Waipio Valley community and DAR to identify the amounts of water needed for the different purposes in Waipio Valley.*

**Question:** *What was the method used to determine water demand for the various crops? Why was the water demand for the crops averaged?*

**Response:** *A monthly crop consumptive use analysis was conducted to determine the gross irrigation requirement per acre for each of six crops - banana, coffee, papaya, macadamia nut, foliage and cut flowers, and truck crops. A crop water budget was developed for each month which basically included rainfall, crop consumptive use factor, pan evaporation rate, and irrigation efficiency. A statistical analysis was used to estimate the design drought period rainfall based on existing rainfall records for the area. A more detailed description of the analysis is found on pages B-4 and B-5 in the DEIS.*

*The water requirements for the six crops were averaged because there is no certainty about the acreage mix of the future cropping. Use of a composite crop is a standard evaluation technique when dealing with diversified agriculture. Currently, it appears that coffee may be a dominant crop type. Below is a table showing the peak daily water requirement for the six crops compared to the averaged value for the reference crop.*

*PEAK DAILY WATER REQUIREMENT (Gallons/Day/Acre)*

	<i>Below 500' elev.</i>	<i>Above 500' elev.</i>
<i>Banana</i>	<i>6,733</i>	<i>5,467</i>
<i>Coffee</i>	<i>5,167</i>	<i>4,067</i>
<i>Papaya</i>	<i>5,167</i>	<i>4,067</i>
<i>Macadamia nut</i>	<i>4,367</i>	<i>3,367</i>
<i>Foliage and cut flowers</i>	<i>5,933</i>	<i>4,767</i>
<i>Truck crops</i>	<i>4,367</i>	<i>3,367</i>
<i>Reference crop (averaged)</i>	<i>5,300</i>	<i>4,200</i>

**Question:** *Does the cost of the exclusion fencing include fencing off the reservoirs?*

**Response:** *The cost of fencing those reservoirs adjacent to the open ditch, mostly silt ponds for lateral systems, is included in the cost. Fencing of reservoirs off of the ditch are not included in the cost and will be later considered, either as part of the project or as an*

*operational cost for the irrigation district, if livestock entry is deemed a problem.*

#### **7.4 Final EIS**

All comments were considered, and modifications, as required, to the revised DEIS were made to produce this Final EIS.

Notices of availability of the FEIS will appear in both the Environmental Notice and Federal Register. A copy will be sent to each individual, agency, or group providing substantive comments on the 1998 DEIS. Copies will be mailed to agencies and organizations on the Hawaii Environmental Process recipient list.

*After issuance of the FEIS, separate state and federal processes must be completed before project implementation can begin.* Following the acceptance of the FEIS by the Governor of the State of Hawaii, there will be a 30-day no action period during which objections to the project may be brought to the Hawaii Circuit Court. For the federal process, a 30-day no action period following the publication of the Notice of Availability in the Federal Register will be observed after which a Record of Decision (to proceed with project implementation) can be issued by the NRCS. The availability of the Record of Decision will be widely published and will be sent to recipients of the FEIS.

NRCS will use this Watershed Plan-FEIS to request funds for the federal share of the installation cost of the Selected Plan. The Sponsors will be responsible for obtaining the necessary local funding from the state legislature or other sources. It is anticipated that funding will be requested in increments as installation proceeds. The Sponsors have acquired appropriations of \$1,000,000 in Act 116, SLH 1998 for implementation of the initial phase of the Selected Plan. Further implementation of the Selected Plan will depend on the availability of both federal and local funding.

## 8. PLAN PREPARERS

Table R lists names and qualifications of NRCS staff who worked on the Watershed Plan-EIS.

**Table S: Plan Preparers and Their Qualifications**

Name	Current Title (years in position)	Previous Experience (years)	Education / Degrees	Other Qualific'n
<b>NRCS Hawaii</b>				
Gail H. Ichikawa	Economist (13)	Planner (2)	BS - Agriculture	
Gary Kam	Dist. Conservationist -Kamuela (16)	Soil Conservationist (7)	BS - Soil Science	
Carol Kawachi	Cultural Resources Specialist (3)	Archeologist (9)	BA - Education MA - Anthropology MA - Education	
Georgiann Kealoha-Jose	Soil Cons. Tech. (6)		AS - General Ag.	
Terrell Kelley	Biologist (3)	Ecologist (3) Env. Protection Spec. (3) Env. Planner (5)	BA - Political Science MS - Env. Science	Wetlands Trainer Cert.
Dudley Kubo	Planning Engineer (12)	Civil Engineer (2)	BA - History MA - History BS - Civil Eng'g.	PE - HI <sup>1/</sup>
Wayne Subica	Dist. Conservationist - Hilo (8)	Soil Conservationist (7) Soil Cons. Tech. (19)	BS - Agriculture	
<b>Other</b>				
Wayne Killgore	Asst. State Con. - AZ (3)	Water Res. Spec. (7) Asst. State Con. (5) Planning Staff Leader (3) RC&D Staff Leader (3) Ag. Economist (10)	BA - Economics MBA - Bus. Admin.	
Kenneth Krug	Wildlife Biologist (11) Environmental Coord. (6)	Environmental Spec. (4) RBWS Biologist (9) Soil Conservationist (2.5) Soil Cons. Tech. (2.5)	BS - Biology	
Joseph Sahlfield	Engineer (3)	Agricultural Engineer (4) Civil Engineer (3) Planning Engineer (6) Design Engineer (6) Hydraulic Engineer (6)	BS - Agricultural Engineering	PE - OR LS - OR <sup>2/</sup>
William White	Agricultural Econ. (8)	Agricultural Econ. (8)	BA - Liberal Arts MS - Nat. Res. Econ. Ph.D. - Ag./Nat. Res. Economics	

<sup>1/</sup> Professional Engineer - state

<sup>2/</sup> Land Surveyor - state

## 9. REFERENCES

Cordy, R., State of Hawaii, Department of Land and Natural Resources, Historic Preservation Division (1994). A Regional Synthesis of Hamakua District, Island of Hawaii.

County of Hawaii (November 1989). The General Plan—Hawaii County.

County of Hawaii, Department of Research and Development (July 1992). The County of Hawaii Agriculture Development Plan.

County of Hawaii, Department of Research and Development (March 1995). Data Book 1994.

*Cowardin, L.M.; U.S. Department of the Interior, Fish and Wildlife Service (USFWS) (1979). Classification of Wetlands and Deepwater Habitats of the United States.*

Ekern, P.C. and Chang, J., University of Hawaii at Manoa, Water Resources Research Center for State of Hawaii, Department of Land and Natural Resources, Division of Water and Land Development (August 1985). Pan Evaporation: State of Hawaii, 1894-1983, Report R74.

Englund, R. and Filbert, R. for U.S. Department of Agriculture, Natural Resources Conservation Service (January 1997). Native and Exotic Stream Organisms Study in the Kawainui, Alakahi, Koiawe, and Lalakea Streams, Lower Hamakua Ditch Watershed Project, County of Hawaii. USDA-NRCS Contract No. 53-9251-6-275.

*Englund, Ronald and Preston, David for U.S. Department of Agriculture, Natural Resources Conservation Service (February 1999). Biological Assessment of the Lower Hamakua Ditch on the Hawaiian Stream Fly (Sigmatineurum meaohi) and Other Aquatic Insects.*

Giambelluca, T.W., Nullet, M.A., Ridgely, M.A., Eyre, P.R., Moncur, J.E.T., and Price, S., State of Hawaii, Department of Land and Natural Resources, Commission on Water Resource Management (December 1991). Drought in Hawaii.

Haraguchi, P. and Giambelluca, T., Pacific Weather, Inc. for State of Hawaii, Department of Land and Natural Resources, Division of Water and Land Development (May 1982). Drought Report - South Kohala-Hamakua, Island of Hawaii, March - November 1981, Circular C89.

# CORRECTION

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

## 8. PLAN PREPARERS

Table R lists names and qualifications of NRCS staff who worked on the Watershed Plan-EIS.

Table S: Plan Preparers and Their Qualifications

Name	Current Title (years in position)	Previous Experience (years)	Education / Degrees	Other Qualific'n
<b>NRCS Hawaii</b>				
Gail H. Ichikawa	Economist (13)	Planner (2)	BS - Agriculture	
Gary Kam	Dist. Conservationist -Kamuela (16)	Soil Conservationist (7)	BS - Soil Science	
Carol Kawachi	Cultural Resources Specialist (3)	Archeologist (9)	BA - Education MA - Anthropology MA - Education	
Georgiann Kealoha-Jose	Soil Cons. Tech. (6)		AS - General Ag.	
Terrell Kelley	Biologist (3)	Ecologist (3) Env. Protection Spec. (3) Env. Planner (5)	BA - Political Science MS - Env. Science	Wetlands Trainer Cert.
Dudley Kubo	Planning Engineer (12)	Civil Engineer (2)	BA - History MA - History BS - Civil Eng'g.	PE - HI <sup>17</sup>
Wayne Subica	Dist. Conservationist -Hilo (8)	Soil Conservationist (7) Soil Cons. Tech. (19)	BS - Agriculture	
<b>Other</b>				
Wayne Killgore	Asst. State Con. - AZ (3)	Water Res. Spec. (7) Asst. State Con. (5) Planning Staff Leader (3) RC&D Staff Leader (3) Ag. Economist (10)	BA - Economics MBA - Bus. Admin.	
Kenneth Krug	Wildlife Biologist (11) Environmental Coord. (6)	Environmental Spec. (4) RBWS Biologist (9) Soil Conservationist (2.5) Soil Cons. Tech. (2.5)	BS - Biology	
Joseph Sahlfield	Engineer (3)	Agricultural Engineer (4) Civil Engineer (3) Planning Engineer (6) Design Engineer (6) Hydraulic Engineer (6)	BS - Agricultural Engineering	PE - OR LS - OR <sup>21</sup>
William White	Agricultural Econ. (8)	Agricultural Econ. (8)	BA - Liberal Arts MS - Nat. Res. Econ. Ph.D. - Ag./Nat. Res. Economics	

<sup>17</sup> Professional Engineer - state

<sup>21</sup> Land Surveyor - state

1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60  
61  
62  
63  
64  
65  
66  
67  
68  
69  
70  
71  
72  
73  
74  
75  
76  
77  
78  
79  
80  
81  
82  
83  
84  
85  
86  
87  
88  
89  
90  
91  
92  
93  
94  
95  
96  
97  
98  
99  
100



## 9. REFERENCES

- Cordy, R., State of Hawaii, Department of Land and Natural Resources, Historic Preservation Division (1994). A Regional Synthesis of Hamakua District, Island of Hawaii.
- County of Hawaii (November 1989). The General Plan—Hawaii County.
- County of Hawaii, Department of Research and Development (July 1992). The County of Hawaii Agriculture Development Plan.
- County of Hawaii, Department of Research and Development (March 1995). Data Book 1994.
- Cowardin, L.M.; U.S. Department of the Interior, Fish and Wildlife Service (USFWS) (1979). Classification of Wetlands and Deepwater Habitats of the United States.*
- Ekern, P.C. and Chang, J., University of Hawaii at Manoa, Water Resources Research Center for State of Hawaii, Department of Land and Natural Resources, Division of Water and Land Development (August 1985). Pan Evaporation: State of Hawaii, 1894-1983, Report R74.
- Englund, R. and Filbert, R. for U.S. Department of Agriculture, Natural Resources Conservation Service (January 1997). Native and Exotic Stream Organisms Study in the Kawaiinui, Alakahi, Koiawe, and Lalakea Streams, Lower Hamakua Ditch Watershed Project, County of Hawaii. USDA-NRCS Contract No. 53-9251-6-275.
- Englund, Ronald and Preston, David for U.S. Department of Agriculture, Natural Resources Conservation Service (February 1999). Biological Assessment of the Lower Hamakua Ditch on the Hawaiian Stream Fly (Sigmatineurum meaohi) and Other Aquatic Insects.*
- Giambelluca, T.W., Nullet, M.A., Ridgely, M.A., Eyre, P.R., Moncur, J.E.T., and Price, S., State of Hawaii, Department of Land and Natural Resources, Commission on Water Resource Management (December 1991). Drought in Hawaii.
- Haraguchi, P. and Giambelluca, T., Pacific Weather, Inc. for State of Hawaii, Department of Land and Natural Resources, Division of Water and Land Development (May 1982). Drought Report - South Kohala-Hamakua, Island of Hawaii, March - November 1981, Circular C89.

Hawaii Island Economic Development Board for State of Hawaii, Department of Business, Economic Development and Tourism (March 1994). Hilo-Hamakua Economic Development Plan.

Herbst, Derral R., U.S. Department of the Army, Corps of Engineers, Pacific Ocean Division (September 20, 1996). Botanical Survey for the Lower Hamakua Ditch Project.

Kawachi, Carol, United States Department of Agriculture, Natural Resources Conservation Service (in preparation). Cultural Resources Survey for the Lower Hamakua Ditch Watershed

*Kinzie, Robert, et al. (May 1997). Final Report on "Effect of Flow Regimes on Productivity in Hawaiian Stream Ecosystems.*

Maptech, Inc., and Harben, B. and Smith, C., U.S. Department of Agriculture, Natural Resources Conservation Service for State of Hawaii Department of Agriculture (November 1997). Cropland Suitability Study - Lower Hamakua Ditch Watershed, Island of Hawaii.

Martin, Donald A., Hawaii Agricultural Statistics Service (March 1998). Statistics of Hawaiian Agriculture.

Megumi Kon, Inc. for County of Hawaii, Department of Water Supply. (December 1991). Hawaii County Water Use and Development Plan.

Mink, John F. (June 1984). Water Resources and Development for Hamakua Sugar Company.

National Park Service, Western Region Natural Resources and Research Division, Hawaii Cooperative Park Service Unit for State of Hawaii, Commission on Water Resource Management. (December 1990). Hawaii Stream Assessment: A Preliminary Appraisal of Hawaii's Stream Resources.

*Newhall, Franklin for U.S. Department of Agriculture, Soil Conservation Service (March 1980). Calculation of Soil Moisture Regimes From the Climate Record.*

State of Hawaii, Department of Health (October 1987). Water Quality Standard Maps.

State of Hawaii, Department of Land and Natural Resources, Division of Water and Land Development (February 1970). An Inventory of Basic Water Resources Data: Island of Hawaii.

State of Hawaii, Office of the Governor, Office of State Planning (November 1989). West Hawaii Regional Plan.

U.S. Department of Agriculture, Natural Resources Conservation Service (July 1998). 200-vi-National Resource Economics Handbook.

U.S. Department of Agriculture, Natural Resources Conservation Service (December 1992). National Watershed Manual.

U.S. Department of the Army, Corps of Engineers (September 1994). Repair Plan and Cost Estimates for the Lower Hamakua Ditch Irrigation Ditch.

*U.S. Department of the Interior, Fish and Wildlife Service (USFWS) (1977). National Wetlands Inventory.*

U.S. Water Resources Council (February 1983). Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies.

Wai Engineering, Inc., for State of Hawaii, Department of Business, Economic Development and Tourism, State of Hawaii Contract Number 37609. (May 1995). Field Reconnaissance and Engineering Evaluation of the Lower Hamakua Ditch System. (known locally as the Wai Report)

Yuen, George A.L. & Associates, Inc. for State of Hawaii, Department of Land and Natural Resources, Commission on Water Resource Management. (March 1992). State Water Resources Protection Plan: Volume II, Appendix.

## 10. GLOSSARY OF TERMS

**ALISH** - Agricultural Lands of Importance to the State of Hawaii - system of land classification adopted in 1977 by the Board of Agriculture in accordance with the USDA program to identify the extent and location of the nation's best lands available for the production of food, feed, fiber, forage, and oilseed crops. It delineates those lands of the State which are of agricultural importance and, within this delineation, categorizes agricultural lands according to specific criteria. It is intended to provide decision makers with a valuable tool for use in agricultural preservation, planning, and development. Three classes of agriculturally important lands that were established are: "Prime", "Unique," and "Other Important."

**ahupua'a** - traditional Hawaiian land division

**alluvial** - Of, pertaining to, or composed of alluvium.

**alluvium** - Sediment deposited by flowing waters.

**Ap horizon** - The surface layer of a soil disturbed by cultivation or pasturing.

**apron** - A concrete or rock shield below a dam which protects the streambed material below from erosion.

**aquaculture** - The propagation and cultivation of aquatic animals and plants for profit or social benefit.

**aquifer** - A porous layer beneath the earth's surface containing usable amounts of groundwater that can supply wells and springs; also may be called groundwater reservoir.

**atrazine compounds** - A photosynthesis-inhibiting persistent herbicide used to kill annual weeds; used by the sugar industry.

**auwai** - A community water system or irrigation ditch that regulates the rate of diversion and distributes the water to taro lo'i. Water flow is controlled by weirs constructed of river rock. Parts of these systems can be traced back to the precontact period.

**basalt** - A dark gray to black dense to fine-grained igneous rock.

**baseflow** - *Streamflow deriving from groundwater or spring contributions and may be considered the normal day-to-day flow if there is no rainfall in the watershed.*

**Bishop Museum** - A Hawaii-based Museum of Natural and Cultural History founded in 1889.

**casuarina trees** - Large, fast growing trees of Australian origin that reach up to 65 feet in, also known as Ironwood trees.

**catchment area** - area from which water is collected

**catchments** - structure for capturing and storing rain water

**CMP** - Corrugated Metal Pipe, large diameter pipe formed of coated steel or aluminum

**demand, water** - *Volume or rate of flow of water required by the user or group of users to fully satisfy all water uses.*

**design-build process** - Project delivery process using a single contract for both design and construction.

**dike** - geologic formation of dense intrusive basalt often constraining groundwater flow.

**diversified agriculture** - Agricultural activities in Hawaii other than sugar or pineapple; e.g., macadamia nuts, anthuriums, coffee, taro, guava, ranching, egg production.

**Diversified Agriculture Task Force** - Formed through the Hilo-Hamakua Coast Revitalization Effort to help the displaced worker have continued agricultural opportunities; the Task Force fostered the creation of the HNHAC (HNHAC).

**diversion** - withdrawal of water from a stream course.

**dracaena** - Decorative foliage plant with broad green leaves and a streak of a lighter green or white in the center; shipped to mainland and international markets.

# CORRECTION

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

State of Hawaii, Office of the Governor, Office of State Planning (November 1989). West Hawaii Regional Plan.

U.S. Department of Agriculture, Natural Resources Conservation Service (July 1998). 200-vi-National Resource Economics Handbook.

U.S. Department of Agriculture, Natural Resources Conservation Service (December 1992). National Watershed Manual.

U.S. Department of the Army, Corps of Engineers (September 1994). Repair Plan and Cost Estimates for the Lower Hamakua Ditch Irrigation Ditch.

*U.S. Department of the Interior, Fish and Wildlife Service (USFWS) (1977). National Wetlands Inventory.*

U.S. Water Resources Council (February 1983). Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies.

Wai Engineering, Inc., for State of Hawaii, Department of Business, Economic Development and Tourism, State of Hawaii Contract Number 37609. (May 1995). Field Reconnaissance and Engineering Evaluation of the Lower Hamakua Ditch System. (known locally as the Wai Report)

Yuen, George A.L. & Associates, Inc. for State of Hawaii, Department of Land and Natural Resources, Commission on Water Resource Management. (March 1992). State Water Resources Protection Plan: Volume II, Appendix.

page 206 :  
NOT IN FILE AT TIME  
OF MICROFILMING.

## 10. GLOSSARY OF TERMS

**ALISH** - Agricultural Lands of Importance to the State of Hawaii - system of land classification adopted in 1977 by the Board of Agriculture in accordance with the USDA program to identify the extent and location of the nation's best lands available for the production of food, feed, fiber, forage, and oilseed crops. It delineates those lands of the State which are of agricultural importance and, within this delineation, categorizes agricultural lands according to specific criteria. It is intended to provide decision makers with a valuable tool for use in agricultural preservation, planning, and development. Three classes of agriculturally important lands that were established are: "Prime", "Unique," and "Other Important."

**ahupua'a** - traditional Hawaiian land division

**alluvial** - Of, pertaining to, or composed of alluvium.

**alluvium** - Sediment deposited by flowing waters.

**Ap horizon** - The surface layer of a soil disturbed by cultivation or pasturing.

**apron** - A concrete or rock shield below a dam which protects the streambed material below from erosion.

**aquaculture** - The propagation and cultivation of aquatic animals and plants for profit or social benefit.

**aquifer** - A porous layer beneath the earth's surface containing usable amounts of groundwater that can supply wells and springs; also may be called groundwater reservoir.

**atrazine compounds** - A photosynthesis-inhibiting persistent herbicide used to kill annual weeds; used by the sugar industry.

**auwai** - A community water system or irrigation ditch that regulates the rate of diversion and distributes the water to taro lo'i. Water flow is controlled by weirs constructed of river rock. Parts of these systems can be traced back to the precontact period.

**basalt** - A dark gray to black dense to fine-grained igneous rock.

**baseflow** - *Streamflow deriving from groundwater or spring contributions and may be considered the normal day-to-day flow if there is no rainfall in the watershed.*

**Bishop Museum** - A Hawaii-based Museum of Natural and Cultural History founded in 1889.

**casuarina trees** - Large, fast growing trees of Australian origin that reach up to 65 feet in, also known as Ironwood trees.

**catchment area** - area from which water is collected

**catchments** - structure for capturing and storing rain water

**CMP** - Corrugated Metal Pipe, large diameter pipe formed of coated steel or aluminum

**demand, water** - *Volume or rate of flow of water required by the user or group of users to fully satisfy all water uses.*

**design-build process** - Project delivery process using a single contract for both design and construction.

**dike** - geologic formation of dense intrusive basalt often constraining groundwater flow.

**diversified agriculture** - Agricultural activities in Hawaii other than sugar or pineapple; e.g., macadamia nuts, anthuriums, coffee, taro, guava, ranching, egg production.

**Diversified Agriculture Task Force** - Formed through the Hilo-Hamakua Coast Revitalization Effort to help the displaced worker have continued agricultural opportunities; the Task Force fostered the creation of the HNHAC (HNHAC).

**diversion** - withdrawal of water from a stream course.

**dracaena** - Decorative foliage plant with broad green leaves and a streak of a lighter green or white in the center; shipped to mainland and international markets.



**drip irrigation systems** - Irrigation method whereby water is released from small holes in tubes (often plastic) placed in the rows of the field; this method results in less evaporation loss as compared to sprinkler system irrigation.

**drought** - *The failure of expected precipitation over a long enough period to result in hurt, damage, or loss.*

**dry year** - *12-month period during which precipitation is equal to or less than 80 percent frequency of rainfall from the existing record.*

**Earthjustice Legal Defense Fund** - Formerly the Sierra Club Legal Defense Fund

**easements** - A right given or sold to a person or agency to make limited use of another's real property; see also right-of-way and landrights.

**ecocommunities or ecological communities** - An association of plants and animals that commonly occur together.

**ecology** - The science of the relationships between organisms and their environment.

**ecosystem** - The area of influence by all biotic (living) and abiotic (nonliving) factors in the environment; because of the principal of environmental interrelationship, ecosystems always interact with each other, forming large ecosystems, and therefore necessitate the limitations of arbitrary boundaries.

**Endangered Species Act (1973)** - Federal law providing protection to all species of plants or animals (including invertebrates) that are currently in danger of extinction ("endangered") and those that may become so in the foreseeable future ("threatened"); allows for the preservation of ecosystems upon which an endangered species is dependent, designated as "critical habitat."

**Environmental Assessment** - An environmental disclosure document for a project for which leads to a determination of no significant environmental effect or to the preparation of an Environmental Impact Statement.

**Environmental Notice** - publication of the State of Hawaii Environmental Quality Commission.

**Environmental Impact Statement** - An environmental document disclosing environmental effects of project implementation. It enumerates significant problems; needs; opportunities; alternatives; the direct, indirect, and cumulative effects of the alternatives; and mitigation of adverse effects.

**erosion** - The detachment and movement of soil particles.

**eucalyptus** - Evergreen trees or shrubs of Australian origin that have rigid leaves and umbellate flowers and are widely cultivated for their gums, resins, oils, and useful woods.

**evapotranspiration** - loss of water from the soil both by evaporation and by transpiration from the plants growing thereon

**Farm Service Agency (FSA)** - U.S. Department of Agriculture agency which administers farm commodity programs; farm ownership, operating and emergency loans; conservation and environmental programs; emergency and disaster assistance; domestic and international food assistance and international export credit programs.

**Federal Register** - Publication of the National Archives and Records Administration containing official federal notices

**floodplain** - An area subject to flooding; includes lands bordering streams, rivers, ponds, lakes, and undrained lowlands.

**flume** - An open surface water conveyance elevated above the ground surface

**flume trestle** - A braced framework of timbers supporting the elevated flume

**francolins** - partridges of Asian or African origin

**groundwater** - Water beneath the earth's surface held in saturated soil and rocks; supplies wells and springs.

**guava** - Shrub or small tree of tropical American origin widely cultivated for its sweet acid yellow fruit.

**guineagrass** - coarse leafy bunchgrass, 4 to 8 feet tall; excellent dryland or irrigated forage plant.

**gully** - The erosion process whereby water accumulates in narrow channels and, over short periods, removes the soil from this narrow area to considerable depths, ranging from 1 to 2 feet to as much as 75 to 100 feet.

**habitat** - The area where an organism or biological population normally lives or occurs; includes the total area where all physical and biological life requirements of a species are found.

**Hamakua Cogeneration Project** - The electrical power generation project by Enserch, Inc. located at the Haina Mill site.

**Hamakua/North Hilo Agricultural Cooperative (HNAAC)** - Agricultural cooperative formed primarily of former sugar industry workers. The HNAAC subleases state land to its members for ranching, papaya, coffee, macadamia, other diversified agriculture, and aquaculture.

**Hawaiian Home Lands** - Lands set aside by the Hawaiian Homes Commission Act of 1920 for native Hawaiians and administered by the State of Hawaii Department of Hawaiian Home Lands.

**Hawaiian Homes Commission Act of 1920** - Federal act which aside approximately 188,000 acres of government-held land for leasehold homesteading by native Hawaiians. The United States assumed this trust responsibility to improve the well-being of the socially and economically disenfranchised native people and the reverse the precipitous decline in the native Hawaiian population. The lands were transferred to the State of Hawaii when statehood was attained in 1959. The Hawaiian Homes Commission and the Department of Hawaiian Home Lands (DHHL) were established to administer the provisions of the Hawaiian Homes Commission Act and Admission Act.

**Hawaiian Irrigation Company** - The corporation that constructed and operated the Lower Hamakua Ditch between 1910 and 1994.

**hexazinone** - a chemical compound contained in herbicides used by the sugar industry

**Highly Erodible Land** - Land that has an erodibility index of eight or more. These lands have been defined by the National Food Security Act Manual, USDA, SCS (NRCS), July 1989, in order to identify areas on which erosion control efforts should be concentrated. The definition is based on Erosion Indexes derived from certain variables of the Universal Soil Loss Equation and the Wind Erosion Equation. The indexes are the quotient of tons of soil loss by erosion predicted for bare ground divided by the sustainable soil loss (T factor).

**impacts, environmental** - Any changes in environmental conditions, positive or negative, that occur as a result, direct or indirect, of installing a project or any other modification.

**inlet box** - an opening for water intake from a stream or ditch.

**intermittent stream** - A stream or portion of a stream that flows only in direct response to precipitation. It receives little or no water from springs and no long-continued supply from other sources.

**ironwood** - see casuarina

**Kamehameha Schools/Bishop Estate (KSBE)** - A charitable trust established by the 1884 will of Princess Bernice Pauahi Bishop in which her wealth of lands were dedicated to support education of Hawaiian children.

**Kuleana lands** - Land parcels created when Hawaiian tenant farmers were allowed the opportunity, by the Kuleana Act of 1850, to acquire fee simple title to lands on which they resided and cultivated crops.

**land treatment practices** - Soil and water conservation practices that protect and conserve the soil and other natural resource base.

**land use** - The service or activity to which a parcel of land is employed; e.g., urban residential, commercial, industrial, green belt, recreation, etc.

**landrights** - The ownership of real property and/or its use, temporary or permanent; see also easements and right-of-way.

**lateral systems** - The secondary level of a water distribution network which conveys water from the main distribution line to the service areas.

**leaching** - The process by which nutrients, chemicals, or contaminants are dissolved by water and are moved into lower layers of soil.

**lime** - fertilizer (usually  $\text{CaCO}_3$  - calcium carbonate) used to correct soil acidity and improve soil productivity.

**lo'i** - Taro paddy. Most of the water passes through the lo'i and returns to the stream or auwai where it is available to downstream users.

**log-Pearson Type III rainfall analysis** - A nonsymmetrical probability distribution function which is widely used in hydrologic analysis.

**National Economic Development (NED) Plan** - The project alternative, as defined by the U.S. Water Resources Council, which addresses the project objective while maximizing the positive difference between economic benefits and costs.

**National Environmental Policy Act of 1969** - This law mandates that each federal agency prepare in advance of each major action, recommendation, or project, that would significantly affect the quality of the human environment, an Environmental Assessment or Environmental Impact Statement to assess and document plans to avoid environmental impacts.

**natural resources** - Those components of the environment which are potentially useful to man, both economically and metaphysically; includes minerals, trees, fossil fuels, fish, wildlife, scenery, etc.

**orographic showers** - rains induced by or otherwise associated with the presence of mountains; particularly where moist air is carried by the predominant wind direction toward the mountains, saturated air masses are forced to rise over the mountains, the cooler temperatures at the higher elevations cause condensation, cloud formation and rain.

**Other Important Agricultural land** - ALISH classification of land that does not satisfy the requirements for Prime or Unique designation, yet is of state-wide or local importance for the production of food, feed, fiber, and forage crops. These lands can be farmed satisfactorily by applying greater inputs of fertilizer and other soil amendments, drainage improvement, erosion control practices, or flood protection. They produce fair to good crop yields when managed properly. Referred to as Additional Farmland of State or Local Importance in the NRCS soil classifications.

**P fertilizer** - Phosphorus-supplying fertilizer; phosphorus deficiency leads to stunted plants with limited root systems and thin stems, resulting in low yields and poor quality.

**pan evaporation** - method of measurement to assess the amount of water use by crops. The standard Class A evaporation pan is circular (47.5" diameter, 10" deep) and made of galvanized or monel metal. It is mounted 6" above ground level and must be level. The water level is maintained at approximately 2" below the rim with water being added or removed at the time measurements are made. The water level is measured with a micrometer hook gage (movable graduated stem with a vernier).

**peak use** - *Highest rate of water use; for crop irrigation, peak use usually coincides with lowest rainfall.*

**percent event** - Denotes the magnitude of a flood; i.e., a flood that has a certain percent chance of occurring in any one year.

**perched groundwater** - Upper elevation groundwater masses; local zone of saturation that exists at some level above the regional water table.

**perennial streams** - Streams with portions that have continuous flow of water.

**planning area** - The 38,500 acres of land defined as the watershed area of the Lower Hamakua ditch. The planning area includes the 11,000 acres of "project area" within which irrigation is expected to provide benefits (from Kukuihaele to Paauilo), as well as other adjacent lands on which improvements are to be made (such as the stream diversions above Waipio Valley) or which may be affected by plan implementation (Waipio Valley).

**Prime Agricultural Land** - ALISH classification indicating the land is best suited for the production of food, feed, forage, and fiber crops. The land has the soil quality, growing season, and moisture supply needed to produce sustained high yields of crops economically when treated and managed, including water management, according to modern farming methods. Equivalent to the NRCS designation of Prime Farmland. This is the highest ALISH classification. See also Unique Farmland.

**project area** - The 11,000 acres within which project improvements could provide agricultural water supply. The area is between the Lower Hamakua Ditch and the ocean and is bounded by Paauilo Gulch to the east and Waipio Valley to the west.

**Public Law 83-566 (PL-566)** - See Watershed Protection and Flood Prevention Act.

**pumping head** - The energy that is needed to convey groundwater to the storage or use location, it includes the energy required to overcome gravitational force, pipe and other friction loss, and pump losses.

**remote terminal unit (RTU)** - A component of a SCADA system that collects data or controls a device at a remote location.

**reservoir** - Any water storage facility.

**right-of-way** - The right to pass through property owned by another party.

**rilling** - The erosional action of water that forms small (less than 1 foot deep), steep-sided channels called rills; left unchecked, rills become gullies.

**riparian** - The zone along banks and adjacent areas of water bodies, water courses, seeps, and springs whose water provide soil moisture in excess of that otherwise available locally; supports hydrophytic (grows in and is adapted to an aquatic or very wet environment) vegetation that otherwise would not thrive due to lack of soil moisture.

**SCADA - Supervisory Control and Data Acquisition System** - Communications system that allows remote data collection and operation of automated devices.

**scoping** - The process of identifying the significant issues to be addressed in the development of a project.

**sediment** - Solid material, both mineral and organic, that is transported by moving water and can be deposited in water bodies.

**sediment pond/trap** - structure with a deep sump which causes a reduced velocity and subsequent settling out of sediment particles greater than a threshold size.

**sedimentation** - The act or process of depositing sediment.

**silty clay loam** - A soil textural class containing a relatively large amount of silt, a lesser quantity of clay, and a still smaller quantity of sand.

**soil** - The layer of the earth's surface composed of both organic and mineral elements and capable of supporting plant life.

**soil loss tolerance (T) value** - The maximum average annual soil loss (in tons per acre per year) that should be permitted on a given soil to maintain its productivity.

**species** - A fundamental category of classifying living things, ranking after genus, and consisting of organisms capable of interbreeding.

**storm flumes** - Structures for passing field runoff water and debris over the ditch.

**stream intakes** - A structure which diverts streamflow into the LHD system.

**structural measures** - A project measure type defined by PL83-566 as those requiring group participation for implementation.

**SWCD - Soil and Water Conservation District** - A self-governing sub-unit of state government with a mission of soil and water conservation. There are 16 such districts in Hawaii.

**taro** - *Colocasia esculenta* - perennial herb with edible corm (underground stem) and leaves; an important staple throughout the Pacific with special significance in traditional Hawaiian culture.

**tillage** - The operation of implements through the soil to prepare seedbeds and root beds; includes the operations of plowing, sowing, and raising crops or cultivating land.

**traffic pans** - A subsurface horizon or soil layer having a high bulk density and a lower total porosity than the soil directly above or below it as a result of pressure applied by normal tillage operation or by other artificial means. Also called pressure or induced pan, or tillage pan.

**tree crops** - also known as orchard crops; in Hawaii, this category typically includes banana, papaya, macadamia nut, and coffee.

**truck crops** - Commercial, nonperennial vegetable crops which are grown in rotation.

**Unique farmland** - NRCS land classification for land other than Prime farmland that is used for the production of specific high-value food and fiber crops. Examples of such crops are citrus, tree nuts, olives, cranberries, fruit, and vegetables. The similar ALISH classification further defines that this land has the special combination of soil quality, growing season, temperature, humidity, sunlight, air drainage, aspect, moisture supply, or other conditions, such as nearness to market, that favor the production of a specific crop of high quality and/or high yield when the land is treated and managed according to modern farming methods. In Hawaii, some examples of such crops are coffee, taro, rice, watercress and non-irrigated pineapple.

**Universal Soil Loss Equation** - An equation used for the design of water erosion control systems;  $A=RKLSCP$  wherein A=average annual soil loss in tons per acre per year; R=rainfall factor; K=soil erodibility factor; L=length of slope; S=percent of slope; C=cropping and management; P=conservation practice factor; (result is compared to T=soil loss tolerance value that has been assigned to each soil type, in tons per acre per year).

**variable diversion structures** - A stream intake structure that allows the amount of water diverted into the ditch system to be adjusted for flow needed.

**volunteer/old sugarcane** - Generation of sugarcane plants that were not planted by man, but developed from previous plantings.

**watershed** - The topographic basin that directs all runoff to a single discharge point. For the purposes of PL83-566 it is an area that is hydrologically connected, such as by the LHD agricultural water system.

**Watershed Plan** - The basic document in which the NRCS and local sponsoring organizations' decisions are recorded. It provides the basis for project authorization and guides the implementation of the plan. The plan describes the work to be installed, the responsibilities of each participant, cost-sharing, financing arrangements, and operation and maintenance provisions.

**Watershed Protection and Flood Prevention Act, Public Law 83-566** - Administered by the Natural Resource Conservation Service (formerly Soil Conservation Service), this law provides technical assistance and cost sharing to local sponsors for developing and implementing water resource plans in watersheds no larger than 250,000 acres; may be multipurpose.

**weir** - A dam placed in a stream to raise the water level or regulate the flow; often used to divert water into another channel. Also used as a method of measuring flow by means of a constriction in the water channel.

**wetland** - Area that is inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances does support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, wet meadows, riparian systems, reservoirs, and similar areas.

To be revised 9/9/99

## 11. INDEX

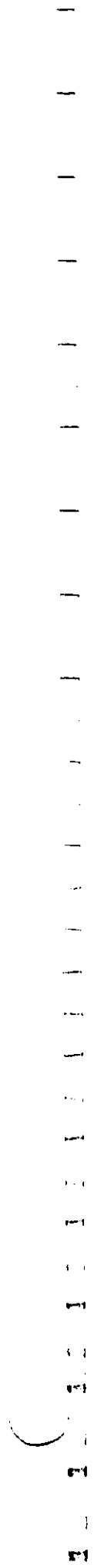
- advisory committee, xvi, 64, 71, 140, 143, 147, 148, 149, 153, 173, 178, 180, 192
- agreements
  - DOA/KSBE, 13, 23, 38, 43, 64, 74, 150
  - historic preservation, 75, 136, 151, 178
  - OM&R, 77, 78
  - operation/bankruptcy settlement, 10
  - Project Agreement, 70
  - state leases, 115
  - stream water use, xvi, 148
  - Watershed Agreement, 65, 71
- agricultural activity, 10-17, 100-105
  - existing, xiii, 10, 12, 29, 102
  - projected, xv, 11, 28, 50, 111
  - truck farming, 11
- air, xv, 50, 126-27
- ALISH, 85, 114, 17, 20
- Alternative plans, 23-46
  - Alternative 1 - No Action, 11, 29-30, 53, 114, 124, 126
  - Alternative 2 - Wells, 30-32, 126
  - Alternative 2 - Wells, 124
  - Alternative 3 - Repair and Restoration of Lower Hamakua Ditch, 34-38, 53
  - Alternative 4 - Replacement of Open Ditch with Pipeline, 39-42, 124, 126
  - comparison, 49-52
  - formulation, 23
- alternatives
  - catchment systems, 23, 24, 29
  - catchments, 17
  - County well water, 25
  - Hamakua stream diversion, 25-26, 29
  - pipeline, 27
  - relocation of farms, 28
  - wells, 26
- aquaculture, 9, 17, 106, 108, 149, 17, 19
- authority, 2, 71
- Authorization, x
- Bishop Museum, 96, 140, 17
- cattle operations, 94, 102, 104
- ceded lands, 157-60
- civil rights, 71
- Coastal Zone Management Program, 156, 178
- commercial operations, 23, 96, 104
- Commission on Water Resources Management (COWRM), xvi, 21, 57, 122, 133, 144, 148
- construction
  - conservation measures, 115, 153
  - contracts, 61, 69
  - inspection, 60, 65
  - project cost, 75
  - consultation and public participation, 161-81, 180
  - contracts
    - administration, 69
    - construction, 61, 69
  - costs, 60-61
    - administration, 61
    - construction, 60
    - engineering, 60
    - installation, 60
    - land treatment, 61
    - OM&R, 61
    - real property, 61
  - cost-sharing
    - conservation practices, 24, 115, 176, 178
    - project, xix, 5, 60, 61, 71, 176, 11
  - crop types, 12, 94, 104
  - cropland, 93
    - ALISH classification, 51
    - sugarcane, 8
  - Cropland Suitability Study, 12, 28, 83, 94-95
  - cultural resources, xv, 50, 70, 127-40
  - Department of Agriculture (DOA), State of Hawaii, x, 1, 2, 8, 12, 20, 36, 57, 59, 60, 61, 71
    - leased lands, 103
    - responsibilities, 65, 69, 72, 73-74, 156
    - temporary LHD management, 9, 29
  - Department of Hawaiian Home Lands (DHHL), State of Hawaii, 96
  - Department of Land and Natural Resources (DLNR), State of Hawaii
    - leased lands, 103
    - responsibilities, 69
  - diversified agriculture, 1, 9, 102, 17
  - diversion amount, 66, 73, 138
  - diversion rate, xvi, 148
  - Draft Environmental Impact Statement (DEIS), 18
    - acceptance, 5, 11
    - consultation, 162, 180
    - of 1995, 1, 12, 161, 162, 167-79, 167-79
    - planning, 161-62
    - public review, 5, 181
    - review, xix
    - review comments, 2
  - drought, 11, 26, 46, 83, 94, 123, 124, 167, 173, 14
  - Earthjustice Legal Defense Fund (ELDF), 18
  - economic development, 50, 72, 93, 99, 102
  - economics, 111
  - Enserch Development Corporation, 107

- erosion, xv, 50, 94, 146
- evaporation, 16, 83
- Farm Service Agency (FSA), 66, 18
- financial assistance, 62, 102, 103
  - conservation practices, 24
  - Environmental Quality Incentives Program (EQIP), 24, 61, 115, 178
  - necessary conditions, 71
  - Wildlife Habitat Incentive Program (WHIP), 24
- flood, xv, 50, 110, 116–21, 116, 156
  - plains, 116
  - Waipio Valley, 22, 141
- forestry operations, 94, 104
- groundwater, xv, 26, 51, 80, 107, 125–26, 18
- Hakalaoa Falls, 21, 27, 36, 54, 57, 62, 128, 129, 144–46
  - temporary repair, 26, 105
  - tunnel repair, 69
- Hamakua Soil and Water Conservation District (Hamakua SWCD), 2, 24, 162
  - responsibilities, 66
- Hamakua Sugar Company (HSC), 1, 8, 21, 93, 99, 133, 144
- Hamakua/North Hilo Agricultural Cooperative (HNHAC), 9, 10, 12, 23, 102, 103, 104, 156, 162, 19
- Hawaii County Department of Water Supply (DWS), 25
- Hawaii County General Plan, 152
- Hawaii County Water Use and Development Plan (WUDP), 153
- Hawaii environmental review process, 2
- Hawaii State Plan, 149
- Hawaii Stream Assessment, 25
- Hawaiian Home Lands, 134, 19
- Hawaiian Irrigation Company, 105
- Highly Erodible Land (HEL), 86, 19
- Hiilawe Falls, 21. *See also* Hakalaoa Falls
- Hilo Coast Processing Company (HCPC), 1, 8
- Hilo-Hamakua Coast Revitalization Effort, 8
- Hilo-Hamakua Economic Development Plan, 111, 128, 156
- historic preservation, 70
- inspection, routine, 73
- installation, 61–72, 65, 67, 68, 147, 159
  - costs, 75
  - prioritization, 54
  - sequence, 62
  - utility lines, 69
- invitations to bid
  - conditions, 71
- irrigation
  - quantity needed, 28
- Kamehameha Schools/Bishop Estate (KSBE), 180, 19
  - consultation, 162
  - Hakalaoa Falls, 21, 144, 145
  - lands, 96, 103, 104, 107
  - leased land, 94, 102, 104, 108
  - LHD, 12, 36, 60, 72, 105, 106
  - responsibilities, 175
- Kuleana lands, 134, 19
- Lalakea Ditch, 108
- Land
  - acquisition, 69
  - development, 99
  - leasing, 104
  - ownership, xiii, 95–96
  - suitability, 167
  - use, xiii, xv, 46, 51, 92–94, 93, 94, 152
- land rights, 18, 19
- land treatment practices, 23–24, 19
  - conservation measures, 24, 115
  - financial assistance, 24
  - irrigation management, 24
  - plans, 66
  - project costs, 37, 61, 63, 64, 75
  - technical assistance, 62, 66, 178
- landrights, 12, 36, 71
  - acquisition, 65, 69
  - project cost, 37, 63, 75, 76
- lateral pipeline systems, 9, 19, 36, 41, 55, 56
- Lower Hamakua Ditch (LHD), 9, 70, 105–7
  - diversion rate, xvi, 134, 148
  - flow, 46
  - flumes, 27, 35, 54, 106, 128, 131
  - historic value, 130
  - intakes, 21, 30, 36, 56, 73
  - leakage, 10, 30, 123, 126
  - livestock access, 19, 123
  - maintenance, 18, 29, 73
  - management, 20
  - open ditch, 18, 35, 54, 106, 129
  - operation, x, 9, 12, 59, 66
  - past use, 105
  - repair and rehabilitation, 26, 27, 35
  - sediment deposition, 10, 35, 54
  - source water, 106
  - storm flumes, 19, 21
  - tunnels, 18, 19, 106
  - water losses, 20, 123
  - water quality, 123
- management, 20
- Mauna Kea Soil and Water Conservation District (Mauna Kea SWCD), 2, 24, 162
  - responsibilities, 66
- National Economic Development (NED) Plan, 53, 20
  - tables, 75–78

National Environmental Policy Act (NEPA),  
 2  
 National Watershed Manual, 2, 60, 179  
 Native Hawaiians, 158, 179  
     cultural resources, 129, 130, 141, 144,  
     173  
     population, 72, 99  
     water rights, 134  
*Natural Resources Conservation Service*  
*(NRCS)*, xix, 1, 5, 62, 73, 162, 11  
     contact information, 7  
     responsibilities, 65  
     technical assistance, 24, 115  
 net economic benefit, xii, 53, 78  
 Operation, maintenance, and replacement  
 (OM&R), 45, 66, 72-74  
     costs, 45  
 pan evaporation, 46, 83. *See*  
 permits, 65, 66-68, 71, 144, 146, 66-68,  
 179  
 planning area, xii, 3, 79, 20  
 Prime farmland, 85, 114, 17, 21  
 problems and opportunities  
     intake structures, 17  
     LHD maintenance, x, 17  
     livestock access, 19  
     trails, 18  
     uncontrolled vegetation, 19  
 project  
     cost analysis, 47  
     purpose, x, 1, 8  
     scoping, 23  
     term, 60  
 project area, 24, 79, 21  
 Project Setting, 78-110  
     boundaries, 79  
     size, 79  
     temperature, 83  
 proposed works of improvement, 54  
 Public Law 83-566, 2, 69, 71, 73, 21  
     cost-sharing, 61  
 Public Law 97-88, Farmland Protection  
 Policy Act, 114  
 public participation, xviii, 60, 66, 108,  
 161-81  
     meetings, xix, 162, 179, 2  
 rainfall, 16, 46, 83, 94  
Repair Plan and Cost Estimate for the Lower  
Hamakua Irrigation Ditch, U.S. Army  
     Corps of Engineers, 27  
 reservoirs, xii, 36, 55, 10  
 safety, 74  
 scoping, 108-10, 161, 21  
 Selected Plan, 53-78  
     cost, 60  
     installation, 67, 159  
     rationale, 53  
     service charge, 61, 74  
     social concerns, 51, 127-29  
     soil, 21  
 Soil Conservation Service. *See* Natural  
     Resources Conservation Service  
 soil suitability study. *See* Cropland  
     Suitability Study  
 soils, 28, 84  
     ALISH classification, 85  
 Sponsors, x, xii, 2, 53, 161  
     responsibilities, 69, 70, 73, 176  
 State Land Use Districts, 149  
 State Water Code, 133  
 stream intakes, 17, 21, 30, 36, 56, 21  
 streams, xv, 52, 105  
     aquatic life, 136  
     diversion rates, xvi, 66, 122, 138, 140,  
     141, 148  
     flow measurement, 170  
     Hamakua area, 25, 121, 123  
     Waipio Valley, 124, 136  
 structural measures, 23, 25-28, 21  
 Supervisory Control and Data Acquisition  
 (SCADA), 29, 36, 41, 57-59, 21  
 surface water, 105, 121-25  
 taro, 24, 48, 108, 128, 129, 134, 140, 17, 21  
 Threatened and Endangered Species, xv, 52,  
 68, 119, 160, 170, 18  
 U.S. Department of Defense, 103, 156  
 U.S. Water Resource Council, 2, 53, 60, 68  
 Unique farmland, 85, 114, 22  
 visual resources, xv, 52, 127-29  
 Wai Engineering report, 26, 27, 16  
 Wailoa River, 48  
 Waimea Irrigation System, 59  
 Waipio Valley, xvi, 108, 128, 129, 135, 136,  
 148  
     farmers, 24, 134, 135, 180  
     financial assistance, 24  
     flooding, 22, 50, 116, 117, 141, 159  
     land ownership, 96  
     streams, xv, 47, 52, 61, 124  
     water supply, 22, 122, 134  
 Waipio Valley Community Association  
 (WVCA), 140  
 Waipio Valley Taro Farmers Association  
 (WVTFA), 140, 142, 162  
 water budget, 16, 83  
 water rights, xv, 36, 52, 72, 140-46  
 watershed, 79, 105, 22  
 wells, 30, 46, 107, 125  
     county, 107  
     pumping energy, 30  
 wetlands, xv, 52, 126, 22  
 wildlife, 118



habitat, xv, 50



**APPENDIX A -  
COMMENTS AND RESPONSES TO 1998 DEIS**

Review comments on the 1998 Draft Environmental Impact Statement were received from the following individuals and organizations. The letter responding to comments follows each comment letter.

COMMENTOR	Page
Jo-Anna Nakata, State Executive Director, USDA Farm Service Agency	A-1
Esther Ueda, Executive Officer, Land Use Commission, DBEDT	A-2
Galen M. Kuba, Division Chief, Department of Public Works, Hawaii County	A-3
Virginia Goldstein, Planning Director, Hawaii County	A-4
Leon A. Thevenin	A-6
Paul Mizue, Chief, Civil Works Branch, U.S. Army Corps of Engineers	A-13
Kazu Hayashida, Director, Hawaii Department of Transportation	A-14
William Meyer, District Chief, U.S. Geological Survey	A-15
Gordon Matsuoka, Public Works Administrator, Department of Accounting and General Services	A-19
Donald K.W. Lau, Executive Director, Housing and Community Development Corporation, DBEDT	A-20
Jody Allione, Sr. Project Development Manager, Ecogen Hawaii L.P.	A-21
Howard O. Wright, Technology for Earth	A-22
Andrew M. Monden, Chief Engineer, Land Division, DLNR	A-24
Patricia Sanderson Port, Regional Environmental Director, U.S. Department of the Interior	A-25
Don Hibbard, Administrator, Historic Preservation Division, DLNR	A-30
C.K. Yokota, Regional Environmental Director, Naval Base Pearl Harbor	A-32
James P.D. Thropp, Jr.	A-33
Ray Soon, Chairman, Hawaiian Homes Commission	A-35
Hawaii's Thousand Friends	A-36
Jerome Akasaki, Akasaki Farms/Kalopa Kai Orchids	A-41
Lawrence Miller, Vice President, Waipio Valley Community Association	A-42
Timothy Johns, Chairperson, Board of Land and Natural Resources	A-44
Christopher Rathbun	A-45
Ed Sakoda, Acting Deputy Director, Commission on Water Resources Management	A-58
Manabu Tagomori, Water Resources Manager, Kamehameha Schools Bishop Estate	A-62

Yoshito Takamine, President, Hamakua County Farm Bureau	A-63
Diane S. Quitiquit, Director, Department of Research and Development, Hawaii County	A-65
Henry Curtis, Executive Director, Life of the Land	A-67
Bruce Anderson, Director of Health, Department of Health	A-68
Marjorie Ziegler, Earthjustice Legal Defense Fund	A-69
David J. Farrel, Chief, Federal Activities Office, EPA, Region IX	A-95
Colin Kippen, Deputy Administrator, Office of Hawaiian Affairs	A-102
John T. Harrison, Environmental Coordinator, Environmental Center	A-104
Morgan F. Toledo, President Waipio Taro Growers Association	A-126



United States  
Department of  
Agriculture

Farm  
Service  
Agency

Hawaii State & Pacific Basin FSA Office  
Post Office Box 50008  
Honolulu, Hawaii 96850  
(808)541-2600 FAX # (808)541-2648  
Extension # 139

December 18, 1998

Kenneth M. Kaneshiro, State Conservationist  
Natural Resource Conservation Service  
P.O. Box 50004  
Honolulu, HI 96850

Dear Ken:

Thank you for the opportunity to review the Draft Watershed Plan-Environmental Impact Statement for Lower Hamakua Ditch Watershed.

The Farm Service Agency has no comments at this time on the plan.

Sincerely,

JO-ANNA NAKATA  
State Executive Director  
Farm Service Agency



United States  
Department of  
Agriculture

Natural  
Resources  
Conservation  
Service

P.O. Box 50004  
Honolulu, HI  
96850

*Our People...Our Islands...In Harmony*

August 19, 1999

Jo-Anna Nakata, State Executive Director  
USDA Farm Service Agency  
P.O. Box 50008  
Honolulu, Hawaii 96850

Dear Ms. Nakata:

Subject: Lower Hamakua Ditch Watershed DEIS Review Comments

Thank you for your review of the Draft Environmental Impact Statement and Watershed Plan for the Lower Hamakua Ditch Watershed, County of Hawaii. We understand from your letter dated December 18, 1998 that you have no comments at the present time.

Sincerely,

KENNETH M. KANESHIRO  
State Conservationist

cc: State of Hawaii Department of Agriculture  
State of Hawaii Office of Environmental Quality Control



Our People...Our Islands...In Harmony

United States Department of Agriculture

Natural Resources Conservation Service

P.O. Box 50004 Honolulu, HI 96850

August 19, 1999

Esther Ueda, Executive Officer  
Land Use Commission  
DBEDT  
P.O. Box 2339  
Honolulu, Hawaii 96804-2339

Dear Ms. Ueda:

Subject: Lower Hamakua Ditch Watershed DEIS Review Comments

Thank you for your review of the Draft Environmental Impact Statement and Watershed Plan for the Lower Hamakua Ditch Watershed, County of Hawaii and confirmation of the State Land Use Districts of the land affected by project implementation. We understand from your letter dated December 21, 1998 that you have no additional comments at this time.

Sincerely,

KENNETH M. KANESHIRO  
State Conservationist

cc: State of Hawaii Department of Agriculture  
State of Hawaii Office of Environmental Quality Control

ESTHER UEDA  
Executive Officer



STATE OF HAWAII  
DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM  
LAND USE COMMISSION

P.O. Box 2339  
Honolulu, HI 96804-2339  
Telephone: 808-531-3827  
Fax: 808-587-3827

December 21, 1998

Mr. Kenneth M. Kaneshiro  
State Conservationist  
Natural Resources Conservation Service  
United States Department of Agriculture  
P.O. Box 50004  
Honolulu, Hawaii 96850

Dear Mr. Kaneshiro:

Subject: Draft Watershed Plan and Environmental Impact Statement for Lower Hamakua Ditch Watershed

We have reviewed the Draft Watershed Plan and Environmental Impact Statement for Lower Hamakua Ditch Watershed, and confirm that the modification of the intake structures and repair of the conveyance at Hakaloa Falls, as represented on Figure 6, will occur on lands designated in the State Land Use Conservation District. We also confirm that the repair and rehabilitation of the ditch system proposed by the Selected Plan (Alternative 3) between the Main Wier at Kukuhaale and Paaulo, as represented on Figure 6, will be located on lands designated within the State Land Use Agricultural District.

We have no further comments to offer at this time. We appreciate the opportunity to comment on the subject Draft Watershed Plan and Environmental Impact Statement.

Should you have any questions, please feel free to call me or Bert Saruwatari of our office at 587-3822.

Sincerely,

ESTHER UEDA  
Executive Officer

EU:th

cc: OEQC  
Paul Matsuo, DOA

Stephen K. Yamashiro  
Mayor



County of Hawaii  
DEPARTMENT OF PUBLIC WORKS  
25 Aupuni Street, Room 202 • Hilo, Hawaii 96720-4252  
(808) 961-8321 • Fax (808) 961-8630

Jiro A. Sumada  
Deputy Chief of Engineer

United States  
Department of  
Agriculture  
Natural  
Resources  
Conservation  
Service  
P.O. Box 50004  
Honolulu, HI  
96850



Our People...Our Islands...In Harmony

August 19, 1999

Galen M. Kuba, P.E., Division Chief  
Engineering Division  
Department of Public Works  
County of Hawaii  
25 Aupuni St., Room 202  
Hilo, Hawaii 96720-4252

MR PAUL MATSUO  
DEPARTMENT OF AGRICULTURE  
STATE OF HAWAII  
P O BOX 22159  
HONOLULU HAWAII 96823-2159

December 24, 1998

SUBJECT: DRAFT ENVIRONMENTAL IMPACT STATEMENT  
LOWER HAMAKUA DITCH WATERSHED

We acknowledge receipt of your letter concerning the subject matter, and have no further comments to offer.

Should there be any questions concerning this matter, please feel free to contact Mr. Casey Yanagihara in our Engineering Division at (808)961-8327.

*Galen M. Kuba*  
GALEN M. KUBA, P.E.  
Division Chief, Engineering Division

CKY

copy: NRCS  
OEQC

Dear Mr. Kuba:

Subject: Lower Hamakua Ditch Watershed DEIS Review Comments

Thank you for your review of the Draft Environmental Impact Statement and Watershed Plan for the Lower Hamakua Ditch Watershed, County of Hawaii. We understand from your letter, addressed to the State of Hawaii Department of Agriculture, dated December 24, 1998 that you have no comments at the present time.

Sincerely,

*Kenneth M. Kaneshiro*  
KENNETH M. KANESHIRO  
State Conservationist

cc: State of Hawaii Department of Agriculture  
State of Hawaii Office of Environmental Quality Control



County of Hawaii

PLANNING DEPARTMENT  
25 Apuakani Street, Room 109 - Hilo, Hawaii 96720-4122  
(808) 941-4228 • Fax (808) 941-4742

Virginia Goldstein  
Director  
Russell Kokubun  
Deputy Director

Mr. Kenneth M. Kaneshiro  
State Conservationist  
Page 2  
December 29, 1998

Stephen K. Yamashiro  
Mayor

December 29, 1998

Mr. Kenneth M. Kaneshiro  
State Conservationist  
Natural Resources Conservation Service  
United States Department of Agriculture  
P.O. Box 50004  
Honolulu, HI 96850-0050

Dear Mr. Kaneshiro:

Draft Watershed Plan  
Draft Environmental Impact Statement for Lower Hamakua Ditch Watershed

We are receipt of your letter dated December 9, 1998, requesting our review and comment on the accompanying draft environmental impact statement (DEIS) for the Lower Hamakua Ditch Watershed Plan. We have completed our review and have the following comments to offer for your consideration:

1. The DEIS identifies Alternative 3 as the preferred alternative. Alternative 3 proposes the repair, rehabilitation or replacement of LHD components thru:
  - o the replacement of all but two wooden flumes with corrugated metal pipe or inverted pipe siphons;
  - o replacement of wooden flume support structures with metal I-beams;
  - o one-time removal of sediment from the open ditch sections;
  - o repair of concrete lining within open ditch sections using wire fabric and mortar;
  - o reconstruction of tunnel behind Hakalaoa Falls which will restore flow to Hillawe Falls;
  - o repair or modify diversion structures at Kawainui, Alakahi and Koiawe streams;
  - o construction of 10 lateral distribution systems along LHD system; and
  - o construction of IMG reservoir at Honokaia and relining of existing Paaulo Reservoir.

Therefore, all of our comments and recommendations will be based on the implementation of improvements specified within Alternative 3.

2. Section 6.7.1- State Land Use Districts - The last paragraph states that "The land use changes caused by the Selected Plan (Alternative 3) will also conform to the allowable uses in the Agricultural district." We are concerned by these expected "land use changes". We would support a statement which concludes that the rehabilitation of the LHD system will support continued agricultural and related activities which are consistent with the project area's Agricultural District classification. We will not support any statement to the contrary. Please clarify this section.
3. Section 6.7.9- Special Management Area - Special Management Area (SMA) Use Permits are issued by the Planning Department (SMA Minor Use Permits) and the Planning Commission (SMA Major Use Permits). The SMA boundary within the project area is generally situated about 500 feet from the shoreline, with the exception of the area near Waipio Valley. The SMA boundary encumbers the entire Waipio Valley, with the top of the valley walls defining the mauka extent of the SMA.  
If some of the proposed improvements will occur on the walls or floor of Waipio Valley, then the DEIS incorrectly states that "works of improvement provided by the watershed project will occur beyond the SMA boundaries". According to DEIS Figure 6- Alternative 3, the following improvements appear to be situated makai of the top-of-pali, and therefore within the County's SMA:
  - o Hakalaoa Falls tunnel repair
  - o Kawainui, Alakahi and Koiawe stream intake modifications
  - o construction of RTU relay station
 Please confirm the location of all improvements and their location relative to the County's SMA.  
The DEIS states that "On-farm assistance provided to agricultural operators and landowners will probably not be great enough to be classified as 'development.'" We would recommend that this statement be deleted.
4. Section 6.7.13- Permits and Compliance - Please include the following review in your list of requirements:



Mr. Kenneth M. Kaneshiro  
State Conservationist  
Page 3  
December 29, 1998

SPECIAL MANAGEMENT AREA USE PERMIT ASSESSMENT  
Hawaii County Planning Department  
25 Aupuni Street, Room 109  
Hilo, Hawaii 96720

Thank you for allowing our office the opportunity to comment on the DEIS. We look forward to receiving a copy of the Final Environmental Impact Statement upon its acceptance by the accepting authority. Please contact Daryn Arai of this office should you have any questions.

Sincerely,

  
VIRGINIA GOLDSTEIN  
Planning Director

DSA:gp  
f:\wp60c\3111998\NRCS01.dta

c: OEQC



United States Department of Agriculture  
Natural Resources Conservation Service  
P.O. Box 50004  
Honolulu, HI 96850

Our People...Our Islands...In Harmony

August 19, 1999

Virginia Goldstein, Planning Director  
Planning Department  
County of Hawaii  
25 Aupuni St., Room 109  
Hilo, Hawaii 96720-4252

Dear Ms. Goldstein:

Subject: Lower Hamakua Ditch Watershed DEIS Review Comments

Thank you for your review of the Draft Environmental Impact Statement and Watershed Plan for the Lower Hamakua Ditch Watershed, County of Hawaii. We wish to respond to the comments in your letter dated December 29, 1998.

You are correct in assuming that the improvements proposed in Alternative 3, as the Selected Plan, will be those implemented through the Watershed Plan.

Comment: Section 6.7.1 states that "the land use changes caused by the Selected Plan will also conform to the allowable uses in the Agricultural District." We are concerned by these expected "land use changes." We would support a statement which concludes that the rehabilitation of the LHD system will support continued agricultural and related activities which are consistent with the project area's Agricultural District classification.

Response: The Watershed Plan intends to preserve agricultural use of the land in the project area designated as Agricultural District. The paragraph in question will be reworded with the language contained in your comment. ...

Comment: The Special Management Area (SMA) boundary for Waipio Valley is at the top of the valley walls and may include the improvements proposed at Hakaloa Falls, stream diversion structures, and the RTU relay station. Please conform the location of the improvements relative to the County's SMA. We recommend the statement that "on-farm assistance provided to agricultural operators and land owners will probably not be great enough to be classified as "development"" be deleted.

Response: The SMA boundary for Waipio Valley is acknowledged. We had mistakenly thought that the SMA was restricted to the valley floor. The discussion in Section 6.7.9 - Special Management Area will be changed to reflect the need to acquire SMA permits for the project improvements occurring below the

Virginia Goldstein, Planning Director  
Planning Department

valley rim. The sentence regarding on-farm assistance in Waipio Valley will  
be deleted.

Comment: Please include the SMA Permit Assessment in the list of requirements.

Response: SMA Permit Assessment has been added to Section 4.4.3 - Permits and  
Compliance.

Sincerely,



KENNETH M. KANESHIRO  
State Conservationist

cc: State of Hawaii Department of Agriculture  
State of Hawaii Office of Environmental Quality Control

12.29.98

Kamuela Kaneshiro  
State Conservationist

USDA Natural Resource Conservation Service  
300 Ala Moana Blvd. Room 4316

P.O. Box 50004

Honolulu, Hawaii 96850-0050

Lona Lona Hawaii Ditch Watershed

FIS

I just received a copy of this very exhaustive  
study of the above subject. How many years since  
1935 I was Dept. in charge of this Water Resource or  
Fertilizer at that time, as late as 9 months at Honolulu  
and retiring.

Perhaps I could have given you just input of  
some value from my knowledge and experience. I have  
made one too big into Westco, supplying the Ditch  
and Punal systems. I probably I used too many during  
one of several to make major repair. This was neglected  
during the last 25 years.

One, assuming you make on the availability

the induction of your group taking a  
second look at irrigation.

By the way, sugar mills need  
1 mil gal. of water for each 10 tons of granulated  
if the 3 plants under Harker, Reardon & Harker  
ground 200 tons the. Their factory required more  
200 mil gal. (Probably less if you re-visit  
water company)

Strom moved into the Ditch once he'd  
found one ch took us 6 weeks but 2000 run to  
clean out the Ditch to open the eye. That is  
why I suggest the Office worked with me  
credit for it. I had all the cost as well. In  
March of 1942 we had 85' of Rain in 5 days.

Your group did a very good job in  
examining the EIS -- I appreciate your  
Wages acts is every to clean and  
must reflect more in the State. It would be  
convenient to absorb it.

Wages Farmers should have no complaint  
over Ditch program. They should be more

of water for irrigation is incorrect. You claim  
that when water for farming came was no longer  
needed, it was available for irrigation.

On the contrary when mechanized farming  
started -- came water in all 3 Factors was  
required. They used enormous quantities of water.

In Harker we dugged 9 wells got  
data for Feb 23 Reardon in a 19" pipe to the  
Harrow Hill. We drilled first through an alluvial  
channel 750 ft deep -- with the subsoil water  
flow used to work cane

Reardon also had a smaller one. By the

way they got a quantity less than of water Ditch  
well as one of the conditions for financing the Ditch in

1909-1910. Therefore Reardon always had a  
supply of water for irrigation when Harker did  
not. Harker at Reardon got less than 2 feet  
and out of necessity had a shaft and main water  
dye which yielded 3 mil in the 1930's. That  
included their father-in-law's of the Ditch Floor  
The advent of large Forestry work should

Wages bet: The water leaving Wapiti  
with the company minister for 4 months. We  
found a great many small white holes  
from fishes disease in the lake.

: We had to cover the water  
catch and added copper sulfate to the Drinking  
water to avoid transmitting the Disease to cattle.

: As Wapiti ch is not desirable to  
grow because of the heavy flow for the season.

Wapiti can also be a trouble maker. In  
1949 we had one of 102 MPH. I had 25  
year old 900 lbs cow also ejected. There was  
not a leaf in Wapiti -- even grass.

The Tannin in 1946 when I returned had  
1' wide water 55' high - going 500 MPH. That  
can be frightening.

So work in Wapiti is not easy but the  
people... always come back.

There is plenty water for all - when I had  
out 30 mil -- then on 50 left on the  
Village. I saw a herd of 40 water buffalo  
in Wapiti.

covered on Flotilla. Some of the  
was created by clearing 1000 acres of forest  
back of Wapiti for corn. This was after I left  
to become Ft. Sigsbee at daylight and then 2 days  
at Okavango and did not participate in that.

We also installed a pump in Wapiti  
concern, ending up to 57th gate then on 18th  
stage of the flow of the dam to the Ditch outlet,  
we brought some from Wapiti.

When I worked on the ditch in Wapiti  
the panic grounds was marked only by  
the people. Now I work, as many are taking  
marginally as white powder.

The solution to me appears obvious  
(1) replace the bridge then at Hukou with a new  
hand.

(2) get the water after the main weir  
is - 1000 ft & maintain the old ditch is an  
act of futility.

In 1977 after a 9 month drought, people came a great  
distance to get drinking water. Saw a horse - 200 lbs (old)  
1600 lbs.

see p 5 Road

1-15-99

Kenneth H. Keneshiro  
State Commissioner  
NRCS

Restoration Proposal

Lower Homadua Ditch. (Upper ditch)

Please accept my following written comments which are given only at your Palo Verde hearing 1-11-99.

(1) Wasps nests emerging at the main weir is the worst, most visible and very porous water in the State.

(2) For this reason, to abandon it until the current migration.

(3) A bird cannot fly on one wing -- therefore creating only a water supply for some insect swarms is unwise thinking.

a - include water for Domestic Use.

b - include use for Industrial Use in Power

generator, sawmills and Fire Power.

c - include water for Fire Fighting.

(4) Based on experience since 1938 -- the 17 miles of open ditch would be impractical to maintain and impossible to maintain.

I have formerly proposed a plastic Pipe of at least 20 PSI for many years. This work would Ditch maintenance, remove water quickly, give up opportunity to develop Hydro power.

I also wrote Mayor S. Greenstein, urging the County to Reconsider this task of interest in this water for Domestic use.

Their support would help that the award, caused by the County on land along the Homadua Creek. Their lack of interest, shared by the Bishop Estate is unfortunate. But for the letter it may be good for the County.

Replacing the Tonguey Flume at Hulan in the Forest and more important help to take

During my tenure dating back 60 years I never saw a lack of water once in the Valley. Just the opposite was True -- to much out Flooding.

I was also allowed in Darby, having now been contacted more or asked a single question. Your EIS was good but could have been improved to deal more on pollutants such as my input.

Henry graduated in Engineering course  
me given on the camp's rebellion journal. I  
high cost will water. one need not be alert  
condition to compare the cost of drinking water and  
number of feet with own ability water. Some of it,  
mostly spent had of South thinking in cost.

Wagner water loss on some household coffee.  
Compare this to the camp's 1200's water which  
have a Davidson's secondary recharging with indication  
of safety.

Supplying Namakua with sperm uranium  
water in tons of Drought is wasteful thinking.  
Therefore please up date your report  
with many other potentials for the use of water  
water. This has been the object of the Namakua  
cost since 1910.

Please consider some input from Kelly Lee,  
my friend who has in Kabul.

I also feel bringing Taliban across Zula  
is far more prudent than fighting alone with  
in Jalle below Jalingo.

To avoid flooding, the 1000 cows,  
dozens of fresh cows feed of Helene and  
Wama. Cows should be retired by the Bishop  
Estate. They can afford this, since they acquired  
the company for 20,000,000 when it had an  
appraised value of 100,000,000. The reason being  
there is no one else around with the kind of  
money.

Lawrence (retire)  
don't remember this (Name might be)  
Namakua will be

PS: My interest in Namakua is because

- a. I want to see it done Right
- b. I do not want my firm to go to go bankrupt

c. I own no land here, except a

200 IP. Only that.

d. Namakua would water would be

a District.



Our People...Our Islands...In Harmony

August 19, 1999

Leon A. Thevenin  
104 Puako Beach Drive  
Kamuela, Hawaii 96743

Dear Mr. Thevenin:

Subject: Lower Hamakua Ditch Watershed DEIS Review Comments

Thank you for your review of the Draft Environmental Impact Statement and Watershed Plan for the Lower Hamakua Ditch Watershed, County of Hawaii. We also appreciate your discussions with the Wayne Subica and Dudley Kubo and your participation at the public meeting held in Honokaa. We would like to respond to the comments you provided in your three letters dated December 29, 1998, January 15, 1999, and January 23, 1999.

Comment: The DEIS states that when fluming of sugarcane to the mills stopped all of the water was available for irrigation. That was not correct because washers were needed at the mills. Haina Mill used nine MGD. Other mills also required wash water. The Paauilo Shaft was constructed to provide additional wash water to Paauilo Mill. A 750-KW hydroelectric generator was placed at the Haina Mill which operated without trouble for decades.

Response: A statement that the LHD also provided wash water to the mills will be included in Section 2.1.2 which provides brief history of the LHD. While this Watershed Project does not include provisions for hydropower development, the operator of the LHD agricultural water system can install such generators if favorable conditions exist.

Comment: Storm runoff into the ditch is a terrible problem. Clean out of the ditch following a major storm can be an enormous task. That is why I suggest installation of a pipe from the Main Weir to Paauilo.

Response: We are aware of the need to repair existing storm ditches and to install new ditches and diversions to handle the runoff above the LHD. As stated in the DEIS in Section 3.2.3, which discusses Alternative 3, the priority of improvements was first for components that were in a condition of imminent failure; second for areas of high water loss; and last, probably unfunded, for elements to reduce maintenance costs. Therefore, repair and construction of the storm ditches and earthwork to prevent runoff from entering the LHD will be undertaken as maintenance tasks by the operator of the agricultural water system.

U.S. Department of Agriculture  
Natural Resources Conservation Service  
P.O. Box 50904  
Honolulu, HI 96850

1-23-99

Kemula M. Kanuhoe  
State Geomorphologist

Renovate Lower Hamakua Ditch

Thank you for the review of the comments made at your Puako Hearing held in Honokaa on January 11, 1999. Do changes come out of all?

I already agree with your conclusion that retaining the 17 miles of open ditch to Paauilo would be more cost effective, than a pipeline which I proposed. The immediate restoration has little bearing on the issue that follows -- straight in the pipe-f.

Pipe	Renovate open ditch
Cost more	Cost less - questionable
No maintenance	Big 1/2 mile maintenance cost
Power into Paauilo	No feasibility study for Paauilo Center
No clogging of ditch	Control problem
No storm damage	Very noticeable to storm
No water theft	High water theft
No leakage & ditch loss	Loss amount to 10 to 20 mms
Prevent water for Paauilo	No power used
Hydro Power Potential	Not Hydro Potential
Current plan will result in a pipeline	
	Lower Hamakua Pipe (open) LHD Ditch

Leon A. Thevenin

We also looked hard at the pipeline alternative, Alternative 4, because it presented several advantages over the open ditch. However, the estimated lifecycle costs, including installation and maintenance over the 25-year life of the project, for the pipeline was nearly \$73,000 per year higher than the open ditch.

Comment: A hazard to livestock drinking LHD water is liver fluke which is harbored by snails in the ditch and in Waipio Valley.

Response: We checked on the liver fluke concern with the NRCS Grazing Land Specialist and Cooperative Extension Service Specialist. They stated that while the liver fluke does exist in the Waipio and Hamakua areas it has not caused an economic impact. Liver from Hamakua cattle are not marketed.

Comment: There is plenty water for all. When I took out 36 million - there was 50 left on the valley floor. I never heard of any water shortage in Waipio.

Response: Thank you for reinforcing our and other's contention that there has not been a shortage of water for taro cultivation.

Comment: The project should include domestic, industrial, and firefighting water supply in addition to irrigation.

Response: While the project plan has been based on irrigation and livestock water, the operators of the system can make water in excess of agricultural demand and Waipio Valley release available to nonagricultural uses. The charter for the irrigation district may restrict other water uses.

Comment: The County should be using the plentiful LHD water for domestic supply in Hamaku rather than pumping from deep wells and elevating the cost of water.

Response: The project sponsors have invited the Department of Water Supply (DWS) to participate in planning this project. The DWS has opted to use wells because the requirements for domestic water treatment are less for groundwater than for surface water. The project has no influence on the operations of the DWS.

Comment: Hanging pipelines across gulches is far more prudent than depending on gulch bottom footings.

Response: There may be some opportunities to suspend pipelines across gulches. Limiting factors will include total weight of the structure full of water and the suspended distance.

Comment: To avoid flooding, the 1,000 acres of denuded forestland above Hiihawe Falls should be revegetated by Bishop Estate.

Leon A. Thevenin

Response: The project sponsors have no influence on Bishop Estate operations in this area.

Comment: I was "stunned in disbelief" that I was not contacted for input during project planning. Please consider input from Kelly Loo, former superintendent, who lives in Kukuiaale.

Response: It was unfortunate that we were not in contact with you during planning. We intend to contact both you and Kelly Loo as construction plans and designs for repair of the LHD are prepared.

Comment: I strongly differ with your conclusions that restoring 17 miles of ditch would be more cost effective than a pipeline which I proposed. It is questionable that the renovation will cost less than a pipeline. The open ditch will require high maintenance costs. Poor water quality - unfit for domestic purposes. Constant clogging problems. Very vulnerable to storms. High water theft. Losses measured to 10% or more. No pressure water. Nil hydropower potential.

Response: While you are correct that the pipeline alternative will reduce or eliminate many of the problems of the open system and provide additional flexibility for hydropower and pressure flow, the additional \$7 million needed to implement the pipeline proposal cannot be offset by the additional benefits. The DOA may consider progressive conversion to pipeline during maintenance repair and replacement activities.

Sincerely,



KENNETH M. KANESHIRO  
State Conservationist

cc: State of Hawaii Department of Agriculture  
State of Hawaii Office of Environmental Quality Control





DEPARTMENT OF THE ARMY  
U.S. ARMY ENGINEER DISTRICT, HONOLULU  
FT. SHAFTER, HAWAII 96858-3440

REPLY TO  
ATTENTION OF

January 6, 1999

Civil Works Branch

Mr. Kenneth M. Kaneshiro  
State Conservationist  
Natural Resources Conservation Service  
U.S. Department of Agriculture  
P.O. Box 50004  
Honolulu, Hawaii 96850

Dear Mr. Kaneshiro:

Thank you for the opportunity to review and comment on the Draft Watershed Plan and Environmental Impact Statement (EIS) for the Lower Hamakua Ditch Watershed, County of Hawaii, Hawaii. The following comments are provided in accordance with U.S. Army Corps of Engineers authorities to provide flood hazard information and to issue Department of the Army (DA) permits.

- a. As noted in our previous letter dated September 18, 1995, a DA permit will be required for the project. For further information, please contact Mr. Peter Galloway of our Regulatory Section at 438-9258 and refer to file number 990000078.
- b. The flood hazard information provided on page 110 of the EIS is correct.

Sincerely,

Paul Mizue, P.E.  
Chief, Civil Works Branch

Copy Furnished:

Mr. Paul Matsuo  
Department of Agriculture  
State of Hawaii  
PO Box 22159  
Honolulu, Hawaii 96823-2159



United States  
Department of  
Agriculture

Natural  
Resources  
Conservation  
Service

P.O. Box 50004  
Honolulu, HI  
96850

Our People...Our Islands...In Harmony

August 19, 1999

Paul Mizue, P.E.  
Chief, Civil Works Branch  
U.S. Army Engineer District, Honolulu  
Ft. Shafter, Hawaii 96858-3440

Dear Mr. Mizue:

Subject: Lower Hamakua Ditch Watershed DEIS Review Comments

Thank you for your review of the Draft Environmental Impact Statement and Watershed Plan for the Lower Hamakua Ditch Watershed, County of Hawaii. We wish to respond to the comments contained in your letter dated January 6, 1999.

We acknowledge that a Department of Army permit will be required for portions of project implementation. Thank you for confirming the flood hazard information contained in the DEIS.

Sincerely,

KENNETH M. KANESHIRO  
State Conservationist

cc: State of Hawaii Department of Agriculture  
State of Hawaii Office of Environmental Quality Control

BENJAMIN J. CATYANO  
GOVERNOR



STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
869 PUNCHBOWL STREET  
HONOLULU, HAWAII 96813-5097

JWI - 6 1999

KAZU HAYASHIDA  
DIRECTOR  
SENIOR DIRECTOR  
BRUNN K. MUKAI  
GLENN H. OCHIMOTO

IN REPLY REFER TO:  
HWY-PS  
2.2217

U. S. States  
Department of  
Agriculture  
Natural  
Resources  
Conservation  
Service  
P.O. Box 50004  
Honolulu, HI  
96850



Our People...Our Islands...In Harmony

August 19, 1999

Kazu Hayashida, Director  
State of Hawaii  
Department of Transportation  
869 Punchbowl Street  
Honolulu, HI 96813-5097

Dear Mr. Hayashida

Subject: Lower Hamakua Ditch Watershed DEIS Review Comments

Thank you for your review of the Draft Environmental Impact Statement and Watershed Plan for the Lower Hamakua Ditch Watershed, County of Hawaii. We wish to respond to the comment contained in your letter, addressed to the State of Hawaii Department of Agriculture, dated January 6, 1999.

We acknowledge that construction plans for any work within the highway right-of-way will be submitted to the Division of Highways for review and approval.

Sincerely,

Thank you for requesting our review of the draft EIS.

The proposed improvements and management plans for the Lower Hamakua Ditch are not anticipated to have a significant impact on our State highways.

Construction plans for any work within our highway right-of-way must be submitted for our review and approval.

c: Kenneth M. Kaneshiro (Natural Resources Conservation Service, USDA)  
Gary Gill (OEQC)

KENNETH M. KANESHIRO  
State Conservationist

cc: State of Hawaii Department of Agriculture  
State of Hawaii Office of Environmental Quality Control



United States Department of the Interior

U.S. GEOLOGICAL SURVEY  
WATER RESOURCES DIVISION  
677 Ala Moana Boulevard, Suite 415  
Honolulu, Hawaii 96813

January 11, 1999

Mr. Kenneth M. Kaneshiro, State Conservationist  
Natural Resources Conservation Service  
United States Department of Agriculture  
P.O. Box 50004  
Honolulu, Hawaii 96850

Dear Mr. Kaneshiro:

Subject: Draft Watershed Plan-Environmental Impact Statement for Lower Hamakua Ditch Watershed

The staff of the U.S. Geological Survey, Water Resources Division, Hawaii District, has reviewed the subject EIS and we are pleased to offer the following comments:

1. The report was inconsistent in regards to the maximum flow to be diverted:  
  
On page xvi it was stated a maximum of 17 MGD will be diverted during peak use periods.  
  
On page 15 it was stated that the objective of the project was to ensure sufficient irrigation water for the 80 percent frequency of rainfall. In table B (which was given as using units of MGD but should more reasonably be GPD) the peak irrigation water need for the 80 percent event was given as 9,500 gallons per day per acre. Using the figure of 2,500 acres that will require irrigation, this works out to be a need for 23.8 MGD.  
  
Finally, on page B-5 the peak water usage of 17 MGD was broken down in detail and was based on irrigation needs identified as the average of high monthly irrigation needed at the 90 percent rainfall exceedance frequency.
2. The cost for flow monitoring was not listed as an OM&R requirement in table F.
3. The LHD tunnel system in Waipio Valley is known to both gain and lose water. How was this factored into the analysis? Are there any plans to reduce tunnel losses in the segment between Waimea Stream and the main weir? Also, there are about 15,400 feet of tunnels in the section of the LHD downstream from the main weir. There was no mention of flow losses or any other potential problems there.

4. On page 44 please note that the USGS flow data for the LHD cited for the period 1964-72 was below the main weir.
5. Throughout the report reference is made to flow in the Waioa River or Waipio Valley Streams. For example, on page 46 it was stated that the mean flow in the Waioa River will increase by 50 percent. However, flows along the streams in this area vary with location and references such as the above should be made site specific. In the above case it is likely that the reference location is the site of the discontinued USGS gage 16732200 on the Waioa River. The same holds true for the LHD where the most common reference location for statements made regarding flows is the main weir.
6. On page 48 it was stated that selected alternative 3 can provide up to 30 cfs reduction in flood discharge to Waipio Valley. This statement may be misleading in that the system is not operated to provide flood protection and a reduction of peak flows by 30 cfs will not provide meaningful protection in the Valley.
7. On page 50 it was stated that there are no adverse effects to threatened and endangered species. At this point it may be more accurate to say there are no known effects.
8. A critical point regarding flow diversions is the amount to be diverted versus the amount left in the streams during periods of baseflow. Throughout the report, estimates were given for these data. What was the source for the data?
9. There was no mention in the report of integrating the management of the upper and lower Hamakua Ditches to minimize disruption of streamflow, especially during periods of base-flow. Was this possibility considered?
10. On page 18 normal allowance for system losses was given as 20 percent, yet in appendix B and in figure 14 loss estimates shown for the new system are much greater than 20%.
11. On page 116 it was stated that about 24 MGD will be restored to Waipio Valley. However, average diversion rate is currently 25-30 MGD and project implementation calls for an average diversion rate of 9 MGD, so the restored flow should be 16-21 MGD. Also, on page 126 it was stated that restoration will average 18-23 MGD.
12. On page 117 it was stated that there has been no development of groundwater by the system. Also, the chart in figure 15 assumes there are no gains or losses of flow in the tunnel system in Waipio Valley. Both gains and losses are known to occur.
13. On page 117 it was stated that the selected alternative will not have a significant impact on ground-water quantity because ground-water development in the area is limited. However, it should be noted that the loss of leakage and irrigation recharge will result in an overall reduction of ground-water recharge to the basal aquifer.



United States  
Department of  
Agriculture  
Natural  
Resources  
Conservation  
Service  
P. O. Box 50004  
Honolulu, HI  
96850

Our People...Our Islands...In Harmony

August 19, 1999

William Meyer, District Chief  
U.S. Geological Survey  
Water Resources Division  
677 Ala Moana Blvd., Suite 415  
Honolulu, HI 96813

Dear Mr. Meyer:

Subject: Lower Hamakua Ditch Watershed DEIS Review Comments

Thank you for your review of the Draft Environmental Impact Statement and Watershed Plan for the Lower Hamakua Ditch Watershed, County of Hawaii. We wish to respond to the comments contained in your letter dated Jan 11, 1999.

Comment: The report was inconsistent in regards to the maximum flow to be diverted.

Response: The maximum diversion rate during baseflow periods has been reduced to 13 MGD as recommended by the U.S. Fish and Wildlife Service. This will be accomplished, basically, by placing plates over 30 percent of the intake gates to allow 30 percent of streamflow to bypass the diversion structures.

The 90% rainfall reference in the table footnote is in error and will be corrected to 80%. The 12.5 MGD for irrigation in the table reflects 2,500 acres using 5,000 gpd per acre.

The reference peak crop water demand will vary from 4,200 gpd per acre for crops grown in the more humid areas above 500 feet elevation to 5,200 gpd per acre for crops grown in the drier lower elevation areas. The two demand rates should not be added together.

Comment: The cost for flow monitoring was not listed as an OM&R requirement in Table F.

Response: Flow monitoring in Waipio Valley streams will be conducted on a limited term basis during the four-year installation period and is not considered to be OM&R.

Comment: Have tunnel gains and losses been factored into the analysis?

Response: While we recognize the uncertain nature of water losses and gains in the 10-mile transmission tunnel and the nearly 3 miles of tunnels along the open ditch, we are not aware of any inordinate losses or gains in the system. The assessment is based on information provided by the State Department of

14. On page 125, the last sentence reads "Factors in the lower reaches responsible....". These factors should be listed.

15. Throughout the report discussion was given regarding the 80 percent frequency rainfall as being one which occurs during two out of every ten years. This is misleading in that frequency analysis typically implies (using this case as an example) that on AVERAGE the event will occur during two out of every ten years.

16. On page 130 under the heading Mitigation, it is not clear how \$25,000 per year to assess improvements of aquatic habitat mitigates taro farming concerns.

17. On page 125 "1,000-foot tall Hiilawe Falls". On page 130 "the falls drop nearly 1,500 feet". Which is correct?

18. On page 134 it was stated that the current diversion accounts for nearly all the flow in the three streams being diverted. This would be true only for baseflow conditions.

Thank you for the opportunity to review this report. If you have any questions, please feel free to contact Mr. Richard Fontaine of my staff at (808) 522-8290.

Sincerely,

William Meyer  
District Chief

cc: Mr. Paul Matsuo, Dept. of Agriculture, State of Hawaii  
Mr. Gary Gill, Director, Office of Environmental Quality Control, State of Hawaii



Agriculture's maintenance contractors. Except for the tunnel repair at Hakaloa Falls, other activity in the tunnels was not contemplated as a part of the watershed project.

**Comment:** The USGS flow data for the period 1964-72 on page 44 was below the Main Weir.

**Response:** The flow through the Main Weir and the gage location, which is in the immediate vicinity of the Main Weir should be identical. Actually, the USGS Surface Water Supply publications for the 1960-1956 and 1966-1970 periods describes the location of gage 16-7331 as "30 ft upstream from the main weir."

**Comment:** Flows along Waipio Valley streams and along the LHD vary with location. References to flow should be made site specific.

**Response:** The EIS will be edited, as practicable, to provide a site location for references to LHD and Waipio Valley stream flows.

**Comment:** It was stated on page 48 that the selected alternative can provide up to 30 cfs reduction in flood discharge to Waipio Valley. This statement may be misleading in that the system is not operated to provide flood protection and a reduction of peak flows by 30 cfs will not provide meaningful protection in the valley.

**Response:** The statements for the alternatives in this summary section will delete the word "flood." The reduction of high flows by LHD diversion is considered important by taro growers in Waipio Valley. Management of the auwai (irrigation systems) is increased with fluctuations in flow.

**Comment:** On page 50 it is stated that there are no adverse effects to threatened and endangered species. At this point it may be more accurate to say that there are no known effects.

**Response:** The statements for the alternatives in this summary section will include the word "known."

**Comment:** What is the source of the data regarding the amount of flow to be diverted versus the amount left in the streams during periods of baseflow?

**Response:** The response to the question requires three parts.

The total demand during periods of drought for the agricultural build out condition was estimated and added to losses and other incidental uses to obtain the 17 MGD diversion rate.

The baseflow of the diverted streams is based on the John Mink's 1984 Water Resources and Development Report for Hamakua Sugar Company.

As stated above, the maximum diversion rate will be 70 percent of the streamflow, which is approximately 13 MGD. Once the projected agricultural buildout condition occurs, in five to ten years, there will be infrequent periods during which demand will exceed supply. Well development, conservation restriction programs, increased system efficiency, and reservoir development will be evaluated to respond to such situations.

**Comment:** Will there be integration of the management of the upper and lower Hamakua ditches to minimize disruption of streamflow, especially during periods of low flow?

**Response:** The integration of the management of the two systems to minimize disruption of dry period streamflow was not considered. During dry periods, the Waimea Irrigation System is generally dependent on water stored in its reservoirs due to diminished or nonexistent flow in the surface streams diverted by the Upper Hamakua Ditch. Modification of the operation of the Upper Hamakua Ditch system is beyond the scope of the present project.

**Comment:** Normal losses were given as 20 percent in DEIS. The losses for the new system are considerably greater than 20 percent.

**Response:** The repair and rehabilitation of the LHD will eliminate the major leaks from the system but will not be eliminate most of the lesser leaks nor be able to restore the system to as-new. A higher-than-normal water loss rate will still occur with implementation of the Selected Alternative. The economic analysis conducted for the project indicates that a partial repair with higher water losses and higher OM&R cost is still more cost-effective than rebuilding the system to minimize water loss and maintenance costs. The reference to "20 percent" will be omitted.

**Comment:** On page 116 it is stated that about 24 MGD will be restored to Waipio Valley. However, the average diversion rate is currently 25-30 MGD and with the project installed will be 9 MGD. So, the restored rate should be 16-21 MGD. On page 126 it is stated that the restoration will average 18-23 MGD.

**Response:** The confusion stems as a result of two sets of flow numbers - one at the Waipio Valley source and another for the LHD below the Main Weir. The gains and losses in the transmission tunnel to the Main Weir and discharge at the waste gate at the Main Weir have been largely ignored in the analysis.

The citation of page 116 will be changed from 24 MGD to 18-23 MGD to be consistent with page 126. The difference of 2 MGD from your computations will be assumed to be a result of loss in the tunnel or at the Main Weir.

William Meyer, District Chief  
U.S. Geological Survey

**Comment:** On page 117 it is stated that there has been no development of groundwater by the system. Also, the chart in Figure 15 assumes there are no gains or losses on the Waipio tunnel. Both gains and losses are known to occur.

**Response:** As there is no intention for the tunnel to capture groundwater flow, that the gain and losses through the tunnel are variable and insignificant to the operation of the system and to groundwater supplies, and that no body of data describing or recording the interaction of the tunnel and groundwater flow exists, the project analysis assumed that the gain and loss within the Waipio tunnel is inconsequential.

**Comment:** On page 117 it was stated that the selected alternative will not have a significant impact on groundwater quality because groundwater development in the area is limited. However, it should be noted that the loss of leakage and irrigation recharge will result in an overall reduction of groundwater recharge to the basal aquifer.

**Response:** The second sentence in the subject paragraph states that the leakage, which provides recharge to the Hamakua aquifer, will be eliminated. We do not feel that the loss of irrigation recharge, compared to the period of sugarcane cultivation, is an effect of this project to repair and rehabilitate the LHD.

**Comment:** On page 125, the last sentence reads "Factors in the lower reaches responsible ...". These factors should be listed.

**Response:** The sentence on page 125 will be expanded to read "Factors in the lower reaches of Waipio Valley, such as increased temperature, altered water chemistry, physical habitat modification, and introduced species, may be responsible for the lack of hiiwai in the system."

**Comment:** Throughout the report discussion was given regarding the 80 percent frequency rainfall as being one which occurs during two out of every ten years. This is misleading in that frequency analysis typically implies (using this case as an example) that on AVERAGE the event will occur during two years out of ten.

**Response:** References to the 80 percent rain will include the phrase "on average" when describing it as the event occurring during two out of every ten years.

**Comment:** On page 130 under the heading Mitigation, it is not clear how \$25,000 per year to assess improvements to aquatic habitat mitigates taro farming concerns.

**Response:** NRCS will contribute \$25,000, during the four-year installation period, to assist other efforts, primarily through the Division of Aquatic Resources to monitor and record streamflow in Waipio Valley. The streamflow data will be used by the Advisory Committee and the system manager to develop diversion/flow prescriptions which address the water requirements of the taro

William Meyer, District Chief  
U.S. Geological Survey

growers, in addition to that required for aquatic habitat improvement and agricultural water supply to the Hamakua area.


**Comment:** On page 125 "1,000-foot tall Iiilawe Falls". On page 130 "the falls drop nearly 1,500 feet". Which is correct?

**Response:** The statement on page 125 will be changed to "1,500-foot tall."

**Comment:** On Page 134 it was stated that the current diversion accounts for nearly all of the flow in the three streams being diverted. This would be true only for baseflow conditions.

**Response:** The statement on page 134 and in other appropriate sections will be changed to indicate that the diversion of nearly all streamflow occurs "during baseflow conditions."

Sincerely,

  
KENNETH M. KANESHIRO  
State Conservationist

cc: State of Hawaii Department of Agriculture  
State of Hawaii Office of Environmental Quality Control



Our People... Our Islands... In Harmony

August 19, 1999

Gordon Matsuoka  
Public Works Administrator  
Department of Accounting and General Services  
P.O. Box 119  
Honolulu, Hawaii 96810

Dear Mr. Matsuoka:

Subject: Lower Hamakua Ditch Watershed DEIS Review Comments

Thank you for your review of the Draft Environmental Impact Statement and Watershed Plan for the Lower Hamakua Ditch Watershed, County of Hawaii. We understand from your letter dated January 12, 1999, that the Department of Accounting and General Services has no comments at this time.

Sincerely,

KENNETH M. KANESHIRO  
State Conservationist

cc: State of Hawaii Department of Agriculture  
State of Hawaii Office of Environmental Quality Control

State of Hawaii  
Department of Agriculture  
Natural Resources Conservation Service  
P.O. Box 50004  
Honolulu, HI 96850



STATE OF HAWAII  
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES  
P.O. BOX 119, HONOLULU, HAWAII 96810

JAN 12 1999

Mr. Kenneth M. Kaneshiro  
State Conservationist  
Natural Resources Conservation Service  
United States Department of Agriculture  
P. O. Box 50004  
Honolulu, Hawaii 96850

Dear Mr. Kaneshiro:

Subject: Watershed Plan and Draft Environmental Impact Statement (EIS) for Lower Hamakua Ditch Watershed, Hawaii County

Thank you for the opportunity to review the subject draft EIS sent by your December 9, 1998 letter.

The project will not impact on any of our existing or proposed facilities. Therefore, we have no comments.

In the future, when actions described by Environmental Assessments, Environmental Impact Statement Preparation Notices, Environmental Impact Statements, Plan Review Use, etc., do not impact on specific state plans or facilities, we for work reasons will not provide a "no comments" or a "good planning principles evaluation" type of response. But, since we are still interested in knowing what is going on planning-wise in our State, we would still appreciate the opportunity to review all such documents.

If you should have any questions, please contact Mr. Ronald Ching of the Planning Branch at 586-0490.

Sincerely,  
  
GORDON MATSUOKA  
Public Works Administrator

RC/ET:jj  
cc: State Department of Agriculture  
OEQC

JAN 14 1999

BERNARD J. CAYLOR  
GOVERNOR



STATE OF HAWAII  
DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM  
HOUSING AND COMMUNITY DEVELOPMENT CORPORATION OF HAWAII  
677 QUEEN STREET, SUITE 300  
HONOLULU, HAWAII 96813  
FAX (808) 547-6860

DONALD K.W. LAU  
EXECUTIVE DIRECTOR

MARTIN L. INTASHIRO  
EXECUTIVE ASSISTANT

99:PEO/95

U.S. DEPARTMENT OF  
AGRICULTURE

Natural  
Resources  
Conservation  
Service

P.O. Box 50004  
Honolulu, HI  
96850



Our People...Our Islands...In Harmony

August 19, 1999

Donald K.W. Lau  
Executive Director  
DBEDT  
Housing and Community Development Corporation  
677 Queen Street, Suite 300  
Honolulu, Hawaii 96813

Dear Mr. Lau:

Subject: Lower Hamakua Ditch Watershed DEIS Review Comments

Thank you for your review of the Draft Environmental Impact Statement and Watershed Plan for the Lower Hamakua Ditch Watershed, County of Hawaii. We understand from your letter, addressed to the State of Hawaii Department of Agriculture, dated January 14, 1999, that the Housing and Community Development Corporation has no comments at this time.

Sincerely,

Thank you for the opportunity to review the subject draft EIS.  
We have no housing related comments to offer at this time.

c: Kenneth M. Kaneshiro, U.S. Dept. of Agriculture-NRCS  
OEQC

KENNETH M. KANESHIRO  
State Conservationist

cc: State of Hawaii Department of Agriculture  
State of Hawaii Office of Environmental Quality Control

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100



Jan-20-99 3P a l l i t o n e

7146731416

P.02

Jan-20-99 02:23P a l l i t o n e

7146731416

P.03

**Encogen Hawaii, L.P.**

JODY ALLIENE  
Project Development Manager  
3416 Via Udo, Suite E  
Newport Beach, CA 92663  
714-673-1317  
714-673-1416 fax

P.O. Box 309  
Honolulu, Hawaii 96727  
808-775-0043  
808-775-0219 Fax

**ENSERCH  
DEVELOPMENT  
CORPORATION**

3000 West MacArthur Boulevard  
Santa Ana, California 92704  
(714) 557-2530  
FAX (714) 662-4107

Jody Allione  
Senior Project Development Manager

FAX/MAIL  
(808) 541-1335

January 20, 1999

Mr. Kenneth Kaneshiro  
State Conservationist  
USDA Natural Resources Conservation Services  
300 Ala Moana Blvd  
Room 4316  
Honolulu, Hawaii 96850-0050

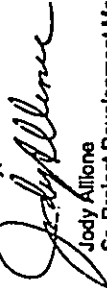
Re: Draft Watershed Plan- EIS  
Lower Hamakua Ditch Watershed  
Hawaii County, Hawaii

Dear Mr. Kaneshiro,

Referencing the EIS, page 108 Figure 13, it is noted that Enserch Inc. would use 1.5 MGD under Average Conditions. This is a misleading statement. Enserch does not intend to use water from the Hamakua Ditch for its daily plant operations. This was stated to you in my January 9, 1998 letter following my conversation with Mr. Paul Matsuo (see attached).

The Encogen cogeneration plant will obtain its plant water from an onsite well that was successfully drilled and tested in 1998. Please remove this reference from the EIS (as well as any other mention of such use of the Hamakua Ditch water by Enserch or the Encogen project), except as stated in the referenced letter.

Sincerely,



Jody Allione  
Sr. Project Development Manager

cc: S. White, EDC  
S. Burt, Jones Capital  
T.Lui Kwan, Carlsmith Ball

January 9, 1996

Lower Hamakua Ditch Watershed Project  
c/o Mr. Kenneth Kaneshiro  
P.O. Box 50005  
Honolulu, HI 96850

Dear Mr. Kaneshiro,

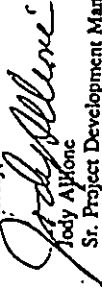
Mr. Paul Matsuo asked me to provide the water requirements for the 60 McGowan Hamakua Cogeneration Project currently being proposed at the Haina Mill site. Mr. Matsuo indicated that this information would be useful for the preparation of the Environmental Impact Report and related planning for the Hamakua Ditch Project.

Enserch plans on utilizing well water for the project, but if there is an adequate supply of Hamakua Ditch water at a reasonable price, we would be interested in using this source of water on an as available basis.

We have calculated a range of water consumption which includes two aquaculture facilities on the site. The minimum daily use would be 1.8 MGD based on a minimum consumption level throughout the day. The maximum daily use would be 3.6 MGD based on minimum consumption for nineteen hours per day and a maximum during five nighttime hours. Under this scenario, the nighttime rate would be 5868 gpm, and the daytime use at 1243 gpm. These numbers are subject to change based on the final engineering design.

We hope this information is useful to you and will be happy to answer any additional questions you may have about the cogeneration project.

Sincerely,



Jody Allione  
Sr. Project Development Manager  
Enserch Hamakua Cogeneration Project

cc: Paul Matsuo, State of Hawaii Agricultural Resource Management Division  
John Spicer, EDC



United States Department of Agriculture

Natural Resources Conservation Service

P.O. Box 50004 Honolulu, HI 96850

Our People...Our Islands...In Harmony

August 19, 1999

Jody Allione Sr. Project Development Manager Encogen Hawaii, L.P. 3416 Via Lido, Suite E Newport Beach, CA 92663

Dear Ms. Allione:

Subject: Lower Hamakua Ditch Watershed DEIS Review Comments

Thank you for your review of the Draft Environmental Impact Statement and Watershed Plan for the Lower Hamakua Ditch Watershed, County of Hawaii. We understand from your letter dated January 20, 1999, that the Enserch power generation facility will not use Lower Hamakua Ditch water. The EIS will be changed to indicate that Enserch will not use LHD water.

Sincerely,

[Signature] KENNETH M. KANESHIRO State Conservationist

cc: State of Hawaii Department of Agriculture State of Hawaii Office of Environmental Quality Control

TECHNOLOGY FOR EARTH

THE BEST CHOICES FOR EARTH AND FOR PEOPLE

HOWARD O. WRIGHT, Ph.D.

HCR 3 Box 13043, Keaau, HI 96749 -9209 tel/fax (808) 982-7133

Kenneth Kaneshiro State Conservationist USDA Natural Resources Conservation Service

300 Ala Moana Blvd., Rm. 4316 P.O. Box 50004 Honolulu HI 96850 -0050

Dear Mr. Kaneshiro:

The following is a comment on the Draft Environmental Impact Statement on the Lower Hamakua Ditch Watershed Plan:

The potential of using the project to generate electricity seems not to have been considered. The description of the project in the Draft Statement does not contain sufficient detail to allow an accurate calculation of the potential hydroelectric benefits of the project. However, some rough estimates can be made from the data given. For example, if the section now in open ditch carries an average of nine million gallons per day at an average drop of 500 feet, it could generate more than 500 kilowatts of electricity.

If the electricity were sold to HELCO, it would be worth more than \$200,000 per year. Under certain other circumstances, the gain might be much higher. Since a project of this sort would have certain special advantages for the local utility, it is possible that much of the project cost could be financed by the sale of electricity.

The electricity need not be generated all at one site, nor would special transmission lines necessarily be required. Turbines at agricultural turnouts are often cost effective with heads as low as three feet. California's Modesto Irrigation District, with much less favorable topography than that in Hamakua, uses many different types of turbines.

The subject is technical, but much usable information exists to assess the feasibility of recovering energy as well as water from the project. Both state and national policies mandate maximum use of renewable energy. I will be glad to go into more detail with your staff if you so desire.

Sincerely,

*Howard O. Wright, Ph.D.*

Howard O. Wright, Ph.D.



United States Department of Agriculture

Natural Resources Conservation Service

P.O. Box 50004  
Honolulu, HI 96850

*Our People...Our Islands...In Harmony*

August 19, 1999

Howard O. Wright, Ph.D.  
Technology for Earth  
HCER 3 Box 13043  
Keeau, Hawaii 96749-9209

Dear Mr. Wright:

Subject: Lower Hamakua Ditch Watershed DEIS Review Comments

Thank you for your review of the Draft Environmental Impact Statement and Watershed Plan for the Lower Hamakua Ditch Watershed, County of Hawaii.

We agree with your assessment that opportunities for hydroelectric power generation exist on the Lower Hamakua Ditch system. However, for the present watershed plan only those components that are essential to the continued operation of the conveyance and which address community concerns were evaluated. As the implementation designs for the lateral systems are developed, the Department of Agriculture and water system management will have opportunities to incorporate hydroelectric generators.

Sincerely,

*Kenneth M. Kaneshiro*

KENNETH M. KANESHIRO  
State Conservationist

cc: State of Hawaii Department of Agriculture  
State of Hawaii Office of Environmental Quality Control

BENJAMIN J. CASTILANO  
DEPARTMENT OF AGRICULTURE



STATE OF HAWAII  
DEPARTMENT OF LAND AND NATURAL RESOURCES  
LAND DIVISION  
ENGINEERING BRANCH  
P.O. BOX 275  
HONOLULU, HAWAII 96850  
January 21, 1999

MAURICE E. JOHNS, CHIEF ENGINEER  
DEPARTMENT OF LAND AND NATURAL RESOURCES  
LAND DIVISION  
ENGINEERING BRANCH  
P.O. BOX 275  
HONOLULU, HAWAII 96850



Our People...Our Islands...In Harmony

August 19, 1999

Andrew M. Monden  
Chief Engineer  
DLNR Land Division  
P.O. Box 373  
Honolulu, Hawaii 96809

United States Department of Agriculture  
Natural Resources Conservation Service  
P.O. Box 50004  
Honolulu, HI 96850

Mr. Kenneth M. Kaneshiro, State Conservationist  
Natural Resources Conservation Service  
United States Department of Agriculture  
P.O. Box 50004  
Honolulu, Hawaii 96850

Dear Mr. Kaneshiro:

Revised Draft Watershed Plan-Environmental Impact  
Statement for Lower Hamakua Ditch Watershed

This is in reference to your letter of December 9, 1998. We previously reviewed the draft Watershed Plan-Environmental Impact Statement for the subject project, and have the following additional comment:

We recommend that the proposed improvements located in the flood zone be designed in accordance with applicable sections of Chapter 27 of the Hawaii County Code.

Thank you for the opportunity to review the revised draft Watershed Plan-Environmental Impact Statement for the subject project.

Should you have any questions, please contact Mr. Eric Yuasa of our Project Planning Section at 587-0229.

Sincerely,

*Andrew M. Monden*  
ANDREW M. MONDEN  
Chief Engineer

Dear Mr. Monden:

Subject: Lower Hamakua Ditch Watershed DEIS Review Comments

Thank you for your review of the Draft Environmental Impact Statement and Watershed Plan for the Lower Hamakua Ditch Watershed, County of Hawaii. We wish to respond to the comment contained in your letter dated January 21, 1999.

Comment: We recommend that the proposed improvements located in the flood zone be designed in accordance with applicable sections of Chapter 27 of the Hawaii County Code.

Response: Any improvements located in flood zones will be designed in accordance with the floodplain management provisions of the Hawaii County Code.

Sincerely,

*Kenneth M. Kaneshiro*  
KENNETH M. KANESHIRO  
State Conservationist

cc: State of Hawaii Department of Agriculture  
State of Hawaii Office of Environmental Quality Control

DI:ex



## United States Department of the Interior

OFFICE OF THE SECRETARY  
Office of Environmental Policy and Compliance  
600 Harrison Street, Suite 515  
San Francisco, California 94107-1576

January 25, 1999

ER 98/0834

Kenneth M. Kaneshiro, State Conservationist  
Natural Resources Conservation Service  
United States Department of Agriculture  
P.O. Box 50004  
Honolulu, Hawaii 96850

Dear Mr. Kaneshiro:

The U. S. Department of the Interior (Department) has reviewed the Draft Environmental Impact Statement (DEIS) for the Lower Hamakua Ditch Watershed Plan, Hawaii County, Hawaii. The following comments are provided for your consideration when preparing the Final Environmental Impact Statement (FEIS).

### GENERAL COMMENTS

The DEIS adequately describes the proposed action which involves repair and modification of the existing Lower Hamakua Ditch (LHD). The proposed repair and modification are needed to provide a dependable water supply for 2,500 acres of irrigated crop land and five acres of aquaculture facilities on the Hamakua Coast of the island of Hawaii. A state-operated agricultural water system would also be established under the provisions of Chapters 167 and 168 of the Hawaii Revised Statutes.

The Department supports restoration of Hawaiian stream systems to ecological conditions as close as possible to the natural state. We recommend the proposed restoration include: 1) restoring flows in historically perennial streams; 2) recovery of the Waioala River system, including its upper reaches, from alien species; and 3) re-colonization of streams by dominant native species (Please note: the potential for re-colonization is diminished when streams are periodically diverted).

However, the Fish and Wildlife Service (FWS) is primarily concerned with the proposed removal of most of the base flows of the Kawaiwi, Alakahi, and Koinawe streams during conditions of drought. The FEIS should address the potential impacts on fish and wildlife resources. In addition, the FEIS should ensure the proposed project allows for greater net benefits to native fish and wildlife species than what the DEIS' proposed water diversion system would provide.

Kenneth M. Kaneshiro, State Conservationist  
Natural Resources Conservation Service

Therefore, we recommend the intake structures have a variable diversion design as stated in the proposal and the structures be set to divert a maximum of 70 percent of stream base flow even during drought conditions. The FEIS also should provide criteria for determining when and how much water may be diverted to the LHD when agricultural developments need additional water beyond the recommended stream base flow of 70 percent during drought conditions.

The FEIS needs to provide an analysis of ground-water and surface-water conditions complete enough to determine the increased contamination risk to water from increased farming activities

### SPECIFIC COMMENTS

Page 43, Subsection 1.4.4, Environmental Analysis, Paragraph 1. The third sentence should state that the intakes are designed to take all of the base flow of these streams. Provision of adjustable gates on the intakes does not mitigate adverse effects of construction work and does not, in itself, ensure minimum base flow for healthy fish and wildlife. We recommend redesign of the intake structures to allow passage of at least 30 percent of base flow. Otherwise, all or almost all of the water in the streams would continue to be diverted during periods when low stream flows coincide with high demand.

Page 110-111, Section 6.1.1, Flooding/Settling. Some of the study area lies in the 100-year coastal flood plain. It is apparent from the past flooding history that flood damage would continue to be a costly problem even after repairs are made to the LHD structure. The FEIS should clarify how these costs would be included in annual costs. It is unlikely that the Natural Resources Conservation Service would provide assistance because of the recurring flooding. More analysis of flood control and flood damage in the FEIS could avoid major damage to soils, roads, crops, and the LHD itself.

Page 113-114, Subsection 6.3.5, Threatened and Endangered Species. Based on the information presented in paragraphs 6 through 9, the FWS is concerned over the survival of the skating fly (*Sigambra meoohi*). This dolichopodid fly species, which has been observed in the upper levels of the Waioala Stream system, is an undescribed Hawaiian stream fly which is not listed under the Endangered Species Act of 1973. All surveys, through December 1998, indicate that this species is a stream rifle dweller and is capable of living at elevations below that of the intake structures. Water diversion above the skating fly's habitat would reduce the volume and size of available stream riffles, especially during times of base flow. Therefore, the intake structures should have a variable diversion design as stated in the proposal, and the structures should be set to divert a maximum of 70 percent of stream base flow even during drought conditions. The FEIS needs to include criteria for determining when and how much water may be removed when agricultural developments need additional water beyond the recommended 70 percent of stream base flow during drought conditions.

Kenneth M. Kaneshiro, State Conservationist  
Natural Resources Conservation Service

Kenneth M. Kaneshiro, State Conservationist  
Natural Resources Conservation Service

4

Page 114. Section 6.3.6 Surface Water Quality and Quantity. The DEIS states that "none of the streams have (sic) been monitored for water quality information." The effects on the water quality from farming need to be adequately documented in the FEIS to determine contamination risk and the effects of increased farming on water-quality trends.

Page 116. Subsection 6.3.6. Surface Water Quality and Quantity. Paragraph 5 asserts that stream system instability would result from increased water restoration into the stream system. Studies by Kinzie et al. (1997) have indicated that increased base flows improve conditions during high water levels, and significantly affect opening of the bed, reducing vegetation encroachment, and reducing overall bank erosion. This information should be included in the FEIS.

Page 117. Section 6.3.7 Groundwater Quality and Quantity. The DEIS states that "water quality information is not available on the aquifers underlying the LHD Watershed area." Baseline ground-water quality and quantity information on wells and aquifers in the watershed should be fully documented in the FEIS before the LHD Watershed Plan is adopted.

Pages 125-126. Subsection 6.3.14. Aquatic Habitat/Natural Stream Flows. Native stream fauna, such as gobies and snails, currently are anomalously rare in the reaches below and above the intakes of the LHD. Although determining causation is impossible without pre-LHD faunal data, this pattern is consistent with the known effects of the Ditch on stream flows. A study by Michael Fitzsimons, et al. (1997) states that restoring strong perennial flows is a necessary component for goby colonization of streams. The FEIS needs to fully address the proposed project's potential to adversely impact the seasonal recruitment and re-colonization of native stream organisms.

Potential goby re-colonization and stronger atyid shrimp (*Atyoida bimaculata*) (*opac koathivi*) establishment in the upper sections of the Waioia River system are currently prevented by the existing intake design. This design results in sections of dry stream bed immediately downstream of the structure during drought conditions. These dry bed sections could inhibit recolonization if other restrictive conditions, i.e., threat of alien species problems, decrease. Proposed provision of adjustable gates on the intakes does not mitigate adverse effects of construction work and does not, in itself, "assure some minimum flows will remain in-stream."

The intake structures need to be redesigned to pass at least 30 percent of base flow and prevent entrainment of animal larvae spawned upstream during base flow. This redesign would allow more native animal reproduction take place above the intakes. Equipping the intake structures with approximately two-foot wide iron plates, set flush on top of the outermost edges of the diversion gates, would facilitate upstream migration of stream animals. Because gobies tend to migrate upstream along only the outer edges of a stream, the FEIS should incorporate this design provision to facilitate future goby re-colonization of the upper stream system of the Waioia River.

SUMMARY

Operation of the LHD would continue to impact the stream ecosystems of Waipio valley unless sufficient minimum flows of the base flow are allowed to remain in the streams under all conditions, including drought. Sufficient minimum flows would allow populations of native fish and molluscs and other invertebrates to repopulate the Waioia River System. We recommend that the FEIS include: 1) a minimum base flow of 30 percent for the streams even in times of drought and 2) criteria for determining when and how much additional water may be diverted in the event of drought.

We prefer adoption of the watershed plan and proposed project be based on the capability of the ecosystem to yield water without negatively impacting the in-stream biota. Project parameters should be based on the volume and timing of ditch flows that could be extracted from the streams in other than base flow conditions. As the average flow in the ditch has been near 30 million gallons per day (MGD) for 85 years indicates "surplus water" is almost constantly available above the 19 MGD base flow. We recommend revising the project to support irrigation for agriculture along the LHD as well as restoring fish and wildlife populations in Waipio Valley.

Thank you for the opportunity to comment on the DEIS.

Sincerely,

Patricia Sanderson Port  
Regional Environmental Officer

cc: Director, OEPC, w/original incoming  
Regional Director, FWS, Portland  
Director, USGS, Reston, VA



Our People...Our Islands...In Harmony

U. S. Dept. of Agriculture

Fitzsimons, J.M. & H.L. Schoenfluss. *Miconesica* 30(1): 117-125, 1997.

Kinzie, R. A. III, Chong, C., Devrell, J., Lindstrom, D., Moser, D., & R. Wolff. Final Report on "Effect of Flow Regimes on Productivity in Hawaiian Stream Ecosystems". (From State of Hawaii, Division of Aquatic Resources funded project report). May 23, 1997.

REFERENCES

August 19, 1999

Patricia Sanderson Port  
Regional Environmental Director  
Office of Environmental Policy and Compliance  
U.S. Department of the Interior  
600 Harrison Street, Suite 515  
San Francisco, California 94107-1376

Dear Ms. Port:

Subject: Lower Hamakua Ditch Watershed DEIS Review Comments

Thank you for your review of the Draft Environmental Impact Statement and Watershed Plan for the Lower Hamakua Ditch Watershed, County of Hawaii. We wish to respond to the comments contained in your letter dated January 25, 1999.

Comment: The DOI supports restoration of Hawaiian stream systems to ecological conditions as close as possible to the natural state.

The FWS is concerned with the proposed removal of most of the base flows of the Kawaiwi, Alakahi, and Koiawe streams during conditions of drought. The FEIS should address the potential impacts on fish and wildlife resources. In addition, the FEIS should ensure the proposed project allows for greater benefit to native fish and wildlife species than what the DEIS' proposed water diversion would provide.

Therefore, we recommend the intake structures have a variable diversion design as stated in the proposal and the structures be set to divert a maximum of 70 percent of baseflow even during drought conditions. The FEIS also should provide criteria for determining when and how much water may be diverted to the LHD when agricultural developments need additional water beyond the recommended stream base flow of 70 percent during drought conditions.

Response: NRCS supports restoration of Hawaiian stream systems to reestablish native ecosystem health. NRCS and the sponsors also support beneficial out-of-stream use of the water resource, such as for agricultural use.

The recommendation to limit diversion to 70 percent of streamflow during baseflow conditions will be adopted. Basically, plates will be placed along the outside edges of the intake gates to cover 30 percent of the intake gates. The detailed design will be developed in consultation with the USFWS.

We are unable to predict the effects of the change in hydrology of streams to aquatic habitat due to the lack of data in this area. We have discussed the issues with the USFWS, the Hawaii Division of Aquatic Resources (DAR), and the 1996 aquatic survey consultant. There is agreement that more research relating the health of native stream ecosystems to streamflow hydrology is needed to determine the effects of this and other such diversions. The biologists at the DAR hold the opinion that high flow events are important to recruitment and movement of native aquatic species and that the organisms are adapted to periods of little or no flow in the streams.

The DAR will be sponsoring a study of the Waipio Valley streams to determine the effects of streamflow levels on native aquatic organisms. The watershed project will participate in this and, perhaps other investigations, with funding contributions for gaging and monitoring for a four-year period. The data developed during the studies will be used by the Advisory Committee and the agricultural water system management to develop diversion and streamflow prescriptions.

We will rely on a process of adaptive management in which the Advisory Committee and the agricultural water management will utilize the data acquired through gaging and other studies; monitor effects of system operation on aquatic resources, taro cultivation, and agriculture in the Hamakua area; and modify the system operation to optimize the benefits of the water system to all of the affected users and resources.

**Comment:** Section 3.4.4 - The third sentence in paragraph 1 states that the intakes are designed to take all of the baseflow of the streams. Provision of adjustable gates on the intakes does not mitigate the adverse effects of construction work and does not, in itself, ensure minimum base flow for healthy fish and wildlife. We recommend redesign of the intake structures to allow passage of at least 30 percent of baseflow. Otherwise all or almost all of the water in the streams would continue to be diverted during periods when low streamflows coincide with high demand.

**Response:** As stated in the first response above, the recommendation to limit baseflow diversion to 70 percent of streamflow will be adopted.

**Comment:** Section 6.3.3 - Some of the study area lies in the 100-year coastal floodplain. It is apparent from past flooding history that flood damage would continue to be a costly problem even after repairs are made to the LHD structure. The FEIS should clarify how these costs would be included in annual costs. It is unlikely that the NRCS would provide assistance because of the recurring

flooding. More analysis of flood control and flood damage in the FEIS could avoid major damage to soils, roads, crops, and the LHD itself.

**Response:** The Effects section will be rewritten to emphasize that flooding is not expected to significantly affect the LHD. Potential problems caused by a major flood event can include scour and debris damage to the concrete and steel diversion structures, entry of floodwater and sediment into the open ditch due to failure of the storm ditches, and scour at the existing outstone flume foundations. Each of these problems will be corrected through the Operation, Maintenance, and Replacement program of the agricultural water system.

The lack of maintenance and obliteration of the many storm diversions and terraces constructed throughout the agricultural area by the sugar companies is worrisome. Without their continued existence, storm runoff may concentrate in the cropland and cause gully erosion, sediment deposition, and resulting crop loss. The concern is addressed through the land treatment component of the watershed project, which extends technical and financial assistance to farmers and ranchers to restore storm diversions and terraces and with other practices to control storm runoff.

**Comment:** Section 6.3.5 - The previously undescribed Hawaiian stream fly (*Sigmalineurum meachii*) is a stream riffle dweller and is capable of living at elevations below that of the intake structures. Water diversion above the stream fly's habitat would reduce the volume and size of available stream riffles, especially in times of baseflow. Therefore the structures should have a variable diversion design as stated in the proposal and should be set to divert a maximum of 70 percent of baseflow during drought periods.

**Response:** The diversions will be modified to divert a maximum of 70 percent of baseflow and will enhance habitat for aquatic insects below the diversion structures.

During the December 1998 survey by England and Preston of the Hawaiian stream fly it was observed below the Alakahi and Koiawe diversions. Overflow of the diversion structures was taking place at that time. However, the location of the diversions and stream reach below the diversion where the stream fly was observed is at the lower end of the identified habitat for the species. The main habitat for the stream fly appears to be at elevations above the diversion structures and will not be affected by project implementation.

**Comment:** Section 6.3.6 - The effects on the water quality from farming needs to be adequately documented in the FEIS to determine contamination risk and the effects of increased farming on water quality trends.

**Response:** The Effects subsection of Section 6.3.6 will be expanded to discuss the surface water quality risk from current and future agricultural activity on the Hamakua coast project area.



**Comment:** Section 6.3.6 - DEIS asserts that stream system instability would result from water restoration to Waipio Valley streams. Studies by Kinzie et. al. (1997) have indicated that increased baseflows improve conditions during high water levels, and significantly affect opening of the bed, reducing vegetative encroachment and reducing overall bank erosion.

**Response:** While we agree that higher baseflows will eventually provide the beneficial changes described in the comment, the adjustment of the stream system to the higher baseflows will create bank and bottom instability during the period prior to establishment of a new stream equilibrium. The taro farmers in the valley have expressed concern that without assistance to provide maintenance work in the river system and to modify their auwai intakes, the increase in baseflow will adversely affect their taro operations.

The summary of Kinzie's findings will be inserted in the FEIS. A statement that the instability will occur during the period of adjustment to a new state of stream equilibrium will also be inserted into the subject paragraph. The time frame for the adjustment process is undetermined.

**Comment:** Section 6.3.7 - "The DEIS states that 'water quality information is not available on the aquifers underlying the LHD Watershed area.'" Baseline groundwater quality and quantity information on wells and aquifers in the watershed should be fully documented in the FEIS before the LHD Watershed Plan is adopted.

**Response:** The DEIS states that water quality information is not available only for the Waimanu Aquifer system which is undeveloped with the exception of Waipio Valley. The DEIS discusses water quality in the Pauilo and Honokaa Aquifer systems. The section will be expanded to include more of the currently available well data.

**Comment:** Section 6.3.14 - The FEIS needs to fully address the proposed project's potential to adversely impact the seasonal recruitment and recolonization of native stream organisms. Potential goby and ayid shrimp recolonization and establishment in the upper section of the Waioa River system are currently prevented by the existing intake design which results in sections of dry streambed immediately downstream of the structure during droughts. These dry bed conditions could inhibit recolonization [of the upper sections of Waioa River] if other restrictive conditions, i.e., threat of alien species problems, decrease.

The intake structures need to be redesigned to pass at least 30 percent of base flow and prevent entrainment of animal larvae spawned upstream during base flow. Equipping the intake structures with approximately two-foot wide iron plates, set flush on top with the outermost edges of the diversion grates, would facilitate upstream migration of stream animals. Because gobies tend to migrate upstream along only the outer edges of streams, the FEIS should

incorporate this design provision to facilitate future goby recolonization of the upper stream system of the Waioa River.

**Response:** The Setting subsection of Section 6.3.14 will be expanded with the following paragraph.

A combination of widely-held concepts regarding the native gobies and observations of the Waipio Valley stream system indicate that an increase in the release of baseflow at the Lower Hamakua Ditch diversions alone may not reestablish significant populations of o'opu in the upper Waioa River stream system.

Recruitment of post-larval gobies from the ocean into the stream system is triggered by a freshet plume extending into the ocean. Individual gobies do not "home" to a particular stream signature, but can be recruited to any stream system. Gobies that habitate middle and higher stream reaches are adapted to dry stream conditions that result in cessation of streamflow and in isolation of pools of water along the streambed. Spawning and migration of larvae to the ocean is triggered by high streamflows.

During the 1996 survey by England all five species of native goby were observed in the Hiiilawe/Lalakea Stream system which flows into Waioa River approximately one-half mile before flowing to the ocean. O'opu alamo'o (*Lentipes concolor*) was found above Hiiilawe Falls at 2,000 feet elevation. Climbing of a 1,000-foot tall waterfall is required to reach that elevation. This demonstrates the ability of the species to negotiate difficult barriers during its upstream migration. Movement up Hiiilawe Falls is particularly difficult because the upper third of the falls and 2,500 feet of the stream above the falls is often dry up to the Lalakea Ditch diversion which is located at nearly the 2,000-foot elevation below the sampling station.

Only O'opu nakea (*Awaous guamensis*) and one individual of O'opu nopihi (*Sicyopterus stimpsoni*) were found in the ten transects in the upper part of the Waioa River, above 480 feet. No o'opu were found at the four transects above the LHD diversions. Only the dry reach of Kawainui Stream below the diversion structure was characterized as "poor" habitat.

The report recommends that "Because factors other than the Lower Hamakua Ditch appear to be influencing the abundance of native animals in Waipio Stream and its tributaries, mitigation measures aimed at ameliorating effects of the ditch may not result in measurable differences in species composition and abundance of stream organisms. The cost of mitigation measures should be weighed against the potential benefit before any steps are taken."

Through a process of adaptive management, the diversion rates may be modified and other measures taken to improve aquatic habitat conditions and increase the population of native organisms, especially native gobies throughout the Waipio watershed. The diversion "bypass" described in the



RECEIVED  
DIVISION OF  
LAND MANAGEMENT  
JAN 25 9 52 AM '99  
STATE OF HAWAII  
DEPARTMENT OF LAND AND NATURAL RESOURCES

WALTER WILSON, CHAIRPERSON  
LAWRENCE B. GILBERT, DEPUTY CHAIRPERSON  
THOMAS L. JONES, DEPUTY CHAIRPERSON  
• Board of Land and Natural Resources  
• Commission on Water Resource Management  
• Advisory Committee  
• Planning and Policy  
• Conservation  
• Division of Land Management  
• Division of Natural Resources  
• Division of Water Resources  
• Division of Wetlands  
• Division of Wildlife Resources  
• Division of Forest Resources  
• Division of Geology  
• Division of Parks and Recreation  
• Division of Public Works  
• Division of Transportation  
• Division of Energy and Public Utilities  
• Division of Health Services  
• Division of Labor Relations  
• Division of Public Safety  
• Division of Social Services  
• Division of State Printing  
• Division of Statewide Planning  
• Division of Technical Services  
• Division of Information Services  
• Division of Intergovernmental Affairs  
• Division of Legislative Services  
• Division of Office of the Attorney General  
• Division of Office of the Comptroller  
• Division of Office of the Treasurer  
• Division of Office of the Secretary of State  
• Division of Office of the Governor  
• Division of Office of the Lieutenant Governor  
• Division of Office of the Chief of State  
• Division of Office of the State Historian  
• Division of Office of the State Librarian  
• Division of Office of the State Archivist  
• Division of Office of the State Curator  
• Division of Office of the State Historian  
• Division of Office of the State Librarian  
• Division of Office of the State Archivist  
• Division of Office of the State Curator

Patricia Sanderson Port  
Regional Environmental Director

comment by U.S. Fish and Wildlife Service will be adopted to increase the baseflow released to the stream and enhance aquatic habitat below the diversions.

Sincerely,

KENNETH M. KANESHIRO  
State Conservationist

cc: State of Hawaii Department of Agriculture  
State of Hawaii Office of Environmental Quality Control

P.O. BOX 821  
HONOLULU, HAWAII 96808

January 11, 1999

MEMORANDUM  
LOG NO: 22753  
DOC NO: 9901HM/01

To: DEAN UCHIDA, Administrator  
Land Division  
From: DON HIBBARD, Administrator  
Historic Preservation Division  
SUBJECT: Lower Hamakua Ditch Draft Watershed Plan - Draft Environmental Impact Statement (Section 106, NHPA and Chapter 6E-8, H.R.S) Hamakua, Hawaii Island, TMK: 4-3 to 9; various parcels

History and Culture

We have reviewed the Draft Environment Impact Statement (DEIS) prepared for the Lower Hamakua Ditch Watershed Plan and have noted one omission in regards to the identification of potentially impacted historic properties and the disclosure of measures to mitigate these impacts. The restoration of Hakalaoa Falls is described as part of the proposed project of this DEIS, and we believe that Hakalaoa Falls itself and the waters it joins to form Hiliawe Falls are eligible for inclusion in the Hawaii and National Registers as a traditional cultural property. Accordingly, those sections of the DEIS which address cultural and historical resources (e.g., 4.4.6; 6.3.10; 8.3.16) should be revised to specifically state that the Falls is a traditional cultural property, why it is eligible, and that appropriate mitigation measures will be followed during the restoration process.

It is also important to note that the restoration of Hakalaoa and Hiliawe Falls is subject to compliance with Section 106 of the National Historic Preservation Act. The DEIS states that federal funds will be used in the restoration effort which therefore makes it a federal undertaking under Section 106. We believe sufficient information is available to determine that Hiliawe Falls (and the contributing Hakalaoa Falls) is significant under criteria "a" (association with events that made a significant contribution to the broad patterns of history), "b" (association with the lives of significant persons), and "d" (has the potential to yield information important in prehistory and history) and is therefore eligible for inclusion in the National Register. It also meets the definition of a traditional cultural property given in National Register Bulletin 38 (Guidelines for Evaluating and Documenting Traditional Cultural Properties).

Don Hibbard

Historic Preservation Division • 401 Keeaule Building • 565 Kalia Avenue • Honolulu, Hawaii 96813 • Tel: (808) 522-8215 • Fax: (808) 632-0223

Hiihawe is associated with cultural practices and beliefs of the living Hawaiian community that are rooted in this community's history and are important in maintaining the continuing cultural identity of this community. The significance and antiquity of practices and beliefs associated with Hiihawe are most strongly demonstrated in various traditional histories, legends, myths, and poetry recorded from the mid-1800s until today. Hiihawe has clearly been significant to the Hawaiian community for more than 50 years, as is generally required of National Register properties, and continues to be a significant cultural landscape component still celebrated in stories, chants, and songs by Native Hawaiians today as well as the general populace of Hawaii.

We also believe that the proposed restoration, while clearly benefiting those characteristics which make this property eligible for the Register, could have an "adverse effect" on Hiihawe Falls if not done appropriately. We therefore ask that this restoration work be included in the Memorandum of Agreement (MOA) which is currently being prepared under Section 106 for the Lower Hamakua Ditch by the National Resources Conservation Service (NRCS). While the specifics of the MOA can be discussed later, we recommend that, at a minimum, it requires the Hawaii State Historic Preservation Office and the native Hawaiian community be given an opportunity to review the detailed restoration plans before they are implemented. Of particular concern during consultation would be the volume of water flowing over the falls. It is these waters and the accompanying mists that are of particular cultural significance and are essential to maintaining and restoring the physical character and integrity of this traditional cultural property and therefore its eligibility for the National Register.

#### Archaeology

The DEIS includes a copy of a letter dated September 28, 1995 from our office that indicated our concurrence with the proposal to conduct an archaeological inventory survey of all areas that would be subjected to ground alteration. The discussion of cultural and historic resources on pages 120-121 indicates that the NRCS archaeologist, Carol Kawachi, undertook a preliminary survey of the 14.5 mile long open ditch portion of the LHD and adjacent cropland in July 1996. The results of that survey are briefly summarized, but there is no accompanying report with the full details. It may be that the preliminary survey was adequate, but we cannot evaluate this without additional information. The NRCS should provide us with a report that describes the survey methodology and findings in greater detail. The report, which could be submitted in letter format, should include a map showing what areas were surveyed and a justification for the areas that were not surveyed. Some explanation is needed, for example, for the statement on page 120 that "Sugar-era structures and earthworks were not considered during the survey." If historic sites are present in the proposed project area then the report should also include significance evaluations and recommended mitigation treatments. The mitigation proposals for the rock platform located in the ahupua'a of Kepoaula on page 120 should be moved to the Mitigation section on page 121.



United States  
Department of  
Agriculture  
Natural  
Resources  
Conservation  
Service  
P.O. Box 50004  
Honolulu, HI  
96850

### *Our People...Our Islands...In Harmony*

August 19, 1999

Don Hibbard  
Administrator  
DLNR  
Historic Preservation Division  
P.O. Box 621  
Honolulu, Hawaii 96809

Dear Mr. Hibbard:

Subject: Lower Hamakua Ditch Watershed DEIS Review Comments

Thank you for your review of the Draft Environmental Impact Statement and Watershed Plan for the Lower Hamakua Ditch Watershed, County of Hawaii. We wish to respond to the Historic Preservation Division's (HPD) comments on the proposed project contained in the HPD memorandum to the DLNR Land Division dated January 11, 1999.

**Comment:** The restoration of Hakalaoa Falls is described as part of the proposed project of this DEIS, and we believe that Hakalaoa Falls itself and the waters it joins to form Hiihawe Falls are eligible for inclusion in the Hawaii and National Registers as a traditional cultural property. Accordingly, those sections of the DEIS which address cultural and historical resources (e.g., 4.4.6, 6.3.10, 6.3.16) should be revised to specifically state that the Falls is a traditional cultural property, why it is eligible, and that appropriate mitigation measures will be followed during the restoration process.

We ask that this restoration work be included in the Memorandum of Agreement (MOA) which is currently being prepared under Section 106. We recommend that, at a minimum, the Hawaii State Historic Preservation Office and native Hawaiian community be given an opportunity to review the detailed restoration plans before they are implemented.

**Response:** We agree that Hakalaoa Falls, as part of the Hiihawe Falls grouping, is a traditional cultural property. The comments regarding the eligibility of the Falls contained in your memorandum and a discussion of mitigation measures to be taken during restoration will be included in the FEIS. Consultation with Hawaiian groups is currently being conducted.

The draft MOA has been revised to include the Hakalaoa Falls restoration and requirement providing Historic Preservation Division and native Hawaiian groups an opportunity to review the detailed restoration plans.

Don Hibbard, Administrator  
Historic Preservation Division

Comment: The discussion on pages 120-121 indicates that the NRCS archaeologist, Carol Kawachi, undertook a preliminary survey of the 14.5 mile long open ditch portion of the LHD and adjacent cropland in July 1996. The NRCS should provide us with a report that describes the survey methodology and findings in greater detail.

Response: A draft report covering the May 1996 archaeological survey was provided to the Historic Preservation Division under separate cover in July 1999.

Sincerely,

  
KENNETH M. KANESHIRO  
State Conservationist



DEPARTMENT OF THE NAVY  
COMMANDER  
NAVAL BASE PEARL HARBOR  
817 RUSSELL AVENUE  
PEARL HARBOR, HAWAII 96850 9870

REF ID: A66507  
5099.7  
SER N421/ 9915  
January 21, 1999

Kenneth M. Kaneshiro, State Conservationist  
Natural Resources Conservation Service  
United States Department of Agriculture  
P. O. Box 50004  
Honolulu, Hawaii 96850

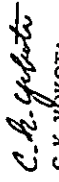
SUBJECT: DRAFT WATERSHED PLAN-ENVIRONMENTAL IMPACT STATEMENT  
FOR LOWER HAMAKUA DITCH WATERSHED

Dear Mr. Kaneshiro,

Thank you for the opportunity to review the subject Draft Environmental Impact Statement. We have reviewed the document and have no comments at this time.

The Naval Base, Pearl Harbor point of contact for this matter is Mr. Jerry Yogi, phone number (808) 471-4275, FAX (808) 474-2328.

Sincerely,

  
C. K. YOKOTA  
Director  
Regional Environmental Department  
By direction of  
the Commander



Our People...Our Islands...In Harmony

August 19, 1999

C.K. Yokota  
Director  
Regional Environmental Director  
Naval Base Pearl Harbor  
517 Russell Avenue  
Pearl Harbor, Hawaii 96860-5020

Dear Mr. Yokota:

Subject: Lower Hamakua Ditch Watershed DEIS Review Comments

Thank you for your review of the Draft Environmental Impact Statement and Watershed Plan for the Lower Hamakua Ditch Watershed, County of Hawaii. We understand from your letter dated January 21, 1999, that the Department of Navy has no comments to offer at the present time.

Sincerely,

KENNETH M. KANESHIRO  
State Conservationist

cc: State of Hawaii Department of Agriculture  
State of Hawaii Office of Environmental Quality Control

January 22, 1999

Mr. Paul Matsuo  
Department of Agriculture  
State of Hawaii  
P.O. Box 22159  
Honolulu, Hawaii 96823-2159

Dear Mr. Matsuo:

This letter is written in support of the plan to repair the Lower Hamakua Ditch. It is important for the continuation and improvement of agriculture in the Hamakua District. I would suggest:

1. The best features of Alternative 1 and 4 be combined. Pipeline installation should not be a limiting factor in total water distribution.
2. The restoration and repair of the Lower Hamakua Ditch should be made so increased water delivery may be allowed, if needed. Increased water delivery should be limited to protect the economy and environment of Waipio Valley.
3. Plans should be made to determine the best economic and favorable environmental yield of water from the ditch and Waipio Valley to guide development of future water needs.

I do not expect to be a direct beneficiary of the Lower Hamakua Ditch but I believe it is important to maintain and improve this important source of water supply for the agricultural community.

Thankyou for your work on this project and providing for public comment.

Sincerely,  
  
James P. D. Thropp, Jr.  
P.O. Box 346  
Paauilo, Hawaii 96776

Copy:

Mr. Kenneth M. Kaneshiro, State Conservationist  
Natural Resources Conservation Service  
United States Department of Agriculture  
P.O. Box 50004  
Honolulu, Hawaii 96850



U.S. Department of Agriculture

Agricultural Resources Conservation Service

O. Box 50004 Honolulu, HI 96850

*Our People...Our Islands...In Harmony*

August 19, 1999

James P.D. Thropp, Jr.  
P.O. Box 346  
Paauilo, Hawaii 96776

Dear Mr. Thropp:

Subject: Lower Hamakua Ditch Watershed DEIS Review Comments

Thank you for your review of the Draft Environmental Impact Statement and Watershed Plan for the Lower Hamakua Ditch Watershed, County of Hawaii and your support of the proposed project. We would like to respond to the comments, addressed to the State of Hawaii Department of Agriculture, contained in your January 22, 1999 letter.

Comment: The best features of Alternative 3 and 4 be combined. Pipeline installation should not be a limiting factor in total water distribution.

Response: While the federally-assisted project is limited to repair of the existing "open ditch" system, the State Department of Agriculture, which will operate the system, can convert portions of the open ditch to pipeline if their operations later favor such modification. Wells will also be considered by the water system management to augment water supply if the stream sources are unable to provide sufficient water to Hamakua ranches and farmers.

Comment: The restoration and repair of the Lower Hamakua Ditch should be made so increased water delivery may be allowed, if needed. Increased water delivery should be limited to protect the economy and environment of Waipio Valley.

Response: The stream diversion structures will be modified to release at least 30 percent of the streamflow during baseflow periods. The maximum diversion during baseflow periods will be approximately 13 MGD. The uncaptured water will remain in the Waipio Valley streams to benefit native streamlife and farmers.

Comment: Plans should be made to determine the best economic and favorable environmental yield of water from the ditch and Waipio Valley to guide development of future water needs.

Response: The project is providing assistance to representatives of LHD users, Waipio Valley community groups, and interested agencies and organizations to get together and develop a method to assess the value of the limited water

James P.D. Thropp, Jr.

resource for various uses. It is hoped that the group can be organized into an advisory committee to the management of the LHD agricultural water system which can help decide the amounts of water needed for the LHD system and for Waipio Valley streams.

Sincerely,

KENNETH M. KANESHIRO  
State Conservationist

cc: State of Hawaii Department of Agriculture  
State of Hawaii Office of Environmental Quality Control

BENJAMIN CATTEANO  
STATE OF HAWAII



STATE OF HAWAII  
DEPARTMENT OF HAWAIIAN HOME LANDS  
P.O. BOX 1079  
HONOLULU, HAWAII 96810

RAYMOND C. BOOY  
DIRECTOR  
HAWAIIAN HOME LANDS COMMISSION  
PO BOX 10, HONOLULU, HI  
96810

United States  
Department of  
Agriculture  
Natural  
Resources  
Conservation  
Service  
P.O. Box 50004  
Honolulu, HI  
96850



Our People...Our Islands...In Harmony

August 19, 1999

Ray Soon  
Interim Chairman  
Hawaiian Homes Commission  
P.O. Box 1879  
Honolulu, Hawaii 96805

Dear Mr. Soon:

Subject: Lower Hamakua Ditch Watershed DEIS Review Comments

Thank you for your review of the Draft Environmental Impact Statement and Watershed Plan for the Lower Hamakua Ditch Watershed, County of Hawaii. We understand from the letter dated January 22, 1999 that the Department of Hawaiian Home Lands and the Hawaiian Homes Commission has no comments to offer at this time.

Sincerely,

KENNETH M. KANESHIRO  
State Conservationist

cc: State of Hawaii Department of Agriculture  
State of Hawaii Office of Environmental Quality Control

January 22, 1999

To: Kenneth M. Kaneshiro, State Conservationist  
Natural Resources Conservation Service

From: Ray Soon, Interim Chairman  
Hawaiian Homes Commission

Subject: Watershed Plan and Draft Environmental Impact  
Statement, Lower Hamakua Ditch Watershed, Hawaii  
County, Dated November, 1998

Thank you for the opportunity to review the subject document.  
The Department of Hawaiian Home Lands has no comment to offer.

If you have any questions, please call Rebecca Alakai at  
586-3036.



January 25, 1999

Kenneth M. Kaneshiro, State Conservationist  
 Natural Resources Conservation Service  
 United States Department of Agriculture  
 P.O. Box 50004  
 Honolulu, Hawaii 96850

Paul Matsuo  
 Department of Agriculture  
 State of Hawaii  
 P.O. Box 22159  
 Honolulu, Hawaii 96813-2159

RE: WATERSHED PLAN AND DRAFT ENVIRONMENTAL IMPACT STATEMENT  
 LOWER HAMAKUA DITCH WATERSHED

Hawaii's Thousand Friends has the following comments:

Pg. xii Since the stated purpose is to "provide a stable, adequate, and affordable supply of agricultural water to farmers and other agricultural producers..." what is meant by the reference to "development" referred to in the first sentence third paragraph?

Pg. xiii Will the "unique" and culturally significant components of the Ditch system be retained? If not why?

Pg. xv What percentage of expected flow will be restored in Waipio? Will it be adequate to sustain native flora and fauna? What are the anticipated impacts to flora, fauna, streams and existing uses once "streamflow resulting from ditch leakage" ceases? Who is the "water management body"? When will the stream fly survey be completed and will the public have the opportunity to review and respond? Once completed how much time will be required to develop protective measures?

Pg. xvi Why is it a "must" to continue to divert 25 to 30 MDG?

What percentage of water will be restored to the Waipio streams when the "high rate of leakage" is eliminated?

Does the Hamakua/Waipio area have community plans? Future land use/zoning and projected/anticipated zoning changes must be considered and included in the water calculations.

Do any plans/agreements show a long term commitment to diversified agricultural by large landowners through such things as long term leases 50+ years? This is a critical element otherwise large landowners could simply hold land until water improvements are in and then seek a redesignation to accommodate other land uses.

Pg. 9 What is the percentage of water going to the state/country owned lands and what is the percentage going to the private lands? It seems that the 70% private lands are the real beneficiaries of this publicly supported improvement. What percentage of the private lands are leased to small farmers and what percentage to large commercial agricultural enterprises? What is the average length of the small farmer lease?

Pg. 10 What is the number of truck farmers, small farmers, family farms, taro farmers, commercial and large agricultural enterprises serviced by the ditch?

What happens after 35 years when DOA no longer manages/controls the KSBE portion of the ditch? Who will manage the ditch?

Pg. 11 If the soil suitability study identified six suitable crops for the area why aren't efforts and monies being directed toward making these crops successful instead of conducting costly repairs/improvements to the ditch system?

If native species and ecosystems are degraded, riparian and riparian water rights and traditional and customary Hawaiian practices are all negatively impacted from stream diversion and area rainfall isn't adequate then perhaps water diversion and costly water delivery systems are to high a price to pay for inappropriate agricultural.

Pg. 16 Once the ditch improvements are completed what is the life expectancy of the ditch? Who will be responsible for maintenance and what will be the yearly maintenance cost?

Pg. 19 We strongly oppose using agricultural ditch water for non-agricultural purposes. This section is counter to the Project Purpose of providing "a stable adequate, and affordable supply of agricultural water to farmers and other agricultural producers..." It would be unfair to the small farmer to make him/her compete with commercial users for "affordable" water.

Is there a commitment from DOH regarding water reuse from these two ventures? It has been our experience that DOH is very hesitant to allow water reuse for irrigation from less than pristine water sources.

Pg. 25 How much of the improved ditch runs through/along KSBE land? Will KSBE have water diversion rights to their land? If so, how many and how much water could be diverted? What types of activities are taking place on KSBE land?

Pg. 68 What types of assurances will DOA provide to guarantee that they have the water rights needed to implement and operate the proposed improvements?

Pg. 69 How will DOA assure adequate water supply for "highest value use" when non-agricultural "high value" commercial uses will be competing for water? Since commercial truck orchard, flower crops and livestock drinking water have been identified as "high value use" where does that place the taro farmer and the small farmer in the water hierarchy? How will they be assured of having adequate water? What constitutes a "commercial use"?





Our People...Our Islands...In Harmony

August 19, 1999

United States Department of Agriculture  
Natural Resources Conservation Service  
P.O. Box 50004  
Honolulu, HI 96850

Hawaii's Thousand Friends  
305 Hahani Street, Suite 282  
Kailua, Hawaii 96734

Dear Reviewer:

Subject: Lower Hamakua Ditch Watershed DEIS Review Comments

Thank you for your review of the Draft Environmental Impact Statement and Watershed Plan for the Lower Hamakua Ditch Watershed, County of Hawaii. We would like to respond to the comments contained in your letter dated January 25, 1999.

Comment: Page xii Since the stated purpose is to "provide a stable, adequate, and affordable supply of agricultural water to farmers and other agricultural producers..." what is meant by the reference to "development."

Response: The phrase should read "agricultural developments" which include private agricultural parks providing leases to small farmers, agricultural subdivisions, value-added processing facilities, and expanded aquaculture facilities.

Comment: Page xiii. Will the "unique" and culturally significant components of the Ditch system be retained? If not, why?

Response: Page xiii contains a summary of the environmental setting in which the proposed project will take place. Project effects and mitigation actions are included in the Environmental Effects table which starts on page xv.

Two exemplary wooden flumes will be restored in materials and structural construction as near original as practical. Photographic and architectural recovery of other unique or significant features that may be modified will be conducted during the rehabilitation process.

Comment: Page xv. What percentage of expected flow will be restored to Waipio? Will it be adequate to sustain native flora and fauna?

Response: The project will adopt the recommendation of the U.S. Fish and Wildlife Service to release at least 30 percent of the streamflow during baseflow conditions. The maximum diversion during baseflow periods will be approximately 13 MGD. Because little data exists to determine the flow needed to sustain native flora and fauna, monitoring of flow rates and effect to native species populations will be conducted during the installation period.

What does "Non-agricultural uses shall be evaluated after agricultural demand has been met" mean? Since potential non-agricultural uses have been identified how will they or other non-agricultural activities know if and when and how much ditch water will be provided? A gain we oppose the use of ditch water for non-agricultural purposes. It seems bogus to consider non-agricultural uses but put them on a "water available" basis as stated on page 69.

Pg. 89 In an area plagued with inadequate rainfall and where millions of dollars is to be spent on this elaborate water delivery system it is absurd to plant 7,400 acres with water hungry eucalyptus. How much water is presently being delivered to the 7,400 acres? What are the water projection needs for the future? What percentage of the total water available from the ditch goes to the 7,400 acres?

Pg. 112 While four endangered animal species and seven endangered plants and seven species of riparian wetlands be impacted by the elimination of ditch leakage? Why wasn't a survey of Waipio Valley riparian wetlands, that will be negatively impacted by the loss of ditch leakage, conducted before - not after - the release of the DEIS? If the survey is in the FEIS the public may comment but there will be no response. That is unacceptable. It is equally unacceptable to just say that "native plant and animal communities" would be adversely affected and not offer alternative solutions.

Will the public have an opportunity to respond to the findings and decision on yet unidentified "significant wetland habitat"?

We appreciate the opportunity to review and respond to this DEIS. Unfortunately pressing issues and time constraints prevented a more thorough and comprehensive review.

Other problems associated with the lower reach of Waipio Valley may limit the effectiveness of increased streamflow to increase native fish populations.

**Comment:** What are the anticipated impacts to flora, fauna, streams, and other uses once "streamflow resulting from ditch leakage" ceases?

**Response:** A major concern of reducing leakage from the LHD was loss of artificial wetlands created by ditch leakage. A survey was conducted November 24-25, 1998 by NRCSS and U.S. Fish and Wildlife Service to characterize the wetlands and to assess the wetlands as habitat for important native plant and animal species, as the Hawaiian damselfly (*Megaladrisia sp.*). The survey concluded that these artificial wetlands did not provide significant habitat to native species.

**Comment:** When will the streamfly survey be completed and will the public have the opportunity to review and respond? Once completed, how much time will be required to develop protective measures?

**Response:** The stream fly survey report was completed in February 1999. As the diversions will be modified to release at least 30 percent of baseflow and because the stream diversions exist at the lowest extent of the stream fly habitat, no significant effect to fly habitat or populations is expected as a result of diversion modification. An additional review of the EIS is not scheduled.

**Comment:** Page xvi. Why is it a must to continue to divert 25 to 30 MGD? What percentage of water will be restored to Waipio Streams when the "high rate of leakage" is eliminated?

**Response:** Due to leakage and undocumented use from the LHD, 25 to 30 MGD is needed at Kukuhaele in order for three to five MGD to flow into Paauilo Reservoir on the terminal end. The project intends to reduce diversion from the Waipio Valley streams to an average of approximately 7 MGD and a maximum of 13 MGD during baseflow periods. During average periods the percentage of restoration will be approximately 75 percent. During baseflow periods the percentage of streamflow restoration is 30 percent.

**Comment:** Does the Hamakua/Waipio area have community plans? Future land uses/zoning and projected/anticipated zoning changes must be considered and included in the water calculations.

**Response:** There are several plans for Hamakua and Waipio that have been prepared in response to specific needs such as the closure of the sugar industry or the expansion of tours into Waipio Valley. There is no plan that combines the needs of both Hamakua and Waipio. Although dated, due to the sugar industry situation, the Hawaii General Plan (1989) and the draft Hawaii County Water Use and Development Plan (1992) still provide guidance in the areas of land and water need and use.

**Comment:** Do any plans/agreements show a long term commitment to diversified agriculture by large landowners through such things as long term leases 50+ years? This is a critical element otherwise large landowners could simply hold land until water improvements are in and then seek a redesignation to accommodate other land uses.

**Response:** We are aware of no such commitments by large private landowners. However, nearly all land not already developed for commercial or residential use is designated for agricultural use. Redesignation of use by the State land use commission and rezoning by the county will be required for the land to be put to nonagricultural use. The LHD water supply will be managed for agricultural use. Non-agricultural uses will be limited and closely monitored.

**Comment:** Page 9. What is the percentage of water going to state/county owned lands and what is the percentage going to private lands? It seems that the 70 percent private lands are the real beneficiaries of this publicly supported improvement. What percentage of the private lands are leased to small farmers and what percentage to large commercial agricultural enterprises? What is the average length of the small farm lease?

**Response:** Currently, approximately two-thirds to three-quarters of the water that is documented and used is going to farmers on state lands. When agriculture is fully developed, about one-third of the water will go to farmers on state lands. Another one-third will be on private non-Bishop Estate land and the final one-third will be on Bishop Estate land. The amount of state land for farming is fixed and has been nearly totally leased. No breakdown of the ratio of small farmer to large farmer in the future has been estimated. The variation of leases in the area extends from month to month to 15 years. As conditions stabilize we expect the average lease term will increase.

**Comment:** What is the number of truck farmers, small farmers, family farms, taro farmers, commercial and large agricultural enterprises serviced by the ditch?

**Response:** Between 75 and 90 state-owned farmplots served by the LHD have been subleased to members of the Hamakua-North Hilo Agricultural Cooperative. These farmers are small farmers. It is estimated that one-quarter to one-third of these farmers are engaged in growing truck crops, with the remainder growing orchard crops, such as papaya and coffee.

Approximately 30 farm operations exist on privately owned land. Most are small farms and many family-owned. The fraction of truck farmers is similar to farmers on the state leases. Pu'u 'Ala Farms and Kapulea Orchards can be considered as larger agricultural operations. Tut Brothers Farm, as yet undeveloped adjacent to the Haina Mill site, will also be a larger farm.

There are sixteen ranches in the watershed, most with access to ditch water.

Taro is grown as a truck crop in Hamakua as it is mostly of the dry land type. All agricultural operations served by the ditch should be considered as commercial activities.

**Comment:** What happens after 35 years when DOA no longer manages/controls the KSBE portion of the ditch? Who will manage the ditch?

**Response:** Several scenarios are possible at the end of the 35-year lease period. If the ditch remains serving the agricultural community in an economically efficient manner, the DOA will be compelled to continue its operation of the ditch. If land use in the area has changed such that the benefits of supplying agricultural water have diminished considerably the lease will terminate and DOA will end its operation of the ditch.

**Comment:** If the soil suitability study identified six suitable crops for the area why aren't efforts and monies being directed toward making these crops successful instead of conducting costly repairs/improvements to the ditch system?

**Response:** The six crops are only representatives of the many types of crops which can be grown in the area. The cropland suitability study indicated that irrigation improved the suitability of the Hamakua cropland considerably for the six representative crops as shown in Table K of the DEIS.

**Comment:** If native species and ecosystems are degraded, riparian and riparian water rights and traditional and customary Hawaiian practices are all negatively impacted from stream diversion and area rainfall isn't adequate then perhaps water diversion and costly water delivery systems are too high a price to pay for inappropriate agriculture.

**Response:** The planning of this project sought to provide balance to agricultural and other water use in Hamakua with improvement of conditions for Waipio Valley streams and water users. The condition of native species and ecosystems can be improved from present and no-project future conditions. Appurtenant and riparian water rights will not be abridged. The repair and restoration of the LHD will provide livelihood and economic stability to a community that was economically and culturally devastated by the collapse of Hamakua Sugar. The LHD will be managed with a sensitivity for and input from Waipio Valley interests.

**Comment:** Once the ditch improvements are completed what is the life expectancy of the ditch? Who will be responsible for maintenance and what will the yearly maintenance cost be?

**Response:** The repairs made under the watershed project should generally last for 25 years. Other repairs and improvements will need to continue to be made during the operation of the ditch system. It is estimated that the annual Operation, Maintenance, and Replacement cost will average \$500,000 per

year and will be funded from user fees. The State Department of Agriculture will operate and maintain the system.

**Comment:** We strongly oppose using agricultural ditch water for non-agricultural purposes. This section (pg.19) is counter to the Project Purpose of providing "a stable, adequate, and affordable supply of agricultural water to farmers and other agricultural producers..." It would be unfair to the smaller farmer to make him/her compete with other commercial users for "affordable" water.

**Response:** Enserch, Inc., the power generation facility, has developed their own well and will not be using the LHD supply. Aquaculture is conducted in the state farmlands and is considered an agricultural use of the water. Nonagricultural use of water will be considered only after agricultural needs have been satisfied and if the charter for the irrigation district will allow such use. Nonagricultural sale of available but unsubscribed water supply will actually benefit agricultural users.

**Comment:** Is there a commitment from DOH regarding water reuse from these two ventures? It has been our experience that DOH is very hesitant to allow water reuse for irrigation from less than pristine water sources.

**Response:** It will be the responsibility of the facility and farm operator to comply with Department of Health requirements for water reuse for irrigation.

**Comment:** How much of the improved ditch runs along/through KSBE land? Will KSBE have water diversion rights to their land? If so, how many and how much water could be diverted? What types of activities are taking place on KSBE land?

**Response:** Approximately two-thirds of the open ditch is on or adjacent to KSBE land. KSBE will have no special water diversion rights. Agricultural lessees on KSBE land will have the opportunity to receive water from the LHD system as other agricultural operators in the service area. Presently, most of the KSBE land is leased month to month for pasture. About 250 acres have been leased as farmland in Paauhau.

**Comment:** What types of assurances will DOA provide to guarantee that they have the water rights needed to implement and operate the project improvements?

**Response:** The main document is the signed agreement between DOA and KSBE transferring rights to the conveyance for the period of the agreement.

**Comment:** How will DOA assure adequate water supply for "highest value use" when nonagricultural "high value" commercial uses will be competing for water? Since commercial truck, orchard, flower crops and livestock drinking water have been identified as "high value use" where does that place the taro farmer and the small farmer in the water hierarchy? How will they be assured of having adequate water? What constitutes a "commercial use"?

**Response:** When the irrigation district is established by DOA under authority of Chapters 167 and 168, Hawaii Revised Statutes, an operating procedure for the agriculture water system will be developed which will prioritize water distribution. Water users and other community groups in Hamakua and Waipio Valley will have an opportunity to provide input at that time.

**Comment:** Commercial agriculture is activity which produces goods for the marketplace. Home garden irrigation and landscaping should not be considered commercial agriculture.

**Comment:** What does "Non-agricultural uses shall be evaluated after agricultural demand has been met" mean? Since potential non-agricultural uses have been identified how will they or other non-agricultural activities know if and when and how much ditch water will be provided. Again we oppose the use of ditch water for non-agricultural purposes. It seems bogus to consider non-agricultural uses but put them on a "water available" basis as stated on page 69.

**Response:** The major non-agricultural use which was considered but has since has withdrawn their request, due to successful development of their own well, is the Enserch power generation facility. They understood that water would be provided only after agricultural needs were satisfied. In addition, Waipio Valley representatives, including taro farmers and aquatic resource interests, would need to agree that the additional water is not needed in the streams. By allowing non-agricultural use of ditch water during plentiful periods, additional revenue can be generated to improve the LHD or make water more affordable to farmers and ranchers.

**Comment:** In an area plagued with inadequate rainfall and where millions of dollars is to be spent on this elaborate water delivery system it is absurd to plant 7,400 acres with water hungry eucalyptus. How much water is presently being delivered to the 7,400 acres? What are the water projection needs for the future? What percentage of the total water available from the ditch goes to the 7,400 acres?

**Response:** No water from the LHD is used to irrigate eucalyptus. All of the eucalyptus, with the exception of less than 100 acres, is planted above the ditch. No LHD agricultural water supply for the irrigation of eucalyptus is projected.

**Comment:** While four endangered animal species and seven endangered plants and seven species of concern are known to occur within the boundaries there is no mention of what long term impacts may be or how these species will be protected so that they eventually can be removed from the lists. What are the expected impacts and solutions from the "short term disturbances" identified on page 113?

**Response:** The T&E species are mostly found in the upper watershed, in the Kohala Mountains, and will not be affected in any way by the project. It is beyond the scope of the project to provide for the recovery of these species. The "short term disturbances" during project implementation include human and mechanical activity, noise, increased stream turbidity, and clearing of small areas of vegetation.

**Comment:** How will endangered/threatened or rare plants and animals known to be in the Waipio riparian wetlands be impacted by the elimination of ditch leakage? Why wasn't a survey of Waipio Valley riparian wetlands, that will be negatively impacted by the loss of ditch leakage, conducted before - not after - the release of the DEIS? If the survey is in the FEIS the public may comment but there will be no response. That is unacceptable to just say that "native plant and animal communities" would be adversely affected and not offer alternative solutions. Will the public have an opportunity to respond to the findings and decision on yet unidentified "significant wetland habitat"?

**Response:** The wetlands that have been created by ditch leakage are located in the Hamakua area in lands which are pasture and gulches, not in Waipio Valley. The wetland areas created by ditch leakage have been determined to be artificial wetlands and may be eliminated if habitat for threatened and endangered or rare native species had been created. No artificial wetland areas are created in Waipio Valley by ditch leakage.

A survey was conducted November 24-25, 1998 by NRCS and U.S. Fish and Wildlife Service to characterize the wetlands created by ditch leakage in Hamakua and to assess the wetlands as habitat for important native plant and animal species, as the Hawaiian damselfly (*Megaladron sp.*). The survey concluded that these artificial wetlands did not provide significant habitat to native species.

The public will have an opportunity to challenge the findings and determinations made in the FEIS during the federal 30-day No Action period and the state's 60-day Legal Challenge Period.

Sincerely,

  
KENNETH M. KANESHIRO  
State Conservationist

cc: State of Hawaii Department of Agriculture  
State of Hawaii Office of Environmental Quality Control



Our People...Our Islands...In Harmony

August 19, 1999

Jerome Akasaki  
Akasaki Farms  
Kalopa Kai Orchids  
P.O. Box 214  
Paauhau, Hawaii 96776

Dear Mr. Akasaki:

Subject: Lower Hamakua Ditch Watershed DEIS Review Comments

Thank you for your review of the Draft Environmental Impact Statement and Watershed Plan for the Lower Hamakua Ditch Watershed, County of Hawaii and your support of the project. We would also like to respond to the comment contained in your January 25, 1999 letter.

Comment: My main concern is whether the pipes used for the ditch system will only accommodate 17 MGD or will it be able to accommodate more water should more farmers decide to use the system in the future?

Response: The project diversion during the dry season has been further reduced to 13 MGD, as recommended by the U.S. Fish and Wildlife Service. The reduction is intended to avoid challenges to the project that would stifle its implementation.

Most of the open flume repairs will continue to use larger diameter culvert pipe to maintain smooth flow from section to section. Other components such as inverted siphons and lateral pipelines will probably be designed to limit the flow to the maximum proposed by the project.

If additional water supply is needed for Hamakua agricultural use in the future, wells and other sources and increased storage will be considered.

Sincerely,

KENNETH M. KANESHIRO  
State Conservationist

cc: State of Hawaii Department of Agriculture  
State of Hawaii Office of Environmental Quality Control

United States  
Department of  
Agriculture

Natural  
Resources  
Conservation  
Service  
P.O. Box 50004  
Honolulu, HI  
96850

January 25, 1999

Kenneth M. Kaneshiro, State Conservationist  
Natural Resources Conservation Service  
United States Department of Agriculture  
P. O. Box 50004  
Honolulu, Hawaii 96850

Dear Mr. Kaneshiro:

Reading the Draft Watershed-Environmental Impact Statement for Lower Hamakua Ditch Watershed seems to be a win-win situation for the greater majority of the people who had concerns about the Lower Hamakua Ditch System and the Waipio waterfall question.

My main concern is whether the pipes used for the ditch system will only accommodate 17 MGD or will it be able to accommodate for more water should more farmers decide to use the system in the future?

Other than the above concern, I'm in total support of the proposal.

Sincerely,  
*Jerome Akasaki*

Jerome Akasaki  
Akasaki Farms  
Kalopa Kai Orchids

Lawrence E. Miller  
P.O. Box 5000  
Makua, HI.  
96727

1/25/95

attention: Kenneth M. Kaneshiro  
State Conservation Natural Resources  
Conservation Service.  
United States Department of Agriculture  
P.O. Box 50034  
Honolulu, HI. 96850

Maui. I would like to make a few comments in regard to the Watershed Plan and Draft Environmental Impact Statement for the Lower Hamakua Ditch Watershed Hawaii County, Hawaii.

On page 128 paragraph four- "The Waipio Valley Community Association (WVCA) has about 12 members of which two are commercial taro growers." In actuality the WVCA has about 30 members of which 16, six are commercial taro growers. Please correct this statement in the DEIS. There are also (10) ten commercial taro growers in Waipio Valley who are not members of the WVCA or WTPA. Please add this statement to the DEIS.

Throughout the DEIS you quote the WTPA as on page 130, "The WTPA has stated that they oppose the increase of flow in the Waioa River. The WTPA cites potential damage to the waterheads and aural and increased water management for the Lo'i." On page 130, "Some Waipio Valley farmers and residents are concerned that without the LAD diversions storm flows will cause increased flooding and erosion problems." The DEIS also states that the ditch project will have no effect on flooding in Waipio Valley. On page 111 "The USCS in 1997, computed a 0.02 (0.24 inch) rise in the average annual peak flood if the JCHSD diversion was completely stopped. The reduced diversion rate proposed by the project will increase average annual peak flood depths less than 0.02 feet in Waioa stream." On page 116, "The additional streamflow during non-drought periods will generally improve quality in the Waipio Valley streams. Water temperature will remain cooler with the higher streamflow. There will be greater dilution of contaminants in the effluent from the Taro Lo'i." I think as the lead organization (USDA or DCA) you should meet directly with the WTPA and other Waipio Taro Farmers and residents to explain very clearly (charts, graphs, studies) that the project will have no effect on flooding in Waipio Valley. This needs to be done to alleviate the fear in the community. I think most of the Farmers and residents in the community won't have an opportunity to read the DEIS.

Another concern of the WVCA is that nowhere in the DEIS does it quote our main concern and that is, "That in times of drought Waipio Valley has priority over the use of water flowing in the Lower Hamakua Ditch for the cultivation of taro."

page 2.

Please add this statement to the DEIS. Another concern I would like to discuss is the sale of water from the Lower Hamakua Ditch to Inserch Inc. a power co-generation project at the site of the Haina Mill. Inserch Inc. is hardly mentioned in the DEIS though they will be the main commercial recipient of the Lower Hamakua Ditch Project. On page 108 there is a projected water demand chart that shows that Inserch Inc. will be the largest single recipient of water from the Lower Hamakua Ditch project.

Is industrial use of the water allowable in a agriculture project of this sort and why isn't Inserch Inc. discussed more fully in the text?

Maui,

Lawrence E. Miller  
( V.P. of the WVCA )

*Lawrence E. Miller*

Lawrence E. Miller

Department of  
Agriculture  
Natural Resources  
Conservation Service

P.O. Box 50004  
Honolulu, HI  
96850

*Our People... Our Islands... In Harmony*

August 19, 1999

Lawrence E. Miller, Vice-President  
Waipio Valley Community Association  
P.O. Box 5080  
Kukuihaele, Hawaii 96727

Dear Mr. Miller:

Subject: Lower Hamakua Ditch Watershed DEIS Review Comments

Thank you for your review of the Draft Environmental Impact Statement and Watershed Plan for the Lower Hamakua Ditch Watershed, County of Hawaii. We wish to respond to the comments contained in your letter dated January 25, 1999.

Comment: "The Waipio Valley Community Association (WVCA) has about 12 members of which two are commercial taro growers." In actuality the WVCA has about 30 members of which six are commercial taro growers. Please correct this statement in the FEIS.

There are also ten commercial taro growers in Waipio Valley who are not members of the WVCA or WVTFA. Please add this statement to the FEIS.

Response: The numbers in Section 6.3.15 Waipio Valley Taro Production will be changed to reflect your comments.

Comment: The concern of members of the WVTFA is that without the LHD diversion increased flooding will take place. Analysis by the USGS indicates an annual flood peak rise of 0.02 feet in Waioia River without LHD diversion of streamflow. The additional water into Waipio Valley will improve quality of Waipio Valley streams.

Response: While the diversion structures will not considerably affect flood levels, they do regulate the variability of streamflow during average flow periods. The discussion of the use of the diversions to smooth daily peaks during non-drought periods will continue.

The project's peak diversion rate during dry periods has been reduced to 70 percent of the baseflow or approximately 13 MGD. The 30 percent of the streamflow that passes over the diversion structures will improve aquatic habitat quality in the stream reached immediately below the diversions.

Comment: I think the DOA or UDSA should meet directly with the WVTFA and other Waipio farmers and residents to explain very clearly (charts, graphs, and studies) that the project will have no effect on flooding in Waipio Valley. This needs to be done to alleviate the fear in the community. I think most of the farmers and residents in the community won't have an opportunity to read the DEIS.

Response: We hope to continue to work with the farmers and others with interests in Waipio Valley to provide information about the effects of the proposed project and to dispel any false information. One effort in this direction will be a meeting to discuss the comments received on the Memorandum of Understanding on the Waipio Valley issues. Other meetings will probably take place as the project improvements are designed and implemented.

The DOA and NRCS is funding a University of Hawaii community planning practicum in Waipio Valley. The practicum instructor, Dr. Luciano Minerbi, has been in contact with the leadership of the community groups in Waipio Valley. While the DOA and NRCS will not be participants in the community planning process, we are hopeful that many of the issues that face the Waipio Valley communities can be addressed and avenues for resolution identified.

We welcome opportunities to meet with members of the community to describe and discuss the watershed project. Please contact Dudley Kubo, Water Resources Planner, at 808-541-2600 ext. 124 if you or your group would like someone familiar with the project to meet and discuss the project effects.

Comment: Another concern of the WVCA is that nowhere in the DEIS does it quote our main concern and that is, "That in times of drought Waipio Valley has priority over the use of water flowing in the Hamakua Ditch for the cultivation of taro." Please add this statement to the FEIS.

Response: The statement will be inserted as the main concern of the WVCA. While the project planners also agree in principle with the statement, the operating policy of the LHD agricultural water system will be established in the next several months by the DOA with community input.

Comment: Enserch, Inc. is hardly mentioned in the DEIS though they will be the main commercial recipient of the Lower Hamakua Ditch project. On page 108 there is projected water demand chart that shows that Enserch, Inc. will be the largest single recipient of water from the Lower Hamakua Ditch project. Is industrial use of water allowable in an agricultural project of this sort and why isn't Enserch, Inc. discussed more fully in the text?

Response: We have recently been told by Enserch that they will not be using LHD water and utilize, instead, water from their newly developed well full-time. Water sale to Enserch was included because it was a discretionary sale which could

Lawrence E. Miller

be stopped when agricultural users needed the water. The sale of water to  
Enserch would have reduced water costs for farmers and ranchers.

The restrictions on use of water from the agricultural system will be  
determined when the irrigation district is established. The public will have an  
opportunity to comment at the time the irrigation district and its rules and  
policies are established.

Sincerely,

  
KENNETH M. KANESHIRO  
State Conservationist

cc: State of Hawaii Department of Agriculture  
State of Hawaii Office of Environmental Quality Control



STATE OF HAWAII  
DEPARTMENT OF LAND AND NATURAL RESOURCES

P.O. BOX 621  
HONOLULU, HAWAII 96809  
JAN 27 1999

Ref: PS:EI

Mr. Kenneth M. Kaneshiro, State Conservationist  
Natural Resources Conservation Service  
United States Department of Agriculture  
P.O. Box 50004  
Honolulu, Hawaii 96850

Dear Mr. Kaneshiro:  
Subject: Lower Hamakua Ditch Watershed Plan and Draft  
Environmental Impact Statement


We have reviewed the subject document and offer the following  
comments for your consideration.

Portions of the Hamakua Ditch traverse State Conservation  
District designated lands. Any improvements planned in these  
areas should be discussed in the Final Environmental Impact  
Statement (FEIS). In addition, the FEIS should discuss whether  
proposed actions are consistent with the objectives of the  
Conservation District and the pertinent subzone category.

Our Division of Forestry and Wildlife agrees with the rationale  
for selecting Alternative J (Repair and Restoration) and supports  
the implementation of that alternative.

Thank you for the opportunity to comment on the subject matter.  
Should you have any questions, please contact staff planner Ed  
Henry at (808) 587-0380.

Very truly yours,

  
Timothy Johns,  
Chairperson

c.c. OEQC  
Department of Agriculture  
Atten: Paul Matsuo  
DOFAW



State of Hawaii  
Department of Agriculture  
Natural Resources Conservation Service  
P.O. Box 50004  
Honolulu, HI 96850



*Our People...Our Islands...In Harmony*

August 19, 1999

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

Dear Mr. Johns:

Subject: Lower Hamakua Ditch Watershed DEIS Review Comments

Thank you for your review of the Draft Environmental Impact Statement and Watershed Plan for the Lower Hamakua Ditch Watershed, County of Hawaii. We wish to respond to the comments contained in your letter dated January 27, 1999.

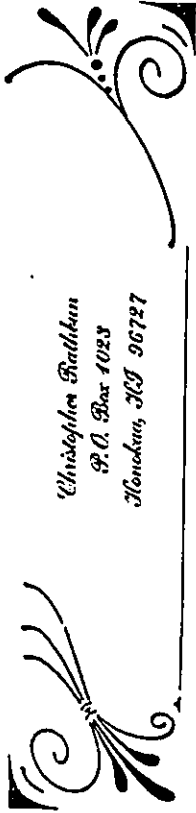
Comment: Portions of the Hamakua Ditch traverse State Conservation District designated lands. Any improvements planned in these areas should be discussed in the FEIS. In addition, the FEIS should discuss whether proposed actions are consistent with the objectives of the Conservation District and pertinent subzone category.

Response: The improvements proposed in the Conservation District are the Hakalaoa Falls restoration and tunnel repair; modification of the stream diversions at Kawainui, Alakahi, and Koiawe Streams; and implementation of remote measurement and control of the Kawainui Stream diversion using Remote Transmitter Units that are operated by solar and hydroelectric power. All improvements are in the Protective Subzone, except for the Hakalaoa Falls repair which is in the Limited Subzone. Chapter 13-5, HRS, allows use of the protective and limited subzones of Conservation District land for public purpose uses, including "land uses undertaken by the State of Hawaii or the counties to fulfill a mandated governmental function, activity, or service for public benefit." The Lower Hamakua Ditch project, undertaken by the State Department of Agriculture and the Hamakua and the Mauna Kea Soil and Water Conservation Districts, conforms to the allowable land use.

Sincerely,

KENNETH M. KANESHIRO  
State Conservationist

cc: State of Hawaii Department of Agriculture  
State of Hawaii Office of Environmental Quality Control



Kenneth Kaneshiro  
USDA NRCS  
P.O. Box 50004  
Honolulu, HI 96850-0050

Re: DEIS for the Lower Hamakua Ditch Watershed

Sir,

Thank you for this opportunity to comment on the Draft Environmental Impact Statement for the Lower Hamakua Ditch Watershed (DEIS). I was impressed by the number of substantive changes from the previous version, making this a much more informative and balanced document. As a Waipio Valley taro farmer, I especially appreciate the recognition that the water for this project will come from Waipio Valley. However, there are still a number of important issues that need to be addressed in the final EIS.

Most importantly, there has been one change that seems to be an attempt to avoid addressing the actual environmental effects of this project. In the previous draft, it was (correctly) assumed that the No Action alternative would result in the eventual failure and subsequent abandonment of the Lower Hamakua Ditch (LHD). In the current draft, the assumption is that the State will continue to minimally repair the ditch for the foreseeable future, but that these stop gap repairs will be insufficient to prevent the leakage that will lead to a water shortage if more acreage is planted. The result of this altered assumption is that the project can claim all of the economic benefits that the ditch provides, while at the same time claiming to be beneficial to the environment, since the water currently wasted to leakage can be "returned" to the streams of origin.

But what will really occur in the "Future Without" the project? Will the State Commission on Water Resource Management (CWRM) allow the LHD system to continue to waste over 20 MGD to deliver 6 MGD? In light of the waste complaint currently in front of the CWRM, it seems unlikely that this kind of waste will be considered a "reasonable and beneficial" use of water and allowed to continue. (On a side note, will the CWRM consider wasting 3 MGD to deliver 6 MGD a "reasonable and beneficial" use?) A far more likely scenario for "No Action" by the NRCS is that the CWRM will order the State Department of Agriculture (DOA) to stop the waste. In this case, the options of the DOA are 1) to fix the ditch in a manner similar to the NRCS plan, or 2) to abandon responsibility for the ditch, which is the option that has been presented by the DOA at every hearing on the project as the alternative to NRCS funding.

Each option would fundamentally alter either the economic benefits or the environmental impacts of the project. (A third possibility, KSBE repairing the ditch as a private system, would have the same economic effect as option 1 above, but seems unlikely, as KSBE considers the ditch to be uneconomical.) If the DOA will repair the LHD in any case, what will the economic benefit of the project be? Even if the ditch continues to be operated in the current fashion, will

preventing occasional interruptions in supply, which usually result from storm runoff, really have an average benefit of \$3,000.00 per acre, for every acre regardless of use? Why would the free, State funded water that the farmers currently enjoy be less beneficial than costly "project water"? And if the DOA would abandon the ditch without partial funding by the NRCS, then what are the effects on Waipio's streams of diverting an average of 9 MGD, and essentially all of the water during drought? A realistic "No Action" scenario is essential as a baseline against which to compare the effects of various alternatives, and the EIS will not be complete until it examines the effects, during droughts, of withdrawing essentially the entire base flow of the tributaries of the Waioea river.

Another serious shortcoming of the DEIS is the limited scope of the alternatives considered. What would the cost of using a combination of water sources be? I suspect that the true NED plan would involve a combination such as laying a pipe sized to carry 6 MGD in the current ditch alignment (surely cheaper than a typical pipe laying job, where the alignment must be determined and then a trench dug), perhaps providing some storage, and supplementing it with the Honoluaia, Haina Mill, Food lot, Paulilo Shail, Enezerath, and Field 20150 wells during peak demand periods. Various combinations should be evaluated to find the most inexpensive. This alternative would provide the needed water, eliminate the waste concern, and have a minimal negative environmental impact on Waipio Valley, all at a relatively low cost, and in my opinion should be the preferred plan even if it is not the NED plan.

In any case, I question whether the selected plan is, in fact, the NED plan. Is wasted water given a value in the NED calculation? If so, what is the value of the 3 MGD that will be wasted to leakage by the selected plan? If water in Waipio is given even the value of the "delivery" charge to top farmers, the value of 3 MGD is greater than the additional cost of the pipeline alternative, which would save 3 MGD. And if there is no value to saving water (in the NED calculations), then why waste money refining the ditch, lining reservoirs, and replacing leaky flumes? And once again I ask, is it "reasonable and beneficial" to waste a third of the water that you are transporting?

The "Wells" alternative seems really stacked to make it expensive. First of all, why spend over 7.5 million dollars for storage on a system that will pump water 24 hours a day? A few thousand dollars worth of timers would allow farmers to water at night, when there would be less evaporation anyway. In addition, the analysis assumes only 2 MGD available from existing wells, when in fact there is over 9.5 MGD of unused capacity in the proposed (Enezerath) and existing wells mentioned in the DEIS. There are also other wells in the area. The \$100,000.00 for Waipio Valley assistance will not be needed with this alternative, and there seem to be several million dollars of excess engineering costs. Why would this relatively simple project cost more to engineer than rebuilding the LHD? The question here is, what would the "Wells" alternative cost if the above factors are taken into account? And what is the chance that the project will not achieve full build out within the time frame assumed by the DEIS (or ever)? The "Wells" alternative could prove to be a cheaper alternative than the "Selected Plan" with only small errors in the projections of water need.

I also have some questions about just allowing water to leak around the Koiawe and Alakahi intakes to provide for instream flow. Will this allow for upstream migration of indigenous stream biota? Won't there need to be some kind of "fish ladder"? I have similar concerns about the Kawaiwai intake. Will dumping water over the spill way be equivalent to leaving that water in the stream? Will the fry of amphipods be able to migrate upstream? Will 1 MGD be sufficient to sustain the stream ecosystem and allow upstream migration in a stream reach that would naturally have no less than 9 MGD? And what is the environmental impact of taking an additional 1 MGD from Koiawe stream during drought periods?

While these are my primary concerns, I also have additional comments on the DEIS, as follows:

I have some questions about the Summary of the selected plan, pages xi-xii, Project Setting. Why does the "watershed" extend into areas that have no relationship to the ditch watershed, yet exclude the headwaters that provide water to the ditch, and the Upper Hamakua ditch, which diverts water from the same streams and contributes to the environmental effects? How can there be 250 farms and 225 limited resource farmers when there are only 170 agricultural operations (two paragraphs later)? Why is the population of North Hilo included in the demographic data, when the ditch only benefits the central portion of Hamakua?

On p. xv "Environmental Effects", the presumption that the project will result in an increase of water to Waipio makes the table meaningless.

The paragraph on page xv-xvii mentioning the advisory board makes me wonder what the purpose of the board will be. Will it have the power to advise that more water be taken out of the river? Will it have any power at all except to "advise"? Will the interests of Waipio be represented equally with the interests who desire water up top?

The "Present and Future Condition" section (pp. 9-10) is based on the preliminary assertion that farmers "have received assurances that water from the LHD will continue to be available". Received assurances from whom? Will the CWRM allow the waste to continue forever? Will the State continue to shell out half a million dollars a year to keep the ditch flowing? Yet the section also assumes that despite the fact that the ditch will continue to flow without the project, farming activity will decline. Why would the free, State-funded water that the farmers currently enjoy be less beneficial than Project water? Would the losses due to temporary ditch closures, which are usually caused by excessive rainfall, really exceed the benefit of free water? Really cause less people to farm? Or is the real limit to farming activity land availability?

In 2.1.3.2, "Project Water Needs", water need is calculated based on pan evaporation. How much would windbreaks alone reduce the amount of evaporation, compared to a canfield? What about tree cover from orchard crops? Why use an average value of six crops to estimate irrigation needs instead of estimating the proportion of acres in each area that will be planted in each crop, and multiplying those numbers by the actual need of each crop in each area (determined by how much the same crop actually uses in other locations of similar rainfall where water has to be paid for)? The projected crop mix is 129 acres truck crops and 2,382 acres of tree crops, so an average value will be inaccurate. How much crop expansion can the islands absorb? What sorts of crops can actually be economically produced here, in what amounts, and what is the actual water demand for each of these crops? And, will the crop utterly fail during low rainfall periods, or will yield just drop? By how much?

Page 16 is almost humorous. Weekly flushing of the sediment traps? Major cause of damage to the intakes is rockfall? Over an hour from the roads end to the trailhead? Access limited to the streambed due to landslides at Kawaiwai? Perhaps it will be soon at Kawaiwai, as it is to Koiawe and Alakahi, due to lack of trail maintenance.

In section 2.2.4 it mentions "the KSBE-DOA agreement which grants to the DOA 33-year management" of the ditch. What did the DOA grant to KSBE in exchange for the Ditch? Is it prepared to grant as much for the 100 or so "private" sections?

And as for the final paragraph of the chapter, why bother listing an unrealistic concern about flooding, especially without pointing out that the concern is unfounded in fact?

On the top of page 22 it mentions that "the most efficient use" of water is an objective of both the federal and state programs under which the project is being planned. Is wasting 3 MGD (1/31) "the most efficient use"?

The catchments described in section 3.1.2 are nothing like the (apparently economic) catchment reservoirs that people in the area build, which take advantage of the natural patterns of storm runoff to fill bulldozed ponds.

In 3.4.4 "Environmental Analysis" it states "The reduced diversion will also increase the variability of the stream volume and surge." The reality is that the less water that is diverted, the less variation there will be between low and high water.

Table G makes some interesting but as far as I can see unsupported claims. First of all is the presumption in "No Action" that the ditch will continue to divert (and waste) as much water as possible. And I think that claiming an economic benefit of \$1000 per acre, for every acre regardless of use, and every year regardless of rainfall, as additional profit due only to the fact that the ditch will not have as many interruptions in service is more than a little far fetched. Yet that presumption is necessary in order to claim that there will be "no change" in fish and wildlife habitat with the "no action" alternative. And what is the point of mentioning the reduction in flood discharge under "flooding and floodplains" if that reduction will have no effect? As for hazardous waste sites, WPCB refused title to several pieces of HSC land due to hazardous waste. The state then indemnified HSC and Morgan against any claims in excess of \$25,000 resulting from the hazardous waste as part of the Final Settlement Agreement in bankruptcy court. Also, there is the abandoned pumping station in Waimea. In the "Social Effects" section, it is hard to imagine that the increased cost of water from alternatives 2 and 4 would effect the bottom line much, considering that the additional cost of water during a drought year to the farmer will be \$33 an acre if alternative 4 is chosen over alternative 3. Under "Streams", as well as the assumption that the ditch will continue to flow with or without the project, it mis-states that the average

diversion rate will be the same with alternatives 3 and 4, when in fact the average diversion rate is 1/3 less with alternative four.

In the "Rationale" of the "Selected Plan" it is claimed that the selected plan is the NED plan. As I mentioned above, I expect that a combined plan would truly be the NED plan. As for this plan, why waste millions of dollars relining the reservoir and ditch? Wouldn't the maximum economic benefit be derived by wasting more water to save on repair costs? Or is there an economic value to conserving water? If so, then why not spend a little more to reduce average use by 1/3 with a pipeline?

The "Rationale" also states that "No Action" was not selected. In part, because it "did not address social and environmental concerns, such as the diversion of Hakalaoa Falls and enhancement of Waipio Valley aquatic resources." Once again, the presumption is that the ditch will go on with or without NRCS funding. Also, Hakalaoa Falls will be restored by December regardless of NRCS involvement, due to the CWRM order to restore the falls by December 1, 1999.

In section 4.2.5 "Inlets" there is no mention that the "fraction" to account for system losses averages 1/3 of the total. It is also stated that the inlet opening will be sized to accommodate the entire low flow.

I would like to suggest a new caption for photo "D" on page 55: "Detail of midpoint on Hakalaoa Falls, showing how the upstream diversions have eliminated flow over the falls except for leakage from the Lower Hamakua Ditch, of which an exposed section is visible as the horizontal line to the left of the falls." The current caption is inaccurate.

Section 4.4.6 "Cultural and Historic Resources" will does not include mention of Waipio. And section 4.4.10 "Water Rights" has no mention of riparian rights, "open rights", or any controversy.

In tables "L" and "M", pp. 96-97, why is North Hilo included? The project does not affect North Hilo! And with only 250 farmers in the whole area, will all of them be farming in the project area? Plus, how does 5.8% poverty level in Hamakua and 5.1% poverty level in North Hilo average out to a 10.6% poverty level in the area?

On p. 98, it says that the number of acres in taro has remained the same since 1994. A lot more taro has been planted in Waipio since then! It also states that the number of agricultural operations in Hamakua has almost doubled in the past four years, without the project. Why wouldn't this trend continue?

In section 5.10.4 "Other Water Systems" we find a serious lack of data. Every water use has the amount of water used listed - except the six "small" rural systems in Waipio! Taro farming is the largest use of water in the district by far - how can the DEIS pretend to consider water use and development in Hamakua in a real way when it describes the largest use as "small"? All of the farmers declared their use to the CWRM - it would be a simple matter to add up the numbers and state the volume of this "small" use.

Also, the DEIS states that "there is little interaction between the stream diversion by the UHID and that by the LHD." Since both ditches are diverting water from the same streams, I don't understand how there can be "little interaction". I would say that the interaction is 100%! It is essential that the combined effects of all of the diversions in Waipio are considered if the environmental impact analysis is to be meaningful.

In section 5.12 "Related Projects" it states that development projects intended to extend tourism are not evident in the project area. The DEIS seems to have overlooked the reopening of Kauhahale for a resort, the plans for three golf courses between Mud Lane and Waipio (one completed), and the dramatic increase in bed and breakfast operations.

In Table "O", why are all of the concerns of Waipio farmers raised "medium", while all of the up top farmers' concerns are raised "high"?

The estimated water delivery change is too low in section 6.2.2. Dudley Kubo estimated \$48 per thousand. In an irrigation district, all of the state's costs must be recovered from the user. In this case we are talking O&M&R costs of \$500,000/year, plus yield on bonds for \$4,198,100, which, at 10%, would come to \$920,000 a year that the users must pay. At full buildout, this would be \$3.42 per thousand. I expect that the exact cost of water would be essential in any economic projections.

Section 6.2.3 "Projected Water Demand" is imaginary numbers with no data to back it up. And where did the 1 MGD for aquaculture suddenly come from? Doesn't the feedlot have a 2 MGD well? Isn't it illegal to use ditch water in a public drinking water system?

Section 6.3.4 "Wildlife" ignores Waipio altogether. The presumpptions in section 6.3.5 "Threatened and Endangered Species" are based on the previous assumption that the ditch will continue to flow with or without the project. If this is indeed the case, what positive economic benefit will the project have? Any real discussion of the environmental effects would consider the effect of reduced streamflow in Waipio.

Section 6.3.6 "Effects" once again shows that they want to have it both ways: they claim that there will be no effect to Hamakua streams, despite the fact that leakage and dumping contribute over 20 MGD to the streams. Kauhahale Falls is entirely fed by leakage, and many other stream reaches are made perennial by ditch water. But the presumption here is that without the project there will be no leakage because there will be no ditch, so no effect.

Waipio Valley effects are all based (once again) on the presumption that the project is returning water to Waipio. And I disagree with the adverse effect suggestion. The percent of change between low and high water is much greater with the diversion. With the ditch currently taking half the water during low/normal times, the percentage of increase

is doubled during high water. It is the percentage of increase over "normal" water levels that determines the severity of a flood, and the severity of floods is what determines bank instability. Awaui systems in the valley are designed to handle the day to day fluctuations in streamflow, and the ditch has not provided, nor should it claim to provide, any benefit to Waipio Valley.

On the subject of hydraulic oils, inexpensive, biodegradable soy based hydraulic fluids are commercially available and should be required.

In section 6.3.9 it is claimed that restoration of Hakalaoa will be a project benefit. The same claim was made in Table III, p. xv. In what way does the project contribute to the restoration of Hakalaoa Falls? All the proposed project has done is delay the inevitable restoration of the falls.

In section 6.3.10 "Cultural and Historic Resources" a decent explanation of the cultural importance of Waipio is given, but there is no mention of "Effects". Of course, all the effects would be positive if the result of the project is to return water to Waipio, but it will be hard to justify the project economically if, in fact, the ditch will continue to flow regardless of whether the project is implemented.

Section 6.3.11 "Wetlands" shows no effect on Waipio. How can diverting up to 17 MGD, or for that matter returning an average of 21 MGD (p. 116) have no effect?

In section 6.3.12, "Water Rights", there is no mention of riparian rights. In light of riparian and Hawaiian water rights being protected by the State Constitution and the State Water Code, how can "all the waters be held by the State? The impression given here that the water that the project will take is held by the State, to do with as the State pleases, is incorrect. The reality is that all the waters of Waipio fall into the category of riparian rights, held by the current owners of the property on which the water was being used in 1848. What about the "McByde" decision (upheld all the way to the U.S. Supreme Court) that stated that inter basin transport of water was illegal in Hawaii? And where did the statement "The taro growers... assert a right to have the water released into the valley controlled" come from? Which taro farmers? What right?

I found section 6.3.14 illogical. It is stated that elevated temperatures and altered water quality downstream may be affecting upstream migration as opposed to the diversions, but isn't the cause of the elevated temperatures and altered water quality in a large part the diversions? The "abyssinith of diversion ditches" is also blamed, but these ditches not only provide increased habitat, but are currently far less of a labyrinth than they were before the ditch, and they had existed for a thousand years with apparently no adverse effect on the native aquatic biota (which crashed about 15 years after the ditch was built). And there are no fish above the diversions! And for effects, naturally the project will be doing this wonderful thing, putting all that water back into the stream....

In section 6.3.15 "Soiling" there is an enormous amount of misinformation. First of all, there are at least 60 taro farmers in Waipio. Many farmers do not belong to either the WVTFA or the WVCA. There is also the Independent Taro Farmers Association, and another group started by the Loos, along with those farmers who belong to none of the above. To say that the WVTFA accounts for "nearly all the commercial taro production in Waipio Valley" is false, although they may account for more than half, to say that it "was formed nearly 30 years ago" is an outright lie, it was formed as a branch of the Community Association in 1987 and eventually became an independent organization. And what right does the WVTFA have to provide "oversight" of the awaui system? The membership of the WVCA is equally misrepresented, but I believe that it represents more riparian rights holding landowners than the WVTFA, in which the membership is composed entirely of Bishop Museum leases.

And as for the water needs estimated under "Awaui", farmers would loose it if they had any idea that they could be left with such minimal flows. I think that "Estimates run from 25,000 G/A/D to 500,000 G/A/D" would be more accurate.

And under "Other Waipio Valley Problems", in the last paragraph it seems the DEIS saying that frequent bulldozing of the river is "necessary for the proper functioning of the waterheads". I believe that bulldozing of the river is the cause of most of the watershed and erosion problems, as well as being illegal and an environmental disaster.

The key to the logic of the "Effects" section is in the opening phrase "Many Waipio Valley farmers believe...." In fact, the sudden increase from 22 MGD to high water has a much greater effect than an increase from 40 MGD would have (percent change again). Also, I'm not so sure that the WVTFA opposes an increase in the base flow. And the planned regime (divert all the water during drought, dump all the water during high flow periods) does nothing to reduce the fluctuation in the river, instead it aggravates the problem. A plan which diverted more water during high flow periods, and less during drought, storing water for the up top farmers, could be helpful to the taro farmers. However, this is not the scenario planned.

Section 6.3.16 reaffirms that repair of Hakalaoa Falls will take place with or without the project. So how can that repair be considered a project benefit?

In section 6.5, the presumption that the ditch will remain regardless of the project prevents examination of the effect of committing 17 MGD of Waipio's water to the project.

Section 6.7.8 once again makes the claim that the plan will restore Hakalaoa and increase flow in Waipio. Section 6.8 is meaningless without recognizing that the plan will take water from Waipio.



*Our People...Our Islands...In Harmony*

August 19, 1999

Christopher Rathbun  
P.O. Box 1023  
Honokaa, Hawaii 96727

Dear Mr. Rathbun:

Subject: Lower Hamakua Ditch Watershed DEIS Review Comments

Thank you for your review of the Draft Environmental Impact Statement and Watershed Plan for the Lower Hamakua Ditch Watershed, County of Hawaii. We wish to respond to the comments contained in your letter received on January 28, 1999.

Comment: There has been one change that seems to be an attempt to avoid addressing the actual environmental effects of this project. In the previous draft, it was (correctly) assumed that the No Action alternative would result in the eventual failure and subsequent abandonment of the Lower Hamakua Ditch (LHD). In the current draft, the assumption is that the State will continue to minimally repair the ditch for the foreseeable future, but that these stop gap repairs will be insufficient to prevent the leakage that will lead to a water shortage if more acreage is planted. The result of this altered assumption is that the project can claim all of the economic benefits that the ditch provides, while at the same time claiming to be beneficial to the environment, since the water currently wasted to leakage can be "returned" to the streams of origin.

Will the State Commission on Water Resource Management (CWRM) allow the LHD system to continue to waste over 20 MGD to deliver 6 MGD? A far more likely scenario for "No Action" by the NRCS is that the CWRM will order the State Department of Agriculture (DOA) to stop the waste. In this case, the options of the DOA are 1) to fix the ditch in a manner similar to the NRCS plan, or 2) to abandon responsibility for the ditch, which is the option that has been presented by the DOA at every hearing on the project as the alternative to NRCS funding.

Response: The State Department of Agriculture (DOA) has stated that they are committed to keep the ditch operational to provide agricultural water to farmers in the Hamakua service area. During the past four years, since the issuance of the original DEIS for this project, agricultural activity in the Hamakua area has stabilized at a high level with strong indications for continued growth in farming activity. This spring, DOA will begin establishment of an irrigation district in Hamakua under authority of Chapters 167 and 168 of the Hawaii Revised Statutes, regardless of the status of the watershed project. While the DOA is not expected to have the means to

United States Department of Agriculture  
Natural Resources Conservation Service  
P.O. Box 50004  
Honolulu, HI 96850

In Appendix B I don't understand how they concluded that 1,554 additional acres of diversified crops would be planted with the project. I also noticed that the money for easements is just to document and record them, not purchase them. Plus, I'd really like to see the math that the H.E.D. figures are based on. And I simply don't understand the section on hydrology. Why is a crop evapotranspiration rate and a pan evaporation rate needed? Why include pan evaporation stations not in the project area? Why figure out the water needs of each crop separately and then average them into a "reference crop"? Why are the peak water need estimates based on 90 percent frequency of rainfall when the objective of the project is "to assure sufficient irrigation water for 80 percent frequency of rainfall"? (p. 15)

In Appendix C- Hawaii Coastal Zone Management Assessment, it is claimed that the project is not near a public right-of-way, that the project will not occur in or affect a popular fishing area, that it is not near a sandy beach, and that there are no swimming or other recreational resources in the area (all on p.C-3). All of this is incorrect. Also, on p. C-2, that the project will not involve dredging (how do they plan to clean the ditch?) And, of course, all effects of the project are positive because it will result in the restoration of Waipio's streams. On p. C-10, the project is not in a potential flood inundation area, which is immediately contradicted when it states that the entire floor of Waipio is designated on the Flood Insurance Rate Map.

After reading the letters in Appendix "D" I find I have unanswered questions: Who's land will be irrigated? What about Hawaiian Homes priority rights to water? How will water rights be obtained? Will Huihawe return to its "original" (pre-plantation) state? Have marketing studies been performed to identify an appropriate level of diversified agriculture? What happens to the assets of a company when that company is "involuntarily dissolved" (as Hawaiian Irrigation Co. who owned the ditch, recently was)? What will the environmental effects of access be? (Rebuild trails, helicopter landing pads, ?) Does the state have any legal claim that would justify it moving water from one watershed for delivery to another? What are the true future water needs of farmers in Waipio? What is the potential of the aauai system in Waipio?

On a final note, what happened to my comment letter? The letter from me in this DEIS is not my comments on the previous version of this DEIS, it is a letter to Paul Matano of the DOA outlining issues I felt should be addressed in the Waipio Watershed Project (Upper Hamakua Ditch), where a letter from Mr. Terrance Shumaker, Esq., representing a group he formed called the Waipio Valley Instream Users Association, was substituted for my very extensive comments on the plan, with my name on the bottom of a letter that I did not write! This time I would appreciate it if my actual, unedited comments were used. Anything else is misrepresentation!

Thank you for considering my input. I hope that these questions will be answered in the final EIS.

Sincerely,

Christopher Rathbun

conduct as complete a repair of the Lower Hamakua Ditch (LHD) as with the federally-assisted project, improvements to the LHD will be made to 1) ensure the function of the LHD and protect against catastrophic failure of ditch components and 2) reduce leakage from the ditch system as much as practicable within their means. A problem exists in that the projected water revenues with the current farming activity will not be sufficient to implement all the needed improvements. It will be the responsibility of the Commission on Water Resource Management to weigh the responsibility of the Commission on Water Resource Management to weigh the agricultural beneficial uses of the water, including system losses, against instream beneficial use.

**Comment:** If the DOA will repair the LHD what will the economic benefit of the project be? Even if the ditch continues to be operated in the current fashion, will preventing occasional interruptions in supply, which usually result from storm runoff, really have an average benefit of \$3,000 per acre, for every acre regardless of use? Why would the free, State funded water that the farmers currently enjoy be less beneficial than costly "project water"?

**Response:** If the DOA continues to operate the system in the current fashion, the economic benefit will be less than if the comprehensive watershed project is implemented. The difference in economic benefit is in the amount of future agricultural development that will take place under the two scenarios. During interviews with farmers and landowners for this DEIS, we were told that without the security of consistent water supply provided by the watershed project, many of the farm expansion plans would not take place. Over 1,500 additional irrigated crop acres have been projected with implementation of the watershed project.

While it is most beneficial for existing farmers to receive free water, that water is subsidized by the general public through state appropriations to the DOA to maintain the LHD. The greatest economic benefit to the region and the nation is attained when the projected agricultural buildup occurs and the farmers fund the operation of the LHD.

**Comment:** The EIS will not be complete until it examines the effects, during droughts, of withdrawing essentially the entire base flow of the tributaries of the Waioa river.

**Response:** The drought period withdrawal by the LHD from the Waipio Valley streams has been reduced from 17 MGD to approximately 13 MGD by adoption of the U.S. Fish and Wildlife Service recommendation to restore 30 percent of the baseflow to the stream systems. The diversion structures will be fitted with plates across 30 percent of the intake gate. While the data to quantify the streamflow requirement needed to improve aquatic ecosystems is yet available, monitoring of streamflow and aquatic communities is being conducted under various programs to obtain that understanding.

**Comment:** Another serious shortcoming of the DEIS is the limited scope of the alternatives considered. What would the cost of using a combination of

water sources be? I suspect that the true NED plan would involve a combination such as laying a pipe sized to carry 6 MGD in the current ditch alignment (surely cheaper than a typical pipe laying job, where the alignment must be determined and then a trench dug), perhaps providing some storage, and supplementing it with the Honokaia, Haina Mill, Feed lot, Paauilo Shaft, Enserch and Field 20150 wells during peak demand periods. Various combinations should be evaluated to find the most inexpensive. This alternative would provide the needed water, eliminate the waste concern, and have a minimal negative environmental impact on Waipio Valley, all at a relatively low cost, and in my opinion should be the preferred plan even if it is not the NED plan.

**Response:** The Selected Alternative provides for the use of well sources to supplement water supply from the Waipio Valley sources when streamflow is insufficient or diversion amount is limited. The pumpage from wells will increase the cost of water to users. Policies for backup use of wells will be established when the irrigation district is organized. Storage reservoirs on farms will be encouraged and additional irrigation district reservoirs will be considered.

As indicated by the costs for the pipeline alternative, the cost of installing pipe to replace the function of the flume is more costly than repair of the flume, even when the pipeline is sized for 6 MGD (18-inch diameter).

**Comment:** I question whether the selected plan is, in fact, the NED plan. Is wasted water given a value in the NED calculation? If so, what is the value of the 3 MGD that will be wasted to leakage by the selected plan? If water in Waipio is given even the value of the "delivery" charge to up top farmers, the value of 3 MGD is greater than the additional cost of the pipeline alternative, which would save 3 MGD. And if there is no value to saving water (in the NED calculations), then why waste money refining the ditch, lining reservoirs, and replacing leaky flumes? And once again I ask, is it "reasonable and beneficial" to waste a third of the water that you are transporting?

**Response:** There was no economic accounting of the 3 MGD which may be lost to leakage with the watershed project. Application of the water fee charged to farmers and ranchers would be inappropriate because the charge is not for the water but for delivery. The leakage has been evaluated as an environmental cost of the project.

**Comment:** The "Wells" alternative seems really stacked to make it expensive. First of all, why spend over 7.5 million dollars for storage on a system that will pump water 24 hours a day? A few thousand dollars worth of timers would allow farmers to water at night, when there would be less evaporation anyway. In addition, the analysis assumes only 2 MGD of available from existing wells, when in fact there is over 9.5 MGD of unused capacity in the proposed (Enserch) and existing wells mentioned in

the DEIS. There are also other wells in the area. The \$100,000.00 for Waipio Valley assistance will not be needed with this alternative, and there seem to be several million dollars of excess engineering costs. Why would this relatively simple project cost more to engineer than rebuilding the LHD? The question here is, what would the "Wells" alternative cost if the above factors are taken into account? And what is the chance that the project will not achieve full build out within the time frame assumed by the DEIS (or ever)? The "Wells" alternative could prove to be a cheaper alternative than the "Selected Plan" with only small efforts in the projections of water need.

**Response:** The storage tanks on the wells systems provide scheduling flexibility, constant system pressure, and a measure of relief against well shutdown. The existing wells considered as part of the system were those already controlled by the State. Engineering costs of 20 percent of the development cost of a deep well are not thought to be excessive. Elimination of the storage tanks, elimination of the \$100,000 for streamflow monitoring in Waipio Valley, and a reduction in engineering cost will not make the alternative more economical than the Selected Plan. Major costs of the wells alternative are the pumping energy and electrical standby costs, which must be directly passed on to water users.

If the Wells Alternative were implemented, either the expansion of the agricultural areas will be controlled by well development or many of the wells will be operated at less than capacity while agricultural development occurs. The economic advantage of modularization provided by the well systems may not be achieved.

**Comment:** I also have some questions about just allowing water to leak around the Koiawe and Alakahi intakes to provide for instream flow. Will this allow for upstream migration of indigenous stream biota? Won't there need to be some kind of "fish ladder"? I have similar concerns about the Kawainui intake. Will dumping water over the spill way be equivalent to leaving that water in the stream? Will the fry of amphidromous species be able to migrate upstream? Will 1 MGD be sufficient to sustain the stream ecosystem and allow upstream migration in a reach that would naturally have no less than 9 MGD? And what is the environmental impact of taking an additional 1 MGD from Koiawe stream during drought periods?

**Response:** The principal native species that may migrate past the diversions is o'opu alamo'o (*Lentipes concolor*) which is found in higher stream reaches. O'opu alamo'o was found throughout the Lalakea/Hiliawe Stream system in the 1996 stream survey. It was found at the 2,000-foot elevation above Hiliawe Falls. In comparison, the stream diversions should not present much of a barrier to the post-larval fish migrating upstream.

The other native stream organisms that inhabit higher stream reaches are opac kals'ole (*Ayolida bisulcata*) and hihawai (*Neritina granosa*). The 1996

survey found healthy populations of opac at all transects at the upper reaches of the Waipio Valley streams. For reasons unknown, no hihawai was found at any of the stations, including near the stream mouth on Lalakea/Hiliawe Stream.

The migration cycle of o'opu alamo'o is dependent on high flow events. Spawning and downstream migration of larvae to the ocean is triggered by the high streamflows that are expected to flow over the diversion structures. Recruitment of post-larval o'opu into stream systems occurs during storm runoff when fresher plumes extend into marine waters. Movement of o'opu alamo'o, therefore, occurs during periods of high streamflow and should not significantly be affected by low flow conditions.

There are significant gaps in the information about the native species which make initial water management decisions difficult. The watershed project sponsors are committed to work with community groups and agencies to gather such information and modify operations to balance the needs of the many groups served by the Waipio Valley water resource.

The adoption of the U.S. Fish and Wildlife recommendations on the modification of the intakes will allow 30 percent of the baseflow to pass over the diversion structures. The additional release of baseflow will improve aquatic habitat during dry periods and assure a continuously flowing stream reach extending from below to above the diversion structure.

**Comment:** I have some questions about the Summary of the selected plan, pages xi-xii, Project Setting. Why does the "Watershed" extend into areas that have no relationship to the ditch whatsoever, yet exclude the headwaters that provide water to the ditch and the Upper Hamakua ditch, which diverts water from the same streams and aggravates the environmental effects?

**Response:** The description of the "watershed" has been changed to include the North Kohala District, where the northern tributary of Kawainui Stream extends into the district, throughout the EIS. The two reasons for not including the area above the Upper Hamakua Ditch are 1) the streams are not included completely by the Upper Hamakua Ditch during peak demand periods, that groundwater seep from the Waipio Valley wall constitutes all the water available to the Lower Hamakua Ditch, and 2) the watershed boundary at the Upper Hamakua Ditch is also the boundary of the Waimea-Paauilo Watershed. The NRCS Watersheds program planning policy prevents overlap of the two "watershed" areas.

**Comment:** How can there be 250 farms and 225 limited resource farmers when there are only 170 agricultural operations (two paragraphs later)? Why is the population of North Hilo included in the demographic data, when the ditch only benefits the central portion of Hamakua?

**Response:** The 250 farms figure was derived from the NRCS/SWCD cooperators database and includes farms above the LHD, to the east of Paauilo, and may have double-counted farm operations. The figures will be corrected to reflect numbers within the watershed. The label of North Hilo for Census Tract 220 was in error. It should have read Paauilo and will be corrected.

**Comment:** On p. xv "Environmental Effects", the presumption that the project will result in an increase of water to Waipio makes the table meaningless.

**Response:** The table indicates that return of water not used in Hamakua to the stream systems may have effects on channel morphology, laro auwai, and to stream ecology.

**Comment:** The paragraph on page xvi-xvii mentioning the advisory board makes me wonder what the purpose of the board will be. Will it have the power to advise that more water be taken out of the river? Will it have any power at all except to "advise"? Will the interests of Waipio be represented equally with the interests who desire water up top?

**Response:** The advisory board is still conceptual. It is hoped that with some project support, it will be self-forming and will equally represent all of the water interests in Waipio Valley and Hamakua. The board will be the means through which knowledge about the effects of the water system will be acquired and spread. The policies and rules under which the irrigation district will be formed will limit the board's role to an advisory nature. This does not mean that the board will not be able to influence management decisions.

**Comment:** The "Present and Future Condition" section (pp. 9-10) is based on the preliminary assertion that farmers "have received assurances that water from the LHD will continue to be available". Received assurances from whom? Will the CWRM allow the waste to continue forever? Will the State continue to shell out half a million dollars a year to keep the ditch flowing? Yet the section also assumes that despite the fact that the ditch will continue to flow without the project, farming activity will decline. Why would the free, State-funded water that the farmers currently enjoy be less beneficial than Project waters? Would the losses due to temporary ditch closures, which are usually caused by excessive rainfall, really exceed the benefit of free water? Really cause less people to farm? Or is the real limit to farming activity land availability?

**Response:** The DOA has asserted that an irrigation district will be formed even prior to implementation of the watershed project. Once the irrigation district is formed the DOA will have the authority to charge users for agricultural water. At this time, we do not believe that water revenues alone will fund the operation and repair of the LHD. Some subsidy, although less than present, will probably be needed.

We cannot predict what actions the CWRM will take if the watershed project is not implemented. While availability of low-cost, long-term leases for farmland is a problem in the area, the uncertainties associated with the LHD water system if the watershed project is not implemented have been stated as a major impediment to expansion of agricultural activity.

**Comment:** In 2.1.3.2, "Project Water Needs", water need is calculated based on pan evaporation. How much would windbreaks alone reduce the amount of evaporation, compared to a canefield? What about tree cover from orchard crops? Why use an average value of six crops to estimate irrigation needs instead of estimating the proportion of acres in each area that will be planted in each crop, and multiplying those numbers by the actual need of each crop in each area (determined by how much the same crop actually uses in other locations of similar rainfall where water has to be paid for)? The projected crop mix is 129 acres truck crops and 2,382 acres of tree crops, so an average value will be inaccurate.

**Response:** Windbreaks are a valuable water conservation measure. The land treatment assistance provided to producers will include technical and financial assistance for installation of perimeter and field windbreaks. The exact reduction in water demand is unknown.

The use of a combined reference crop is a standard evaluation procedure when the future cropping pattern is not known. The six evaluated crops and their average and peak irrigation requirements will be included in Appendix B - Investigation and Analysis. While there may be some discrepancy between the projection and what actually is grown in the future, the averaged estimate is intended to minimize the difference. Considerable variability in cropping from season to season already exists due to market demand, crop rotation, and changes in lease arrangements.

**Comment:** How much crop expansion can the Islands absorb? What sorts of crops can actually be economically produced here, in what amounts, and what is the actual water demand for each of these crops? And, will the crop utterly fail during low rainfall periods, or will yield just drop? By how much?

**Response:** The market analysis for crops that are considered in Hamakua show that coffee, macadamia nut, papaya, and flowers and foliage have markets that extend beyond the state. While there are always market considerations, many of the crops will not be constrained solely by the Hawaii market. As stated earlier, the six evaluated crops and their average and peak irrigation requirements will be included in Appendix B - Investigation and Analysis. Some crops such as many truck crops and flower crops may be completely lost during a drought if sufficient irrigation is not available. Most tree crops will suffer reduced yields.

Comment: Weekly flushing of the sediment traps? Major cause of damage to the intakes is rockfall? Over an hour from the roads end to the trailhead? Access limited to the streambed due to landslide at Kawainui?

Response: Maintenance of the intake structures is imperative if correct diversion of the flows to the LHD and release to the Waipio Valley Streams is desired.

Comment: "The KSBE-DOA agreement which grants to the DOA 35-year management" of the ditch. What did the DOA grant to KSBE in exchange for the Ditch? Is it prepared to grant as much for the 100 or so "private" sections?

Response: The KSBE-DOA agreement provides a standard lease arrangement. We do not understand your reference to "private" sections.

Comment: Why bother listing an unrealistic concern about flooding, especially without pointing out that the concern is unfounded in fact?

Response: Flooding as a result of increased streamflow in Waipio Valley was expressed as a concern by community members and, therefore, is addressed.

Comment: "The most efficient use" of water is an objective of both the federal and state programs under which the project is being planned. Is wasting 3 MGD (1/31) "the most efficient use"?

Response: While water loss from the system will be reduced as much as practicable, some leakage is expected in a system with older components such as the LHD.

Comment: The catchments described in section 3.1.2 are nothing like the (apparently economic) catchment reservoirs that people in the area build, which take advantage of the natural patterns of storing runoff to fill bulldozed ponds.

Response: The description of the catchment system emphasizes the size required of a fully efficient catchment system. With permeable drainage area and open ponds efficiency drops off and larger drainage areas and storage volumes are needed. Most farm ponds of the type you describe are used for stockwater rather than for crop irrigation during drought periods.

Comment: In 3.4.4 "Environmental Analysis" it states "The reduced diversion will also increase the variability of the stream volume and stage." The reality is that the less water that is diverted, the less variation there will be between low and high water.

Response: You are correct. The sentence is meant to indicate that the frequency of stream variability will increase.

Comment: Table G makes some interesting but as far as I can see unsupported claims. First of all is the presumption in "No Action" that the ditch will continue to

divert (and waste) as much water as possible. And I think that claiming an economic benefit of \$3000 per acre, for every acre regardless of use, and every year regardless of rainfall, as additional profit due only to the fact that the ditch will not have as many interruptions in service is more than a little far fetched. Yet that presumption is necessary in order to claim that there will be "no change" to fish and wildlife habitat with the "no action" alternative. And what is the point of mentioning the reduction in flood discharge under "flooding and floodplains" if that reduction will have no effect? As for hazardous waste sites, WFCB refused title to several pieces of RSC land due to hazardous waste. The state then indemnified HSC and Morgan against any claim in excess of \$25,000 resulting from the hazardous waste as part of the Final Settlement Agreement in bankruptcy court. Also, there is the abandoned pumping station in Waimea. In the "Social Effects" section, it is hard to imagine that the increased cost of water from alternatives 2 and 4 would effect the bottom line much, considering that the additional cost of water during a drought year to the farmer will be \$33 an acre if alternative 4 is chosen over alternative 3. Under "Streams", as well as the assumption that the ditch will continue to flow with or without the project, it misstates that the average diversion rate will be the same with alternatives 3 and 4, when in fact the average diversion rate is 1/3 less with alternative 4.

Response: Most of the responses to the comments above are found in other parts of this letter. Two of the comments are addressed below.

No hazardous waste concerns or sites were identified in the watershed in consultation with the State Department of Health's Solid and Hazardous Waste Branch. A survey of hazardous sites remaining from sugar cultivation is currently being conducted. Some of the problems identified above, including the Waimea pumps, will be assessed in the survey. The Summary and Comparison table will be changed to indicate that the alternatives will have no effect on possible hazardous material sites in the watershed.

The Summary and Comparison table will be changed to indicate an average 4 MGD diversion for Alternative 4.

Comment: In the "Rationale" of the "Selected Plan" it is claimed that the selected plan is the NED plan. As I mentioned above, I expect that a combined plan would truly be the NED plan. As for this plan why waste millions of dollars refining the reservoir and ditch? Wouldn't the maximum economic benefit be derived by wasting more water to save on repair costs? If so, then why not spend a little more to reduce average use by 1/3 with a pipeline?

Response: Part of the response to this comment is included above. The return of streamflow to Waipio Valley is an environmental benefit that is not quantifiable in economic units. Similarly, the system water loss is an environmental cost. The NED alternative provides the most practicable level of environmental benefits commensurate with cost.



Comment: The "Rationale" also states that "No Action" was not selected, in part, because it "did not address social and environmental concerns, such as the diversion of Hakalaoa falls and enhancement of Waipio Valley aquatic resources." Once again the presumption is that the ditch will go on with or without NRCS funding. Also, Hakalaoa Falls will be restored by December regardless of NRCS involvement, due to the CWRM order to restore the falls by December 1, 1999.

Response: Discussion of the future without project is discussed above. The restoration of Hakalaoa Falls without the involvement of the federal project may not provide a permanent repair which includes construction of a tunnel and removal of the flume on the cliff face and diversion structure above the valley rim.

Comment: In section 4.2.5 "Intakes" there is no mention that the "fraction" to account for system losses averages 1/3 of the total. It is also stated that the inlet opening will be sized to accommodate the entire low flow.

Response: The Kawainui intake will be limited to approximately 7 MGD during baseflow periods. During higher flows, the intakes may capture 70 percent of the streamflow. A control gate on the flume will return water that is not needed in Hamakua to the stream. During droughts, at least 3 MGD will be released at Kawainui. The "fraction" mentioned in the paragraph is not the water lost to system leaks but the insurance that water enters the intake grate even with considerable clogging. The reference to "fraction" has been deleted.

Comment: I would like to suggest a new caption for photo "D" on page 55: "Detail of midpoint on Hakalaoa falls, showing how the upstream diversions have eliminated flow over the falls except for leakage from the Lower Hamakua Ditch of which an exposed section is visible as the horizontal line to the left of the falls." The current caption is inaccurate.

Response: A modified version of your suggested caption will be used.

Comment: Section 4.4.6 "Cultural and Historic Resources" still does not include mention of Waipio. And section 4.4.10 "Water Rights" has no mention of riparian and riparian rights, "o'opu rights", or any controversy.

Response: Section 4.4 is intended to discuss the immediate institutional and regulatory concerns that need to be satisfied for project installation. Section 4.4.6 will include expanded discussion of Hiliawe/Hakalaoa Falls. Discussion of Waipio Valley cultural concerns is included in Section 6.3.10. Discussion of Waipio Valley instream concerns is included in Sections 6.3.6, 6.3.12, and 6.3.14.

Comment: In tables "L" and "M", pp. 96-97, why is North Hilo included? The project does not effect North Hilo! And with only 250 farmers in the whole area,

will all of them be farming in the project area? Plus, how does 5.8% poverty level in Hamakua and 5.1% poverty level in North Hilo average out to a 10.6% poverty level in the area?

Response: As explained earlier, Census Tract 220 is Paauilo, not North Hilo. The Poverty Level percentage should have been averaged, not added.

Comment: On p. 98, it says that the number of acres in taro has remained the same since 1994. A lot more taro has been planned in Waipio since then! It also shows that the number of agricultural operations in Hamakua has almost doubled in the past four years, without the project. Why wouldn't this trend continue?

Response: The statement reflects activity in the Hamakua project area and will be so clarified. Much of the increase in agricultural activity is due to the expansion of the State program to provide small farmers with leases on state lands. Nearly all of the available state land has been awarded. Most farmers are counting on the implementation of the watershed project ensure and stabilize long-term water supply.

Comment: In section 5.10.4, "Other Water Systems" we find a serious lack of data. Every water use has the amount of water used listed- except the six "small" auwai systems in Waipio! Taro farming is the largest use of water in the district by far- how can the DEIS pretend to consider water use and development in Hamakua in a real way when it describes the largest use as "small"? All of the farmers declared their use to the CWRM- it would be a simple matter to add up the numbers and state the volume of this "small" use.

Response: From discussions with taro farmers and agronomists, we understand that this project will not diminish water available to taro farmers. With a base flow of 23 MGD and a current average flow of 50 MGD, the Waialoa River provides sufficient water supply for taro cultivation. If 50,000 gallons per day is required per acre of taro lo'i, 5 MGD is the demand for 100 acres of taro. The CWRM water declarations are incomplete and the declared water use information, when included, is unreliable.

Comment: Also, the DEIS states that "there is little interaction between the stream diversion by the UHD and that by the LHD." Since both ditches are diverting water from the same streams, I don't understand how there can be "little interaction". I would say that the interaction is 100%! It is essential that the combined effects of all of the diversions in Waipio are considered if the environmental impact analysis is to be meaningful.

Response: The statement in Section 5.10.4 is not intended to address impacts to Waipio Valley but to indicate that during critical periods, such as droughts, the LHD is dependent on groundwater seeps below the UHD diversions.

Comment: In section 5.12 "Related Projects" it states that development projects intended to extend tourism are not evident in the project area. The DEIS seems to

have overlooked the rezoning of Kukuihaele for a resort, the plans for three golf courses between Mud Lane and Waipio (one completed), and the dramatic increase in bed and breakfast operations.

**Response:** The Aman Resort development in Kukuihaele which was planned in the late 1980s is inactive and it is doubtful whether the plans can be revived according to the County Department of Planning. It is believed that two of the golf courses were a part of the Aman Resort. There are a large number of bed and breakfast operations in the area. However, most are not registered and permitted making it difficult to document the "dramatic increase."

**Comment:** In Table "O", why are all of the concerns of Waipio farmers rated "medium", while all of the up top farmers' concerns are rated "high"?

**Response:** The ratings on Table O reflect a combination of whether the watershed project purpose can be applied, significance to federal, state or local laws and policies, and expression of the concern by the public. The concerns of the Hamakua farmers are more directly affected by the project than are concerns in Waipio Valley. During the latter part of the planning process, however, Waipio Valley concerns have become more prominent.

**Comment:** The estimated water delivery charge is too low in section 6.2.2. Dudley Kubo estimated \$48 per thousand. In an irrigation district, all of the state's costs must be recovered from the users. In this case we are talking 0.M&R costs of \$500,000/year, plus yield on bonds for \$4,198,100, which, at 10%, would come to \$920,000 a year that the users must pay. At full buildout, this would be \$42 per thousand. I expect that the exact cost of water would be essential in any economic projections.

**Response:** The water delivery charge given in Section 6.2.2 is based on charges for other State-operated irrigation systems. In addition to the \$0.32 to \$0.40 per 1,000 is a acreage charge of \$2.25 to \$3.00 per acre per month. The capital improvement cost will not be recovered through water use fees. The exact fee schedule will not be set until the irrigation district is organized.

**Comment:** Section 6.2.3 "Projected Water Demand" is imaginary numbers with no data to back it up. And where did the 1 MGD for aquaculture suddenly come from? Doesn't the feedlot have a 2 MGD well? Isn't it illegal to use ditch water in a public drinking water system?

**Response:** The aquaculture water need has been established by the Hawaiian sunfish facility in the State Paauilo West agricultural area. The feedlot does have its own well facility but uses it only during off peak hours for the slaughterhouse operation. LHD water is used in pasture areas and for wash water. Water for the Kukuihaele Community will be chlorinated but will still be substandard by Safe Drinking Water Act Standards.

**Comment:** Section 6.3.4 "Wildlife" ignores Waipio altogether. The presumptions in section 6.3.5 "Threatened and Endangered Species" are based on the previous assumption that the ditch will continue to flow with or without the project. If this is indeed the case, what positive economic benefit will the project have? Any real discussion of the environmental effects would consider the effect of reduced streamflow in Waipio.

**Response:** The current flow rates in the Waipio Valley streams will continue generally unchanged without project implementation or CWRM intercession. Positive benefits to Waipio Valley aquatic resources will be higher flow rates in the streams during most of the time.

**Comment:** Section 6.3.6 "Effects" once again shows that they want to have it both ways: they claim that there will be no effect to Hamakua streams, despite the fact that leakage and dumping contribute over 20 MGD to the streams. Kalaehine Falls is entirely fed by leakage, and many other reaches are made perennial by ditch water. But the presumption here is that without the project there will be no leakage because there will be no ditch, so no effect.

Waipio Valley effects are all based (once again) on the presumption that the project is returning water to Waipio. And I disagree with the adverse effect suggestion. The percent of change between low and high water is much greater with the diversion. With the ditch currently taking half the water during low/normal times, the percentage of increase is doubled during high water. It is the percentage of increase over "normal" water levels that determines the severity of a flood, and the severity of floods is what determines bank instability. Auwai systems in the valley are designed to handle the day to day fluctuations in streamflow, and the ditch has not provided, nor should it claim to provide, any benefit to Waipio Valley.

**Response:** The first sentence in the Effects section should state that the "Selected Alternative will have no significant effect on flow rates" in Hamakua streams, except at the Main Weir above Kalaehine Stream. The ever-changing volumes and locations of the leaks prevents permanent establishment of ecosystems or other uses for flume leakage. There is no presumption that the ditch will cease to exist.

The Waipio Taro Farmers Association feels that increased streamflow and more frequent variation in stage as a result of restoration of streamflow will increase management effort for the auwai. They feel that the current diversion method that takes the first 30 to 40 MGD provides the most stable streamflow for their needs.

**Comment:** On the subject of hydraulic oils, inexpensive, biodegradable soy based hydraulic fluids are commercially available and should be required.

**Response:** Soy based oils will be investigated for use near streams.

**Comment:** In section 6.3.9 it is claimed that restoration of Hakalaoa will be a project benefit. The same claim was made in Table iii, p. xv. In what way does the project contribute to the restoration of Hakalaoa Falls? All the proposed project has done is delay the inevitable restoration of the falls.

**Response:** The project will assure continued operation of the LHD while Hakalaoa Falls is restored. Without a tunnel-type repair of the collapsed portion of the LHD, full restoration of the falls while maintaining operation of the LHD is impossible.

**Comment:** In section 6.3.10 "Cultural and Historic Resources" a decent explanation of the cultural importance of Waipio is given, but there is no mention of "Effects". Of course, all the effects would be positive if the result of the project is to return water to Waipio, but it will be hard to justify the project economically if, in fact, the ditch will continue to flow regardless of whether the project is implemented.

**Response:** The FEIS will state that the effects to Waipio Valley cultural resources will be the restoration of Hakalaoa Falls and repair and modification of the stream diversions. No adverse effects are expected. The major economic benefit of implementation of the Selected Alternative is expanded agricultural activity in Hamakua due to consistent and stable water supply.

**Comment:** Section 6.3.11 "Wetlands" shows no effect on Waipio. How can diverting up to 17 MGD, or for that matter returning an average of 24 MGD (p. 116) have no effect?

**Response:** The changes in diversion rates are well within the natural variability of the stream system. No effects to Waipio Valley wetlands by project implementation should result.

**Comment:** In section 6.3.12, "Water Rights", there is no mention of riparian rights. In light of appurtenant and Hawaiian water rights being protected by the State Constitution and the State Water Code, how can "all the waters" be held by the State? The impression given here that the water that the project will take is held by the State, to do with as the State pleases, is incorrect. The reality is that all the waters of Waipio fall into the category of appurtenant rights, held by the current owners of the property on which the water was being used in 1848. What about the "McBryde" decision (appealed all the way to the U.S. Supreme Court) that stated that inter basin transport of water was illegal in Hawaii? And where did the statement "The taro growers... assert a right to have the water released into the valley controlled" come from? Which taro farmers? What right?

**Response:** Because of the adequate volume of baseflow of Waioia River below the diversions, about 23 MGD, implementation of the project will not affect riparian use of water in Waipio Valley. The language in the State Water Code referring to "all waters being held by the State" is intended to

acknowledge the States role as the trustee for the water resource. The ability of taro growers to exercise appurtenant rights to water for taro cultivation is not expected to be abridged by the project due to the available water supply in Waioia River. Although the McBryde case appeared to rule against interbasin transfers, the State Water Code permits interbasin transfer of water in designated water management areas. While the Water code is silent in nondesignated areas, no legal challenge has been mounted against the numerous water systems throughout the state that transport water from one part of islands to another.

The Waipio Taro Farmers Association made the assertion regarding Waipio Valley water rights.

**Comment:** I found section 6.3.14 illogical. It is stated that elevated temperatures and altered water quality downstream may be affecting upstream migration as opposed to the diversions, but isn't the cause of the elevated temperatures and altered water quality in a large part due to the diversions? The "labyrinth of diversion ditches" is also blamed, but these ditches not only provide increased habitat, but are currently far less of a labyrinth than they were before the ditch, and they had existed for a thousand years with apparently no adverse effect on the native aquatic biota (which crashed about 15 years after the ditch was built). And there are no fish above the diversions! And for effects, naturally the project will be doing this wonderful thing, putting all that water back into the stream.....

**Response:** Increased flow in Waioia River is expected to improve aquatic habitat for native species at the lower end of the stream system. However, increased streamflow, in its self, may not restore populations of native species, as discussed above. The project sponsors will be working with the Division of Aquatic Resources to develop data and techniques to support the increase of native stream species.

**Comment:** In section 6.3.15 "Settling" there is an enormous amount of misinformation. First of all, there are at least 60 taro farmers in Waipio. Many farmers do not belong to either the WTFA or the WVCA. There is also the Independent Taro Farmers Association, and another group started by the Loos, along with those farmers who belong to none of the above. To say that the WTFA accounts for "nearly all the commercial taro production in Waipio Valley" is false, although they may account for more than half. To say that it "was formed nearly 50 years ago" is an outright lie, it was formed as a branch of the Community Association in 1987 and eventually became an independent organization. And what right does the WTFA have to provide "oversight" of the auwai system? The membership of the WVCA is equally misrepresented, but I believe that it represents more appurtenant rights holding landowners than the WTFA, in which the membership is composed entirely of Bishop Museum lessees.

Christopher Kaitihun

**Response:** The number of taro farmers in the valley will be changed in the FEIS to reflect the numbers you propose. While the specifics of the formation of the WTFA can be debated, the WVFTA remains the strongest advocate for commercial taro growing activity in the valley. We understand appurtenant rights to be attached to land parcels under land use similar to that when the appurtenant right was conferred during the Great Mahele, irrespective of ownership.

**Comment:** And as for the water needs estimated under 'Auwai', farmers would loose it if they had any idea that they could be left with such minimal flows. I think that "Estimates run from 25,000 G/A/D to 500,000 G/A/D" would be more accurate.

**Response:** No less water than is currently available to taro farmers will result from project implementation. The WTFA has stated that there is sufficient water under current conditions for taro cultivation.

**Comment:** And under "Other Waipio Valley Problems", in the last paragraph it seems the DEIS saying that frequent bulldozing of the river is "necessary for the proper functioning of the waterheads". I believe that bulldozing of the river is the cause of most of the waterhead and erosion problems, as well as being illegal and an environmental disaster.

**Response:** The need to provide maintenance in the main channel of the Wailoa River to stabilize the auwai system and prevent flooding was expressed by the WTFA. The WTFA is pursuing the required permits and approvals to allow such maintenance.

**Comment:** The key to the logic of the "Effects" section is in the opening phrase "Many Waipio Valley farmers believe..... In fact, the sudden increase from 22 MGD to high water has a much greater effect than an increase from 40 MGD would have (percent change again)". Also, I'm not so sure that the WTFA opposes an increase in the low flow. And the planned regime (divert all the water during drought, dump all the water during high flow periods) does nothing to reduce the fluctuation in the river; instead it aggravates the problem. A plan which diverted more water during high flow periods, and less during drought, storing water for the up top farmers, could be helpful to the taro farmers. However, this is not the scenario planned.

**Response:** The subject sentence is intended to convey the beliefs and feelings of a large and significant group of taro farmers. There is agreement among taro farmers that there would be little problem to auwai and taro production if more water were released during dry periods. However, many taro farmers also agree that use of the water to irrigate cropland in Hamakua is a beneficial use of the water resource. The option of providing a reservoir to store water for the dry season in Hamakua was investigated and is described in the EIS.

16

Christopher Radtke

**Comment:** Section 6.3.16 reaffirms that repair of Hakalaoa Falls will take place with or without the project. So how can that repair be considered a project benefit?

In section 6.5, the presumption that the ditch will remain regardless of the project prevents examination of the effect of committing 17MGD of Waipio's water to the project.

Section 6.7.8 once again makes the claim that the plan will restore Hakalaoa and increase flow in Waipio.

Section 6.8 is meaningless without recognizing that the plan will take water from Waipio.

**Response:** The responses to the comments are provided above.

**Comment:** In Appendix B I don't understand how they concluded that 1,554 additional acres of diversified crops would be planted with the project. I also noticed that the money for easements is just to document and record them, not purchase them. Plus, I'd really like to see the math that the NED figures are based on. And I simply don't understand the section on hydrology. Why is a crop evaporation rate and a pan evaporation rate needed? Why include pan evaporation stations not in the project area? Why figure out the water needs of each crop separately and then average them into a 'reference crop'? Why are the peak water need estimates based on 90 percent frequency of rainfall when the objective of the project is "to assure sufficient irrigation water for 80 percent frequency of rainfall" (p. 15)

**Response:** The expansion of agricultural activity is a estimate following discussions with farmers and landowners and which was reviewed by many of the interviewees. The analysis for the NED determination and crop hydrology are available for review at the NRCS State Office in Honolulu. Please contact Dudley Kubo, Water Resources Planner, at the address on the letterhead or by telephone at 808-541-2600 ext.124 if you wish to examine the documentation.

Crop evapotranspiration is based on pan evaporation modified by a crop consumptive use coefficient. While an averaged crop coefficient may have been used, the development of separate irrigation requirements for various crops allowed analyses with different crop distributions. An additional table displaying the water need for the six evaluated crops will be inserted. The foot note for Table B-3 should be for 80% annual rainfall exceedence frequency.

**Comment:** In Appendix C- Hawaii Coastal Zone Management Assessment, it is claimed that the project is not near a public right-of-way, that the project will not occur in or affect a popular fishing area, that it is not near a sandy beach, and that there are no swimming or other recreational resources in the area (all on p.C-3). All of this is incorrect. Also, on p. C-7, that the project will not

17

Christopher Raitlhubn

involve dredging (how do they plan to clean the ditch?) And, of course, all effects of the project are positive because it will result in the restoration of Waipio's streams. On p. C-10, the project is not in a potential flood inundation area, which is immediately contradicted when it states that the entire floor of Waipio is designated on the Flood Insurance Rate Map.

**Response:** The CZM Assessment is correct in that the project improvements are not on the coastline. Dredging by the project will not take place in streams, wetlands, or marine areas which are all regulated as "waters of the United States." The project improvements in Waipio Valley do not extend to the valley floor and are not in the floodplain. Land treatment assistance to farmers in Waipio Valley will be evaluated separately.

**Comment:** After reading the letters in Appendix "D" I find I have unanswered questions: Who's land will be irrigated? What about Hawaiian Homes priority rights to water? How will water rights be obtained? Will Hiihawe return to its "original" (pre-plantation) state? Have marketing studies been performed to identify an appropriate level of diversified agriculture? What happens to the assets of a company when that company is "involuntarily dissolved" (as Hawaiian Irrigation Co., who owned the ditch, recently was)? What will the environmental effects of access be? (Rebuild trails, helicopter landing pads?) Does the state have any legal claim that would justify it moving water from one watershed for delivery to another? What are the true future water needs of farmers in Waipio? What is the potential of the suwai system in Waipio?

**Response:** The land on which irrigated crops are grown will be a mix of government and private lands. The current estimate provides for approximately one-third State, one-third KSBE, and one-third non-KSBE. The Department of Hawaiian Home Lands does not have any land in the watershed area or a reservation for water captured by the LHD. Hiihawe will not be restored to its pre-plantation state due to its diversion by a water system separate from the LHD.

The Hawaiian Irrigation Company was involuntarily dissolved by the Department of Commerce and Consumer Affairs on November 16, 1998 for inactivity. Our understanding is that the Hawaiian Irrigation Company did not have tangible assets. The environmental effects of construction will be temporary and will be in compliance with County Codes and Conservation District use requirements. That interbasin transfer is acceptable under the current State Water Code is assumed. The project has not assessed, in detail, the future potential for Waipio taro production. Most of the information is based on discussions with community members.

**Comment:** On a final note, what happened to my comment letter? The letter from me in this DEIS is not my comments on the previous version of this DEIS, it is a letter to Paul Matsuo of the DOA outlining issues I felt should be addressed in the State EIS. This reminded me a bit too much of what happened to my comment letter regarding the Waimea-Paauilo Watershed Project (Upper

18

Christopher Raitlhubn

Hamakua Ditch), where a letter from Mr. Terrance Shuemaker, Esq., representing a group he formed called the Waipio Valley Instream Users Association was substituted for my very extensive comments on the plan, with my name on the bottom of a letter that I did not write! This time I would appreciate it if my actual, unedited comments were used. Anything else is misrepresentation!

**Response:** We are puzzled by these allegations. A review of our files did not turn up any other letters that we may have received from you for either this project or the Waimea-Paauilo Watershed project. If you have copies of the comment letters that you refer to and wish to pursue this matter, please contact Dudley Kubo.

Sincerely,



KENNETH M. KANESHIRO  
State Conservationist

cc: State of Hawaii Department of Agriculture  
State of Hawaii Office of Environmental Quality Control



STATE OF HAWAII  
DEPARTMENT OF LAND AND NATURAL RESOURCES  
COMMISSION ON WATER RESOURCE MANAGEMENT  
HONOLULU, HAWAII 96850

January 27, 1999

Mr. Kenneth M. Kaneshiro, State Conservationist  
Natural Resources Conservation Service  
United States Department of Agriculture  
P.O. Box 50004  
Honolulu, HI 96850

Dear Mr. Kaneshiro:

Comments on the Draft Watershed Plan and EIS for the  
Lower Hamakua Ditch Watershed

Thank you for requesting our comments to the draft plan. In general, the Commission on Water Resource Management (CWRM) strongly promotes the efficient use of our water resources through conservation measures and use of alternative non-potable water resources whenever available, feasible, and there are no harmful effects to the ecosystem. Also, the CWRM encourages the protection of water recharge areas, which are important for the maintenance of streams and the replenishment of aquifers. Specifically, our comments are summarized as follows:

- 1) p. 17 - The report should explain and/or justify how cracks in the ditch lining do not contribute to water loss from the ditch system as significantly as leakage from the 50 flumes along the ditch.
- 2) p. 18 - Section 2.2.3 System Losses. The report should explain and/or justify that the normal allowance for water losses for this ditch system can be as high as 20 percent.
- 3) p. 19 - The report should identify when the KSBE-DOA Agreement was reached and signed.
- 4) p. 23 - Section 3.1.4.1 Hamakua Area Streams. We have no record of stream diversions on Kapulea Stream under our registration or regulation programs from either Hamakua Sugar or private individuals. If this diversion was put in place after July 1987, then an after-the-fact stream diversion works permit may be necessary. Additionally, if put in place after June 15, 1988, an amendment to the interim instream flow standard may be necessary.
- 5) p. 24 - Section 3.1.4.2 Wells. Our records show that the Paauilo Tunnel (also known as Paauilo Shaft, State Well No. 5321-02) has a 250 gpm pump which is incapable of pumping up to the 2 mgd capacity mentioned in the plan. Our records also show that the Feedlot Well (also known as the Slaughter House Well, State Well No. 6323-01) has a 950 gpm pump installed which should be capable of producing the 1 mgd. Finally, Field 20150 Well (which we assume to be Hamakua Sugar Well #2, State Well No. 8424-01) has been drilled with a pump installed (no power), but no well completion report has been submitted to the Commission. Likewise, a pump installation permit must be obtained and a completion report submitted for Well No. 6124-01 before the well may be pumped.

THOMAS L. JONES  
Secretary  
ROBERT G. CORALD  
DAVID A. MORGAN  
BRIAN S. ANDERSON  
JAMES W. HARRIS  
KAREN M. RICHARDS, JR.

EDWARD J. SAUNDRA  
Commissioner

Mr. Kenneth M. Kaneshiro  
Page 2 of 7  
JAN 27 1999

In general, scanty information exists for these wells, and other ground-water sources such as tunnels, associated with Hamakua Sugar and these sources' relationship with the Lower Hamakua Ditch. Before any modifications are made to any ground-water sources a well construction and/or pump installation permit may need to be obtained prior to such work.

- 6) p. 26 - Section 3.2 Alternative Plans. SCADA systems are an excellent idea; however, provisions for vandalism should be specified. Data from such a system will help to meet the requirements of monthly water diversion reporting required by the Commission. In the absence of this SCADA system, no monthly water use is reported to the Commission. The Commission strongly emphasizes that measurement of water use from ground and surface water sources is required.
- 7) p. 27 - Alternative 1. The document should explain how the leakage figure 'as high as 25' mgd was estimated.
- 8) p. 27 - Alternative 1. The last paragraph states that repair of the Hakaloa Falls will not be pursued by DOA if the watershed project is not implemented. To avoid confusion, it should be clarified that the repair of the 'tunnel portion of the Lower Hamakua Ditch below Hakaloa Falls' will not be repaired. The restoration of the falls is a requirement by Order of the Commission and is to be done no later than December 1, 1999 by removing the illegal stream diversion above the falls which was constructed to protect the damaged tunnel portion of the Lower Hamakua Ditch below Hakaloa Falls.
- 9) p. 56 - Section 4.2.7 SCADA. We reiterate that the Commission strongly emphasizes that measurement of water use from ground and surface water sources is required. Therefore, provisions to measure Alakahi and Kolaue stream diversions flows should be made.
- 10) p. 58 - Section 4.3 Costs. From our experience through our cooperative agreement with the U.S. Geological Survey, \$25,000/yr may cover only 1 stream gaging station in the valley. It is not clear how the measurement of Waipio Valley Stream flows would be covered by this budget.
- 11) p. 64 - Section 4.4.3 permits and Compliance. Additionally, a stream diversion works modification permit would need to be obtained prior to construction work on the Waipio Valley stream intake modifications.
- 12) p. 102 - Section 5.10.1 Lower Hamakua Ditch. The document should state how the figure of current use from the ditch is estimated to be between 2 to 5 mgd.
- 13) p. 116 - Section 6.3.6 Surface Water Quality and Quantity. The Commission strongly emphasizes that measurement of water use from ground and surface water sources is required. Therefore, all surface water diversions from streams into the Lower Hamakua Ditch must be measured and reported to the Commission.
- 14) p. 117 - Section 6.3.7 Ground Water Quality and Quantity. The Commission strongly emphasizes that measurement of water use from ground and surface water sources is required. Therefore, all well pumpage into the Lower Hamakua Ditch, or delivered via other means to users who would otherwise use the Waipio Valley water, must be measured and reported to the Commission.





United States Department of Agriculture  
Natural Resources Conservation Service  
P.O. Box 50004  
Honolulu, HI 96850

*Our People...Our Islands...In Harmony*

August 19, 1999

Linnel Nishioka, Deputy Director  
Commission on Water Resource Management  
P.O. Box 621  
Honolulu, Hawaii 96809

Dear Ms. Nishioka:

Subject: Lower Hamakua Ditch Watershed DEIS Review Comments

Thank you for the Commission on Water Resource Management (CWRM) review of the Draft Environmental Impact Statement and Watershed Plan for the Lower Hamakua Ditch Watershed, County of Hawaii. We wish to respond to the comments contained in the CWRM letter dated January 27, 1999.

Comment: p. 17 - The report should explain and/or justify how cracks in the ditch lining do not contribute to water loss from the ditch system as significantly as leakage from the 50 flumes along the ditch.

Response: Leakage from through the cracked concrete lining has only been qualitatively assessed based on the areas observed. The absence of major leakage in those areas actually viewed is based on the presence of soil backing against the concrete, absence of eddying and whirling characteristic of seepage, and the infrequency of obvious wet areas adjacent to the ditch where leakage appears at the soil surface. Once the major flume leaks have been corrected, a measured water budget can be used to identify and characterize the leakage through the ditch lining. Repairs to the ditch lining will be made first to locations where lining is missing.

Comment: p. 18 - Section 2.2.3 System Losses. The report should explain and/or justify that the normal allowance for water losses for this ditch system can be as high as 20 percent.

Response: The 20 percent loss figure was a "guesstimate" to provide a realistic expectation of the effectiveness of the proposed repairs to eliminate all the water loss from the system. Conveyance efficiency is an important factor when modeling irrigation systems. Without thorough instrumentation and substantial record of flow measurements throughout the ditch system it is impossible to generate an accurate prediction of the conveyance efficiency in the LHD system after the proposed repairs are completed. As the 20 percent figure cannot be substantiated, the statement will be deleted.

Mr. Kenneth M. Kaneshiro  
Page 3  
July 27 1999

15) p. 123 - Section 6.3.12 Water Rights and Traditional Uses of Water. It should be clarified that existing uses of water in areas not designated as Water Management Areas are determined partially based on registration of water sources and declarations of water use. This registration and declaration program does not purvey or establish any water rights per se, but is used by the Commission to identify actual users of water at the time the Water Code was enacted. To date, no registered sources or declared uses on the Big Island have been certified by the Commission. Additionally, the Commission's regulation program continually inventories those diversions of surface and ground-water sources, which occur within both within and outside Water Management Areas. Status of the use of water is ultimately tied to the monthly reporting requirements of the Commission under its administrative rules for both ground and surface water diversions.

16) p. 147 - Same as comment 11.

17) p. 152 - The Commission should be identified as one of the agencies consulted during this document review

18) AppB - System loss calculations should be expanded and defined.

19) General - The document should explore the possibility of providing for more reservoir storage outside of the valley. This would further reduce the drought reliance on 100% diversion at all Waipio Valley Diversion structures during drought conditions.

20) General - We defer comment on potential water quality concerns to the State Department of Health and the Federal EPA.

Sincerely,

*Edwin T. Sakoda*  
EDWIN T. SAKODA  
Acting Deputy Director

RH:ss

c: Ed Henry, DLNR, Land Division

Linnel Nishioka, Deputy Director  
Commission on Water Resources Management

Comment: p. 19 - The report should identify when the KSBE-DOA Agreement was reached and signed.

Response: The FEIS will provide the date when the agreement was signed.

Comment: p. 23 - Section 3.1.4.1 Hamakua Area Streams. We have no record of stream diversions on Kapulena Stream under our registration or regulation programs from either Hamakua Sugar or private individuals. If this diversion was put in place after July 1987, then an after-the-fact stream diversion works permit may be necessary. Additionally, if put in place after June 15, 1988, an amendment to the interim instream flow standard may be necessary.

Response: As reported in the DEIS the diversion is no longer in use and probably was abandoned before 1987. The Watershed project does not intend to put the Kapulena Stream diversion back into use.

Comment: Section 3.1.4.2 Wells. Our records show that the Paauilo Tunnel (also known as Paauilo Shaft, State Well No. 6321-02) has a 250 gpm pump which is incapable of pumping up to the 2 MGD capacity mentioned in the plan. Our records also show that the Feedlot Well (also known as the Slaughter House Well, State Well No. 6323-01) has a 950 gpm pump installed which should be capable of producing the 1 MGD. Finally, Field 20150 Well (which we assume to be Hamakua Sugar Well #2, State Well No. 6424-01) has been drilled with a pump installed (no power), but no well completion report has been submitted to the Commission. Likewise, a pump installation permit must be obtained and a completion report submitted for Well No. 6424-01 before the well may be pumped. In general, scanty information exists for these wells, and other ground-water sources such as tunnels, associated with Hamakua Sugar and these sources' relationship with the Lower Hamakua Ditch. Before any modifications are made to any ground-water sources a well construction and/or pump installation permit may need to be obtained prior to such work.

Response: During the period 1946 to 1967 the pumpage from the Paauilo Shaft averaged 2 MGD. Similar output can be expected with a increase in pump capacity. It will be noted in the FEIS that modifications and various well permits from CWRM will be required to utilize these wells for the Watershed project.

Comment: p. 26 - Section 3.2 Alternative Plans. SCADA systems are an excellent idea; however, provisions for vandalism should be specified. Data from such a system will help to meet the requirements of monthly water diversion reporting required by the Commission. In the absence of this SCADA system, no monthly water use is reported to the Commission. The Commission strongly emphasizes that measurement of water use from ground and surface water sources is required.

Response: While some preliminary provisions for vandalism, such as fencing and enclosures, can be suggested in the FEIS, the final anti-vandalism provisions

Linnel Nishioka, Deputy Director  
Commission on Water Resources Management

will be developed during system design. The stream diversion flow data required by the CWRM will be collected and transmitted.

Comment: p. 27 - Alternative 1. The document should explain how the leakage figure "as high as 25" MGD was estimated.

Response: The estimate was made by the Department of Agriculture's maintenance contractor. The source of the estimate will be included in Section 2.2.3 System Losses.

Comment: p. 27 - Alternative 1. The last paragraph states that repair of the Hakalao Falls will not be pursued by DOA if the watershed project is not implemented. To avoid confusion, it should be clarified that the repair of the 'tunnel portion of the Lower Hamakua Ditch below Hakalao Falls' will not be repaired. The restoration of the falls is a requirement by Order of the Commission and is to be done no later than December 1, 1999 by removing the illegal stream diversion above the falls which was constructed to protect the damaged tunnel portion of the Lower Hamakua Ditch below Hakalao Falls.

Response: The subject sentence has been changed to indicate that it is the LHD tunnel that will not be permanently repaired. A sentence indicating that Hakalao Falls will be restored by December 1, 1999 has also been inserted.

Comment: p. 56 -Section 4.2.7 SCADA. We reiterate that the Commission strongly emphasizes that measurement of water use from ground and surface water sources is required. Therefore, provisions to measure Alakahi and Koiawe stream diversions flows should be made.

Response: A statement which states that measurement of Alakahi and Koiawe Stream diversion is required and that SCADA implementation for the measurement and recording should be evaluated will be included in Section 4.2.7. If a SCADA unit cannot be used, another form of flow recording will be used.

Comment: p. 58 -Section 4.3 Costs. From our experience through our cooperative agreement with the U.S. Geological Survey, \$25,000/yr may cover only 1 stream gaging station in the valley. It is not clear how the measurement of Waipio Valley Stream flows would be covered by this budget.

Response: The \$25,000 per year for four years is not intended to provide all of the flow measurement in Waipio Valley. NRCS will contribute the funds to other efforts, most likely by the Division of Aquatic Resources, to measure flow rates in Waipio Valley in relation to ecosystem analysis.

Comment: p. 64 -Section 4.4.3 permits and Compliance. Additionally, a stream diversion works modification permit would need to be obtained prior to construction work on the Waipio Valley stream intake modifications.



J. Mishioka, Deputy Director  
Commission on Water Resources Management

Response: The Stream Diversion Works Modification Permit will be added to the list in Section 4.4.3.

Comment: p. 102 - Section 5.10.1 Lower Hamakua Ditch. The document should state how the figure of current use from the ditch is estimated to be between 2 to 5 MGD.

Response: The section will be expanded to state that the estimate of two to five MGD, during the current non-drought period, is based on estimates by water users, the LHD maintenance contractor, and analysis of the estimated crop acreage.

Comment: p. 116 - Section 6.3.6 Surface Water Quality and Quantity. The Commission strongly emphasizes that measurement of water use from ground and surface water sources is required. Therefore, all surface water diversions from streams into the Lower Hamakua Ditch must be measured and reported to the Commission.

Response: A paragraph stating the CWRM requirement on measurement and reporting will be inserted into this section.

Comment: p. 117 -Section 6.3.7 Ground Water Quality and Quantity. The Commission strongly emphasizes that measurement of water use from ground and surface water sources is required. Therefore, all well pumpage into the Lower Hamakua Ditch, or delivered via other means to users who would otherwise use the Waipio Valley water, must be measured and reported to the Commission.

Response: A paragraph stating the CWRM requirement on measurement and reporting will be inserted into this section.

Comment: p.123 -Section 6.3.12 Water Rights and Traditional Uses of Water. It should be clarified that, existing uses of water in areas not designated as Water Management Areas are determined partially based on registration of water sources and declarations of water use. This registration and declaration program does not purvey or establish any water rights per se, but is used by the Commission to identify actual users of water at the time the Water Code was enacted. To date, no registered sources or declared uses on the Big Island have been certified by the Commission. Additionally, the Commission's regulation program continually inventories those diversions of surface and ground-water sources, which occur with time both within and outside Water Management Areas. Status of the use of water is ultimately tied to the monthly reporting requirements of the Commission under its administrative rules for both ground and surface water diversions.

Response: The second paragraph in Section 6.3.12 will be changed to include much of the language in your comment to clarify the oversight role of the CWRM.

A-61

Linné Nishioka, Deputy Director  
Commission on Water Resources Management

Comment: p.152 -The Commission should be identified as one of the agencies consulted during this document review.

Response: The CWRM will be added to the list of agencies reviewing the 1995 version of the DEIS.

Comment: App B- System loss calculations should be expanded and defined.

Response: As discussed in the response to the comment on page 18 of the DEIS, above, the system losses can only be estimated at this time. A paragraph describing the potential system losses will be inserted into Appendix B.

Comment: General - The document should explore the possibility of providing for more reservoir storage outside of the valley. This would further reduce the drought reliance on 100% diversion at all Waipio Valley Diversion structures during drought conditions.

Response: The evaluation of reservoir storage in Hamakua to alleviate the demand on Waipio Valley streams will be included as Section 3.1.4.6 Storage Reservoirs.

Sincerely,



KENNETH M. KANESHIRO  
State Conservationist

cc: State of Hawaii Department of Agriculture  
State of Hawaii Office of Environmental Quality Control





**HAMAKUA COUNTY FARM BUREAU  
P. O. BOX 1380  
HONOKAA, HAWAII 96727**

Kenneth Kaneshiro, State Conservationist  
USDA Natural Resources Conservation Services  
300 Ala Moana Blvd., Room 4316  
P. O. Box 50004  
Honolulu, Hawaii 96850-0050

January 29, 1999

Dear Mr. Kaneshiro:

Thank you for allowing us the opportunity to comment on the Draft Environmental Impact Statement (DEIS) for the Lower Hamakua Ditch (LHD) Watershed Plan.

The Hamakua County Farm Bureau wishes to go on record in support of the DEIS for the Lower Hamakua Ditch Watershed Plan. We request, however, that the following recommendations be considered for inclusion in the DEIS:

1. Page XV/17/18 One - 'The participating agencies and groups will be included in the LHD agricultural water system advisory board once the agricultural water system is formally organized.'

We request that the Hamakua County Farm Bureau be included as a member of the advisory board.

2. Page 34/7 One & Two - Sizing of intakes at Kawainui, Alakahi and Koiawe Streams.

While we are satisfied with the low flow rate of approximately 17 MGD that the three streams would provide for the 2,500 acres of croplands in Hamakua, we are concerned that the sizing of the three intakes at Kawainui, Alakahi and Koiawe Streams would be permanent and unable to accommodate future demands for water as more acreage become available for crops.

We recommend that the sizing of the intakes be constructed in such a manner as to be flexible enough to accommodate future demands for water beyond the 17 MGD designated by the DEIS. We also ask that the 2,500 acres be defined to eliminate questions in the future as to who is entitled to water during low flow conditions.

USDA Natural Resources Conservation Services  
January 29, 1999  
Page 2.

3. Pages 33-41 - Alternative Plans for the Restoration and Repair of the LHD.

We concur with the DEIS that Alternative 3 - Repair and Restoration of the LHD is the best and most feasible of the four alternatives. We suggest, however, that Alternative 4 - 'Replacement of Open Ditch with Pipeline' - be kept in the DEIS as the best way to improve future maintenance of the LHD and resolve problems with the open ditch system. Pipes large enough to accommodate future demands (up to 25 MGD) should be installed piecemeal as funding becomes available.

Again, thank you for this opportunity to submit comments on the DEIS. We ask that our suggestions and/or recommendations be seriously and favorably considered.

Sincerely,

  
Yoshitō Takamine  
President

cc: Paul Matsuo, Hawaii State Department of Agriculture



Department of  
Agriculture  
Resources  
Conservation  
Service  
P.O. Box 50004  
Honolulu, HI  
96850

*Our People... Our Islands... In Harmony*

August 19, 1999

Yoshito Takamine, President  
Hamakua County Farm Bureau  
P.O. Box 1380  
Honokaa, Hawaii 96727

Dear Mr. Takamine:

Subject: Lower Hamakua Ditch Watershed DEIS Review Comments

Thank you for your review of the Draft Environmental Impact Statement and Watershed Plan for the Lower Hamakua Ditch Watershed, County of Hawaii. We wish to respond to the comments contained in your letter dated January 29, 1999.

Comment: Page xvii - "The participating agencies and groups will be included in the LHD agricultural water system advisory board once the agricultural water system is formally organized." We request that the Hamakua County Farm Bureau be included as a member of the advisory board.

Response: The Hamakua County Farm Bureau will be added to the list in the FEIS.

Comment: Page 54/ff One & Two - Sizing of intakes at Kawainui, Alakahi and Koiawe Streams. While we are satisfied with the low flow rate of approximately 17 MGD that the three streams would provide for the 2,500 acres of croplands in Hamakua, we are concerned that the sizing of the three intakes at Kawainui, Alakahi and Koiawe Streams would be permanent and unable to accommodate future demands for water as more acreage become available for crops. We recommend that the sizing of the intakes be constructed in such a manner as to be flexible enough to accommodate future demands for water beyond the 17 MGD designated by the DEIS. We also ask that the 2,500 acres be defined to eliminate questions in the future as to who is entitled to water during low flow conditions.

Response: The project has since adopted a recommendation by the U.S. Fish and Wildlife Service to limit stream diversion during baseflow periods to 70 percent of the streamflow. This action reduces the drought period diversion to approximately 13 MGD. The physical intakes themselves can easily be modified to divert more streamflow. If in the future, water supply in excess of 13 MGD is needed for Hamakua agricultural users an application for additional diversion can be submitted to the Commission on Water Resources Management. Wells, storage reservoirs, and conservation restrictions will also be considered if agricultural water demand exceeds the supply available from the Lower Hamakua Ditch.


Yoshito Takamine, President  
Hamakua County Farm Bureau

Most of the estimated 2,500 acres of projected cropland are yet to be developed and cannot be exactly located. Many of the details of the operation of the agricultural water system will be developed once the DOA irrigation district is established. Farmers and the public will have an opportunity at that time to provide input.

Comment: Pages 33-41 - Alternative Plans for the Restoration and Repair of the LHD. We concur with the DEIS that Alternative 3 - Repair and Restoration of the LHD is the best and most feasible of the four alternatives. We suggest, however, that Alternative 4 "Replacement of Open Ditch with Pipeline" - be kept in the DEIS as the best way to improve future maintenance of the LHD and resolve problems with the open ditch system. Pipes large enough to accommodate future demands (up to 25 MGD) should be installed piecemeal as funding becomes available.

Response: While the most cost-effective alternative is Alternative 3, pipeline replacement offers many advantages. The management of the LHD agricultural water system will likely incorporate pipeline components into the system as a part of their repair and replacement activities.

Sincerely,

  
KENNETH M. KANESHIRO  
State Conservationist

cc: State of Hawaii Department of Agriculture  
State of Hawaii Office of Environmental Quality Control

02/02/99

FAX 808 935 1205

Co/ll Res & Dev

Stephen K. Yamashiro  
Mayor



Diane S. Quilquitt  
Director

02/02/99 TUE 17:19 FAX 808 935 1203

Co/ll Res & Dev

LC002

Mr Kenneth M. Kaneshiro  
Page 2  
January 29, 1999

**County of Hawaii**  
**DEPARTMENT OF RESEARCH AND DEVELOPMENT**

23 Airport Street, Room 219 • Hahaione, HI 96720-4152  
HONOLULU, (808) 961-4366 • FAX (808) 935-1205 • KONA: (808) 329-5126 • FAX (808) 326-5663  
E-mail: chreds@limerpc.net

January 29, 1999

Mr. Kenneth M. Kaneshiro, State Conservationist  
Natural Resources Conservation Service  
United States Department of Agriculture  
P.O. Box 50004  
Honolulu, HI 96850

Dear Mr. Kaneshiro:

Subject: Draft Watershed Plan-Environmental Impact Statement for Lower Hamakua  
Ditch Watershed

The County of Hawaii Department of Research and Development supports the proposed project relating to the repair of existing Lower Hamakua Ditch to provide a dependable irrigation water supply to 2,500 acres of irrigated croplands in the Hamakua coast area between Pauilo and Kukuilaale. The availability of dependable agricultural water creates a tremendous opportunity to expand diversified agriculture on the Big Island.

However we have a great concern regarding the economic viability of the project. There is nothing in this document that indicates KSBE's assurance that their lands that can be served by this project will be committed/dedicated for the farming activities identified in the document. Other farming activities that do not require much irrigation could be conducted on those lands thus creating a situation where users of the water from the system may have to pay very high water rates. If the price of the water will be above what is considered economically viable for farmers, then the farming activities will be limited to a few very high value crops that could pay for the high cost of water. These crops may not use all the water from the system. This document did not address the issue of excess water capacity (if not all 2,500 acres irrigate).

The issue of ownership of the system in the event that DOA will not continue the operation of the system after the 35 years lease was not addressed.

The issue of diversion structures constructed by farmers to divert water from the ditch will have to be addressed. Those who spent considerable amount of money may refuse to remove those structures without compensation. If the state will compensate these farmers, where will the funds come from? Will the state look into providing these farmers credit in terms of reduced water rates? If so, will the rest of the users of the water pay higher water rates?

On page 9, under section 2.1.3, first paragraph, line 6, change the word capitol to capital. On page 15, Table D, the units are inconsistent with the numbers in the table.

We thank you very much for the opportunity to comment on this document. If you have questions, please contact us at (808) 961-8366.

Sincerely,

*Diane S. Quilquitt*  
Diane S. Quilquitt  
Director

Cc: Mayor Stephen Yamashiro



United States  
Department of  
Agriculture

Natural  
Resources  
Conservation  
Service

P.O. Box 50004  
Honolulu, HI  
96850

*Our People... Our Islands... In Harmony*

August 19, 1999

Diane S. Quitiquit  
Director  
Department of Research and Development  
25 Aupuni Street, Room 219  
Hilo, Hawaii 96720

Dear Ms. Quitiquit:

Subject: Lower Hamakua Ditch Watershed DEIS Review Comments

Thank you for your review of the Draft Environmental Impact Statement and Watershed Plan for the Lower Hamakua Ditch Watershed, County of Hawaii. We wish to respond to the comments contained in your letter dated January 27, 1999.

**Comment:** We have a great concern regarding the economic viability of the project. There is nothing in this document that indicates KSBE's assurance that their lands that can be served by this project will be committed/dedicated for the farming activities identified in the document. Other farming activities that do not require much irrigation could be conducted on those lands thus creating a situation where users of the water from the system may have to pay very high water rates. If the price of the water will be above what is considered economically viable for farmers, then the farming activities will be limited to a few very high value crops that could pay for the high cost of water. These crops may not use all the water from the system. This document did not address the issue of excess water capacity (if not all 2,500 acres irrigate).

**Response:** The project assumes, and KSBE has stated, that farming activity on KSBE land will be conducted by individual farmers leasing KSBE land. These farmers will have the same access to agricultural water supply from the LHD as other farmers in the area. The estimated 2,500 acres of projected irrigated cropland is expected to occur throughout the over 10,000 acres of available agriculturally-zoned land potentially served by the Lower Hamakua Ditch. The current water demand of two to five MGD will provide enough of a user base to keep water fees affordable, i.e. less than \$0.50 per 1,000 gallons. Except for timber, all other evaluated crops in Hamakua utilize irrigation.

The plan calls for any water in excess of agricultural demand and allowable system loss to remain in the Waipio Valley streams.

**Comment:** The issue of ownership of the system in the event that DOA will not continue the operation of the system after the 35 years lease was not addressed.

Diane S. Quitiquit, Director  
Department of Research and Development

**Response:** Section 4.2.8 Operation states that at the end of the lease period and the 25-year life of the Watershed project "the sponsors can elect to relinquish control of the, then, depreciated system or renegotiate the lease agreement with KSBE."

**Comment:** The issue of diversion structures constructed by farmers to divert water from the ditch will have to be addressed. Those who spent considerable amount of money may refuse to remove those structures without compensation. If the state will compensate these farmers, where will the funds come from? Will the state look into providing these farmers credit in terms of reduced water rates? If so, will the rest of the users of the water pay higher water rates?

**Response:** The issues of water distribution directly from the ditch and charges will be addressed when the State Department of Agriculture establishes an irrigation district later this year. At that time the agricultural users and the public will have an opportunity to review and comment on the operating policies.

**Comment:** On page 9, under section 2.1.3, first paragraph, line 6, change the word capitol to capital. On page 15, Table B, the units are inconsistent with the numbers in the table.

**Response:** Thank you for the corrections.

Sincerely,

KENNETH M. KANESHIRO  
State Conservationist

cc: State of Hawaii Department of Agriculture  
State of Hawaii Office of Environmental Quality Control

# LIFE OF THE LAND

*Ma Mau Ke Ea O Ka Aiea I Ke Pono*  
Hawaii's own Community Action Group  
Protecting our Fragile Environment through  
Research, Education, Advocacy and Litigation



*Our People... Our Islands... In Harmony*

August 19, 1999

Henry Curtis  
Executive Director  
Life of the Land  
1111 Bishop Street, Suite 503  
Honolulu, Hawaii 96813

Dear Mr. Curtis:

Subject: Lower Hamakua Ditch Watershed DEIS Review Comments

Thank you for your review of the Draft Environmental Impact Statement and Watershed Plan for the Lower Hamakua Ditch Watershed, County of Hawaii. We wish to respond to the comments contained in your letter dated January 21, 1999.

**Comment:** How much of the water is going for a few large landowners? For the ten largest probable water users, who are they and what is the percentage of the total water that will be used by each of the users? How much of the water will be used by small farmers?

**Response:** Presently, there is only one large farm known to use LHD water. That is the Pu'u 'Ala Farm on Gibson Trust land. Most documented water users, at present are small farmers. Projections for future agricultural activity, based on interviews with farmers and farm groups tends to continue the trend toward small farming enterprises. Future large water users may include Tut Brothers farm and Kapulena Orchards. KSBE states that farming activity on their property will be by lessees.

**Comment:** Who uses the water now? Will Native Hawaiians be affected by this project? Have you considered the Office of Environmental Quality Control's Cultural Impact Guidelines?

**Response:** The water from LHD currently is used by farmers on State farm lots, private farms such as Pu'u 'Ala Farms and many smaller private farms, ranchers, and many undocumented users. Water supply is currently free of charge because the Department of Agriculture does not have the authority to assess fees during this interim period.

Native Hawaiians are represented in the Hamakua farmers and Waipio Valley farmers. No Hawaiian Home Lands are included in the Watershed area. The project is not expected to adversely affect traditional or cultural practices and, therefore, the Guidelines were not consulted. The State Historic Preservation Division is providing cultural resources oversight for the Hakalana Falls restoration.

U. S. States  
Department of  
Agriculture  
Natural  
Resources  
Conservation  
Service  
P.O. Box 50004  
Honolulu, HI  
96850

January 21, 1999

Kenneth Kaneshiro, State Conservationist  
USDA NRCS  
300 Ala Moana Blvd., Room 4316  
P.O. Box 50004  
Honolulu, Hawaii 96850-0050

Aloha,

The growth and productivity of diversified agriculture is important to the state economy. Life of the Land strongly supports continued expansion in the number of farms, the types of crops grown and the number of small farms.

Life of the Land also supports the rights of Native Hawaiians to practice traditional and customary rights.

After reviewing the DEIS and after touring the area, a few questions stick out.

How much of the water is going for a few large landowners? For the ten largest probable water users, who are they and what is the percentage of the total water that will be used by each of the users? How much of the water will be used by small farmers?

Who uses the water now? Will Native Hawaiians be affected by this project? Have you considered the Office of Environmental Quality Control's Cultural Impact Guidelines?

How much water will be used by (a) the Hamakua/North Hill Agricultural Cooperative (HNHAC); (b) KSBE and (c) the state/county/federal government?

*Henry Curtis*  
Henry Curtis  
Executive Director

1111 Bishop Street • Suite 503 • Honolulu, Hawaii 96813 • phone (808) 533-3434 • fax (808) 533-0993





State  
Department of  
Agriculture

Natural  
Resources  
Conservation  
Service

P.O. Box 50004  
Honolulu, HI  
96850



*Our People... Our Islands... In Harmony*

August 19, 1999


Bruce Anderson, Ph.D., M.P.H.  
Director of Health  
Department of Health  
P.O. Box 3378  
Honolulu, Hawaii 96801

Dear Mr. Anderson:

Subject: Lower Hamakua Ditch Watershed DEIS Review Comments

Thank you for your review of the Draft Environmental Impact Statement and Watershed Plan for the Lower Hamakua Ditch Watershed, County of Hawaii. We understand from your letter dated February 5, 1999 that the Department of Health has no comments at the present time.

Sincerely,

  
KENNETH M. KANESHIRO  
State Conservationist

cc: State of Hawaii Department of Agriculture  
State of Hawaii Office of Environmental Quality Control



**EARTHJUSTICE**  
LEGAL DEFENSE FUND

801 MAIN STREET, SUITE 200, WASHINGTON, DC 20001  
1000 CALIFORNIA STREET, SUITE 200, WASHINGTON, DC 20001  
1000 CALIFORNIA STREET, SUITE 200, WASHINGTON, DC 20001

February 1, 1999

Via Facsimile Transmittal (808) 973-9467 and U.S. Mail

Paul Matsuo  
State Department of Agriculture  
P.O. Box 22159  
Honolulu, HI 96823-2159

Re: Comments on Watershed Plan and Draft Environmental Impact Statement  
Lower Hamakua Ditch Watershed, Hawaii County, Hawaii

Dear Mr. Matsuo:

On behalf of the Waipi'o Valley Community Association (WVCA) and Earthjustice Legal Defense Fund, we submit these comments on the Watershed Plan and Draft Environmental Impact Statement Lower Hamakua Ditch Watershed, Hawaii County, Hawaii (DEIS). The DEIS was prepared by the United States Department of Agriculture's Natural Resources Conservation Service (consultant) for the Hawaii Department of Agriculture (applicant) pursuant to Hawaii Revised Statutes Chapter 343 and the National Environmental Policy Act (NEPA; 42 USC §§ 4321, et seq.). The proposed action (Alternative 3) primarily involves the repair and restoration of the Lower Hamakua Ditch (LHD) and continued diversion of Alakahi, Kawainui, and Ko'iawe streams to provide 9-17 million gallons per day (mgd) for agriculture and other uses.

Our overriding concern is that the proposed action is being planned, implemented, and funded by state and federal agencies at significant cost to the taxpayers, in order to promote the interests of farmers and other users who have access to the LHD, at the expense of instream values protected by the State Water Code. While our primary objection pertains to the proposed action during dry conditions, the projected acreage and water demand for average and dry conditions are inflated in an attempt to justify the proposed action. Even if the proposed amount of water could be used reasonably and beneficially, water should only be diverted from Waipi'o streams if instream uses, including stream ecosystem maintenance and taro cultivation, are accommodated first. Unlike the Hamakua Coast, there are no alternative water sources in Waipi'o Valley.

The DEIS is inadequate and does not meet the minimum requirements of state and federal laws governing the preparation of environmental impact statements. We provide specific comments below on the applicant's failure to: adequately describe and justify the proposed action (Section I); adequately describe the affected environment and the proposed action's impacts (Section II); and consider all reasonable alternatives to the proposed action (Section III). We recommend that the document be revised and reissued in draft form for public review and comment.

LAW FIRM FOR THE ENVIRONMENT  
223 SOUTH KING STREET, 4TH FLOOR, HONOLULU, HI 96813-4501  
T: 808 539-3416 F: 808 531-8841 E: ejustice@earthjustice.org W: www.earthjustice.org

I. Failure To Adequately Describe And Justify The Proposed Action

The DEIS fails to describe and justify the proposed action in terms of the projected use of the LHD, projected water demand, and proposed modifications to the LHD system. NEPA requires the applicant to "[d]evote substantial treatment to each alternative considered in detail, including the proposed action, so that reviewers may evaluate their comparative merits." 40 CFR § 1502.14(b) (emphasis added).

A. Proposed Use of the LHD

1. The DEIS does not adequately describe the proposed use of the LHD. The DEIS (p. 11) states that "[m]any larger farm operators and landowners could not disclose in detail what their plans or those of their agricultural lessees would be with assurance of agricultural water supply." Information on the proposed use is either missing, vague, or inconsistent, rendering the proposed action difficult to evaluate. For example, various sections of the DEIS identify as proposed uses of the LHD irrigation of truck crops, tree crops, and pasture; cattle watering; aquaculture; cooling (Enserch power plant); feedlot/slaughterhouse; domestic uses at Kukuihale; and emergency domestic uses at Pa'uilo. It is not clear from the DEIS whether forestry irrigation and hydro-electric power generation are proposed uses as well. Table A (p. 12) describes only truck and tree crops on 2,500 acres as proposed uses, while Figure 13 (p. 108) identifies more, but not all of the proposed uses discussed elsewhere in the DEIS.

2. The description of agricultural operations on pp. 98-101 should distinguish between all agricultural operations in the Hämākua District, operations that propose to use the LHD, and operations in the project area that depend on water sources other than the LHD. In addition, the term "project area" is used in some cases to refer to the 2,500 acres, and in other cases to the 11,000-acre watershed.

What is the relationship between the agricultural operations described on pp. 98-101 and the proposed use? Which of the state lands described on pp. 98-101 correspond to the state entries in Table A? How many total acres to be irrigated by the LHD are located above and below 500 feet?

3. It is not clear whether the entire 1,438 acres cultivated by the 130 members of the Hämākua/North Hilo Agricultural Cooperative (HNHAC) will be served by the LHD under the proposed action. Since a total of only 600 acres are currently being irrigated by the LHD, how are the remaining HNHAC parcels currently being irrigated? Are all 1,400 acres in Table N (p. 99) proposed as uses of the LHD, and if so, how do these areas correspond to the information in Table A?

4. Which of the proposed uses are identified in the applicant's list of "Lower Hämākua Ditch/Undocumented Water Users" (Attachment 1)? Are any of the 13 areas listed in Table A located above the LHD? If so, the DEIS must discuss the methods, costs, impacts, and alternatives to transporting water above the LHD.

5. The DEIS (p. 102) states that ranchers are currently using LHD water to irrigate 2,000 acres in the project area. How do these ranchers plan on irrigating these lands under the proposed action?

6. According to the acreage identified in Table A, Kamehameha Schools Bishop Estate (KSBE) owns anywhere from 35 to over 50 percent of the 2,500 acres proposed for truck and tree crops. If most of KSBE's land in the project area will remain in grazing leases (p. 100), which will require minimum amounts of LHD water, if any, why is LHD water needed to irrigate tree crops on 95 percent of the 2,500 acres?

7. Do the animal units identified in Table G refer to animal watering or pasture irrigation? Why would the existing number of animal units served (2,300) be reduced to 1,800 under alternatives 2, 3, or 4?

8. The DEIS fails to show that, even if 2,500 acres of diversified agriculture required the proposed amount of water, that amount of acreage will be profitable. For example, how profitable are existing agricultural projects in the region? Is there a market for the additional crops being proposed? How profitable is cattle grazing on the Hämākua Coast? Which agricultural operations have been, and/or will have to be subsidized by state or federal entities to remain solvent? Did the economic analysis of the proposed plan consider such subsidies?

9. The DEIS fails to support the applicant's assumption that large landowners are committed to agriculture in the region. The DEIS should clarify the landowners' options and that, even if LHD water is provided to them, they are free to pursue state land-use classification and county zoning amendments to accommodate non-agricultural land-uses in the project area.

B. Projected Water Demand

1. The DEIS fails to show that agricultural operations in the project area could, at any time in the foreseeable future, reasonably and beneficially use either an average of 9 mgd or a maximum of 17 mgd. Even assuming that all 2,500 acres within the project area could be cultivated in the near future and remain profitable, the projected water demand is inflated in an attempt to justify the maximum diversion of base flows during the dry period. Apparently, the projected water demand for irrigation was estimated by calculating the irrigation need of a "reference crop," based on three truck crops and three tree crops likely to be planted in the project area. The reference crop's water need was then multiplied by the entire 2,500 acres, even though only 129 acres (5 percent of project area) are proposed for truck crops and 2,382 acres (95 percent of project area) are proposed for tree crops. The DEIS states that orchard crops are less drought-sensitive than truck crops. Some of the proposed tree crops require little, if any, irrigation in the project area, and, apparently, pasture irrigation was not considered in the calculation. Presumably, the water need of the reference crop on 2,500 acres was adjusted to account for the number of acres above and below 500-foot elevation.<sup>1</sup>

2. Separate calculations should be made for each of the proposed crop-types (i.e., truck crops, tree crops, pasture irrigation, and forestry, if proposed) based on reasonable irrigation rates and the proposed acreage for the proposed crops. For example, does coffee require irrigation on the Hämākua Coast? How much irrigation does coffee require in Kona?

<sup>1</sup> The estimated water need of each of the crops, the calculated water need of the reference crop, and the acreage above and below 500 feet are not disclosed in the DEIS.

How do the growing conditions in Hāmākua compare with those in Kona? Why would macadamia nut trees require irrigation if they are currently grown in the project area without irrigation? How much irrigation, if any, does papaya require? A farmer in Pepe'ekeo stated that 2,000 acres of papaya would need 3 mgd (1,500 gad). How much water does pasture irrigation require in the project area? The assumptions, credible water use data, and the water need calculations should be disclosed in the DEIS. NEPA requires agencies to insure the professional integrity, including scientific integrity, of the discussions and analyses in environmental impact statements, and to identify any methodologies used and make explicit reference by footnote to the scientific and other sources relied upon for conclusions in the statement. 40 CFR § 1502.24

3. Regardless of how the projected water demand was calculated, the amounts proposed in Table B (p. 15) are clearly excessive. The DEIS proposes a minimum of 900 gallons per acre per day (gad) and a maximum of 4,700 gad during 50 percent frequency/average year, and a minimum of 1,350 gad and maximum of 5,500 gad during 80 percent frequency/dry year. The Hāmākua Coast is generally considered to be a wet region. According to the DEIS, average annual rainfall in the project area is lowest at the coast near Kukuihaele, approximately 60 inches, and increases toward Pa'auilo, which averages 100 inches per year. In contrast, the median annual rainfall for central O'ahu is 30-40 inches, with a minimum of 2-3 inches in the dry period between May and October. The Commission on Water Resource Management (COWRM) used a standard figure of 2,500 gad when it allocated water for diversified agriculture (mostly truck crops) in central O'ahu.

4. According to the DEIS (p. 126), in the 80 percent frequency/dry year, when up to 17 mgd is allegedly needed, the proposed 17 mgd diversion is expected to occur for several days to several weeks during 2 of 10 years. The DEIS (pp. 15, 155) states that irrigation is necessary for the project area during the dry season from May to October. However, the DEIS does not indicate how much irrigation water is needed for which crop-types and for how many acres during this period. Nonetheless, given the rainfall for the project area during the dry period, it is difficult to imagine any situations in which 4,700 gad would be needed during average conditions and an average of 100 inches of rain per year.

5. What does peak refer to in an average year and in a dry year? How often would these conditions occur and for how many acres at any given time? It is also curious that peak use during the second driest year in a 10-year period is 5,300 gad, only 600 gad more than the peak-use amount in an average wet year. The unit of measure in Table B should be gallons per day, not million gallons per day.

6. The terms, base flow conditions, dry year, drought, peak demand/use are used throughout the DEIS, but no definitions are provided. Drought is used in some parts of the DEIS to describe the proposed action during peak-use conditions, but the DEIS also states that prolonged drought was not considered and would need to be addressed. Is this statement accurate in light of the definition of 80 percent frequency scenario? The estimated or average frequency of each condition in the project area should also be disclosed so that reviewers can evaluate the proposed action and the alternatives.

7. The DEIS states that irrigation would enhance some areas, primarily in the project area, for certain selected crops. The crop analysis upon which this statement is based is not provided in the DEIS, and while this general statement can be said of virtually all agricultural lands in the state, it can not justify the excessive amounts of water requested by the applicant. Furthermore, it does not necessarily follow that more water results in a higher level of production; at some point, the use is excessive. For example, according to the DEIS (p. 26), as much as 7 mgd has been used from the LHD for existing agricultural operations on around 600 acres. This amounts to approximately 11,650 gad, which is excessive and requires immediate attention.

8. The DEIS (p. 11) states that a shift in crops in the project area has occurred since 1995, from predominantly truck crops to orchard crops, yet there has been no corresponding decrease in the projected water demand. The projected water demand in the 1995 draft environmental impact statement is the same as the projected demand in 1999 for the same 2,500 acres. It is obvious that the project water demand is almost entirely arbitrary, and designed to justify the proposed action.

9. The DEIS (p. 69) states that "[p]asture irrigation is not considered to be highest value use and should be allowed only during periods of excess water supply." What does "periods of excess water supply" mean? The applicant proposes to divert excessive amounts of water to irrigate 2,500 acres during average and dry conditions. Consequently, "excess" water will probably be available all of the time. Does this mean that LHD water will be used for pasture irrigation even during the dry period, at the expense of instream values? Furthermore, the DEIS states that most of KSBE's land in the project area will remain in grazing leases. Any agreement between the State and KSBE that commits water from the LHD should be conditioned; no LHD water should be used by KSBE or anyone else to irrigate pasture during the dry period, regardless of the amount of available "excess" water in the LHD.

10. The DEIS should describe and evaluate the proposed use of 1 mgd for aquaculture. Can any of this water be reused for agriculture, and if so, was this factored into the projected water demand calculation?

11. The DEIS (p. 26) states that the peak daily water demand is an estimated 14 mgd, of which 12.5 mgd is for crop irrigation. What is the proposed use for the remaining 1.5 mgd? The 1.5 mgd proposed use by Enserch, Inc. is not included in Figure 13 during peak usage conditions when the 14 mgd is allegedly needed. Why is Enserch a proposed user of the LHD? Doesn't Enserch have a well or permits to drill a well for 1.5 mgd?

12. The DEIS (p. 69) states that "[n]on-agricultural uses shall be evaluated after agricultural demand has been met." Our understanding of the cost-sharing arrangement is that federal funds can not be used for non-agricultural purposes. The DEIS should discuss the requirements and restrictions of the federal funding program.

13. How is LHD water used domestically? The DEIS states that the county Board of Water Supply provides potable water from two wells to all of the communities in the project area. Do any communities or households use LHD water directly, or are all domestic uses of LHD water regulated by the Board of Water Supply? Figure 13 (p. 108) indicates that LHD water is used only as an emergency supply in Honoka'a and regularly by the Kukuiahele community. The applicant's list of "Lower Hāmākua Ditch Undocumented Water Users" (Attachment 1) lists a number of potable uses of the LHD water. Is LHD water treated in accordance with the Safe Drinking Water Act? How do the costs of treatment compare with pumping ground water?

14. The DEIS fails to discuss how the proposed action can be justified when it promotes the interests of farmers in proximity to the LHD at the expense of other farmers in Waipi'o Valley and instream values such as the maintenance of native aquatic ecosystems. Wherever large agricultural irrigation systems exist, valley farmers -- who depend on the same streams diverted by these systems -- are always the last to be served, if at all.

#### C. LHD Repair and Restoration

1. The DEIS fails to adequately describe the stream diversions, including the existing intakes and diversion structures and proposed modifications. Photographs and/or diagrams would be useful.

2. The statement on p. 54 of the DEIS regarding modification of the Kawaiinui intake is unclear: "The inlet opening will be sized to accommodate no more than the 10 MGD, which is approximately the low flow rate, plus a fraction to account for clogging of the intake grate." (Elsewhere in the DEIS, the applicant proposes a maximum diversion of 9 mgd from Kawaiinui Stream.) How does the additional 1 mgd "account for clogging of the intake grate?" What exactly does this mean? How was this amount determined? This amount (1 percent of the Kawaiinui diversion) is hardly a "fraction." We do not agree that this is a reasonable use of 1 mgd from Kawaiinui Stream during base-flow conditions. The DEIS should include the amount of the "fraction" of water proposed for the same purpose on Alakahi and Ko'iawe streams.

3. We agree that the LHD diversions have no discernible effect during severe floods (DEIS, p. 111), just as partial or full restoration would not increase the magnitude or frequency of flooding events in Waipi'o Valley. The DEIS overstates the effectiveness of the diversion structures to decrease flood water in the valley. If anything, the status quo and proposed action create greater fluctuations in stream levels than would occur under natural conditions, and may even aggravate the effects of flooding in the valley. The DEIS should explain the calculation used to support the statement that modified LHD diversions can provide up to 30 cfs reduction in flood discharge to Waipi'o Valley (Table G, Flooding and Floodplains, Alternative 3). What is the amount of flood discharge that is reduced by the three existing diversion structures? How significant is this reduction of flood discharge? Million gallons per day should be used here instead of cubic feet per second. Has any modeling been done on how the proposed action would alter Waipi'o/Wailoa channel alignments?

4. The DEIS is vague on how much water is currently leaking from the LHD and how much water is being released unused. Is the sum of the system losses and dumping 20 or 25 mgd?

5. What is the basis for the statement: "Normal allowance for losses for a system of the 25-mile length can amount to 20 percent" (DEIS p. 18)? We do not agree that a 20 percent loss in an efficient system is reasonable. Assuming the LHD flows at 9 mgd during average conditions, 20 percent loss would amount to 1.8 mgd, as opposed to 3 mgd proposed throughout the DEIS. During dry conditions, the LHD should not be allowed to divert 17 mgd, nearly all of the base flow from the three streams at issue. Therefore, it would be unreasonable to allow 20 percent (3.4 mgd) for system losses under these conditions.

6. The statement on p. 53 (Section 4.25 Intakes) is misleading. Approximately 3.4 mgd (20 percent of the proposed maximum diversion) would be lost to seepage, evaporation, and other system losses, under the preferred plan. This is hardly a "fraction" of the diverted water, especially during base-flow conditions.

7. What do the pressure relief systems and pressure-related failures in the lateral pipeline system specifically refer to? Are any energy sources required to transport water from the ditch or within the lateral pipeline system, and if so, which sources are proposed, at what cost, who will bear the expense, and how was this expense factored into the cost-benefit analysis?

8. What is the annual cost of installing and operating the SCADA, including electricity? Is the cost of electricity included in Table D in the appropriate categories?

9. The DEIS fails to adequately describe or evaluate many of the proposed action's associated infrastructure, including the expanded lateral system and modification or relocation of roads and utility infrastructure. For example, the DEIS (p. 53) states: "Other areas will require more time to begin to be developed and the irrigation lateral systems will be installed at a later time and will be funded separately. Expansion of the existing lateral systems will also take place at a later time and will be funded separately." The DEIS must evaluate these essential components of the project, including their impacts, total cost of the proposed agricultural build-out, and alternatives.

10. A schematic diagram should be included in the DEIS depicting existing pipelines and features installed for sugarcane, and existing and proposed lateral systems in relation to the LHD and the 13 areas within the project area.

11. The DEIS (p. 52) states: "Presently, the four reservoirs on the LHD have a combined storage capacity of 31 MG. However, the location of the reservoirs leaves much of the project area without water-leveling capability." What does this statement mean? Why are only two reservoirs being considered (one new, one existing), and how were they selected? Why aren't the three additional existing reservoirs going to be maintained? Storage capacity for 31 mgd would come in handy during the dry period. We are also informed that the catchments described in the DEIS (p. 22) are different than the ones people build in the region, which take advantage of natural patterns of storm runoff that fill constructed ponds. The DEIS should expand its discussion on the options available here.

12. How efficient are the scuffling ponds? Are they lined, or would they be under the proposed action?

13. The discussion of repairs to the LHD and restoration of Hakaloa Falls should disclose that the proposed "medium-term debris basin" will probably require a stream channel alteration permit, stream diversion works permit, and petition to amend the interim instream flow standard (IIFS).

14. The DEIS fails to adequately describe the issues relating to ownership of the LHD. Does the Hamakua Sugar Company (HSC) still exist on paper, and does it own the LHD infrastructure? The DEIS (p. 95) states that many of the housing units are still controlled by the Plantation Trustee. Does the same apply to the LHD? Does HSC have any potential claims to the LHD system?

15. What is the status of the agreement between State and KSBE? As of mid-January 1999, the agreement had not been finalized. The DEIS should include any proposed or finalized agreements between the State and KSBE relating to the LHD.

## II. Failure To Adequately Describe Affected Environment And Proposed Action's Impacts

The DEIS fails to adequately describe the affected environment with regard to natural resources and existing and future water use in Waipi'o Valley. The DEIS also fails to evaluate the environmental impacts of the proposed action. NEPA requires a discussion of the areas to be affected or created by the alternatives under consideration, including the proposed action, 40 CFR § 1502.15, and evaluation of the environmental impacts of the proposed action and its alternatives, including direct and indirect effects, and possible conflicts between the proposed action and the objectives of federal, regional, state, and local land use plans, policies, and controls for the area concerned. 40 CFR § 1502.16.

Appropriate mitigation measures are not included in the DEIS, as required by 40 CFR § 1502.14(f). Mitigation measures include: avoiding the impacts altogether by not taking certain actions or parts of an action; minimizing the impacts by limiting the degree or magnitude of the action; rectifying the impact by repairing, rehabilitating, or restoring the affected environment; reducing or eliminating the impact over time; and compensating for the impact by replacing or providing substitute resources or environments. 40 CFR § 1508.20.

### A. Natural Resources

1. The DEIS fails to describe the affected environment, particularly in the Waipi'o watershed. The impact analysis is inadequate, and the discussion superficial and misleading. The DEIS fails to provide any recent stream gaging data for average and dry periods to support the applicant's claim that the proposed action will result in adequate stream flows and environmental benefit. No impact analysis has been conducted for the proposed action and its effects on the native stream biota, including the continued use of archaic gates to divert stream flows. No minimum conservation flows are proposed for native stream animals, which require access to and from the ocean to complete their lifecycles.

NEPA requires that the DEIS be supported by evidence that the agencies have made the necessary environmental analyses, and that the DEIS serve as the means of assessing the environmental impact of the proposed action, rather than justifying decisions already made. 40 CFR §§ 1500.2(b), 1502.2(g). Statements regarding the impacts of the proposed action must be supported by credible scientific evidence disclosed in the DEIS. The burden is on the applicant to obtain, evaluate, and disclose the necessary information to support the continued diversions, not on citizens trying to conserve water and restore degraded streams.

2. The DEIS fails to adequately describe or mitigate the impact of insufficient stream flows resulting from diversions by the LHD. Not surprisingly, no populations of 'o'opu were found above the LHD diversions during a survey of the Alakahi, Kawaiui, Ko'iawe, and Waipi'o streams (DEIS p. 125). According to the DEIS, the survey results indicate that the diversion structures appear to prevent 'o'opu from moving into stream reaches above the LHD diversion structures, which is probably true given the nature of these archaic structures. According to the DEIS, the survey results also suggest that environmental factors in Waipi'o Valley near the ocean, such as elevated temperature, altered water quality, a labyrinth of ditches, and introduced species, may be at least partially responsible for limiting the abundance of fish further upstream. However, no evidence or analysis to support this statement is provided in the DEIS.

Insufficient flows resulting from the LHD diversions contribute to adverse conditions, such as elevated water temperature, altered water quality, and the presence of introduced species. Extensive taro lo'i have been maintained for hundreds of years on Kava'i, Moloka'i, Maui, O'ahu, and Waipi'o Valley prior to the LHD, and have not destroyed fish populations. Indeed, the presence of all five 'o'opu species in the lower reaches of Lāiākea/Hii'iawe Stream, which flows through Waipi'o Valley and converges with Waioa River approximately 0.5 mile from the coast, suggests that the LHD diversions are the primary factors in limiting native fish populations in Alakahi, Kawaiui, Ko'iawe streams.

3. The description of the proposed action's benefits to Waipi'o Valley and instream values is misleading. While increased flows during average conditions will increase potential suitable habitat for native stream species, the net result of the proposed action during the dry period is no different than the status quo: 17 mgd, nearly the entire base flow, will continue to be diverted by the LHD from Kawaiui Stream (9 mgd), Alakahi Stream (5 mgd), and Ko'iawe Stream (3 mgd). The only difference between the status quo and the proposed action during the dry period is that 5, rather than 6 mgd would be diverted from Alakahi, and 3, rather than 2 mgd would be diverted from Ko'iawe. Maintaining minimum conservation flows for native stream animals and ecosystems is especially critical during the dry period. Stream ecosystems require adequate base flows at all times of the year. Increasing flows during high flow periods while draining them during low periods is no benefit at all.

4. The DEIS must evaluate the direct, indirect, and cumulative impact<sup>2</sup> of the proposed action, including the effect of stream diversions by the Upper Hāmākua Ditch (UHD). The DEIS incorrectly states that there is no relationship between the UHD and the LHD diversions. 40 CFR §§ 1502.16, 1508.25(a)(2).

5. The DEIS (p. 114) states that a survey of a rare, undescribed Hawaiian stream fly is being undertaken and that the results of the survey will be used to develop mitigation strategies if it is determined that the proposed action will adversely affect the stream fly or its habitat. The results of the survey and habitat characterization, and appropriate mitigation must be evaluated and disclosed in the DEIS.

6. The DEIS fails to adequately evaluate the proposed action's impact on wetlands and endangered waterbirds. The endangered kōlea, Hawaiian duck, 'ālele, ke'oke'o, Hawaiian coot, and ae'o Hawaiian stilts utilize streams, wetlands, and mudflats in the Waipi'o watershed. Waipi'o Valley has been identified by the United States Fish and Wildlife Service (FWS) as "essential habitat" for these birds. The Hawaiian Waterbirds Recovery Plan states that the "[p]rotection and enhancement of these areas as well as stream habitat on Kauai and Hawaii (Kohala and windward Mauna Kea) will provide a long term base of habitat" and that "[m]aintenance of suitable habitat is the foundation for the entire recovery program."<sup>3</sup>

7. The Endangered Species Act requires federal agencies to "utilize their authorities in furtherance of the purposes [of the act] by carrying out programs for the conservation of endangered and threatened species . . ." 16 USC § 1536(a)(1). The DEIS fails to recognize the importance of essential habitat in Waipi'o Valley, and does not describe the proposed action's impacts or appropriate mitigation measures. Instead, the DEIS merely states that mitigation action to retain or enhance wetlands or endangered species habitat will be taken if significant wetland resources or native endangered insects are found. This is inadequate.

8. The DEIS fails to address FWS's concerns and recommendations. Among other things, FWS recommends: that stream intakes be modified to pass base flows and withdraw only surplus flows up to the maximum amount required by the project; that the proposed acreage be reduced or water use plans be modified to require volumes consistent with surplus flow withdrawals; and that the intakes be redesigned to allow planktonic larvae of native stream animals to pass downstream without being entrained into the LHD and to facilitate upstream migration of stream animals.<sup>4</sup> FWS has also stated that it is unable to support alternatives that "entail continued diversions of the majority of base flow and thus continued severe impacts to aquatic communities below the intakes."<sup>5</sup>

<sup>2</sup> Cumulative impact is the impact on the environment that results from the incremental impact of the action when added to the other past, present, and foreseeable future actions regardless of what federal or non-federal agency or person undertakes such other actions. 40 CFR § 1508.7.

<sup>3</sup> U.S. Fish and Wildlife Service, Appendix A, September 11, 1985.

<sup>4</sup> Letter to Kenneth Kaneshiro, Natural Resources Conservation Service, from Willie R. Taylor, U.S. Department of the Interior, November 24, 1995.

<sup>5</sup> Letter to Kenneth Kaneshiro, Natural Resources Conservation Service, from Brooks Harper, FWS, August 7, 1995.

NEPA requires all federal agencies to "prepare draft environmental impact statements concurrently with and integrated with environmental impact analyses and related surveys and studies required by the Fish and Wildlife Coordination Act (FWCA) . . ." 40 CFR § 1502.25(a). The FWCA requires:

The reports and recommendations of the Secretary of the Interior on the wildlife aspects of [affected] projects . . . shall be made an integral part of any report prepared or submitted by any agency of the Federal Government responsible for engineering surveys and construction of such projects when such reports are presented to the Congress or to any agency or person having the authority or the power, by administrative action or otherwise, (1) to authorize the construction of water-resource development projects . . . The reporting officers in project reports of Federal agencies shall give full consideration to the report and recommendations of the Secretary of the Interior . . .

16 USC § 662(b).

What is the status of the consultant's compliance with the FWCA? Clearly, FWS's concerns and recommendations have not been considered, nor have the environmental impact analyses and related surveys and studies been included in the DEIS, as required by the FWCA and NEPA.

9. The "watershed" boundaries should include the headwaters of the affected streams and diversions by the UHD. The DEIS should also include a more detailed hydrologic analysis of the proposed action's impacts in the watershed. We urge the applicant to employ the services of the United States Geological Survey or other qualified hydrologists to conduct these required studies.

10. The DEIS should describe more specifically how the \$25,000/year will be spent for stream flow measurement in Waipi'o Valley. The DEIS (p. 62) states that the consultant will assist with stream flow measurement in Waipi'o Valley during the installation period. Which streams will be gaged, by whom, and for how long? Stream flows above and below diversions, ditch flow, and Waipi'o Stream/Wailoa River should be gaged at this time to obtain sufficient data for the impact analyses required by NEPA and for future decision-making by COWRM and others.

11. The DEIS should describe the abandoned Waimā pump and its impact on the environment, including the possible presence of hazardous substances in the Waipi'o watershed. During a field survey of Waipi'o Valley on June 19-21, 1995, FWS observed an inactive pump house and three electrical transformers, which may contain PCBs, above Waimā Stream. This situation should be investigated immediately, in addition to formally abandoning the Waimā stream diversion structure, as required by the State Water Code, HRS § 174C-95, HAR § 12-168-34. The DEIS should also identify any other potential impacts associated with hazardous waste in the project area.

12. The DEIS should evaluate the impact of transporting, storing, and using hydraulic oils and other petroleum-based substances in the Waipi'o watershed, including the use of alternative inexpensive, biodegradable, hydraulic fluids.

13. The proposed action, and the continued diversion of nearly all of the base flows in the three streams at issue during the dry period is inconsistent with county, state, and federal objectives relating to water management, native species/ecosystem conservation, and cultural resources. For example, there is no identification of how the proposed action is inconsistent with the State Water Code's mandate to identify the best use of stream flows in the Waipi'o watershed and to protect instream values, appurtenant water rights, and traditional and customary Hawaiian practices.

There is no evaluation of the proposed action's impacts on state policies for maintaining water quality. According to the DEIS, the Hawai'i Water Quality Standards Map classifies the Waipi'o Valley drainage area above the valley floor as Class 1, which requires that the waters remain in their natural state as nearly as possible with an absolute minimum of pollution from human caused sources. The continued diversion of nearly the entire base flows from the Alakahi, Kawainui, and Ko'iawe streams significantly alters the natural state of these streams and reduces their ability to dilute contaminants and sediment. In addition, the draft Hawai'i Coastal Zone Management Assessment (Appendix C to the DEIS) is incomplete regarding impacts on the affected environment, natural and cultural resources, public access, recreation, and other considerations. These inconsistencies must be discussed in the DEIS pursuant to 40 CFR § 1502.16(c).

#### B. Existing And Future Uses In Waipi'o Valley

1. The DEIS fails to adequately describe the affected environment or the proposed action's impacts with regard to existing and future water use in Waipi'o Valley. The DEIS focuses on the benefits of the proposed action to users on the Hamakua Coast, but gives short shrift to Waipi'o Valley, which has been identified as Unique Agricultural Land.<sup>6</sup> The DEIS assumes that, while there is economic benefit in diverting water to the Hamakua Coast, there is no economic value in allowing streams to flow in the Waipi'o watershed. The DEIS (p. 109) states that no mitigation of the proposed action's impacts on prime and unique farmland are necessary. However, no surveys or investigations are provided in the DEIS to support the applicant's claim that the proposed action provides enough water in Waipi'o Valley.

2. The DEIS fails to describe or quantify existing and proposed water uses in Waipi'o Valley. As a starting point, the DEIS should identify all of the declared water uses and water rights in the Waipi'o watershed.

3. The estimated 25,000-50,000 gad for wetland taro cultivation is low. What is the source of this estimate? Have any measurements been taken in Waipi'o Valley?

4. The DEIS misrepresents the Waipi'o Valley community. Apparently, there are approximately 60 (not 25) farmers in the valley. Many of the farmers do not belong to either WVCA or the Waipi'o Valley Taro Farmers Association (WVTF). Other organizations, such as the Independent Taro Farmers Association and Waipi'o Valley Instream Users Association, should be mentioned in the DEIS and involved in any proposed use of Waipi'o water. According to WVCA, WVTF was organized in 1987, initially as a branch of the community association.

<sup>6</sup> Agricultural Land of Importance to the State of Hawai'i, (ALISH) system. Hawai'i Board of Agriculture, 1988.

5. The DEIS incorrectly states that the number of acres in taro in Waipi'o Valley has remained the same since 1994. The DEIS should include information on the additional acreage put into taro cultivation since then. The DEIS should discuss the Bishop Museum's leases to taro farmers in the valley, including the number and acreage in current and future leases, and lease conditions such as any requirements to establish and maintain taro to 1.

6. The DEIS should clarify that all waters of the state are regulated by COWRM. Any memoranda of agreement, management authorities, and advisory boards anticipated by the applicant/consultant are still subject to the State Water Code and regulation by COWRM. Whether the Draft Memorandum of Agreement between affected parties will be finalized remains to be seen. WVCA has not committed to signing any agreements. A significant unresolved issue is the proposed diversion of 17 mgd, nearly all of the base flows for Alakahi, Kawainui, and Ko'iawe streams during the dry period. Appurtenant and riparian water uses in Waipi'o Valley, native stream ecosystems, and traditional and customary practices must be accommodated before water is diverted out of the Waipi'o watershed during the dry period.

7. The discussion on water declaration and water rights is misleading. The DEIS states that the applicant will secure the water rights to operate the ditch, which do not exist, and fails to describe or evaluate the proposed project's impacts on appurtenant, riparian, and native Hawaiian rights, which do exist. The DEIS should state that the LHD diversions at Alakahi, Kawainui, Ko'iawe, and Waimā streams were declared by the Hamakua Sugar Company in 1989, and that a declaration of water use does not create a right to that use, just as failure to declare a use does not extinguish it.

8. Any agreement between the State and KSDE cannot transfer water rights that do not exist, and can only transfer the opportunity to exercise a previously declared water use until such time as the declared use changes. That time has come. The purposes for which the use was declared have changed. The amount of the water use has changed, including a significant increase in system losses. The diversion structure and pump at Waimā Stream have been abandoned. A citizens' complaint on water waste and dumping is currently being investigated by COWRM staff. A citizen petition has been filed with COWRM to amend the IIFS for streams in Waipi'o, including Alakahi, Kawainui, and Ko'iawe.

9. We are aware of the following kinds of rights that relate to surface water, all of which may apply to Waipi'o Valley (not the LHD) and are affected by the proposed action:

- o appurtenant water rights that run with the land, protected by the Hawai'i State Constitution and State Water Code
- o riparian water rights for uses adjacent to streams, protected by the Hawai'i State Constitution and common law
- o water rights for kuleana lands, protected by state law
- o Hawaiian rights, including the right to fish and gather in streams, cultivate taro, worship, protected by the Hawai'i State Constitution and State Water Code

The DEIS should describe these rights as they pertain to the Waipi'o watershed and how they are affected by the proposed action. We disagree that no measures are necessary to mitigate the proposed action's impacts on water rights and traditional uses of water.

10. There is no right to have the water released in Waipi'o Valley controlled by the LHD diversions, as described in the DEIS under water rights (p. 123). The status quo and the proposed action increase the fluctuations in stream levels in the Waipi'o watershed, and far more taro was cultivated in Waipi'o Valley at one time without the LHD diversions. Although WVTFA may want the LHD diversions maintained at full capacity, including the Waimā Stream diversion (at least during the high-flow period), the applicant must show that the proposed use is reasonable and beneficial. Maintaining maximum stream diversions, regardless of need or impact, as opposed to implementing structural and/or operational modifications to the 'auwai system, is ludicrous.

Assistance in protecting, repairing, modifying, and/or managing the 'auwai systems may be necessary so that restored stream flows can be maximized and enjoyed with minimal impacts to farmers in the valley. If the taro farmers are having difficulty getting permits and approvals to work in the main stem of the Wailoa River, as stated in the DEIS (p. 129), then the applicant/consultant should provide technical assistance in applying for the proper permits and approvals. The DEIS should also state WVTFA's position on restored flows during the dry period.

11. Table G Water Rights Alternative 2 (wells) should be clarified by stating that all stream flows diverted by the LHD would be restored to Waipi'o Valley. (Diversions by the UHD would not be restored under the proposed well alternative.) Table G Water Rights, Alternative 3 (ditch repair/restoration) also should be clarified by stating that partial restoration of stream flow to Waipi'o Valley and an amendment to the IFS will not address WVCA's concerns regarding the continued diversion of nearly all of the base flow from Alakahi, Kawainui, and Kōiawe streams during the dry period, when water shortages in the valley are already occurring and minimum conservation flows for native species are needed.

12. All descriptions of economic losses and limited agricultural activities and expansion, including the summary and comparison of alternatives Table G, should include the economic losses associated with inadequate stream flows, increased water temperatures, taro rot, and other diseases associated with water shortages in Waipi'o Valley. The DEIS and Table G must also describe the impacts of continued diversion of 17 mgd during the dry/drought period on existing taro cultivation, expansion of taro lo'i, and the exercise of traditional and customary practices such as fishing and gathering in streams.

13. The DEIS (Table H, p. 60) proposes to spend \$25,000/year on the required stream gaging and the item is budgeted as "assistance" to Waipi'o Valley, and \$212,500/year on conservation practices and accelerated technical assistance for LHD users. The stream gaging proposed in the DEIS is required as part of the environmental impact analysis required under NEPA, and the information generated by the proposed gaging will also be required as part of the applicant's stream diversion works permit application and petition to amend the IFS. While we appreciate the stream gaging effort, it should not be identified as assistance to Waipi'o Valley farmers.

All farmers in the project area are entitled to assistance and fair/equal treatment by the applicant and consultant, not just those along the Hāmākua Coast. Adequate funding should be allocated to providing technical assistance to Waipi'o Valley farmers, who may require assistance in managing their 'auwai systems, adjusting to increased flow in Waipi'o Stream/Wailoa River during average conditions, and ensuring adequate flows in the valley during the dry period.

14. It is inaccurate to refer to ditch leakage as stream flow, even if the leakage flows in streambeds below the LHD.

### III. Failure To Adequately Consider All Reasonable Alternatives To The Proposed Action

1. NEPA requires the applicant to rigorously explore and objectively evaluate all reasonable alternatives to the proposed action, and devote substantial treatment to each alternative considered. 42 USC §4332(C)(ii); CFR §§ 1502.14(a), (b). The applicant must also "identify and assess the reasonable alternatives to the proposed actions that will avoid or minimize adverse effects of these actions upon the quality of the human environment," 40 CFR § 1500.2(e), including "reasonable alternatives not within the jurisdiction of the lead agency." 40 CFR §§ 1500.2(e), 1502.14(c). Instead, the applicant has chosen the most destructive, inefficient, and least creative alternative, one that does not address the unresolved issues relating to streams in the Waipi'o watershed.

2. The DEIS fails to consider an integrated water source alternative for the dry period in order to avoid or minimize the adverse effects of the project on taro cultivation, native aquatic ecosystems, and other instream values protected by the State Water Code. A combination of ditch water, wells, county water, and, possibly, additional stream diversions along the Hāmākua Coast deserves serious consideration. Replacing the open ditch with a pipeline would also save as much as 3 mgd in leakage alone, which could be restored to the streams of origin or be made available for reasonable and beneficial uses.

3. The DEIS (p. 57) states that "[a]n active program to assure the availability of wells that can be used to augment the LHD supply should be undertaken as agricultural development in Hāmākua approaches the projected "build-out" level. Yet, the DEIS fails to adequately consider wells in combination with other sources and conservation measures during the dry period. Ground water development on the Hāmākua Coast is inevitable; stream flows can not and should not be sacrificed when ground water is plentiful. The applicant should subsidize the drilling and operation of existing and planned wells to provide adequate irrigation water during the dry period, which is only expected to occur for several days to several weeks during 2 of 10 years, according to the DEIS (p. 126).

Two aquifer systems are relevant to the proposed action. The Honoka'a Aquifer System has a sustainable yield of approximately 31 mgd, with current use at less than 1 percent of the sustainable yield. The Pa'aulo Aquifer System has a sustainable yield of 60 mgd, with a current use of 4.4 mgd (7 percent). The DEIS mentions the Pa'aulo Tunnel, Feedlot Well, and Field 20150 Well, which are already built and which could produce as much as 6-8 mgd. (The DEIS erroneously reports Pa'aulo Tunnel's capacity at 2 mgd, rather than 6 mgd, which affects the cost estimates for wells.) Has the applicant considered the Haina and Honokaa wells, or any additional wells that may have been registered by the HSC?



According to hydrologist John Mink, "groundwater resources within HMCo. lands are enormous and have a sustainable yield far in excess of plantation needs. Virtually anywhere within the plantation boundaries a successful well could be drilled to supply both domestic and irrigation requirements." Appendix 4 to Mink's report lists groundwater sources in the general project area. Have any wells, shafts, tunnels, or surface water diversions in the project area been obtained by KSBCE or the State? What is the operational status of these water works, and have any been abandoned formally or otherwise? Why is the State's Feedlot/Slaughterhouse identified as a proposed use of the LHD (0.10 mgd, Figure 13, p. 108), if a well is available? Could that well provide more than 2 mgd as a back-up during the dry period? Does the projected water demand for the project area include the expected 2 mgd from this well?

At least 9.5 mgd, as opposed to 4 mgd, may be available from existing wells. This oversight alone, added more than \$8 million to the estimated cost of the well alternative. Additional savings could be realized with the use of irrigation timers, conversion of the open ditch to the pipeline, and water conservation measures. The applicant should consider subsidizing existing wells during the dry period, including any wells that are currently operated or planned by the proposed users of the LHD.

4. According to the DEIS (p. 26), alternative stream diversions were ruled out because of prohibitive storage reservoir requirements, but there is no consideration given to diverting surface water into the LHD system. Additional surface water sources along the Hāmākua Coast, such as streams and springs, should be considered as part of an integrated source alternative, subject to minimum conservation flows and no adverse impacts to existing uses. The DEIS (p. 114) identifies 23 perennial streams between Waipū'o Valley and Pa'auilo Gulch, seven of which flow continuously to the ocean year round. HSC declared its use of several streams and springs along the Hāmākua Coast in 1989. The applicant should determine the status of the streams, springs and infrastructure, and whether any of this water could be available during the dry period.

Additional potential surface water sources include water diverted by the Lalākea Ditch and by the UHD. An average of 1.5 mgd is currently diverted from three streams in the Hi'iawe Stream system by the Lalākea Ditch. Are the existing uses reasonable and beneficial? Are the current users of the Lalākea Ditch in line for LHD water too? Could this water accommodate any existing or proposed uses of the LHD? The UHD diverts water from the Alakahi, Kawaiūi, Ko'iawe, and Waīma streams above the LHD diversions. As additional ground water sources are developed in Waīmea, less water could be diverted by the UHD and remain in the streams of origin, thereby mitigating some of the adverse impact of any LHD diversions during the dry period. The DEIS should also discuss the reasons why diversions of Alakahi, Kawaiūi, and Ko'iawe streams are proposed over Waīma.

<sup>7</sup> Water Resources and Development for Hāmākua Sugar Company, June 20, 1984.

5. Conservation measures would stretch the limited water supply during the dry period, and should be explored as part of an integrated source alternative. These include replacing the open ditch with the more efficient pipeline; requiring farmers to install inexpensive timers and irrigate at night when evaporation rates and pumping costs are lower, and mixing saline and fresh water for use wherever possible. The water saved by the pipeline alone could remain in the streams of origin where it is most needed during the dry period, or, if sold, would help cover the installation costs. In addition to saving water, the advantages of a pipeline include better tracking of unauthorized connections and lower maintenance costs. The estimated cost of the pipeline seems high in light of the fact that the foundation for the open ditch has already been established.

6. The description of the status quo/no-action alternative is misleading. A year-to-year continuation of the present situation, in which up to 25 mgd is lost to leakage or dumped unused, is highly unlikely in light of the pending complaint on water waste and dumping and petition to COWRM to amend the IIFS for the streams diverted by the LHD and the Lalākea Ditch. Furthermore, COWRM has already ordered the restoration of Hāmākua Falls regardless of what happens to the LHD, and it is misleading to identify the restoration as a benefit to be realized only if the LHD is restored.

7. Stream channel alteration permits, petitions to amend the IIFS, and stream diversion permits are required to modify existing intakes and to abandon stream diversion works, such as the infrastructure at Waīma Stream. HRS §§ 174C-93, 95, HAR § 12-168-32-34. This information should be included in the DEIS.

8. The alleged economic benefit of the proposed action, \$3,000 per acre across the board, regardless of use, rainfall, and economic factors, is questionable.

9. The DEIS incorrectly states that the amount of stream flow diverted in alternatives 3 and 4 would be the same. Under alternative 4, stream diversions would be reduced by approximately 30 percent during average conditions and 18 percent during dry conditions.

10. It is difficult to compare the relative costs of alternatives 2, 3, and 4 given the information disclosed in the DEIS. For example, what is the currently proposed delivery charge for LHD water, \$45 or \$48 per 1000 gallons? Does the estimated cost of alternative 3 include the cost of purchasing easements, as opposed to only documenting and recording them?

11. The statement on p. 10 regarding concerns about the project that were raised between 1995 and 1998 is misleading. In fact, many of the project concerns remain unresolved. The agreement between the State and KSBCE to operate the LHD had not been finalized as of mid-January 1999, half of the remaining easements on the other private properties have yet to be secured, and the question of ditch ownership has not been resolved. From our perspective, the most significant unresolved issue is the proposed use during dry/base-flow conditions. The applicant/consultant are simply unwilling to ensure adequate stream flows to enhance and maintain native stream ecosystems and accommodate other uses in Waipū'o Valley during base-flow conditions.

I. KSEBE LANDS (Total - 7,322.87 acres)

TAX	ACRES	USE	TAX	ACRES	USE
4-8-0413	219.53	pastoral	4-8-08116	8.84	div. ag.
4-8-0611	221.91	pastoral	4-8-0114	276.94	pastoral
4-8-0612	81.72	-	4-8-0115	81.25	-
4-7-0412	151.76	-	4-7-0411	445.19	-
4-7-0411	16.65	-	4-7-03118	27.75	-
4-7-03116	37.87	-	4-7-0311	593.46	-
4-7-01126	139.2	-	4-7-01123	142.7	-
4-6-0314	46.14	div. ag	4-6-0317	31.18	div. ag
4-6-03110	43.5	-	4-6-0511	630.15	pastoral
4-6-0212	782.12	pastoral	4-6-0116	715.29	-
4-6-0815	202.77	-	4-5-0112	350.9	-
4-5-0111	310.48	-	4-5-0116	31.51	-
4-4-0411	744.1	-	4-4-0214	243.15	-
4-4-1017	135.67	-	4-4-1C16	33.1	-
4-4-0112	167.02	-	4-4-0117	43	-
4-3-0418	291.96	-	4-3-0412	20.32	-
4-4-03111	24.12	div. ag	4-4-03110	18.03	div. ag
4-4-0318	18.31	-	4-4-0316	18.53	-
4-4-03134	40	-	4-4-0312	17.77	-
4-4-0315	18.06	-	4-4-03136	17.37	-
4-4-3137	17.67	-			

II. STATE LANDS (Total - 1,465.3 acres)

TAX	ACRES	USE	TAX	ACRES	USE
4-4-0111	32.1	div. ag	4-6-0311	645	pastoral/agr.
4-3-0212	thru 7	160	4-6-0512	-	-
4-3-0511	10.7	-	4-6-04101	-	-
4-6-0117	118.5	pastoral	4-6-0413	-	-
18	-	-	4-5-311	509	div. ag
118	-	-			

III. PRIVATE LANDS (OTHER THAN KSEBE LANDS) (Total - 1,581.17 acres)

KSEBE	ACRES	USE
Randall estate	521.99	pastoral
Cooper estate	637.35	agr./pastoral
Holt estate	80.45	div. ag
Kaaua estate	5.93	-
Hoo estate	302.2	pastoral
Roman Catholic Church	33.25	div. ag./pastoral

IV. PORTABLE WATER USE (Total - est. 169 households)

- Kukuhoale Camp (est. 8 households)
- County Park, Waipio Lookout
- Camp 105 (est. 6 households)
- Waipio Rim Kuleana Lots (4 households)
- Kapulea Camp (est. 12 households)
- Haina Hill Camp (est. 20 households)
- Panauhau Villages (est. 115 households)
- County DHS emergency at Kapulea (4 inch)
- County DHS emergency at Haina (6 inch)

12. NEPA requires the applicant and consultant to "study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources." 42 USC § 4332(2)(E). The applicant's/consultant's duty to develop appropriate alternatives in light of the unresolved conflicts is in addition to the alternative analysis required by NEPA. 42 USC § 4332(C)(iii); 40 CFR §§ 1501.2(e), 1502.1. In *Environmental Defense Fund v. Corps of Engineers of the U.S. Army*, 492 F.2d 1123, 1135 (5th Cir. 1974), the court found this requirement to be:

supplemental to and more extensive in its commands than the requirement of 102(2)(D)(iii). It was intended to emphasize an important part of NEPA's theme that all change was not progress and to insist that no major federal project should be undertaken without intense consideration of other more ecologically sound courses of action, including shelving the entire project, or of accomplishing the same result by an entirely different means.

Thank you for the opportunity to comment. We look forward to your response.

Sincerely,

*Marjorie Ziegler*

Marjorie Ziegler

cc: Natural Resources Conservation Service  
 Governor Benjamin Cayetano  
 Office of Environmental Quality Control  
 Commission on Water Resource Management  
 Hawai'i Congressional Delegation  
 United States Fish and Wildlife Service

*Our People...Our Islands...In Harmony*

August 19, 1999

Marjorie Ziegler  
Earthjustice Legal Defense Fund  
223 South King Street, 4th floor  
Honolulu, Hawaii 96813-4501

Dear Ms Ziegler:

Subject: Lower Hamakua Ditch Watershed DEIS Review Comments

Thank you for your review of the Draft Environmental Impact Statement and Watershed Plan for the Lower Hamakua Ditch Watershed, County of Hawaii. We wish to respond to the comments contained in your letter, addressed to the State of Hawaii Department of Agriculture, dated February 1, 1999.

**Comment:** Our overriding concern is that the proposed action is being planned, implemented, and funded by state and federal agencies at significant cost to the taxpayers, in order to promote the interests of farmers and other users who have access to the LHD, at the expense of instream values protected by the State Water Code. While our primary objection pertains to the proposed action during dry conditions, the projected acreage and water demand for average and dry conditions are inflated in an attempt to justify the proposed action. Even if the proposed amount of water could be used reasonably and beneficially, water should only be diverted from Waipi'o streams if instream uses, including stream ecosystem maintenance and taro cultivation, are accommodated first. Unlike the Hamakua Coast, there are no alternative water sources in Waipi'o Valley.

**Response:** The Lower Hamakua Ditch Watershed project seeks to balance the economic and social objectives of providing opportunities for agricultural enterprise and economic revitalization of the Hamakua area with enhancement of environmental and cultural resources in Waipi'o Valley. The project planners have worked with government agencies and Waipi'o Valley farmers and community to ensure that water for taro cultivation and stream ecosystem management are fully considered.

The baseflow period diversion recommended by the U.S. Fish and Wildlife Service in their comments on the DEIS will be adopted. The recommended release of 30 percent of the baseflow to Waipi'o Valley streams will result in reduction of the peak diversion from the earlier-proposed 17 MGD to approximately 13 MGD.

**Comment:** The DEIS is inadequate and does not meet the minimum requirements of state and federal laws governing the preparation of environmental impact statements. We provide specific comments below on the applicant's failure

to: adequately describe and justify the proposed action (Section 1); adequately describe the affected environment and the proposed action's impacts (Section 11); and consider all reasonable alternatives to the proposed action (Section 11). We recommend that the document be revised and reissued in draft form for public review and comment.

**Response:** The DEIS was distributed for wide review. Nearly 40 letters of comment were received by the project planners. We are satisfied from examination of the DEIS and review comments that the DEIS provides sufficient information to describe the effects of project implementation and that with some modification can be issued as a FEIS.

**Comment:** The DEIS does not adequately describe the proposed use of the LHD. The DEIS (p.11) states that "[m]any larger farm operators and landowners could not disclose in detail what their plans or those of their agricultural lessees would be with assurance of agricultural water supply." Information on the proposed use is either missing, vague, or inconsistent, rendering the proposed action difficult to evaluate. For example, various sections of the DEIS identify as proposed uses of the LHD irrigation of truck crops, tree crops, and pasture; cattle watering; aquaculture; cooling (Enserch power plant); feedlot/slaughterhouse; domestic uses at Kukuhaele; and emergency domestic uses at Pa'auilo. It is not clear from the DEIS whether forestry irrigation and hydroelectric power generation are proposed uses as well. Table A (p. 12) describes only truck and tree crops on 2,500 acres as proposed uses, while Figure 13 (p. 108) identifies more, but not all of the proposed uses discussed elsewhere in the DEIS.

**Response:** An amount of uncertainty will always exist for a project of this type which involves a large number of individuals (persons and corporations) and individual decisions. As a whole, however, the planners are confident that the projected future conditions are a reasonable and accurate estimate.

While the wording describing the water use may differ in parts of the document, the basic purposes of cropland irrigation and livestock drinking water are central. No forestry irrigation or hydropower generation are immediately contemplated. No LHD water will be provided to the Enserch facility, as they have since developed a source.

**Comment:** The description of agricultural operations on pp. 98-101 should distinguish between all agricultural operations in the Hamakua District, operations that propose to use the LHD, and operations in the project area that depend on water sources other than the LHD. In addition, the term "project area" is used in some cases to refer to the 2,500 acres, and in other cases to the 11,000-acre watershed.

**Response:** Further clarification will be made in this section to indicate whether an operation is in the project area or not in the project area and whether it will receive LHD water or not.

The term "project area", as defined in Section 5.1 [Watershed] Location and Size and in the glossary, is the approximately 11,000 acre region within which agricultural water from the LHD can be provided. We project 2,500 acres of irrigated cropland to be developed within the project area. The Watershed area, which is approximately 38,500 acres, is all of the area that is hydrologically connected by the LHD, including the Kohala Mountain source, Waipio Valley streams, and the potential Hamakua service area.

**Comment:** What is the relationship between the agricultural operations described on pp. 98-101 and the proposed use? Which of the state lands described on pp. 98-101 correspond to the state entries in Table A7? How many total acres to be irrigated by the LHD are located above and below 500 feet?

**Response:** With the exception of timber and approximately one-half of the pastureland, nearly all of the cropland discussed on pages 98 to 101 are within the project area described in Table A and will receive agricultural water from the LHD. The preliminary projection is that crops will be evenly split between by the 500-foot elevation line.

**Comment:** It is not clear whether the entire 1,438 acres cultivated by the 130 members of the Hamakua/North Hilo Agricultural Cooperative (HNHAC) will be served by the LHD under the proposed action. Since a total of only 600 acres are currently being irrigated by the LHD, how are the remaining HNHAC parcels currently being irrigated? Are all 1,400 acres in Table N (p. 99) proposed as uses of the LHD, and if so, how do these areas correspond to the information in Table A7?

**Response:** Additional clarification of the HNHAC acreage will be made in the FEIS. Of the 1,438 acres of state land leased to HNHAC members, about 400 acres are presently cultivated and irrigated with LHD water. Over one half of the total HNHAC land is pasture, including areas above the LHD in Niemie and Honokaa. The total HNHAC acreage is not included in either Table A or Table N. Eventually, about 700 acres of HNHAC and other state-let cropland below the LHD will be supplied irrigation water.

**Comment:** Which of the proposed uses are identified in the applicant's list of "Lower Hamakua Ditch "Undocumented Water Users" (Attachment 1)? Are any of the 13 areas listed in Table A located above the LHD? If so, the DEIS must discuss the methods, costs, impacts, and alternatives to transporting water above the LHD.

**Response:** Approximately one-half of the State and three-quarters of the KSBE parcels on the "Undocumented Water Users" attachment are included in the project area.

The only areas above the ditch included in the project area are immediately adjacent to the ditch. No pipelines or pumping from the ditch is included as a part of this project.

**Comment:** The DEIS (p. 102) states that ranchers are currently using LHD water to irrigate 2,000 acres in the project area. How do these ranchers plan on irrigating these lands under the proposed action?

**Response:** Ranchers do not irrigate pasture land. The water is used for livestock drinking water. Livestock drinking water will continue to be provided to ranchers once the project is implemented.

**Comment:** According to the acreage identified in Table A, Kamehameha Schools Bishop Estate (KSBE) owns anywhere from 35 to over 50 percent of the 2,500 acres proposed for truck and tree crops. If most of KSBE's land in the project area will remain in grazing leases (p. 100), which will require minimum amounts of LHD water, if any, why is LHD water needed to irrigate tree crops on 95 percent of the 2,500 acres?

**Response:** It is estimated that approximately 800 acres of the 2,500 acres of eventually-developed cropland will be on land leased by farmers from KSBE. As KSBE owns approximately 7,000 acres of the project area, most of the land will remain in grazing leases. During interviews for the most recent phase of planning, farmers expressed an overwhelming long-term interest in coffee, macadamia, and fruit tree crops over truck and flower crops. That interest in tree-type crops, together with the higher suitability of the soil conditions for tree-type crops, resulted in the 95 percent tree crop to five percent truck and flower crop ratio.

**Comment:** Do the animal units identified in Table G refer to animal watering or pasture irrigation? Why would the existing number of animal units served (2,300) be reduced to 1,800 under alternatives 2, 3, or 4?

**Response:** The animal units identified in Table G are provided with drinking water only. The increase in cropland acres with the implementation of the project will result in a reduction of pasture land and a decrease in total animal units.

**Comment:** The DEIS fails to show that, even if 2,500 acres of diversified agriculture required the proposed amount of water, that amount of acreage will be profitable. For example, how profitable are existing agricultural projects in the region? Is there a market for the additional crops being proposed? How profitable is cattle grazing on the Hamakua Coast? Which agricultural operations have been, and/or will have to be subsidized by state or federal entities to remain solvent? Did the economic analysis of the proposed plan consider such subsidies?

**Response:** The economic analysis conducted for this project indicates an average economic benefit of nearly \$4,000,000 annually once projected agricultural buildout occurs. Most of the benefit is derived from the expansion of agricultural activity which would not take place without project implementation. A smaller amount is a result of reductions in drought damage to existing crops due to water supply failure. Cattle production in the area has not been very profitable in the recent past. However, new marketing

strategies and upgrades in feedlot and slaughter house facilities hope to improve the local market for cattle. None of the crops considered in Hamakua are subsidized as was sugar. Many of the HNHAC farmers received assistance grants from a federal Department of Defense program for farm startup costs. Producers will also be eligible for cost-shared financial assistance to implement soil and water conservation measures. No production subsidies, as for commodity crops, will be available to these farmers.

**Comment:** The DEIS fails to support the applicant's assumption that large landowners are committed to agriculture in the region. The DEIS should clarify the landowners' options and that, even if LHD water is provided to them, they are free to pursue state land-use classification and county zoning amendments to accommodate non-agricultural land-uses in the project area.

**Response:** The large landowners or their representatives contacted by the project, including KSBE, Tui Brothers Farm, and Gibson Estate, have verbally committed to continuation of agriculture in Hamakua. All believe that implementation of the LHD project is necessary to maintain agricultural activity. Many believe that conversion of land to nonagricultural uses will be induced by the failure to implement the watershed project. Any rezoning or landuse change requiring public disclosure will need to undergo public review.

**Comment:** The DEIS fails to show that agricultural operations in the project area could, at any time in the foreseeable future, reasonably and beneficially use either an average of 9 MGD or a maximum of 17 MGD. Even assuming that all 2,500 acres within the project area could be cultivated in the near future and remain profitable, the projected water demand is inflated in an attempt to justify the maximum diversion of base flows during the dry period. Apparently, the projected water demand for irrigation was estimated by calculating the irrigation need of a "reference crop," based on three truck crops and three tree crops likely to be planted in the project area. The reference crop's water need was then multiplied by the entire 2,500 acres, even though only 129 acres (5 percent of project area) are proposed for truck crops and 2,382 acres (95 percent of project area) are proposed for tree crops. The DEIS states that orchard crops are less drought-sensitive than truck crops. Some of the proposed tree crops require little, if any, irrigation in the project area, and, apparently, pasture irrigation was not considered in the calculation. Presumably, the water need of the reference crop on 2,500 acres was adjusted to account for the number of acres above and below 500-foot elevation.

Separate calculations should be made for each of the proposed crop-types (i.e., truck crops, tree crops, pasture irrigation, and forestry, if proposed) based on reasonable irrigation rates and the proposed acreage for the proposed crops. For example, does coffee require irrigation on the Hamakua Coast? How much irrigation does coffee require in Kona? The estimated water need of each of the crops, the calculated water need of the reference crop, and the acreage above and below 500 feet are not disclosed in the DEIS.

**Response:** The worksheets displaying the irrigation requirements for the six crops - coffee, papaya, macadamia nut, banana, truck crops, and flower and foliage crops - will be included in Appendix B - Investigation and Analysis.

**Comment:** How do the growing conditions in Hamakua compare with those in Kona? Why would macadamia nut trees require irrigation if they are currently grown in the project area without irrigation? How much irrigation, if any, does papaya require? A farmer in Pepekeo stated that 2,000 acres of papaya would need 3 MGD (1,500 gpd). How much water does pasture irrigation require in the project area? The assumptions, credible water use data, and the water need calculations should be disclosed in the DEIS. NEPA requires agencies to insure the professional integrity, including scientific integrity, of the discussions and analyses in environmental impact statements, and to identify any methodologies used and make explicit reference by footnote to the scientific and other sources relied upon for conclusions in the statement. 40 CFR § 1502.24

**Response:** The total rainfall in the Hamakua project area and areas in Kona, where coffee and macadamia nut are grown, are similar, around 60 to 80 inches. However, the rainfall distribution through the year is quite different with Kona receiving most of its rainfall during the demanding summer months and Hamakua receiving very little rainfall during the same months when temperature, wind, and evaporation are greatest.

While some macadamia and other orchard crops are grown in or near the project area without irrigation, irrigating can provide increased productivity and earlier maturation and production.

The average annual rainfall in Pepekeo is considerably higher than in the project area. An average of the rainfall records at Honouliuli, Pepekeo, and Papekou at elevations between 100 and 350 feet is 142 inches per year. That is almost double of that in our project area.

**Comment:** Regardless of how the projected water demand was calculated, the amounts proposed in Table B (p. 15) are clearly excessive. The DEIS proposes a minimum of 900 gallons per acre per day (gpd) and a maximum of 4,700 gpd during 50 percent frequency/average year, and a minimum of 1,350 gpd and maximum of 5,300 gpd during 80 percent frequency/dry year. The Hamakua Coast is generally considered to be a wet region. According to the DEIS, average annual rainfall in the project area is lowest at the coast near Kukuihaele, approximately 60 inches, and increases toward Pa'auilo, which averages 100 inches per year. In contrast, the median annual rainfall for central Oahu is 30-40 inches, with a minimum of 2-3 inches in the dry period between May and October. The Commission on Water Resource Management (COWRM) used a standard figure of 2,500 gpd when it allocated water for diversified agriculture (mostly truck crops) in central Oahu.

Response: Clearly, the project analysis has shown that the average of 2,500 gallons per day per acre is more than adequate for crops grown in the Hamakua project area. The average demand through the life of the project is expected to be 900 gpd/acre at elevations above 500 feet and 1,500 gpd/acre below 500 feet. Even during dry years (80% exceedence) the average daily demand is between 1,350 to 2,100 gpd/acre. The minimum daily irrigation requirement will frequently be zero during wet winter months.

However, during the summer months when rainfall is lowest and evapotranspiration the greatest, considerably more water is required per day to maintain crop productivity. The peak demand rates reflect the water needs for these periods. While it is possible to store 2,500 gpd/acre for use during the high irrigation demand period, it is not practical. Nearly 1.3 billion gallons of storage will be needed to provide for a three-month drought in the project area.

Comment: According to the DEIS (p. 126), in the 80 percent frequency/dry year, when up to 17 MGD is allegedly needed, the proposed 17 MGD diversion is expected to occur for several days to several weeks during 2 of 10 years. The DEIS (pp. 15, 155) states that irrigation is necessary for the project area during the dry season from May to October. However, the DEIS does not indicate how much irrigation water is needed for which crop-types and for how many acres during this period. Nonetheless, given the rainfall for the project area during the dry period, it is difficult to imagine any situations in which 4,700 gpd would be needed during average conditions and an average of 100 inches of rain per year.

What does peak refer to in an average year and in a dry year? How often would these conditions occur and for how many acres at any given time? It is also curious that peak use during the second driest year in a 10-year period is 5,300 gpd, only 600 gpd more than the peak-use amount in an average wet year. The unit of measure in Table B should be gallons per day, not million gallons per day.

Response: The projections assume an averaged mix of the six crop types evenly divided below and above the 500-foot elevation. The irrigation demand analysis was conducted using monthly data for various frequencies of annual rainfall. The monthly requirement was divided by 30 days to derive the daily irrigation requirement. The 4,700 gpd/acre figure is the irrigation requirement for short periods of sustained droughtiness suffered during otherwise "average" years. The pronounced dry season and high evapotranspiration rate periods, during summer, result in depletion of soil moisture which creates a need for high irrigation rates during summer months. The units for Table B will be corrected.

Comment: The terms, base flow conditions, dry year, drought, peak demand/use are used throughout the DEIS, but no definitions are provided. Drought is used in some parts of the DEIS to describe the proposed action during peak-use conditions, but the DEIS also states that prolonged drought was not

considered and would need to be addressed. Is this statement accurate in light of the definition of 80 percent frequency scenario? The estimated or average frequency of each condition in the project area should also be disclosed so that reviewers can evaluate the proposed action and the alternatives.

Response: The terms mentioned above will be included in the glossary. Drought has been used to indicate relatively dry annual conditions, such as during the 80 percent rainfall year and also to identify a prolonged period of no or little rainfall. A prolonged drought is envisioned to be a period of six months to over a year during which no sustained rainfall occurs, as did in 1962. During such periods, the Waipio Valley source streams may not be able to provide adequate irrigation water supply.

Comment: The DEIS states that irrigation would enhance some areas, primarily in the project area, for certain selected crops. The crop analysis upon which this statement is based is not provided in the DEIS, and while this general statement can be said of virtually all agricultural lands in the state, it can not justify the excessive amounts of water requested by the applicant. Furthermore, it does not necessarily follow that more water results in a higher level of production; at some point, the use is excessive. For example, according to the DEIS (p. 26), as much as 7 MGD has been used from the LHD for existing agricultural operations on around 600 acres. This amounts to approximately 11,650 gpd, which is excessive and requires immediate attention.

Response: The current absence of management of the water system and the free cost of the water results in undocumented use, inefficient use, and considerable wastage.

Comment: The DEIS (p. 11) states that a shift in crops in the project area has occurred since 1995, from predominantly truck crops to orchard crops, yet there has been no corresponding decrease in the projected water demand. The projected water demand in the 1995 draft environmental impact statement is the same as the projected demand in 1999 for the same 2,500 acres. It is obvious that the project water demand is almost entirely arbitrary, and designed to justify the proposed action.

Response: The irrigation water demand does not necessarily decrease when converting from truck to orchard crops as shown by the expanded discussion of irrigation water demand in Appendix B. The basic tenets of the plan between the 1995 effort and the present remain the same. Further discussions conducted with farmers, landowners, and agencies and interest groups and observation of agricultural trends in the area validated the planning projections made in 1995.

Comment: The DEIS (p. 69) states that "[p]lature irrigation is not considered to be highest value use and should be allowed only during periods of excess water supply." What does "periods of excess water supply" mean? The applicant

proposes to divert excessive amounts of water to irrigate 2,500 acres during average and dry conditions. Consequently, "excess" water will probably be available all of the time. Does this mean that LHD water will be used for pasture irrigation even during the dry period, at the expense of instream values? Furthermore, the DEIS states that most of KSBE's land in the project area will remain in grazing leases. Any agreement between the State and KSBE that commits water from the LHD should be conditioned; no LHD water should be used by KSBE or anyone else to irrigate pasture during the dry period, regardless of the amount of available "excess" water in the LHD.

**Response:** The term "excess" as used here describes water supply availability over and above that needed by other agricultural users in Hamakua and that needed for taro cultivation and instream purposes in Waipio Valley. The formulation of policy on irrigated pasture use of the water system will be the responsibility of the management of the agricultural water system and its advisory committee.

**Comment:** The DEIS should describe and evaluate the proposed use of 1 MGD for aquaculture. Can any of this water be reused for agriculture, and if so, was this factored into the projected water demand calculation?

**Response:** The discussion of aquaculture is inserted in Section 2.1.3.3 in the FEIS. The existing aquaculture operation reuses the effluent for irrigation. As effluent use must comply with Department of Health restrictions and as the effluent is not returned to the LHD system, it was not factored into the projected water demand calculation.

**Comment:** The DEIS (p. 26) states that the peak daily water demand is an estimated 14 MGD, of which 12.5 MGD is for crop irrigation. What is the proposed use for the remaining 1.5 MGD? The 1.5 MGD proposed use by Enserch, Inc. is not included in Figure 13 during peak usage conditions when the 14 MGD is allegedly needed. Why is Enserch a proposed user of the LHD? Doesn't Enserch have a well or permits to drill a well for 1.5 MGD?

**Response:** Enserch, Inc. has indicated that their facility will not be needing any water from the LHD. During earlier discussions, Enserch, Inc. was interested in receiving water "as available" from the LHD, meaning when agricultural demand was low and water supply at the source streams high. The sale of water to Enserch, Inc. during such periods could reduce water rates for agricultural users.

**Comment:** The DEIS (p. 69) states that "[n]on-agricultural uses shall be evaluated after agricultural demand has been met." Our understanding of the cost-sharing arrangement is that federal funds can not be used for non-agricultural purposes. The DEIS should discuss the requirements and restrictions of the federal funding program.

**Response:** The non-agricultural use of the LHD water is incidental to its agricultural use. All project improvements have been planned and will be designed for conveyance of agricultural water. Aquaculture is an agricultural activity.

**Comment:** How is LHD water used domestically? The DEIS states that the county Board of Water Supply provides potable water from two wells to all of the communities in the project area. Do any communities or households use LHD water directly, or are all domestic uses of LHD water regulated by the Board of Water Supply? Figure 13 (p. 108) indicates that LHD water is used only as an emergency supply in Honoka'a and regularly by the Kukuihaele community. The applicant's list of "Lower Hamakua Ditch Undocumented Water Users" (Attachment 1) lists a number of potable uses of the LHD water. Is LHD water treated in accordance with the Safe Drinking Water Act? How do the costs of treatment compare with pumping ground water?

**Response:** The Board of Water Supply has control of only the emergency water supply connection at Honoka'a where chlorination treatment is provided. New Safe Drinking Water requirements further restricts use of LHD water for potable supply. We have learned that Kukuihaele and the Waipio Valley overlook area is provided BWS water from a chlorinated spring source. Any LHD water used directly in these areas is assumed to be nonpotable use.

**Comment:** The DEIS fails to discuss how the proposed action can be justified when it promotes the interests of farmers in proximity to the LHD at the expense of other farmers in Waipio Valley and instream values such as the maintenance of native aquatic ecosystems. Wherever large agricultural irrigation systems exist, valley farmers -- who depend on the same streams diverted by these systems -- are always the last to be served, if at all.

**Response:** The impacts to the Waipio Valley farmers and instream uses have been described in the DEIS. No adverse effects to Waipio Valley farmers and instream resources, except for increased streamflows due to reduced stream diversion, are identified. There are still outstanding questions, such as the stream hydrology most critical to native stream organisms. A process of adaptive management, including studies by the Division of Aquatic Resources and the formation of an advisory committee to the agricultural water system, has been identified to deal with the uncertainties involved. While there are some perceived undesirable effects, the project provides economic and social benefits to a region affected by sugar industry closure.

**Comment:** The DEIS fails to adequately describe the stream diversions, including the existing intakes and diversion structures and proposed modifications. Photographs and/or diagrams would be useful.

**Response:** A diagram of a potential modification to the intakes will be inserted in Section 4.2.5. The final configuration will be developed during the design phase of this project.

**Comment:** The statement on p. 54 of the DEIS regarding modification of the Kawaiinui intake is unclear. "The inlet opening will be sized to accommodate no more than the 10 MGD, which is approximately the low flow rate, plus a fraction to account for clogging of the intake grate." (Elsewhere in the DEIS, the applicant proposes a maximum diversion of 9 MGD from Kawaiinui Stream.) How does the additional 1 MGD "account for clogging of the intake grate?" What exactly does this mean? How was this amount determined? This amount (11 percent of the Kawaiinui diversion) is hardly a "fraction." We do not agree that this is a reasonable use of 1 MGD from Kawaiinui Stream during base-flow conditions. The DEIS should include the amount of the "fraction" of water proposed for the same purpose on Alakahi and Ko'iawe streams.

**Response:** The discussion in this section has been changed. The implementation of the U.S. Fish and Wildlife Service recommendation to limit baseflow intake to 70 percent of flow will be accomplished by installing plates at the level of the intake grate along the bank areas. The plates will provide a flow path across 30 percent of the intake opening. Further adjustments to the diverted amount to reflect Hamakua demand will be made at the remotely controlled dump gate at the Kawaiinui intake.

**Comment:** We agree that the LHD diversions have no discernible effect during severe floods (DEIS, p.111), just as partial or full restoration would not increase the magnitude or frequency of flooding events in Waipi'o Valley. The DEIS overstates the effectiveness of the diversion structures to decrease flood water in the valley. If anything, the status quo and proposed action create greater fluctuations in stream levels than would occur under natural conditions, and may even aggravate the effects of flooding in the valley. The DEIS should explain the calculation used to support the statement that modified LHD diversions can provide up to 30 cfs reduction in flood discharge to Waipi'o Valley (Table G, Flooding and Floodplains, Alternative 3). What is the amount of flood discharge that is reduced by the three existing diversion structures? How significant is this reduction of flood discharge? Million gallons per day should be used here instead of cubic feet per second. Has any modeling been done on how the proposed action would alter Waipi'o/Wailoa channel alignments?

**Response:** Table G has been changed, striking the word "flood" from the effects description. The discussion of the 30 cfs (actually 32 cfs) reduction is included in Section 6.3.15 on page 129 of the DEIS.

Because of the transient nature of the stream level fluctuations in response to rainfall in the upper part of the watershed, the use of cubic feet per second is more meaningful than using million gallons per day. No geomorphic modeling has been conducted for Waipi'o Valley.

**Comment:** The DEIS is vague on how much water is currently leaking from the LHD and how much water is being released unused. Is the sum of the system losses and dumping 20 or 25 MGD?

11

**Response:** The amount of water lost from the ditch system is an estimate based on the experience of the maintenance personnel and a rough water budget based on imprecise measurement of flows at various points on the system. The locations and volumes of the leaks continually change as repairs are made and new leaks form or are increased. The important point is that a large amount of water is lost with the present condition of the LHD. The Commission on Water Resource Management is undertaking a more detailed measurement of the leakage from the ditch which will be useful in the implementation of this watershed project.

**Comment:** What is the basis for the statement: "Normal allowance for losses for a system of the 25-mile length can amount to 20 percent" (DEIS p. 18)? We do not agree that a 20 percent loss in an efficient system is reasonable. Assuming the LHD flows at 9 MGD during average conditions, 20 percent loss would amount to 1.8 MGD, as opposed to 3 MGD proposed throughout the DEIS. During dry conditions, the LHD should not be allowed to divert 17 MGD, nearly all of the base flow from the three streams at issue. Therefore, it would be unreasonable to allow 20 percent (3.4 MGD) for system losses under these conditions.

**Response:** The statement will be removed from the FEIS. The FEIS will state that losses of water in transmission will occur in a system such as the LHD. The maximum diversion amount during baseflow period will be 70 percent of flow or approximately 13 MGD based on records of baseflow.

**Comment:** The statement on p. 53 (Section 4.2.5 Intakes) is misleading. Approximately 3.4 MGD (20 percent of the proposed maximum diversion) would be lost to seepage, evaporation, and other system losses, under the preferred plan. This is hardly a "fraction" of the diverted water, especially during base-flow conditions.

**Response:** The paragraph will include a statement that the loss is estimated to be approximately 3 MGD.

**Comment:** What do the pressure relief systems and pressure-related failures in the lateral pipeline system specifically refer to? Are any energy sources required to transport water from the ditch or within the lateral pipeline system, and if so, which sources are proposed, at what cost, who will bear the expense, and how was this expense factored into the cost-benefit analysis?

**Response:** The lateral systems are pipeline distribution systems leading from a filter at the LHD to the farm boundaries. All flow in the lateral systems will be through gravity. An elevation difference of over 500 feet can exist between the LHD and some of the downlope farms. A static pressure of over 200 psi can be developed in the pipeline. Higher transient pressures can develop when valves are closed. In order to limit the pressure to protect pipelines and fittings and to provide a usable pressure range to farmers, pressure relief devices are included in the system. The failure of the pressure relief devices

12



and ruptures of seals and pipelines due to uncontrolled pressure results in water loss from the lateral systems.

**Comment:** What is the annual cost of installing and operating the SCADA, including electricity? Is the cost of electricity included in Table D in the appropriate categories?

**Response:** The implementation of the SCADA system, including controls and monitoring at Kawaiwi Stream intake, is estimated to be \$500,000. The average annual cost, similar to a mortgage payment, over the 25-year life of the project at a discount rate of 7.125 percent is \$43,400. The SCADA system will be installed using project funds and will not be assessed from water users. The operating cost, including electricity, is a part of the Operation, Maintenance, and Replacement (OM&R) cost which totals \$500,000 per year. OM&R costs include maintenance crew, baseyard facilities, equipment, supplies, and replacement materials. Energy costs for the SCADA system are expected to be inconsequential, on the order of \$100 per year.

**Comment:** The DEIS fails to adequately describe or evaluate many of the proposed action's associated infrastructure, including the expanded lateral system and modification or relocation of roads and utility infrastructure. For example, the DEIS (p. 53) states: "Other areas will require more time to begin to be developed and the irrigation lateral systems will be installed at a later time and will be funded separately. Expansion of the existing lateral systems must also take place at a later time and will be funded separately." The DEIS must evaluate these essential components of the project, including their impacts, total cost of the proposed agricultural buildout, and alternatives.

**Response:** The areas affected by agriculture supported by the irrigation project are all previously disturbed by sugarcane cultivation. There is uncertainty about the exact location and mix of crops for the projected buildout condition. The existing lateral systems will be upgraded or expanded to service the new cropland. An assessment of the entire project area has been made in terms of wildlife, cultural resources, prime farmland, erodibility, water quality, and landuse. The projected agricultural buildout should not result in significant adverse effects.

**Comment:** A schematic diagram should be included in the DEIS depicting existing pipelines and features installed for sugarcane, and existing and proposed lateral systems in relation to the LHD and the 13 areas within the project area.

**Response:** A display showing the areas served by the main lateral systems used by Hamakua Sugar Company and a description of their condition in 1994 will be included in the FEIS. The pipelines and other detailed features will not be included due to lack of data for many of the lateral systems.

**Comment:** The DEIS (p. 52) states: "Presently, the four reservoirs on the LHD have a combined storage capacity of 31 MG. However, the location of the reservoirs

leaves much of the project area without water-leveling capability." What does this statement mean? Why are only two reservoirs being considered (one new, one existing), and how were they selected? Why aren't the three additional existing reservoirs going to be maintained? Storage capacity for 31 MG would come in handy during the dry period. We are also informed that the catchments described in the DEIS (p. 22) are different than the ones people build in the region, which take advantage of natural patterns of storm runoff that fill constructed ponds. The DEIS should expand its discussion on the options available here.

**Response:** Water leveling capability means storage to retain, then, release water at a higher rate than is possible directly from the LHD. Essentially, the reservoirs provide short-term storage for irrigation flexibility, such as irrigating during workday hours, and as a buffer for short system shutdowns. All of the existing reservoirs will be incorporated into the LHD system and will receive maintenance. The Paatilo Reservoir will be lined to correct its high leakage rate. A new Honokaia Reservoir will be constructed to provide short-term storage for the HNHAC farmers in the state-owned agricultural area. The catchments described in the DEIS are meant to maximize capture and storage efficiency with the smallest land area. A much larger area would be needed if a natural drainage area with an unlined, unenclosed storage pond were used.

**Comment:** How efficient are the settling ponds? Are they lined, or would they be under the proposed action?

**Response:** Two types of settling ponds exist on the LHD system. One type is located on the LHD and is designed to trap sediment within the ditch system. The other type is at the take off to the lateral systems and is designed to prevent sediment from entering the lateral system. An additional screen/filter box is also used at the lateral system. The on-ditch sediment traps are filled in and are not functioning. The settling ponds for the laterals still function although many are becoming overgrown with vegetation. The sediment traps on the ditch are lined. The settling ponds for the laterals are not lined. There is no intention to line the settling ponds.

**Comment:** The discussion of repairs to the LHD and restoration of Hakalaoa Falls should disclose that the proposed "medium-term debris basin" will probably require a stream channel alteration permit, stream diversion works permit, and petition to amend the interim instream flow standard (IIFS).

**Response:** A statement that such an interim debris basin will require a stream alteration permit has been added to Section 4.2.6. As the volume of streamflow will be unaffected the stream diversion works permit and the petition to amend the interim instream flow standard should not be required.

**Comment:** The DEIS fails to adequately describe the issues relating to ownership of the LHD. Does the Hamakua Sugar Company (HSC) still exist on paper, and does it own the LHD infrastructure? The DEIS (p. 95) states that many of the

housing units are still controlled by the Plantation Trustee. Does the same apply to the LHD? Does HSC have any potential claims to the LHD system?

**Response:** A separate company maintained ownership of the ditch system during sugar cultivation. Until the collapse of the sugar industry, the owner of the ditch system improvements was the Hawaiian Irrigation Company, Ltd. Since that time, however, the corporation has been inactive. HIC was involuntarily dissolved on November 16, 1998 by the Department of Commerce and Consumer Affairs for nonpayment of past fees and failure by corporation officers to report activity.

**Comment:** What is the status of the agreement between State and KSBE? As of mid-January 1999, the agreement had not been finalized. The DEIS should include any proposed or finalized agreements between the State and KSBE relating to the LHD.

**Response:** The DOA/KSBE agreement was finalized and signed in July 1998. General terms of the agreement will be included in the FEIS.

**Comment:** The DEIS fails to describe the affected environment, particularly in the Waipi'o watershed. The impact analysis is inadequate, and the discussion superficial and misleading. The DEIS fails to provide any recent stream gaging data for average and dry periods to support the applicant's claim that the proposed action will result in adequate stream flows and environmental benefit. No impact analysis has been conducted for the proposed action and its effects on the native stream biota, including the continued use of archaic gates to divert stream flows. No minimum conservation flows are proposed for native stream animals, which require access to and from the ocean to complete their lifecycles.

NEPA requires that the DEIS be supported by evidence that the agencies have made the necessary environmental analyses, and that the DEIS serve as the means of assessing the environmental impact of the proposed action, rather than justifying decisions already made. 40 CFR §§ 1500.2(b), 1502.2(g). Statements regarding the impacts of the proposed action must be supported by credible scientific evidence disclosed in the DEIS. The burden is on the applicant to obtain, evaluate, and disclose the necessary information to support the continued diversions, not on citizens trying to conserve water and restore degraded streams.

The DEIS fails to adequately describe or mitigate the impact of insufficient stream flows resulting from diversions by the LHD. Not surprisingly, no populations of 'o'opu were found above the LHD diversions during a survey of the Alakahi, Kawaiui, Koiawe, and Waipi'o streams (DEIS p. 125). According to the DEIS, the survey results indicate that the diversion structures appear to prevent 'o'opu from moving into stream reaches above the LHD diversion structures, which is probably true given the nature of these archaic structures. According to the DEIS, the survey results also suggest that environmental factors in Waipi'o Valley near the ocean, such as elevated

temperature, altered water quality, a labyrinth of ditches, and introduced species, may be at least partially responsible for limiting the abundance of fish further upstream. However, no evidence or analysis to support this statement is provided in the DEIS.

Insufficient flows resulting from the LHD diversions contribute to adverse conditions, such as elevated water temperature, altered water quality, and the presence of introduced species. Extensive taro lo'i have been maintained for hundreds of years on Kauai, Molokai, Maui, O'ahu, and Waipi'o Valley prior to the LHD, and have not destroyed fish populations. Indeed, the presence of all five 'o'opu species in the lower reaches of Lalakea/Wailoa Stream, which flows through Waipi'o Valley and converges with Wailoa River approximately 0.5 mile from the coast, suggests that the LHD diversions are the primary factors in limiting native fish populations in Alakahi, Kawaiui, Koiawe streams.

The description of the proposed action's benefits to Waipi'o Valley and instream values is misleading. While increased flows during average conditions will increase potential suitable habitat for native stream species, the net result of the proposed action during the dry period is no different than the status quo: 17 MGD, nearly the entire base flow, will continue to be diverted by the LHD from Kawaiui Stream (9 MGD), Alakahi Stream (5 mod), and Koiawe Stream (3 MGD). The only difference between the status quo and the proposed action during the dry period is that 5, rather than 6 MGD would be diverted from Alakahi, and 3, rather than 2 MGD would be diverted from Koiawe. Maintaining minimum conservation flows for native stream animals and ecosystems is especially critical during the dry period. Stream ecosystems require adequate base flows at all times of the year. Increasing flows during high flow periods while draining them during low periods is no benefit at all.

**Response:** The recommendation by the U.S. Fish and Wildlife Service to release 30 percent of the stream flow during baseflow periods to provide conservation flows during the dry season will be adopted. During the minimum flows documented by Mink, the diversion rates will be 6.6 MGD from Kawaiui Stream, 3.9 MGD from Alakahi Stream, and 1.8 MGD from Koiawe Stream. As Alakahi and Koiawe streams recover 2.1 MGD and 3.0 MGD almost immediately downstream of the diversions, Kawaiui Stream, with practically no additional spring inflow for some 4,000 feet downstream of the diversion, will be most affected by the 30 percent restoration of baseflow.

However, a combination of widely-held concepts regarding the native gobies and observations of the Waipi'o Valley stream system indicate that an increase in the release of baseflow at the Lower Hamakua Ditch diversions alone may not reestablish significant populations of 'o'opu in the upper Wailoa River stream system.

Recruitment of post-larval gobies from the ocean into the stream system is triggered by a fresher plume extending into the ocean. Individual gobies do

not "home" to a particular stream signature, but can be recruited to any stream system. Gobies that habitate middle and higher stream reaches are adapted to dry stream conditions that result in cessation of streamflow and in isolation of pools of water along the streambed. Spawning and migration of larvae to the ocean is triggered by high streamflows.

During the 1996 survey by Englund all five species of native goby were observed in the Hiihawe/Lalakea Stream system which flows into Wailoa River approximately one-half mile before flowing to the ocean. O'opu alamo'o (*Leiostichus xanthurus*) was found above Hiihawe Falls at 2,000 feet elevation. Climbing of a 1,000-foot tall waterfall is required to reach that elevation. This demonstrates the ability of the species to negotiate difficult barriers during its upstream migration. Movement up Hiihawe Falls is particularly difficult because the upper third of the falls is often dry up to the Lalakea Ditch diversion located at nearly the 2,000-foot elevation below the sampling station.

Only O'opu na'kea (*Awaous guamerensis*) and one individual of O'opu nopihi (*Sicyopterus japonicus*) were found in the ten transects in the upper part of the Wailoa River, above 480 feet. No o'opu were found at the four transects above the LHD diversions. Only the dry reach of Kawaiinui Stream below the diversion structure was characterized as "poor" habitat.

The report recommends that "Because factors other than the Lower Hamakua Ditch appear to be influencing the abundance of native animals in Waipio Stream and its tributaries, mitigation measures aimed at ameliorating effects of the ditch may not result in measurable differences in species composition and abundance of stream organisms. The cost of mitigation measures should be weighed against the potential benefit before any steps are taken."

Through a process of adaptive management in operation of the agricultural water system, the diversion rates may be modified and other measures taken to improve aquatic habitat conditions and increase the population of native organisms, especially native gobies throughout the Waipio watershed.

Comment: The DEIS must evaluate the direct, indirect, and cumulative impact of the proposed action, including the effect of stream diversions by the Upper Hamakua Ditch (UHD). The DEIS incorrectly states that there is no relationship between the UHD and the LHD diversions. 40 CFR §§ 1502.16, 1508.25(b)(2).

Response: During the dry season, the Upper Hamakua Ditch diversions on Kawaiinui, Kawaki, Alakahi, and Koiawe streams capture nearly all of the surface runoff in these drainages up to approximately 25 MGD before they plunge into Waipio Valley. However, as these streams are fed by surface runoff, the streams are dry or flowing very low during the dry season. The average flow in the Upper Hamakua Ditch past Alakahi is 3.3 MGD and at the Waimaea Reservoir is 6 MGD. The Upper Hamakua Ditch is dependent on capturing water during the sporadic high runoff events. During storm runoff, however,

most of the water overtops the intake structures and cascades into Waipio Valley. The LHD is dependent on springs which issue from near the base of the valley walls that are independent of rainfall events. The diversion of 6 MGD by the Upper Hamakua Ditch, mainly during periods of rainfall in the Kohala Mountains, does not significantly affect baseflow in Waipio Valley.

During the near-century that the two separate agricultural water systems have been operating, no shortage of water during critical periods has been identified, either by users of the LHD system or Waipio Valley farmers.

Comment: The DEIS (p. 114) states that a survey of a rare, undescribed Hawaiian stream fly is being undertaken and that the results of the survey will be used to develop mitigation strategies if it is determined that the proposed action will adversely affect the stream fly or its habitat. The results of the survey and habitat characterization, and appropriate mitigation must be evaluated and disclosed in the DEIS.

Response: Additional assessment was conducted was the Hawaiian stream fly (*Sigmatentomum meaohi*). The investigation, which was conducted in December 1998 concluded that "Because the Lower Hamakua Ditch is located at the lowest elevational range of *S. meaohi*, adverse impacts to populations of this species because of continued or renewed operation of the diversion are expected to be minimal. However, in 1996 some impacts were observed because of ditch operation, and this species was not found below the diversion."

Comment: The DEIS fails to adequately evaluate the proposed action's impact on wetlands and endangered waterbirds. The endangered koloa/Hawaiian duck, "alae ke'oke'o/Hawaiian coot, and ae'o/Hawaiian stilts utilize streams, wetlands, and mudflats in the Waipio watershed. Waipio Valley has been identified by the United States Fish and Wildlife Service (FWS) as "essential habitat" for these birds. The Hawaiian Waterbirds Recovery Plan states that the "[p]rotection and enhancement of these areas as well as stream habitat on Kawai'i and Hawaii'i (Kohala and windward Mauna Kea) will provide a long term base of habitat" and that "[m]aintenance of suitable habitat is the foundation for the entire recovery program."

The Endangered Species Act requires federal agencies to "utilize their authorities in furtherance of the purposes [of the act] by carrying out programs for the conservation of endangered and threatened species..... 16 USC § 1536(a)(1). The DEIS fails to recognize the importance of essential habitat in Waipio Valley, and does not describe the proposed action's impacts or appropriate mitigation measures. Instead, the DEIS merely states that mitigation action to retain or enhance wetlands or endangered species habitat will be taken if significant wetland resources or native endangered insects are found. This is inadequate.

Response: The effects to Threatened and Endangered waterbirds has been discussed with the U.S. Fish and Wildlife Service as part of the informal Endangered Species

Watershed and the Lower Hamakua Ditch Watershed. The existing body of hydrologic data was used during project planning. Further study of streamflow will be conducted by NRCS and others and the resultant data used to manage diversion rates.

**Comment:** The DEIS should describe more specifically how the \$25,000/year will be spent for stream flow measurement in Waipi'o Valley. The DEIS (p. 62) states that the consultant will assist with stream flow measurement in Waipi'o Valley during the installation period. Which streams will be gaged, by whom, and for how long? Stream flows above and below diversions, ditch flow, and Waipi'o Stream/Waioa River should be gaged at this time to obtain sufficient data for the impact analyses required by NEPA and for future decision-making by COWRM and others.

**Response:** The \$25,000 per year is earmarked to support a Division of Aquatic Resources study or other studies to be conducted in the same time frame as installation. The financial assistance will be available for four years. Separate measurement of diversion and flows in the LHD will be conducted and supplied to the COWRM.

**Comment:** The DEIS should describe the abandoned Waimea pump and its impact on the environment, including the possible presence of hazardous substances in the Waipi'o watershed. During a field survey of Waipi'o Valley on June 19-21, 1995, FWS observed an inactive pump house and three electrical transformers, which may contain PCBs, above Waimea Stream. This situation should be investigated immediately, in addition to formally abandoning the Waimea stream diversion structure, as required by the State Water Code, HRS § 174C-95, HAR § 12-168-34. The DEIS should also identify any other potential impacts associated with hazardous waste in the project area.

**Response:** The Waimea Stream situation and other impacts associated with hazardous wastes will be included in Section 6.3.17. However, the watershed project will not be utilizing the Waimea Stream diversion or pumps and will not include its investigation in this project.

**Comment:** The DEIS should evaluate the impact of transporting, storing, and using hydraulic oils and other petroleum-based substances in the Waipi'o watershed, including the use of alternative inexpensive, biodegradable, hydraulic fluids.

**Response:** The use of vegetable-based, biodegradable hydraulic fluids will be pursued for use in Waipi'o Valley installations.

**Comment:** The proposed action, and the continued diversion of nearly all of the base flows in the three streams at issue during the dry period is inconsistent with county, state, and federal objectives relating to water management, native species/ecosystem conservation, and cultural resources. For example, there is no identification of how the proposed action is inconsistent with the State Water Code's mandate to identify the best use of stream flows in the Waipi'o

20

Act, Section 7 consultation. Their concurrence that the watershed project will not have an adverse effect on the birds or their habitat is contained in their correspondence documenting consultation for this project.

**Comment:** The DEIS fails to address FWS's concerns and recommendations. Among other things, FWS recommends: that stream intakes be modified to pass base flows and withdraw only surplus flows up to the maximum amount required by the project; that the proposed acreage be reduced or water use plans be modified to require volumes consistent with surplus flow withdrawals; and that the intakes be redesigned to allow planktonic larvae of native stream animals to pass downstream without being entrained into the LHD and to facilitate upstream migration of stream animals. FWS has also stated that it is unable to support alternatives that "entail continued diversions of the majority of base flow and thus continued severe impacts to aquatic communities below the intakes."

NEPA requires all federal agencies to "prepare draft environmental impact statements concurrently with and integrated with environmental impact analyses and related surveys and studies required by the Fish and Wildlife Coordination Act (FWCA) . . . 40 CFR § 1502.25(a). The FWCA requires: "The reports and recommendations of the Secretary of the Interior on the wildlife aspects of [affected] projects . . . shall be made an integral part of any report prepared or submitted by any agency of the Federal Government responsible for engineering surveys and construction of such projects when such reports are presented to the Congress or to any agency or person having the authority or the power, by administrative action or otherwise, (1) to authorize the construction of water-resource development projects . . . The reporting officers in project reports of Federal agencies shall give full consideration to the report and recommendations of the Secretary of the Interior . . ." 16 USC § 662(b).

What is the status of the consultant's compliance with the FWCA? Clearly, FWS's concerns and recommendations have not been considered, nor have the environmental impact analyses and related surveys and studies been included in the DEIS, as required by the FWCA and NEPA.

**Response:** The U.S. Fish and Wildlife Service recommendation for modification of the intakes to pass at least 30 percent of the baseflow has been adopted.

**Comment:** The "watershed" boundaries should include the headwaters of the affected streams and diversions by the UHD. The DEIS should also include a more detailed hydrologic analysis of the proposed action's impacts in the watershed. We urge the applicant to employ the services of the United States Geological Survey or other qualified hydrologists to conduct these required studies.

**Response:** The watershed boundaries are stopped at the Upper Hamakua Ditch because it marks the edge of the contributing drainage during critical dry periods and to administratively demarcate the separation between the Waimea-Paauilo

19

watershed and to protect instream values, appurtenant water rights, and traditional and customary Hawaiian practices.

There is no evaluation of the proposed action's impacts on state policies for maintaining water quality. According to the DEIS, the Hawaii Water Quality Standards Map classifies the Waipio Valley drainage area above the valley floor as Class 1, which requires that the waters remain in their natural state as nearly as possible with an absolute minimum of pollution from human caused sources. The continued diversion of nearly the entire base flows from the Alakahi, Kawainui, and Ko'iawe streams significantly alters the natural state of these streams and reduces their ability to dilute contaminants and sediment. In addition, the draft Hawaii Coastal Zone Management Assessment (Appendix C to the DEIS) is incomplete regarding impacts on the affected environment, natural and cultural resources, public access, recreation, and other considerations. These inconsistencies must be discussed in the DEIS pursuant to 40 CFR § 1502.16(c).

**Response:** The U.S. Fish and Wildlife Service recommendation to release 30 percent of the baseflow will be adopted to improve aquatic habitat downstream of the diversions. The DEIS and Watershed Plan presents a proposal to obtain the maximum beneficial use of the limited water resource. It provides for beneficial uses of aquaculture, irrigation, and other agricultural uses while providing for the protection of customary and traditional Hawaiian rights and stream ecosystem resources.

The modified diversion structures are not expected to have any further adverse impact on the Class 1 streams and, in fact, will improve aquatic resource conditions by a partial restoration of streamflow. The Hawaii CZM Assessment is believed to be factual and complete.

**Comment:** The DEIS fails to adequately describe the affected environment or the proposed action's impacts with regard to existing and future water use in Waipio Valley. The DEIS focuses on the benefits of the proposed action to users on the Hamakua Coast, but gives short shrift to Waipio Valley, which has been identified as Unique Agricultural Land. The DEIS assumes that while there is economic benefit in diverting water to the Hamakua Coast, there is no economic value in allowing streams to flow in the Waipio watershed. The DEIS (p. 109) states that no mitigation of the proposed action's impacts on prime and unique farmland are necessary. However, no surveys or investigations are provided in the DEIS to support the applicant's claim that the proposed action provides enough water in Waipio Valley.

The DEIS fails to describe or quantify existing and proposed water uses in Waipio Valley. As a starting point, the DEIS should identify all of the declared water uses and water rights in the Waipio watershed.

The estimated 25,000-50,000 gpd for wetland taro cultivation is low. What is the source of this estimate? Have any measurements been taken in Waipio Valley?

**Response:** The Waipio Taro Growers Association which represent over one-half (source: Christopher Raihubun) to nearly all (source: WTFA) of the commercial taro production in Waipio Valley has stated that there has never been a shortage of water for taro production during the period the L:ID has been operating. No complaints that substantiate the inadequacy of Waipio Valley water supply to cultivate taro or other crops have been filed.

The inventory of water use for taro and other crops in Waipio Valley is not possible with the existing record, i.e., the declarations of water use. The declarations generally do not separate the acreage of taro from other crops and do not include water use rates. A rigorous on-site inventory is beyond the scope of this project as the project will not increase diversion rates from the existing or recent past condition or decrease the amount of Waipio Valley streamflow available for taro cultivation.

The 25,000 to 50,000 gallons per acre per day estimate of wetland taro water requirement was based on two sources. One source is *Taro: A Review of Colocasia esculenta and its Potentials*, ed. Jan-Kei Wang, 1983, UH Press. In the chapter on agronomy, the author of the chapter, Dr. Ramon de la Pena, writes that "Watson (1970) concluded that the water requirement of wetland taro is in the range of 140,000 to 373,000 liters/ha/day (15,000 to 40,000 gallons/acre/day). He also recognized that as much as 560,000 liters/ha/day (60,000 gallons/acre/day) may be required in some wetland taro patches." Dr. de la Pena, himself, asserted that "280,000 liters/ha/day (30,000 gallons/acre/day) is suggested as a fair amount with which to work, with the water increased or decreased if situations warrant."

The second source was information provided by taro grower Merrill Toledo in 1995 which estimated the annual water requirement for lo'i taro to be 17,500,000 gallons per acre for an average of 48,000 gallons per acre per day.

Recent water requirement suggestions in the 1997 CTAGR publication *Taro: Mauka to Makai*, range from 1.2 gallons per square foot to 12 gallons per square foot (50,000 to 500,000 gallons per acre per day). A study completed for the U.S. Fish and Wildlife Service wildlife refuge in Hanalei measured the irrigation inflow to provide "2 to 3 inch equivalent water depth (54,000 to 95,000 gallons per acre per day" to [taro] pondfields and impoundments." The report further recognized "to fill or empty pondfields, rates over 350,000 gpd were recorded." It is assumed that the high end of the range suggested by the CHATR publication may take place during lo'i filling operations.

Based on the new data, the average wetland taro water requirement in the FEIS will be from 50,000 to 100,000 gallons per day. Therefore, at the high end, 7 MGD will be required for 100 acres of taro. No known measurement of taro irrigation rates has been conducted in Waipio Valley.

**Comment:** The DEIS misrepresents the Waipio Valley community. Apparently, there are approximately 60 (not 25) farmers in the valley. Many of the farmers do

not belong to either WVCA or the Waipi'o Valley Taro Farmers Association (WVTF). Other organizations, such as the Independent Taro Farmers Association and Waipi'o Valley Instream Users Association, should be mentioned in the DEIS and involved in any proposed use of Waipi'o water. According to WVCA, WVTF was organized in 1987, initially as a branch of the community association.

**Response:** A similar comment was received from the Waipi'o Valley Community Association. The proposed changes will be made in the FEIS.

**Comment:** The DEIS incorrectly states that the number of acres in taro in Waipi'o Valley has remained the same since 1994. The DEIS should include information on the additional acreage put into taro cultivation since then. The DEIS should discuss the Bishop Museum's leases to taro farmers in the valley, including the number and acreage in current and future leases, and lease conditions such as any requirements to establish and maintain taro lo'i.

**Response:** Both the WVTF and Bishop Museum report that the acreage of taro production in Waipi'o Valley has been generally unchanged since 1994-95 although there has been some change in the locations and farmers involved. The Bishop Museum reports that while there are lease requirements to engage in farming, enforcement of the requirement is not strict. They also suggest that there are desirable farm locations that will always be in demand while large areas of potential lo'i are not sought due to a number of environmental conditions, including the need to clear and prepare the lo'i.

**Comment:** The DEIS should clarify that all waters of the state are regulated by COWRM. Any memoranda of agreement, management authorities, and advisory boards anticipated by the applicant/consultant are still subject to the State Water Code and regulation by COWRM. Whether the Draft Memorandum of Agreement between affected parties will be finalized remains to be seen. WVCA has not committed to signing any agreements. A significant unresolved issue is the proposed diversion of 17 MGD, nearly all of the base flows for Alakahi, Kawainui, and Koiawe streams during the dry period. Appurtenant and riparian water uses in Waipi'o Valley, native stream ecosystems, and traditional and customary practices must be accommodated before water is diverted out of the Waipi'o watershed during the dry period.

The discussion on water declaration and water rights is misleading. The DEIS states that the applicant will secure the water rights to operate the ditch, which do not exist, and fails to describe or evaluate the proposed project's impacts on appurtenant, riparian, and native Hawaiian rights, which do exist. The DEIS should state that the LHD diversions at Alakahi, Kawainui, Koiawe, and Waimea streams were declared by the Hamakua Sugar Company in 1989, and that a declaration of water use does not create a right to that use, just as failure to declare a use does not extinguish it.

Any agreement between the State and KSBE cannot transfer water rights that do not exist, and can only transfer the opportunity to exercise a previously

declared water use until such time as the declared use changes. That time has come. The purposes for which the use was declared have changed. The amount of the water use has changed, including a significant increase in system losses. The diversion structure and pump at Waimea Stream have been abandoned. A citizens' complaint on water waste and dumping is currently being investigated by COWRM staff. A citizen petition has been filed with COWRM to amend the IIFS for streams in Waipi'o, including Alakahi, Kawainui, and Koiawe.

We are aware of the following kinds of rights that relate to surface water, all of which may apply to Waipi'o Valley (not the LHD) and are affected by the proposed action:

- appurtenant water rights that run with the land, protected by the Hawaii State Constitution and State Water Code
- riparian water rights for uses adjacent to streams, protected by the Hawaii State Constitution and common law
- water rights for kuleana lands, protected by state law
- Hawaiian rights, including the right to frit and gather in streams, cultivate taro, worship, protected by the Hawaii State Constitution and State Water Code

The DEIS should describe these rights as they pertain to the Waipi'o watershed and how they are affected by the proposed action. We disagree that no measures are necessary to mitigate the proposed action's impacts on water rights and traditional uses of water.

**Response:** The transfer of the management and use of the LHD system between KSBE and DOA does not transfer "water rights." It will be noted in Section 4.4.10 that references to water rights, in the context of LHD agricultural water system, means access to the water source and conveyance. You are correct in that all agreements and management authorities regarding surface and groundwater supplies are subject to the State Water Code administered by the COWRM.

We agree that the water use declaration does not create the right to the water source. We do not agree that a change in the type of agriculture irrigated causes the access to the water source.

While we understand that the WVCA has not committed to any agreement, it is hoped that they will participate in the discussions to develop a common and mutual basis for decision-making regarding Waipi'o Valley streamflow. The NRCS and project sponsors are supporting a practicum from the University of Hawaii's Department of Urban and Regional Planning to provide community planning assistance to Waipi'o Valley. It is hoped that water issues can be addressed first at the community level.

None of the codified water rights, above, or traditional and customary uses of water are prevented from being exercised because of the diversion of stream flow by the LHD. No claim substantiating the inadequacy of the Waipi'o

Valley flow to fulfill any of the activities guaranteed by a recorded water right has been forwarded.

**Comment:** There is no right to have the water released in Waipio Valley controlled by the LHD diversions, as described in the DEIS under water rights (p. 123). The status quo and the proposed action increase the fluctuations in stream levels in the Waipio watershed, and far more taro was cultivated in Waipio Valley at one time without the LHD diversions. Although WVTFA may want the LHD diversions maintained at full capacity, including the Waimea Stream diversion (at least during the high-flow period), the applicant must show that the proposed use is reasonable and beneficial. Maintaining maximum stream diversions, regardless of need or impact, as opposed to implementing structural and/or operational modifications to the 'auwai system, is ludicrous.

Assistance in protecting, repairing, modifying, and/or managing the 'auwai systems may be necessary so that restored stream flows can be maximized and enjoyed with minimal impacts to farmers in the valley. If the taro farmers are having difficulty getting permits and approvals to work in the main stem of the Waioa River, as stated in the DEIS (p. 129), then the applicant/consultant should provide technical assistance in applying for the proper permits and approvals. The DEIS should also state WVTFA's position on restored flows during the dry period.

**Response:** The suggestion to continue full capacity diversion to reduce impacts to taro farmers will be evaluated by the advisory committee along with other measures to address the many issues in Waipio Valley. The NRCS and Mauna Kea Soil and Water Conservation District are committed to assist farmers and landowners in Waipio Valley to manage natural resources and address problems of agricultural water management, soil erosion, and water quality. The DEIS will include the statement that the WFTA believes that if there is a water shortage in Waipio Valley that Waipio Valley farmers should first receive water before other users.

**Comment:** Table G Water Rights Alternative 2 (wells) should be clarified by stating that all stream flows diverted by the LHD would be restored to Waipio Valley. (Diversions by the UHD would not be restored under the proposed well alternative.) Table G Water Rights, Alternative 3 (ditch repair/restoration) also should be clarified by stating that partial restoration of stream flow to Waipio Valley and an amendment to the ITFS will not address WVCA's concerns regarding the continued diversion of nearly all of the base flow from Alakahi, Kawainui, and Koiawe streams during the dry period, when water shortages in the valley are already occurring and minimum conservation flows for native species are needed.

**Response:** Table G will be edited to reflect that only streamflow diverted by the LHD will be restored. Reference to the WVCA complaint will be removed from Table G.

**Comment:** All descriptions of economic losses and limited agricultural activities and expansion, including the summary and comparison of alternatives Table G, should include the economic losses associated with inadequate stream flows, increased water temperatures, taro rot, and other diseases associated with water shortages in Waipio Valley. The DEIS and Table G must also describe the impacts of continued diversion of 17 MGD during the dry/drought period on existing taro cultivation, expansion of taro lo'i, and the exercise of traditional and customary practices such as fishing and gathering in streams.

**Response:** The adverse effects blamed on the operation of the LHD contained in the comment are unsubstantiated.

**Comment:** The DEIS (Table H, p. 60) proposes to spend \$25,000/year on the required stream gaging and the item is budgeted as "assistance" to Waipio Valley, and \$212,500/year on conservation practices and accelerated technical assistance for LHD users. The stream gaging proposed in the DEIS is required as part of the environmental impact analysis required under NFEPA, and the information generated by the proposed gaging will also be required as part of the applicant's stream diversion works permit application and petition to amend the HFS. While we appreciate the stream gaging effort, it should not be identified as assistance to Waipio Valley farmers.

All farmers in the project area are entitled to assistance and fair/equal treatment by the applicant and consultant, not just those along the Hamakua Coast. Adequate funding should be allocated to providing technical assistance to Waipio Valley farmers, who may require assistance in managing their 'auwai systems, adjusting to increased flow in Waipio Stream/Waioa River during average conditions, and ensuring adequate flows in the valley during the dry period.

**Response:** The \$25,000 per year is earmarked to assist the Division of Aquatic Resources sponsored study or other study to correlate hydrologic characteristics with improved o'opu habitat and populations. Separate gaging of stream diversions will be conducted as a operational activity of the LHD agricultural water system.

Technical and financial assistance through this project and other USDA and SWCD programs will be made available to both Hamakua and Waipio Valley farmers in the watershed area.

**Comment:** It is inaccurate to refer to ditch leakage as stream flow, even if the leakage flows in streambeds below the LHD.

**Response:** Such flow resulting from ditch leakage will be referred to as "flows" in the FEIS.

**Comment:** NEPA requires the applicant to rigorously explore and objectively evaluate all reasonable alternatives to the proposed action, and devote substantial treatment to each alternative considered. 42 USC §4332(C)(iii); CFR §§

1502.14(e), (f). The applicant must also "identify and assess the reasonable alternatives to the proposed actions that will avoid or minimize adverse effects of these actions upon the quality of the human environment," 40 CFR § 1500.2(e), including "reasonable alternatives not within the jurisdiction of the lead agency." 40 CFR §§ 15002(c), 1502.14(c). Instead, the applicant has chosen the most destructive, inefficient, and least creative alternative, one that does not address the unresolved issues relating to streams in the Waipi'o watershed.

**Response:** An extensive range of measures to address the central problem of agricultural water supply for the Hamakua was evaluated. The DEIS discusses those measures and potential structural alternative plans that were examined in closer detail. The economic, social and environmental effects of the alternatives is documented in the DEIS.

The present watershed plan provides economic benefits, such as local employment opportunities and regional economic revitalization of an area injured by the closure of the sugar industry; social and cultural benefits, such as the maintenance of Hamakua's agrarian character and the restoration of Hakalona Falls; and environmental benefits, such as the partial restoration of Waipi'o Valley streamflows.

Discussion of the effects of implementing the other alternatives will be expanded in the FEIS.

**Comment:** The DEIS fails to consider an integrated water source alternative for the dry period in order to avoid or minimize the adverse effects of the project on taro cultivation, native aquatic ecosystems, and other instream values protected by the State Water Code. A combination of ditch water, wells, county water, and, possibly, additional stream diversions along the Hamakua Coast deserves serious consideration. Replacing the open ditch with a pipeline would also save as much as 3 MGD in leakage alone, which could be restored to the streams of origin or be made available for reasonable and beneficial uses.

The DEIS (p. 57) states that "[a]n active program to assure the availability of wells that can be used to augment the LHD supply should be undertaken as agricultural development in Hamakua approaches the projected "build-out" level. Yet, the DEIS fails to adequately consider wells in combination with other sources and conservation measures during the dry period. Ground water development on the Hamakua Coast is inevitable; stream flows can not and should not be sacrificed when ground water is plentiful. The applicant should subsidize the drilling and operation of existing and planned wells to provide adequate irrigation water during the dry period, which is only expected to occur for several days to several weeks during 2 of 10 years, according to the DEIS (p. 126).

Two aquifer systems are relevant to the proposed action. The Honoka'a Aquifer System has a sustainable yield of approximately 31 MGD, with

current use at less than 1 percent of the sustainable yield. The Pa'auiho Aquifer System has a sustainable yield of 60 MGD, with a current use of 4.4 MGD (7 percent). The DEIS mentions the Pa'auiho Tunnel, Feedlot Well, and Field 20150 Well, which are already built and which could produce as much as 6-8 MGD. (The DEIS erroneously reports Pa'auiho Tunnel's capacity at 2 MGD, rather than 6 MGD, which affects the cost estimates for wells.) Has the applicant considered the Haina and Honokaia wells, or any additional wells that may have been registered by the HSC?

According to hydrologist John Mink, "groundwater resources within HMCO lands are enormous and have a sustainable yield far in excess of plantation needs. Virtually anywhere within the plantation boundaries a successful well could be drilled to supply both domestic and irrigation requirements." Appendix 4 to Mink's report lists groundwater sources in the general project area. Have any wells, shafts, tunnels, or surface water diversions in the project area been obtained by KSBE or the State? What is the operational status of these water works, and have any been abandoned formally or otherwise? Why is the State's Feedlot/Slaughterhouse identified as a proposed use of the LHD (0.10 MGD, Figure 13, p. 108), if a well is available? Could that well provide more than 2 MGD as a back-up during the dry period? Does the projected water demand for the project area include the expected 2 MGD from this well?

At least 9.5 MGD, as opposed to 4 MGD, may be available from existing wells. This oversight alone, added more than \$8 million to the estimated cost of the well alternative. Additional savings could be realized with the use of irrigation timers, conversion of the open ditch to the pipeline, and water conservation measures. The applicant should consider subsidizing existing wells during the dry period, including any wells that are currently operated or planned by the proposed users of the LHD.

**Response:** The integration of wells into the LHD agricultural water system is encouraged as the limitations of available surface water supply are approached. The added cost of utilizing basal groundwater makes it uneconomical while higher elevation surface water is available. It is estimated that using groundwater will add \$.45, in energy cost alone, to every 1,000 gallons, effectively doubling the cost of water to agricultural users. A major cost of maintaining wells to provide water only during water short periods is the electrical standby charge.

Similar arguments for the use of pipeline can be made, although the conversion of the system to pipeline over the long term as repairs and replacements are made is a distinct possibility. The absence of substantial storage, on the order of hundreds of million gallons, makes the diversion of the ephemeral Honoka'a area streams ineffective for dry season water supply. Similar concerns to those in Waipi'o Valley will need to be addressed for these previously undiverted streams.



The output of the Paauilo Shaft was stated to be 2 MGD in the DEIS based on reported pumpage records from 1945 to 1967 which averaged about 700 MGY or 2 MGD. In 1956, the only year when pumpage exceeded 1,000 MGD the salinity level rose to nearly 200 ppm from a base of 156 to 177 ppm. While we are aware of the higher pumping capacity, we limited the output to assure long-term output.

The wells on HSC lands transferred to the State and KSBE became the properties of the new owners. While the State continues to let lessees operate the Paauilo and Feedlot wells, KSBE is not known to operate any of their wells.

The Feedlot Well is operated by the lessee to provide potable quality water to the slaughter house. The well is only operated during off peak hours to take advantage of the lower electrical rates. Water is stored on site for use during the work day. Livestock drinking water at the feed operation and wash water are provided by the LHD. It is possible that the well can be operated continually during water short periods to augment LHD supply. In that case the well operator will lose the access to the lower electrical rates.

**Comment:** According to the DEIS (p. 26), alternative stream diversions were ruled out because of prohibitive storage reservoir requirements, but there is no consideration given to diverting surface water into the LHD system. Additional surface water sources along the Hamakua Coast, such as streams and springs, should be considered as part of an integrated source alternative, subject to minimum conservation flows and no adverse impacts to existing uses. The DEIS (p. 114) identifies 23 perennial streams between Waipi'o Valley and Paauilo Gulch, seven of which flow continuously to the ocean year round. HSC declared its use of several streams and springs along the Hamakua Coast in 1989. The applicant should determine the status of the streams, springs and infrastructure, and whether any of this water could be available during the dry period.

**Response:** The primary reasons for not further considering stream in the Hamakua area are discussed in Section 3.1.4.1 of the DEIS. John Mink in his 1984 study for HSC did not even consider the Hamakua surface sources to expand agricultural water supply, leading us to believe that utilization of the source is not feasible. As for the four springs declared by HSC for community water use, all are in the Laupahoehoe area, well outside of the service area of the LHD system.

**Comment:** Additional potential surface water sources include water diverted by the Lalakea Ditch and by the UHD. An average of 1.5 MGD is currently diverted from three streams in the Hii'iawe Stream system by the Lalakea Ditch. Are the existing uses reasonable and beneficial? Are the current users of the Lalakea Ditch in line for LHD water too? Could this water accommodate any existing or proposed uses of the LHD? The UHD diverts water from the Alakahi, Kawainui, Ko'iawe, and Waima streams above the LHD diversions. As additional ground water sources are developed in Waima, less water

29

could be diverted by the UHD and remain in the streams of origin, thereby mitigating some of the adverse impact of any LHD diversions during the dry period. The DEIS should also discuss the reasons why diversions of Alakahi, Kawainui, and Ko'iawe streams are proposed over Waima.

**Response:** The Lalakea Ditch and its service area is completely within KSBE property. The negotiation discussion for the DOA to operate the LHD did not include the completely separate Lalakea Ditch. The low yield of the Lalakea Ditch during dry periods, falling below 1 MGD, limits its utility.

The Upper Hamakua Ditch is over five miles away from the LHD. It is a system completely dependent on surface runoff as compared with the LHD which has a significant spring water component. Flow variability in the Upper Hamakua Ditch makes the system least dependable during the dry season when augmentation of the LHD supply is proposed.

The Waima Stream diversion was not incorporated into this plan because of the low sustained flow in the stream at the elevation of the LHD diversion during dry periods. Mink estimates the average contribution of the Waima diversion to be less than 1 MGD while springs below the diversion provide an average of 16 MGD to the lower part of Waima Stream. The economic inefficiency and capital costs of operating the pumps placed at Waima Stream by HSC led to its exclusion from the project plans.

**Comment:** Conservation measures would stretch the limited water supply during the dry period, and should be explored as part of an integrated source alternative. These include replacing the open ditch with the more efficient pipeline; requiring farmers to install inexpensive liners and irrigate at night when evaporation rates and pumping costs are lower; and mixing saline and fresh water for use wherever possible. The water saved by the pipeline alone could remain in the streams of origin where it is most needed during the dry period, or, if sold, would help cover the installation costs. In addition to saving water, the advantages of a pipeline include better tracking of unauthorized connections and lower maintenance costs. The estimated cost of the pipeline seems high in light of the fact that the foundation for the open ditch has already been established.

**Response:** The land treatment assistance provided by the SWCDs and the NRCS will encourage use of water conserving measures such as trickle irrigation, windbreaks, and irrigation scheduling. The long term conversion of parts of the LHD system to pipeline is also envisioned. However, the initial capital cost of a complete conversion at the present time is prohibitive. It faulty to believe that additional water supply, i.e., the leakage amount, could be sold to pay for the conversion. The agricultural water demand will be fixed regardless of conveyance type.

**Comment:** The description of the status quo/no-action alternative is misleading. A year-to-year continuation of the present situation, in which up to 25 MGD is lost to leakage or dumped unused, is highly unlikely in light of the pending

30

complaint on water waste and dumping and petition to COWRM to amend the IFS for the streams diverted by the LHD and the Lalakea Ditch. Furthermore, COWRM has already ordered the restoration of Hakaloa: Falls regardless of what happens to the LHD, and it is misleading to identify the restoration as a benefit to be realized only if the LHD is restored.

**Response:** The description of the future leakage from the LHD in the No Action Alternative will indicate that efforts will be made by DOA to reduce the leakage to levels acceptable to COWRM. The funding of the repair of the LHD tunnel behind Hakaloa Falls and the removal of the dam above Hakaloa Falls is provided as a project measure. Restoration of the falls, while maintaining the integrity of the LHD conveyance, is a project benefit.

**Comment:** Stream channel alteration permits, petitions to amend the IFS, and stream diversion permits are required to modify existing intakes and to abandon stream diversion works, such as the infrastructure at Waimea Stream. HRS §§ 174C-93, 95, HAR § 12-168-32-34. This information should be included in the DEIS.

**Response:** The need for a Stream Diversion Works Modification Permit will be included in the FEIS. The requirement for the project sponsors to obtain the other permits and approvals is still undecided.

**Comment:** The alleged economic benefit of the proposed action, \$3,000 per acre across the board, regardless of use, rainfall, and economic factors, is questionable.

**Response:** While we are unsure where the \$3,000 per acre number was read, the economic analysis was conducted in a more detailed manner. No "across the board" number was applied to all of the benefited acres.

**Comment:** The DEIS incorrectly states that the amount of stream flow diverted in alternatives 3 and 4 would be the same. Under alternative 4, stream diversions would be reduced by approximately 30 percent during average conditions and 18 percent during dry conditions.

**Response:** The FEIS will be corrected to indicate the reduced diversion rates for Alternative 4.

**Comment:** It is difficult to compare the relative costs of alternatives 2, 3, and 4 given the information disclosed in the DEIS. For example, what is the currently proposed delivery charge for LHD water, \$.45 or \$.48 per 1000 gallons? Does the estimated cost of alternative 3 include the cost of purchasing easements, as opposed to only documenting and recording them?

**Response:** With implementation of the Selected Alternative the water delivery charge is expected to be in the range of \$0.32 to \$0.40 plus an additional acreage charge ranging from \$2.25 to \$3.00 per acre per month. These estimated charges are based on existing charges at other State-operated irrigation

systems in Hawaii. The charge for water with the Wells Alternative will be higher to recover the pumping energy cost.

The sponsors are expecting to be able to use State lands and road rights of way to implement the Wells Alternative, limiting costs, mostly, to survey and recording. Alternatives 3 and 4 provide for negotiating and recording the easement. Term lease rents, if any, will be a operations cost.

**Comment:** The statement on p. 10 regarding concerns about the project that were raised between 1995 and 1998 is misleading. In fact, many of the project concerns remain unresolved. The agreement between the State and KSBE to operate the LHD had not been finalized as of mid-January 1999, half of the remaining easements on the other private properties have yet to be secured, and the question of ditch ownership has not been resolved. From our perspective, the most significant unresolved issue is the proposed use during dry/base-flow conditions. The applicant/consultant are simply unwilling to ensure adequate stream flows to enhance and maintain native stream ecosystems and accommodate other uses in Waipi'o Valley during base-flow conditions.

**Response:** The agreement between KSBE and DOA has been completed. Easement negotiations with other private landowners will begin once the environmental review process is completed and the project moves into its implementation phase. The LHD ownership issue was settled with the involuntary dissolution of Hawaiian Irrigation Company by the Department of Commerce and Consumer Affairs in November 1998. While the baseflow issue still is unresolved, for some, a process of investigation and data collection and an adaptive management process for stream diversion that involves all community interests has been proposed to address the issue.

**Comment:** NEPA requires the applicant and consultant to "study, develop, and describe appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources." 42 USC § 4332(2)(E). The applicant's/consultant's duty to develop appropriate alternatives in light of the unresolved conflicts is in addition to the alternative analysis required by NEPA. 42 USC § 4332(C)(iii); 40 CFR §§ 1501.2(c), 1502.1. In *Environmental Defense Fund v. COEFS of Engineers of the U.S. Army*, 492 F.2d 1123, 1135 (5th Cir. 1974), the court found this requirement to be:


supplemental to and more extensive in its commands than the requirement of 102(2)(D)(iii). It was intended to emphasize an important part of NEPA's theme that all change was not progress and to insist that no major federal project should be undertaken without intense consideration of other more ecologically sound courses of action, including shelving the entire project, or of accomplishing the same result by an entirely different means.

**Response:** The sponsors of this watershed project and the NRCS believe that the selected the DEIS and Watershed Plan presents a proposal to obtain the

Maipinic Ziegler  
Earthjustice Legal Defense Fund

maximum beneficial use of the limited water resource. It provides for beneficial uses of aquaculture, irrigation, and other agricultural uses while providing for the protection of customary and traditional Hawaiian rights and stream ecosystem resources.

Sincerely,

  
KENNETH M. KANESHIRO  
State Conservationist

cc: State of Hawaii Department of Agriculture  
State of Hawaii Office of Environmental Quality Control



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION IX  
75 Hawthorne Street  
San Francisco, CA 94105

3/23/99

Kenneth Kaneshiro  
State Conservationist  
US Department of Agriculture  
Natural Resources Conservation Service  
300 Ala Moana Blvd., Room 4316  
P.O. Box 50004  
Honolulu, HI 96850-0050

Dear Mr. Kaneshiro:

The Environmental Protection Agency (EPA) has reviewed the Revised Draft Environmental Impact Statement (Revised DEIS) for the project entitled Watershed Plan - Lower Hamakua Ditch Watershed, Hawaii County, Hawaii. Our review is pursuant to the National Environmental Policy Act (NEPA), Council on Environmental Quality (CEQ) regulations (40 CFR Parts 1500-1508), and Section 309 of the Clean Air Act.

The Natural Resources Conservation Service (NRCS), State of Hawaii Department of Agriculture (State DOA), Hamakua Soil and Water Conservation District, and Mauna Kea Soil and Water Conservation District propose to repair the existing Lower Hamakua Ditch to provide a dependable irrigation water supply to 2500 acres of irrigated cropland. Repairs include restoration of Hakalaoa Falls as required by the State Commission on Water Resources Management. The purpose of the project is to provide a stable, adequate, and affordable supply of agricultural water to farmers and other agricultural producers in the Lower Hamakua Ditch service area. A state-operated agricultural water system will be established.

The Lower Hamakua Ditch (LHD) system is nearly 100-years old and was maintained and operated by the Hamakua Sugar Company until its bankruptcy in the early 1990s. Since that time, the LHD has been operated and maintained by the State Department of Agriculture on an annual basis as part of a program to provide employment opportunities and economic revitalization for the rural, agricultural Hamakua region following the collapse of the sugarcane industry. Due to lack of funding, adequate maintenance has been lacking and the LHD is in a highly degraded condition.

The LHD diverts 25-30 million gallons per day (MGD) from three major streams in the Waipio Valley, significantly reducing the base flow of these streams and the Waioea River to which they are tributaries. Much of the existing diversion is lost through leakage, evaporation, and unrecorded hookups. Implementation of the proposed

project will reduce the diversion from Waipio Valley to 9 - 17 MGD and establish an agricultural water system organization which can collect fees and oversee operation and maintenance of the system. In addition, a water management advisory group, with representation from all stakeholders, will be formed to provide a forum for addressing issues such as beneficial water use, water allocation, LHD operation and maintenance, restoration of Waipio Valley ecosystems, and preservation of the traditional taro agriculture in Waipio Valley.

Planning activities for this project were initiated in 1995. At that time, NRCS and project sponsors conducted a number of workshops and issued a Draft EIS. Comments on the 1995 DEIS prompted a number of additional studies and surveys and issuance of the Revised DEIS.

The Revised DEIS is an improvement over the 1995 version. As requested in our 1995 DEIS comments, the EIS now contains additional specific detailed information regarding environmental consequences. We are also pleased with the watershed approach and the inclusion of project components which enhance the benefits of the proposed action such as the partial restoration of full in-stream flows in the Waipio Valley, preservation of historical components of the LHD, creation of the multi-stakeholder water management advisory group, restoration of Hakalao Falls and traditional taro farming, on-farm land treatment assistance, and modernization of LHD operations with telemetry and a Supervisory Control and Data Acquisition System. We recommend amendment of the State Commission on Water Resources Management declaration of water use (pg. 123) as soon as feasible in order to expedite and ensure the restoration of in-stream flows to Waipio Valley streams. While we believe the Revised DEIS is greatly improved, there are several areas which require additional evaluation: 1) water rights and equitable water allocation; and 2) environmental consequences of the other, non-selected alternatives. Comments on these issue areas are enclosed.

Because of the above areas which require additional evaluation, we have classified this Revised DEIS as category EC-2, Environmental Concerns - Insufficient Information (see attached "Summary of the EPA Rating System"). We appreciate the opportunity to review this Revised DEIS. Please send two copies of the Final EIS to this office at the same time it is officially filed with our Washington, D.C. office. If you have questions or wish to discuss our comments, please call Ms. Laura Fujii, of my staff, at (415) 744-1601.

Sincerely,



David J. Farrell, Chief  
Federal Activities Office  
Cross Media Division

Enclosure: (3 pages)

Filename: hamakuad.vpd  
M1002513

cc: Dudley Kubo, NRCS  
State Department of Land and Natural Resources  
Coastal Zone Management, Office of Planning, DBEDT  
US COE, Pacific Ocean Division  
US Fish and Wildlife Service, Pacific Island Ecoregion

**COMMENTS****Water Rights and Water Allocation**

As stated in a number of comments received in response to the 1995 DEIS, the issues of beneficial water use, water rights, appropriate levels of water diversion, and equitable allocation of the water are core issues which should be adequately addressed prior to final project construction. Although water rights are discussed in conjunction with the proposed agreement to transfer LHD diversions and operation from the principle landowner to the State DOA, the Revised DEIS does not describe or discuss in detail water rights of other local landowners or native Hawaiians, in-stream and environmental requirements, or the State water rights process. Given the public concerns regarding equitable allocation of the water and provision of adequate in-stream and environmental needs, a clear understanding of the water rights issue is essential in ensuring a sound decision.

EPA advocates an approach which focuses on determination of available water supplies and aligning water demand and allocations with these supplies. The determination of available water and water needs should fully account for in-stream and environmental needs, other public trust responsibilities, and water quality standards (e.g., in-stream flow requirements, if any). An objective should be implementation and maintenance of a water supply/water demand balance which provides reliability even during droughts and flexibility to adjust to changing water policy and needs. We strongly recommend against an approach that provides water allocations which consistently exceed available water supply. Such an approach could create "shortages" which imply a "need" to develop additional water supplies. Often development of "new supplies" is only reallocation of scarce water from environmental in-stream beneficial uses to consumptive uses.

There are a number of tools which can be used to ensure effective water management, help improve supply reliability, and secure a sustainable water balance between supply and demand. These tools include conservation, water pricing (e.g., block and tiered pricing), irrigation efficiencies, conservation, operational flexibilities, conjunctive use, market-based incentives, water acquisition, voluntary temporary or permanent land fallowing, and wastewater reclamation and recycling. We urge NRCS to integrate these tools into the project proposal and to factor the use of these tools into its evaluation of water allocation and the timing and level of diversion. We are especially concerned about the minimal in-stream base flows in Waipio Valley streams (e.g., Kawaihuli) during peak agricultural water demand and drought periods. We urge use of the above tools to minimize dewatering of the water sources.

The Final EIS (FEIS) should also include a description and discussion of the water allocation criteria, allocation procedures during shortages, and the water contract process. The description and discussion should address the issue of equity and in-stream and environmental needs.

**Environmental Consequences of Other Non-Selected Alternatives**

The environmental effects evaluation of the Revised DEIS (pg. 107) focuses on the effects of the selected plan. The relative effects of the other alternatives are mentioned only when important for comparison. A detailed evaluation of the environmental consequences of the non-selected alternatives is not provided. We believe additional discussion and evaluation of the environmental effects of the other alternatives and of the qualitative differences between alternatives may better serve decisionmakers and the public. As stated by NEPA, the EIS should present the environmental impacts of the proposal and the alternatives in comparative form, thus sharply defining the issues and providing a clear basis for choice among options by the decisionmaker and the public [40 CFR Section 1502.14].

**General Comments**

1. As noted in the Revised DEIS (pg. 126), there are concerns and uncertainty regarding the restoration of native species populations and aquatic habitat within Waipio Valley. To address these concerns, we recommend formation of a Watershed Management Forum specific to Waipio Valley. Tasks for this forum could include discussion and decisions regarding research, monitoring, modelling, and project needs to achieve the desired increase in native species populations and ecosystem restoration. This forum could be a subcommittee of the proposed water management advisory group for the Lower Hamakua Ditch Irrigation system, provided all perspectives and interests are fairly represented. We also urge use of project assistance programs, e.g. EQIP and voluntary monitoring, to help implement the necessary monitoring, assessment, and modeling required to determine what is required to restore the native ecosystems within Waipio Valley.
2. The Revised DEIS does not specify whether the aquifers in the region are considered sole source aquifers for drinking water. Sole source aquifers have special management and regulatory requirements which may affect the proposed alternatives. The FEIS should state the status of the regional aquifers and, if designated sole source aquifers, describe requirements which may affect the proposed action and alternatives and/or influence the selected plan.
3. We strongly recommend inclusion of the US Fish and Wildlife Biological Opinion as an appendix to the FEIS. If there is no formal Biological Opinion, the FEIS should



*Our People...Our Islands...In Harmony*

August 19, 1999

David J. Farrell, Chief  
Federal Activities Office  
Cross Media Division  
U.S. Environmental Protection Agency, Region IX  
75 Hawthorne Street  
San Francisco, CA 94105

Dear Mr. Farrell:

Subject: Lower Hamakua Ditch Watershed DEIS Review Comments

Thank you for your review of the Revised Draft Environmental Impact Statement and Watershed Plan for the Lower Hamakua Ditch Watershed, County of Hawaii. We wish to respond to the comments attached to your letter dated January 29, 1999.

Comment: Water Rights and Water Allocation

As stated in a number of comments received in response to the 1995 DEIS, the issues of beneficial water use, water rights, appropriate levels of water diversion, and equitable allocation of the water are core issues which should be adequately addressed prior to final project construction. Although water rights are discussed in conjunction with the proposed agreement to transfer LHD diversions and operation from the principle landowner to the State DOA; the Revised DEIS does not describe or discuss in detail water rights of other local landowners or native Hawaiians, in-stream and environmental requirements, or the State water rights process. Given the public concerns regarding equitable allocation of the water and provision of adequate in-stream and environmental needs, a clear understanding of the water rights issue is essential in ensuring a sound decision.

EPA advocates an approach which focuses on determination of available water supplies and aligning water demand and allocations with these supplies. The determination of available water and water needs should fully account for in-stream and environmental needs, other public trust responsibilities, and water quality standards (e.g., in-stream flow requirements, if any). An objective should be implementation and maintenance of a water supply/water demand balance which provides reliability even during droughts and flexibility to adjust to changing water policy and needs. We strongly recommend against an approach that provides water allocations which consistently exceed available water supply. Such an approach could create "shortages" which imply a "need" to develop additional water supplies. Often development of "new supplies" is

EPA REVISED DEIS COMMENTS, NHECS, LOWER HAMAKUA DITCH WATERSHED, HI, JAN 1999

describe the consultation process, its results, and any recommendations provided by the US Fish and Wildlife Service.

4. If references to previous documents are used, the FEIS should provide a summary of critical issues, assumptions and decisions complete enough to stand alone without depending upon continued referencing of the other document. Providing just a citation of the location of the referenced documents is not adequate since many of the interested public may not have easy access to locations in the State of Hawaii (e.g., they are located on the mainland).

David J. Farrell, Chief  
Federal Activities Office, EPA Region IX

only reallocation of scarce water from environmental in-stream beneficial uses to consumptive uses.

There are a number of tools which can be used to ensure effective water management, help improve supply reliability, and secure a sustainable water balance between supply and demand. These tools include conservation, water pricing (e.g. block and tiered pricing), irrigation efficiencies, conservation, operational flexibilities, conjunctive use, market-based incentives, water acquisition, voluntary temporary or permanent land following, and wastewater reclamation and recycling. We urge NRCS to integrate these tools into the project proposal and to factor the use of these tools into its evaluation of water allocation and the timing and level of diversion. We are especially concerned about the minimal in-stream base flows in Waipio Valley streams (e.g., Kawaiwi) during peak agricultural water demand and drought periods. We urge use of the above tools to minimize dewatering of the water sources.

The Final EIS (FEIS) should also include a description and discussion of the water allocation criteria, allocation procedures during shortages, and the water contract process. The description and discussion should address the issue of equity and instream and environmental needs.

**Response:** The FEIS will contain a more detailed discussion of the State Water Code and the various water rights and uses that are recognized by the State Constitution and Water Code. These various water rights include riparian rights, appurtenant rights, Kuleana water rights, and traditional and customary native gathering rights. Beneficial uses include non-instream uses and instream uses. The amount of water required to exercise of the water rights and to satisfy existing and projected use in Waipio Valley will be estimated. The effect of the watershed project on the exercise of these rights and uses will be discussed.

While the water management tools listed above will be evaluated, the primary tools that will be used to ensure effective water management will be on-farm irrigation water management and a broad-based advisory committee to the operator of the agricultural water system. Irrigation water management assistance, both technical and financial, will be provided as a part of the land treatment component of this project by the Soil and Water Conservation Districts and NRCS. Practice measures will include water-conserving irrigation systems, irrigation scheduling, and shelterbelts and windbreaks.

An advisory committee to develop, review, and provide data for management decisions on the agricultural water system will be formally organized. The representation on the advisory committee will include Hamakua farmers, Waipio Valley farmers, fish and wildlife agencies, project sponsors, and other community groups with water resource interests.

The NRCS and the Hawaii Department of Agriculture will fund the expenses for a University of Hawaii Department of Urban and Regional Planning graduate practicum led by Dr. Luciano Minerbi this fall to work with the

David J. Farrell, Chief  
Federal Activities Office, EPA Region IX

Waipio Valley communities to develop common understanding of resource issues and identify ways to attain community-developed objectives. The practicum will be allowed to operate independently.

The maximum diversion rate during baseflow periods has been reduced from 17 MGD to approximately 13 MGD in response to DEIS comments by the U.S. Fish and Wildlife Service and others. The recommendation by the USFWS that 30 percent of the streamflow be released during baseflow periods will be adopted. Plates to block 30 percent of the intake grate area will be included in the intake modifications.

The release of 30 percent of baseflow will assure flow in all stream reaches below the diversions. Although the project proposes its maximum diversion during periods of baseflow in the Waipio Valley streams, the effects on native stream organisms is expected not to be significant.

We have discussed the issues with the USFWS, the Hawaii Division of Aquatic Resources (DAR), and the 1996 aquatic survey consultant. There is agreement that more research relating the health of native stream ecosystems to streamflow hydrology is needed to determine the effects of these and other such diversions. The biologists at the DAR hold the opinion that high flow events are important to recruitment and movement of native aquatic species and that the organisms are adapted to periods of little or no flow in the streams.

The DAR will be sponsoring a study of the Waipio Valley streams to determine the effects of streamflow levels on native aquatic organisms. The watershed project will participate in this and, perhaps other investigations, with funding contributions for gaging and monitoring for a four-year period. The data developed during the studies will be used by the advisory committee and the agricultural water system management to develop diversion and streamflow prescriptions. The committee and system management will develop and may modify the water allocation criteria and procedures during water short periods.

**Comment:** The environmental effects evaluation of the Revised DEIS (pg. 107) focuses on the effects of the selected plan. The relative effects of the other alternatives are mentioned only when important for comparison. A detailed evaluation of the environmental consequences of the non-selected alternatives is not provided. We believe additional discussion and evaluation of the environmental effects of the other alternatives and of the qualitative differences between alternatives may better serve decisionmakers and the public. As stated by NEPA, the EIS should present the environmental impacts of the proposal and the alternatives in comparative form, thus sharply defining the issues and providing a clear basis for choice among options by the decisionmaker and the public (40 CFR Section 1502.14).

David J. Farrell, Chief  
Federal Activities Office, EPA Region IX

**Response:** Additional discussion of the effects of the other alternatives will be included in Section 6. Effects of the Selected Plan.

**Comment:** As noted in the Revised DEIS (pg. 126), there are concerns and uncertainty regarding the restoration of native species populations and aquatic habitat within Waipio Valley. To address these concerns, we recommend formation of a Watershed Management Forum specific to Waipio Valley. Tasks for this forum could include discussion and decisions regarding research, monitoring, modeling, and project needs to achieve the desired increase in native species populations and ecosystem restoration. This forum could be a subcommittee of the proposed water management advisory group for the Lower Hamakua Ditch irrigation system, provided all perspectives and interested are fairly represented. We also urge use of project assistance programs, e.g. EQIP and voluntary monitoring, to help implement the necessary monitoring, assessment, and modeling required to determine what is required to restore the native ecosystems within Waipio Valley.

**Response:** The suggestion for the formation of the Watershed Management Forum is appreciated and will be included in the FEIS discussion of Waipio Valley issues. We expect an effort by the State Division of Aquatic Resources, as part of the advisory committee, to provide leadership for native ecosystem monitoring in Waipio Valley.

The University of Hawaii practicum, discussed above, is expected to address many of the issues identified in the comment. The process of developing community discussion and attempting to reach consensus will be significant for the Waipio Valley community.

**Comment:** The Revised DEIS does not specify whether the aquifers in the region are considered sole source aquifers for drinking water. Sole source aquifers have special management and regulatory requirements which may affect the proposed alternatives. The FEIS should state the status of the regional aquifers and, if designated sole source aquifers, describe requirements which may affect the proposed action and alternatives and/or influence the selected plan.

**Response:** The FEIS will state that the aquifers in the region are not designated as sole source aquifers for drinking water.

**Comment:** We strongly recommend inclusion of the US Fish and Wildlife Biological Opinion as an appendix to the FEIS. If there is no formal Biological Opinion, the FEIS should describe the consultation process, its results, and any recommendations provided by the US Fish and Wildlife Service.

**Response:** A U.S. Fish and Wildlife Service Biological Opinion or similar document will be attached to the FEIS. A similar document noting the status of consultation with the State Historic Preservation Officer will also be included in the FEIS.

David J. Farrell, Chief  
Federal Activities Office, EPA Region IX

**Comment:** If references to previous documents are used, the FEIS should provide a summary of critical issues, assumptions and decisions complete enough to stand alone without depending upon continued referencing of the other document. Providing just a citation of the location of the referenced documents is not adequate since many of the interested public may not have easy access to locations in the State of Hawaii (e.g., they are located on the mainland).

**Response:** Such a summary of the critical issues will be provided for references that are not widely available.

Sincerely,

  
KENNETH M. KANESHIRO  
State Conservationist

cc: State of Hawaii Department of Agriculture  
State of Hawaii Office of Environmental Quality Control



PHONE (808) 594-1868

FAX (808) 594-1865



STATE OF HAWAII  
OFFICE OF HAWAIIAN AFFAIRS  
711 KAPUOLANI BOULEVARD, SUITE 500  
HONOLULU, HAWAII 96813

February 17, 1999

Mr. Kenneth M. Kaneshiro, State Conservationist  
Natural Resources Conservation Service  
United States Department of Agriculture  
P.O. Box 50004  
Honolulu, HI 96850

EIS (98) 262

Re: Watershed Plan and Draft Environmental Impact Statement for the Lower Hamakua Ditch Watershed (Draft), Hawaii County

Dear Mr. Kaneshiro:

Thank you for the opportunity to comment on the draft Watershed Plan and Environmental Impact Statement for the Lower Hamakua Ditch Watershed, County of Hawaii. I apologize for the delay in submitting the following comments.

The Office of Hawaiian Affairs (OHA) is extremely concerned about the condition of the Lower Hamakua Ditch and the planning process for the use of water that flows through the ditch and its associated streams. OHA plans to continue monitoring the water issues in the Hamakua area. As part of that monitoring process, we raise the following questions and concerns.

Water Rights

The stated purpose of the proposed project is to "provide a stable, adequate, and affordable supply of agricultural water to farmers and other agricultural producers in the Lower Hamakua Ditch service area." (Document p. ix) As such, the primary purpose of the project is to make more water available for increased diversified agriculture. However, it is unclear how the State Department of Agriculture plans to deal with the issue of competing water rights claims from taro farmers located in/affected by the project area.

Mr. Kenneth M. Kaneshiro, State Conservationist  
Natural Resources Conservation Service  
February 17, 1999  
Page two

The State Water Code specifically provides for the protection of Native Hawaiian water rights, including traditional and customary rights, and appurtenant water rights of kuleana and taro lands. OHA would like the Final EIS to address this issue in more detail.

Economic Development

The document operates on the assumption that as long as a sufficient amount of water is provided, agricultural expansion of approximately 2,500 acres will occur. The methodology for estimating this potential expansion is unclear and warrants further explanation. It is essential to address this issue in large part because water is in essence being reserved for these potential, as-yet undeveloped uses. Without a better explanation of the future water demand projection that is satisfactory to all parties affected, the proposed project will remain open to criticisms that the ditch "wastes" water, as alleged in the complaint under review by the Commission on Water Resource Management (CWRM). (Document, p. xvi)

Cost-Benefit Analysis

The document is cryptic about the cost-benefit ratio to each of the stakeholders within the Hamakua Ditch area. It appears that there are private landowners who will directly reap the benefits of an improved ditch system. Yet, there appears to be no mechanism for them to share in the costs of the necessary repairs. The document should include a chart of all stakeholders and their respective gains and losses resulting from the proposed project. Quantifying such costs and benefits are not necessary, and in fact may cloud some issues; a simple list of the concerns for each party would help clarify the project's strengths and weaknesses.

Need for Long-Term Stream Gaging

The Plan-EIS attempts to make wide-sweeping policy decisions about the development of the water resources in the watershed without sufficient data. I am not aware of any long-term stream gaging programs that can provide reliable and objective information on water flow at various points on the Lower Hamakua Ditch system and its associated streams. It would be prudent to determine more reliable data on water quantity before long-range policies are implemented.

Cultural Issues

The Office of Hawaiian Affairs would also like the Plan-EIS to address the possibility that native Hawaiian gathering rights may exist on the project site. The Hawaii Supreme Court has ruled that the existence of native rights must be addressed. We suggest that NRCS seek expert opinion among the Hawaiian community about this issue.



Our People...Our Islands...In Harmony

August 19, 1999

United States Department of Agriculture  
Natural Resources Conservation Service  
P.O. Box 50004  
Honolulu, HI 96850

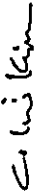
Mr. Kenneth M. Kaneshiro, State Conservationist  
Natural Resources Conservation Service  
February 17, 1999  
Page three


**Ceded Lands**

As the document notes, a significant amount of the project area is classified as ceded lands. OHA strongly suggests that Native Hawaiians be consulted before any efforts to use, modify, or destroy ceded lands.

Thank you for your attention in this matter. Should you have any questions concerning our comments, please contact Sebastian Aloot, Land and Natural Resources Officer, or Namf Ohtomo, Natural Resource Specialist at 594-1755. Please refer to the document number noted at the top of this letter in any future correspondence.

Sincerely,

  
Colin Kippen  
Deputy Administrator

  
Sebastian Aloot  
Land and Natural Resources Division Officer

cc: Paul Matsuo, State of Hawaii  
Department of Agriculture  
BOT  
CAC, Hilo

Colin Kippen, Deputy Administrator  
Office of Hawaiian Affairs  
711 Kapiolani Blvd., Suite 500  
Honolulu, Hawaii 96813

Dear Mr. Kippen:

Subject: Lower Hamakua Ditch Watershed DEIS Review Comments

Thank you for your review of the Draft Environmental Impact Statement and Watershed Plan for the Lower Hamakua Ditch Watershed, County of Hawaii. While we received your comment letter, dated February 17, 1999, after the close of the review period on February 1, 1999, we have provided our response below.

**Comment:** The stated purpose of the proposed project is to "provide a stable, adequate, and affordable supply of agricultural water to farmers and other agricultural producers in the Lower Hamakua Ditch service area." (Document p. ix) As such, the primary purpose of the project is to make more water available for increased diversified agriculture. However, it is unclear how the State Department of Agriculture plans to deal with the issue of competing water rights claims from taro farmers located in/affected by the project area.

The State Water Code specifically provides for the protection of Native Hawaiian water rights, including traditional and customary rights, and appurtenant water rights of kuleana and taro lands. OHA would like the Final EIS to address this issue in more detail.

**Response:** The project planners have been consulting with the Waipio Taro Farmers Association to identify potential impacts. The taro farmers relate that no water shortage for taro cultivation has been experienced, even during the height of diversion during sugar cultivation. However, the taro farmers insist that if a water shortage does arise that they and the Waipio Valley community receive water before other users. A impact identified by the taro growers is

the increase in management effort at the auwais when additional water is released at the diversions due to increased variability of streamflow levels.

The FEIS will contain a more detailed discussion of the State Water Code and the various water rights and uses that are recognized by the State Constitution and Water Code. These various water rights include riparian rights, appurtenant rights, Kuleana water rights, and traditional and customary native gathering rights. Beneficial uses include non-instream uses and instream uses. The amount of water required to exercise of the water rights and to satisfy existing and projected use in Waipio Valley will be estimated. The effect of the watershed project on the exercise of these rights and uses will be discussed.

**Comment:** The document operates on the assumption that as long as a sufficient amount of water is provided, agricultural expansion of approximately 2,500 acres will occur. The methodology for estimating this potential expansion is unclear and warrants further explanation. It is essential to address this issue in large part because water is in essence being reserved for these potential, as-yet undeveloped uses. Without a better explanation of the future water demand projection that is satisfactory to all parties affected, the proposed project will remain open to criticisms that the ditch "wastes" water, as alleged in the (CWRM). (Document, p. xvi)

**Response:** While the 2,500-acre number is an estimated projection based on discussions with farmers, landowners, farm organizations, and government agencies, the expansion of agricultural activity with the implementation of an agricultural water system is not disputed by those interviewed. Section 2.1.3.1 will be expanded to discuss the process by which the 2,500-acre number was decided. Appendix B - Investigation and Analysis will be expanded to show the water requirement for the projected crops that will be grown in the area to further document the total water demand.

**Comment:** The document is cryptic about the cost-benefit ratio to each of the stakeholders within the Hamakua Ditch area. It appears that there are private landowners who will directly reap the benefits of an improved ditch system. Yet, there appears to be no mechanism for them to share in the costs of the necessary repairs. The document should include a chart of all stakeholders and their respective gains and losses resulting from the proposed project. Quantifying such costs and benefits are not necessary, and in fact may cloud some issues; a simple list of the concerns for each party would help clarify the project's strengths and weaknesses.

**Response:** An expanded discussion of effects to stakeholder groups will be included as Section 6.2.4 Benefits to Stakeholders. There should not be a significant disparity between the benefits to various landowners in the Hamakua area benefiting from implementation of the project. The easement fees to the landowners whose land the ditch are expected to be nominal. Agricultural

lease rents, although variable, will be subject to market pressures and the ability for farmers to maintain profitability.

**Comment:** The Plan-EIS attempts to make wide-sweeping policy decisions about the development of the water resources in the watershed without sufficient data. I am not aware of any long term stream gaging programs that can provide reliable and objective information on water flow at various points on the Lower Hamakua Ditch system and its associated streams. It would be prudent to determine more reliable data on water quantity before long-range policies are implemented.

**Response:** You are correct that water records are scant. However, the existing records of the Waipio Valley streams and LHD have remained consistent over time and variations are explainable. The 1984 Mink Report, upon which much of the streamflow considerations are based, provides a solid synthesis of the existing data. As the project does not propose any modifications that will adversely affect streamflow in Waipio Valley beyond the present condition, the prior collection of stream data to ascertain effects does not appear to be warranted.

Long-term measurement of flows at the diversions and through the LHD will be provided by system operation. NRCS will provide assistance for a four-year monitoring effort in Waipio Valley to correlate native stream ecosystem health to streamflow. Modifications to the irrigation system operation will be made in response to new data regarding water needs of Waipio Valley taro farmers and aquatic ecosystems.

**Comment:** The Office of Hawaiian Affairs would also like the Plan-EIS to address the possibility that native Hawaiian gathering rights may exist on the project site. The Hawaii Supreme Court has ruled that the existence of native rights must be addressed. We suggest that NRCS seek expert opinion among the Hawaiian community about this issue.

**Response:** The implementation of the selected plan should not abridge native Hawaiian gathering rights. Construction activity will be limited to the alignment of the existing LHD and within the agricultural lands once cultivated by the sugar industry. Fencing will extend around the ditch and some water storage areas to exclude livestock. Egress across the ditch will be provided by the many roads that currently cross over the LHD.


As a part of the project's consultation with the State Historic Preservation Division, native Hawaiian groups are being contacted to elicit concerns about the project, with a focus on the restoration of Hakalaoa Falls.

**Comment:** As the document notes, a significant amount of the project area is classified as ceded lands. OHA strongly suggests that Native Hawaiians be consulted before any efforts to use, modify, or destroy ceded lands.

Colin Kippen, Deputy Administrator  
Office of Hawaiian Affairs

Response: The OHA representative on the Big Island has been added to the mailing list and will be kept informed of the project's activities. Land use of the ceded lands will continue to be agricultural. Most of the ceded lands in the project area are those lands leased to farmers and ranchers by the State Department of Agriculture and the Department of Land and Natural Resources. All of the lands are former sugar lands. Project improvements such as repair or installation of irrigation pipelines and a 1-MG reservoir may be made on these lands.

Sincerely,

  
KENNETH M. KANESHIRO  
State Conservationist

cc: State of Hawaii Department of Agriculture  
State of Hawaii Office of Environmental Quality Control

## University of Hawai'i at Mānoa



Environmental Center  
A Unit of Water Resources Research Center  
Crawford 317 • 3530 Campus Road • Honolulu, Hawaii 96822  
Telephone: (808) 956-7361 • Facsimile: (808) 956-3960

February 1, 1999  
EA:00181

Paul Maisuo  
State Department of Agriculture  
PO Box 22159  
Honolulu, Hawaii 96823-2159

Dear Mr. Maisuo:

### Draft Environmental Assessment Hamakua Lower Ditch Watershed Project Hamakua, Hawaii

The purpose of the Lower Hamakua Ditch Watershed Project is to provide a stable, adequate, and affordable supply of water to farmers and other agricultural producers in the lower Hamakua Ditch service area between Panuilo and Kubulhaele on the island of Hawaii. The proposed project is intended to revitalize the Hamakua regional economy following the collapse of the sugar cane industry. The repair and restoration of the sugar-era agricultural system is intended to result in the establishment of a state-operated agricultural water system formed under the provisions of Chapter 167 and 168, Hawaii Revised Statutes. The project is a partnership effort between the State of Hawaii, Department of Agriculture, Hamakua Soil and Water Conservation District, Mauna Kea Hamakua Soil and Water Conservation District, and the USDA Natural Resources Conservation Service.

The proposed improvements will provide structural repair and reduce water losses along the Lower Hamakua Ditch. Most of the 24 deteriorating wooden flumes will be replaced with corrugated metal pipe or inverted pipe siphons. In the open ditch sections, sediment will be removed and the concrete lining repaired. The diversion structures at Kawainui, Alakahi, and Koiawe streams will be repaired and modified to prevent structural failure, reduce maintenance and restore stream flow to Waipio Valley streams. A new reservoir will be built, while an existing one will be lined to prevent seepage. Hakaloa falls will be restored with repair of the tunnel behind the falls and removal of temporary flume structure. A Supervisory Control and Data Acquisition system will be implemented to allow remote data collection and operation of key components. Technical and financial assistance will be provided to Hamakua and Waipio Valley farmers to implement soil and water conservation measures.

The estimated total cost of the project is \$10,592,900. The federal share of the cost is estimated to be \$6,047,500, and will be funded through the Watershed Protection and Flood

Mr. Matsuo  
February 1, 1999  
Page 2

Prevention Act. The local cost is estimated to be \$4,545,400. Implementation of the project is estimated to result in \$3,948,200 in annual benefits from the increase in agriculture production.

We reviewed this draft Environmental Assessment with the assistance of Paul Ekern, Soil and Agronomy, Emeritus; Dave Penn, Geography; and Victoria Cullins of the Environmental Center.

#### Primary Concerns

Due to the significance of unresolved issues, basic information needs, and the pending completion of parallel administrative processes (especially the Water Commission investigation of the waste complaint and the Department of Agriculture formation of the Honokaa-Paaitilo Irrigation Project), the document does not seem sufficient to proceed directly to the Final EIS stage. Rather, a Revised Draft or Draft Supplemental EIS should be completed first.

Water rights, ditch infrastructure, and ownership/access conflicts are the most critical unresolved issues. Even though water rights are one of five identified concerns evaluated "High" (must be considered in the analysis of alternative solutions) (p. 105), they are not considered appropriately. Existing or potential water rights are not specifically identified in the document, much less assessed or evaluated. The present owner of ditch infrastructure is not positively identified.

#### Kamehameha Schools/Bishop Estate Water Rights

If "An agreement between DOA and Kamehameha Schools/Bishop Estate (KSBE) will transfer the land and water diversion rights to DOA for the life of the project" (p. 34), the nature of KSBE water diversion rights should be carefully defined and the agreement should be produced. If "The State Department of Agriculture will provide assurances that they possess the water rights needed to implement and operate the proposed improvements through the project life" (p. 68), then those rights should be identified and the assurances documented.

KSBE wrote (p. D-18) that "Unless both the federal and state governments can guarantee to KSBE that KSBE's present and future ownership of the Hamakua water resource will be formally recognized and that our present and future rights to the resource will be protected, KSBE will be unable to participate in the proposed Lower Hamakua Ditch Watershed project." KSBE does not explicitly state what rights they claim. The rights need to be stated and the available mechanisms for formal recognition described. Even then, the government cannot make any guarantees until these mechanisms reach their conclusion. Regardless, "ownership of the Hamakua water resource" is unlikely to be recognized under current state and federal law.

Mr. Matsuo  
February 1, 1999  
Page 3

No discussion of this KSBE assertion appears in the document, yet KSBE participation in the project is implied or explicitly noted in several passages. Does KSBE still maintain this position? Have the State of Hawaii and the USA provided the requested guarantees?

#### Native Hawaiian Water Rights

"Hawaiian Home Lands owns 650 acres within the watershed. Thus the draft EIS should address their priority rights to water" (our 1995 comment). Addressing these rights depends upon the types of land involved. For irrigated pasture or crops, total demand could reach 1-2 mgd, and could go even higher if residences are incorporated. These factors need to be discussed in the document.

#### Other Water Rights

Many source registrations and use declarations were filed for project-affected waters. Page 123, which only discusses the filings of the defunct Hawaii Irrigation Company, should summarize all these filings.

It is inaccurate to state that "Use of water in areas not designated as Water Management Areas by the COWRM is based on the registration of water sources and declaration of water use" (p. 123). Until such use is certified by the Commission as a "reasonable and beneficial use", we might say that the use is identified or recognized but there is no explicit government authorization of that use. Since no water rights have been adjudicated or recognized by a competent authority, merely making "An amendment to the water declaration made by Hamakua Sugar Company" (p. 123) would have no binding effect on limiting diversion rates.

Water rights are one subject of a complaint currently being investigated by the Water Commission (p. 134), and "The need for resolution of land and water rights issues before implementation of the plan is noted" (p. 165). Given all of the above and the potential for serious social and economic repercussions (the cost of the Waiahole case, for example), how can the document state that, with regard to water rights, "No mitigation is required" (p. 123). Maybe a more correct statement is "No mitigation is possible."

#### Ditch Ownership, Access, and Operation

"The DOA negotiated an agreement with Kamehameha Schools/Bishop Estate (KSBE) to obtain management and control of the ditch portion owned by KSBE for a 35 year period" (p. 11). Through this agreement, "The DOA agreed to repair the Lower Hamakua Ditch (LHD) tunnel behind Hakaloa Falls" (p. 19). However, KSBE ownership of any "ditch portion" may still be in doubt. For example, "The DOA and KSBE, owners of the land parcels containing the stream intakes and 60 percent of the ditch alignment, have agreed to transfer the rights needed for the operation of the LHD to the DOA for a period of 35 years" (p. 68). This implies that KSBE owns the land under the ditch, but not necessarily the ditch infrastructure.

Mr. Matsuo  
February 1, 1999  
Page 4

"Until the collapse of the sugar industry, the owner of the ditch system improvements was the Hawaiian Irrigation Company, Ltd. (HIC). Since that time, however, the corporation has been inactive. HIC was voluntarily dissolved on November 16, 1998 by the State Department of Commerce and Consumer Affairs due to inactivity" (p. 165). The document does not tell us who is the current owner of the ditch system improvements. OEQC's letter dated Sept. 25, 1995 states that, in the 1995 DEIS, no mention is made of ownership or title of the ditch itself and the waters flowing through the ditch, and asks the authors to "Please indicate in the draft EIS ownership and/or titles to the ditch itself and the water flowing through the ditch proper" (D-5). The current document does not provide the requested information.

"It appears that many rights-of-way have expired over the years and we have been unable to find out if any or all of these have been renewed." Then how valid is the estimated cost of obtaining land rights? "Obtaining land rights, including access, is the responsibility of the project sponsors" (p. 165). However, with ownership of the infrastructure perhaps in doubt, who is responsible to obtain the infrastructure and what will it take for them to do it? "The system is currently operated by the DOA under the bankruptcy settlement agreement among major creditors in 1993. This authority and funding was extended in 1997 and continues on a year-to-year basis" (p. 8). Perhaps a summary of the bankruptcy settlement agreement should be appended to the DEIS, or at least a specific citation to court documents should be added to the reference list.

#### Information Needs

##### Maps and Diagrams

While many separate maps provide spatial information about certain aspects of the project, there needs to be a comprehensive map that overlays many of these coverages into a single view. Single-view coverages should include present and proposed irrigation service area, public/private lands, and all past, existing, and potential water sources and distribution system alignments. A set of system flow diagrams should be produced showing existing sources, diversion, uses, and a number of alternative future scenarios.

##### Inconsistent/Incomplete Figures

According to page 17, 13.6 miles (16-3.4-13.6) of new fencing would be needed along open ditch for animal control. However, tabulated cost estimates are for 17 miles of new fencing (pages 35, 71).

Computation of water yields for the Wells alternative varies from 3.05-4.5 mgd for 3 wells (pp. xiii, 24). Is future Feedlot well yield 1 or 2 mgd? Is future Field 20150 well yield 0.05 or 0.5 mgd? Is this infrastructure owned by KSBE (p. 103)? The DEIS should provide the results of searching the COWRM database for other existing wells that could service the project area, and tally pending permit applications for other proposed wells that could service the project area.

Mr. Matsuo  
February 1, 1999  
Page 5

#### Other Issues

Why does the Ensearch facility not receive any allocation in drought? What are the impacts of this? How will they be mitigated? Please address issue of potential conflicts over water during drought, not limited to Ensearch.

One mgd is projected for aquaculture use as depicted in Fig. 18 (p. 108). How many acres are projected to be in aquacultural use? What are the impacts of mitigation of effluent disposal and reuse?

#### Hydrology

Historic and potential hydrology should be more rigorously examined and more clearly presented, through the use of basic time-series and frequency-duration curves of historic flows and potential future flows under various post-project scenarios. There are several inconsistencies and omissions in the data presented that should be clarified, resolved, and included.

1. On page 8, historic ditch "base flow level" (poor use of term, since "base flow" usually refers to groundwater contribution to streams) is estimated at 18-19 mgd, and "The historical low flow has been about 15 mgd." However, on page 45 a 17-19 mgd historic minimum diversion is discussed, and p. 101 references a 19 mgd historic minimum at the main weir.

2. The 1995 DEIS estimated system loss at 5.5 mgd estimated loss. The present document states that much of the system loss occurs at deteriorating flume systems (p. 9), unused water is released at Main Weir, Kukuihaele (p. 10), water is lost to seepage at Paaulo reservoir (p. 34), and total leakage is anomalously as high as 25 mgd (p. 27). Without more rigorous measurement and estimation of system losses (how much at flumes, how much released, how much reservoir seepage, evaporation based on pan figures used in crop water demand study), it is difficult to assess the potential impacts of alternative project scenarios. This breakdown should be reflected on Figure 14, p. 115.

3. Page 52 notes the presence of 4 existing reservoirs totaling 31 mg storage capacity. More information on the location, storage capacity, service connections and area, lack of "water-leveling capability," and seepage and evaporation losses in these reservoirs is needed.

4. If 5-7 mgd are now flowing into Paaulo reservoir and it has a 10 mg storage capacity, how much of the inflow is used downstream for irrigation or other purposes and what are the current seepage (p. 53) and evaporation losses? This should be compared with projected water use downstream from the reservoir and lining-induced changes in seepage and evaporation loss to determine if reservoir lining is a sound alternative. A figure depicting a curve of supply and effective demand would be beneficial.

Mr. Matsuo  
February 1, 1999  
Page 6

5. The agricultural climate section fails to adequately address two elements that may be very important to the crops and practices needed for successful cropping.
  - a. The specific elements mentioned in the assessment do not include wind. However, the corner effect on the trades (Ramage, CS 1976 Effect of the Hawaiian Islands on the Trade Winds, Dept. of Meteorology, University of Hawaii), as well as the wind power survey (Ramage et al. 1979, UHMEY Wind Energy Resource Atlas: Volume 11 - Hawaii and Pacific Region, Pacific Northwest Laboratory) all suggest that the study area is one of high wind potential. This has implications for crop damage, by salt spray and high evaporation rates and can demonstrate the need for shelter belts.
  - b. The second missing element is solar radiation. Measured values in the cane areas are reported in DLNR's report #RS7, "Solar Radiation in Hawaii, 1932-1975. The orographic cloud shield during trade periods reduces sunlight in summer or during periods of trade-like wind flow. Winter finds the area additionally in shadow to the north of the Kohalas. Studies on maize production on Oahu have shown a direct relationship to sunlight. The shade culture of coffee may make this an advantage, however. Though comments have asked for this information, it still has not been included and could be critical to crop plans.
6. There are inconsistencies and questions in future flow estimates presented.
  - a) While portions of the text refer to 6-9 mgd average flow, Figure 13 (p. 108) estimates 9 mgd average flow. However, the breakdown presented in the same pie chart (3 IRR, 1.5 Ensearch, 1 aqua, 0.05 stock, 0.1 slaughter, 0.05 domestic, 3 losses) only adds up to 8.7 mgd. The additional 0.3 mgd should be accounted for or the flow figure revised.
  - b) The same pie chart proposes 33% future system losses under average conditions (3/9). However, page 18 states that "normal allowance for losses for a system of the 2.5-mile length can amount to 20%." Derivation of this "normal allowance" should be explained and the basis for breakdown of other calculations of system losses should be tabulated.
  - c) While portions of the text refer to 24-27 mgd maximum system flow, Figure 13 (p. 108) estimates 17 mgd peak flow. However, the breakdown presented in the same pie chart (12.5 IRR, others same, +1.5 emergency) totals 18.35 mgd. Page B-5 implies that Ensearch would not receive water during peak flow periods, thus 18.35-1.5=16.85. Differences in the breakdown of average and peak usage conditions should be clarified in Figure 13.
  - d) Peak flow system losses are estimated at 12% (p. 108, 3/17), yet "normal allowance for losses for a system of the 2.5-mile length can amount to 20%." These inconsistencies in system loss estimates beg explanation.

Water Code's mandate to identify the best use of stream flows in the Waipi'o watershed and to protect instream values, appurtenant water rights, and traditional and customary Hawaiian practices.

There is no evaluation of the proposed action's impacts on state policies for maintaining water quality. According to the DEIS, the Hawaii Water Quality Standards Map classifies the Waipi'o Valley drainage area above the valley floor as Class 1, which requires that the waters remain in their natural state as nearly as possible with an absolute minimum of pollution from human caused sources. The continued diversion of nearly the entire base flows from the Aialahi, Kawainui, and Ko'iawe streams significantly alters the natural state of these streams and reduces their ability to dilute contaminants and sediment. In addition, the draft Hawaii Coastal Zone Management Assessment (Appendix C to the DEIS) is incomplete regarding impacts on the affected environment, natural and cultural resources, public access, recreation, and other considerations. These inconsistencies must be discussed in the DEIS pursuant to 40 CFR § 1502.16(c).

**Response:** The DEIS and Watershed Plan presents a proposal to obtain the maximum beneficial use of the limited water resource. It provides for beneficial uses of aquaculture, irrigation, and other agricultural uses while providing for the protection of customary and traditional Hawaiian rights and stream ecosystem resources.

The modified diversion structures are not expected to have any further adverse impact on the Class 1 streams and, in fact, will improve aquatic resource conditions by a partial restoration of streamflow. The Hawaii CZM Assessment is believed to be factual and complete.

**Comment:** The DEIS fails to adequately describe the affected environment or the proposed action's impacts with regard to existing and future water use in Waipi'o Valley. The DEIS focuses on the benefits of the proposed action to users on the Hamakua Coast, but gives short shrift to Waipi'o Valley, which has been identified as Unique Agricultural Land. The DEIS assumes that while there is economic benefit in diverting water to the Hamakua Coast, there is no economic value in allowing streams to flow in the Waipi'o watershed. The DEIS (P. 109) states that no mitigation of the proposed action's impacts on prime and unique farmland are necessary. However, no surveys or investigations are provided in the DEIS to support the applicant's claim that the proposed action provides enough water in Waipi'o Valley.

The DEIS fails to describe or quantify existing and proposed water uses in Waipi'o Valley. As a starting point, the DEIS should identify all of the declared water uses and water rights in the Waipi'o watershed.

The estimated 25,000-50,000 gad for wetland taro cultivation is low. What is the source of this estimate? Have any measurements been taken in Waipi'o Valley?

**Response:** The Waipi'o Valley Taro Growers Association which represent over one-half (source: Christopher Rathbun) to nearly all (source: WVTFA) of the

Mr. Matsuo  
February 1, 1999  
Page 8

7. "Some Waipio Valley farmers and residents are concerned that without the LHD diversions, storm flows will cause increased flooding and erosion problems. The existing stream diversions remove a fixed amount of flood water thereby reducing the volume of floodwater entering the valley" (p. 20). This statement should be followed by references to page 111: "The USGS, in 1997, computed a 0.02 foot (0.24 inch) rise in the average annual peak flood of the 30 MGD diversion was completely stopped" and "... The diversions have no discernible effects during extreme floods."

All current use should be regarded as undocumented, pending results of the current Water Commission investigation. The lack of information in the DEFA about present water use and system hydrology is a big problem. If 3-5 mgd is flowing into Paaulo reservoir and 2-5 mgd is being used from the entire system, what is going on at Paaulo reservoir. (See, Hydrology, comment 2, above)? Has an engineering study been conducted for the reservoir re-lining component of the project?

Water Resource Management/Streamflow

1. "A draft Memorandum of Understanding providing a basis for cooperation to evaluate water use needs and to develop streamflow prescriptions for Waipio Valley streams has been prepared and is being reviewed" (p. xvii). This document should be appended to the DEIS.

2. "It is intended for this group to become the advisory group for the lower Hamakua Ditch agricultural water system" (p. 63). Does the Water Commission concur with this intent, and with the more detailed group description (p. 156), as follows:

"The development of a Waipio streamflow management prescription that meets the needs of all the parties that are affected or interested will be pursued through the establishment of an advisory group to the Lower Hamakua Ditch agricultural water system. The responsibility of the advisory group will be expanded to include the Waipio Valley issues. An "adaptive management" approach will be used allowing management of an agricultural water system, diversion rates, and streamflow in Waipio Valley to be adjusted as measurement and monitoring provide better information."

3. "The most current update of the WUDP (Hawaii County Water Use and Development Plan) was prepared before the collapse of the sugar industry in Hamakua" (pp. xvii, 140.) While the WUDP was updated in 1992, this draft was never adopted by the County Council (the WUDP is a county ordinance) or the Water Commission. The original WUDP (1990) is in effect, however both the County and the Water Commission are delinquent in the update process (by law the Water Commission was to adopt a 1991 revisions and County was to take action in 1995). The WUDP mandate is allocation of water to land use - this fundamental question (could be a single spreadsheet) must be answered in conjunction with acknowledge unresolved issues of streamflow and in order to consider the integrated alternative proposed below.

4. Permits and Compliance (pp. xvii, 64) should include Water Commission stream diversion works permit, declaration of water use, water use reporting, and waste prohibitions.

Mr. Matsuo  
February 1, 1999  
Page 7

7. "Some Waipio Valley farmers and residents are concerned that without the LHD diversions, storm flows will cause increased flooding and erosion problems. The existing stream diversions remove a fixed amount of flood water thereby reducing the volume of floodwater entering the valley" (p. 20). This statement should be followed by references to page 111: "The USGS, in 1997, computed a 0.02 foot (0.24 inch) rise in the average annual peak flood of the 30 MGD diversion was completely stopped" and "... The diversions have no discernible effects during extreme floods."

In addition, citation to the USGS computation seems necessary, as well as more comprehensive and preferably graphic depiction of flow-duration curves, flow time-series, and storm hydrographs, as suggested in 1995 by the Department of Interior (p. D-25): "For example, the frequency and seasonal occurrence of base flow events in each stream could be contrasted with the worst-case demand schedule."

Similar deficiencies are also necessary on a stream-by-stream basis to complement statements such as: "Dewatering associated with baseflow withdrawals is therefore probably most frequent in Koiawe" (p. D-25). "During dry periods more agricultural water will be required and may result in the capture of most of streamflow at the diversions during extreme drought" (p. 45). Also note that with the proposed project SCADA, storm flows might be managed on a real-time basis to minimize adverse impacts.

Funding

"The sponsors will be responsible for obtaining the necessary local funding from the state legislature or other sources ... The sponsors have acquired appropriations of \$1,000,000 in Act 116, SLH 1998 for implementation of the initial phase of the selected plan." What is the initial phase and how much has been spent to date?

Water Use

Justification is needed for the statement that "The existing system must continue to divert 25-30 MGD, in order to meet the agricultural water needs of current users ..." (xvi).

"Water use is declared and recorded, however, as required by the State Water Code" (p. 9). As mentioned previously, all declarations involving project-related waters should be summarized, as well as all records of water use. The Water Code requires a monthly report of water use. It appears that these being filed by DOA is unlikely if "Current Lower Hamakua Ditch agricultural water usage is difficult to assess due to the absence of formal management of the system. There has been no record keeping or charge for water use during the transition period. While most users have declared their water connections and usage to the interim maintenance contractor, surreptitious connections to the ditch and lateral systems are common. The estimate of current water use from the Lower Hamakua Ditch is between two and five MGD ... Anecdotal accounts state that, due to leakage, and less importantly, to other users, 25 MGD



Mr. Matsuo  
February 1, 1999  
Page 9

5. "Without implementation of the proposed project, no modification of the intake structures to limit diversion of Kawaiwi, Alakahi, Waimea, and Koiawe streams will occur. The intakes will continue to divert the streams at current rates ... Successful pursuit of the complaint to COWRM changing waste of water in the LHD system may require a reduction in diversion rates from Waipio Valley" (page 10). These and other passages (see below) underemphasize the potential for Water Commission-directed alteration of diversion rates and do not reference the petition to amend interim instream flow standards previously submitted by WVCA and currently under revision. This could be resolved by referencing the petition and placing the caveat first, rather than last, e.g. "Unless directed otherwise by the Water Commission, without implementation of the proposed project ..."

"No modification of the intake structures will be performed unless ordered to do so by the Commission on Water Resource management in settlement of the pending complaint regarding water waste on the LHD" (p. 27).

6. "Elevated temperatures, altered water quality, a labyrinth of diversion ditches, and introduced species may be affecting upstream migration of post-larval o'opu" (p. 125). Where are the data to support this? Reports covering measurement of water temperature, water quality, ditch patterns, introduced species populations, and post-larval migrations should be referenced, or the statement should be otherwise qualified.

7. Project assistance to record streamflow will be provided for four years. The budgeted amounts are not adequate to install and operate USGS-standard stations unless all four years of funds are pooled (this might get 2 stations at current rates). Sources for additional assistance and some sort of strategy for the recording program should be discussed.

8. "It is anticipated that nearly the entire baseflow of Kawaiwi stream, except for a release of one MGD, will be diverted for several days to several weeks during two years in a ten year period" (p. 157). The document should discuss in detail the impact and mitigation related to this diversion.

Relationship with State of Hawaii Board of Agriculture Honokaa-Paaulio Irrigation Project and Waimea-Paaulio Watershed Project

"A state operated agricultural water system will be established under the provisions of Chapters 167 and 168, Hawaii Revised Statutes" (p. ix). It would appear that this can be accomplished independent of the proposed project to resolve the concern that "The temporary nature of the DOA agreement to maintain the LHD and the absence of formal management authority prevents the collection of user fees for the development of water and prevents the development of longer ranged plans for system improvements to better serve the water users" (p. 18). A public notice on the formation of the State of Hawaii Board of Agriculture Honokaa-Paaulio Irrigation Project has been issued and a meeting set for March 15, 1999.

Mr. Matsuo  
February 1, 1999  
Page 10

The State of Hawaii DLNR Division of Water and Land Development wrote on September 14, 1995 requesting that "you coordinate the Waimea-Paaulio Watershed project with this project" (p. D-23). Is there a response to this request? Such coordination is not discussed in the DEIS. It seems that at the very least a summary of the Waimea-Paaulio project and its potential for interaction with LHD should be presented.

Hook-up Fees

Hook-up fees for meter connection have been standard in DOA irrigation projects but are mentioned for non-agricultural uses only (p. 108). Past experience in the Waianalo Irrigation System suggests that these fees can be \$1000-\$5000 per lot depending upon location.

Agricultural Investment and Productivity

Appendix B - Investigation and Analysis Economics

1. "The LHD project will contribute to NED by alleviating the agricultural water shortage problems in the watershed project area. The project will reduce income losses caused by the inadequate quantity and distribution of water for crop irrigation and livestock drinking, especially during droughts. The project will also increase income by allowing increased diversified agricultural development, which is essential to the economic revitalization of the area"

What are the statistics or the basis for assumptions? There should be some concrete documentation of how people are suffering now, in addition to a prediction of how they might suffer in the future.

2. "The intensification benefits were measured as the difference or increase in net farm income between the without project-condition and the with-project condition that would occur in response to cropping pattern or land use change. Crop budgets (cost-return estimates) were developed for the major crops grown in the watershed and used to estimate net farm income" (B-2).

Summary tables for all parameters used in the analysis should be displayed. Watershed land use Table B-1 (B-3) should distinguish between recent past and present conditions for diversified crops (how much for truck, coffee, etc.?); Where is the existing 5 acres of aquaculture located? There is no specific mention in the documentation of this operation. Additionally, why not use individual farm accounting (for existing farms) as a basis for crop budgets?

3. Land assessed as good, fair, poor (p. 155)

Mr. Matsuo  
February 1, 1999  
Page 11

In this section a more complete breakdown, and spatial references are needed. There is 7000 acres designated as good - fair for trees, and 2000 as good - fair for truck crops. This leaves 4500 rated as poor. There should be some discussion of where these areas are and how they relate to present and proposed irrigation service areas. Also what are present returns, and environmental impacts for each type?

4. "The crop suitability study showed that irrigation would allow a substantial number of acres to be upgraded from fair suitability to good suitability, or from poor suitability to fair suitability..." (p. 155).

Please define "substantial." 600 acres are irrigated now, only 1900 more to upgrade, and only 100-something planned for truck crops. Some quantification and tabulation of irrigation upgrade potential beyond the current generalized statement should be presented. Projections could be based on market prices and acreage, and compared with performance of existing ventures in the area.

5. "This concern [uncertainty of the temporary operation of the LHD by the DOA] has prevented fuller investment in agricultural enterprise in this area ..." (pp. ix, 7)

What statistics and analyses support this presumption? Table i: Current Land Use (pp. xii, text 90) could show a breakdown of production values and returns on investment.

6. "Dependable agricultural water supply is essential for economic revitalization of the area ..." (page 1).

Please substantiate this comment.

7. "Lease rents and terms are not as favorable for small farmers on the larger estates as it is for state-owned land" (9).

What about small farmers on smaller estates? Comparative, quantitative examples of terms and rents should be presented.

8. "There has also been a shift in crop types since 1995 providing more stability and marketing potential ... These crops also increase the opportunity to add value within the Hamakua area through processing, packaging, and marketing" (11).

Some documentation of how this is already occurring should be provided. Where are the real statistics?

9. "Many larger farm operators and landowners could not disclose in detail what their

Mr. Matsuo  
February 1, 1999  
Page 12

plans or those of their agricultural lessees would be with assurance of agricultural water supply" (p. 11). "Some [farmowners and landowners with plans for larger farms or developments] have made the investments on private lands for infrastructure improvement and have taken steps to ensure their supply of water by developing or identifying back-up wells" (pp. xii, 9).

These statements indicate that a lot of producers may solve their water supply problems without state and federal assistance or without the particular project proposed. Specific identification of private investments and other steps taken should be presented, along with an analysis of how these efforts might be pooled or integrated with those of other private and public parties.

Agricultural water use

1. The ditch formerly irrigated 6000 acres came with 19 mgd of base flow (this approximates 3167 gpd) (p. 102). The cane water requirement is higher than that for any crop being proposed within the project area (except wetland taro and aquaculture).

2. For a more realistic basis on crop water requirements, water demand projections should be compared with actual water use, yield, and return from similar ventures in Hamakua and other areas (e.g. Kona, Ka'u, Hamakua coffee, macadamia nut, etc.).

3. The 600 acres of currently irrigated cropland (p. 11) should be broken down by crop, production value, water use, etc.

4. Based on 13.5 mgd total for buildout (12.5 IRR + 1.0 aqua), 3.5 mgd from 3 existing wells "will sustain irrigated crop production on approximately 600 acres of cropland during the second biggest drought year during an average ten year period (5,833 gpd). An additional 10 MGD capacity would be needed to sustain the projected buildout level (2382-600-1782 acres, p. 12)) of irrigated cropland" (p. 24). Analysis of the Honokaa-Paauilo County system (p. 23) suggests delivery of 10,000 gallons per day for 2-3 acres of drought irrigation, implying 3333-5000 gpd water requirement during peak demand. However, in contrast to these two examples, estimates of 0.5 mgd/acre for the average reference crop (p. 26) translate to a 1373 mgd average crop water demand, and 1.0 mgd/acre in a 90% year (the plan is for 80% year) implies only 2746 gpd water requirement during peak demand.

5. Table A: Projected Irrigated Cropland with Project Implementation (12) shows 129 acres irrigated truck crops, broken down by ownership as: 20 small private, 21 state, and 88 large private; and 2382 acres irrigated tree crops (state 592, small private 281, and large private 1509). This gives a good indication as to who will benefit most from the proposed project. Do the benefits to small farmers and state lands justify the investment? Does the public investment in large private ventures generate good public return?

6. Project Water Needs/ Irrigation and water requirement analysis (p. 15)

On an annual basis, assuming a 1:1 crop/pan ratio, no irrigation is necessary. During May-October (6 months), rainfall must be matched by irrigation. How was the project objective [ensure sufficient irrigation water for 80 percent frequency of rainfall] selected? Based on economic analysis? The DEIS should explicate projection methods used (Table B) by referencing the source for all parameters and by tabulating: monthly and annual crop water requirements used, and average of 6 crops used as reference. Then compare this average with and acreage-weighted, crop-discriminate (truck v. tree crops or 6 crops) reference. The analysis should also discuss the uncertainty of using time-aggregating methods to estimate results of processes occurring at sub-daily time-steps.

"Evaporative pan data and monthly rainfall data at six weather stations between Kukuihaele and Paauilo at elevations between 300 and 920 feet elevation were analyzed using the Newhall model for estimating soil moisture status" (p. 79). References are needed for this model.

"A number of potential industries that may be established in the Hamakua area would use LHD water if made available." Electric power generation and aquaculture "provide discharge water that can be reused for irrigation" (p. 19). Would it be reused? What other sources are available to these industries?

6. Taro water use "Estimates range from 25,000 gpd to 50,000 gpd" (p. 128). Sources for these estimates should be referenced? Actual taro water use measurements ranging from 15,000 - 1,500,000 gpd have been made by our reviewers in various locations.

As discussed on page 130, "The resulting variability in stream depth in response to rainfall in the watershed will increase the water and awai management requirement considerable for taro growers." However, other sections of the document suggest that stream depth will not vary much (see Hydrology section above). It should be noted that greater flows can also reduce management requirements by reducing sedimentation, inhibiting growth of riparian and aquatic weeds, and allowing greater flexibility in on-farm water management.

Tummons letter (p. D-26) suggests that "Rather, the EIS should consider the prospect that all lands suitable for taro cultivation in Waipi'o Valley are in productive use and use this figure as the basis for arriving at an estimate of the maximum amount of water flow in Waipi'o that taro farmers will need. Only after calculating this maximum amount can the amount available for uses out of the valley be calculated." Such calculations should be presented.

7. The water budget method presented on page B-4 needs clarification. All parameters used in the calculations should be displayed in a summary table. Problems of using a monthly time-step should be discussed, as well as those of using a reference crop that is an average of six crop types v. one that is a spatially-weighted average based on crop-discrete analysis.

Spatial distribution of current and planned water use within the irrigation service area needs to be presented within the document.

#### Agricultural Inputs and Outputs

Impacts stemming from "poorly drained to somewhat poorly drained soils" (pp. 80-81) are inadequately discussed, as well as other issues relating to identified P requirements; low calcium, magnesium, potassium fertility; some aluminum saturation requiring heavy liming; and compaction susceptibility. The blanket mitigation seems to be "additional technical support from NRCS," but there is no documentation of how this technical assistance has actually mitigated impacts in this and other areas across the state.

How can areas be ranked as Prime farmland when soil and crop suitability ratings only range from poor-fair-good for the 6 types of crops analyzed (p. 11)? With 5 acres of aquaculture using 1 mgd of water, there should be some discussion of aquaculture effluent quality and its potential impacts on surface and groundwater (pp. 115, 117).

#### Ceded Lands

"Lease of the ceded lands to Hamakua area farmers and ranchers provide a public use of the land that returns market-based revenues" (pp. xviii, 145). Will these revenues increase upon project completion, or are lease rents already fixed based on pre-project conditions?

#### Alternatives Analysis

1. The alternative analysis should look beyond "minimizing the cost of implementation" and "maximizing the net economic benefit to the nation" (p. xi).

2. The tables below are supplied in the document. Where are similar tables for other alternatives? Table ii: Economic Effects (of the Selected Plan) (xiv) and Table iii: Environmental Effects (of the Selected Plan). Additionally, there is no cost table for Alternative 1.

3. "The most pressing repairs are needed along the 14.5 miles of the open ditch system" (p. 16).

How much would leakage, repair and restoration costs be reduced by refining the mauka system? This should avoid or reduce intake repairs, weekly flushing of sediment traps, rockfall damage and hazards, foot and helicopter access requirements, and continual trail reestablishment (p. 16), and perhaps reduce the cost of continuing the existing operation.

4. The DEIS proposes to upgrade 2 existing wells and construct 8 new wells (0.6 mg storage each, total 6.0 mg new storage). Unlike the selected plan, the "wells alternative provides

Mr. Matsuo  
February 1, 1999  
Page 15

modularization of the system, "considerably better" water quality, "the ability to provide water to domestic water customers without extensive treatment," and will not "require nearly the full installation cost to service less than full buildout" (pp. x, 28). In particular, more discussion of potential public-private cooperation in groundwater source development seems necessary, initially focusing on the Paauilo shaft (6.0 mgd potential yield).

System Integration Alternative

The most important alternative lacking from the present analysis is a system integration alternative. Discussion of this alternative requires comprehensive descriptions and depictions of all available options. Since surface water quantity is 1 of 5 identified concerns evaluated "High" (must be considered in the analysis of alternative solutions) (p. 105), a greater variety of stream diversion alternatives should be identified and assessed, especially the reactivation of Waiaina (including more information on the two 200 hp pumps) which is supported by WVTFA.

Energy costs associated with groundwater alternatives are estimated at 0.45/kgal. This should also consider the potential for hydroelectric power generation and associated energy cost reductions (see p. 19). The Ensearch facility is located on a former hydroelectric generating site that used 7 mgd of water. How much power was produced there and at what cost? The public notice for the Honokaa-Paauilo Irrigation Project proposes surface water delivery costs of 0.35-0.50/kgal (Public notice), which may not be much different from groundwater costs. Groundwater-based alternatives should also involve fewer land rights and water rights complications, including social impacts and project costs.

"As most of the cropland service area lies between 200 and 800 feet, the average total dynamic pumping head was assumed to be 500 feet for the analysis" (p. 27)  
How does this compare with weighted average service area elevation, potential well and pumping station sites, and how is it considered within the context of total system integration? Other components of an integrated system could include:

- a) Honokaa-Paauilo County system (p. 23), up to 10,000 gallons per user, per day.
- b) Hamakua streams. 10 mgd in 23 streams is used to assume 0.5 mgd average yield (p. 23). What is the basis for the assumption? The DEIS should take a closer look at individual streams.
- c) "The Upper Hamakua (UHD) ditch is located at the southwest LHD watershed boundary at an elevation of 4,000 feet. The UHD diverts Kawainui, Alakahi, and Waiaina streams before they plunge into Waipio Valley" (p. 104).
- d) Lalakea ditch is projected at 1 mgd @ 2000', 30 mg reservoir. KSBE aquaculture lease is using how much of this?

Mr. Matsuo  
February 1, 1999  
Page 16

It seems that an integrated system could be constructed using groundwater for base system needs and keeping Waiaina intake open for drought use, while also considering connection to UHD and Lalakea ditch.

Project Support

1.5 FTE (p. 29) is projected to service 120 irrigated parcels, 170 agricultural operations, 25 Waipio taro lands totaling 75-100 acres. How does this compare with the workload of other natural resource conservation teams? Additionally, our reviewers project that the 25K/year flow monitoring will not even pay for installation of one standard USGS stream gauging station unless 2 years of funding are pooled.

Thank you for the opportunity to comment on this draft EIS.

Sincerely,

John T. Harrison  
Environmental Coordinator

cc: OEQC  
Roger Fujioka  
Department of Agriculture  
Paul Ekern  
Dave Penn  
Victoria Collins



Division of  
Future

*Our People...Our Islands...In Harmony*

August 19, 1999

John T. Harrison, Environmental Coordinator  
Environmental Center  
Crawford 317  
2550 Campus Road  
Honolulu, Hawaii 96822

Dear Mr. Harrison:

Subject: Lower Hamakua Ditch Watershed DEIS Review Comments

Thank you for your review of the Draft Environmental Impact Statement and Watershed Plan for the Lower Hamakua Ditch Watershed, County of Hawaii. We wish to respond to the comments contained in your letter, addressed to the State of Hawaii Department of Agriculture, dated February 1, 1999.

Comment: Due to the significance of unresolved issues, basic information needs, and the pending completion of parallel administrative processes (especially the Water Commission investigation of the waste complaint and the Department of Agriculture formation of the Honokaa-Paaulo Irrigation Project), the document does not seem sufficient to proceed directly to the Final EIS stage. Rather, a Revised Draft or Draft Supplemental EIS should be completed first.

Water rights, ditch infrastructure, and ownership/access conflicts are the most critical unresolved issues. Even though water rights are one of five identified concerns evaluated "High" (must be considered in the analysis of alternative solutions) (p. 105), they are not considered appropriately. Existing or potential water rights are not specifically identified in the document, much less assessed or evaluated. The present owner of ditch infrastructure is not positively identified.

Response: The waste complaint before the CWRM points the need for a comprehensive repair of the LHD to eliminate, as much as practicable, the leakage from the agricultural water system. The CWRM may defer action on the complaint until the status of the watershed project has been decided. The formation of the DOA irrigation district is a required condition for the implementation of the watershed project.

The discussion on water rights is expanded in the FEIS. The issue of the ownership of the ditch infrastructure has been settled with the involuntary dissolution of the Hawaiian Irrigation Company on November 15, 1998.

John T. Harrison, Environmental Coordinator  
Environmental Center

The information contained in the DEIS and new information added in response to comments made by reviewers of the DEIS provide a sufficient basis for proceeding to the Final EIS.

Comment: If "An agreement between DOA and Kamehameha Schools/Bishop Estate (KSBE) will transfer the land and water diversion rights to DOA for the life of the project" (p. 34), the nature of KSBE water diversion rights should be carefully defined and the agreement should be produced. If "The State Department of Agriculture will provide assurances that they possess the water rights needed to implement and operate the proposed improvements through the project life" (p. 68), then those rights should be identified and the assurances documented.

KSBE wrote (p. D-18) that "Unless both the federal and state governments can guarantee to KSBE that KSBE's present and future ownership of the Hamakua water resource will be formally recognized and that our present and future rights to the resource will be protected, KSBE will be unable to participate in the proposed Lower Hamakua Ditch Watershed project." KSBE does not explicitly state what rights they claim. The rights need to be stated and the available mechanisms for formal recognition described. Even then, the government cannot make any guarantees until these mechanisms reach their conclusion. Regardless, "ownership of the Hamakua water resource" is unlikely to be recognized under current state and federal law.

No discussion of this KSBE assertion appears in the document, yet KSBE participation in the project is implied or explicitly noted in several passages. Does KSBE still maintain this position? Have the State of Hawaii and the USA provided the requested guarantees?

Response: The confusion about these citations revolves around the broad use of the term "rights." While a strict legal definition of rights, especially in the realm of water, has permeated the discussion, the way the term has been used in the DEIS and the KSBE letter is to signify the access to and use of the water resource. This is particularly true for the sponsor's responsibility to secure "water rights", in the federal language, as a condition for federal project participation. We understand that only a narrow range of water rights are conferred in Hawaii by the State Constitution and the State Water Code, none of which apply to water diverted and distributed by the LHD.

The DOA lease agreement for the LHD infrastructure on KSBE land has been concluded without further discussion of formally recognizing water rights.

Comment: "Hawaiian Home Lands owns 650 acres within the watershed. Thus the draft EIS should address their priority rights to water." (our 1995 comment)  
Addressing these rights depends upon the types of land involved. For irrigated pasture or crops, total demand could reach 1-2 MGD, and could go even higher if residences are incorporated. These factors need to be discussed in the document.

John T. Harrison, Environmental Coordinator  
Environmental Center

agreed to transfer the rights needed for the operation of the LHD to the DOA for a period of 35 years" (p. 68). This implies that KSBE owns the land under the ditch, but not necessarily the ditch infrastructure.

"Until the collapse of the sugar industry, the owner of the ditch system improvements was the Hawaiian Irrigation Company, Ltd. (HIC). Since that time, however, the corporation has been inactive. HIC was voluntarily dissolved on November 16, 1998 by the State Department of Commerce and Consumer Affairs due to inactivity" (p. 165). The document does not tell us who is the current owner of the ditch system improvements, OEQC's letter dated Sept. 25, 1995 states that, in the 1995 DEIS, no mention is made of ownership or title of the ditch itself and the waters flowing through the ditch, and asks the authors to "Please indicate in the draft EIS ownership and/or titles to the ditch itself and the water flowing through the ditch proper" (D-5). The current document does not provide the requested information.

"It appears that many rights-of-way have expired over the years and we have been unable to find out if any or all of these have been renewed." Then how valid is the estimated cost of obtaining land rights? "Obtaining land rights, including access, is the responsibility of the project sponsors" (p. 165).

However, with ownership of the infrastructure perhaps in doubt, who is responsible to obtain the infrastructure and what will it take for them to do it? "The system is currently operated by the DOA under the bankruptcy settlement agreement among major creditors in 1993. This authority and funding was extended in 1997 and continues on a year-to-year basis" (p. 8). Perhaps a summary of the bankruptcy settlement agreement should be appended to the DEIS, or at least a specific citation to court documents should be added to the reference list.

**Response:** The ditch infrastructure is an improvement conveyed with title to the parcel to the new owners of the former Hamakua Sugar Company lands. While the existence of the Hawaiian Irrigation Company and its claim to the ditch infrastructure complicated the ownership issue, with its dissolution it is clear that the landowners on whose parcels the ditch is situated own the ditch infrastructure. It is imperative that the easement rights be acquired by DOA to assure unification of the ditch components. The DOA has been in contact with all of the landowners and expects to obtain term easements for the ditch at nominal cost. The DOA is prepared to use the State's power of eminent domain if negotiation is unsuccessful.

Until the irrigation district, with management authority over the ditch is established, there is no defined ownership of or right to the water in the ditch as reflected in the present situation. The organization of the irrigation district under authority of Chapters 167 and 168, Hawaii Revised Statutes will formalize the DOA's management authority over the water supply.

Citations of the pertinent court documents will be included in the FEIS.

4

John T. Harrison, Environmental Coordinator  
Environmental Center

**Response:** All Hawaiian Home Lands in the project area are about one mile above the LHD. The ranchers on these pastoral lots may be eligible to receive water from the LHD at the same rate structure as other ranchers. However, there is no provision within the project to pump water uphill.

While State Water Code (Section 174C-101) and the Hawaiian Homes Commission Act (Section 221) affirm the right of the DHHL to use water and acquire use of conveyances, such as the LHD, to provide water to DHHL users, the Code and Act are silent on the process of acquiring a reservation of water outside of designated water management areas. It is certain that the Department of Hawaiian Home Lands will need to pursue some action on the behalf of their beneficiaries to obtain any special consideration for water from the LHD.

**Comment:** Many source registrations and use declarations were filed for project-affected waters. Page 123, which only discusses the filings of the defunct Hawaii Irrigation Company, should summarize all these filings.

It is inaccurate to state that "Use of water in areas not designated as Water Management Areas by the COWRM is based on the registration of water sources and declaration of water use" (p. 123). Until such use is certified by the Commission as a "reasonable and beneficial use", we might say that the use is identified or recognized but there is no explicit government authorization of that use. Since no water rights have been adjudicated or recognized by a competent authority, merely making "An amendment to the water declaration made by Hamakua Sugar Company" (p. 123) would have no binding effect on limiting diversion rates.

Water rights are one subject of a complaint currently being investigated by the Water Commission (p. 134), and "The need for resolution of land and water rights issues before implementation of the plan is noted" (p. 165). Given all of the above and the potential for serious social and economic repercussions (the cost of the Waiahole case, for example), how can the document state that, with regard to water rights, "No mitigation is required" (p. 123). Maybe a more correct statement is "No mitigation is possible."

**Response:** Section 6.3.12 Water Rights and Traditional Uses will be modified to reflect the comments above and will be expanded to identify and discuss codified water rights and water uses.

**Comment:** "The DOA negotiated an agreement with Kamehameha School/Bishop Estate (KSBE) to obtain management and control of the ditch portion owned by KSBE for a 35 year period" (p. 11). Through this agreement, "The DOA agreed to repair the Lower Hamakua Ditch (LHD) tunnel behind Hakaloa Falls" (p. 19). However, KSBE ownership of any "ditch portion" may still be in doubt. For example, "The DOA and KSBE, owners of the land parcels containing the stream intakes and 60 percent of the ditch alignment, have

3

Response: All Hawaiian Home Lands in the project area are about one mile above the LHD. The ranchers on these pastoral lots may be eligible to receive water from the LHD at the same rate structure as other ranchers. However, there is no provision within the project to pump water uphill.

While State Water Code (Section 174C-101) and the Hawaiian Homes Commission Act (Section 221) affirm the right of the DHHL to use water and acquire use of conveyances, such as the LHD, to provide water to DHHL users, the Code and Act are silent on the process of acquiring a reservation of water outside of designated water management areas. It is certain that the Department of Hawaiian Home Lands will need to pursue some action on the behalf of their beneficiaries to obtain any special consideration for water from the LHD.

Comment: Many source registrations and use declarations were filed for project-affected waters. Page 123, which only discusses the filings of the defunct Hawaii Irrigation Company, should summarize all these filings.

It is inaccurate to state that "Use of water in areas not designated as Water Management Areas by the COWRM is based on the registration of water sources and declaration of water use" (p. 123). Until such use is certified by the Commission as a "reasonable and beneficial use", we might say that the use is identified or recognized but there is no explicit government authorization of that use. Since no water rights have been adjudicated or recognized by a competent authority, merely making "An amendment to the water declaration made by Hamakua Sugar Company" (p. 123) would have no binding effect on limiting diversion rates.

Water rights are one subject of a complaint currently being investigated by the Water Commission (p. 134), and "The need for resolution of land and water rights issues before implementation of the plan is noted" (p. 165). Given all of the above and the potential for serious social and economic repercussions (the cost of the Waiahole case, for example), how can the document state that, with regard to water rights, "No mitigation is required" (p. 123). Maybe a more correct statement is "No mitigation is possible."

Response: Section 6.3.12 Water Rights and Traditional Uses will be modified to reflect the comments above and will be expanded to identify and discuss codified water rights and water uses.

Comment: "The DOA negotiated an agreement with Kamehameha School/Bishop Estate (KSBE) to obtain management and control of the ditch portion owned by KSBE for a 35 year period" (p. 11). Through this agreement, "The DOA agreed to repair the Lower Hamakua Ditch (LHD) tunnel behind Hakaloa Falls" (p. 19). However, KSBE ownership of any "ditch portion" may still be in doubt. For example, "The DOA and KSBE, owners of the land parcels containing the stream intakes and 60 percent of the ditch alignment, have

agreed to transfer the rights needed for the operation of the LHD to the DOA for a period of 35 years" (p. 68). This implies that KSBE owns the land under the ditch, but not necessarily the ditch infrastructure.

"Until the collapse of the sugar industry, the owner of the ditch system improvements was the Hawaiian Irrigation Company, Ltd. (HIC). Since that time, however, the corporation has been inactive. HIC was voluntarily dissolved on November 16, 1998 by the State Department of Commerce and Consumer Affairs due to inactivity" (p. 165). The document does not tell us who is the current owner of the ditch system improvements, OEQC's letter dated Sept. 25, 1995 states that, in the 1995 DEIS, no mention is made of ownership or title of the ditch itself and the waters flowing through the ditch, and asks the authors to "Please indicate in the draft EIS ownership and/or titles to the ditch itself and the water flowing through the ditch proper" (D-5). The current document does not provide the requested information.

"It appears that many rights-of-way have expired over the years and we have been unable to find out if any or all of these have been renewed." Then how valid is the estimated cost of obtaining land rights? "Obtaining land rights, including access, is the responsibility of the project sponsors" (p. 165). However, with ownership of the infrastructure perhaps in doubt, who is responsible to obtain the infrastructure and what will it take for them to do it? "The system is currently operated by the DOA under the bankruptcy settlement agreement among major creditors in 1993. This authority and funding was extended in 1997 and continues on a year-to-year basis" (p. 8). Perhaps a summary of the bankruptcy settlement agreement should be appended to the DEIS, or at least a specific citation to court documents should be added to the reference list.

Response: The ditch infrastructure is an improvement conveyed with title to the parcel to the new owners of the former Hamakua Sugar Company lands. While the existence of the Hawaiian Irrigation Company and its claim to the ditch infrastructure complicated the ownership issue, with its dissolution it is clear that the landowners on whose parcels the ditch is situated own the ditch infrastructure. It is imperative that the easement rights be acquired by DOA to assure unification of the ditch components. The DOA has been in contact with all of the landowners and expects to obtain term easements for the ditch at nominal cost. The DOA is prepared to use the State's power of eminent domain if negotiation is unsuccessful.

Until the irrigation district, with management authority over the ditch is established, there is no defined ownership of or right to the water in the ditch as reflected in the present situation. The organization of the irrigation district under authority of Chapters 167 and 168, Hawaii Revised Statutes will formalize the DOA's management authority over the water supply.

Citations of the pertinent court documents will be included in the FEIS.

John T. Harrison, Environmental Coordinator  
Environmental Center

**Comment:** While many separate maps provide spatial information about certain aspects of the project, there needs to be a comprehensive map that overlays many of these coverages into a single view. Single-view coverages should include present and proposed irrigation service area, public/private lands, and all past existing, and potential water sources and distribution system alignments. A set of system flow diagrams should be produced showing existing sources, diversion, uses, and a number of alternative future scenarios.

**Response:** A Project Map, displaying some of the information requested on one map, will be included in the FEIS.

**Comment:** According to page 17, 13.6 miles (16-3-4-13-6) of new fencing would be needed along open ditch for animal control. However, tabulated cost estimates are for 17 miles of new fencing (pages 35, 71).

**Response:** The computation for fencing included reconstruction and/or relocation of the existing fencing to accommodate maintenance roads and repair and rehabilitation activities. An additional mile of fencing was included to fence the sediment ponds and reservoirs that are located apart from the ditch itself.

**Comment:** Computation of water yields for the Wells alternative varies from 3.05-4.5 MGD for 3 wells (pp. xiii, 24). Is future Feedlot well yield 1 or 2 MGD? Is future Field 20150 well yield 0.05 or 0.5 MGD? Is this in infrastructure owned by KSBE (p. 103)? The DEIS should provide the results of searching the COWRM database for other existing wells that could service the project area, and tally pending permit applications for other proposed wells that could service the project area.

**Response:** The Feedlot well is capable of 1.4 MGD but is currently operated during off-peak hours to take advantage of lower electricity rates. The KSBE-owned Field 20150 well has reportedly been tested with a small pump at rates about 50,000 gpd. Therefore, the total well output from the three available wells with existing pumps in the Paaulo-Kalopa area is about 3.45 MGD. The connection of well sources into the agricultural water system will be undertaken after the implementation of the watershed project as operation and management activities. Corrections will be made in the FEIS.

**Comment:** Why does the Enserch facility not receive any allocation in drought? What are the impacts of this? How will they be mitigated? Please address issue of potential conflicts over water during drought, not limited to Enserch.

**Response:** Enserch has recently stated that their facility will not require water for cooling from the LHD as an adequate well source was developed. Earlier, Enserch was to receive water when available in the system, meaning, during nondrought periods. During periods when LHD was not available they would use supposedly more costly well water. The inclusion of other water customers to the system when all of the potential supply is not used for agriculture could reduce water rates to farmers and ranchers.

5

John T. Harrison, Environmental Coordinator  
Environmental Center

Operating policies during drought periods will be formulated when the irrigation district is formed with input from the community. The proposed advisory committee will continue to measure effects of water allocation and will be able to recommend changes in operating policy.

**Comment:** One MGD is projected for aquaculture use as depicted in Fig. 18 (p. 108). How many acres are projected to be in aquacultural use? What are the impacts or mitigation of effluent disposal and reuse?

**Response:** The existing aquaculture operation utilizes a 5-acre Hamakua/North Hilo Agricultural Cooperative farmplot. The facility consists of 13 above-ground, 30,000-gallon tanks and a processing building. The existing facility is projected to continue. Effluent from the tanks is used to irrigate papaya grown on the farmplot. Presently, the DOH does not have standards regarding reuse of aquacultural effluent.

**Comment:** Historic and potential hydrology should be more rigorously examined and more clearly presented, through the use of basic time-series and frequency-duration curves of historic flows and potential future flows under various post-project scenarios. There are several inconsistencies and omissions in the data presented that should be clarified, resolved, and included.

On page 8, historic ditch "base flow level" (poor use of term, since "base flow" usually refers to groundwater contribution to streams) is estimated at 18-19 MGD, and "The historical low flow has been about 15 MGD." However, on page 45 a 17-19 MGD historic minimum diversion is discussed, and p. 101 references a 19 MGD historic minimum at the main weir.

**Response:** The amount of 18-19 MGD (Mink, 1984) will be used consistently throughout the document.

**Comment:** The 1995 DEIS estimated system loss at 5.5 MGD estimated loss. The present document states that much of the system loss occurs at deteriorating flume systems (p. 9), unused water is released at Main Weir, Kukuhihale (p. 10), water is lost to seepage at Paaulo Reservoir (p. 34), and total leakage is anecdotally as high as 25 MGD (p. 27). Without more rigorous measurement and estimation of system losses (how much at flumes, how much released, how much reservoir seepage, evaporation based on pan figures used in crop water demand study), it is difficult to assess the potential impacts of alternative project scenarios. This breakdown should be reflected on Figure 14, p. 115.

**Response:** The mixture of losses from ditches, flumes, tunnels, reservoirs, and pipelines and absence of recent measurement of flow through the system makes detailed quantification of the system losses difficult. The variability of the system loss in response to water level and due to ongoing repairs and development of new leaks also makes quantification less meaningful. The

6



John T. Harrison, Environmental Coordinator  
Environmental Center

current effort by the CWRM in response to the waste complaint may provide the information requested and will be included in the FEIS if available.

**Comment:** Page 52 notes the presence of 4 existing reservoirs totaling 31 mg storage capacity. More information on the location, storage capacity, service connections and area, lack of "waterleveling capability," and seepage and evaporation losses in these reservoirs is needed.

**Response:** The information will be included in the FEIS in Section 3.1.4.6 Storage Reservoirs.

**Comment:** If 5-7 MGD are now flowing into Paauilo reservoir and it has a 10 mg storage capacity, how much of the inflow is used downstream for irrigation or other purposes and what are the current seepage (p. 53) and evaporation losses? This should be compared with projected water use downstream from the reservoir and lining-induced changes in seepage and evaporation loss to determine if reservoir lining is a sound alternative. A figure depicting a curve of supply and effective demand would be beneficial.

**Response:** Approximately 300 acres of irrigated cropland are served from the Paauilo Reservoir. The average demand has been about 1.5 MGD. With full development an additional 100 acres of irrigated cropland will be served. Therefore, the peak need will be approximately 2 MGD. Present leakage is estimated to be 2 to 3 MGD. The reservoir has a surface area of approximately 1.5 acres with a daily average evaporation rate of approximately 9,000 gallons. While present inflow into the reservoir is inconsistent and often creates a condition of water shortage, once repairs to the ditch are completed inflow should be consistent. The impetus for lining the reservoir comes, not solely, from economic considerations but also to reduce the amount of water diverted from the Waipio Valley stream sources.

**Comment:** The agricultural climate section fails to adequately address two elements that may be very important to the crops and practices needed for successful cropping.

The specific elements mentioned in the assessment do not include wind. However, the corner effect on the trades (Ramage, CS 1976 Effect of the Hawaiian Islands on the Trade Winds, Dept. of Meteorology, University of Hawaii), as well as the wind power survey (Ramage et al, 1979, UHMET Wind Energy Resource Atlas: Volume 11 - Hawaii and Pacific Region, Pacific Northwest Laboratory) all suggest that the study area is one of high wind potential. This has implications for crop damage, by salt spray and high evaporation rates and can demonstrate the need for shelter belts.

The second missing element is solar radiation. Measured values in the cane areas are reported in DLNR's report #RS7, "Solar Radiation in Hawaii, 1932-1975." The orographic cloud shield during trade periods reduces sunlight in summer or during periods of trade-like wind flow. Winter finds the area

John T. Harrison, Environmental Coordinator  
Environmental Center

additionally in shadow to the north of the Kohalas. Studies on maize production on Oahu have shown a direct relationship to sunlight. The shade culture of coffee may make this an advantage, however. Though comments have asked for this information, it still has not been included and could be critical to crop plans.

**Response:** While we recognize that understanding wind and insolation are important considerations for some crops, their relative importance for agriculture in the project area is low. Cultivation success of many crops, including sugarcane, coffee, and macadamia nut, have already been demonstrated in the area. The cropland suitability study conducted for this project used soil site factors, topography, and the climatological factors of rainfall, evapotranspiration, and temperature for its analysis. Shelterbelts and field windbreaks will be a recommended conservation practice to reduce water demand and soil erosion and to increase productivity.

**Comment:** There are inconsistencies and questions in future flow estimates presented.

While portions of the text refer to 6-9 MGD average flow, Figure 13 (P. 108) estimates 9 MGD average flow. However, the breakdown presented in the same pie chart (3 IRR, 1.5 Enserch, 1 aqua, 0.05 stock, 0.1 slaughter, 0.05 domestic, 3 losses) only adds up to 8.7 MGD. The additional 0.3 MGD should be accounted for or the flow figure revised.

The same pie chart proposes 33% future system losses under average conditions (3/9). However, page 18 states that "normal allowance for losses for a system of the 25-mile length can amount to 20%." Derivation of this "normal allowance" should be explained and the basis for breakdown of other calculations of system losses should be tabulated.

While portions of the text refer to 24-27 MGD maximum system flow, Figure 13 (P.108) estimates 17 MGD peak flow. However, the breakdown presented in the same pie chart (12.5 IRR, others same, +15 emergency) totals 18.35 MGD. Page B-5 implies that Enserch would not receive water during peak flow periods, thus 18.35-1.5-16.85. Differences in the breakdown of average and peak usage conditions should be clarified in Figure 13.

Peak flow system losses are estimated at 12% (p. 108, 3/17), yet "normal allowance for losses for a system of the 25-mile length can amount to 20%." These inconsistencies in system loss estimates beg explanation.

**Response:** The numbers are projected estimates that are intended to demonstrate the difference in water demand during average and peak demand periods. We do not feel that the differences between 8.7 and the rounded 9 MGD or 16.85 and the rounded 17 MGD are significant.

The statement regarding 20 percent loss over a 25-mile system has been removed from the FEIS.

John T. Harrison, Environmental Coordinator  
Environmental Center

**Comment:** "Some Waipio Valley farmers and residents are concerned that without the LHD diversions, storm flows will cause increased flooding and erosion problems. The existing stream diversions remove a fixed amount of flood water thereby reducing the volume of floodwater entering the valley" (p. 20). This statement should be followed by references to page 111: "The USGS, in 1997, computed a 0.02 foot (0.24 inch) rise in the average annual peak flood if the 30 MGD diversion was completely stopped" and "...The diversions have no discernible effects during extreme floods."

In addition, citation to the USGS computation seems necessary, as well as more comprehensive and preferably graphic depiction of flow-duration curves, flow time-series, and storm hydrographs, as suggested in 1995 by the Department of Interior (p. D-25): "For example, the frequency and seasonal occurrence of base flow events in each stream could be contrasted with the worst-case demand schedule."

Similar depictions are also necessary on a stream-by-stream basis to complement statements such as: "Dewatering associated with baseflow withdrawals is therefore probably most frequent in Koiawe" (p. D-25). "During dry periods more agricultural water will be required and may result in the capture of most of streamflow at the diversions during extreme drought" (p. 45). Also note that with the proposed project SCADA, storm flows might be managed on a realtime basis to minimize adverse impacts,

**Response:** The last paragraph on page 20 will be expanded to note that the stream diversions do not provide a significant flow reduction during extreme floods. The stream diversions do provide regulation of stream levels against frequent variation caused by rainfall in the upper watershed.

The potential effect on streamflows during the worst-case demand scenario is shown in the lower half of Figure 15 of the DEIS.

The use of SCADA during periods of high streamflow to alleviate stream level variation problems will be considered.

**Comment:** "The sponsors will be responsible for obtaining the necessary local funding from the state legislature or other sources ... The sponsors have acquired appropriations of \$1,000,000 in Act 116, SLH 1998 for implementation of the initial phase of the selected plan." What is the initial phase and how much has been spent to date?

**Response:** The initial phase will be the repair of the tunnel and restoration of Hakaloa Falls. The DOA is also expected to provide interim repair and maintenance for the system with a part of the \$1,000,000 appropriation for 1999.

John T. Harrison, Environmental Coordinator  
Environmental Center

**Comment:** Justification is needed for the statement that "The existing system must continue to divert 25-30 MGD, in order to meet the agricultural water needs of current users ..." (xvi).

"Water use is declared and recorded, however, as required by the State Water Code" (P. 9). As mentioned previously, all declarations involving project-related waters should be summarized, as well as all records of water use. The Water Code requires a monthly report of water use. It appears that these being filed by DOA is unlikely if "Current Lower Hamakua Ditch agricultural water usage is difficult to assess due to the absence of formal management of the system. There has been no record keeping or charge for water use during the transition period. While most users have declared their water connections and usage to the interim maintenance contractor, surreptitious connections to the ditch and lateral systems are common. The estimate of current water use from the Lower Hamakua Ditch is between two and five MGD ... Anecdotal accounts state that, due to leakage, and less importantly, to other users, 25 MGD must be delivered from the Main Weir in order for water to flow into Paauilo reservoir". (p. 102) The 2-5 MGD being used should be mapped out.

All current use should be regarded as undocumented, pending results of the current Water Commission investigation. The lack of information in the DEIA about present water use and system hydrology is a big problem. If 3-5 MGD is flowing into Paauilo reservoir and 2-5 MGD is being used from the entire system, what is going on at Paauilo reservoir (see, Hydrology, comment 2, above)? Has an engineering study been conducted for the reservoir retining component of the project?

**Response:** The depiction of the leakage problem was by the DOA maintenance contractor. A detailed inventory of water use and water loss from the system was not conducted as the lack of management of both the physical water conveyance and water use by farmers and ranchers made collection of the information difficult. The CWRM staff is currently attempting to gather this information but has encountered difficulties. While a complete inventory of the leakage problem was not conducted, the leakage problem is obvious.

The discussion of water use declaration to the CWRM in Section 6.3.12 will be changed to reflect that declaration does not create a right or allotment of the water. Water declarations to the CWRM were not required for water use from the LHD. HSC was the main user in 1989 when the declarations were requested.

The leakage problem at the Paauilo Reservoir will be thoroughly examined by an engineer before reservoir lining design is prepared.

**Comment:** "A draft Memorandum of Understanding providing a basis for cooperation to evaluate water use needs and to develop streamflow prescriptions for Waipio

John T. Harrison, Environmental Coordinator  
Environmental Center

Valley streams has been prepared and is being reviewed" (p. xvii). This document should be appended to the DEIS.

"It is intended for this group to become the advisory group for the lower Hamakua Ditch agricultural water system" (p. 63). Does the Water Commission concur with this intent, and with the more detailed group description (p. 156), as follows?

"The development of a Waipio streamflow management prescription that meets the needs of all the parties that are affected or interested will be pursued through the establishment of an advisory group to the Lower Hamakua Ditch agricultural water system. The responsibility of the advisory group will be expanded to include the Waipio Valley issues. An "adaptive management" approach will be used allowing management of an agricultural water system, diversion rates, and streamflow in Waipio Valley to be adjusted as measurement and monitoring provide better information."

Response: The draft MOU will be appended to the FEIS.

The CWRM supports the efforts to bring together the various groups and interests involved in Waipio Valley and Hamakua to discuss and resolve water resources issues. The CWRM has requested to participate in the process.

The NRCS and the Hawaii Department of Agriculture will fund the expenses for a University of Hawaii Department of Urban and Regional Planning graduate practicum led by Dr. Luciano Minerbi this fall to work with the Waipio Valley communities to develop common understanding of resource issues and identify ways to attain community-developed objectives. The practicum will be allowed to operate independently.

Comment: "The most current update of the WUDP [Hawaii County Water Use and Development Plan] was prepared before the collapse of the sugar industry in Hamakua" (pp. xvii, 140.) While the WUDP was updated in 1992, this draft was never adopted by the County Council (the WUDP is a county ordinance) or the Water Commission. The original WUDP (1990) is in effect, however both the County and the Water Commission are delinquent in the update process (by law the Water Commission was to adopt a 1991 revisions and County was to take action in 1995). The WUDP mandate is allocation of water to land use - this fundamental question (could be a single spreadsheet) must be answered in conjunction with acknowledge unresolved issues of streamflow and in order to consider the integrated alternative proposed below.

Response: We do not understand the comment and are unable to provide a response at this time.

11

John T. Harrison, Environmental Coordinator  
Environmental Center

Comment: Permits and Compliance (pp. xvii, 64) should include Water Commission stream diversion works permit, declaration of water use, water use reporting, and waste prohibitions.

Response: The Stream Diversion Works permit has been added to the list. The other items will be implemented with operation of the system.

Comment: "Without implementation of the proposed project, no modification of the intake structures to limit diversion of Kawainui, Alakahi, Waimea, and Kalawe streams will occur. The intakes will continue to divert the streams at current rates... Successful pursuit of the complaint to COWRM charging waste of water in the LHD system may require a reduction in diversion rates from Waipio Valley" (page 10). These and other passages (see below) underestimate the potential for Water Commission-directed alteration of diversion rates and do not reference the petition to amend interim instream flow standards previously submitted by WVCA and currently under revision. This could be resolved by referencing the petition and placing the caveat first, rather than last, e.g. "Unless directed otherwise by the Water Commission, without implementation of the proposed project..."

"No modification of the intake structures will be performed unless ordered to do so by the Commission on Water Resource Management in settlement of the pending complaint regarding water waste on the LHD" (P. 27).

Response: The recommended reference to the complaint will be added at the start of the paragraph.

Comment: "Elevated temperatures, altered water quality, a labyrinth of diversion ditches, and introduced species may be affecting upstream migration of post-larval o'opu" (p. 125). Where are the data to support this? Reports covering measurement of water temperature, water quality, ditch patterns, introduced species populations, and post-larval migrations should be referenced, or the statement should be other-wise qualified.

Response: The statement was quoted from the 1997 report of the stream survey of the upper portion of Waipio Valley. (Englund, 1997) The reference will be added to the paragraph. A new study being undertaken by the Division of Aquatic Resources may uncover reasons for poor upstream migration of post-larval o'opu.

Comment: Project assistance to record streamflow will be provided for four years. The budgeted amounts are not adequate to install and operate USGS-standard stations unless all four years of funds are pooled (this might get 2 stations at current rates). Sources for additional assistance and some sort of strategy for the recording program should be discussed.

Response: The \$25,000 per year was intended to assist with a stream measurement effort taken in connection with a Division of Aquatic Resources sponsored study of

12

John T. Harrison, Environmental Coordinator  
Environmental Center

o'opu in Waipio Valley streams. Other monitoring programs, such as by OHA, are also planned for Waipio Valley. These efforts will be coordinated to develop the most usable data with the limited funding.

**Comment:** "It is anticipated that nearly the entire baseflow of Kawainui stream, except for a release of one MGD, will be diverted for several days to several weeks during two years in a ten year period" (p. 157). The document should discuss in detail the impact and mitigation related to this diversion.

**Response:** The baseflow period diversion recommended by the U.S. Fish and Wildlife Service in their comments on the DEIS will be adopted. The recommended release of 30 percent of the baseflow to Waipio Valley streams will result in reduction of the peak diversion from the earlier-proposed 17 MGD to approximately 13 MGD.

Additional discussion about the effects of drought period diversion on Waipio Valley streams will be included in Section 6.3.14 Aquatic Habitat/Natural Stream Flows.

**Comment:** A state operated agricultural water system will be established under the provisions of Chapters 167 and 168, Hawaii Revised Statutes" (p. ix). It would appear that this can be accomplished independent of the proposed project to resolve the concern that "The temporary nature of the DOA agreement to maintain the LHD and the absence of formal management authority prevents the collection of user fees for the development of water and prevents the development of longer ranged plans for system improvements to better serve the water users" (p. 18). A public notice on the formation of the State of Hawaii Board of Agriculture Honokaa-Paauilo Irrigation Project has been issued and a meeting set for March 15, 1999.

**Response:** The DOA-operated irrigation district is being formed with the expectation that this federally-assisted watershed project will be implemented. It is through the federal-state-local partnership, that federal technical assistance, such as for the preparation of the Watershed Plan and EIS and engineering designs for the improvements, and federal financial assistance, estimated to exceed \$6 million, is made possible. One of the responsibilities of the DOA in the implementation of the watershed plan is to use their authorities to form the irrigation district.

**Comment:** The State of Hawaii DLNR Division of Water and Land Development wrote on September 14, 1995 requesting that "you coordinate the Waimea-Paauilo Watershed project with this project" (p. D-23). Is there a response to this request? Such coordination is not discussed in the DEIS. It seems that at the very least a summary of the Waimea-Paauilo project and its potential for interaction with LHD should be presented.

13

John T. Harrison, Environmental Coordinator  
Environmental Center

**Response:** The coordination between the Waimea-Paauilo Watershed project to expand the Waimea Irrigation system and the present project will be limited to sharing office staff and equipment between the two DOA irrigation districts.

A short discussion of the Waimea-Paauilo project will be included in Section 6.7.14.

**Comment:** Hook-up fees for meter connection have been standard in DOA irrigation projects but are mentioned for non-agricultural uses only (p. 108). Past experience in the Waimanalo Irrigation System suggests that these fees can be \$1000-\$5000 per lot depending upon location.

**Response:** The standard hookup fees charged to new users in the state-operated irrigation systems may be waived for existing LHD users. This issue will be decided during formation of the irrigation district.

**Comment:** "The LHD project will contribute to NED by alleviating the agricultural water shortage problem in the watershed project area. The project will reduce income losses caused by the inadequate quantity and distribution of water for crop irrigation and livestock drinking, especially during droughts. The project will also increase income by allowing increased diversified agricultural development, which is essential to the economic revitalization of the area"

What are the statistics or the basis for assumptions? There should be some concrete documentation of how people are suffering now, in addition to a prediction of how they might suffer in the future.

**Response:** The LHD project was initiated in response to requests from local project area farmers and ranchers to help them alleviate their water shortage problems. Numerous means were used to gather information about the situation, including the following:

- Conducted numerous personal interviews of project area farmers, ranchers, residents, and other persons knowledgeable about the farming community in the project area.
- Held publicized public meetings in the project area to solicit comments from interested parties.
- Held meetings and worked closely with the major land owners, lessees, and farmer organizations
- Used a written survey of the project area farmers and ranchers conducted by the Hamakua County Farm Bureau.
- Used existing publications and studies.

All of the above clearly indicated that the farming community is currently suffering from water shortage and uncertainty and will continue to suffer in the future if nothing is done.

14

All documentation (interviews, notes, surveys, etc.) are available at the NRCS State Office in Honolulu. The names of participants will be withheld in situations where privacy issues or release of proprietary information is involved.

**Comment:** The intensification benefits were measured as the difference or increase in net farm income between the without project-condition and the with-project condition that would occur in response to cropping pattern or land use change. Crop budgets (cost-return estimates) were developed for the major crops grown in the watershed and used to estimate net farm income" (B-2).

Summary tables for all parameters used in the analysis should be displayed. Watershed land use Table B-1 (B-3) should distinguish between recent past and present conditions for diversified crops (how much for truck, coffee, etc.). Where is the existing 5 acres of aquaculture located? There is no specific mention in the documentation of this operation. Additionally, why not use individual farm accounting (for existing farms) as a basis for crop budgets?

**Response:** A breakdown of the various acreages included in diversified crops will be included in the land use table in Appendix B.

The five acres of aquaculture reflects the partial aquaculture use of a five-acre farm parcel in the HNHAC lots in Kalopa. Most of the parcel is planted in papaya irrigated with effluent water from the aquaculture ponds.

The crop budgets were based on cost of production data gathered from existing project area farmers and also business plans submitted to the HNHAC. As federally mandated, prices received for the crops were five-year averages for the State. Crop yield used in the budgets were based on current yields experienced by project area farmers using average management. In situations where a commodity is new to the area, has not reached maturation, and/or is not well established in the area, published cost of production and yield data was used.

**Comment:** Land assessed as good, fair, poor (p. 155) in this section a more complete breakdown, and spatial references are needed. There is 7000 acres designated as good - fair for trees, and 2000 as good - fair for truck crops. This leaves 4500 rated as poor. There should be some discussion of where these areas are and how they relate to present and proposed irrigation service areas. Also what are present returns, and environmental impacts for each type?

**Response:** A summary of the Cropland Suitability Study (Maptech, 1997) will be included as an Appendix. The document is available for review at the NRCS State Office in Honolulu or NRCS Hilo Field Office.

**Comment:** The crop suitability study showed that irrigation would allow a substantial number of acres to be upgraded from fair suitability to good suitability, or

from poor suitability to fair suitability..." (P. 155) Please define "substantial." 600 acres are irrigated now, only 1900 more to upgrade, and only 100- something planned for truck crops. Some quantification and tabulation of irrigation upgrade potential beyond the current generalized statement should be presented. Projections could be based on market prices and acreage, and compared with performance of existing ventures in the area.

**Response:** The following table indicates the crop suitability improvement provided by irrigation.

	Improved Suitability (acres)			Total
	Good from Fair	Fair from Poor		
Banana	1197	5766		6963
Coffee	176	105		281
Macadamia Nut	1059	105		1164
Papaya	697	104		801
Cut Foliage/Flowers	193	2562		2755
Truck Crops	0	970		970

**Comment:** This concern [uncertainty of the temporary operation of the LHD by the DOA] has prevented fuller investment in agricultural enterprise in this area ..." (pp. ix, 7) What statistics and analyses support this presumption? Table I: Current Land Use (pp. xii, text 90) could show a breakdown of production values and returns on investment.

"Dependable agricultural water supply is essential for economic revitalization of the area ..." (page 1) Please substantiate this comment.

**Response:** The two statements reflect the feelings of the Hamakua community and have been expressed in interviews and discussions during planning and at public meetings and hearings, for example, testimony given at the hearings held by CWRM during their investigation of the Hakalao Falls issue. The first sentiment was also voiced by two of the large farm interests regarding expansion of their operations during our interviews.

**Comment:** Lease rents and terms are not as favorable for small farmers on the larger estates as it is for state-owned land" (9). What about small farmers on smaller estates? Comparative, quantitative examples of terms and rents should be presented.

**Response:** Some examples of lease terms that were disclosed in 1998 are:

State DOA	\$60/ac./yr.
State DLNR	\$125/ac./yr.
KSBE	\$165/ac./yr.

**Comment:** There has also been a shift in crop types since 1995 providing more stability and marketing potential... These crops also increase the opportunity to add

John T. Harrison, Environmental Coordinator  
Environmental Center

value within the Hamakua area through processing, packaging, and marketing" (11). Some documentation of how this is already occurring should be provided. Where are the real statistics?

**Response:** The shift in crop types has been observed but not inventoried. There is far less dracaena and papaya than in 1995 and more coffee and fruit trees. New crops such as awa, which were not even considered in 1995, have taken substantial hold.

**Comment:** "Many larger farm operators and landowners could not disclose in detail what their plans or those of their agricultural lessees would be with assurance of agricultural water supply" (p. 11). "Some [farmers and landowners with plans for larger farms or developments] have made the investments on private lands for infrastructure improvement and have taken steps to ensure their supply of water by developing or identifying back-up wells". (pp. xii, 9).

These statements indicate that a lot of producers may solve their water supply problems without state and federal assistance or without the particular project proposed. Specific identification of private investments and other steps taken should be presented, along with an analysis of how these efforts might be pooled or integrated with those of other private and public parties.

**Response:** While some operators are seeking alternative sources for agricultural water, such as wells and the domestic water system, both sources will be more costly than the LHD system. The smaller farmers who will comprise the largest group of operators will not benefit from the alternative water sources identified or developed by the larger farm operators. Again the difficulty of obtaining privileged business information prevents us from conducting the desired analysis.

**Comment:** The ditch formerly irrigated 6000 acres cane with 19 MGD of base flow (this approximates 3167 gad) (p. 102) The cane water requirement is higher than that for any crop being proposed within the project area (except wetland taro and aquaculture).

**Response:** An estimate by Hamakua Sugar Company included in the 1984 Water Resources Report for Hamakua Sugar Company by John Mink states that "1.4 inches of water per week (5,431 gallons per acre per day) distributed by drip irrigation having 80 percent efficiency is required to sustain cane." In 1984, the dependable LHD supply for 95 percent of the time was estimated to be 25 MGD and Hamakua Sugar Company was seeking an additional 10 MGD from other sources to fully irrigate the 6,000 acres.

**Comment:** For a more realistic basis on crop water requirements, water demand projections should be compared with actual water use, yield, and return from similar ventures in Hamakua and other areas (e.g. Kona, Ka'u, Hamakua coffee, macadamia nut etc.).

17

John T. Harrison, Environmental Coordinator  
Environmental Center

**Response:** The projections of water use in other areas may not be meaningful when applied to the project area. For example, the total rainfall in the Hamakua project area and areas in Kona, where coffee and macadamia nut are grown, are similar, around 60 to 80 inches. However, the rainfall distribution through the year is quite different with Kona receiving most of its rainfall during the demanding summer months and Hamakua receiving very little rainfall during the same months when temperature, wind, and evaporation are greatest.

While macadamia and other trees are grown in or near the project area without irrigation, irrigation can provide increased productivity and earlier maturation and production.

**Comment:** The 600 acres of currently irrigated cropland (p. 11) should be broken down by crop, production value, water use, etc.

**Response:** A complete inventory of agricultural activity was not considered necessary to verify the need for the agricultural water system. The data sources for agricultural activity in the project area consisted of interviews with farmers and farm groups, data gathered by the Hamakua Farm Bureau, records of the Hamakua North Hilo Agricultural Cooperative, and cooperators records from the NRCS Hilo Field Office. While a correlation of the various data was attempted, it was not successful. Estimates of present acreage and crops for the cropland evaluation areas will be included in the FEIS.

**Comment:** Based on 13.5 MGD total for buildout (12.5 IRR + 1.0 aqua), 3.5 MGD from 3 existing wells "will sustain irrigated crop production on approximately 600 ten year period [5,833 gad]. An additional 10 MOD capacity would be needed to sustain the projected buildout level [2382-600=1782 acres, p. 12] of irrigated cropland" [5563 gad] (p. 24). Analysis of the Honokaa-Paauilo County system (p. 23) suggests delivery of 10,000 gallons per day for 2-3 acres of drought irrigation, implying 3333-5000 gad water requirement during peak demand. However, in contrast to these two examples, estimates of 0.5 MGY/acre for the average reference crop (p. 26) translate to a 1373 MGD average crop water demands and 1.0 MGY/acre in a 90% year (the plan is for 80% year) implies only 2746 gad water requirement during peak demand.

**Response:** The statement in Section 3.1.3 will be corrected to say that the 5/8-inch meter can irrigate about two acres during drought periods.

Because the irrigation water requirement is computed on a monthly basis and totaled for the year it is incorrect to average the annual total to obtain the peak use rate. During average rainfall conditions, the peak daily requirement for the reference crop is between 3,500 and 4,700 gad. During drought years (80%) the peak daily requirement is between 4,200 and 5,300 gad. A table

18

displaying this information will be included in Appendix B of the FEIS. The reference to the 90% year on page 26 will be corrected to 80%.

**Comment:** Table A: Projected Irrigated Cropland with Project Implementation (12) shows 129 acres irrigated truck crops, broken down by ownership as: 20 small private, 21 state, and 88 large private; and 2382 acres irrigated tree crops (state 592, small private 281, and large private 1509). This gives a good indication as to who will benefit most from the proposed project. Do the benefits to small farmers and state lands justify the investment? Does the public investment in large private ventures generate good public return?

**Response:** The "Major Landowner" column in Table A is intended to indicate ownership of the land and not the operator of the farms. It is expected that most of the operators on State and KSBEL lands will be small operators with farms from ten to thirty acres in size. Larger ventures can also provide benefits to the community through employment opportunities, tax revenues, and continued agricultural use of the land.

**Comment:** Project Water Needs/ Irrigation and water requirement analysis (p. 15) On an annual basis, assuming a 1:1 crop/pan ratio, no irrigation is necessary. During May-October (6 months), rainfall must be matched by irrigation. How was the project objective [ensure sufficient irrigation water for 80 percent frequency of rainfall] selected? Based on economic analysis? The DEIS should explicate projection methods used (Table B) by referencing the source for all parameters and by tabulating: monthly and annual crop water requirements used, and average of 6 crops used as reference. Then compare this average with and acreage weighted, crop-discriminate (truck v. tree crops or 6 crops) reference. The analysis should also discuss the uncertainty of using time-aggregating methods to estimate results of processes occurring at sub-daily time-steps.

**Response:** The inputs and computations for the determination of irrigation water requirement will be included in Appendix B - Investigation and Analysis. The 80 percent rainfall frequency, which is low for irrigation projects, was selected because a baseflow of 17 MGD was continually available. While water supplies less than full irrigation requirement will occur at times, the loss of water will not be complete, such as is the case for reservoir projects when the stored water is exhausted. No detailed incremental economic analysis was conducted for this project.

**Comment:** Evaporative pan data and monthly rainfall data at six weather stations between Kukuhaele and Pasuilo at elevations between 300 and 920 feet analyzed using the Newhall model for estimating soil moisture status" (p. 79). References are needed for this model.

**Response:** The reference to the paper "Calculation of Soil Moisture Regimes from the Climatic Record" by Franklin Newhall in March 1990 has been included.

**Comment:** "A number of potential industries that may be established in the Hamakua area would use LHD water if made available." Electric power generation and aquaculture "provide discharge water that can be reused for irrigation" (p. 19). Would it be reused? What other sources are available to these industries?

**Response:** Enserch has recently stated that their facility will not require water for cooling from the LHD as an adequate well source was developed. Earlier, Enserch was to receive water when available in the system, meaning, during nondrought periods. Effluent from aquaculture tanks are reused for papaya irrigation.

**Comment:** Taro water use "Estimates range from 25,000 gal to 50,000 gal" (p. 128). Sources for these estimates should be referenced? Actual taro water use measurements ranging from 15,000 - 1,500,000 gal have been made by our reviewers in various locations.

**Comment:** The 25,000 to 50,000 gallons per acre per day estimate of wetland taro water requirement was based on two sources. One source is Taro: A Review of Colocasia esculenta and its Potentials, ed. Jan-Kci Wang, 1983, UH Press. In the chapter on agronomy, the author of the chapter, Dr. Ramon de la Pena, writes that "Waisson (1970) concluded that the water requirement of wetland taro is in the range of 140,000 to 375,000 liters/ha/day (15,000 to 40,000 gallons/acre/day). He also recognized that as much as 560,000 liters/ha/day (60,000 gallons/acre/day) may be required in some wetland taro patches." Dr. de la Pena, himself, asserted that "280,000 liters/ha/day (30,000 gallons/acre/day) is suggested as a fair amount with which to work, with the water increased or decreased if situations warrant."

The second source was information provided by Merrill Toledo in 1995 which estimated the annual water requirement for lo'i taro to be 17,500,000 gallons per acre for an average of 48,000 gallons per acre per day.

Recent water requirement suggestions in the 1997 CTAHR publication Taro: Mauka to Makai, range from 1.2 gallons per square foot to 12 gallons per square foot (50,000 to 500,000 gallons per acre per day). A study completed for the U.S. Fish and Wildlife Service wildlife refuge in Hanalet measured the irrigation inflow to provide "2 to 3.5 inch equivalent water depth (54,000 to 95,000 gallons per acre per day" to [taro] ponds/fields and impoundments." The report further recognized "to fill or empty ponds/fields, rates over 350,000 gal were recorded." It is assumed that the high end of the range suggested by the CHATR publication may take place during lo'i filling operations.

Based on the new data, the average wetland taro water requirement in the FEIS will be from 50,000 to 100,000 gallons per day.

**Comment:** As discussed on page 130, "The resulting variability in stream depth in response to rainfall in the watershed will increase the water and auwai

management requirement considerable for taro growers." However, other sections of the document suggest that stream depth will not vary much (see Hydrology section above). It should be noted that greater flows can also reduce management requirements by reducing sedimentation, inhibiting growth of riparian and aquatic weeds, and allowing greater flexibility in on-farm water management.

**Response:** The increased frequency of flow variation in response to mauka rainfall will result from decreased diversion by the LHD. The more frequent change in stream stage will increase management effort for the auwai. The Waipio Valley Taro Farmers Association feels that the current diversion method that takes the first 30 to 40 MGD provides the most stable streamflow for their needs.

**Comment:** Turmons letter (p. D-26) suggests that "Rather, the EIS should consider the prospect that all lands suitable for taro cultivation in Waipi'o Valley are in productive use and use this figure as the basis for arriving at an estimate of the maximum amount of water flow in Waipi'o that taro farmers will need. Only after calculating this maximum amount can the amount available for uses out of the valley be calculated." Such calculations should be presented.

**Response:** There are between 75 and 100 acres of taro production in the valley. The Bishop Museum states that, at the present time, there is little interest for expansion of taro leases. Approximately 130 acres of Waipio Valley bottom is identified as unique agricultural land. If expansion to 200 acres of taro is assumed and the water requirement is 50,000 to 100,000 gpd, then 10 to 20 MGD will be needed from the Waioia River. The average discharge of the Waioia River, at a location upstream of the valley floor and approximately 2.5 miles from the shoreline, was 48 MGD during the 1964 to 1969 period of record, during which time the LHD was in operation. During that same period, the minimum recorded flow was 23.2 MGD for one day.

**Comment:** The water budget method presented on page B-4 needs clarification. All parameters used in the calculations should be displayed in a summary table. Problems of using a monthly time-step should be discussed, as well as those of using a reference crop that is an average of six crop types v. one that is a spatially-weighted average based on crop-discrete analysis.

Spatial distribution of current and planned water use within the irrigation service area needs to be presented within the document.

**Response:** The discussion of the irrigation water requirement in Appendix B will be expanded. Additional discussion of the use of the averaged reference crop and additional information on current water use will be included in the FEIS. As discussed above, the exact location of the projected 2,500 acres of irrigated cropland within the 11,000 acre project area is uncertain.

**Comment:** Agricultural Inputs and Outputs. Impacts stemming from "Poorly drained to somewhat poorly drained soils" (pp. 80-81) are inadequately discussed, as well as other issues relating to identified P requirements; low calcium, magnesium, potassium fertility; some aluminum saturation requiring heavy liming; and compaction susceptibility. The blanket mitigation seems to be "additional technical support from NRCS," but there is no documentation of how this technical assistance has actually mitigated impacts in this and other areas across the state.

**Response:** The soils are described as to the characteristics that need to be addressed by farmers. Most of the technical assistance for agronomic practice will be provided by the Cooperative Extension Service. NRCS assistance will be provided for the purposes of soil and water conservation and natural resources protection.

**Comment:** How can areas be ranked as Prime farmland when soil and crop suitability ratings only range from poor-fair-good for the 6 types of crops analyzed (p. 11)? With 5 acres of aquaculture using 1 MGD of water, there should be some discussion of aquaculture effluent quality and its potential impacts on surface and groundwater (pp.115, 117).

**Response:** The crop suitability study included factors such as equipment trafficability, slope complexity, and temperature ranges for specific crops that are not considered in the USDA Prime farmland designation. Aquaculture impacts will receive expanded discussion in the FEIS.

**Comment:** "Lease of the ceded lands to Hamakua area farmers and ranchers provide a public use of the land that returns market-based revenues" (pp, xviii, 145). Will these revenues increase upon project completion, or are lease rents already fixed based on pre-project conditions?

**Response:** The lease fees for state-owned lands are not expected change with implementation of the project.

**Comment:** The alternative analysis should look beyond "minimizing the cost of implementation" and "maximizing the net economic benefit to the Nation." (p. xi)

**Response:** The federal involvement in this project is guided by the U.S. Water Resource Council's "Principles and Guidelines" which require conformance to the above statements.

**Comment:** The tables below are supplied in the document. Where are similar tables for other alternatives? Table ii: Economic Effects (of the Selected Plan) (xiv) and Table iii: Environmental Effects (of the Selected Plan). Additionally, there is no cost table for Alternative 1.



Response: Tables ii and iii are located in the summary. Similar information about other alternatives that were not selected is contained in the body of the EIS. There are no project-related economic costs for Alternative 1.

Comment: "The most pressing repairs are needed along the 14.5 miles of the open ditch system." (p. 16)

How much would leakage, repair and restoration costs be reduced by retiring the mauka system? This should avoid or reduce intake repairs, weekly flushing of sediment traps, rockfall damage and hazards, foot and helicopter access requirements, and continual trail re-establishment (p. 16), and perhaps reduce the cost of continuing the existing operation.

Response: The proposal to abandon the LHD system can save the installation and annual OM&R costs identified in the DEIS but will forego the economic and social and cultural benefits discussed in the DEIS

Comment: The DEIS proposes to upgrade 2 existing wells and construct 8 new wells (0.6 mg storage each, total 6.0 mg new storage). Unlike the selected plan, the "wells alternative provides modularization of the system," "considerably better" water quality, "the ability to provide water to domestic water customers without extensive treatment," and will not "require nearly the full installation cost to service less than full buildout" (pp. x, 28). In particular, more discussion of potential public-private cooperation in groundwater source development seems necessary, initially focusing on the Paauilo shaft (6.0 MGD potential yield).

Response: Alternative 2 - Wells does provide a number of advantages over the Selected Plan. However its higher installation cost, even to provide water to one-half of the agricultural buildout, and its continued elevated water cost to users due to the pumping energy cost makes it less economically feasible than the Selected Plan. Discussion of a potential public-private project to develop the Paauilo Shaft is beyond the scope of the project plan and EIS.

Comment: System Integration Alternative

The most important alternative lacking from the present analysis is a system integration alternative. Discussion of this alternative requires comprehensive descriptions and depictions of all available options. Since surface water quantity is 1 of 5 identified concerns evaluated "High" (must be considered in the analysis of alternative solutions) (p. 105), a greater variety of stream diversion alternatives should be identified and assessed, especially the reactivation of Waimea (including more information on the two 200 hp pumps) which is supported by WVTFA.

Energy costs associated with groundwater alternatives are estimated at 0.45/kgal. This should also consider the potential for hydroelectric power generation and associated energy cost reductions (see p. 19). The Enserch

facility is located on a former hydroelectric generating site that used 7 MGD of water. How much power was produced there and at what cost? The public notice for the Honokaa-Paauilo Irrigation Project proposes surface water delivery costs of 0.35-0.50/kgal (Public notice), which may not be much different from groundwater costs. Groundwater-based alternatives should also involve fewer land rights and water rights complications, including social impacts and project costs.

"As most of the cropland service area lies between 200 and 800 feet, the average total dynamic pumping head was assumed to be 500 feet for the analysis" (p. 27) how does this compare with weighted average service area elevation, potential well and pumping station sites, and how is it considered within the context of total system integration? Other components of an integrated system could include:

a) Honokaa-Paauilo County system (p. 23), up to 10,000 gallons per user, per day.

b) Hamakua streams, 10 MGD in 23 streams is used to assume 0.5 MGD average yield (p.23). What is the basis for the assumption? The DEIS should take a closer look at individual streams.

c) "The Upper Hamakua (UHD) ditch is located at the southwest LHD watershed boundary at an elevation of 4,000 feet. The UHD diverts Kawainui, Alakahi, and Waimea streams before they plunge into Waipio Valley" (p. 104).

d) Lalakea ditch is projected at 1 MGD @ 2000', 30 mg reservoir. KSBE aquaculture lease is using how much of this?

It seems that an integrated system could be constructed using groundwater for base system needs and keeping Waimea intake open for drought use, while also considering connection to UHD and Lalakea ditch.

Response: While the NRCS is encouraging the DOA to evaluate all options in the operation and, if later needed, the expansion of the LHD agricultural water system, the Selected Plan provides the minimum cost alternative capable of fulfilling the objectives of consistent and adequate agricultural water supply to Hamakua farmers and ranchers.

The management of the agricultural water system may evaluate incorporation of hydropower electrical generation if the configuration and water use patterns allow it.

The Waimea intake and Waimea pumps were not considered past the preliminary planning stage due to high costs for repair and rehabilitation and operation.

John T. Harrison, Environmental Coordinator  
Environmental Center

The delivery costs for water from well sources will be more than just that for the pumping energy cost. Other operation, maintenance, and replacement costs may increase the delivery cost by 50 to 100 percent. The 500-foot average pumping elevation may underestimate the amount of pumping energy required. If a single tank is used to provide water to an entire service area ranging from 200 feet to 800 feet in elevation the tank would be situated above 800 feet.

The County Department of Water Supply wants to eliminate agricultural users from their systems in order to free supply for domestic demand.

Farmers on the Upper Hamakua Ditch and the Waimea Irrigation System experience water shortages due to low flow from surface stream diversions during dry periods.

The Hamakua streams flow in reaches near the service area during wet seasons. Development of the Hamakua Streams for dry season use will require costly development of springs in the mauka forest reserve areas. The Lalakea Ditch is completely owned and controlled by KSBE and was not included in the DOA negotiations with KSBE. It will be difficult to obtain access to the system in order to integrate it into a project alternative.

Comment: 1.5 FTE (p. 29) is projected to service 120 irrigated parcels, 170 agricultural operations, 25 Waipio taro lands totaling 75-100 acres. How does this compare with the workload of other natural resource conservation teams? Additionally, our reviewers project that the 25K/year flow monitoring will not even pay for installation of one standard USGS stream gauging station unless 2 years of funding are pooled.

Response: The additional technical staff will augment the NRCS staffs from both the Hilo and Kamuela Field Offices that already provide assistance to farmers and ranchers in Hamakua and Waipio.

The \$25,000 was originally to provide stream measurement in connection with a Division of Aquatic Resources sponsored study of o'opu in Waipio Valley streams. It will now be used to augment other monitoring efforts.

Sincerely,



KENNETH M. KANESHIRO  
State Conservationist

cc: State of Hawaii Department of Agriculture  
State of Hawaii Office of Environmental Quality Control

25

WAIPIO TARO FARMERS ASSOCIATION  
P.O. Box 5034  
Honokaa, Hawaii 96727

March 25, 1999

Kenneth Kaneshiro - State Conservationist  
USDA Natural Resources Conservation Service  
300 Ala Moana Boulevard  
Honolulu, Hawaii 96850

RE: WATERSHED PLAN AND DRAFT ENVIRONMENTAL IMPACT STATEMENT,  
LOWER HAMAKUA DITCH WATERSHED  
HAWAII COUNTY, HAWAII

Dear Mr. Kaneshiro:

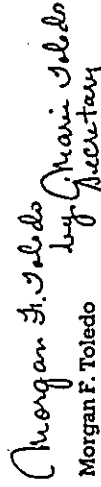
Our Association finds that we must oppose the above report for the reasons noted in the attached documents:

- Copy of letter (2 pages) dated March 15, 1999 to James J. Nakatani, Board of Agriculture, State of Hawaii voicing our opposition to the proposed draft of the above EIS.
- Copy of our MOU (Memorandum of Understanding) dated October 13, 1999 regarding this issue and other issues regarding water in Waipio Valley.

All of the concerns of The Waipio Taro Farmers Association are listed in these two documents, but we find that the majority of them were not addressed in the first draft.

Thank you for taking the time to review these documents.

Sincerely,



Morgan F. Toledo  
President

MF7/mt

cc: (See a list of recipients on the following page who received a copy of this same letter addressed to The Secretary of Agriculture in Washington, DC along with the attachments noted above.)

Benjamin J. Cayetano, Governor  
Executive Chambers  
State Capital  
Honolulu, HI 96813

Honorable Steven K. Yamashiro, Mayor  
Office of the Mayor  
County of Hawaii  
Hilo, HI 96720

Representative Patsy T. Mink  
U.S. House of Representatives  
2135 Rayburn House Office Bldg.  
Washington, DC 20515-1102

Senator Daniel Akaka  
U.S. Senate  
720 Hart State Office Bldg.  
Washington, DC 20510

Senator Daniel K. Inouye  
U.S. Senate  
101 Aupuni Street  
Hilo, HI 96720

James J. Nakatani, Chairman  
Board of Agriculture - State of Hawaii  
1428 South King Street  
Honolulu, HI 96814

W. Donald Duckworth  
President and Director - Bishop Museum  
1525 Bishop Street  
Honolulu, HI 96817

Representative Dwight Takamine  
State of Hawaii  
State Capital - Room #306  
Honolulu, HI 96813

Councilman Dominic Yegong  
County Council  
25 Aupuni Street  
Hilo, HI 96720

Kenneth Brown  
Friends of the Future  
1099 Alakea - #1170  
Honolulu, HI 96813

Michael Wilson, Director  
Department of Land & Natural Resources  
1151 Punchbowl Street  
Honolulu, HI 96813

Ray H. Jyo, PE  
Director of Engineering  
U.S. Army Corps of Engineers  
Building 230  
Ft. Shafter, HI 96858-5440

March 15, 1999

James J. Nakatani, Chairman  
Board of Agriculture  
State of Hawaii  
1428 South King Street  
Honolulu, HI 96814

Dear Chairman Nakatani and Fellow Board Members,

Our organization, the Waipi'o Taro Farmers Association, would like to thank you for the opportunity to submit our official statement regarding the proposed Honoka'a-Paauilo Irrigation Project. Since the earliest discussions began, following the closure of the Hanakua Sugar Company, members of our Association have always supported the continuing availability of water for the new farmers and agricultural projects along the Lower Hanakua Ditch. Although we still support the farmers along the Ditch, we regret to say that our Association feels that we have no other choice at this time but to oppose the further development of the proposed Project.

The underlying reason for our opposition is because there are outstanding water-related issues which are threatening the future of Waipi'o Valley and our taro-farming culture and we believe that these issues have not been given the attention and support necessary, and they are now being treated as secondary to the proposed Honoka'a-Paauilo Project.

Attached is a copy of an M.O.U. (Memorandum Of Understanding), dated October 13, 1998, which our Association submitted to Mr. Dudley Kubo of the NRCS, following a meeting of our Association with several representatives of other private organizations and government agencies, regarding current and outstanding water-related issues of Waipi'o Valley. It clearly outlines all of our concerns and the position we have taken on each of these water-related issues.

Of all the concerns outlined, we would like to convey one issue, in particular, which illustrates why we feel the need to prioritize our water-related concerns above the proposed Irrigation Project and why we feel the need to take such a strong position against the Project's further development:

This issue is regarding the stonage of critically needed stream repairs to certain areas along the Waioa Stream in Waipi'o Valley (the main waterway of the Valley). Three years ago, our Association began outstanding repair work to sections of Waioa Stream but we were stopped by the Army Corps of Engineers because of a complaint filed by someone outside of our Association. Although members of our Association have been responsible for continuing to maintain "the traditional water management system of Waipi'o"—a system passed down from the earliest Hawaiian settlers of the Valley, and many of our members therefore have extensive work experience and knowledge with the waterways of Waipi'o, the Army Corps still felt compelled to enforce current legal interpretation of water regulations and required our Association to cease our work until additional technical and liability concerns were satisfied. Today, we do not have the

financial resources to complete the work and have been unable to satisfy the additional technical and liability requirements. Our underlying concern is that several farms along the affected area of Wailoa Stream where repair work has been stopped, have already been threatened by flooding, several times, and unless the necessary repairs are done in a timely fashion, these farms will undoubtedly be severely damaged or destroyed and the affected farmers forced to seek extensive recovery assistance, if they have the means and will to continue taro farming.

A very puzzling and disturbing fact for our Association, is that only approximately \$100,000 is needed to complete the necessary stream repairs and after several attempts to obtain the necessary funds and technical assistance from the State of Hawaii and other government agencies, we are still without the needed money and yet the State of Hawaii has somehow recently found \$2 million to perform work to restore Hiihawe Falls, as a result of a legal suit filed by one individual, who utilized Legal Aid to help win his case. We believe that this is a major discrepancy and an injustice to our culture.

It is very frustrating to know that some of the water-related issues, which we have been pursuing for several years, continue to directly threaten the future of taro farming in Waipi'o Valley and also require far less resources to resolve than the proposed Irrigation Project but we are now being asked to place our needs aside to support this Project.

Our Association feels so strongly about these circumstances that we are asking you to defer or deny approval of the proposed Honoka'a-Paaulo Irrigation Project until the outstanding issues outlined in our attached M.O.U. have been addressed and certain issues resolved. In addition, we are prepared to take legal action to stop this Project if necessary, since water for this Project originates from the surface water sources of Waipi'o Valley—the same source for which we believe we have "first rights" to, as part of "the traditional water management system of Waipi'o". We truly hope that this will not be necessary and we earnestly ask for your needed help and attention to this matter.

Mahalo nui loa,

The Waipi'o Taro Farmers Association  
P.O. Box 5034  
Honoka'a, HI 96727

The Waipi'o Taro Farmers Association  
M.O.U.  
(Memorandum Of Understanding)

October 13, 1998

A Meeting convened by The Waipi'o Taro Farmers Association (WTFA) with:

1. Earthjustice Legal Defense Fund
2. The Waipi'o Valley Community Association (WVCA)
3. The United States Dept. of Agriculture (USDA), Natural Resources Conservation Service (NRCS)
4. The United States Fish and Wildlife Services
5. The State of Hawaii, Dept. of Agriculture (DOA)
6. The State of Hawaii, DLNR, Division of Aquatic Resources (DAR)
7. The Hamakua-North Hilo Agricultural Cooperative

Re: A. WVCA's formal complaint filed with the State of Hawaii, for the full return of water from Kawainui, Alakahi, Ko'iawe, Waima, Lalakea, Hakaloa, Hiihawe Streams.

B. The current status of the Lower Hamakua Ditch System and related water management issues.

As a result of this Meeting, WTFA asserts the following facts:

1. That all of the water that has naturally and historically flowed into Waipi'o Valley (into the Wailoa/Waipio Stream) via the Waipi'o streams of Alakahi, Kawainui, Ko'iawe, Waima, Lalakea, Hakaloa and Hiihawe, and the various waterfalls of Waipi'o Valley, are all part of the first Water Resources Management System of the Ahupua'a of Waipi'o, established by the ancient Hawaiian Culture—the earliest known inhabitants of Waipi'o Valley.
2. That the first Water Resources Management System of the Ahupua'a of Waipi'o, created by the Hawaiians, includes and integrates all of the above streams which feed into Wailoa/Waipio Stream, in addition to all of the natural and man-made diversions which carries water offstream (out of Wailoa Stream) to all of the various areas on the floor of the Valley, and ultimately into the sea at Waipi'o Bay, are all together, necessarily treated as "one integral" Water Resources Management System.
3. That this Water Resources Management System was designed to:
  - a. first, provide all of the necessary water for wetland Kalo (Taro) Cultivation, throughout the Valley.
  - b. secondly, minimize the impact of high volumes of water at times of heavy rains and potential flood conditions in Waipi'o Valley.
4. That Wetland Kalo (Taro) Cultivation has historically been, and is currently, the primary purpose for, and the most widespread use of, this Water Resources

Management System and it is also the primary cultural and agricultural activity within the Ahupua'a of Waipi'o.

5. That this Water Resources Management System (hereafter referred to as "The Traditional Water Management System of Waipi'o"), established by the Hawaiian Culture, has been passed down from the first Hawaiians in Waipi'o Valley, to the taro-farming families of today, now represented by The Waipi'o Taro Farmers Association (WTFA).

6. That the WTFA, as today's link in an "unbroken line" of "Keepers" (and managers) of "The Traditional Water Management System of Waipi'o", are therefore the holders of the "first rights" to this System and all of its resources (as listed above).

7. That the WTFA recognizes that the State of Hawaii's Commission on Water Resource Management, has, according to current laws, "exclusive authority to manage Hawaii's stream resources and overall matters involving the State Water Code" but the WTFA also believes that there is no conflict between the WTFA and the Commission, since WTFA's management of the "Traditional Water Management System of Waipi'o" is maintained within the State Water Code and the WTFA is positioning the State of Hawaii to recognize its "historical precedence" and will allow the WTFA to amend the Interim Instream Flow Standards of all Waipi'o Valley's streams to reflect the WTFA's past and present methods and authority for managing the "Traditional Water Management System of Waipi'o".

8. That the WTFA is petitioning the State of Hawaii to secure the necessary financial and technical resources for completing the "pending stream maintenance work" in Waipi'o Valley (outstanding since 1996) to the Waioa Stream before attending the interim instream flow standards for all of the streams identified in the WVCA's official complaint.

9. That the WTFA will hold the State of Hawaii and WVCA responsible for any damages or losses to the farms of members of WTFA should water from the above streams be restored before the needed stream maintenance work in Waipi'o (in the Waioa Stream) is completed.

10. That the WTFA will seek reparations from the State of Hawaii and WVCA, for its members who may experience greater difficulty in accessing their farms from the new water levels in the Waipi'o streams, at normal and heavy rain periods, as a result of the restoration of the above streams into the Valley.

11. That the construction of the Upper and Lower Hamakua Ditch Systems and all other water diversion structures, originally built approximately 88 years ago and since then, does not relinquish or diminish the "first rights" of the WTFA, to all of the water resources of Waipi'o.

12. That the WTFA recognizes that the State of Hawaii, DOA wishes to establish, under the provision of Chapter 167, Hawaii Revised Statutes, a "sub" water management system to the "primary" "Traditional Water Management System of Waipi'o" (with the consent and cooperation of WTFA), specifically for the Waioa/Waipi'o Stream Diversions and other related water control structures along the Lower Hamakua

Ditch.

13. That the DOA, with financial and technical assistance from the USDA, NRCS, is seeking to repair and rehabilitate the Lower Hamakua Ditch (LHD) System, to provide water for "Agricultural Use Only", to Hamakua farmers and ranchers, along the LHD.

14. That the LHD project includes the cleaning and any necessary repairs for the intake structures at Kawaiui, Alakahi, Ko'iawe and Waimea Streams, to allow the LHD System to carry the maximum capacity of water it was designed for.

15. That a water gauge should be installed at the base of Waimea, on the floor of the Valley, to measure the total volume of water flowing into Waipi'o Valley, and another gauge should be installed at the entrance to the tunnel (at the back of Waipi'o) to measure and monitor the total volume of water flowing into the LHD System, at any moment in time, and ultimately, to provide the necessary data to help determine the feasibility of serving and balancing:

a) the essential water needs for Kalo Cultivation throughout Waipi'o Valley.

b) the traditional and customary Hawaiian practices and recreational and educational activities in Waipi'o Valley.

c) the water needs for traditional and other compatible agriculture in Waipi'o Valley.

d) the instream flow needs for native aquatic habitat in Waipi'o Valley.

e) the concerns for "high water" and "flood" conditions in Waipi'o Valley.

f) the riparian water rights in Waipi'o Valley.

g) the agricultural water needs for the LHD System—the new farmers and ranchers along the LHD.

16. That the DOA's proposal to have the LHD System divert an average of approximately 17 million gallons a day (MGD) normally and approximately 17 MGD under drought conditions (which includes anticipated losses, through leakage in the system's deteriorated condition) for the "Agricultural Users" in Hamakua, should be subject to change, pending further study (including data provided from the installation of the above water gauges) for:

a) determining and maintaining the minimal volume of water needed in Waipi'o Valley, at anytime, now or in the future.

b) the establishment of a system or procedure for validating "bona-fide" agricultural users and their proposed water volume needs.

17. That a Plan should be developed to terminate the dumping of excess water into Waipi'o Valley, from the Upper Hamakua Ditch (during heavy rains and flood conditions) which will eliminate the wasting of this excess water and find a valid use (i.e., linking to other nearby or additional reservoirs?).

18. That the State of Hawaii, DLNR, DAR is aware that there is insufficient knowledge regarding the minimum streamflow needs for native aquatic habitat in Waipi'o Valley and hence, is pursuing studies to determine the streamflow requirements for o'opu and other native stream organisms in Waipi'o Valley.

19. That the WVCA's environmental interests and desired activities in Waiolea Stream, acknowledges the precedence and purpose of "The Traditional Water Management System of Waipi'o", to be first for Kalo Cultivation (Taro Farming) and all other proposed or desired uses and activities with the water resources of Waipi'o, should be presented to the WTTA (as the "Keepers" and managers of "The Traditional Water Management System of Waipi'o") before seeking further action with any other governing agency or interested parties.
20. That the WVCA and Chris Raibun should rescind or withdraw their "suit" with the State of Hawaii, regarding the restoration of Hakalaoa Falls, in order to:
- eliminate the threat of irrevoable damage and closure of the LHD System, should there be insufficient funds to perform all of the necessary repairs to the face of Hakalaoa Falls and the remainder of the system, all the way to Paaulo, by the December 1, 1999 deadline.
  - allow whatever funds that are made available, to be used first for the needed repairs to the section of the LHD System from the main weir at Kukuihaele, all the way to its terminus at Paaulo, and then perform the repairs to the face of Hakalaoa Falls, as and when funds become available.
  - honor the wishes of the Elders and long-time taro-farming families of Waipi'o Valley, who wish to see that the new farmers and ranchers along the LHD continue to have access to water from this system, without the threat of closure due to this suit, as outlined above.
  - stop further harm and damage to the 'Aina by the work that would be necessary to remove the diversion above the Twin Falls of Hi'ilawe.
  - defer or cancel the restoration of Hakalaoa Falls, because for some of the Elders of Waipi'o Valley, the idea for its restoration brings back tragic and painful memories of flooding and devastation in Waipi'o Valley.
21. That all of the parties present at this meeting (of October 13, 1998), wish to establish a formally organized and empowered "Cooperative Water Resources Management Group" (of Waipi'o), which includes and is supported by the State of Hawaii's Commission on Water Resources Management, to:
- oversee the coordinated management of all the water resources of Waipi'o and Hamakua (and ultimately, the Kohala Watershed).
  - monitor and regulate future "uses" and "users" of these water resources.
  - promote the education and dissemination of information about the cultural and historical significance (including the present and future) of the water resources, aquatic life and agricultural activities of the Waipi'o, Hamakua and Kohala areas of this island.
22. That all of the agencies and organizations signing this Memorandum, therefore agree, that the Waipi'o Taro Farmers Association—as the "Keepers" and managers of the first Water Management System in the Waipi'o Valley area, known as "The Traditional Water Management System of Waipi'o", hold "first rights" to this System (including all of its relevant water resources), and therefore also agree, in principle, to

participate in a process to co-develop (with the WTTA) a streamflow prescription for the Waipi'o Valley streams that will be used for management of the stream diversions of the LHD agricultural "sub" water system.

DOA will:

- With the consent and cooperation of the WTTA;
  - establish the LHD agricultural "sub" water system, with,
  - a formally organized and empowered "Cooperative Water Management Group" (of Waipi'o), consisting of the WTTA, DOA, and other water users of "The Traditional Water Management System of Waipi'o" and relevant "sub" systems, signing this memorandum. In the interim, prior to the establishment of the LHD agricultural "sub" water system, a predecessor group will begin a discussion of the issues and decision-making process, to be convened by the WTTA and DOA.
- Measure and record, for the life of the project, diversion rates and water flow through the LHD agricultural "sub" water system.
- Support the use "adaptive management" by the "Cooperative Water Management Group" (of Waipi'o), which is a process of using monitoring, evaluation, and experimentation to provide information to adjust resource management decisions.

NRCS will:

- Assist with measurement of streamflow in Waipi'o Valley during the four-year period of project implementation.
- Assist the WTTA and other Valley farmers with conservation planning and application for USDA cost-shared assistance, i.e., Environmental Quality Incentive Program and Wildlife Habitat Incentive Program.

DAR will:

- Conduct measurement of native stream communities in Waipi'o Valley.
- Develop streamflow rate and other stream management recommendations to benefit native stream communities.

In agreement with the above, the:

- State of Hawaii, Commission on Water Resources Management, its Chairman,

(Signature) \_\_\_\_\_ Date: \_\_\_\_\_



Our People...Our Islands...In Harmony

United States Department of Agriculture

Natural Resources Conservation Service

P.O. Box 50004 Honolulu, HI 96850

August 19, 1999

Morgan F. Toledo, President Waipio Taro Farmers Association P.O. Box 5034 Honokaa, Hawaii 96727

Dear Mr. Toledo:

Subject: Lower Hamakua Ditch Watershed DEIS Review Comments

Thank you for your review of the Draft Environmental Impact Statement and Watershed Plan for the Lower Hamakua Ditch Watershed, County of Hawaii. We wish to respond to the comments contained in your letter dated March 25, 1999 and its attachments.

The following comments are contained in your attached letter to James Nakatani dated March 15, 1999.

Comment: Since the earliest discussions began, following the closure of the Hamakua Sugar Company, members of our Association have always supported the continuing availability of water for the new farmers and agricultural projects along the Lower Hamakua Ditch. Although we still support the farmers along the Ditch, we regret to say that our Association feels that we have no other choice at this time but to oppose the further development of the proposed Project.

The underlying reason for our opposition is because there are outstanding water-related issues which are threatening the future of Waipi'o Valley and our taro-farming culture and we believe that these issues have not been given the attention and support necessary, and they are now being treated as secondary to the proposed Honoka'a-Paauilo Project.

Response: The project sponsors appreciate the Waipio Taro Farmers Association's (WTFAs) assistance provided to the project planners and support to the Hamakua area farmers. Both the Lower Hamakua Ditch Watershed project, which provides planning and federal assistance for the repair and rehabilitation of the Lower Hamakua Ditch, and the Honoka'a-Paauilo Irrigation Project, which established a Department of Agriculture (DOA)-managed irrigation district in Hamakua, will affect Waipio Valley farmers by increasing the amount of water released at the LHD stream diversions.

page 6.

2. State of Hawai'i, Dept. of Agriculture (DOA), its, (Title) \_\_\_\_\_  
(Signature) \_\_\_\_\_ Date: \_\_\_\_\_
3. State of Hawai'i, DENR, Division of Aquatic Resources (DAR), its, (Title) \_\_\_\_\_  
\_\_\_\_\_  
(Signature) \_\_\_\_\_ Date: \_\_\_\_\_
4. United States Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS), its, (Title) \_\_\_\_\_  
(Signature) \_\_\_\_\_ Date: \_\_\_\_\_
5. United States Fish and Wildlife Services, its (Title) \_\_\_\_\_  
(Signature) \_\_\_\_\_ Date: \_\_\_\_\_
6. Waipi'o Valley Community Association (WVCA), its President,  
(Signature) \_\_\_\_\_ Date: \_\_\_\_\_
7. Hamakua-North Hilo Agricultural Cooperative, its (Title) \_\_\_\_\_  
(Signature) \_\_\_\_\_ Date: \_\_\_\_\_
8. Waipi'o Taro Farmers Association (WTFAs), its President,  
(Signature) \_\_\_\_\_ Date: \_\_\_\_\_

Morgan F. Toledo, President  
Waipio Taro Farmers Association

As the primary focus of the DEIS is agricultural water supply for farmers and ranchers in the Hamakua area and because most of the improvements proposed by the Selected plan will occur in the Hamakua area, the bulk of the discussion in the DEIS is unrelated to the Waipio Valley concerns. The discussion of the concerns raised by the WTFA will be expanded in the DEIS.

While we are disappointed that the WTFA has chosen to oppose the projects at this time we are confident that the concerns that have been raised can be addressed.

Comment: This issue is regarding the stoppage of critically needed stream repairs to certain areas along the Wailoa Stream in Waipio Valley (the main waterway of the Valley). Three years ago, our Association began outstanding repair work to sections of Wailoa Stream but we were stopped by the Army Corps of Engineers because of a complaint filed by someone outside of our Association. Although members of our Association have been responsible for continuing to maintain "the traditional water management system of Waipio" - a system passed down from the earliest Hawaiian settlers of the Valley, and many of our members therefore have extensive work experience and knowledge with the waterways of Waipio, the Army Corps still felt compelled to enforce current legal interpretation of water regulations and required our Association to cease our work until additional technical and liability concerns were satisfied. Today, we do not have the financial resources to complete the work and have been unable to satisfy the additional technical and liability requirements. Our underlying concern is that several farms along the affected area of Wailoa Stream where repair work has been stopped, have already been threatened by flooding, several times, and unless the necessary repairs are done in a timely fashion, these farms will undoubtedly be severely damaged or destroyed and the affected farmers forced to seek extensive recovery assistance, if they have the means and will to continue taro farming.

A very puzzling and disturbing fact for our Association, is that only approximately \$100,000 is needed to complete the necessary stream repairs and after several attempts to obtain the necessary funds and technical assistance from the State of Hawaii and other government agencies, we are still without the needed money and yet the State of Hawaii has somehow recently found \$2 million to perform work to restore Hillawe Falls, as a result of a legal suit filed by one individual, who utilized Legal Aid to help win his case. We believe that this is a major discrepancy and an injustice to our culture.

Response: The project sponsors will provide assistance to acquire the necessary permits for the stream maintenance. A contract has been let by the DOA to acquire these and other permits needed for the LHD rehabilitation. Once the watershed project is approved for implementation, land treatment funds

Morgan F. Toledo, President  
Waipio Taro Farmers Association

become available to implement measures to address water and soil resource problems.

As clarification, the amount of money appropriated for the Hakahoa Falls tunnel repair is \$1 million.

The following selected comments are from the attached "Waipio Valley Farmers Association MOU (Memorandum of Understanding)." The WFTA MOU contains the WFTA revisions to the draft MOU which was prepared by the project planners to form a base for cooperative action by the various interest groups in Waipio Valley and Hamakua.

Comment: The WTFA asserts that the first Water Resources Management System of the Ahupua'a of Waipio, created by the Hawaiians, includes and integrates all of the above streams which feed into Wailoa/Waipio Stream, in addition to all of the natural and man-made diversions which carries water offstream (out of Wailoa Stream) to all of the various areas on the floor of the Valley, and ultimately into the sea at Waipio Bay, are all together, necessarily treated as "one integral" Water Resources Management System.

That this Water Resources Management System was designed to provide all of the necessary water for wetland Kalo (Taro) Cultivation, throughout the Valley and secondly, minimize the impact of high volumes of water at times of heavy rains and potential flood conditions in Waipio Valley.

That this Water Resources Management System (hereafter referred to as "The Traditional Water Management System of Waipio"), established by the Hawaiian Culture, has been passed down from the first Hawaiians in Waipio Valley, to the taro-farming families of today, now represented by The Waipio Taro Farmers Association (WTFFA).

That the WTFA, as today's link in an "unbroken line" of "Keepers" (and managers) of "The Traditional Water Management System of Waipio", are therefore the holders of the "first rights" to this System and all of its resources.

That the WTFA recognizes that the State of Hawaii's Commission on Water Resource Management, has, according to current laws, "exclusive authority to manage Hawaii's stream resources and overall matters involving the State Water Code" but the WTFA also believes that there is no conflict between the WTFA and the Commission, since WTFFA's management of the "Traditional Water Management System of Waipio is maintained within the State Water Code and the WTFA is petitioning the State of Hawaii to recognize its "historical precedence" and will allow the WTFA to amend the Interim Instream Flow Standards of all Waipio Valley's streams to reflect the WTFA's past and present methods and authority for managing the "Traditional Water Management System of Waipio".



Morgan E. Foleola, President  
Waipio Taro Farmers Association

That the construction of the Upper and Lower Hamakua Ditch Systems and all other water diversion structures, originally built approximately 88 years ago and since then, does not relinquish or diminish the "first rights" of the WTFA, to all of the water resources of Waipio.

**Response:** The project sponsors acknowledge in the DEIS the connection between the Waipio Valley stream system, the auwai system to irrigate wetland taro, and the flows diverted for the LHD. The project sponsors, while supportive and respectful of the efforts of the WTFA to manage the water resource in Waipio Valley for taro cultivation, cannot acknowledge the assertion that the WTFA are "the holders of the 'first rights' to this System and all of its resources" until it is so recognized by the State of Hawaii as a result of the WTFA petition.

The rights to water as established in the Hawaii State Constitution and the State Water Code which include appurtenant water rights, riparian water rights, and water rights for kulana lands, will guide the management of the water diversion for the LHD. The water rights listed above should be unaffected by implementation of the project.

**Comment:** That the WTFA is petitioning the State of Hawaii to secure the necessary financial and technical resources for completing the "pending stream maintenance work" in Waipio Valley (outstanding since 1996) to the Wailoa Stream before amending the interim instream flow standards for all of the streams identified in the WVCA's official complaint.

**Response:** The state, county, and federal agencies with regulatory jurisdiction or assistance programs have been contacted by the effort headed by Representative Dwight Takamine. It appears that short-term and long-term strategies for acquisition of approvals and permits and funding have been identified.

The CWRM has yet to make a judgment on the WVCA complaint seeking restoration of nearly all of the flow diverted by the LHD back to the Waipio Valley streams. There is a possibility that the CWRM will use the implementation of the watershed project to determine the flow rates returned to the Waipio Valley streams.

**Comment:** That a water gauge should be installed at the base of Waima, on the floor of the Valley, to measure the total volume of water flowing into Waipio Valley, and another gauge should be installed at the entrance to the tunnel (at the back of Waipio) to measure and monitor the total volume of water flowing into the LHD System, at any moment in time, and ultimately, to provide the necessary data to help determine the feasibility of serving and balancing:  
a) the essential water needs for Kalo Cultivation throughout Waipio Valley.  
b) the traditional and customary Hawaiian practices and recreational and educational activities in Waipio Valley.

4

Morgan E. Foleola, President  
Waipio Taro Farmers Association

- c) the water needs for traditional and other compatible agriculture in Waipio Valley.
- d) the instream flow needs for native aquatic habitat in Waipio Valley.
- e) the concerns for "high water" and "flood" conditions in Waipio Valley.
- f) the appurtenant and riparian water rights in Waipio Valley.
- g) the agricultural water needs for the LHD System-the new farmers and ranchers along the LHD.

That the DOA's proposal to have the LHD System divert an average of approximately 7 million gallons a day (MGD) normally and approximately 17 MGD under drought conditions (which includes anticipated losses, through leakage in the system's deteriorated condition) for the "Agricultural Users" in Hamakua, should be subject to change, pending further study (including data provided from the installation of the above water gauges) for determining and maintaining the minimal volume of water needed in Waipio Valley, at anytime, now or in the future, and the establishment of a system or procedure for validating "bona-fide" agricultural users and their proposed water volume needs.

**Response:** Gaging of streamflow in Waipio Valley streams for the purposes listed above will be conducted during the four-year installation period of the project. The stream data and other inputs will be used by the proposed advisory committee to recommend operating parameters for the stream diversions to the agricultural water system manager.

Longer term gaging of the Waipio Valley streams may be warranted and will be addressed during the initial four-year period. Gaging of diversion rates and flow within the LHD agricultural water system will continue for the life of the project.

The policy determination of who will be allowed to receive water from the agricultural water system will be made during the establishment of the DOA-managed irrigation district.

The baseflow period diversion recommended by the U.S. Fish and Wildlife Service in their comments on the DEIS will be adopted. The recommended release of 30 percent of the baseflow to Waipio Valley streams will result in reduction of the peak diversion from the earlier-proposed 17 MGD to approximately 13 MGD.

**Comment:** A Plan should be developed to terminate the dumping of excess water into Waipio Valley, from the Upper Hamakua Ditch (during heavy rains and flood conditions) which will eliminate the wasting of this excess water and find a valid use (i.e., linking to other nearby or additional reservoirs?).

**Response:** The Upper Hamakua Ditch/Waimea Irrigation System is a separate system with no connection to the LHD system. Water flows over the instream diversion structures during high streamflow. The DOA will examine ways of

5

Morgan E. Toledo, President  
Waipio Taro Farmers Association

reducing the overflow. However, storage reservoir capacity is usually full during the wet season when the overflow occurs and other outlets for the flow have not been identified.

**Comment:** The WVCA's environmental interests and desired activities in Wailoa Stream, acknowledges the precedence and purpose of "The Traditional Water Management System of Waipi'o", to be for Kalo Cultivation (Taro Farming) and all other proposed or desired uses and activities with the water resources of Waipi'o, should be presented to the WTFA (as the "Keepers" and managers of "The Traditional Water Management System of Waipi'o") before seeking further action with any other governing agency or interested parties.

The WVCA and Chris Rathbun should rescind or withdraw their "suit" with the State of Hawaii, regarding the restoration of Hakalaoa Falls, in order to:

- eliminate the threat of irrevocable damage and closure of the LHD System, should there be insufficient funds to perform all of the necessary repairs to the face of Hakalaoa Falls and the remainder of the system, all the way to Pauilo, by the December 1, 1999 deadline.
- allow whatever funds that are made available, to be used first for the needed repairs to the section of the LHD System from the main weir at Kukuihaele, all the way to its terminus at Pauilo, and then perform the repairs to the face of Hakalaoa Falls, as and when funds become available.
- honor the wishes of the Elders and long-time taro-farming families of Waipi'o Valley, who wish to see that the new farmers and ranchers along the LHD continue to have access to water from this system, without the threat of closure due to this suit, as outlined above.
- stop further harm and damage to the 'Aina by the work that would be necessary to remove the diversion above the Twin Falls of Hihikwe.
- defer or cancel the restoration of Hakalaoa Falls, because for some of the Elders of Waipi'o Valley, the idea for its restoration brings back tragic and painful memories of flooding and devastation in Waipi'o Valley.

**Response:** While the project sponsors have not been able to influence the WVCA to alter their opposition to the watershed project, a process for the various groups interested in the LHD and Waipio Valley resources to discuss issues and resolve disagreements was offered. The draft MOU and the discussion process that leads to an acceptable document for all is intended to resolve the issues that you have identified. The project planners have been negligent in actively pursuing the discussion process due to other urgent workload.

The NRCS and the Hawaii Department of Agriculture will fund the expenses for a University of Hawaii Department of Urban and Regional Planning graduate practicum led by Dr. Luciano Minerbi this fall to work with the Waipio Valley communities to develop common understanding of resource

Morgan E. Toledo, President  
Waipio Taro Farmers Association

issues and identify ways to attain community-developed objectives. The practicum will be allowed to operate independently. It is hoped that the practicum can pursue agreement on the MOU.

**Comment:** That all of the parties present at this meeting (of October 13, 1998), wish to establish a formally organized and empowered "Cooperative Water Resources Management Group" (of Waipi'o), which includes and is supported by the State of Hawaii's Commission on Water Resources Management, to:

- oversee the coordinated management of all the water resources of Waipi'o and Hamakua (and ultimately, the Kohala Watershed).
- monitor and regulate future "uses" and "users" of these water resources.
- promote the education and dissemination of information about the cultural and historical significance (including the present and future) of the water resources, aquatic life and agricultural activities of the Waipi'o, Hamakua and Kohala areas of this island.

**Response:** The groups entering into the discussion of the MOU can organize themselves in any manner that they see fit. The proposal offered above by the WTFA is an acceptable structure. The establishment of the outreach function is a positive aspect. Ultimately, the group should have even representation of all of the interests connected to the LHD and Waipio Valley and should be able to make operating recommendations to the agricultural water system management.

**Comment:** All of the agencies and organizations signing this Memorandum should agree, that the Waipio Taro Farmers Association-as the "Keepers" and managers of the first Water Management System in the Waipio Valley area, known as "The Traditional Water Management System of Waipi'o", hold "first rights" to this System (including all of its relevant water resources), and therefore also agree, in principle, to participate in a process to co-develop (with the WTFA) a streamflow prescription for the Waipio Valley streams that will be used for management of the stream diversions of the LHD agricultural "sub" water system.

**Response:** It will be the responsibility of the WTFA to convince the other organizations and agencies to accept the assertion that the WTFA holds such "first right" to the water resource.

**Comment:** DOA will, with the consent and cooperation of the WTFA, establish the LHD agricultural "sub" water system, with a formally organized and empowered "Cooperative Water Management Group" (of Waipi'o), consisting of the WTFA, DOA, and other water users of "The Traditional Water Management System of Waipi'o" and relevant "sub" systems, signing this memorandum. In the interim, prior to the establishment of the LHD agricultural "sub" water system, a predecessor group will begin a discussion of the issues and decision-making process, to be convened by the WTFA and DOA.

Morgan F. Ioleka, President  
Waipio Taro Farmers Association

The DOA will measure and record, for the life of the project, diversion rates and water flow through the LHD agricultural "sub" water system.

The DOA will support the use "adaptive management" by the "Cooperative Water Management Group" (of Waipio), which is a process of using monitoring, evaluation, and experimentation to provide information to adjust resource management decisions.

The NRCS will assist with measurement of streamflow in Waipio Valley during the four-year period of project implementation.

The NRCS will assist the WTFA and other Valley farmers with conservation planning and application for USDA cost-shared assistance, i.e., Environmental Quality Incentive Program and Wildlife Habitat Incentive Program.

The Division of Aquatic Resources (DAR) will conduct measurement of native stream communities in Waipio Valley.

The DAR will develop streamflow rate and other stream management recommendations to benefit native stream communities.

Response: The three agencies are prepared to perform the functions listed above. The DAR responds that they will assess rather than measure streamflow rates.

Sincerely,



KENNETH M. KANESHIRO  
State Conservationist

cc: State of Hawaii Department of Agriculture  
State of Hawaii Office of Environmental Quality Control

**APPENDIX B -  
INVESTIGATION AND ANALYSIS REPORT**

## APPENDIX B - INVESTIGATION AND ANALYSIS

### B.1 ECONOMICS

The economic analysis conducted for the Lower Hamakua Ditch Watershed project measured or quantified the contribution of the proposed measures and alternatives to national economic development (NED). National economic development is the increase in the net value of the national output of goods and services, expressed in monetary units.

The LHD project will contribute to NED by alleviating the agricultural water shortage problems in the watershed project area. The project will reduce income losses caused by the *inadequate quantity and distribution* of water for crop irrigation and livestock drinking, especially during droughts. The project will also increase income by allowing increased diversified agricultural development, which is essential to the economic revitalization of the area.

The economic analysis followed the standard NRCS procedures in accordance with *The Economics and Environmental Principles and Guidelines for Water and Related Land Resources Studies* issued by the Water Resources Council and the NRCS *National Resource Economics Handbook, Part 611, Water Resources*.

All of the potential NED benefits are "agricultural benefits." Agricultural benefits are divided into two mutually exclusive categories depending on whether there is a change in cropping pattern: intensification benefits and damage reduction benefits.

Intensification benefits accrue on lands where the cropping pattern is changed. Damage reduction benefits accrue on land where there is no change in cropping pattern between the with and without project conditions.

Alternative 1, No Action, would not produce any benefits.

Alternatives 2, 3, and 4 all propose installation of measures that would provide a fuller water supply whether via wells, ditch repair, or replacement with pipeline and thus, the potential benefits for these three alternative are assumed would be the same.

Intensification benefits would be the primary source of project benefits for alternatives 2, 3, and 4. Under with project conditions an estimated 4,500 acres of land in the watershed would be used for diversified crop production, an increase of 2,600 acres over without project conditions (Table B-1). Of the total 4,500 acres, an estimated 2,510 acres would be planted and irrigated, an increase of 1,554 over without project conditions. This estimate is based on the crop suitability study (see section 5.5.1) and interviews with area landowners, farmers, and other familiar with crop cultivation in the project area. The increased acreage would be converted from idle sugarcane land and pasture land.

The intensification benefits were measured as the difference or increase in net value of the increased production between the without project condition and the with project condition, that would occur due to the cropping pattern or land use change. Crop budgets (cost-return estimates) were developed for the major crops grown in the watershed and used to estimate net farm income. The crop budgets were based on cost of production data gathered from existing project areas farmers and also business plans submitted to the Hamakua Coop. As federally mandated, prices received for the commodities were five-year averages for the State. The Statistics of Hawaiian Agriculture was the source of crop prices. Crop yields used in the budgets were based on yields published in the Statistics of Hawaiian Agriculture and on current yields experienced by watershed farmers using average management. In situations where a commodity is new to the area, has not reached maturation yet, and/or is not well established in the area; published cost of production and yield data was used.

Intensification benefits were estimated at \$4,653,700 for Alternatives 2, 3, and 4 (Table B-2). This amount was discounted to account for a 5 year lag in accrual (7.125% federal discount rate), assuming that it will take approximately 5 years after project installation is complete for the full build out of the additional planted and irrigated acres to occur. The adjusted average annual benefits were estimated at \$3,948,180 or \$3,948,200 rounded to the nearest 100.

Alternative 2, 3, and 4 also produce some damage reduction benefits on the 1,900 acres of land that would be in diversified crop production under without project conditions and on the 6,950 acres of pasture land that would remain in pasture under with project conditions.

The damage reduction benefits on the diversified crop land would be due to reducing crop losses under without project conditions (net income losses resulting from lower yields or total crop failure) to crops from periodic system failure or breakdowns. Under Future Without Project Conditions, it is likely that failures along the ditch which can curtail flow in the ditch or shut down a lateral for one to two days will occur frequently, such as twice monthly. It is estimated that closures of the ditch lasting between three and fourteen days may take place once every two months. Major failures that close the ditch from two weeks to two months may take place approximately every other year.

The damage reduction benefits on the pasture land would be due to the elimination of costs associated with hauling drinking water to cattle when the ditch fails to operate. It is anticipated that the alternative plans would not allow an increase in stocking rate because the irrigating of pastures would not be allowed by the State of Hawaii (ditch operator) and because the cost of on-farm infrastructure necessary for intensive grazing systems is economically unfeasible.

An estimate of the damage reduction benefits was not made because of the lack of records regarding the year-to-year reliability of the water supply under recent past and present conditions.

**Table B-1: Watershed Land Use  
(acres)**

Land Use	Recent Past	Present Conditions	Projected Future Conditions		
			Without Project	With Project	Difference (With-Without)
SUGARCANE *	21,400	6,125	5,595	3,795	-1,800
FOREST					
Conservation	11,700	11,700	11,700	11,700	0
Commercial	0	8,700	8,700	8,700	0
TOTAL FOREST	11,700	20,400	20,400	20,400	0
PASTURE	2,050	7,750	7,750	6,950	-800
FEEDLOT	200	200	200	200	0
MACADAMIA NUTS **	600	600	600	600	0
DIVERSIFIED CROPS ***	500	1,370	1,900	4,500	2,600
Planted	264	589	956	2,510	1,554
WAIPIO VALLEY					
Wetland Taro	80	80	80	80	0
Idle Cropland	170	170	170	170	0
Wetland	500	500	500	500	0
TOTAL WAIPIO VALLEY	750	750	750	750	0
AQUACULTURE	0	5	5	5	0
URBAN	1,300	1,300	1,300	1,300	0
GRAND TOTAL	38,500	38,500	38,500	38,500	0

\* Idle sugarcane land under present conditions.

\*\* Non-irrigated macadamia nuts above the LHD.

\*\*\* Represents gross cropland below the LHD.

**Table B - 2  
Intensification Benefits**

Crop	Projected Future Conditions		Increase (acres)	Annual Net Return /Acre	Increase in Net Returns
	Without Project (acres)	With Project (acres)			
Diversified Crops:					
Vegetables	40	189	149	\$4256	\$634,144
Dracaena	10	10	0	\$3,035	\$0
Fruit	174	306	132	\$1,000	\$132,000
Papaya	85	359	274	\$1,975	\$541,150
Coffee	206	746	540	\$4,448	\$2,401,920
Mac Nuts	426	755	329	\$1,047	\$344,463
Herbs	4	124	120	\$5,000	\$600,000
Other	11	11	0	\$2,000	\$0
<b>Total</b>	<b>956</b>	<b>2,500</b>	<b>1,544</b>		<b>\$4,653,677</b>

0.8484 5-yr. lag in  
accrual factor  
adjusted  
benefits  
rounded to  
nearest 10



## B.2 HYDROLOGY

The hydrologic analysis for the Lower Hamakua Ditch Watershed was directed toward assuring a consistent and adequate supply of irrigation water for the projected buildout condition of 2,500 acres of irrigated cropland in Hamakua.

*Monthly rainfall predictions for annual frequency of rainfall between 50 and 90 percent were developed using rainfall records from seven rainfall stations in or near the project service area.*

Irrigation water demand was calculated for cropland in the project area using a monthly water budget for crops that included crop consumptive use (CU), effective precipitation, and irrigation efficiency.

$$\text{Irr. Requirement} = (\text{crop CU} - \text{eff. precipitation}) / \text{irr. efficiency}$$

Distribution system losses and non-crop water requirements were added to the project-wide irrigation water demand to calculate total system demand.

$$\text{System Req'ment} = (\text{Irr. Req'ment} * \text{Acres}) + \text{System Loss} + \text{Non-crop Demand}$$

### B.2.1 Rainfall

*Seven rainfall stations with relatively long period of record were identified in or near the service area of the project. (Figure B-1, Table B-3) The recording periods ranged from 44 years to 102 years. The average period of record was more than 80 years. Analysis indicated an increase in rainfall with elevation in the service area. The service area was divided into two sub areas - below 500 feet elevation and above 500 feet elevation. A composite rainfall profile was developed for each area using the four rainfall stations above 500 feet and the three rainfall stations below 500 feet.*

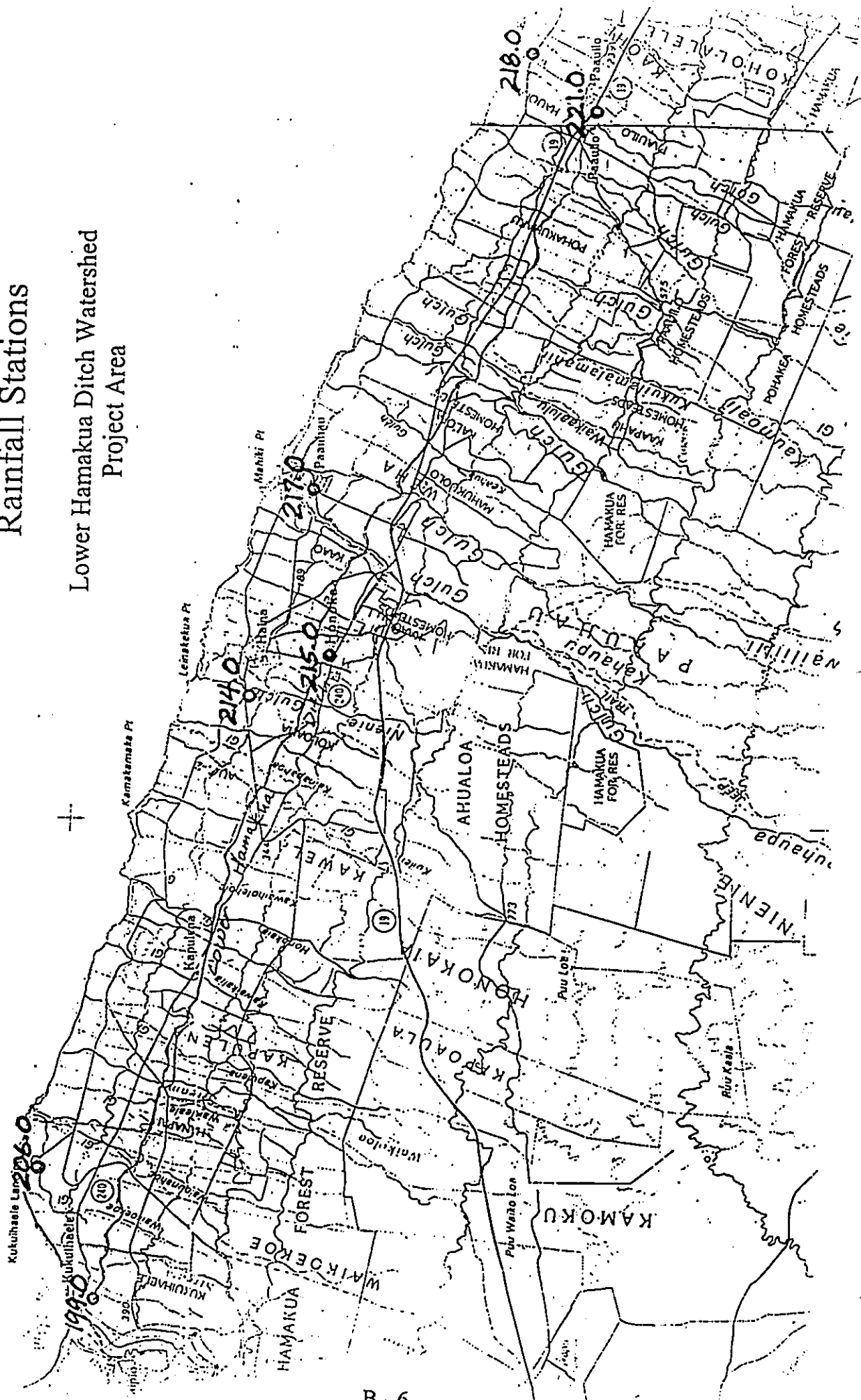
*A log Pearson Type III analysis was conducted on the each stations' record to derive annual rainfall for frequencies between 50 and 90 percent. The annual rainfalls were averaged for each subarea.*

*Monthly distribution of rainfall was derived by dividing the cumulative total for each month by the cumulative annual rainfall. Percentages of monthly rainfall were applied to the averaged annual rainfall to obtain the monthly rainfall average for each frequency of rainfall.*

*Drought period rainfall estimates were also developed for three to twelve month drought periods occurring during 50 to 90 percent rainfall frequency years. (Table B-4) The estimates are based on isohythal maps in DLNR, Drought in Hawaii, R88.*

Figure B-1  
Rainfall Stations

Lower Hamakua Ditch Watershed  
Project Area



Tab. B-3a  
Rainfall Analysis

AVERAGE ANNUAL RAINFALL PROBABILITY (Log Pearson III analysis)																					
STATION	ELEV. (ft)	YEARS	ANN AVG (in)	SKEW	50%	60%	70%	80%	90%												
199.0	84	82	84	0.2	77.8	71.0	64.5	57.8	49.9												
206.0	61	99	61	-0.9	60.5	54.7	48.8	42.1	33.6												
214.0	69	101	69	-0.1	65.3	59.7	54.2	48.3	41.1												
215.0	87	44	87	-0.2	83.3	76.3	69.4	61.9	52.7												
217.0	68	102	68	-0.1	64.1	58.5	52.9	47.1	40.0												
218.0	78	45	78	-0.7	77.4	71.4	65.0	58.0	48.7												
221.0	97	91	97	-0.2	92.5	84.4	76.4	67.9	57.4												
Lower Hamakua Ditch																					
AVG RAINFALL FOR AREAS BELOW 500 FT																					
STATION	ELEV.	YEARS	ANN AVG	SKEW	50%	60%	70%	80%	90%												
206.0	61	99	61	-0.9	60.5	54.7	48.8	42.1	33.6												
214.0	69	101	69	-0.1	65.3	59.7	54.2	48.3	41.1												
217.0	68	102	68	-0.1	64.1	58.5	52.9	47.1	40.0												
218.0	78	45	78	-0.7	77.4	71.4	65.0	58.0	48.7												
AVERAGE					267.3	244.3	220.9	195.5	163.4												
					66.8	61.1	55.2	48.9	40.9												
MONTHLY RAINFALL FOR AREAS BELOW 500 FT (Monthly distribution from MON_PREC.XLS)																					
Mon Disr	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL								
50%	9.82	6.6	6.5	9.66	13.47	6.53	12.21	5.51	7.01	6.38	10.88	11.59	100.0								
60%	6.6	6.0	5.9	8.2	4.4	4.0	8.2	3.7	4.7	4.3	7.3	7.7	66.8								
70%	5.4	5.4	5.3	7.4	3.6	3.6	6.7	3.4	4.3	3.9	6.6	7.1	61.1								
80%	4.8	4.8	4.7	6.6	3.2	3.2	6.0	3.0	3.9	3.5	6.0	6.4	55.2								
90%	4.0	4.0	3.9	5.5	2.7	2.7	5.0	2.7	3.4	3.1	5.3	5.7	48.9								
								2.3	2.9	2.6	4.4	4.7	40.9								

Table B-3b  
Rainfall Analysis

AVG RAINFALL FOR AREAS ABOVE 500 FT													
STATION	ELEV.	YEARS	ANN AVG	SKEW	50%	60%	70%	80%	90%				
199.0	890	82	84	0.2	77.8	71.0	64.5	57.8	49.9				
215.0	1070	44	87	-0.2	83.3	76.3	69.4	61.9	52.7				
221.0	800	91	97	-0.2	92.5	84.4	76.4	67.9	57.4				
AVERAGE					253.6	231.7	210.3	187.6	160				
					84.5	77.2	70.1	62.5	53.3				
MONTHLY RAINFALL FOR AREAS ABOVE 500 FT (Monthly distribution from MON_PREC.XLS)													
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
Mon Distr	9.62	9.42	13.46	12.66	6.84	3.4	5.68	7.11	3.78	6.08	10.44	11.5	100.0
50%	8.1	8.0	11.4	10.7	5.8	2.9	4.8	6.0	3.2	5.1	8.8	9.7	84.5
60%	7.4	7.3	10.4	9.8	5.3	2.6	4.4	5.5	2.9	4.7	8.1	8.9	77.2
70%	6.7	6.6	9.4	8.9	4.8	2.4	4.0	5.0	2.6	4.3	7.3	8.1	70.1
80%	6.0	5.9	8.4	7.9	4.3	2.1	3.6	4.4	2.4	3.8	6.5	7.2	62.5
90%	5.1	5.0	7.2	6.8	3.6	1.8	3.0	3.8	2.0	3.2	5.6	6.1	53.3

**Table B-4**  
**Drought Analysis**

TABULARIZATION OF DROUGHT ANALYSIS															
Source: DLNR, Drought in Hawaii R88															
Read from isohythal maps															
	Rainfall (mm)			Rainfall (in)			3-MON	9-MON	12-MON	3-MON	6-MON	9-MON	12-MON		
	3-MON	6-MON	9-MON	6-MON	9-MON	12-MON									
2-YR	50	200	400	7.9	15.7	39.4	2000	1000	2000	7.9	15.7	39.4	78.7		
3-YR	67	100	375	3.9	14.8	33.5	1900	850	1900	3.9	14.8	33.5	74.8		
5-YR	80	90	350	3.5	13.8	31.5	1000	800	1000	3.5	13.8	31.5	39.4		
10-YR	90	75	225	3.0	8.9	19.7	1000	500	1000	3.0	8.9	19.7	39.4		
20-YR	95	50	175	2.0	6.9	14.8	800	375	800	2.0	6.9	14.8	31.5		
30-YR	96.3	35	125	1.4	4.9	13.8	700	350	700	1.4	4.9	13.8	27.6		
50-YR	98	30	75	1.2	3.0	9.8	500	250	500	1.2	3.0	9.8	19.7		
100-YR	99	20	50	0.8	2.0	5.9	300	150	300	0.8	2.0	5.9	11.8		
200-YR	99.5	10	20	0.4	0.8	3.0	250	75	250	0.4	0.8	3.0	9.8		
Normalized using log probability graphs															
	Rainfall (in)														
	3-MON	6-MON	9-MON	3-MON	6-MON	9-MON	3-MON	6-MON	9-MON	3-MON	6-MON	9-MON	3-MON	6-MON	9-MON
50%	5.5	17	40	5.5	17	40	82	82	82	82	82	82	82	82	82
60%	5.3	16	38	5.3	16	38	78	78	78	78	78	78	78	78	78
70%	4.8	15	35	4.8	15	35	71	71	71	71	71	71	71	71	71
80%	4.3	12.8	31	4.3	12.8	31	62	62	62	62	62	62	62	62	62
90%	3	9.2	23	3	9.2	23	46	46	46	46	46	46	46	46	46

### B.2.2 Irrigation Requirement

Six representative crops were evaluated for irrigation water need - banana, papaya, coffee, macadamia nut, truck crops, and foliage and cut flowers. Monthly crop irrigation water demand was determined for the six crop types for the following conditions: 1) 80 percent chance rainfall, meaning the rainfall conditions experienced, on average, during the driest and second driest years of a ten year group, 2) 50 percent rainfall, meaning the median annual rainfall representing the average condition, and 3) separately for crops grown below the 500-foot elevation and above the 500-foot elevation.

Crop evapotranspiration was estimated for the six crop types by application of a crop consumptive use factor ( $k_c$ ) to the reference evapotranspiration rate ( $et_o$ ) of a clipped grass reference crop. Crop consumptive use factors are found in Part 623 NEH, Chapter 2, Irrigation Water Requirements.

The reference evaporation rate was estimated for the project area using Class A evaporation pan evaporation rates and a pan coefficient ( $k_p$ ). Records from 17 pan evaporation stations in and near the project area, reported in DOWALD, Pan Evaporation: State of Hawaii, 1894-1983, 1985, were evaluated to obtain average monthly pan evaporation rates for areas below 500 feet and areas above 500 feet.

Precipitation records of seven rainfall gage stations were evaluated to derive monthly rainfall amounts for rainfall recurrence probability of 50, 60, 70, 80, and 90 percent. The recurrence probability reflects the percentage of years that the rainfall amount is exceeded. A log Pearson type III analysis was used to determine annual rainfall amounts for the various recurrence frequencies. The monthly precipitation of the three gages above 500 feet and the four gages below 500 feet were averaged and monthly rainfall percentages were determined. The monthly percentages were then applied to the annual rainfall amounts for the various rainfall recurrence probabilities to achieve monthly rainfall amounts.

Irrigation supply to address the 80 percent rainfall recurrence probability has been judged in past analysis as the lower limit of profitability. The project will aim to provide the source and conveyance capability to supply adequate irrigation water during the 90 percent rainfall recurrence.

A monthly crop water budget was used to determine the gross irrigation requirement for each of the six crop types both above and below the 500-foot elevation. The inputs include a crop consumptive use coefficient which related crop evapotranspiration to pan evaporation, monthly effective rainfall, and an efficiency of the irrigation system. A gross monthly irrigation depth was determined for differing rainfall frequencies for the six crop types. (Table B-6)

A reference crop, which is the average of the six crop types, was used in the evaluation of water need for the 2,500 acres. The 2,500-acre area was divided between the area above 500 feet and below 500 feet. Table B-7 displays the average daily water requirement (over a year) and peak daily water requirement for the reference crop during an average year and during a drought (80 percent frequency rainfall) year.

Table B-5a  
Crop Water Demand Summary

Lower Hamakua Ditch					
SUMMARY OF CROP WATER DEMAND					
Annual	MGY				
	Below 500'			Above 500'	
	50%	80%	50%	80%	
Banana	0.807	1.181	0.52	0.717	
Coffee	0.537	0.759	0.311	0.473	
Papaya	0.537	0.759	0.311	0.473	
Macnut	0.416	0.576	0.205	0.362	
Foliage/flowers	0.66	0.969	0.416	0.584	
Truck crops	0.416	0.576	0.205	0.362	
Average daily	Gal/day				
	Below 500'			Above 500'	
	50%	80%	50%	80%	
Banana	2211	3236	1425	1964	
Coffee	1471	2079	852	1296	
Papaya	1471	2079	852	1296	
Macnut	1140	1578	562	992	
Foliage/flowers	1808	2655	1140	1600	
Truck crops	1140	1578	562	992	
REFERENCE CROP (ANN. AVG.)	1500	2100	900	1350	
Peak Monthly	MG/Mon				
	Below 500'			Above 500'	
	50%	80%	50%	80%	
Banana	0.184	0.202	0.142	0.164	
Coffee	0.138	0.155	0.101	0.122	
Papaya	0.138	0.155	0.101	0.122	
Macnut	0.115	0.131	0.082	0.101	
Foliage/flowers	0.161	0.178	0.122	0.143	
Truck crops	0.115	0.131	0.082	0.101	
Peak Month	Gal/day				
	Below 500'			Above 500'	
	50%	80%	50%	80%	
Banana	6133	6733	4733	5467	
Coffee	4600	5167	3367	4067	
Papaya	4600	5167	3367	4067	
Macnut	3833	4367	2733	3367	
Foliage/flowers	5367	5933	4067	4767	
Truck crops	3833	4367	2733	3367	
REFERENCE CROP (PEAK)	4700	5300	3500	4200	

**Table B-6a**  
**Crop Water Demand Analysis**

Lower Hamakua Ditch  
IRRIGATION REQUIREMENT FOR AREAS ABOVE 500 FEET ELEVATION

CROP	Banana											
Crop Coefficient	1											
Pan Evaporation Coefficient	0.80											
Irrigation Efficiency	0.70											
Net Application Depth	3.00											
Application Depth Factor	1.00											
MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Month. Evap. (in)	4.98	4.96	5.46	5.88	6.97	7.34	7.14	7.23	6.57	5.78	5.11	4.78
ETo (in/mo)	3.98	3.97	4.37	4.70	5.58	5.87	5.71	5.78	5.26	4.62	4.09	3.82
Kc	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
ETcrop (in/mo)	3.98	3.97	4.37	4.70	5.58	5.87	5.71	5.78	5.26	4.62	4.09	3.82
50% Rain (in)	8.10	8.00	11.40	10.70	5.80	2.90	4.80	6.00	3.20	5.10	8.80	9.70
50% Eff. Rain (in)	4.83	4.77	6.58	6.36	3.97	2.21	3.40	4.13	2.33	3.37	5.21	5.57
Net Irr. Req'd. (in)	0.00	0.00	0.00	0.00	1.61	3.66	2.31	1.65	2.93	1.26	0.00	0.00
Gross Irr. (in)	0.00	0.00	0.00	0.00	2.30	5.23	3.31	2.36	4.18	1.79	0.00	0.00
Eff. Rain/ETo	1.21	1.20	1.51	1.35	0.71	0.38	0.59	0.71	0.44	0.73	1.27	1.46
80% Rain (in)	6.00	5.90	8.40	7.90	4.30	2.10	3.60	4.40	2.40	3.80	6.50	7.20
80% Eff. Rain (in)	3.74	3.68	5.09	4.92	3.07	1.66	2.65	3.16	1.80	2.61	4.03	4.33
Net Irr. Req'd. (in)	0.25	0.29	0.00	0.00	2.51	4.22	3.07	2.62	3.45	2.01	0.06	0.00
Gross Irr. (in)	0.35	0.41	0.00	0.00	3.59	6.02	4.38	3.74	4.93	2.88	0.09	0.00
Eff. Rain/ETo	0.94	0.93	1.16	1.05	0.55	0.28	0.46	0.55	0.34	0.56	0.98	1.13
90% Rain (in)	5.10	5.00	7.20	6.80	3.60	1.80	3.00	3.80	2.00	3.20	5.60	6.10
90% Eff. Rain (in)	3.25	3.19	4.46	4.33	2.63	1.44	2.26	2.79	1.53	2.25	3.54	3.76
Net Irr. Req'd. (in)	0.73	0.78	0.00	0.37	2.95	4.43	3.46	3.00	3.73	2.38	0.54	0.07
Gross Irr. (in)	1.05	1.11	0.00	0.53	4.21	6.33	4.94	4.28	5.32	3.40	0.78	0.10
Eff. Rain/ETo	0.82	0.80	1.02	0.92	0.47	0.24	0.39	0.48	0.29	0.49	0.87	0.98
GALLONS PER MONTH/ACRE												
50%	0	0	0	0	62378	142100	89767	64060	113600	48684	0	0
80%	9574	11152	0	0	97356	163565	118890	101615	133926	78074	2436	0
90%	28449	30070	0	14520	114392	171968	134076	116289	144525	92217	21134	2611
PEAK DAILY WATER REQUIREMENT (GAL/ACRE)												
50%	4737											
80%	5452											
90%	5732											



Tab. 6b

*Crop Water Demand Analysis*

Lower Hamakua Ditch  
IRRIGATION REQUIREMENT FOR AREAS BELOW 500 FEET ELEVATION

CROP	Banana											
Crop Coefficient	0.8											
Pan Evaporation Coefficient	0.80											
Irrigation Efficiency	0.70											
Net Application Depth	3.00											
Application Depth Factor	1.00											
MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Month. Evap. (in)	5.63	5.7	6.41	6.44	7.43	8.18	7.8	7.91	7.23	6.74	5.7	5.25
ETo (in/mo)	4.50	4.56	5.13	5.15	5.94	6.54	6.24	6.33	5.78	5.39	4.56	4.20
Kc	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
ETcrop (in/mo)	3.60	3.65	4.10	4.12	4.76	5.24	4.99	5.06	4.63	4.31	3.65	3.36
50% Rain (in)	6.60	6.50	9.00	8.20	4.40	2.20	3.70	4.70	2.50	4.30	7.30	7.70
50% Eff. Rain (in)	3.97	3.93	5.31	4.91	2.99	1.67	2.60	3.22	1.81	2.86	4.34	4.46
Net Irr. Reqd. (in)	0.00	0.00	0.00	0.00	1.77	3.57	2.39	1.84	2.82	1.46	0.00	0.00
Gross Irr. (in)	0.00	0.00	0.00	0.00	2.53	5.10	3.41	2.64	4.03	2.08	0.00	0.00
Eff. Rain/ETo	0.88	0.86	1.04	0.95	0.50	0.25	0.42	0.51	0.31	0.53	0.95	1.06
80% Rain (in)	4.80	4.70	6.60	6.00	3.20	1.60	2.70	3.40	1.80	3.10	5.30	5.70
80% Eff. Rain (in)	3.02	2.97	4.08	3.77	2.26	1.25	1.97	2.43	1.34	2.15	3.30	3.45
Net Irr. Reqd. (in)	0.58	0.67	0.02	0.36	2.49	3.99	3.02	2.63	3.29	2.17	0.35	0.00
Gross Irr. (in)	0.83	0.96	0.03	0.51	3.56	5.70	4.31	3.76	4.69	3.09	0.50	0.00
Eff. Rain/ETo	0.67	0.65	0.80	0.73	0.38	0.19	0.32	0.38	0.23	0.40	0.72	0.82
90% Rain (in)	4.00	3.90	5.50	5.00	2.70	1.30	2.30	2.90	1.50	2.60	4.40	4.70
90% Eff. Rain (in)	2.58	2.53	3.49	3.22	1.95	1.03	1.71	2.11	1.13	1.84	2.81	2.93
Net Irr. Reqd. (in)	1.02	1.12	0.61	0.90	2.81	4.21	3.28	2.95	3.49	2.48	0.84	0.43
Gross Irr. (in)	1.46	1.60	0.87	1.29	4.01	6.01	4.69	4.22	4.99	3.54	1.20	0.62
Eff. Rain/ETo	0.57	0.55	0.68	0.63	0.33	0.16	0.27	0.33	0.20	0.34	0.62	0.70
GALLONS PER MONTH/ACRE												
50%	0	0	0	0	68563	138451	92622	71555	109440	56487	0	0
80%	22614	26174	819	13793	96665	154755	117079	102182	127432	84034	13597	0
90%	39724	43396	23693	34961	108900	163299	127290	114485	135504	96044	32566	16843
PEAK DAILY WATER REQUIREMENT (GAL/ACRE)												
50%	4615											
80%	5158											
90%	5443											

*Table B-6c*  
*Crop Water Demand Analysis*

Lower Hamakua Ditch  
IRRIGATION REQUIREMENT FOR AREAS ABOVE 500 FEET ELEVATION

CROP  
Coffee  
Crop Coefficient 0.8  
Pan Evaporation Coefficient 0.80  
Irrigation Efficiency 0.70  
Net Application Depth 3.00  
Application Depth Factor 1.00

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Month. Evap. (in)	4.98	4.96	5.46	5.88	6.97	7.34	7.14	7.23	6.57	5.78	5.11	4.78
ETo (in/mo)	3.98	3.97	4.37	4.70	5.58	5.87	5.71	5.78	5.26	4.62	4.09	3.82
Kc	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
ETcrop (in/mo)	3.19	3.17	3.49	3.76	4.46	4.70	4.57	4.63	4.20	3.70	3.27	3.06
50% Rain (in)	8.10	8.00	11.40	10.70	5.80	2.90	4.80	6.00	3.20	5.10	8.80	9.70
50% Eff. Rain (in)	4.62	4.56	6.27	6.03	3.73	2.07	3.19	3.87	2.19	3.20	4.98	5.34
Net Irr. Reqd. (in)	0.00	0.00	0.00	0.00	0.73	2.63	1.38	0.75	2.01	0.50	0.00	0.00
Gross Irr. (in)	0.00	0.00	0.00	0.00	1.05	3.76	1.97	1.08	2.87	0.71	0.00	0.00
Eff. Rain/ETo	1.16	1.15	1.44	1.28	0.67	0.35	0.56	0.67	0.42	0.69	1.22	1.40
80% Rain (in)	6.00	5.90	8.40	7.90	4.30	2.10	3.60	4.40	2.40	3.80	6.50	7.20
80% Eff. Rain (in)	3.57	3.52	4.84	4.67	2.88	1.55	2.48	2.97	1.70	2.48	3.85	4.15
Net Irr. Reqd. (in)	0.00	0.00	0.00	0.00	1.58	3.15	2.09	1.66	2.50	1.22	0.00	0.00
Gross Irr. (in)	0.00	0.00	0.00	0.00	2.26	4.50	2.98	2.37	3.58	1.74	0.00	0.00
Eff. Rain/ETo	0.90	0.89	1.11	0.99	0.52	0.26	0.43	0.51	0.32	0.54	0.94	1.08
90% Rain (in)	5.10	5.00	7.20	6.80	3.60	1.80	3.00	3.80	2.00	3.20	5.60	6.10
90% Eff. Rain (in)	3.11	3.05	4.25	4.11	2.47	1.35	2.12	2.61	1.44	2.13	3.38	3.60
Net Irr. Reqd. (in)	0.08	0.12	0.00	0.00	1.99	3.35	2.45	2.02	2.76	1.57	0.00	0.00
Gross Irr. (in)	0.11	0.17	0.00	0.00	2.85	4.79	3.51	2.88	3.95	2.24	0.00	0.00
Eff. Rain/ETo	0.78	0.77	0.97	0.87	0.44	0.23	0.37	0.45	0.27	0.46	0.83	0.94
GALLONS PER MONTH/ACRE												
50%	0	0	0	0	28416	101986	53602	29220	77974	19391	0	0
80%	0	0	0	0	61282	122088	80925	64424	97140	47302	0	0
90%	3030	4658	0	0	77288	129957	95172	78180	107134	60732	0	0
PEAK DAILY WATER REQUIREMENT (GALL/ACRE)												
50%	3400											
80%	4070											
90%	4332											

14

I R R I G A T I O N R E Q U I R E M E N T F O R A R E A S A B O V E 5 0 0 F E E T E L E V A T I O N

Ta 3-6d

*Crop Water Demand Analysis*

Lower Hamakua Ditch  
IRRIGATION REQUIREMENT FOR AREAS BELOW 500 FEET ELEVATION

CROP  
Coffee  
Crop Coefficient 0.8  
Pan Evaporation Coefficient 0.80  
Irrigation Efficiency 0.70  
Net Application Depth 3.00  
Application Depth Factor 1.00

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Month. Evap. (in)	5.63	5.7	6.41	6.44	7.43	8.18	7.8	7.91	7.23	6.74	5.7	5.25
ETo (in/mo)	4.50	4.56	5.13	5.15	5.94	6.54	6.24	6.33	5.78	5.39	4.56	4.20
Kc	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
ETcrop (in/mo)	3.60	3.65	4.10	4.12	4.76	5.24	4.99	5.06	4.63	4.31	3.65	3.36
50% Rain (in)	6.60	6.50	9.00	8.20	4.40	2.20	3.70	4.70	2.50	4.30	7.30	7.70
50% Eff. Rain (in)	3.97	3.93	5.31	4.91	2.99	1.67	2.60	3.22	1.81	2.86	4.34	4.46
Net Irr. Req'd. (in)	0.00	0.00	0.00	0.00	1.77	3.57	2.39	1.84	2.82	1.46	0.00	0.00
Gross Irr. (in)	0.00	0.00	0.00	0.00	2.53	5.10	3.41	2.64	4.03	2.08	0.00	0.00
Eff. Rain/ETo	0.88	0.86	1.04	0.95	0.50	0.25	0.42	0.51	0.31	0.53	0.95	1.06
80% Rain (in)	4.80	4.70	6.60	6.00	3.20	1.60	2.70	3.40	1.80	3.10	5.30	5.70
80% Eff. Rain (in)	3.02	2.97	4.08	3.77	2.26	1.25	1.97	2.43	1.34	2.15	3.30	3.45
Net Irr. Req'd. (in)	0.58	0.67	0.02	0.36	2.49	3.99	3.02	2.63	3.29	2.17	0.35	0.00
Gross Irr. (in)	0.83	0.96	0.03	0.51	3.56	5.70	4.31	3.76	4.69	3.09	0.50	0.00
Eff. Rain/ETo	0.67	0.65	0.80	0.73	0.38	0.19	0.32	0.38	0.23	0.40	0.72	0.82
90% Rain (in)	4.00	3.90	5.50	5.00	2.70	1.30	2.30	2.90	1.50	2.60	4.40	4.70
90% Eff. Rain (in)	2.58	2.53	3.49	3.22	1.95	1.03	1.71	2.11	1.13	1.84	2.81	2.93
Net Irr. Req'd. (in)	1.02	1.12	0.61	0.90	2.81	4.21	3.28	2.95	3.49	2.48	0.84	0.43
Gross Irr. (in)	1.46	1.60	0.87	1.29	4.01	6.01	4.69	4.22	4.99	3.54	1.20	0.62
Eff. Rain/ETo	0.57	0.55	0.68	0.63	0.33	0.16	0.27	0.33	0.20	0.34	0.62	0.70
GALLONS PER MONTH/ACRE												
50%	0	0	0	0	68563	138451	92622	71555	109440	56487	0	0
80%	22614	26174	819	13793	96665	154755	117079	102182	127432	84034	13597	0
90%	39724	43396	23693	34961	108900	163299	127290	114485	135504	95044	32566	16843
PEAK DAILY WATER REQUIREMENT (GAL/ACRE)												
50%	4615											
80%	5158											
90%	5443											

**Table B-6e**  
**Crop Water Demand Analysis**

Lower Hamakua Ditch  
IRRIGATION REQUIREMENT FOR AREAS ABOVE 500 FEET ELEVATION

CROP	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Foliage/flowers												
Crop Coefficient	0.9											
Pan Evaporation Coefficient	0.80											
Irrigation Efficiency	0.70											
Net Application Depth	3.00											
Application Depth Factor	1.00											
MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Month. Evap. (in)	4.98	4.96	5.46	5.88	6.97	7.34	7.14	7.23	6.57	5.78	5.11	4.78
ETo (in/mo)	3.98	3.97	4.37	4.70	5.58	5.87	5.71	5.78	5.26	4.62	4.09	3.82
Kc	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
ETcrop (in/mo)	3.59	3.57	3.93	4.23	5.02	5.28	5.14	5.21	4.73	4.16	3.68	3.44
50% Rain (in)	8.10	8.00	11.40	10.70	5.80	2.90	4.80	6.00	3.20	5.10	8.80	9.70
50% Eff. Rain (in)	4.72	4.67	6.42	6.19	3.85	2.14	3.29	4.00	2.26	3.28	5.09	5.45
Net Irr. Req'd. (in)	0.00	0.00	0.00	0.00	1.17	3.15	1.85	1.20	2.47	0.88	0.00	0.00
Gross Irr. (in)	0.00	0.00	0.00	0.00	1.67	4.50	2.64	1.72	3.53	1.26	0.00	0.00
Eff. Rain/ETo	1.18	1.18	1.47	1.32	0.69	0.36	0.58	0.69	0.43	0.71	1.25	1.43
80% Rain (in)	6.00	5.90	8.40	7.90	4.30	2.10	3.60	4.40	2.40	3.80	6.50	7.20
80% Eff. Rain (in)	3.65	3.60	4.96	4.79	2.97	1.60	2.56	3.06	1.75	2.54	3.93	4.24
Net Irr. Req'd. (in)	0.00	0.00	0.00	0.00	2.05	3.68	2.58	2.14	2.98	1.62	0.00	0.00
Gross Irr. (in)	0.00	0.00	0.00	0.00	2.92	5.26	3.68	3.06	4.26	2.31	0.00	0.00
Eff. Rain/ETo	0.92	0.91	1.14	1.02	0.53	0.27	0.45	0.53	0.33	0.55	0.96	1.11
90% Rain (in)	5.10	5.00	7.20	6.80	3.60	1.80	3.00	3.80	2.00	3.20	5.60	6.10
90% Eff. Rain (in)	3.18	3.12	4.35	4.22	2.55	1.39	2.18	2.70	1.49	2.19	3.46	3.68
Net Irr. Req'd. (in)	0.41	0.45	0.00	0.02	2.47	3.89	2.96	2.51	3.24	1.97	0.22	0.00
Gross Irr. (in)	0.58	0.64	0.00	0.02	3.53	5.56	4.22	3.58	4.64	2.82	0.31	0.00
Eff. Rain/ETo	0.80	0.79	1.00	0.90	0.46	0.24	0.38	0.47	0.28	0.47	0.85	0.96
GALLONS PER MONTH/ACRE												
50%	0	0	0	0	45470	122088	71750	46721	95825	34080	0	415933
80%	0	0	0	0	79375	142860	99958	83081	115562	62721	0	583557
90%	15770	17394	0	630	95888	150992	114667	97289	125854	76503	8380	703366
PEAK DAILY WATER REQUIREMENT (GAL/ACRE)												
50%	4070											
80%	4762											
90%	5033											

*Table of*  
**Crop Water Demand Analysis**

Lower Hamakua Ditch  
IRRIGATION REQUIREMENT FOR AREAS BELOW 500 FEET ELEVATION

CROP  
Foliage/flowers  
Crop Coefficient 0.9  
Pan Evaporation Coefficient 0.80  
Irrigation Efficiency 0.70  
Net Application Depth 3.00  
Application Depth Factor 1.00

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Month. Evap. (in)	5.63	5.7	6.41	6.44	7.43	8.18	7.8	7.91	7.23	6.74	5.7	5.25
ETo (in/mo)	4.50	4.56	5.13	5.15	5.94	6.54	6.24	6.33	5.78	5.39	4.56	4.20
Kc	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
ETcrop (in/mo)	4.05	4.10	4.62	4.64	5.35	5.89	5.62	5.70	5.21	4.85	4.10	3.78
50% Rain (in)	6.60	6.50	9.00	8.20	4.40	2.20	3.70	4.70	2.50	4.30	7.30	7.70
50% Eff. Rain (in)	4.07	4.03	5.47	5.06	3.09	1.73	2.70	3.33	1.87	2.94	4.45	4.57
Net Irr. Req'd. (in)	0.00	0.08	0.00	0.00	2.26	4.16	2.92	2.36	3.34	1.91	0.00	0.00
Gross Irr. (in)	0.00	0.11	0.00	0.00	3.23	5.95	4.17	3.37	4.77	2.73	0.00	0.00
Eff. Rain/ETo	0.90	0.88	1.07	0.98	0.52	0.26	0.43	0.53	0.32	0.55	0.98	1.09
80% Rain (in)	4.80	4.70	6.60	6.00	3.20	1.60	2.70	3.40	1.80	3.10	5.30	5.70
80% Eff. Rain (in)	3.10	3.05	4.20	3.88	2.34	1.29	2.04	2.52	1.39	2.21	3.38	3.54
Net Irr. Req'd. (in)	0.96	1.05	0.42	0.76	3.01	4.60	3.57	3.18	3.82	2.64	0.72	0.24
Gross Irr. (in)	1.37	1.51	0.59	1.09	4.30	6.57	5.10	4.54	5.46	3.77	1.03	0.35
Eff. Rain/ETo	0.69	0.67	0.82	0.75	0.39	0.20	0.33	0.40	0.24	0.41	0.74	0.84
90% Rain (in)	4.00	3.90	5.50	5.00	2.70	1.30	2.30	2.90	1.50	2.60	4.40	4.70
90% Eff. Rain (in)	2.64	2.59	3.59	3.31	2.01	1.06	1.77	2.19	1.17	1.89	2.88	3.00
Net Irr. Req'd. (in)	1.41	1.51	1.02	1.32	3.34	4.83	3.84	3.51	4.03	2.96	1.22	0.78
Gross Irr. (in)	2.01	2.16	1.46	1.89	4.77	6.89	5.49	5.01	5.76	4.23	1.75	1.12
Eff. Rain/ETo	0.59	0.57	0.70	0.64	0.34	0.16	0.28	0.35	0.20	0.35	0.63	0.71
GALLONS PER MONTH/ACRE												
50%	0	2917	0	0	87707	161429	113243	91610	129576	74013	0	0
80%	37100	40886	16109	29512	116758	178340	138568	123338	148158	102403	27985	9465
90%	54646	58553	38648	51298	129405	187202	149141	136084	156496	114779	47444	30440
PEAK DAILY WATER REQUIREMENT (GAL/ACRE)												
50%												
80%												
90%												

*Table B-6g*  
**Crop Water Demand Analysis**

Lower Hamakua Ditch  
IRRIGATION REQUIREMENT FOR AREAS ABOVE 500 FEET ELEVATION

CROP	Macadamia											
	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Crop Coefficient	0.7											
Pan Evaporation Coefficient	0.80											
Irrigation Efficiency	0.70											
Net Application Depth	3.00											
Application Depth Factor	1.00											
Month. Evap. (in)	4.98	4.96	5.46	5.88	6.97	7.34	7.14	7.23	6.57	5.78	5.11	4.78
ETo (in/mo)	3.98	3.97	4.37	4.70	5.58	5.87	5.71	5.78	5.26	4.62	4.09	3.82
Kc	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
ETcrop (in/mo)	2.79	2.78	3.06	3.29	3.90	4.11	4.00	4.05	3.68	3.24	2.86	2.68
50% Rain (in)	8.10	8.00	11.40	10.70	5.80	2.90	4.80	6.00	3.20	5.10	8.80	9.70
50% Eff. Rain (in)	4.51	4.46	6.12	5.88	3.61	2.00	3.09	3.75	2.13	3.12	4.86	5.23
Net Irr. Req'd. (in)	0.00	0.00	0.00	0.00	0.29	2.11	0.91	0.30	1.55	0.12	0.00	0.00
Gross Irr. (in)	0.00	0.00	0.00	0.00	0.41	3.01	1.30	0.43	2.21	0.17	0.00	0.00
Eff. Rain/ETo	1.13	1.13	1.40	1.25	0.65	0.34	0.54	0.65	0.41	0.67	1.19	1.37
80% Rain (in)	6.00	5.90	8.40	7.90	4.30	2.10	3.60	4.40	2.40	3.80	6.50	7.20
80% Eff. Rain (in)	3.50	3.44	4.73	4.55	2.79	1.50	2.41	2.87	1.65	2.42	3.76	4.06
Net Irr. Req'd. (in)	0.00	0.00	0.00	0.00	1.11	2.61	1.59	1.18	2.03	0.82	0.00	0.00
Gross Irr. (in)	0.00	0.00	0.00	0.00	1.59	3.73	2.28	1.68	2.90	1.17	0.00	0.00
Eff. Rain/ETo	0.88	0.87	1.08	0.97	0.50	0.26	0.42	0.50	0.31	0.52	0.92	1.06
90% Rain (in)	5.10	5.00	7.20	6.80	3.60	1.80	3.00	3.80	2.00	3.20	5.60	6.10
90% Eff. Rain (in)	3.04	2.99	4.15	4.00	2.39	1.30	2.05	2.53	1.40	2.08	3.31	3.52
Net Irr. Req'd. (in)	0.00	0.00	0.00	0.00	1.51	2.81	1.95	1.52	2.28	1.16	0.00	0.00
Gross Irr. (in)	0.00	0.00	0.00	0.00	2.16	4.01	2.78	2.17	3.25	1.65	0.00	0.00
Eff. Rain/ETo	0.76	0.75	0.95	0.85	0.43	0.22	0.36	0.44	0.27	0.45	0.81	0.92
GALLONS PER MONTH/ACRE												
50%	0	0	0	0	11222	81798	35329	11562	60049	4620	0	0
80%	0	0	0	0	43080	101251	61793	45647	78661	31818	0	0
90%	0	0	0	0	58595	108867	75593	58966	88366	44907	0	0
PEAK DAILY WATER REQUIREMENT (GAL/ACRE)												
50%	2727											
80%	3375											
90%	3629											

*Crop Water Demand Analysis*

Lower Hamakua Ditch  
IRRIGATION REQUIREMENT FOR AREAS BELOW 500 FEET ELEVATION

CROP	Macadamia
Crop Coefficient	0.7
Pan Evaporation Coefficient	0.80
Irrigation Efficiency	0.70
Net Application Depth	3.00
Application Depth Factor	1.00

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Month. Evap. (in)	5.63	5.7	6.41	6.44	7.43	8.18	7.8	7.91	7.23	6.74	5.7	5.25
ETo (in/mo)	4.50	4.56	5.13	5.15	5.94	6.54	6.24	6.33	5.78	5.39	4.56	4.20
Kc	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
ETcrop (in/mo)	3.15	3.19	3.59	3.61	4.16	4.58	4.37	4.43	4.05	3.77	3.19	2.94
50% Rain (in)	6.60	6.50	9.00	8.20	4.40	2.20	3.70	4.70	2.50	4.30	7.30	7.70
50% Eff. Rain (in)	3.87	3.83	5.16	4.78	2.89	1.61	2.51	3.11	1.75	2.77	4.23	4.36
Net Irr. Req'd. (in)	0.00	0.00	0.00	0.00	1.27	2.97	1.85	1.32	2.30	1.00	0.00	0.00
Gross Irr. (in)	0.00	0.00	0.00	0.00	1.82	4.25	2.65	1.89	3.29	1.43	0.00	0.00
Eff. Rain/ETo	0.86	0.84	1.01	0.93	0.49	0.25	0.40	0.49	0.30	0.51	0.93	1.04
80% Rain (in)	4.80	4.70	6.60	6.00	3.20	1.60	2.70	3.40	1.80	3.10	5.30	5.70
80% Eff. Rain (in)	2.95	2.90	3.97	3.66	2.19	1.20	1.91	2.34	1.30	2.08	3.21	3.37
Net Irr. Req'd. (in)	0.21	0.29	0.00	0.00	1.97	3.38	2.46	2.09	2.75	1.69	0.00	0.00
Gross Irr. (in)	0.30	0.42	0.00	0.00	2.82	4.83	3.52	2.98	3.93	2.42	0.00	0.00
Eff. Rain/ETo	0.65	0.64	0.77	0.71	0.37	0.18	0.31	0.37	0.22	0.39	0.70	0.80
90% Rain (in)	4.00	3.90	5.50	5.00	2.70	1.30	2.30	2.90	1.50	2.60	4.40	4.70
90% Eff. Rain (in)	2.52	2.47	3.39	3.13	1.88	0.99	1.65	2.04	1.10	1.78	2.74	2.86
Net Irr. Req'd. (in)	0.64	0.73	0.20	0.48	2.28	3.59	2.72	2.39	2.95	1.99	0.45	0.08
Gross Irr. (in)	0.91	1.04	0.28	0.68	3.25	5.13	3.88	3.42	4.22	2.84	0.65	0.12
Eff. Rain/ETo	0.56	0.54	0.66	0.61	0.32	0.15	0.26	0.32	0.19	0.33	0.60	0.68

GALLONS PER MONTH/ACRE	0	0	0	0	49292	115387	71877	51344	89232	38860	0	415993
50%	8055	11386	0	0	76476	131105	95497	80907	108651	65590	0	575667
80%	24739	28176	7626	18521	88311	139343	105358	92783	114467	77243	17618	717369
90%												

PEAK DAILY WATER REQUIREMENT (GAL/ACRE)

50%	3846
80%	4370
90%	4645

**Table B-6i**  
**Crop Water Demand Analysis**

Lower Hamakua Ditch  
IRRIGATION REQUIREMENT FOR AREAS ABOVE 500 FEET ELEVATION

CROP Papaya  
Crop Coefficient 0.8  
Pan Evaporation Coefficient 0.80  
Irrigation Efficiency 0.70  
Net Application Depth 3.00  
Application Depth Factor 1.00

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Month. Evap. (in)	4.98	4.96	5.46	5.88	6.97	7.34	7.14	7.23	6.57	5.78	5.11	4.78
ETo (in/mo)	3.98	3.97	4.37	4.70	5.58	5.87	5.71	5.78	5.26	4.62	4.09	3.82
Kc	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
ETcrop (in/mo)	3.19	3.17	3.49	3.76	4.46	4.70	4.57	4.63	4.20	3.70	3.27	3.06
50% Rain (in)	8.10	8.00	11.40	10.70	5.60	2.90	4.80	6.00	3.20	5.10	8.80	9.70
50% Eff. Rain (in)	4.62	4.56	6.27	6.03	3.73	2.07	3.19	3.87	2.19	3.20	4.98	5.34
Net Irr. Req'd. (in)	0.00	0.00	0.00	0.00	0.73	2.63	1.38	0.75	2.01	0.50	0.00	0.00
Gross Irr. (in)	0.00	0.00	0.00	0.00	1.05	3.76	1.97	1.08	2.87	0.71	0.00	0.00
Eff. Rain/ETo	1.16	1.15	1.44	1.28	0.67	0.35	0.56	0.67	0.42	0.69	1.22	1.40
80% Rain (in)	6.00	5.90	8.40	7.90	4.30	2.10	3.60	4.40	2.40	3.80	6.50	7.20
80% Eff. Rain (in)	3.57	3.52	4.84	4.67	2.88	1.55	2.48	2.97	1.70	2.48	3.85	4.15
Net Irr. Req'd. (in)	0.00	0.00	0.00	0.00	1.58	3.15	2.09	1.66	2.50	1.22	0.00	0.00
Gross Irr. (in)	0.00	0.00	0.00	0.00	2.26	4.50	2.98	2.37	3.58	1.74	0.00	0.00
Eff. Rain/ETo	0.90	0.89	1.11	0.99	0.52	0.26	0.43	0.51	0.32	0.54	0.94	1.08
90% Rain (in)	5.10	5.00	7.20	6.80	3.60	1.80	3.00	3.80	2.00	3.20	5.50	6.10
90% Eff. Rain (in)	3.11	3.05	4.25	4.11	2.47	1.35	2.12	2.61	1.44	2.13	3.38	3.60
Net Irr. Req'd. (in)	0.08	0.12	0.00	0.00	1.99	3.35	2.45	2.02	2.76	1.57	0.00	0.00
Gross Irr. (in)	0.11	0.17	0.00	0.00	2.85	4.79	3.51	2.88	3.95	2.24	0.00	0.00
Eff. Rain/ETo	0.78	0.77	0.97	0.87	0.44	0.23	0.37	0.45	0.27	0.46	0.83	0.94
GALLONS PER MONTH/ACRE												
50%	0	0	0	0	28416	101986	53602	29220	77974	19391	0	0
80%	0	0	0	0	61282	122088	80925	64424	97140	47302	0	0
90%	3030	4658	0	0	77288	129957	95172	78180	107134	60732	0	0
PEAK DAILY WATER REQUIREMENT (GAL/ACRE)												
50%	3400											
80%	4070											
90%	4332											



*Tavie B-6j*  
**Crop Water Demand Analysis**

Lower Hamakua Ditch  
 IRRIGATION REQUIREMENT FOR AREAS BELOW 500 FEET ELEVATION

CROP  
 Papaya  
 Crop Coefficient 0.8  
 Pan Evaporation Coefficient 0.80  
 Irrigation Efficiency 0.70  
 Net Application Depth 3.00  
 Application Depth Factor 1.00

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Month. Evap. (in)	5.63	5.7	6.41	6.44	7.43	8.18	7.8	7.91	7.23	6.74	5.7	5.25
ETo (in/mo)	4.50	4.56	5.13	5.15	5.94	6.54	6.24	6.33	5.78	5.39	4.56	4.20
Kc	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
ETcrop (in/mo)	3.60	3.65	4.10	4.12	4.76	5.24	4.99	5.06	4.63	4.31	3.65	3.36
50% Rain (in)	6.60	6.50	9.00	8.20	4.40	2.20	3.70	4.70	2.50	4.30	7.30	7.70
50% Eff. Rain (in)	3.97	3.93	5.31	4.91	2.99	1.67	2.60	3.22	1.81	2.86	4.34	4.46
Net Irr. Reqd. (in)	0.00	0.00	0.00	0.00	1.77	3.57	2.39	1.84	2.82	1.46	0.00	0.00
Gross Irr. (in)	0.00	0.00	0.00	0.00	2.53	5.10	3.41	2.64	4.03	2.08	0.00	0.00
Eff. Rain/ETo	0.88	0.86	1.04	0.95	0.50	0.25	0.42	0.51	0.31	0.53	0.95	1.06
80% Rain (in)	4.80	4.70	6.60	6.00	3.20	1.60	2.70	3.40	1.80	3.10	5.30	5.70
80% Eff. Rain (in)	3.02	2.97	4.08	3.77	2.26	1.25	1.97	2.43	1.34	2.15	3.30	3.45
Net Irr. Reqd. (in)	0.58	0.67	0.02	0.36	2.49	3.99	3.02	2.63	3.29	2.17	0.35	0.00
Gross Irr. (in)	0.83	0.96	0.03	0.51	3.56	5.70	4.31	3.76	4.69	3.09	0.50	0.00
Eff. Rain/ETo	0.67	0.65	0.80	0.73	0.38	0.19	0.32	0.38	0.23	0.40	0.72	0.82
90% Rain (in)	4.00	3.90	5.50	5.00	2.70	1.30	2.30	2.90	1.50	2.60	4.40	4.70
90% Eff. Rain (in)	2.58	2.53	3.49	3.22	1.95	1.03	1.71	2.11	1.13	1.84	2.81	2.93
Net Irr. Reqd. (in)	1.02	1.12	0.61	0.90	2.81	4.21	3.28	2.95	3.49	2.48	0.84	0.43
Gross Irr. (in)	1.46	1.60	0.87	1.29	4.01	6.01	4.69	4.22	4.99	3.54	1.20	0.62
Eff. Rain/ETo	0.57	0.55	0.68	0.63	0.33	0.16	0.27	0.33	0.20	0.34	0.62	0.70
GALLONS PER MONTH/ACRE												
50%	0	0	0	0	68563	138451	92622	71555	109440	56487	0	0
80%	22614	26174	819	13793	96665	154755	117079	102182	127432	84034	13597	0
90%	39724	43396	23693	34961	108900	163299	127290	114485	135504	96044	32566	16843
PEAK DAILY WATER REQUIREMENT (GAL/ACRE)												
50%												
80%												
90%												

**Table B-6k**  
**Crop Water Demand Analysis**

Lower Hamakua Ditch  
IRRIGATION REQUIREMENT FOR AREAS ABOVE 500 FEET ELEVATION

CROP	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Truck Crops												
Crop Coefficient	0.7											
Pan Evaporation Coefficient	0.80											
Irrigation Efficiency	0.70											
Net Application Depth	3.00											
Application Depth Factor	1.00											
Month. Evap. (in)	4.98	4.96	5.46	5.88	6.97	7.34	7.14	7.23	6.57	5.78	5.11	4.78
ETo (in/mo)	3.98	3.97	4.37	4.70	5.58	5.87	5.71	5.78	5.26	4.62	4.09	3.82
Kc	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
ETcrop (in/mo)	2.79	2.78	3.06	3.29	3.90	4.11	4.00	4.05	3.68	3.24	2.86	2.68
50% Rain (in)	8.10	8.00	11.40	10.70	5.80	2.90	4.80	6.00	3.20	5.10	8.80	9.70
50% Eff. Rain (in)	4.51	4.46	6.12	5.88	3.61	2.00	3.09	3.75	2.13	3.12	4.86	5.23
Net Irr. Reqd. (in)	0.00	0.00	0.00	0.00	0.29	2.11	0.91	0.30	1.55	0.12	0.00	0.00
Gross Irr. (in)	0.00	0.00	0.00	0.00	0.41	3.01	1.30	0.43	2.21	0.17	0.00	0.00
Eff. Rain/ETo	1.13	1.13	1.40	1.25	0.65	0.34	0.54	0.65	0.41	0.67	1.19	1.37
80% Rain (in)	6.00	5.90	8.40	7.90	4.30	2.10	3.60	4.40	2.40	3.80	6.50	7.20
80% Eff. Rain (in)	3.50	3.44	4.73	4.55	2.79	1.50	2.41	2.87	1.65	2.42	3.76	4.06
Net Irr. Reqd. (in)	0.00	0.00	0.00	0.00	1.11	2.61	1.59	1.18	2.03	0.82	0.00	0.00
Gross Irr. (in)	0.00	0.00	0.00	0.00	1.59	3.73	2.28	1.68	2.90	1.17	0.00	0.00
Eff. Rain/ETo	0.88	0.87	1.08	0.97	0.50	0.26	0.42	0.50	0.31	0.52	0.92	1.06
90% Rain (in)	5.10	5.00	7.20	6.80	3.60	1.80	3.00	3.80	2.00	3.20	5.60	6.10
90% Eff. Rain (in)	3.04	2.99	4.15	4.00	2.39	1.30	2.05	2.53	1.40	2.08	3.31	3.52
Net Irr. Reqd. (in)	0.00	0.00	0.00	0.00	1.51	2.81	1.95	1.52	2.28	1.16	0.00	0.00
Gross Irr. (in)	0.00	0.00	0.00	0.00	2.16	4.01	2.78	2.17	3.25	1.65	0.00	0.00
Eff. Rain/ETo	0.76	0.75	0.95	0.85	0.43	0.22	0.36	0.44	0.27	0.45	0.81	0.92
GALLONS PER MONTH/ACRE												
50%	0	0	0	0	11222	81798	35329	11562	60049	4620	0	204580
80%	0	0	0	0	43080	101251	61793	45647	78661	31818	0	362250
90%	0	0	0	0	58595	108867	75593	58966	88366	44907	0	435293
PEAK DAILY WATER REQUIREMENT (GAL/ACRE)												
50%	2727											
80%	3375											
90%	3629											

*Crop Water Demand Analysis*

Lower Hamakua Ditch

IRRIGATION REQUIREMENT FOR AREAS BELOW 500 FEET ELEVATION

CROP

Crop Coefficient	Truck crops
Pan Evaporation Coefficient	0.7
Irrigation Efficiency	0.80
Net Application Depth	0.70
Application Depth Factor	3.00
	1.00

MONTH	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Month. Evap. (in)	5.63	5.7	6.41	6.44	7.43	8.18	7.8	7.91	7.23	6.74	5.7	5.25
ETo (in/mo)	4.50	4.56	5.13	5.15	5.94	6.54	6.24	6.33	5.78	5.39	4.56	4.20
Kc	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
ETcrop (in/mo)	3.15	3.19	3.59	3.61	4.16	4.58	4.37	4.43	4.05	3.77	3.19	2.94
50% Rain (in)	6.60	6.50	9.00	8.20	4.40	2.20	3.70	4.70	2.50	4.30	7.30	7.70
50% Eff. Rain (in)	3.87	3.83	5.16	4.78	2.89	1.61	2.51	3.11	1.75	2.77	4.23	4.36
Net Irr. Reqd. (in)	0.00	0.00	0.00	0.00	1.27	2.97	1.85	1.32	2.30	1.00	0.00	0.00
Gross Irr. (in)	0.00	0.00	0.00	0.00	1.82	4.25	2.65	1.89	3.29	1.43	0.00	0.00
Eff. Rain/ETo	0.86	0.84	1.01	0.93	0.49	0.25	0.40	0.49	0.30	0.51	0.93	1.04
80% Rain (in)	4.80	4.70	6.60	6.00	3.20	1.60	2.70	3.40	1.80	3.10	5.30	5.70
80% Eff. Rain (in)	2.95	2.90	3.97	3.66	2.19	1.20	1.91	2.34	1.30	2.08	3.21	3.37
Net Irr. Reqd. (in)	0.21	0.29	0.00	0.00	1.97	3.38	2.46	2.09	2.75	1.69	0.00	0.00
Gross Irr. (in)	0.30	0.42	0.00	0.00	2.82	4.83	3.52	2.98	3.93	2.42	0.00	0.00
Eff. Rain/ETo	0.65	0.64	0.77	0.71	0.37	0.18	0.31	0.37	0.22	0.39	0.70	0.80
90% Rain (in)	4.00	3.90	5.50	5.00	2.70	1.30	2.30	2.90	1.50	2.60	4.40	4.70
90% Eff. Rain (in)	2.52	2.47	3.39	3.13	1.88	0.99	1.65	2.04	1.10	1.78	2.74	2.86
Net Irr. Reqd. (in)	0.64	0.73	0.20	0.48	2.28	3.59	2.72	2.39	2.95	1.99	0.45	0.08
Gross Irr. (in)	0.91	1.04	0.28	0.68	3.25	5.13	3.88	3.42	4.22	2.84	0.65	0.12
Eff. Rain/ETo	0.56	0.54	0.66	0.61	0.32	0.15	0.26	0.32	0.19	0.33	0.60	0.68

GALLONS PER MONTH/ACRE

50%	0	0	0	0	49292	115387	71877	51344	89232	38860	0	0
80%	8055	11386	0	0	76476	131105	95497	80507	105651	65590	0	0
90%	24739	28176	7626	18521	88311	139343	105358	92783	114467	77243	17618	3183

PEAK DAILY WATER REQUIREMENT (GAL/ACRE)

50%	3846
80%	4370
90%	4645

The future estimated daily average water demand for the LHD agricultural water system for an average day (*Table B-8*) and during peak demand (*Table B-9*) periods were estimated from discussions with interests in the community and from the irrigation requirement analysis.

**Table B-7: Daily Irrigation Water Requirement  
(Gallons/Acre/Day)**

(Freq. Rainfall)	Below 500 Ft.		Above 500 Ft.	
	50%	80%	50%	80%
Average Daily	1,500	2,100	900	1,350
Peak Daily	4,700	5,300	3,500	4,200

**Table B-8  
Peak Daily Water Usage  
Million Gallons per Day**

Irrigation (1)	12.50
Aquaculture	1.00
Livestock water	0.05
Feedlot/Slaughterhouse	0.10
Kukuihaele Community	0.05
Honokaa Emergency Supply	0.15
<b>Subtotal</b>	<b>13.85</b>
Estimated Maximum Daily Use	14
Estimated Residual System Loss	3
<b>Maximum Daily Water Diversion</b>	<b>17</b>

(1) Average of high monthly irrigation need  
at 80% annual rainfall exceedence frequency

**Table B-9  
Average Daily Water Usage  
Million Gallons per Day**

Irrigation (1)	3.00
Aquaculture	1.00
Livestock water	0.05
Feedlot/Slaughterhouse	0.10
Kukuihaele Community	0.05
Honokaa Emergency Supply	0.00
<b>Subtotal</b>	<b>4.2</b>
Estimated Maximum Daily Use	4.2
Estimated Residual System Loss	3
<b>Maximum Daily Water Diversion</b>	<b>7.2</b>

(1) Average of annual irrigation need at  
50% annual rainfall exceedence frequency

### B.3 ENGINEERING

Three structural alternatives, in addition to the No Action Alternative, were developed for consideration by the sponsors. The level of engineering evaluation and design of the structural alternatives was limited to that sufficient to compare benefits to life cycle costs for the alternatives. The feasibility of the alternatives and determination of the sizes or capacities of the alternative's components was evaluated by examining existing infrastructure and conducting basic hydraulic analysis. Estimated lump sum-type costs were applied to major components of each alternative. (Tables D, E, and F) Operation, maintenance, and replacement costs, including energy costs, were estimated for the average annual period. (Table G)

Alternative 2 - Wells was intended to provide all of the water needed in the Hamakua project area from groundwater sources. The capability of the aquifer to provide the peak of 14 MG was based on past performance of existing wells and published analysis of the island of Hawaii aquifer systems. Well development costs reflected the depth of well development required in the Hamakua area. The depth of the wells will be between 300 and 500 feet in order to be able to pump at the rate of 1,000 gpm with reduced risk of saltwater intrusion. Pumping energy requirements were estimated using the procedures in the NRCS National Engineering Handbook Section 15 - Irrigation, Chapter 8 - Irrigation Pumping Plants. Electrical rate schedule information was provided by HELCO.

Alternative 3 - Repair and Restoration of the LHD is intended to provide the maintenance, repair, and replacement necessary to bring the system to a level where an ordinary amount of maintenance would be sufficient to ensure continued operation of the existing system. The proposed improvements on the open ditch are based on field observations, discussions with the current maintenance contractor, and two 1995 engineering reports. Work on the open ditch will be similar to that that has been undertaken in the recent past. Although the repair of the Hakalaoa tunnel has been based on discussions with numerous parties, a clear sense of the procedure or design of the repair has not developed. Because of the specialized nature of the work, it is suggested that a design-build process, in which the contractor both prepares the design and specifications of the work and provides construction, be used.

Alternative 4 - Pipeline assumes the entire open ditch is converted to pipeline. While pipe pressure analysis using the NRCS-developed agricultural pipeline analysis tool IPIPE was conducted, the most satisfactory alignment to minimize pipe costs was that of the open ditch.

The lateral system and SCADA system for both Alternatives 3 and 4 will be designed and installed as the projected farm areas are established.

The components of the Selected Plan were evaluated and planned to a level which provides decisionmakers and funding managers the information needed to support their actions. The plans are intended to guide designers to prepare the final plans

and specifications for construction of the project components. Component costs are based generally on similar work conducted in Hawaii.

### **B.3.1 Costs**

Total installation cost sums construction, engineering, project administration, and real property costs. The average annual cost of the installed project is the amortized installation cost, for 25 years at the federal Fiscal Year 1998 discount rate of 7.75 percent, plus the average annual operation, maintenance, and replacement cost.

### **B.3.2 Construction Costs**

Construction costs include materials and labor for the repair and construction of the LHD system. All but two wooden flumes will be replaced with corrugated metal pipe or inverted pipe siphons. Metal I-beams will replace the rotting timber supports. In the open ditch sections, sediment will be removed and the concrete lining will be repaired. The diversion structures at Kawainui, Alakahi, and Koiawe streams will be repaired and modified to prevent structural failure, reduce maintenance requirements, and restore stream flow to Waipio Valley streams. A 1 MG reservoir will be installed at the Honokaia lateral to provide operational flexibility to HNHAC farmers. The 10 MG Paauilo Reservoir will be lined to eliminate seepage losses. Approximately ten lateral distribution systems will be installed. Hakalaoa Falls will be restored through the repair of the tunnel behind the falls and removal of the temporary flume structure. A Supervisory Control and Data Acquisition system will be implemented to allow remote data collection and operation of key components.

Project cost estimates were made based on work item quantities and unit costs. Unit costs were developed using past estimates and bids for similar work performed in Hawaii by NRCS and the Maui Department of Water Supply. Update of costs used the Engineering News Record's Construction Cost Index. Quantities for each work item were estimated through the preparation of low- to medium-intensity engineering designs.

For agricultural water management purposes, PL-566 will provide up to 50 percent of construction costs.

### **B.3.3 Real Property Costs**

Real property costs include acquisition of construction and maintenance rights-of-way, relocation and repair of utilities and road surfaces, acquisition of water rights, and legal costs for these items. All real property costs are the responsibility of the sponsors.

It is assumed that the major landrights cost will be documenting and recording the passing of the LHD through a parcel. Approximately 100 parcels are affected and will cost approximately \$2,000 each to process.

#### **B.3.4 Engineering Costs**

Engineering costs include surveys for pipeline alignment and installation, design of the pipeline and connections, preparation of the design plans and specifications, and quality assurance during construction. All engineering costs except those associated with real property elements and construction inspection are the responsibility of NRCS.

Engineering costs have been estimated to be 20 percent of total construction cost.

#### **B.3.5 Project Administration Costs**

Project administration costs include contract administration, government representatives during construction, costs associated with permit acquisition, and relocation assistance costs. Project administration costs will be shared by PL-566 and local funding sources.

Contracts will be administered by the State Department of Agriculture and will be guided by state and federal contract requirements. Project costs are estimated to be 12 percent of total construction costs and two-thirds of the cost will be borne by the sponsors.

#### **B.3.6 Operation, Maintenance, and Replacement**

Operation, maintenance, and replacement costs include the costs of keeping project improvements in good working order and accounting for water sales and billing. Operation, maintenance, and replacement costs are the responsibility of the sponsors.

#### **B.4 BIOLOGICAL ANALYSIS**

*The analysis of biological effects of the LHD project was an ongoing effort throughout the planning process. This environmental analysis consisted of the following major steps:*

- *Scoping of concerns - identifying potential biological, cultural, and other concerns.*
- *Preliminary assessment - determining project impacts on those concerns.*
- *Detailed investigation and inventory - specialists conducting field assessments to develop resource inventory.*
- *Detailed assessment - determining project impact on resources that have been inventoried.*

*The initial environmental concerns were identified during the introductory stages of the first Draft EIS (1995), and during the preparation of the second Draft EIS (1998) at the public participation and agency comment stages. Four categories of concern were raised: (A) Some people were concerned about the impact of the project to threatened and endangered species; (B) Several people questioned the impact of changing the flow regime on nonlisted native stream animals and their habitats; and (C) USFWS raised the question about potential adverse effects on wetlands and native damselfly habitat from fixing leaking flumes.*

*Preliminary evaluation of these issues identified the need to conduct more thorough investigation and analysis. The procedures, techniques, and conclusions of the investigations are described below.*

##### **B.4.1 Threatened and Endangered Species**

*The Nature Conservancy's Natural Heritage Database and informal consultation with the U.S. Fish and Wildlife Service under Section 7 of the Endangered Species Act were used to inventory known sightings of both (1) plants and (2) animals that are federally listed threatened or endangered species. The map with element occurrence locations as well as the table with identification number, scientific name, common name, last observed data, accuracy, and federal status under the Endangered Species Act is included in Attachment B-1. Also, field investigations were conducted to inventory and to determine effect of the project on threatened or endangered species.*

##### (1) Botanical

###### Heritage Database:

*Review of the Heritage record showed that in the general area of the LHD, no threatened or endangered species had been sighted. However, *Ochrosia haleakalae* (Holei), a rare species, was seen in 1995; *Cyanea grimesiana* ssp *cylindrocalyz*, (Oha), a Species of Concern (SOC), was sighted in 1909; and *Pritchardia lanigera* (loulou), a SOC, was seen in 1990.*



*In June, 1995, the USFWS determined that six SOC plants were also potentially in the watershed: Platydesma remyi; Trematolobelia grandifolia; Stenogyne cranwelliae; Clermontia drepanomorpha; Eurya sandwicensis; and Gardenia remyi.*

*Field Investigation*

*A field investigation was necessary to establish whether the above species were within the project corridor and whether the project would adversely affect them. Botanist Dr. Derral R. Herbst conducted a field reconnaissance-level survey of the project area in July-August 1996. His study included a corridor approximately 15 miles long and 100 feet wide. No proposed or listed threatened or endangered plants or Species of Concern were seen during the field survey (Herbst 1996).*

*(2) Animal*

*Heritage Database:*

*Four endangered animal species were sighted within the project boundaries and documented in the database: Lasiurus cinereus semotus (Hawaiian hoary bat, 'Ope'ape'a), Listed Endangered (LE) and sighted in 1960, 1964, and 1976; Buteo solitarius (Hawaiian hawk, 'Io) LE and seen in 1971, 1973, and by NRCS in 1998; Anas wyvilliana (Hawaiian, koloa duck) LE and sighted by Englund in 1997; and Fulica alai (Hawaiian coot) LE and recorded as a sighting in Waipio Valley in 1963. Because of these documented sightings of LE species, informal Section 7 consultation was instituted by NRCS.*

*In November 1996 and January 1997, surveys of Waipio Valley streams were undertaken to assess the effect of the diversions on native and threatened and endangered aquatic species. (Englund and Filbert, 1997) No threatened or endangered aquatic species were identified in the survey reaches. Lentipes concolor (O'opu alamo'o), a Species of Concern, was observed in Lalakea/Hiilawe Stream, a stream which will not be affected by the project.*

*(3) Informal Section 7 Consultation*

*NRCS initiated informal consultation with the USFWS on August 22, 1995 by forwarding the "Biological Assessment of Project Effects on Threatened and Endangered Species, Lower Hamakua Ditch Watershed, Island of Hawaii, Hawaii." The USFWS responded in a letter dated October 4, 1995, stating that the Biological Assessment addresses the potential impacts of the LHD project on the Hawaiian hawk, Hawaiian hoary bat, Hawaiian duck, and Hawaiian coot. It stated, "Based on the information included in the Biological Assessment and our knowledge of the project area, the Service will concur with the determination that the proposed action to construct and implement the LHD watershed project is*

*not likely to adversely affect federally listed threatened and endangered species."*

#### **B.4.2 Stream Habitat**

*Concerns were raised about the effects of the LHD project on nonlisted native aquatic species in the stream systems. The two key concerns were: (1) Potential adverse effect on native fauna from water diversions and the decrease in base stream flow, particularly during drought; and (2) Intakes not well designed to release planktonic larvae to flow downstream.*

##### *(1) Stream Flow*

*Between November, 1996 and January 1997, biological assessments of Waipio River and four of its major tributaries were conducted by Ronald A. Englund and David J. Preston of Pacific Aquatic Environmental. The purpose of the study was to inventory baseline distribution and abundance of native and introduced fish, crustaceans, mollusks, and aquatic insects, to evaluate habitat quality, and to assess potential impacts of the LHD project.*

*1996-97 survey results indicate that the diversion structures appear to prevent o'opu from moving into stream reaches above the LHD diversion structures, especially during drought conditions. Stream flow appears to have an effect on aquatic species, in particular o'opu. Other environmental factors in Waipio Valley, such as elevated temp, altered water quality, a labyrinth of ditches, and introduced species, may be partially responsible for limiting the abundance of fish further upstream (Englund, 1997). A new study currently being undertaken by the DAR may uncover reasons for poor upstream migration of post-larval o'opu.*

*During the 1996-97 aquatic survey, a previously undescribed Hawaiian stream fly (Sigmatineurum meaohi) was observed upstream of the Alakahi Stream intake (Englund and Filbert, 1997). While the stream fly is not a listed species, the presumed rarity of the insect prompted the USFWS to request a survey of the extent of the stream fly and characterization of its habitat.*

*Thus in December, 1998, Ronald A. Englund and David J. Preston, now of the Hawaii Biological Survey of the Bishop Museum, and Mike Richardson of the USFWS conducted aquatic insect field assessments on Koiawe, Alakahi, Kawainui, and Waimanu Streams, to assess populations of the newly discovered stream fly and to assess other aquatic insect fauna below and above the LHD diversions to determine if the LHD may have an adverse effect.*

*Intensive surveys for the stream fly started at 640 ft elevation in upper Waipio Stream, and continued upstream along three major tributaries to 1400 ft in Kawainui Stream. One individual of the Hawaiian stream fly (S. meaohi) was found in Alakahi stream below the 1030' elevation*

*diversion at 960, but in the majority of findings this species were at elevations of 1100-1220 in Alakahi and 1020-1040 in Koiawe, above the diversions. The stream fly was not found in Waipio, Kawainui, or Waimanu Streams. Its preferred habitat appears to be in 3 to 12-foot high riffle and cascade zones. Because the survey found only one individual of S. meaohi below the diversion, the surveyors deduced that the location of the sighting is at the lower end of the identified habitat for the species. The main habitat appears to be at higher elevations.*

*The 1998 survey of the distribution of the Hawaiian stream fly (S. meaohi) concluded that because the LHD intakes are located at the lowest elevational range of the stream fly adverse impacts to the species from continued operation of the LHD are expected to be minimal. The survey did indicate that the aquatic habitat below all of the LHD diversions had improved since the 1996 survey, in part, due to the unmaintained condition of the intakes allowing considerable flow to bypass the intakes and also, in part, due to the much wetter climatic conditions during the 1998 survey.*

*A new species of Sigmatineurum was first collected on a seep wall above the diversion in Alakahi Stream, then later collected in seeps of Waimanu Stream, the surveyor's reference site which will not be affected by the project. The LHD project should not impact the new Sigmatineurum species because seep habitats were observed only above the Alakahi diversion, and Waimanu Stream is not diverted or influenced by the LHD (Englund, 1997). Also, the survey determined that it should be considered common due to the large amount of seep faces in Waimanu stream and upper Waipio Valley tributaries. Over 90 specimens were collected from two widely separated areas, in a wide range of elevations (300-1240 ft.)*

*On January 25, 1999, the US Department of the Interior (DOI) provided comments on the LHD project Draft EIS. The main concern was with the proposed removal of most of the base flows of the Kawainui, Alakahi, and Koiawe streams during conditions of drought. DOI recommended the intake structures have a variable diversion design as stated in the proposal and the structures be set to divert a maximum of 70 percent of stream base flow even during drought conditions.*

*The Draft EIS has been changed to reflect this recommendation. The Selected Plan will improve stream habitat for native species found in the streams, including S. meaohi, by providing bypass of 30 percent of the flow during baseflow periods. The restored streamflow will be significant for the stream reaches immediately below the LHD diversions, especially on Kawainui Stream where approximately 1,000 feet of the stream channel is left dry before spring contributions reestablish streamflow. By keeping a minimum of 30% of the baseflow of the streams as instream flow, water over the spillways should be enough to not impede migration. The recommended release of 30 percent of the baseflow to Waipio Valley*

streams will result in reduction of the peak diversion from the earlier-proposed 17 MGD to approximately 13 MGD.

NRCS will continue to work with USFWS and the State Division of Aquatic Resources to measure streamflow and to monitor habitat quality and populations of native organisms during the implementation period of the project. Adaptive management techniques can be used to adjust management of the LHD agricultural water system if adverse impacts are identified.

#### (2) Design of Intakes

Some people expressed concern over the intakes and the ability of native stream biota to migrate upstream over spillways. This will be addressed basically, by placing plates over 30 percent of the intake grates to allow 30 percent of streamflow to bypass the diversion structures. This redesign will allow more native animal reproduction to take place above the intakes and facilitate upstream migration of stream animals. Details of the actual design of the plates will be developed in consultation with the USFWS.

A Watershed Management Forum specific to Waipio valley will be formed to discuss and make decision regarding research, monitoring, modeling, and project needs to achieved the desired increase in native species populations and ecosystem restoration.

#### **B.4.3 Wetlands**

The concern was raised during informal consultation with the USFWS in 1998 that significant wetland habitat may have developed at locations along the Hamakua Ditch where leakage from the ditch and flumes have created artificial wetlands. In particular, habitat for important native plant and animal species, such as species of the Hawaiian damselfly (*Megalagrion* sp.), may be affected by the repair of the ditch and flumes.

##### Offsite Inventory

Wetlands were initially assessed by reviewing the USFWS National Wetlands Inventory maps (USFWS, 1977). (Figure B-2) The entire bottom of Waipio Valley below the Waima Stream confluence is mapped wetland. Kawainui and Alakahi Streams are also mapped and classified by the USFWS as Riverine perennial wetlands. Along the Hamakua coast the lower reaches of the stream gulches are classified as Palustrine forested wetlands and agricultural reservoirs are classified as Palustrine open water impoundments. The open ditch portion of the LHD is classified as excavated Riverine open water (Cowardin, 1979).

RECEIVED AS FOLLOWS

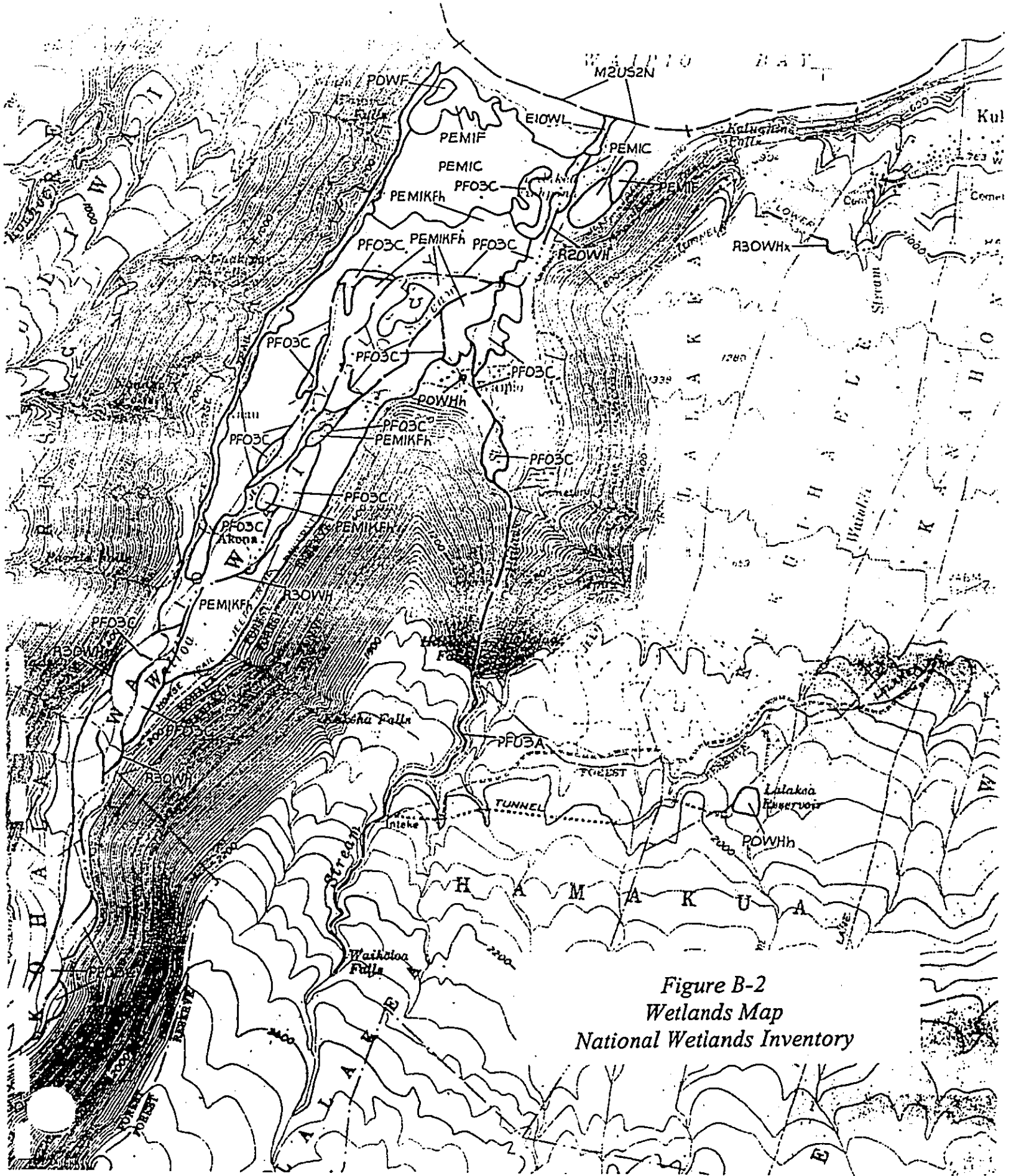


Figure B-2  
Wetlands Map  
National Wetlands Inventory

Onsite Assessment

*An examination of the wetlands and streams created by leakage from the flumes along the LHD was conducted by NRCS and USFWS December 2 and 3, 1998. The survey concluded that no significant wildlife habitat, especially for native damselflies and other invertebrates, was created by the leaking flumes. In fact, alien invasive species are introduced into the stream systems from the ditch leaks. This influx of alien species, such as Tahitian prawns, tilapia, and mosquito fish, may negatively affect any potential native fish/insect habitat below the leaks in the stream systems. The leaks after flume #5 may have particularly negative impacts due to the abundance of tilapia from flumes #5-36.*

*Modification of the flumes and intake structures will not significantly affect the riparian areas along streams during the period of construction, since flume replacements are expected to use the existing foundations and no earthwork will be necessary in waters. Modification to intakes will be to the existing structure without additional permanent disturbance to the streams. There may be some temporary effects from construction equipment mobilization and use, but this will be minimized by employment of best management practices.*

*All construction activity in or near wetlands will be reviewed for the need for an U.S. Army Corps of Engineers permit. It is expected that many of the restoration and modification activities for the LHD can be conducted under nationwide permit 3 for maintenance, the maintenance exemption, or General Permit 95-002 Permit for Utility Lines In, Under or Above Waters of the United States, Including Navigable Waters, in the State of Hawaii.*

## **B.5 CULTURAL RESOURCES**

*The project planners have consulted with both the Archaeological and Architectural Branches of the State Historic Preservation Division, Native Hawaiian groups, and others to determine potential effects of project implementation on cultural resources and to meet the requirements of federal agencies engaging in major actions under Section 106 of the National Historic Preservation Act. Major cultural resources concerns included repair modifications to the LHD, which is eligible for listing on the National Register of Historic Places and effects of restoration of Hakalaoa Falls, which is a traditional cultural property.*

*Section 106 requires internal and external review of federal actions and effects "historic properties," defined as places included in or eligible for the National Register of Historic places. The Act also requires the federal agency to afford the Advisory Council on Historic Preservation a reasonable opportunity to comment on the action and its effects.*

*The SHPD was contacted by correspondence dated May 19, 1995 with a preliminary description of the project and requesting the identification of cultural resources concerns. A reply from the SHPD, dated June 22, 1995, indicated that the LHD, itself, "appeared to meet the criteria for listing in the National Register of Historic Places. The letter requested that all ground disturbing work in Waipio Valley be coordinated with SHPD. For areas in Hamakua, the SHPD concluded that "since the ditch is located in sugar cane fields that have been previously cleared and developed, it is unlikely that archaeological sites will be found. So, we believe actions in those areas will have 'no effect' on significant archaeological sites."*

*In an August 9, 1995 letter to SHPD, NRCS concurred that the LHD meets the criteria for listing. NRCS also agreed to conduct a study along the ditch.*

*A survey of the ditch was conducted by Carol Kawachi, NRCS Cultural Resources Specialist, in July and August 1996. A Preliminary Archaeological Investigation Report was prepared on August 13, 1996.*

*A meeting was held with SHPD on September 15, 1996 to examine the effects of LHD repair. It was agreed that maintenance and repair of the operational system is necessary. However, steps needed to be taken to assure that the historic character of the LHD is not lost due to the project. It was agreed that two of the 24 flumes that will be reconstructed will be done in original construction and materials, as closely as possible. The two flumes will be identified, in coordination with SHPD, during the design phase. Other components of the LHD which have unique or important features will be recorded before repair/reconstruction. The stone lining and other examples of stonework on the LHD will not be modified by the project. Background information and other available data will be collected.*

*A two-party draft Memorandum of Agreement was developed incorporating the discussion items at the September 15, 1999 meeting. ( Attachment B-2)*

*A draft Survey Report on the LHD was submitted to SHPD in July 1999.  
(Attachment B-3)*

*In January 1999, the SHPD recognized that the flume repair and restoration of Hakalaoa Falls may affect the Hakalaoa/Hiilawe Falls which the SHPD believed was eligible for inclusion in the National and Hawaii Registers of Historic Places. SHPD requested that sections of the EIS be revised to "state that the Falls is a traditional cultural property, why it is eligible, and that appropriate mitigation measures will be followed during the restoration process." In addition, the SHPD requested consultation with native Hawaiian communities and groups on Hakalaoa Falls be added to the Memorandum of Agreement which is being prepared under Section 106.*

*A letter requesting assistance to determine to the cultural significance of Hakalaoa Falls and other historic properties in the LHD Watershed was mailed to seven native Hawaiian groups and leaders on August 18, 1999. Their input will be incorporated into any mitigation strategy for the restoration of Hakalaoa Falls.*



July 20, 1999

ID	SCINAME	COMNAME	LASTOBS	ACCURACY	USES
1,157.	LASIURUS CINEREUS SEMOTUS	'OPE'APE'A, HAWAIIAN HOARY BAT	1,978	M	LE
1,200.	BRANTA SANDVICENSIS	NENE, HAWAIIAN GOOSE	1,970	M	LE
1,239.	LOXOPS COCCINEUS COCCINEUS	HAWAII 'AKEPA	1,888	M	LE
1,214.	ANAS WYVILLIANA	HAWAIIAN DUCK, KOLOA	1,981	G	LE
1,215.	BUTEO SOLITARIUS	HAWAIIAN HAWK, 'IO	1,931	G	LEFT
1,217.	BIDENS CAMPYLOTHECA SSP CAMPYLOTHECA	KO'OKO'OLAU, KOKO'OLAU	1,800	G	SOC
1,218.	TETRAMOLOPIUM ARENARIUM VAR ARENARIUM		1,840	G	LE
1,220.	TETRAMOLOPIUM CONSANGUINEUM VAR LEPTOPHYLLUM		1,840	G	SOC
1,221.	CLERMONTIA WAIMEAE	'OHA, 'OHA WAI	1,910	G	SOC
1,223.	PHYLLOSTEGIA STACHYOIDES		1,872	G	SOC
1,224.	STENOZYNE ANGUSTIFOLIA		1,840	G	SOC
1,225.	STENOZYNE MICROPHYLLA		1,840	G	LE
1,226.	RANUNCULUS MAUIENSIS	MAKOU	1,840	G	SOC
1,227.	COLUBRINA OPPOSITIFOLIA	KAUULA	1,909	G	SOC
1,228.	NOTHOCESTRUM BREVIFLORUM	'AIEA	1,933	G	LE
1,229.	LINDSAEA REPENS VAR MACRAEANA		0 00	G	LE
1,230.	CYSTOPTERIS DOUGLASSII		1,800	G	LE
1,231.	ADENOPHORUS PERIENS		1,910	G	SOC
1,209.	ANAS WYVILLIANA		1,910	G	SOC
1,355.	LASIURUS CINEREUS SEMOTUS	HAWAIIAN DUCK, KOLOA	1,860	G	LE
1,411.	ANAS WYVILLIANA	'OPE'APE'A, HAWAIIAN HOARY BAT	1,970	M	LE
1,155.	ANAS WYVILLIANA	HAWAIIAN DUCK, KOLOA	1,986	S	LE
1,186.	PHYLLOSTEGIA BREVIDENS	HAWAIIAN DUCK, KOLOA	1,900	S	LE
1,187.	PHYLLOSTEGIA WARSHAUERI		1,974	S	LE
1,192.	ANAS WYVILLIANA		1,995	SC	SOC
1,193.	PRITCHARDIA LANIGERA	HAWAIIAN DUCK, KOLOA	1,995	SC	LE
1,194.	LOXOPS COCCINEUS COCCINEUS	LOULU	1,975	SC	LE
1,197.	CLERMONTIA WAIMEAE	HAWAII 'AKEPA	1,900	M	LE
1,198.	TREMATOLOBELIA GRANDIFOLIA	'OHA, 'OHA WAI	1,892	M	SOC
1,199.	PHYLLOSTEGIA FLORIBUNDA		1,981	M	LE
			1,909	M	SOC
			1,910.	M	SOC
					RC

Attachment B-1  
Natural Heritage Database

July 20, 1999

ID	SCINAME	CONNAME	LASTOBS	ACCURACY	USES
1,255.	PLATYDESMA REMYI	PILO KEA	1 979	SC	RC
1,248.	PRITCHARDIA LANIGERA	LOULU	1 986	SC	SOC
1,269.	CLERMONTIA CALOPHYLLA	'OHA, 'OHA WAI	1 938	M	SOC
1,270.	CYANEA PLATYPHYLLA	'OHA, HAHA, 'OHA WAI	1 932	M	LE
1,271.	TREMATOLOBELIA GRANDIFOLIA		1 981.	M	SOC
1,272.	STENOGYNE CRANWELLIAE		1 938.	M	SOC
1,287.	PRITCHARDIA LANIGERA	LOULU	1 990	S	SOC
1,275.	OCHROSIA HALEAKALAE	HOLEI	1 995	SC	RC
1,168.	EURYA SANDWICENSIS	ANINI, WANINI	1 926	S	SOC
1,184.	PHYLLOSTEGIA WARSHAUERI		1 995	SC	LE
1,203.	STENOGYNE CRANWELLIAE		1 995	SC	SOC
1,258.	MIXED SEDGE AND GRASS MONTANE BOG	MIXED SEDGE AND GRASS MONTANE BOG	1 988	SC	
1,259.	METROSIDEROS POLYMORPHA MIXED MONTANE BOG	'OHI'A MIXED MONTANE BOG	1 988	SC	
1,278.	BUTEO SOLITARIUS	HAWAIIAN HAWK, 'IO	1 976	M	LEFT
1,250.	TREMATOLOBELIA GRANDIFOLIA		1 994	SC	SOC
1,264.	PRITCHARDIA LANIGERA		1 988	SC	SOC
1,314.	PLATYDESMA REMYI	LOULU	1 938.	S	RC
1,332.	PHYLLOSTEGIA VESTITA	PILO KEA	1 986	SC	SOC
1,338.	LOBELIA HYPOLEUCA	'OPELU, LIUA, MO'OWAHIE	1 938	S	SOC
1,358.	PRITCHARDIA LANIGERA	LOULU	1 990	S	SOC
1,348.	CYANEA GRIMESIANA SSP CYLINDROCALYX	'OHA, HAHA, 'OHA WAI	1 909	M	SOC
1,310.	AWAOUS GUAMENSIS	'O'OPU NAKEA	1 976	S	
1,311.	ATYOIDA BISULCATA	'OPEAKALA'OLE	1 987	S	
1,312.	NERITINA GRANOSA	HIHIWAI, WI	1 987	S	SOC
1,329.	PRITCHARDIA LANIGERA	LOULU	1 989.	SC	SOC
1,434.	CYANEA PLATYPHYLLA	'OHA, HAHA, 'OHA WAI	1 909.	M	LE
1,473.	ANAS WYVILLIANA	HAWAIIAN DUCK, KOLOA	1 982.	M	LE
1,359.	BUTEO SOLITARIUS	HAWAIIAN HAWK, 'IO	1 969	M	LEFT
1,366.	HAWAIIAN CONTINUOUS PERENNIAL STREAM	HAWAIIAN CONTINUOUS PERENNIAL STREAM	1 976	SC	
1,399.	HAWAIIAN CONTINUOUS PERENNIAL STREAM	HAWAIIAN CONTINUOUS PERENNIAL STREAM	1 976.	SC	

July 20, 1999

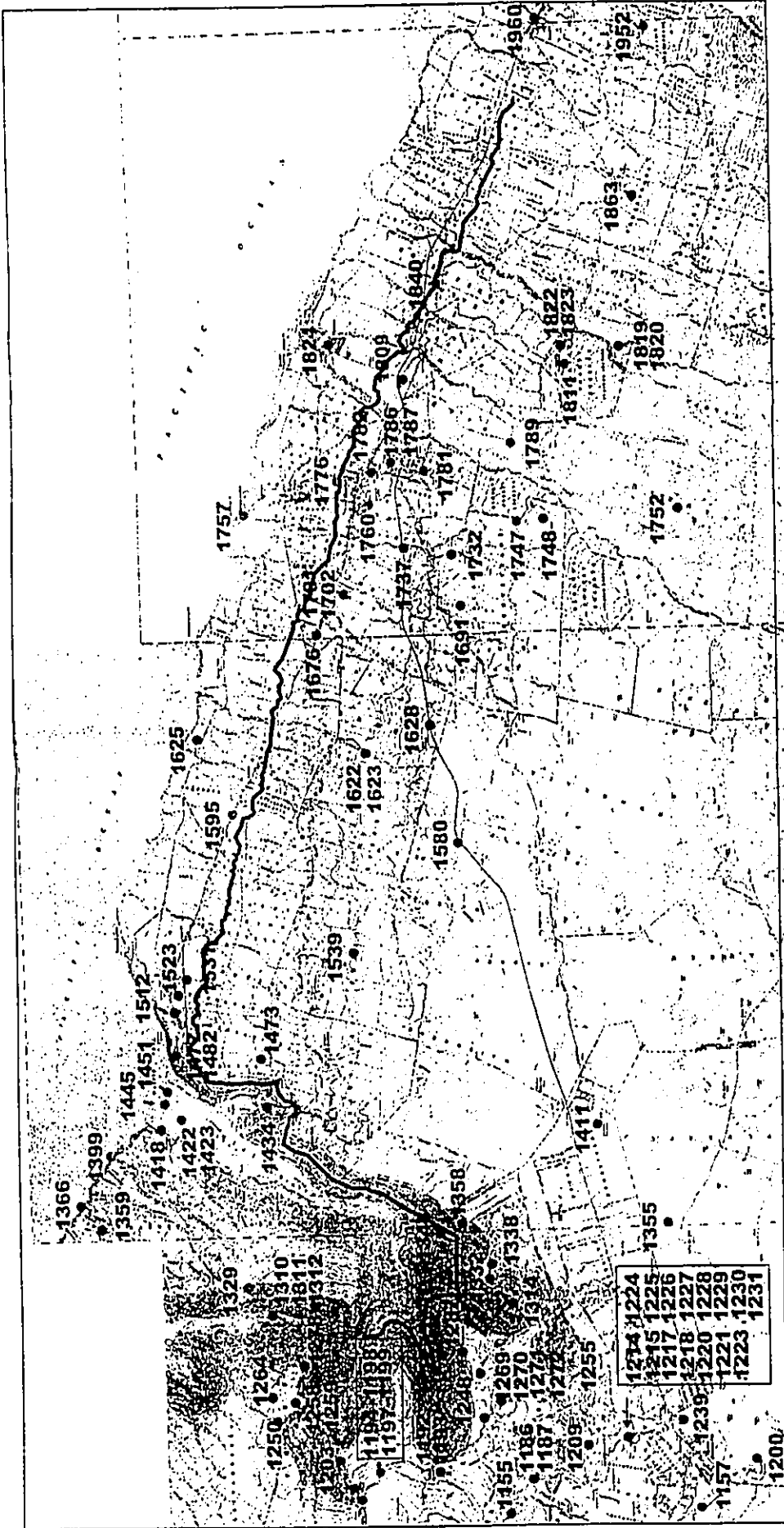
ID	SCINAME	CONNAME	LASTOBS	ACCURACY	USES
1,422.	ANAS WYVILLIANA	HAWAIIAN DUCK, KOLOA	1 989.	S	LE
1,423.	FULICA ALAI	'ALAE KE' OKE'O, HAWAIIAN COOT	1 963	S	LE
1,418.	BUTEO SOLITARIUS	HAWAIIAN HAWK, 'IO	1 971	S	LEPT
1,445.	LASIURUS CINEREUS SEMOTUS	'OPE' APE'A, HAWAIIAN HOARY BAT	1 965	S	LE
1,451.	HAWAIIAN CONTINUOUS PERENNIAL STREAM	HAWAIIAN CONTINUOUS PERENNIAL STREAM	1 968	SC	
1,477.	PUFFINUS NEWELLI	NEWELL SHEARWATER, 'A'O	1 994	S	LT
1,482.	LASIURUS CINEREUS SEMOTUS	'OPE' APE'A, HAWAIIAN HOARY BAT	1 973	S	LE
1,752.	CYRTANDRA TINTINNABULA	HA' IWALE, KANAWAO KE' OKE'O	1 909	M	LE
1,748.	PRITCHARDIA LANIGERA	LOULU	1 920	G	SOC
1,747.	BUTEO SOLITARIUS	HAWAIIAN HAWK, 'IO	1 993	S	LEPT
1,789.	PSITTIOSTRA PSITTACEA	'O' U	1 888	G	LE
1,539.	BUTEO SOLITARIUS	HAWAIIAN HAWK, 'IO	1 971	S	LEPT
1,531.	BUTEO SOLITARIUS	HAWAIIAN HAWK, 'IO	1 981	M	LEPT
1,580.	BUTEO SOLITARIUS	HAWAIIAN HAWK, 'IO	1 979.	M	LEPT
1,628.	LASIURUS CINEREUS SEMOTUS	'OPE' APE'A, HAWAIIAN HOARY BAT	1 978	S	LE
1,622.	MANDUCA BLACKBURNI	BLACKBURN'S SPHINX MOTH	1 905.	G	C
1,623.	PHYLLOSTEGIA FLORIBUNDA				
1,595.	LASIURUS CINEREUS SEMOTUS	'OPE' APE'A, HAWAIIAN HOARY BAT	1 909.	G	RC
1,625.	BUTEO SOLITARIUS	HAWAIIAN HAWK, 'IO	1 965.	M	LE
1,512.	LASIURUS CINEREUS SEMOTUS	'OPE' APE'A, HAWAIIAN HOARY BAT	1 971	M	LEPT
1,523.	ANAS WYVILLIANA	HAWAIIAN DUCK, KOLOA	1 976	S	LE
1,691.	ANAS WYVILLIANA	HAWAIIAN DUCK, KOLOA	1 983	G	LE
1,701.	BUTEO SOLITARIUS	HAWAIIAN HAWK, 'IO	1 981.	G	LE
1,702.	LASIURUS CINEREUS SEMOTUS	'OPE' APE'A, HAWAIIAN HOARY BAT	1 990	M	LEPT
1,676.	BUTEO SOLITARIUS	HAWAIIAN HAWK, 'IO	1 900	M	LE
1,732.	LASIURUS CINEREUS SEMOTUS	'OPE' APE'A, HAWAIIAN HOARY BAT	1 973	M	LEPT
1,737.	LASIURUS CINEREUS SEMOTUS	'OPE' APE'A, HAWAIIAN HOARY BAT	1 900	S	LE
1,760.	LASIURUS CINEREUS SEMOTUS	'OPE' APE'A, HAWAIIAN HOARY BAT	1 964.	S	LE
1,781.	LASIURUS CINEREUS SEMOTUS	'OPE' APE'A, HAWAIIAN HOARY BAT	1 960	S	LE
1,786.	BUTEO SOLITARIUS	HAWAIIAN HAWK, 'IO	1 975	S	LE
			1 971	S	LEPT

July 20, 1999

ID	SCINAME	COMNAME	LASTOBS	ACCURACY	USES
1,787.	LASIURUS CINEREUS SEMOTUS	'OPE'APE'A, HAWAIIAN HOARY BAT	1 974	S	LE
1,782.	LASIURUS CINEREUS SEMOTUS	'OPE'APE'A, HAWAIIAN HOARY BAT	1 976	S	LE
1,776.	LASIURUS CINEREUS SEMOTUS	'OPE'APE'A, HAWAIIAN HOARY BAT	1 964	M	LE
1,757.	LASIURUS CINEREUS SEMOTUS	'OPE'APE'A, HAWAIIAN HOARY BAT	1 900.	S	LE
1,819.	BUTEO SOLITARIUS	HAWAIIAN HAWK, 'IO	1 981.	S	LEPT
1,820.	OCHROSIA HALEKALAE	HOLEI	1 994.	S	RC
1,811.	BUTEO SOLITARIUS	HAWAIIAN HAWK, 'IO	1 981.	S	LEPT
1,822.	BUTEO SOLITARIUS	HAWAIIAN HAWK, 'IO	1 993	S	LEPT
1,823.	LASIURUS CINEREUS SEMOTUS	'OPE'APE'A, HAWAIIAN HOARY BAT	1 900	S	LE
1,863.	ANAS WYVILLIANA	HAWAIIAN DUCK, KOLOA	1 983	M	LE
1,952.	LASIURUS CINEREUS SEMOTUS	'OPE'APE'A, HAWAIIAN HOARY BAT	1 961	S	LE
1,960.	BUTEO SOLITARIUS	HAWAIIAN HAWK, 'IO	1 971	M	LEPT
1,809.	LASIURUS CINEREUS SEMOTUS	'OPE'APE'A, HAWAIIAN HOARY BAT	1 960.	S	LE
1,824.	LASIURUS CINEREUS SEMOTUS	'OPE'APE'A, HAWAIIAN HOARY BAT	1 964	S	LE
1,840.	BUTEO SOLITARIUS	HAWAIIAN HAWK, 'IO	1 971	M	LEPT

RECEIVED AS FOLLOWS

Hawai'i Natural Heritage Program  
Hamakua Ditch Parcel



Kamuela, Kukuihaele, Honoka'a, and Kukaiau Quads - Big Island

2 PARTY MOA

06/17/99

**MEMORANDUM OF AGREEMENT  
AMONG THE UNITED STATES DEPARTMENT OF AGRICULTURE  
NATURAL RESOURCES CONSERVATION SERVICES AND  
THE HAWAII STATE HISTORIC PRESERVATION OFFICER,  
SUBMITTED TO THE  
ADVISORY COUNCIL ON HISTORIC PRESERVATION  
PURSUANT TO 36 CFR § 800.5 (e)(4)  
REGARDING THE LOWER HAMAKUA DITCH WATERSHED**

WHEREAS the United States Department of Agriculture Natural Resources Conservation Services (referred to herein as NRCS) proposes to repair, rehabilitate or replace components of the Lower Hamakua Ditch system to assure dependable operation for the 25-year life of the project to supply agricultural water to farmers and ranchers on the Hamakua coast between Kukuihaele and Pa`auilo. Twenty-four of the fifty flumes on the "open ditch" system of the Lower Hamakua Ditch are in poor condition and will be replaced or restored. Approximately ten percent of the concrete ditch lining along the 14.5-mile long "open ditch" system will be replaced. Sediment accumulation, averaging one-foot in depth, will be removed from easily accessible reaches of the "open ditch" system. Approximately ten sugarcane-era distribution lateral systems will be repaired and extended to supply water to agricultural users. A permanent tunnel repair of the 1989 failure at Hakalaoa Falls will allow removal of the temporary flume on the cliff wall, removal of the diversion on Lalakea Stream, and restoration of the twin falls of Hi`ilawe. The intakes on Kawainui, Alakahi and Ko`iawe Streams will be modified to allow low-flow stream release. The Kawainui intake will also be modified to allow remote telemetric operation of the flow gate and sand trap gate; and

WHEREAS NRCS has established the repair, rehabilitation or replacement of components of the Lower Hamakua Ditch system's area of potential effects, as defined at 36 CFR 15 800.2(c) to be 100 feet (30.5m) wide corridor centered on the Lower Hamakua Ditch;

WHEREAS NRCS has determined that the repair, rehabilitation or replacement of components of the Lower Hamakua Ditch system to assure dependable operation for the 25-year life of the project to supply agricultural water to farmers and ranchers on the Hamakua coast between Kukuihaele and Pa`auilo may have effects on a rock platform in location; and

WHEREAS NRCS, pursuant to 36 CFR 15 800.4(c), has determined that the above-referenced properties are eligible for inclusion in the National Register of Historic Places; and

WHEREAS NRCS, pursuant to 36 CFR Part 800.4(c), has determined that the twin falls of Hi'ilawe and Hakalaoa meets the definition of a traditional cultural property given in National Register Bulletin 38 (*Guidelines for Evaluating and Documenting Traditional Cultural Properties*) and is eligible for inclusion in the National Register of Historic Places; and

WHEREAS NRCS has consulted with the Hawaii State Historic Preservation Officer (SHPO) and the Advisory Council on Historic Preservation (Council) in accordance with Section 106 of the National Historic Preservation Act, 16 U.S.C. section 470 (NHPA), and its implementing regulations (36 CFR Part 800) to resolve the adverse effect of the repair, rehabilitation or replacement of components of the Lower Hamakua Ditch on historic properties; and

NOW, THEREFORE, NRCS, the SHPO, and the Council agree upon NRCS's decision to proceed with the repair, rehabilitation or replacement of components of the Lower Hamakua Ditch system to assure dependable operation for the 25-year life of the project to supply agricultural water to farmers and ranchers on the Hamakua coast between Kukulhaele and Pa'auilo; NRCS shall ensure that the following stipulations are implemented in order to take into account the effects of the repair, rehabilitation or replacement of components of the Lower Hamakua Ditch system on historic properties.

#### Stipulations

NRCS shall ensure that the following stipulations are implemented:

1. Two representative wooden flumes along the "open ditch" system will be repaired using construction materials and structural configuration that match, as closely as possible, the original. These flumes will be maintained in such condition for the 25-year life of the project.
2. Unique or exemplary features of those flumes that are replaced or modified will be photographed and described to meet the documentation standards and guidelines developed by the National Park Service's Historic American Engineering Record.
3. Components that are of cut stone masonry are not expected to be affected and will not be modified or altered without consultation with SHPO.
4. Background research of the Lower Hamakua Ditch system will be conducted by Carol Kawachi, NRCS Cultural Resources Specialist (CRS).

- 5. Detailed plans for the tunnel repair, flume removal, and upstream diversion removal for the restoration of the twin falls will be submitted to SHPD for their review and comment before implementation. A notification will be provided to the Native Hawaiian community that the restoration plans are available for review.

Execution of this MOA by NRCS and the SHPO, its subsequent acceptance by the Council, and implementation of its terms evidence that NRCS has afforded the Council an opportunity to comment on the repair, rehabilitation or replacement of components of the Lower Hamakua Ditch system and its effects on historic properties, and that NRCS has taken into account the effects of the repair, rehabilitation or replacement of components of the Lower Hamakua Ditch system to assure dependable operation for the 25-year life of the project to supply agricultural water to farmers and ranchers on the Hamakua coast between Kukuihaele and Pa'auilo on historic properties.

**NATURAL RESOURCES CONSERVATION SERVICES**

By: \_\_\_\_\_ Date: \_\_\_\_\_

**HAWAII STATE HISTORIC PRESERVATION OFFICER**

By: \_\_\_\_\_ Date: \_\_\_\_\_

**CONCUR:**

**HAWAII STATE DEPARTMENT OF AGRICULTURE**

By: \_\_\_\_\_ Date: \_\_\_\_\_

**ACCEPTED: ADVISORY COUNCIL ON HISTORIC PRESERVATION**

By: \_\_\_\_\_ Date: \_\_\_\_\_



DRAFT

A PRELIMINARY ARCHAEOLOGICAL SURVEY  
IN PREPARATION FOR  
REPAIRS TO THE LOWER HAMAKUA DITCH  
BY THE  
UNITED STATES DEPARTMENT OF AGRICULTURE  
NATURAL RESOURCES CONSERVATION SERVICES,  
MAUNA KEA AND HAMAKUA SWCD,  
AND THE  
STATE OF HAWAII DEPARTMENT OF AGRICULTURE

by

Carol T. Kawachi, M.A.  
Cultural Resources Specialist

United States Department Of Agriculture  
Natural Resources Conservation Services  
Kealahou Field Office  
Kealahou, Hawaii

July 1999

## ABSTRACT

USDA NRCS, Mauna Kea and Hamakua Soil and Water Conservation Districts, and the State of Hawaii DOA propose to repair the Lower Hamakua Ditch to make water available for diversified agriculture, ranching and housing developments. A preliminary archaeological survey to determine the absence or presence of archaeological sites was done in a 100-foot (30.5m) wide corridor along the Ditch for approximately 23.5 miles (37.8km) from Kukuihaele to Pa`auilo *ahupua`a*. The construction of the ditch, plantation activities and modern development have modified much of the landscape and obliterated traces of past human activity.

## TABLE OF CONTENTS

Introduction .....	1
Environmental Setting .....	2
Historic Background .....	3
1. Northwest Hamakua District .....	3
2. Hi'ilawe Falls and Waip`io Valley .....	4
3. Lower Hamakua Ditch .....	6
Archaeological Background .....	7
Research Design .....	8
Field Methods .....	9
Inventory of Resources .....	10
Evaluation of Research .....	11
Summary and Recommendations .....	12
References .....	14
Appendices	
A. Gulches and Streams .....	16
B. Memo, Hibbard to Loui .....	17
C. Ahupua`a .....	23
D. Land Commission Awards, Grants, General Leases .....	24

A PRELIMINARY ARCHAEOLOGICAL SURVEY  
IN PREPARATION FOR  
REPAIRS TO THE LOWER HAMAKUA DITCH  
BY THE  
UNITED STATES DEPARTMENT OF AGRICULTURE NATURAL  
RESOURCES CONSERVATION SERVICES,  
MAUNA KEA AND HAMAKUA SWCD,  
AND THE  
STATE OF HAWAII DEPARTMENT OF AGRICULTURE

Introduction

The United States Department of Agriculture Natural Resources Conservation Services (USDA NRCS) with the Mauna Kea and Hamakua Soil and Water Conservation Districts and the State of Hawaii Department of Agriculture, proposes to repair the Lower Hamakua Ditch System in the East Hamakua District on the eastern coast of the island of Hawai'i. With the demise of the Hamakua Sugar plantation, the abandoned sugar fields will be available for diversified agriculture, ranching and housing developments. The ditch system can provide water for the farmers and ranchers.

A preliminary archaeological and botanical survey along the Lower Hamakua Ditch was done concurrently by Derral Herbst, PhD, Army Corps of Engineers and Carol Kawachi, USDA NRCS Cultural Resources Specialist, in July and August, 1996.

This paper will attempt to provide a background for the ditch and the area of potential effect which this particular project will cover. The area of impact is narrow (50 feet/15m on each side of the ditch) but covers 23.5 miles (37.8km) or 57 *ahupua`a* and 28 streams/gulches (Figure 1).

The preliminary archaeological survey was to determine the absence or presence of archaeological sites along a 100-foot (30.5m) wide corridor along the Lower Hamakua Ditch for approximately 23.5 miles (37.8km) long. The survey started at Lalakea *ahupua`a* and ended at the Pa`auilo reservoir in Kamaui *ahupua`a*. Fifty feet (15.24m) on each side of the ditch was surveyed on foot, or visually from the vehicle or as close as it was possible to get to the subject area. As much as possible was covered by driving the entire length of the maintenance road.

The ditch was dug along and into the slope. The upslope was a straight wall, varying in height up to about 10 feet (3m). Downslope, the excavated soil appeared to have been used to build-up a one-vehicle wide maintenance road level with the ditch. This meant in some places, depending on the original slope, the road might rise approximately 10 feet (3m) above the downslope.

The ditch system includes open ditches, tunnels, flumes and pipelines. The survey concentrated on the open ditch areas. The flumes and pipelines crossed gulches, many of which were inaccessible.

The entire ditch system is one historic site although there are obviously bridges and pipelines less than fifty years old. The flumes are wooden and probably more than fifty years old. The State Historic Preservation Office has given the ditch system site number 50-10-7, 8, 9 -7513. Associated features will be given letter designations.

Mostly foundation remains of old pipelines were seen in the gulches. One possible pre-sugar structure, a platform at the very edge of the ditch in Kapoaula ahupua'a, was found. A cursory look at the platform suggest probable pre-sugar construction but surface artifacts suggest more recent use.

#### Environmental Setting

The lands surveyed were abandoned sugar cane lands. Some were already in pasture, macadamia nut farms, cleared for truck farms and delineated for housing developments. Others were in tall and thick vegetation: Guinea grass (*Panicum maximum*), sugar cane (*Saccharum officinarum*), molasses grass (*Melinis minutiflora*), common ironwood (*Casuarina equisetifolia*), indigo (*Indigofera suffruticosa*), sour grass (*Pluchea carolinensis*), etc. The gulches were in common ironwood (*Casuarina equisetifolia*), kukui (*Aleurites moluccana*), Chinese banyan (*Ficus microcarpa*), Java plum (*Syzygium cumini*), swamp mahogany (*Eucalyptus robusta*), gunpowder tree (*Trema orientalis*), avocado (*Persea americana*), christmas berry (*Schinus terebinthifolius*), guava (*Psidium guajava*), ginger (*Hedychium spp.*), coffee (*Coffea arabica*), mango (*Mangifera indica*), etc. Please see Herbst 1996 for a more detailed description of the botanical survey.

The ditch system follows for the most part, the 1000 foot (304.8m) contour with some deviation but no more than 150 feet (45.7m) downslope and this near the Pa`auilo reservoir.

It crosses 28 streams/gulches (Appendix A). Gulch or stream names do not necessarily correspond with the *ahupua`a* in which they were located. Some of the gulches or streams, especially the small ones, were unnamed.

The topography is gentle rolling hills with narrow and deep gulches. "These gulches are steep-sided in their lower reaches with virtually no valley floors. The uplands between the gulches are gently sloping" (Cordy 1994:59). It appeared that the plantations use to push their excess into the gullies and gulches. This has made the edges of the steeply sloped and heavily vegetated gulches unstable and abrupt. The bottoms, where visible, were water scoured rocks.

The soils in the area are deep to moderately deep andisols, volcanic-ash based soils, which need to be irrigated to release its high fertility agricultural potential (Juvik & Juvik 1998:92).

The rainfall in the project area is approximately 80 inches to the north and increases to approximately 160 inches to the south (Juvik & Juvik 1998:57).

#### Historic Background

This section will be divided into three sections: Northwest Hamakua District, Hi'ilawe Falls and Waipi'o Valley, and the Lower Hamakua Ditch.

##### I. Northwest Hamakua District

In 1798, the Hamakua coast was described by Townsend as appearing "in the highest state of cultivation" (Hudson 1932:184).

The project area, "in the early 1800s . . . were farms and fallow grasslands with scattered clumps of trees" (Cordy 1994:59). "The narrow paths [were] bordered with long grass or [passed] through the well-cultivated plantations of the natives" (Ellis 1969:355). Just before reaching Waipi'o, Isabella Bird described the "track is mostly through long grass, over undulating uplands, with park-like clumps of trees, and thickets of guava and the exotic sumach" (1881:94).

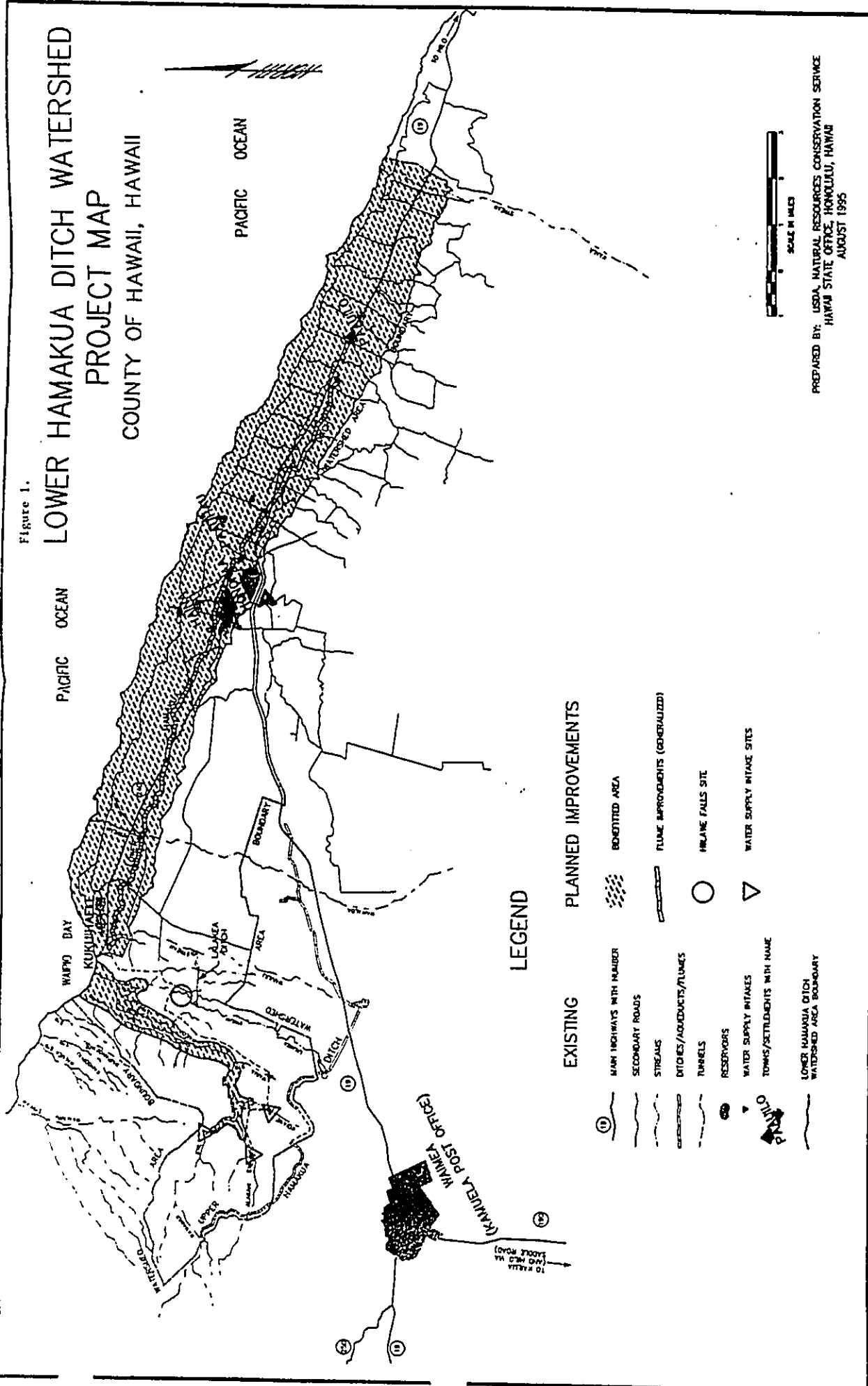
"The wet-taro section of the Hamakua coast extended from Honoka'a to Kukuihaele, where there is a succession of small terraces with high retaining walls, watered by Waikokoe Stream. Several of the upper terraces have been converted into small reservoirs, while the lower ones are still used for raising wet taro" observed Handy and Handy in the 1920s (1972:533).

Hudson notes that traditional accounts relate of "an inland trail between Waipio and Hilo at a fairly high elevation in the forest which would avoid crossing the gulches . . . in the thick forest of ohia and koa" above the 2,000 foot elevation where journeys into the forest were probably made chiefly to catch birds and obtain large timber for canoes" (Hudson 1932:182-187).

"Travel by land through the district along the coast was extremely difficult because of the deep gulches and turbulent streams" (Hudson 1932:197). Coan wrote "the patch was a simple trail, . . . going down and up precipices, some of

Figure 1.

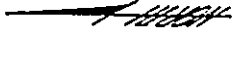
# LOWER HAMAKUA DITCH WATERSHED PROJECT MAP COUNTY OF HAWAII, HAWAII



## LEGEND

- | EXISTING                                      | PLANNED IMPROVEMENTS               |
|---|------------------------------------|
| ① MAIN HIGHWAYS WITH NUMBER                   | ▨ BENEFITED AREA                   |
| --- SECONDARY ROADS                           | — FLUME IMPROVEMENTS (GENERALIZED) |
| ~ STREAMS                                     | ○ MILLANE FALLS SITE               |
| — DITCHES/AQUEDUCTS/FLUMES                    | ▽ WATER SUPPLY INTAKE SITES        |
| --- TUNNELS                                   |                                    |
| ● RESERVOIRS                                  |                                    |
| ▲ WATER SUPPLY INTAKES                        |                                    |
| ▼ TOWNS/SETTLEMENTS WITH NAME                 |                                    |
| — LOWER HAMAKUA DITCH WATERSHED AREA BOUNDARY |                                    |

PREPARED BY: USDA, NATURAL RESOURCES CONSERVATION SERVICE  
HAWAII STATE OFFICE, HONOLULU, HAWAII  
AUGUST 1995



which could only be descended and ascended by grasping the shrubs and grasses (Hudson 1932:187).

Ellis noted that the Hawaiians "generally appear in clusters at the opening of the valleys, or lived scattered over the face of the high land" (1969:351). "The people seem to have lived in a narrow fringe close to the shore, and in the bottom of the larger gulches where land was irrigated for taro near the mouths of the streams. . . . References to permanent habitations at any distance from the sea are rare" (Hudson 1932:186).

About the population around Honoka`a, Ellis observed "the houses were in general large, containing usually three or four families each." (1979: 353). This "indicate[d] a fairly large population" (Hudson 1932:191).

However, "by the mid-1800s, Hamakua was a very rural backwater" (Cordy 1994:9) due to emigration to port towns and disease.

Beginning in the late 1870s, the area was "extensively converted to sugarcane land and plantation towns" (Cordy 1994:82). "Along the coast there is a belt of sugar cane cultivation from two to four miles wide, the upper level being 1,200 to 2,000 feet above the sea" (Hudson 1932:182).

## 2. Hi`ilawe Falls and Waipi`o Valley

A short description is given here of Waipi`o Valley although it will not be directly impacted by the Lower Hamakua Ditch. Hi`ilawe Falls, which is located on the east side of the valley, approximately 1.8 miles inland, and with its twin Hakaiaoa Falls, will be affected by the proposed project's attempt to restore the flow of the falls.

"The falls is considered culturally significant because of its direct association with mythological characters and significant individuals in the traditional history of Hawaii; its repeated use as a setting for events taking place in myths and legends; and its poetic sayings and chants. All demonstrate a continuity in the cultural significance of Hi`ilawe through time and a diversity of use in various forms of cultural expression" (Hibbard 1995 in Appendix B). See Cordy 1994 for further information on Waipi`o.

Hi`ilawe was born to Kakea and Kaholo, "children of the cliffs, . . . wrapped in moss and flung away by [his] mother. . . . Hina-ulu-ohia sees that the bundle contains a child and she recognizes the signs of a chief and takes the child as her own" (Beckwith 1979: 523).



Hi'ilawe is where the god Lono finds the beautiful Kaikilani and makes her his wife thereby transforming her into the goddess Kaikilani'lopuna. Lono institutes the Makahiki games in her honor (Beckwith 1979:37).

At his death, Hi'ilawe was transformed into a stone " and his spirit into the mist of that waterfall in Waipi'o valley which is called after his name, of which Hawaiian poets love to sing" (Beckwith 1979:522). Hi'ilawe is protected by Hina-ulu-ohia, the female goddess of the `ohi'a-lehua forest. . . . The flowering `ohi'a is sacred to both god and goddesses (Beckwith 1979:17).

Waipi'o Valley, at the northern edge of the project area, was the "home of high chiefs" (Handy & Handy 1972:534). "The great high chief Umi is identified with Waipi'o, the largest area in which wet taro was cultivated on the island of Hawaii and one of the most favorable localities in the Islands for a lo'i system. . . . [Waipi'o] was the home of the high chiefs Liloa and his son Umi, who first made the island of Hawaii one kingdom" (Handy & Handy 1972:534; Ellis 1969:365). Olopana, Kila are other chiefs also associated with Waipi'o (Beckwith 1979:353-357).

Umi is credited with laying out the great taro patches in Waipi'o (Beckwith 1979:391). "It was . . . a great center of taro cultivation, hence of population" (Handy & Handy 1972:273).

In Waipi'o Valley, is the most sacred heiau on the Hawai'i island, Paka'alana, (Beckwith 1979: 389). Ellis visited the puuhonua Pakarana [sic], a large enclosure but less extensive than at Honaunau. (Ellis 1969:363).

Ellis' first view of Waipi'o in 1823, "appeared in beautiful miniature. Its numerous inhabitants, cottages, plantations, fish-ponds, and meandering streams" (Ellis 1969: 355). "The bottom of the valley was one continued garden, cultivated with taro, bananas, sugar-cane, . . . all growing luxuriantly. Several large ponds were also seen in different directions, well stocked with excellent fish. A number of small villages, containing from twenty to fifty house each, stood along the foot of the mountains, . . . and extended up the valley till projecting cliffs obstructed the view" (Ellis 1969: 356).

"In 1935, . . . a quarter of the lower valley produced taro; many old terraces served for pasturing horses, and the rest were neglected" (Handy & Handy 1972:533). "During the era of rice growing, the lower flatlands . . . were devoted mainly to rice culture by Chinese" (H&H 1972:533).

### 3. Lower Hamakua Ditch

The Lower Hamakua Ditch was hand-dug between 1905 and 1910. The system was originally used to float sugar cane to the processing mills and as a source of water for the actual processing (Cordy 1994:82).

"The great Hamakua ditch system, consisting of a lower and an upper ditch, used to supply water for irrigation and fluming for the Hamakua plantations. . . . The ditches . . . are also interesting as splendid engineering feats" (Thrum 1910:41).

The water in the Lower Ditch begins flows from Waima, Ko`iawe, Alekahi and Kawainui streams which are in the back of Waipi`o Valley. At each of these intakes, there was "Japanese keeper's house, with a telephone" (Thrum 1910:41).

Hundreds of Japanese, Hawaiians, Koreans and Chinese were employed to construct the Lower Ditch between May 1909 and June 1910. The ditch consists of 10.8 miles of tunnels, nearly 11 miles of open ditches and 1.3 miles of flumes connecting the deep ravines (Thrum 1910:140). "The tunnels are all cement and stone lined where necessary. The open ditch and tunnels through the plantations are all cement lined with plaster reinforced by wire netting" (Thrum 1910:141). Flume piers are of stone masonry.

Thirty miles of pack trails run along side the open ditch "for taking in supplies and materials used on the work" because the mountain was inaccessible to wagons (Thrum 1910:141)

The ditch system crosses 57 *ahupua`a* from Waipi`o to Pa`auilo (see Appendix C). Many of these were narrow and extended some 4 miles inland. They "frequently had the top edge of gulches as borders, or the stream at the bottom of the gulches; but they also cross-cut gulches and had their borders keyed to stone cairns, to cinder cones and to groves of certain trees" (Cordy 1994:12)

The ditch system crosses 16 LCA (Appendix D). Four awards were to *ali`i*:

V. Kamamalu	LCA 7713:21	Kuilei 2 <i>ahupua`a</i>
Wm C. Lunalilo	LCA 8559B:1	Kawela
W.P. Leleiohoku	LCA 9971	Keahua
W.P. Leleiohoku	LCA 9971:5	Pa`alaea

There was minimal information on these awards.

In 1848 when most of these awards were made, crops in the project area included:

Bananas	Coffee	Mamaki
Oranges	Sweet potato	Taro
Unspecified	"Vegetable Food"	Wauke

There were houses/house lots as well as one canoe house (Kamauoha in Honokaia *ahupua`a*) and a church (S. Haina in Kaumoali *ahupua`a*). The parcel where the canoe house is located is over one mile from the coast. It may have been a workshop where the canoe log would be worked on before its final descent to the coast.

Northwest Hamakua, with its wide ridges and many streams, supported a substantial native Hawaiian population and agricultural fields. Waipi`o at its northeastern end, was a major taro producer as well as the home of chiefs and gods. Hi`ilawe Falls is directly associated with mythological and traditional individuals.

#### Archaeological Background

Early investigations by Thrum (1908), Stokes (1919), and Hudson (1932) named eight heiau between Kukuihaele and Nienie with five of them "very close to the sea on the slopes" (Cordy 1994:63).

By 1932, regarding archaeological sites in general, Hudson noted that the archaeological sites "have nearly all been destroyed in the extensive development of sugar plantations" (Hudson 1932:182). "Although the cultivation of sugar cane has destroyed nearly all former sites it is evident from traditional sources and the accounts of early travelers that a large Hawaiian population lived along the coast" (Hudson 1932:184).

Cordy noted a holua slide "below the Government Road" and a mauka-makai trail for Keahua 2 *ahupua`a* (1994:62). Neither the tax map or the topographic map showed such features. Both are in the midst of plantation land. The rocks from the holua slide might have been removed for road or other plantation structures. The trail probably disappeared after abandonment. See Cordy for a more detailed report.

Thrum's heiau and other sites and their locations

	Name	Location	Evidence	Problem	Page #
1	Kalelemauli	Kukuihaele	Nothing remains	Exact location could not be determined	188
2	Pukiohuaka	Kukuihaele	Nothing remains	Exact location could not be determined	188
3	Kaiponihua	Kea, between Kukuihaele & Kapulena		No information obtainable	188
4	Punanamoia	Waikoekoe		Name unknown to informants	189
5	Menehune's residence	Kapulena Point	mound		190
6	Wawaemakilo	Honokaa landing	few stones		192
7	Ka Loa	Honokaa mill	nothing		192
8	Burial cave	Along road from Honokaa mill to mill			192
9	Hanola	Hamakua		No information obtainable	193

Head and Goodfellow(1991) did a mainly aerial survey of the lands from Lalakea to Kalakalaua. Ground surveys were conducted in Waiulili Stream, Waikoekoe Gulch and Waipunahoe Gulch (1991:8). Site 15016, a habitation terrace site was recorded near the Lower Hamakua Ditch on the west of Waikoekoe Gulch.

Cordy lists thirteen sites for Hi'ilawe Valley: an agricultural complex on the east side and a habitation complex on the west side (1994:52).

Although most evidence of early Hawaiian presence have been obliterated by plantation and modern development, some remnants can be still be found in less accessible areas.

#### Research Design

The Lower Hamakua Ditch defines the area of potential effect. The purpose of this preliminary survey was to identify historic sites within a 50 feet (15.2m) corridor on each side of the ditch. However, the specific areas of actual impact have not yet been decided.

The proposed repair will include restoring Hakalaoa Falls to its former flow; intake structures (Kawai Nui, Alakahi, Ko`iawe streams) will be rehabilitated; 35 flumes will be reconstructed or replaced; 25 sites on the open ditch will be replaced or repaired; 10 areas where large amounts of sediment will be removed; silt and root removal will be done on about 15 tunnels; mains and submains, pressure regulators, air/vacuum valves will be replaced or repaired and additional valves and submains will be installed (EIS:67-69).

At Hakalaoa Falls, the area of potential impact has previously been disturbed in the past at the time of the original ditch construction and naturally, when the cliff collapsed. If SHPD deems an archaeological survey needs to be conducted, this will be done prior to construction activities.

No archaeological field check was done in the Hi`ilawe and Hakalaoa Falls area. Once the specific areas of potential effect are identified, the archaeologist will do a field check prior to construction.

The project does not involve any moving or changing of the ditch route. The land has been previously impacted by the ditch excavation and maintenance, the building and upkeep of the maintenance road and 100 years of sugar cultivation, harvesting and related activities. In addition, ranching and human habitation and their related activities have already impacted the project area.

#### Field Methods

Access to the survey area was via the ditch maintenance road and old plantation roads. We drove along the maintenance road, doing a visual survey. When possible, we walked along the road and ditch. The vegetation, for the most part, was much too thick and inaccessible to be ground surveyed.

A visual check was done as much as possible from either the edges of the gulches or from the catwalk alongside the pipeline. We walked the old wooden flumes when it was possible and deemed safe.

It appeared that the plantations use to push their excess into the gullies and gulches. Standing on these unstable and abrupt edges was a bit risky.

The entire length of the ditch from Lalakea *ahupua`a* to the Pa`auilo reservoir was driven or walked. The only areas not investigated were in inaccessible gulches, Hi`ilawe and Hakalaoa Falls.

## Inventory of Resources

Following are some probable reasons why remnants of the pre-contact/pre-sugar period were not found within the project area:

1. The actual building of the ditch system - the excavation and build-up of the maintenance road, would have destroyed any features had they been present.
2. A hundred years of sugar cultivation would have altered the landscape had there been fields of pre-contact cultivation.  
A platform found at the ditch's edge in Kapoaula *ahupua'a* may originally have been constructed in pre-sugar times but surface artifacts suggest it was used in more recent times.
3. Had the early Hawaiians lived or cultivated in these narrow and steep gulches, the heavy rains would have flooded and destroyed everything.

From north to south, the features noted included:

1. mauka of highway, Waipi`o side of Honoka`a town, historic habitation at the weir. This is an old shed under a mango tree near some bamboo and Christmas berry. Modern garbage also litter the area. This shed is most likely associated with the maintenance of the weir and other associated ditch system structures.
2. mauka side of highway, Waipi`o side of Honoka`a, remains of a platform alongside ditch on a small rise under Christmas berry west of a macadamia nut farm in Kapoaula *ahupua'a*. It may originally have been constructed in pre-sugar times but surface artifacts suggest it was used in more recent times.

The findings may actually be outside of the proposed impact area. We were doing visual measurements rather than pulling a tape.

Head and Goodfellow recorded a terrace habitation site on the west bank of Waikoekoe Gulch (1991: A18). Its exact location is not indicated so a re-check might be in order to be sure it is outside the 100 feet (30m) corridor

Stone cairns, *ahupua'a* boundary markers (Cordy 1994:61), were not found on this survey. Those near the shore would have been destroyed by cultivation alterations and those in the center of the gulches would have washed away by flooding in the last two hundred years.

Taro had once been irrigated in Waiko'eko'e gulch (Cordy 1994:61). The gulch was investigated but no evidence of cultivation was found. From the ditch maintenance road, the land slopes to the stream. There was an area west and close to the stream which may once have been cultivated but it is approximately 10 feet (3m) higher than the present stream bed. The stream bed is quite narrow (1-2m) and the sides are quite steep. If there once had been irrigated or terraced pondfields with canals (Cordy 1994:61), they were demolished years ago.

Kukuihaele gulch also had irrigated taro (Cordy 1994:61). The gulch was not investigated due to safety reasons. The present owner has dry taro growing upslope and downslope. The proposed project work will not be in the bottom of the gulches. Should it be necessary to impact the bottom, the cultural resources specialist will be called in to do a field check prior to any activity.

The finding of site remains near the sea cliffs (Cordy 1994:119) appears unlikely. In areas where we had access, the plantation appeared to have bulldozed as close to the cliff edge as possible. Tall grasses and ironwood marked the cliff edge.

The extensive literature search and review of Mahele documents suggested physical remains may still be present in some of the less accessible places. However, a ground search showed that most of the structures and features have been obliterated over time through cultural and natural means.

#### Evaluation of Research

According to Head and Goodfellow, their survey was "among the first to be done" in this area (1991:34). Although hampered by the thick vegetation in the gulches: "much of the floor of both gulches and *kuleana* could not be seen" they concluded that the features that were found were "common to other areas of Hawaii island" (1991:34). "Most of the project area has been deep plowed and bulldozed, and as a result we have only a limited, non-representative sample of sites once present in the area" (Head & Goodfellow 1991:34).

The sheer number (57) of land units (*ahupua'a*) in this 24 mile (38.6km) length suggest this area was very fertile and productive prior to the introduction of sugar. Interviews with former plantation workers stress the periods of drought and its effect on the plantation. Hence, the need for the ditch system to insure a consistent water source.

Most of the project area surveyed showed disturbance from past plantation use, ranching and more recent macadamia nut plantings. Much of the abandoned sugar cane fields were beginning to be overtaken by grasses and shrubs (Herbst 1996:3-4).

Cordy was consulted about the burial cave mentioned by Hudson (pers comm 8 June 1999). The contents of the cave may already have been removed if the road gave it public access. This particular site was not brought to the agency's attention at any of its public meetings or nor by any community member or consultants.

The platform found in Kapoaula *ahupua`a* may be the probable remains of a house mentioned in the Native Testimony which shows that LCA 10671-B to Pule had two houses in section 1 with two cultivated fields. The exact location however, was not clear. If the site will be directly affected by the proposed work, the site will be recorded and mapped.

### Summary and Recommendations

This archaeological survey was a preliminary investigation to note the absence or probable presence of pre-contact/pre-sugar sites. This survey yielded only one feature which may have been a remnant of the period prior to the digging of the ditch system.

The platform on the north side of the ditch in Kapoaula *ahupua`a*, may have been modified for more recent use as indicated by the presence of recent artifacts. At present, the proposed work does not appear that it will have a direct impact upon this feature. Should it be necessary to affect the site, the feature will be recorded including photographs and noting its location on a USGS quad map.

The habitation terrace site (PHRI site15016) on the west bank of Waikoekoe Gulch should be looked at again to determine its distance from the ditch.

The bottom of the gulches will not be directly affected by the proposed project. Should it be necessary that the bottom be impacted, the cultural resources specialist will do a field check prior to activity.

The concrete remnants of old bridge foundations in the gulch bottoms will not be directly affected by the proposed project. Should these foundations need to be impacted, the the cultural resources specialist will do a field check and record them prior to activity,

The reconstruction or replacement of the flumes will be done from upslope. Should there be a need for machinery to work from the bottom of the gulches, the cultural resources specialist will be called in to survey the area prior to any activity.

At Hakalaoa Falls, the area of potential impact has previously been disturbed in the past at the time of the original ditch construction and naturally, when the cliff



collapsed. If SHPD deems an archaeological survey needs to be conducted, this will be done prior to construction activities.

No archaeological field check was done in the Hi'ilawe and Hakalaoa Falls area. Once the specific areas of potential effect are identified, the archaeologist will do a field check prior to construction.

## REFERENCES

- Beckwith, Martha  
1979 Hawaiian Mythology. University Press of Hawaii. Honolulu, Hawaii.
- Bird, Isabella L.  
1881 Six Months in the Sandwich Islands. Mutual Publishing. Honolulu, Hawaii.
- Cordy, Ross  
1994A Regional Synthesis of Hamakua District, Island of Hawaii. State of Hawaii Department of Land and Natural Resources. State Historic Preservation Division. Honolulu, Hawaii.
- Ellis, William  
1969 Polynesian Researches Hawaii. A new Edition, Enlarged and Improved. Charles E. Tuttle Company. Rutland, Vermont & Tokyo, Japan.
- Handy, E. S. Craighill and Elizabeth Green Handy  
1972 Native Planters in Old Hawaii: Their Life, Lore, and Environment. Bernice P. Bishop Museum Bulletin 233. Bishop Museum Press. Honolulu, Hawaii.
- Head, James A. and Susan T. Goodfellow  
1991 Archaeological Inventory Survey Hamakua Sugar Company Waipio Lands: Lands of Lalakea, Kukuihaele, Kanahonua, Waikoekoe, Keaa, and Kalakalaua, Hamakua District, Island of Hawaii. Paul H. Rosendahl, PhD, Inc. Hilo, Hawaii.
- Herbst, Derral R. PhD  
1995 Botanical Survey for the Lower Hamakua Ditch Project. U.S. Army Corps of Engineers. Pacific Ocean Division. Honolulu, Hawaii.
- Hibbard, Don  
1995 Memo to Rae M. Loui, Deputy Director, Commission on Water Resources Management. State Historic Preservation Division. Honolulu, Hawaii.
- Hudson, Alfred E.  
1932 Archaeology of East Hawaii. Manuscript. B.P. Bishop Museum. Honolulu, Hawaii.

- Juvik, Sonia and James O. Juvik, Editors  
 1998 Atlas of Hawai'i Third Edition. Department of Geography, University of Hawai'i at Hilo. University of Hawai'i Press. Honolulu, Hawaii.
- Kawachi, Carol T.  
 1983 The Kona Field System. Student paper. University of Hawaii. Honolulu, Hawaii.
- Krauss, Beatrice H.  
 1983 Ethnobotany of Hawaii. University of Hawaii. Department of Botany. Honolulu, Hawaii.
- Lucas, Paul F.  
 1995 A Dictionary of Hawaiian Legal Land-Terms. University of Hawai'i Committee for the Preservation and Study of Hawaiian language, Art and Culture. Native Hawaiian Legal Corporation. Honolulu, Hawaii.
- Maps
- 1905 Pacific Sugar Mill Forests Lands
- 1905 Pacific Sugar Mill Plantation Lands
- 1909 Plan of the Northwest Part of Hamakua, Honokaa and Pacific Sugar Mill Plantations Upper and Lower Ditches. Reg. Map #2640: Government Survey.
- Pukui, Mary Kawena, Samuel H. Elbert and Esther T. Mookini  
 1974 Place Names of Hawaii. Revised and expanded edition. University Press of Hawaii. Honolulu, Hawaii.
- Thum, Thomas G.  
 1910 "Hamakua Ditch Opening" in Hawaiian Annual and Almanac for 1911. Pp. 138 - 142. Honolulu, Hawaii.

## APPENDIX A.

Gulch or stream names did not necessarily correspond with the ahupua'a in which they were located. Some of the gulches or streams, especially the smaller ones, were unnamed. The following moves north to south, from Waipi'o to Pa'auilo.

STREAM/GULCH	AHUPUA'A
Waiulili stream	Kukuihaele
Waikoekoe gulch	Waikoekoe
Waipunahoe gulch	Keaa, Kalakalaula
Waialeale gulch	Niupuka
Waikoloa stream	boundary Waikoloa/Waialeale 2
Kapulena gulch	Kapulena
Kawaikalia gulch	boundary Keahakea/Haukoi
Malanahae gulch	boundary Kapoaula/Malanahae
Honokaia gulch	Boundary Malanahe/Honokaia
Kawaiholehole gulch	Honokaia
Keaakaukau gulch	boundary Kawela/Kuilei 2
Kainapahoa gulch	Ahualoa
Ahualoa gulch	boundary Ahualoa/Koloaha
unnamed stream	Kulihai
Nienie gulch	boundary Lauka/Nienie
unnamed stream	boundary Papuaa/Namoku
Ouhi stream	boundary Ouhi/Kaao
Kukuiaonanipahu gulch	Kaao
Kahupu gulch	boundary Kaao/Paauhau
Kahawaililii gulch	boundary Paauhau/Weha
Keahua gulch	boundary Keahua 1/Kalopa
Kalopa gulch	boundary Kalopa/Waikaalulu
Waikaalulu gulch	Waikaalulu
Kaapahu gulch	Kaapahu
Kukuilamalahii Homesteads	boundary Kaapahu/Kaunamano
Alilipali gulch	Kaunamano
Kaumoali gulch	boundary Kaumoali/Kemau 2
Pohakuhaku stream	boundary Pohakuhaku/Kamaui

The ahupua'a, streams and gulches named are those which fall in the project area. That is, these are between the 850 - 1000 foot (259 - 304.8m) levels. There may be others which may be at higher or lower elevations.

## APPENDIX A.

Gulch or stream names did not necessarily correspond with the ahupua'a in which they were located. Some of the gulches or streams, especially the smaller ones, were unnamed. The following moves north to south, from Waipi'o to Pa'auilo.

STREAM/GULCH	AHUPUA'A
Waiulili stream	Kukuihaele
Waikoekoe gulch	Waikoekoe
Waipunahoe gulch	Keaa, Kalakalaula
Waialeale gulch	Niupuka
Waikoloa stream	boundary Waikoloa/Waialeale 2
Kapulena gulch	Kapulena
Kawaikalia gulch	boundary Keahakea/Haukoi
Malanahae gulch	boundary Kapoaula/Malanahae
Honokaia gulch	boundary Malanahe/Honokaia
Kawaiholehole gulch	Honokaia
Keaakaukau gulch	boundary Kawela/Kuilei 2
Kainapahoa gulch	Ahualoa
Ahualoa gulch	boundary Ahualoa/Koloaha
unnamed stream	Kulihai
Nienie gulch	boundary Lauka/Nienie
unnamed stream	boundary Papuaa/Namoku
Ouhi stream	boundary Ouhi/Kaao
Kukuiaonanipahu gulch	Kaao
Kahupu gulch	boundary Kaao/Paauhau
Kahawaililii gulch	boundary Paauhau/Weha
Keahua gulch	boundary Keahua 1/Kalopa
Kalopa gulch	boundary Kalopa/Waikaalulu
Waikaalulu gulch	Waikaalulu
Kaapahu gulch	Kaapahu
Kukuilamalahii Homesteads	boundary Kaapahu/Kaunamano
Alilipali gulch	Kaunamano
Kaumoali gulch	boundary Kaumoali/Kemau 2
Pohakuhaku stream	boundary Pohakuhaku/Kamaui

The ahupua'a, streams and gulches named are those which fall in the project area. That is, these are between the 850 - 1000 foot (259 - 304.8m) levels. There may be others which may be at higher or lower elevations.

APPENDIX B.

Memo, Hibbard to Loui, July 5, 1995.

RECEIVED AS FOLLOWS

BENJAMIN J. TAYETANO  
GOVERNOR OF HAWAII



STATE OF HAWAII  
DEPARTMENT OF LAND AND NATURAL RESOURCES

STATE HISTORIC PRESERVATION DIVISION  
33 SOUTH KING STREET, 6TH FLOOR  
HONOLULU, HAWAII 96818

July 5, 1995

MICHAEL D. WALSON, CHAIRPERSON  
BOARD OF LAND AND NATURAL RESOURCES

DEPUTY  
GILBERT COLOMA-AGARAN

AQUACULTURE DEVELOPMENT  
PROGRAM

AQUATIC RESOURCES  
CONSERVATION AND

ENVIRONMENTAL AFFAIRS  
CONSERVATION AND

RESOURCES ENFORCEMENT  
CONVEYANCES

FOWLTRY AND WILDLIFE  
HISTORIC PRESERVATION


DIVISION  
LAND MANAGEMENT

STATE PARKS  
WATER AND LAND DEVELOPMENT

Memorandum:

LOG NO: 15038 ✓  
DOC NO: 9507hm02

To: Rae M. Loui, Deputy Director  
Commission on Water Resources Management

From: Don Hibbard, Administrator  
State Historic Preservation Division 

Subject: **After-the Fact Petition to Amend Interim Instream Flow Standard  
and Application for Stream Channel Alteration and Diversion Works  
Permits, East Tributary Hi'ilawe Stream, Waipi'o Valley  
TMK: 4-8-03: 006**

This memorandum is in response to your request for additional information on the traditional significance of Hi'ilawe Falls in Waipi'o. In a previous review (Memo, Hibbard to Loui, Nov. 23, 1992), our office expressed concern about the possible alteration and diversion of streams that are the major tributaries of Hi'ilawe Falls. We believe that Hi'ilawe Falls is, itself, a significant cultural site and that a substantial diversion of water or a reduction in water flowing over the falls could further diminish the integrity of this once prominent feature of the Waipi'o landscape. Thus, we feel that such actions could have an "adverse effect" on a significant historic site. The falls is considered culturally significant because of its direct association with mythological characters and significant individuals in the traditional history of Hawaii; its repeated use as a setting for events taking place in myths and legends; and its use in poetic sayings and chants. All demonstrate a continuity in the cultural significance of Hi'ilawae through time and a diversity of use in various forms of cultural expression. Hi'ilawe Falls is also a prominent component of the culturally significant landscape which is currently being considered for nomination to the National and State Register of Historic Places as an Historic District. The supporting references for these assessments are discussed below:

JUL 05 1995

**1. Association with Mythological Characters and Events**

In the collections of myths and legends recorded during the 19th century, the character most directly associated with the falls is the man for whom the falls was named. According to the myth entitled Lau-ka-lele, Hi'ilawe is the brother of the main character, a woman named Lau-ka-ieie who lived in Waipi'o. When Hi'ilawe is dying, he asks her to bury him "where he could always see the eyes of the people" and where he could be changed into wonderful forms. Eventually his body is placed at the "brow of the highest precipice" where he is turned into a large stone. In his *kupua* (demigod) form, however, he appears as the "wonderful misty falls of Waipio, looking into the eyes of his people." Thus he becomes an *aumakua* of the waterfalls of Waipi'o and, as stated by Beckwith (1970:522), his spirit is transformed "into the mist of that waterfall in Waipio valley which is called after his name, of which Hawaiian poets love to sing." All this is made possible by their protector, the goddess Hina in her form as Hina-ulu-ohia (Hina the growing ohia tree) (Westervelt 1987: 102, 109; Beckwith 1970:17). A legend told by a resident of Waipi'o in the 1970's gives an alternative explanation for the name of the falls (Salmoraghi and Yoshinaga 1974). Hi'ilawe was a beautiful woman who was courted by a chief from Puna. During a rendezvous, the chirp of an 'elepaio was seen as an omen of their ill-fated future but they vowed never to part. The woman then took the form of the waterfall while the chief became a large rock near the falls.

More frequently, however, the falls are mentioned only in passing and as the setting for a particular event as the story unfolds. In one example, a mythical character named Paliula and her companion travel throughout the districts of Hawaii Island. When they arrive at Waipi'o, they see a handsome man standing "above a precipice over which leaped the wonderful mist-falls of Hi'ilawe" (Westervelt 1987:154). This young chief then marries the companion of Paliula. In explaining the origin of the annual Makahiki celebrations, a localized version of a well-known tradition places a major figure, Ka-iki-lani, in a breadfruit grove next to the waterfall of Hi'ilawe (Thrum 1923:019; Beckwith 1970:36). Two brothers of the god Lono are sent to earth to find Lono a wife and are successful with the discovery of Ka-iki-lani near Hi'ilawe. After Ka-iki-lani's death, Lono commemorates her life by instituting the games and ceremonies which become part of the Makahiki celebrations. Earlier versions of this tradition do not mention Hi'ilawe and portray Lono, Kamakahiki and Ka-iki-lani as real people. Both appear on chiefly genealogies and were only deified after their deaths.

**2. Association with Traditional Histories and Individuals.**

In the recorded traditions, the mist of Hi'ilawe helps shroud caves in which the remains of the high-ranking chiefs were placed. These traditions essentially reflect the major role of Waipi'o as a primary chiefly residence for many generations of the highest ranking ali'i of Hawaii Island. One tradition recorded in 1853, placed the



burial of Umi, the celebrated 17th century *ali'i*, "in a cave at Waipi'o, at Puahuku, at the top of the great pali over which the cascade of Hiilawae falls" (Remy 1979:20). In 1865, Kamakau wrote that a hidden cave at the base of Hi'ilawe Falls was "where the bones of the famous kings were deposited; where the *ka'ai* [sennit caskets] were made, and the navels placed of Kauhola, Kihe, Liloa, Lonoikamakahiki and Lole" (Rose 1992:8; Kamakau 1988:60).

### 3. Poetic Sayings

As in most references, it is images of the celebrated mists of Hi'ilawe that are emphasized in poetic sayings. In conjuring up images of Hi'ilawe, Kamakau spoke of the "...the glorious waterfall Hiilawe, whose misty spray is carried upon the gentle wind" (*he waiilele hanohano o Hi'ilawe, e pupuku ana kona mau huna huna wai i ke ahu a ka makani*) (Kamakau 1988: 56, 60). A more common saying, or *olelo noeau*, simply states: "Falling into the mist is the water of Hi'ilawe" (Westervelt 1987:103). The most familiar allusion to Hi'ilawe, however, is the song called Hi'ilawe which was made popular more recently by Gabby Pahanui (Elbert and Mahoe 1970:3/49). In this song, the singer seeks the refuge of Hi'ilawe to escape the gossip of the people in Waipi'o.

### 4. Significant Component of a Historic District

As argued in the draft submittal to the Hawaii Review Board of Historic Places (Cordy n.d.), the exceptional significance of Waipi'o lies in the high number of historic sites found in Waipi'o, the rich traditional histories of the valley and the integrity of its dramatic physical setting. Collectively, these factors suggest a level of significance that is greater than just the combined significance of individual sites. In terms of traditional histories, Waipi'o was the primary royal center for the powerful Hawai'i Island chiefly line descended from the chief Pili. Their residence in Waipi'o lasted at least from the time of Kahaimoelea to that of 'Umi, a period stretching from the 1400's to the 1600's. Some traditions place even earlier chiefs in Waipi'o. Representing these and later traditions are the remains of heiau, a royal mausoleum, a pu'uhonua and other structures that are generally present at the residence of a paramount *ali'i*. In even earlier periods, when traditions become mixed with myth, a number of major gods were also said to live in Waipi'o at one time or another. These include the gods Kane and Kanaloa; the Wakea or the "first man" and Milu who became co-ruler of the mythical underworld kingdom. Economically, the valley floor represents an exceptional example of a highly managed and productive environment, including the development of extensive and intensive irrigation systems for which Waipi'o is still famous and several large fishponds. These production systems not only supported the members and activities of the chiefly courts, but a population estimated at 2,500. Within this context, Hi'ilawe Falls stands out as a significant feature of the Valley walls which provided a truly beautiful backdrop for this rich

RECEIVED AS FOLLOWS

4

traditional past and gave highly productive, economic landscape distinct boundaries. The prominence of Hi'ilawe in this backdrop is clear, not only in the references discussed above, but in early historic accounts of the Valley and in the few remaining drawings and etchings of the landscape. Hi'ilawe was also an important source of water for irrigating portions of the Valley's taro *lo'i*. Given the current emphasis on revitalizing taro production, Hi'ilawe would also be of contemporary significance to Hawaiians.

In summary, we recommend that the distribution and flow of water in the tributaries of Hi'ilawe Falls be maintained at levels that allows the falls to retain its historic appearance and the mists for which it was celebrated. This includes maintaining the two separate cascades which merge into form the a single waterfall called Hi'ilawe. If you have any questions, please call Holly McEldowney at 587-0047.

HM:jk

Attachment 1

References Cited

- Beckwith, M. 1970 *Hawaiian Mythology*. Honolulu: University of Hawaii Press.
- Cordy, R. n.d. *National Register of Historic Places Form: Waipi'o Historical District*. Draft Manuscript in the State Historic Preservation Office.
- Elbert, S. H. and N. Mohoe. *Na Mele o Hawai'i Nei*. Honolulu: University of Hawaii Press.
- Kamakau, S. M. 1988 *I Ka W o Kamehameha (In the Time of Kamehameha)*. Edited and Translated by M. N. Chun. Honolulu: The Folk Press.
- Remy, M. Jules. 1979. *Contributions of a Venerable Native to the Ancient History of the Hawaiian Island*. Reno, Nevada: Outbooks.
- Rose, Roger. 1992 *Reconciling the Past: Two Basketry Ka'al and the Legendary Liloa and Lonokikamakahi*. Honolulu: Bishop Museum Bulletin in Anthropology 5.
- Salmoiraghi, F. and Y. Yoshinaga 1974 *Waipi'o: A Hawaiian Valley*. Privately Published Catalog for a Photograph Exhibition at the Wailoa Center, Hilo, Hawaii.
- Thrum, T. G. 1923 *More Hawaiian Folktales*. Chicago: Privately Printed
- Westervelt, W. D. 1987 *Myths and Legends of Hawaii*. Honolulu: Mutual Publishing Company.

## APPENDIX C.

The ditch system crosses 57 ahupua'a from Waipio to Paauilo:

Lalakea	Kukuihaele
Kanahonua	Waikoekoe
Kea`a	Kalakalaula
Mooiki	Hanapai
Niupuka	Papalapuka
Waikoloa	Kapulena
Wai`ale`ale 1,2	Ke`ahakea
Ka`auhuhu	Kapoaula
Hauko`i	Honokaia
Malanahae	Kuilei 1,2
Kawela	Papaki
Au 1-2	Koloaha
Ahualoa	Lauka
Kuliha`i	Papuaa
Nienie	Haina
Namoku	Pa`alaea
Papaanui	Pakiloa
Kalua	Kaao
Ouhi	Weha
Pa`auhau	Keahua 1,2
Mahakuolo	Papalele
Kalopa	Ka`apahu
Waikaalulu	Heneheneula
Kalua	Kaumo`ali
Kaunamano	Kemau 1,2
Alaekila	Kamaui
Pohakuhaku	

## APPENDIX D.

**Table 1. Land Commission Awards**

The ditch system went through the following LCAs listed in numerical order. Some *ahupua'a* names may be repeated. "Awards issued by the Board of Commissioners to Quiet Land Titles between 1846 and 1855 to persons who filed claims to land between 1846 and 1848" (Lucas 1995:65).

\*Archival records not checked.

LCA	Ahupua'a	Royal Patent	Awardee	Description
Kam IV deed	Lalakea		Hamakua Sugar	
M.Aw 4-B	Malanahae	7825 5728 7704	Luluhiwalani	
231	Keahua 1	154	Robert Robinson	House high in mtn
4117:2	Malanahae		Kahakupuna	Houselot, kihapai
4233	Koloaha	7863	Elia Kahuhu	Mamaki, taro
7588-B	*Mooiki	7752	Kalaimamahu	
7713:21	Kuilei 2	4475	Victoria Kamamalu	
7823	Haina	5405	Kahoopahee (w)	Sweet potato, taro, wauke
7832B	Namoku	6511	Keaweopala 2	Kihapai, kula
7837	Nienie	7810	Kane	Houselot, kihapai
7839	Honokaia		Kamaouha	Vegetable food, banana, wauke, coffee, canoe house, 1 house
7957:3	*Kukuihaele	6513	Kaluli	
8281	Haukoi		Kualoha	Not awarded
8365	Honokaia			
8396	Manai	7506	Kaihelelelemoku	Houselot, vegetable food, wauke
8407	Kaumoali	7325	Saimana Haina	Houselot, church, coffee, taro
8408	Kaumoali			
8423	*Honokaia		Kekuaopio	Not awarded
8452:14	Paauhau	8123	Keohokatole, A.	
8559-B:1	Kawela		Wm C. Lunalilo	
8559-B:2	Waikoekoe		Wm C. Lunalilo	
9971	*Keahua 2	845	Wm Pitt Leleiohoku	
9971	Kalakalaula		Wm Pitt Leleiohoku	
9971:2	Kapoaula		Wm Pitt Leleiohoku	
9971:3	Kemau 1		Wm Pitt Leleiohoku	
9971:4	Waikoloa		Wm Pitt Leleiohoku	
9971:5	Paalaea		Wm Pitt Leleiohoku	
9971:8	Waialeale 1		Wm Pitt Leleiohoku	
10671-B	Kapoaula		Pule	Cultivated fields, houses
11216:30	Kanahonua		M. Kekauonohi	

**Table 2.**

The ditch system went through the following grants listed in numerical order. There are no descriptions for grants. "Grants were issued by the Hawaiian government, territory, or State of Hawai'i, for various purposes, e.g. homesteading" (:Lucas 1995:21).

<b>Grant</b>	<b>Ahupua'a</b>	<b>Grant</b>	<b>Ahupua'a</b>
663	Keaa	2490	Au 1 & 2
670	Kapulena	2560	Weha
791	Waikoloa	2985	Kuilei 1
868	Waikoloa	3078	Kalua
935	Kukuihaele	3142	Kaao
938	Ahualoa	3149	Mahukuolo
940	Ahualoa	3156	Haina
946	Haina	3158	Haina
1072	Heneheneula	3264	Koloaha
1156	Malanahae	3603	Heneheneula
1556	Waikaalulu	3722	Papalele
1772	Keaa	3738	Kaunamano
1774	Papuaa	3774	Paapalele
1776	Papalapuka	3776	Kaahuhu Homesteads
1882	Hanapai	3848	Kaumoali
2123	Keahakea	4203	Kaalua
2160	Nienie	4204	Kaalua
2162	Alaekila	4262	Kaahuhu Homesteads
2375	Kulihai	7281	Kaapahu
2448	Kamaui	7910	Kalopa (Homesteads)
2450	Kaumoali	8344	Kalopa (Homesteads)
2465	Papaanui	8433	Kalopa (Homesteads)
2464	Weha	8492	Kalopa (Homesteads)
2486	Kalopa (Homesteads)	9553	Kalopa (Homesteads)

**TABLE 3.**

The ditch system went through the following General Leases (GL). "Leases of public lands usually issued for a 55-year term by the Division of Land Management, Department of Land and Natural Resources, State of Hawai'i" (Lucas 1995:20).

<b>Ahupua'a</b>	<b>General Lease</b>	<b>Awardee</b>
Honokaia	2343	Honokaa Sugar
Kulihai	2369	Honokaa Sugar

RECEIVED AS FOLLOWS

02/03/99

13:36

1 505 322 3735

USDA NRCS KONA

HI STATE OFFICE

002

## LOWER HAMAKUA DITCH CULTURAL RESOURCES ACTION PLAN

### INTRODUCTION

The Lower Hamakua Ditch has been designated State site 50-10-7, 8, 9 -7513 by the Hawaii State Historic Preservation Division (SHPD). The Ditch, Hi ilawe and Hakalaoa Falls are eligible for inclusion on the Hawaii and National Registers of Historic Places. This document outlines the action plan for cultural resources in compliance with Section 106 of the National Historic Preservation Act (NHPA).

Twenty-four sections of the ditch will be replaced or restored. Two of these twenty-four, not yet determined, will be restored to its original state as much as possible. The remaining twenty-two will be modified. Unique, exemplary significant features that will be lost in the modification will be recorded.

All work will be done from the top side of the gulches. No equipment will be placed in the bottom of the gulches. Should there be any need for any equipment to be placed in the bottom of the gulches, the Cultural Resource Specialist will be notified. The CRS will survey the area proposed to be impacted to insure no other historic sites are affected.

The following outlines the action plan for cultural resources for this project:

#### A. Background Research

Prior to the actual work beginning, a background literature search will be conducted. Such research will provide information regarding Native Hawaiian and plantation past land use, agricultural practices and locations of past habitation sites.

1. old maps at State Survey Office, State Land Management
2. contract reports (previous work) at SHPD library.
3. Archives, museums, libraries.
4. Oral histories (talk story with old timers)

#### B. Field Check

A field check to determine the absence/presence of historic sites 50 feet on each side of the ditch was conducted in July and August 1996. The associated maintenance road, sections of stone retaining walls of the road, grouted rock foundation remains in the gulches, will all be components of site 7513.



RECEIVED AS FOLLOWS

02/03/90

13:36

1 505 322 3735

USDA NRCS KONA

HI STATE OFFICE

003

A rock platform in the *ahupua'a* of Kapoaula is very close to and upslope of the ditch. It has not yet been determined if this site will be impacted. If it is determined that it will be impacted, a detailed recording will be done.

C. Specifically for the two sections of the ditch which will be restored:

1. A detailed field survey of the area around the two sections.
2. photographs and detailed description of present state.
3. photographs and detailed description of work in progress.
4. photographs and detailed description of completed work.
5. Any background information on these specific sections.
6. "These flumes will be maintained in such condition for the 25-year life of the project." Discuss future actions for maintenance and preservation of these two sections.

D. Specifically for the twenty-two sections of the ditch which will be replaced, once the sections have been identified:

1. The engineer will do a field check for unique and exemplary significant features that will be lost in the modification or replacement.
  - a. these unique and exemplary significant features that will be lost in the modification or replacement will be recorded in photographs, drawings to scale and a detailed description.
  - b. the CRS will check her notes to check what the findings were during the field check.
    - 1) if there is a question as to probable impact to historic sites, another field check should be made.
    - 2) If there is no question about the absence of sites, she will clear it with the project engineer.

E. Cut stone masonry components will not be modified or altered without consultation with SHPO.

RECEIVED AS FOLLOWS

02/03/99

13:37

☎ 1 808 322 3735

... USDA NRCS KONA

--- HI STATE OFFICE

004

**G. Hīilawe and Hakalaoa Falls**

1. CRS to do literature background research to support National and State Registers eligibility as a traditional cultural property with a discussion of the mythology and significance of the falls to the Native Hawaiian people.
2. A detailed field survey of the area around the two falls needs to be done prior to any work. Findings need to be submitted to SHPD so they can determine the next step especially if work will involve ground disturbing activities.
3. Mitigation measures to be followed during restoration process:
  - a. photographs and detailed description of present state.
  - b. photographs and detailed description of work in progress.
  - c. photographs and detailed description of completed work.
  - d. Discuss future actions for maintenance and preservation of the twin falls.

**F. Write up report. Report should include:**

1. maps (TMK, USGS) with ditch highlighted.
2. history
  - a. resources at time of early Hawaiian presence.
  - b. what political role these resources or lack of, meant for area: desired/scorned by rival chiefs.
  - c. listing of and maps of LCAs and gulches which were impacted by the construction of the ditch.
  - d. gulches without LCAs but which could have been used for habitation and/or cultivation.
3. Land use
  - a. early Hawaiian use.
  - b. advent of foreigners and their schemes for the land and their effects upon Native Hawaiians and other ethnic groups.

RECEIVED AS FOLLOWS

02/03/99 13:37 1 805 322 3735

USDA NRCS KONA --- HI STATE OFFICE

005

- c. effect of the sugar plantation and ditch upon Native Hawaiians and other ethnic groups.
- d. map of lands previously intensively cultivated by the plantation.
- e. effects of the demise of the sugar plantation upon Native Hawaiians and other ethnic groups.

H. Analysis of findings

- 1. background research, location of LCAs, and probable sites found in the field, etc.
- 2. map, photographs and description of any field findings.
- 3. Discussion of findings and/or lack of sites.
- 4. Discuss action for any sites that are found: preserve in place, avoidance.

I. Role of the repaired and rehabilitated Lower Hamakua Ditch in the Hamakua district.

02/03/99

**APPENDIX C -  
HAWAII COASTAL ZONE MANAGEMENT  
ASSESSMENT**

FEDERAL CONSISTENCY  
SUPPLEMENTAL INFORMATION FORM

Project/Activity Title or Description: Lower Hamakua Ditch Watershed Project

Island Hawaii Tax Map Key No. 3rd:6-3 various Est. Start Date: April 1999  
4-3,4,5,6,7,8,9 var.

APPLICANT OR AGENT

Name & Title Kenneth M. Kaneshiro, State Conservationist  
Agency/Organization USDA Natural Resources Telephone (808) 541-2600  
Conservation Service  
Address PO BOX 50004, Honolulu, HI Zip 96850

TYPE OF APPLICATION (check one only)

I. Federal Activity  
(statement "a")

"The proposed activity is consistent with and will be conducted in a manner consistent to the maximum extent practicable with the Hawaii Coastal Zone Management Program."

Signature *Kenneth M. Kaneshiro* Date Nov. 17, 1998

II. Permit or License  
(statement "b")

"The proposed activity complies with Hawaii's Coastal Zone Management Program and will be conducted in a manner consistent with such a program."

Signature \_\_\_\_\_ Date \_\_\_\_\_

III. OCS Plan/Permit

IV. Grants & Assistance

HAWAII CZM PROGRAM  
ASSESSMENT FORM

RECREATIONAL RESOURCES

Objective: Provide coastal recreational opportunities accessible to the public.

Policies

- 1) Improve coordination and funding of coastal recreation planning and management.
- 2) Provide adequate, accessible, and diverse recreational opportunities in the coastal zone management area by:
  - a) Protecting coastal resources uniquely suited for recreational activities that cannot be provided in other areas;
  - b) Requiring replacement of coastal resources having significant recreational value, including but not limited to surfing sites and sandy beaches, when such resources will be unavoidably damaged by development; or requiring reasonable monetary compensation to the State for recreation when replacement is not feasible or desirable;
  - c) Providing and managing adequate public access, consistent with conservation of natural resources, to and along shorelines with recreational value;
  - d) Providing an adequate supply of shoreline parks and other recreational facilities suitable for public recreation;
  - e) Encouraging expanded public recreational use of County, State, and Federally owned or controlled shoreline lands and waters having recreational value;
  - f) Adopting water quality standards and regulating point and non-point sources of pollution to protect and where feasible, restore the recreational value of coastal waters;
  - g) Developing new shoreline recreational opportunities, where appropriate, such as artificial reefs for surfing and fishing; and
  - h) Encouraging reasonable dedication of shoreline areas with recreational value for public use as part of discretionary approvals or permits by the land use commission, board of land and natural resources, County planning commissions; and crediting such dedication against the requirements of section 46-6.

Check either "Yes" or "No" for each of the following questions.

	<u>Yes</u>	<u>No</u>
1. Will the proposed action involve or be near a dedicated public right-of-way?	—	<u>X</u>
2. Does the project site abut the shoreline?	—	<u>X</u>
3. Is the project site near a State or County park?	—	<u>X</u>
4. Is the project site near a perennial stream?	<u>X</u>	—
5. Will the proposed action occur in or affect a surf site?	—	<u>X</u>
6. Will the proposed action occur in or affect a popular fishing area?	—	<u>X</u>
7. Will the proposed action occur in or affect a recreational or boating area?	—	<u>X</u>
8. Is the project site near a sandy beach?	—	<u>X</u>
9. Are there swimming or other recreational uses in the area?	—	<u>X</u>

RECREATIONAL RESOURCES - Discussion

Project activities are not expected to have an effect on the coastal recreational resource objective because of the physical profile of the shoreline, distance of structural improvements from the shoreline, and minimal environmental impacts of the project.

Recreational activities along the shoreline are limited because it is formed mainly of steep cliffs that range from 50 to 350 feet in height.

The majority of the structural improvements are to the ditch structure which, at its closest point, is one-third mile from the shoreline and is typically over 1 mile from shore along its length.

Other major improvements will be well away from shore at the ditch intakes and Hakalaoa Falls above Waipio Valley and at the new reservoir site at Honokaia. Pollution control measures will be utilized in accordance with county grading ordinance and NRCS construction specifications.

The exact location of individual farms and their associated land treatments will not be known until actual leases on the land are developed sometime in the future. However, it is unlikely that any improvements on the cropland would adversely affect any coastal recreational opportunities in the area. Accelerated land treatment assistance will be provided during the four year installation period to design and implement water and other conservation and pollution-prevention practices on individual farms.

Twenty-three streams that are perennial along some reach of the stream are identified between Waipio Valley and Paauilo by the Hawaii Stream Assessment. Most of these are at higher elevations than the project area. The Lower Hamakua Ditch (LHD) currently diverts about 25-30 MGD of surface water from three streams in Waipio Valley. Implementation of the project plan will decrease, by two-thirds, the average diversion amount to 9 MGD.

HISTORIC RESOURCES

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

Policies

- 1) Identify and analyze significant archaeological resources;
- 2) Maximize information retention through preservation of remains and artifacts or salvage operations; and
- 3) Support State goals for protection, restoration, interpretation, and display of historic resources.

Check either "Yes" or "No" for each of the following questions.

	<u>Yes</u>	<u>No</u>
1. Is the project site within a historic/cultural district?	___	<u>X</u>
2. Is the project site listed on or nominated to the Hawaii or National register of historic places?	___	<u>X</u>
3. Does the project site include undeveloped land which has not been surveyed by an archaeologist?	___	<u>X</u>
4. Has a site survey revealed any information on historic or archaeological resources?	<u>X</u>	___
5. Is the project site within or near a Hawaiian fishpond or historic settlement area?	<u>X</u>	___

Discussion

(See following page)



#### HISTORIC RESOURCES - Discussion

The major cultural resources of the Lower Hamakua Ditch watershed include native Hawaiian archaeological sites and present-day expressions of native Hawaiian culture in Waipio Valley and historic resources in the Hamakua project area, including the Lower Hamakua Ditch.

Surveys performed in the area include a regional synthesis for the Hamakua area (Cordy, 1994) and a preliminary investigation for pre-sugar cultural resources along a 14.5-mile long, 100-foot wide corridor centered on the LHD in July 1996. Extensive sugarcane cultivation for over a century in the Hamakua project area has eliminated most opportunities for the detection of Hawaiian archaeological resources. Though the 1994 synthesis suggested archaeological features could still be found in gulches, the later investigation suggested that natural flooding in the narrow gulch bottoms would have washed away any evidence of early habitation or cultivation.

The numerous archaeological sites and settlement area of Waipio Valley are not expected to be affected by the project. Project construction activities in Waipio Valley will be limited to modification of three existing stream diversions, mainly using hand labor. The traditional taro cultivation may be affected by the increased flow in the Waipio Valley streams resulting from the reduced diversion to the Hamakua area. Some taro farmers believe this will improve taro farming, while others contend that auwai water management will become more difficult. The twin falls at the back of Hiilawe Valley, with their traditional and cultural significance, will be restored by the project.

Many of the structures that were built by the sugar industry, including the LHD, meet the criteria for nomination to the National Register of Historic Places. In consultation with the Hawaii State Historic Preservation Office, NRCS will ensure that the LHD historic values are not lost or destroyed. Two flumes will be repaired in original structural construction and materials and retained as operational components of the LHD. Other flumes with significantly unique features will be recorded through engineering rendering and photography before modification. Original stonework along the open ditch will not be disturbed.

In the event that any unanticipated sites or remains such as artifacts, shell, bone or charcoal deposits; human burials; rock or coral alignment, pavings, or walls are encountered during construction, work will be stopped and the State Historic Preservation Officer and the U.S. Secretary of the Interior will be contacted in accordance with the procedures outlined in the NRCS General Manual, Title 420, Part 401, October 1983, as amended. NRCS will take actions to protect or recover, or both, any significant cultural resources discovered during construction.

SCENIC AND OPEN SPACE RESOURCES

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

Policies

- 1) Identify valued scenic resources in the coastal zone management area;
- 2) Insure that new developments are compatible with their visual environment by designing and locating such developments to minimize the alteration of natural landforms and existing public views to and along the shoreline;
- 3) Preserve, maintain and, where desirable, improve and restore shoreline open space and scenic resources; and
- 4) Encourage those developments which are not coastal dependent to locate in inland areas.

Check either "Yes" or "No" for each of the following questions.

	<u>Yes</u>	<u>No</u>
1. Does the project site abut a scenic landmark?	<u>X</u>	—
2. Does the proposed action involve the construction of a multi-story structure or structures?	—	<u>X</u>
3. Is the project site adjacent to undeveloped parcels?	<u>X</u>	—
4. Does the proposed action involve the construction of structures visible between the nearest coastal roadway and the shoreline?	—	<u>X</u>
5. Will the proposed action involve construction in or on waters seaward of the shoreline? On or near a beach?	—	<u>X</u>

SCENIC AND OPEN SPACE RESOURCES - Discussion

This project will achieve restoration and support preservation of scenic and open space resources. By promoting diversified agricultural activity, implementation will ensure the rural/agrarian character in the Hamakua project area. Much of the idle sugarcane land near and below the highway will be used for cropland or grazing. Protection of agricultural land and land use through the county zoning process will be better supported by an active agricultural economy.

The project area includes Waipio Valley, an important scenic area. Construction activity in Waipio Valley will be limited to modification of three existing stream diversions and tunneling repair and removal of the upstream diversion of the Lalakea Stream tributary to restore Hakalaoa Falls. A remote relay transmitter unit will be placed near the Waima intake of the Upper Hamakua Ditch. No previously undeveloped areas will be affected by project implementation.

Minimal negative impacts may be perceived from the conversion of most of the existing wooden flume structures along the LHD to large diameter culvert pipe and steel supports. Approximately one-half of the 50 flumes have already been reconstructed in this manner.

COASTAL ECOSYSTEMS

Objective: Protect valuable coastal ecosystems from disruption and minimize adverse impacts on all coastal ecosystems.

Policies

- 1) Improve the technical basis for natural resource management;
- 2) Preserve valuable coastal ecosystems of significant biological or economic importance;
- 3) Minimize disruption or degradation of coastal water ecosystems by effective regulation of stream diversions, channelization, and similar land water uses, recognizing competing water needs; and
- 4) Promote water quantity and quality planning and management practices which reflect the tolerance of fresh water and marine ecosystems and prohibit land and water uses which violate State water quality standards.

Check either "Yes" or "No" for each of the following questions.

	<u>Yes</u>	<u>No</u>
1. Does the proposed action involve dredge or fill activities?	___	<u>X</u>
2. Is the project site within the Shoreline Setback Area (20 to 40 feet inland of the shoreline)?	___	<u>X</u>
3. Will the proposed action require some form of effluent discharge into a body of water?	___	<u>X</u>
4. Will the proposed action require earthwork beyond clearing and grubbing?	<u>X</u>	___
5. Will the proposed action include the construction of special waste treatment facilities, such as injection wells, discharge pipes, or cesspools?	___	<u>X</u>
6. Is an intermittent or perennial stream located on or near the project site?	<u>X</u>	___
7. Does the project site provide habitat for endangered species of plants, birds, or mammals?	<u>X</u>	___
8. Is any such habitat located nearby?	<u>X</u>	___
9. Is there a wetland on the project site?	<u>X</u>	___
10. Is the project site situated in or abutting a Natural Area Reserve?	<u>X</u>	___

- |  |   |          |
|--|---|----------|
| 11. Is the project site situated in or abutting a Marine Life Conservation District? | — | <u>X</u> |
| 12. Is the project site situated in or abutting an estuary?                          | — | <u>X</u> |

COASTAL ECOSYSTEMS - Discussion

No adverse impacts to coastal or other ecosystems are anticipated. Project implementation will result in restoration of much of the flow currently diverted from the streams that flow into Waipio Valley.

Installation of project improvements will require mobilization, staging, and demobilization of equipment and material. Most of construction activity will not require any excavation or earth moving, except for site preparation for equipment. There will be excavation for a tunnel repair in the rock wall behind Hiilawe Falls and for a one-MG reservoir at Honokaia. All construction activity will be in conformance with Hawaii County's Erosion and Sediment Control codes. A county-approved erosion and sediment control plan will be developed and included in the design for each phase of work.

The average diversion rate will be reduced from the 25 to 30 MGD to 9 MGD. During droughts the diversion rate will be similar to current drought period diversion rates. The selected alternative will increase the average flow in Wailoa river by about 50 percent through reduced diversion rates from the three Waipio Valley streams. During dry periods when agricultural water demand will be greatest, the diversion from the Waipio Valley streams will be approximately 17 MGD, nearly all of the base flow of the three streams diverted, leaving approximately 23 MGD flowing in Wailoa River. This is expected to occur for several days to several weeks during two of ten years.

There are four endangered animal species, nine threatened or endangered plant species, and seven species of concern to the U.S. Fish and Wildlife Service that occur within the project boundaries. No effect to threatened and endangered species is expected by project implementation. Three of the animal species are wide-ranging species that will not normally be adversely affected by specific construction activities, however short term disturbances may occur during modification of the Kawainui Stream intake and lining of the Paauilo reservoir.

The wetland areas of Waipio Valley should not be adversely affected and may benefit from the increase in average flow in Wailoa River. In the Hamakua area, artificially created wetlands and reaches of perennial streams will likely be eliminated as leakage from the flumes along the Lower Hamakua Ditch will be reduced with project implementation. An investigation conducted in September 1998 indicated that the leakage from the LHD did not create unique or valuable wildlife habitat.

The Pu'u O 'Umi Natural Area Reserve occupies 10,142 acres to the west of and including a portion of the northwest corner of the Lower Hamakua Watershed in the summits of the Kohala Mountains. There will be no project activities within reserve boundaries. All of the stream diversion intakes, ditch structures, and project activities are outside of and at elevations 2000 feet or more lower than the nearest Natural Area Reserve boundaries. Project activities are not expected to have any offsite effects in the Reserve.

ECONOMIC USES

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

Policies

- 1) Concentrate in appropriate areas the location of coastal dependent development necessary to the State's economy;
- 2) Insure that coastal dependent development such as harbors and ports, visitor industry facilities, and energy generating facilities are located, designed, and constructed to minimize adverse social, visual, and environmental impacts in the coastal zone management area; and
- 3) Direct the location and expansion of coastal dependent developments to areas presently designated and used for such development and permit reasonable long-term growth at such areas, and permit coastal dependent development outside of presently designated areas when:
  - a) Utilization of presently designated locations is not feasible;
  - b) Adverse environmental effects are minimized; and
  - c) Important to the State's economy.

Check either "Yes" or "No" for each of the following questions.

	<u>Yes</u>	<u>No</u>
1. Does the project involve a harbor or port?	___	<u>X</u>
2. Is the project site within a designated tourist destination area?	___	<u>X</u>
3. Does the project site include agricultural lands or lands designated for such use?	<u>X</u>	___
4. Does the proposed activity relate to commercial fishing or seafood production?	___	<u>X</u>
5. Does the proposed activity relate to energy production?	___	<u>X</u>
6. Does the proposed activity relate to seabed mining?	___	<u>X</u>

ECONOMIC USES - Discussion

Project implementation will preserve the value of important area visitor sites through restoration of the twin falls at Hiilawe and promotion of diversified agricultural activity in the Hamakua project area ensuring the rural/agrarian character and landscape of the Hamakua area.

Modification of the intakes and the tunnel repair at Hakalaoa Falls will occur on land designated Conservation. The proposed ditch restoration is to be on land designated Agricultural. Project implementation will support the land use designations of the state and county.

COASTAL HAZARDS

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

Policies

- 1) Develop and communicate adequate information on storm wave, tsunami, flood erosion, and subsidence hazard;
- 2) Control development in areas subject to storm wave, tsunami, flood, erosion, and subsidence hazard;
- 3) Ensure that developments comply with requirements of the Federal Flood Insurance Program; and
- 4) Prevent coastal flooding from inland projects.

Check either "Yes" or "No" for each of the following questions.

	<u>Yes</u>	<u>No</u>
1. Is the project site on or abutting a sandy beach?	___	<u>X</u>
2. Is the project site within a potential tsunami inundation area as depicted on the National Flood Insurance Program flood hazard map?	___	<u>X</u>
3. Is the project site within a potential flood inundation area according to a flood hazard map?	___	<u>X</u>
4. Is the project site within a potential subsidence hazard area according to a subsidence hazard map?	___	<u>X</u>
5. Has the project site or nearby shoreline areas experienced shoreline erosion?	___	<u>X</u>

COASTAL HAZARDS - Discussion

The proposed project is not expected to have a significant effect upon or be significantly affected by coastal hazards. Flooding has not been identified as a significant problem along the Hamakua project area. Storm wave, tsunami, and flooding have been identified as hazards affecting the Waipio Valley floor.

In the Hamakua area, the Flood Insurance Rate Map indicates only the occasional strands of low-lying land at the base of the Hamakua cliffs are subject to inundation by the 100-year coastal flood. Conversely, the entire floor of Waipio Valley is designated as 100-year floodplain. Although the valley has had three recent severe floods, the selected plan is not expected to affect flooding hazard in the project area because the proposed project will increase average annual peak flood depths less than 0.02 feet in Wailoa Stream.

No project improvements are expected to be affected by coastal hazards.

MANAGING DEVELOPMENT

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

Policies

- 1) Effectively utilize and implement existing law to the maximum extent possible in managing present and future coastal zone development;
- 2) Facilitate timely processing of application for development permits and resolve overlapping or conflicting permit requirements; and
- 3) Communicate the potential short- and long-term impacts of proposed significant coastal developments early in their life cycle and in terms understandable to the general public to facilitate public participation in the planning and review process.

Check either "Yes" or "No" for each of the following questions.

	<u>Yes</u>	<u>No</u>
1. Will the proposed activity require more than two (2) permits or approvals?	<u>X</u>	___
2. Does the proposed activity conform with the State and County land use designations for the site?	<u>X</u>	___
3. Has or will the public be notified of the proposed activity?	<u>X</u>	___
4. Has a draft or final environmental impact statement or an environmental assessment been prepared?	<u>X</u>	___

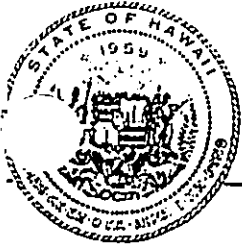
MANAGING DEVELOPMENT - Discussion

The following permits will need to be obtained before implementation of proposed plan:

Grading, Grubbing, Excavating And Stockpiling Permit (Department of Public Works)  
Building Permit " "  
State Land Use Approval (Department of Land and Natural Resources)  
Conservation District Use Application " "  
Interim Instream Flow Standard Amendment " "  
Stream Channel Alteration Permit " "  
State Highways Permit (Department of Transportation)  
Department of the Army (404) Permit (U.S. Army Corps of Engineers)

No State or County land use designation revision or variances will be required.

A Draft Environmental Impact Statement (DEIS) is being submitted concurrently with this CZM review. The current DEIS supersedes a version submitted in August 1995 that was produced after no less than six public participation meetings and includes the additional information requested by review comments on that document. This DEIS will be reviewed through both State of Hawaii and NEPA review processes with extensive public notification and participation. A widely publicized public meeting to discuss the DEIS will be held in the project area during the DEIS review period.



**DEPARTMENT OF BUSINESS,  
ECONOMIC DEVELOPMENT & TOURISM**

**OFFICE OF PLANNING**

235 South Beretania Street, 6th Flr., Honolulu, Hawaii 96813  
Mailing Address: P.O. Box 2359, Honolulu, Hawaii 96804

BENJAMIN J. CAYETANO  
GOVERNOR  
SEIJI F. NAYA  
DIRECTOR  
BRADLEY J. MOSSMAN  
DEPUTY DIRECTOR  
~~BOWEN~~  
DIRECTOR, OFFICE OF PLANNING

David W. Blane

Tel.: (808) 587-2846  
Fax: (808) 587-2824

Ref. No. P-7901

January 15, 1999

Mr. Kenneth M. Kaneshiro  
State Conservationist  
Natural Resources Conservation Service  
P.O. Box 50004  
Honolulu, Hawaii 96850

Dear Mr. Kaneshiro:

Subject: Hawaii Coastal Zone Management (CZM) Program Federal Consistency  
Review for the Lower Hamakua Ditch Watershed Project, Hamakua, Hawaii

Your proposal for the repair, rehabilitation and replacement of components of the Lower Hamakua Ditch system has been reviewed for consistency with Hawaii's CZM Program. The basis for this CZM consistency review is the *Watershed Plan and Environmental Impact Statement - Lower Hamakua Ditch Watershed, Hawaii County, Hawaii*. We concur with your CZM assessment and finding that the activity is consistent to the maximum extent practicable based on the following conditions.

1. The mitigation measures prescribed in Chapter 6 of the Draft EIS shall be fully implemented for:

Section 6.3.2 Erosion and Sedimentation;  
Section 6.3.4 Wildlife;  
Section 6.3.5 Threatened and Endangered Species;  
Section 6.3.6 Surface Water Quality and Quantity; and  
Section 6.3.10 Cultural and Historic Resources.

2. According to the Draft EIS (p. 121), a Memorandum of Agreement is being executed between NRCS and the State Historic Preservation Division to comply with Section 106 of the National Historic Preservation Act of 1966.
3. The project shall be in compliance with all requirements of the Commission on Water Resource Management, Department of Land and Natural Resources.

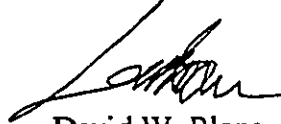


Mr. Kenneth M. Kaneshiro  
Page 2  
January 15, 1999

4. The project shall be in compliance with State water quality standards and requirements of the Department of Health.

CZM consistency concurrence is not an endorsement of the project nor does it convey approval with any other regulations administered by any State or County agency. Thank you for your cooperation in complying with Hawaii's CZM Program. If you have any questions, please call John Nakagawa of our CZM Program at 587-2878.

Sincerely,



David W. Blane  
Director  
Office of Planning

cc: U.S. Army Corps of Engineers, Operations Branch  
U.S. National Marine Fisheries Service, Pacific Area Office  
U.S. Fish and Wildlife Service, Pacific Islands Ecoregion  
State Department of Agriculture  
Department of Health, Clean Water Branch  
Department of Land & Natural Resources,  
Planning & Technical Services Branch  
Commission on Water Resource Management  
Historic Preservation Division  
Planning Department, County of Hawaii

**APPENDIX D -  
COMMENTS RECEIVED DURING 1995  
REVIEW PERIOD**

Twenty-six letters commenting on the federal DEIS were received during the review period. In addition, four letters commenting on the Environmental Assessment/EIS Preparation Notice were received by OEQC and forwarded to NRCS for reply.

Acknowledgment of receipt of comments was sent immediately following the review period. A consolidated discussion of all comments received during the 1995 review period was later sent to commentors and is reproduced below.



STATE OF HAWAII  
DEPARTMENT OF LAND AND NATURAL RESOURCES  
DIVISION OF FORESTRY AND WILDLIFE  
1151 PUNCHBOWL STREET  
HONOLULU, HAWAII 96813  
September 26, 1995

MOHOLE D. HELUM  
GOVERNOR  
BOARD OF LAND AND NATURAL RESOURCES

DEPUTY  
CELEST E. COLONIA-JAGARAN

ACQUISITION DEVELOPMENT  
PLANNING  
POLICY AND ADMINISTRATION  
SOILS AND OCEAN RECLAMATION  
CONSERVATION AND  
ENVIRONMENTAL AFFAIRS  
COMPLIANCE  
RESPONSES AND COMPLAINTS  
FORESTRY AND WILDLIFE  
HISTORIC PRESERVATION  
STATE PARKS  
WATER AND LAND DEVELOPMENT  
WATER RESOURCE MANAGEMENT

Mr. Kenneth M. Kaneshiro, State Conservationist  
Natural Resources Conservation Service  
P.O. Box 50004  
Honolulu, HI 96850-0001

Dear Mr. Kaneshiro:

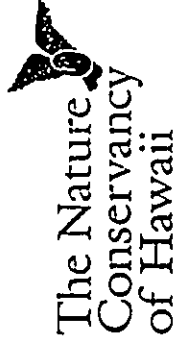
Thank you for the opportunity to comment on the environmental impact statement (EIS) for the draft watershed plan on the Lower Hamakua Ditch Watershed. We are, as you know, negotiating with Fletcher Challenge of New Zealand to lease over 5,000 acres along the Hamakua Coast for a sustainable forestry operation. Although irrigation water is not needed for the plantation trees after they are planted, water might be needed for nursery operations should one be established.

The draft watershed plan EIS does not elaborate as to the locations that will be modified, the modification activity to take place, and the changes in soil moisture along the ditch. Due to the changes in vegetative cover and soil moisture, invasive weeds could be a major problem. Reseeding mixtures to mitigate adverse impacts to various sites is also a concern to us. Certain species could spread throughout the area and become a weed pest. No extensive botanical surveys were apparent for the area. Threatened and endangered species that might be found in the area include *Phyllostegia floribunda*, *Pritchardia lanigera*, *Lobelia hypoleuca*, *Phyllostegia vesita*, *Clermontia waimeae*, *Clermontia calophylla*, *Cyanea guinesiana* ssp. *cylindrocalyx*, *Tetraplasandra oahuensis*, and *Diplazium molokaiense*. Does the project area also fall within the Puu O Umi Natural Area Reserve?

Should you have any questions or comments concerning this letter, please contact Dr. Carolyn Corn of my staff at 587-0166.

Very truly yours,

Michael G. Buck  
Administrator



August 14, 1995

Kenneth M. Kaneshiro  
State Conservationist  
USDA  
Natural Resources Conservation Service  
P. O. Box 50004  
Honolulu, HI 96850-0001

Re: Draft Watershed Plan Environmental Impact Statement for Lower Hamakua Ditch Watershed

Dear Mr. Kaneshiro:

Thank you for considering us however we have no comments and should not be included on your list of reviewers.

Sincerely,

Tamara Chow  
Administrative Coordinator  
Science and Stewardship

D.P.D. Mike Chomura  
A. Lynn Anderson  
C. David Brown  
Zakia M. Brown  
Amanda J. Chen  
Arnell F. Clark

Shirley A. Clark  
Nancy A. Clark, Jr.  
Paul J. Clark  
James J. Clark

Shirley King  
Arnell F. King  
Thomas C. King  
Debra M. King  
Fred J. King

Margaret M. King  
Charles J. King  
C. Dudley King, Jr.  
H. Henry King  
John E. King

Yvonne Smith  
R. Douglas Smith  
Charles E. Smith  
William H. Smith  
Edward D. Smith, Jr.  
John H. Smith

International Headquarters, 1115 North Lynn Street, Arlington, Virginia 22209



# University of Hawaii at Manoa

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

5 October 1995

Mr. Kenneth M. Kaneshiro  
State Conservationist  
Natural Resources Conservation Service  
P.O. Box 50004  
Honolulu, Hawaii 96850-0001

Dear Mr. Kaneshiro:

**Subject:** Draft EIS: Watershed Plan, Lower Hamakua Ditch Watershed Hawaii County, Hawaii

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

Comment 1

This DEIS has detailed 4 alternative plans to alleviate unemployment in project areas due to the closure of Hamakua Sugar Plantation. Wooden flumes of lower Hamakua ditch will be repaired/replaced to maintain irrigation water flow. In the abstract the local share of the cost is about 37%. It needs more information: is it state's share or users share? Plan for final EIS is well arranged in this DEIS.

Comment 2

The draft environmental impact (DEIS) seems to be well done overall. The objectives of this project seem to be as follows:

1. To restore flow over Hakaloa Falls which has been diverted since 1989 to protect a temporary flume installed there after a portion of the tunnel system failed. Approximately \$1,308,800 (or 14%) of the estimated costs of the recommended project are related to restoring flow to Hakaloa Falls. This has a positive environmental impact and constitutes a relatively small portion of the total cost.
2. To repair the ditch system which had an original capacity of 40 MGD and currently conveys about 30 MGD, of which about 2 MGD is used and 5.5 MGD is lost to leakage. The project would presumably restore the flows in Hamakua Ditch to 30 MGD. Approximately \$1,311,700 or (14%) of the estimated costs of the recommended project are related to repairing Hamakua Ditch, presumably such that losses will be reduced and a new farm irrigation distribution system can also be constructed.
3. To construct new irrigation water distribution systems for 2,500 acres of cropland, 5 acres of aquaculture and 2,000 acres of pasture. Approximately \$2,246,700 (or 23%) of the estimated costs of the recommended project are related to the trickle irrigation systems. The irrigation systems would be used on 250 10-acre farms which would help create 350 new jobs.

AN EQUAL OPPORTUNITY EMPLOYER

Mr. Kenneth M. Kaneshiro  
5 October 1995  
Page 2

4. To provide land treatment including seeding, fertilizer, fencing, distribution systems, and holding tanks. Approximately \$4,632,000 (or 48%) of the estimated costs of the recommended project are related to land treatment costs. Land treatment would also help to create new farms and 350 new jobs.

Of the total cost (\$9,579,200), it seems that the State share is \$3,576,400 (37%) and that the Federal share is \$6,002,800 (63%). It needs to be made clear that local share means State share. Allocation of the O&M costs (\$574,600 per year) is much less clear. The DEIS mentions Long Term Contracts (LTCs) with the users for cost-share funds for up to ten years. What are these funds for, and what percentage is paid by the state and the users? How much, if anything, do the users have to pay for the water delivered? The DEIS mentions that O&M is a local responsibility. Who's responsibility, the State or the users?

It is unclear whether diversions to the repaired Hamakua Ditch will be at 30 MGD all of the time or only as needed by downstream users. Why restore Hamakua Ditch flows to 30 MGD when only an average of 7.4 MGD and a peak flow of 17.2 MGD is needed during extreme drought times? Are there any other beneficial uses of water in Hamakua Ditch other than agricultural irrigation? If not, only flows that will be used should be diverted, and the rest should flow over Hakaloa Falls and into Waipio Valley. How were the average annual benefits calculated? More details are needed regarding the calculation of average annual benefits.

All potential environmental impacts seems to have been addressed.

Thank you for the opportunity to comment.

Sincerely,

Roger S. Fujioka, Ph.D.  
Director, WRRC

RSF:jmn

cc: Y.S. Fok  
R. Babcock, Jr.

Legal Aid  
Society  
of  
Hawaii  
Empowering The State Of Hawaii

1110 HIKETAU 305 WAIALAE DRIVE HONOLULU, HAWAII 96816-2416  
TELEPHONE (808) 941-2831

STEPHEN LIVING, ESQ.  
PRACTICING BOARD OF DIRECTORS  
MI VICTOR GONZALEZ, ESQ.  
EXECUTIVE DIRECTOR

November 1, 1995

Kenneth M. Kaneshiro  
State Conservationist  
Natural Resources Conservation Service  
P.O. Box 50004  
Honolulu, HI 96850-0001

RE: Comments, Draft Watershed Plan-Environmental Impact  
Statement for Lower Hamakua Ditch Watershed

Dear Mr. Kaneshiro,

The Legal Aid Society of Hawaii ("LASH") appreciates this opportunity to comment on the Draft Watershed Plan for the Lower Hamakua Ditch Watershed (hereinafter, "DEIS" or "Watershed Plan"). LASH represents several farmers, homeowners, and tenants living in Waipio Valley. Our clients are keenly interested in the proposed Watershed Plan. They feel that the proposed project will have substantial aesthetic, environmental, and cultural impacts on Waipio Valley, and may adversely affect their ability to cultivate taro and earn a living from their small farms.

The project as proposed both offers opportunities and poses risks for Waipio residents. Many of the opportunities relating to Waipio residents are set forth in the Watershed Plan. For example, the DEIS identifies as an opportunity the deeply felt need "to restore Hakaloa Falls." DEIS, at 24. Also, the DEIS identifies employment in small scale diversified agriculture along the Hamakua coast (which presumably would be available to Waipio residents) as a key program goal. As well, the DEIS identifies the opportunity "to reduce the diversions from [the Kawaihau, Alakahi, and Koiawe] streams so more water is available for natural stream flows and for traditional uses of water." DEIS, at 25. Time constraints on the Natural Resources Conservation Service's ("NRCS") planning team, however, seem to have precluded a careful review of the potential risks posed by the Watershed Plan to farmers in Waipio Valley.

The critical risk for Waipio residents posed by the Watershed Plan lies in the rehabilitation of the Lower Hamakua Ditch for the primary benefit of water users on the Hamakua Coast. All of the

water diverted by the ditch would otherwise be available for use by the residents and farmers in Waipio Valley. Ordinarily there is sufficient water flowing down the streams feeding into Waipio Valley such that average program diversion of 7.4 MGD would be inconsequential. However, during low flow periods when irrigation needs along the Hamakua Coast are high, program diversions could require virtually all of the water flowing in the tributary streams. See DEIS at 49.

Although the DEIS clearly indicates that water rights issues are the province of state law, nevertheless, the operating assumption in the Watershed Plan is that program irrigation requirements are met first, and thereafter, remaining water is released to Waipio Valley. For example, in the "Formulation and Comparison of Alternatives" section, the DEIS declares that irrigation of 2,500 acres is the "first and foremost concern," and that "leaving enough water in the natural streams that flow into Waipio Valley to provide for anticipated taro farming . . ." is a secondary matter. DEIS at 34. Moreover, the DEIS specifically asserts that although water diversions would substantially decline from historic levels under the proposed plan, nevertheless, only "the remaining water would be available for other uses including taro farming in Waipio Valley, stream and wetland biota, or additional irrigation in the future." DEIS at 35 (emphasis added). See also DEIS at 67, ("Stream flows in excess of the needed flow will be left in the stream or returned to the stream immediately below the diversion point."). If water allocation is a function of state law, then it would appear premature for planners to assume that water diversions take precedence over in-stream flows.

Although a PL-566 project is not the appropriate vehicle to resolve water rights disputes, the Watershed Plan might facilitate resolution of this matter by proposing a process by which Valley and coastal residents could engage the issue. It is possible that an irrigation district or committee could be established with fair representation for all water users with the charge of setting water-sharing principles or procedures for low-flow periods.

Whether or not competition arises over water during drought will depend upon the actual need for irrigation water on the Hamakua Coast. Water needs on the coast will be determined by the demand for irrigated farmland, and the water budget for the crops planted. Unfortunately, the information provided in the DEIS is insufficient to allow for an objective determination of these matters.

For instance, the basis for the scope of the proposed project is not well articulated. According to the DEIS, "Irrigation needs are based on 2,500 acres of intensive irrigated agriculture. . . . The 2,500 acres of irrigated cropland was determined in consensus planning session with the steering committee." DEIS at 57.

Without additional information, one might conclude that the mark of 2,500 acres is rather arbitrary.

In addition, the Watershed Plan does not fairly explicate the expected use of the proposed irrigated cropland. The DEIS states that the "proposed intensively farmed areas will be used for growing crops such as taro, ginger, draceana, papaya, and other tropical fruits and vegetables." DEIS at 24. See also DEIS at C-2. ("The crops will be truck crops, flowers, foliage and fruits.") It would seem to be impossible to evaluate water needs from such vague premises.

Moreover, the discussion of water needs in Appendix C is highly generalized and does not fairly address the critical issue of potential conflict during low-flow periods and drought. According to the DEIS, the peak water requirement used to design the proposed delivery system "is not expected to occur very frequently." DEIS at C-2. Although satisfying program peak demands will almost certainly affect water availability in Waipio Valley, we are left to wonder about the frequency and duration of such events.

In addition to issues relating to water use and potential conflict, our clients are concerned about environmental and cultural impacts of the proposed program, about the viability of the proposed Watershed Plan, and about the wisdom of providing federal and state monies to improve what is claimed to be a private water conveyance system.

The people of Waipio Valley live and farm in this undisturbed area in large part because they treasure the unspoiled environment and because they value the traditional culture of taro production. The preferred plan in the DEIS incorporates restoring Hakalao Falls by tunneling into the wall of the canyon and removing the temporary diversion that was installed to protect the ditch repairs. DEIS at 68. The residents of the Valley see the restoration of the twin falls as an essential component of the Watershed Plan. Moreover, our clients agree that restoration of some minimum flow to the streams in the back of the Valley in order to provide habitat for native aquatic species is critical to general acceptance of the proposed plan. See DEIS at 69.

Real politics teaches that money for mitigation measures on public works projects are rarely expended where the underlying project itself is underfunded. Waipio residents are justifiably concerned that if the proposed project itself is not viable, the promised mitigation measures will never be delivered. The DEIS itself provides little economic analysis regarding the feasibility of leasing 2,500 irrigated acres to local farmers, or the prospect of turning a profit on leased lands. Issues relating to capital formation, marketing, transportation, and agronomic expertise are

not carefully reviewed. The potential displacement of other lands under cultivation, and the increased supply pressures on prices received by farmers are issues that are not addressed. As pointed out above, it is not clear from the DEIS what crops will be grown on the project lands.

Finally, the DEIS states that about 30 percent of the area encompassed in the Watershed Plan is owned by government. DEIS at 9. The DEIS also indicates that there are four major landowners in the watershed including, Kamahameha Schools/Bishop Estate, Western Farm Credit Bank, Bishop Museum, and the Trustee for Hamakua Sugar Company. Id. What the DEIS does not tell us is how much of the private lands lie under the control of the "big four", and whether the program lands are likely to fall under these landowners' control. The DEIS ought to provide such information.

In closing we would again thank the NRCS for their efforts in preparing the DEIS. We also wish to thank the local staff and Portland staff for their patience in responding to many questions and concerns about this project. We see real value in the support and program provided to small scale farmers on the Hamakua Coast. We also appreciate the mitigation measures proposed under the project. We have concerns about competition for water which we have raised herein. We hope you carefully review our comments and incorporate our concerns in the ultimate design of the Watershed Plan.

I am respectfully,



PATRICK GARDNER  
Managing Attorney

WILLIAM J. CANTLAND  
DIRECTOR



STATE OF HAWAII  
OFFICE OF ENVIRONMENTAL QUALITY CONTROL  
278 SOUTH KING STREET  
FOURTH FLOOR  
HONOLULU, HAWAII 96813  
TELEPHONE: 935-3411/15  
FACSIMILE: 935-3444

GARY GILL  
Director

Stephen K. Yamashiro  
Mayor



Virginia Goldstein  
Director  
Norman Olsen  
Deputy Director

County of Hawaii  
PLANNING DEPARTMENT  
25 Airport Street, Room 179 • Hahaione, Hawaii 96720-0151  
(808) 961-8188 • Fax: (808) 961-9615

September 25, 1995

The Honorable James J. Nakatani, Chairperson,  
Board of Agriculture, State of Hawaii  
1428 South King Street  
Honolulu, Hawaii 96814-2512

Dear Mr. Nakatani:

Having reviewed the *Watershed Plan - Environmental Assessment Statement (for the Lower Hamakua Ditch Watershed, August 1995)*, we submit the following comments.

- 1) Although the environmental assessment discusses "land ownership," no mention is made of ownership or title of the ditch itself and the waters flowing through the ditch. Please indicate in the draft EIS ownership and/or titles to the ditch itself and the waters flowing through the ditch proper.
- 2) Please consult with the Commission on Water Resource Management and discuss in the draft EIS the impacts/mitigative measures (to natural stream flow, traditional native water uses, and native stream ecosystems) arising from proposed improvements to the ditch. Please also discuss in the draft EIS the relationship between the proposed action and instream flow standards.

Thank you for the opportunity to comment.

Sincerely,

GARY GILL  
Director

c: ✓ U. S. Dept. of Agriculture, National Resources Conservation Service

October 20, 1995

Mr. Kenneth M. Kaneshiro  
State Conservationist  
United States Department of Agriculture  
Natural Resources Conservation Service  
P.O. Box 50004  
Honolulu, HI 96850

Draft Watershed Plan-Environmental Impact Statement for the  
Lower Hamakua Ditch Watershed

We have completed our review of the subject document and have only one general comment to offer. The Draft Watershed Plan-Environmental Impact Statement (DEIS) is being prepared in accordance with the requirements of Chapter 343, Hawaii Revised Statutes relating to Environmental Impact Statements. However, there is no discussion of the project's relationship with the goals, policies and standards of the Hawaii County General Plan or other County land use plans or regulations as prescribed under the Department of Health's Environmental Impact Statement Rules (Title 11, Chapter 200, Hawaii Administrative Rules). Of special concern to our office are the location and extent of all improvements associated with this project with respect to the County's Special Management Area.

We apologize for our delay in responding to your submittal. Should you have any questions, please feel free to contact Daryn Aral of this office at 961-8288.

Sincerely,

VIRGINIA GOLDSTEIN  
Planning Director

DSA:mjs  
LKanes01.dsa

# CORRECTION

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





STATE OF HAWAII  
OFFICE OF ENVIRONMENTAL QUALITY CONTROL  
725 SOUTH KING STREET  
FOURTH FLOOR  
HONOLULU, HAWAII 96813  
TELEPHONE 595-146-1116  
FACSIMILE 595-146-1447

GARY GILL  
DIRECTOR

Stephen K. Yamashiro  
Mayor



Virginia Goldstein  
Director  
Norman Olson  
Deputy Director

County of Hawaii  
PLANNING DEPARTMENT  
25 Aupohi Street, Room 109 - Hahaione, Hawaii 96720-4111  
(808) 961-8288 - Fax (808) 961-9615

September 25, 1995

The Honorable James J. Nakatani, Chairperson  
Board of Agriculture, State of Hawaii  
1428 South King Street  
Honolulu, Hawaii 96814-2512

Dear Mr. Nakatani:

Having reviewed the *Watershed Plan - Environmental Assessment Statement* for the *Lower Hamakua Ditch Watershed*, August 1995, we submit the following comments.

- 1) Although the environmental assessment discusses "land ownership," no mention is made of ownership or title of the ditch itself and the waters flowing through the ditch. Please indicate in the draft EIS ownership and/or titles to the ditch itself and the waters flowing through the ditch proper.
- 2) Please consult with the Commission on Water Resource Management and discuss in the draft EIS the impacts/mitigative measures (to natural stream flow, traditional native water uses, and native stream ecosystems) arising from proposed improvements to the ditch. Please also discuss in the draft EIS the relationship between the proposed action and instream flow standards.

D-5

Thank you for the opportunity to comment.

Sincerely,

GARY GILL  
Director

c: U. S. Dept. of Agriculture, National Resources Conservation Service

October 20, 1995

Mr. Kenneth M. Kaneshiro  
State Conservationist  
United States Department of Agriculture  
Natural Resources Conservation Service  
P.O. Box 50004  
Honolulu, HI 96850

Draft Watershed Plan-Environmental Impact Statement for the Lower Hamakua Ditch Watershed

We have completed our review of the subject document and have only one general comment to offer. The Draft Watershed Plan-Environmental Impact Statement (DEIS) is being prepared in accordance with the requirements of Chapter 343, Hawaii Revised Statutes relating to Environmental Impact Statements. However, there is no discussion of the project's relationship with the goals, policies and standards of the Hawaii County General Plan or other County land use plans or regulations as prescribed under the Department of Health's Environmental Impact Statement Rules (Title 11, Chapter 200, Hawaii Administrative Rules). Of special concern to our office are the location and extent of all improvements associated with this project with respect to the County's Special Management Area.

We apologize for our delay in responding to your submittal. Should you have any questions, please feel free to contact Daryn Arai of this office at 961-8288.

Sincerely,

VIRGINIA GOLDSTEIN  
Planning Director

DSA:mjs  
LKanes01.dsa



# University of Hawai'i at Mānoa

Environmental Center  
A Unit of Water Resources Research Center  
Cawford 317 - 2350 Campus Road - Honolulu, Hawai'i 96822  
Telephone: (808) 956-7361 • Facsimile: (808) 956-3980

October 9, 1995  
PN:0087

Mr. Benjamin J. Cayetano  
c/o Office of Environmental Quality Council  
220 South King Street, Suite 400  
Honolulu, Hawai'i 96813

Dear Mr. Cayetano:

Preparation Notice  
Hamakua Lower Ditch Watershed Project  
Hamakua, Hawai'i

D-6

The State Department of Agriculture (DOA) proposes to make major improvements to the existing 26-mile long Lower Hamakua Ditch system. The improvements include replacement, renovation, and rehabilitation of intakes, flumes, tunnels, and open ditches. The goal of the project is to transform former sugar cane lands into diversified agriculture farms and to create employment opportunities for former Hamakua Sugar Plantation workers.

We reviewed this Preparation Notice (PN) with the assistance of Paul Ekern, Emeritus, Agronomy and Soil Science; Dave Penn, Geography; and Paul Berkowitz of the Environmental Center.

### Procedural Issues

The review procedure for the proposed project is unclear. The document's title, "Watershed Plan - Environmental Assessment Statement," seems to combine the terms Environmental Assessment and Environmental Impact Statement (EIS). The document itself serves as an EIS Preparation Notice. However, the federal EIS prepared for this project under the National Environmental Policy Act (NEPA) was listed in the Federal Register, but was omitted from the State's Environmental Notice. Thus, there remains considerable ambiguity surrounding the sequencing of documentation for the proposed project.

Mr. Benjamin J. Cayetano  
October 9, 1995  
Page 2

For projects which are subject to both federal and state EIS requirements, Chapter 343 of the Hawai'i Revised Statutes provides that state and federal agencies should cooperate if possible to reduce needless duplication of work. According to Section 11-200-25, Hawai'i Administrative Rules, this cooperation "to the fullest extent possible, shall include joint environmental impact statements with concurrent public review and processing at both levels of government." In light of this stipulation for concurrent review, it seems inappropriate for the federal EIS to be published and available for review, while the State environmental review process is at the scoping or PN stage.

The current status raises obvious questions. For instance, how can preliminary comments from the Chapter 343 scoping process be incorporated into the federal EIS process? Will the State EIS be identical to the federal EIS? If identical, then it seems improbable that scoping comments from the State process could be adequately considered. If not identical, then the extent of cooperation between federal and state government comes into question, as does the degree to which Section 11-200-25 is fulfilled.

Having separate documents and review processes for the same project sets a bad precedent for future projects, and allows critics of the environmental review process to point their fingers at senseless government waste. For the present case, our review will assume that a separate state draft EIS will be compiled, and that differences between the federal and state EIS documents will be reconciled at the final federal EIS level.

### Feasibility of Diversified Agriculture

#### A. Soils

The PN does not discuss the special chemical and physical properties of the region's soils. The parent material, Pahala ash, has been weathered extensively to form soils which are thixotropic, acidic, nutrient deficient, and rich in aluminum. Thixotropic soils liquefy under compression, which means that ordinary plowing and tire traffic are infeasible. The sugar cane industry struggled with this difficulty for years. Furthermore, if these soils ever dry out, then they turn to gravel irreversibly.

The other soil properties (high acidity, low nutrient levels, and high concentrations of aluminum) result in a general lack of fertility. Consequently, as described by Fox ("Fertilization of Volcanic Ash Soils," Hawai'i Agricultural Experiment Station, Journal No. 1127) the soils require large concentrations of fertilizers and respond positively to lime applications to increase pH levels.

The issue of complexity of the soils requires careful consideration in the draft EIS.

Mr. Benjamin J. Cayetano  
October 9, 1995  
Page 3

#### B. Climate

In particular, three aspects of climate need to be considered in relation to the proposed project. First, the Hamakua coast is a very wet and cloudy region. As stated in the PN, rainfall in the watershed ranges from 60 to over 175 inches per year. Given the area's wet climate, the need for irrigation should be carefully assessed. Based on data in DLNR reports ("Drought in Hawaii," Report R88), drought frequency and severity do not appear great. Thus, on a cost-benefit basis, irrigation may be difficult to defend.

To determine whether irrigation is necessary, the draft EIS should include a complete analysis of rainfall, evaporation, and drought frequency. The magnitude and distribution of these elements, in relation to crop water needs, should be used to determine if there is a consistent need to irrigate.

Second, due to the generally overcast conditions, the area receives a relatively low level of solar radiation. Therefore the region's growth potential is quite low. When sugar cane was grown on the Hamakua coast, it took 2 to 3 years to get one crop and yields were poor. In short, decision makers need to question the logic of diversified agriculture in a region with low growth potential.

Third, since the proposed project involves 517,500 feet of windbreaks, the draft EIS should describe the area's wind regime and assess the need for shelter. How do upslope and downslope breezes interact with the trade wind flow along the Hamakua coast?

#### C. Crop Needs

The PN does not provide specific details about what crops will be grown, and what the requirements are for each crop. Since the proposed project involves irrigation, water needs in particular need to be addressed. Additionally, given the region's problematic soil and sunlight characteristics, a detailed agricultural assessment should be made to determine the feasibility for each crop.

#### D. Social and Institutional Frameworks

The plan to convert former Hamakua Sugar land to diversified agriculture parallels similar efforts on Oahu. The draft EIS should discuss the merits of Hamakua diversified agriculture in comparison to other diversified agriculture projects around the state. How does the Hamakua project fit into the State's overall strategic plan to promote diversified agriculture? Agricultural, water use, and environmental planning that fails to consider statewide implications is irresponsible and inadequate.

Mr. Benjamin J. Cayetano  
October 9, 1995  
Page 4

The document does not reference known problems concerning land ownership and water rights. The section on resource information should articulate whether the land is fee simple or leasehold. Bishop Estate owns a substantial portion of the land along the ditch, and substantial State funds were diverted to Hamakua Sugar who formerly maintained the system. Thus, the actual ownership of the ditch system is uncertain. In the draft EIS, these ownership issues should be clarified. Is the State resurrecting an irrigation system for the benefit of Bishop Estate?

Given the current fiscal and administrative climate, will the Hawaii Department of Agriculture be able to install and maintain the proposed system? In particular, have the acquisition costs of land and water been factored into total cost estimates? Can water rights legally be acquired in the anticipated manner? (Usually water rights can only be obtained by purchasing the lands they are tied to.)

The PN states that farmers will be able to grow crops on 2,500 acres of land leased from the State or Bishop Estate. Are these farmers individuals or big companies? Are they ready at this time to undertake this endeavor?

Finally, have marketing studies been performed to identify an appropriate level of diversified agriculture? It seems likely that the existing and planned markets may not accommodate all of the planning production.

#### Native Hawaiian Issues

The civil rights impact analysis mentions employment, as well as community and family values, but it does not consider the civil rights of Native Hawaiians, nor does it address historical and potential future infringement upon these rights.

Hawaiian Home Lands owns 650 acres within the watershed. Thus the draft EIS should address their priority rights to water.

#### National Historic Place

It has been determined that the Lower Hamakua Ditch meets the criteria for nomination to the National Register of Historic Places. The implications of becoming a historic place should be fully discussed. Will this status require that the ditch be restored?

Mr. Benjamin J. Cayetano  
October 9, 1995  
Page 5

Waipio Valley

While the document recognizes the historic value of the Hamakua Ditch infrastructure, the Hawaiian irrigation systems of Waipio Valley have not received similar recognition. The water systems of Waipio Valley were formerly far more extensive and have far greater potential than are indicated in the document.

Will Hiihawe Falls return to its "original" (pre-plantation) state? This would imply full stream restoration.

How does the return of Waipio streamflow fit into the State's overall plan for streamflow and watershed restoration? Will an increase in streamflow in Waipio Valley potentially be used as an argument for additional diversions from other streams?

Finally, given the changes in streamflow, the proposed project will probably require amendment to interim instream flow standards.

Resource Information

The resource information in the PN (p. 2) states that no highly erodible cropland exists within the entire watershed. This conclusion seems questionable. Also, since four endangered species and seven threatened species inhabit the watershed, it will be essential for the draft EIS to analyze the ecology of these species in order to assess and mitigate potential impacts.

Identified Concerns

The concerns identified in Table D require further explanation. For each listed issue, various groups of people differ significantly in their opinions about the relative degree of importance. Whose values are represented in the table? That is, who decided how important each concern is to the decision making process? How were controversial issues handled? The draft EIS should address these questions.

Alternatives

Given that crops along the Hamakua Coast probably only require irrigation during dry periods, when streamflow is lowest and impacts on aquatic organisms are greatest, perhaps groundwater represents a better candidate for irrigation source water. This alternative should be discussed in the draft EIS.


Mr. Benjamin J. Cayetano  
October 9, 1995  
Page 6

Conclusion

In summary, the Preparation Notice fails to identify several important areas for consideration in the draft EIS. First, the procedural ambiguity surrounding the proposed project needs to be clarified. Second, the feasibility of diversified agriculture should be carefully analyzed, especially with regard to soil conditions, growth potential, crop requirements, constraints on water rights, and marketing limitations. The costs and benefits of diversified agriculture along the Hamakua coast should be examined carefully before continuing with the proposed project. Also, the Hamakua coast should be described within the State's overall strategic plan to promote diversified agriculture. Third, the civil rights of Native Hawaiians need to be addressed. Fourth, the implications of being placed on the National Register of Historic Places should be discussed. At the same time, the historic nature of Hawaiian irrigation systems in Waipio Valley should be recognized. Finally miscellaneous issues concerning resource information, identified concerns, and alternatives need to be considered in more detail.

We hope that our comments are helpful in preparing the upcoming draft EIS for the proposed project. Thank you for the opportunity to comment on this Preparation Notice.

Sincerely,



John T. Harrison  
Environmental Coordinator

cc: Department of Agriculture  
U.S.D.A. Natural Resources ✓  
Roger Fujioka  
Paul Ekern  
Dave Penn  
Paul Berkowitz

NOBUAKIJI CAIETAWO  
GOVERNOR



STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
869 PUNCHBOWL STREET  
HONOLULU, HAWAII 96813-5097

September 6, 1995

Mr. Kenneth M. Kaneshiro  
State Conservationist  
United States Department of Agriculture  
Natural Resources Conservation Service  
P.O. Box 50004  
Honolulu, Hawaii 96850-0001

Dear Mr. Kaneshiro:

Subject: Draft Watershed Plan-Environmental Impact Statement  
for Lower Hamakua Ditch Watershed

D-9

Thank you for your transmittal of August 28, 1995, requesting our comments on the subject plan. The subject project is not anticipated to have an adverse impact on our State transportation facilities.

We appreciate the opportunity to provide comments.

Very truly yours,

*Kazu Hayashida*  
KAZU HAYASHIDA  
Director of Transportation

YAZU HAYASHIDA  
DIRECTOR

DEPUTY DIRECTORS  
JERRY M. MATSUDA  
GLENN M. OKAMOTO

IN REPLY REFER TO:

STP 8.6978

NOBUAKIJI CAIETAWO  
GOVERNOR OF HAWAII



STATE OF HAWAII  
DEPARTMENT OF LAND AND NATURAL RESOURCES  
STATE HISTORIC PRESERVATION DIVISION  
33 SOUTH KING STREET, 8TH FLOOR  
HONOLULU, HAWAII 96813

September 28, 1995

Mr. Kenneth M. Kaneshiro, State Conservationist  
United States Department of Agriculture  
Natural Resources Conservation Service  
P.O. Box 50004  
Honolulu, Hawaii 96850-0001

Dear Mr. Kaneshiro:

SUBJECT: Draft Watershed Plan-Environmental Impact Statement for Lower  
Hamakua Ditch Watershed

Thank you for your letter of August 28, 1995 and the opportunity to comment on the Draft Watershed Plan and EIS. We also have received your letter of August 9, 1995, concurring that the ditch is significant and noting that you will be conducting a study to better document the ditch.

As noted, some of the proposed project activities could have an adverse effect on significant historic sites adjacent to the ditch. We are particularly concerned with the possible adverse effects of repair work on historic sites in the back of Waipio Valley. We are glad to see that your letter of August 9, 1995, notes the sensitivity of Waipio and notes that no ground disturbing activity is planned there. We do agree with the statement on page 52 that an inventory survey be done in all areas where land alteration will occur along the ditch, to determine if other significant historic sites are in these areas. Such sites might include sites which were used along with the ditch's use, or they might be earlier native Hawaiian sites.

Once that survey is done, if significant historic sites are present, then we agree with the proposed courses of action outlined for Alternatives 2, 3, and 4 on page 52 of the subject document -- some form of mitigation will be required (e.g., preservation through avoidance). If any sites of traditional cultural significance to native Hawaiians are found

MICHAEL CHAMBERLAIN  
BOARD OF LAND AND NATURAL RESOURCES  
DEPUTY  
CABERT COLONIA AGLIARU

AQUACULTURE DEVELOPMENT  
PROGRAM  
AGRICULTURAL RESOURCES  
CONSERVATION AND  
ENVIRONMENTAL AFFAIRS  
CONSERVATION DIVISION  
ALSOUSKIE BALCONCHINE  
CONSERVANCER  
FORESTRY AND WILDLIFE  
HISTORIC PRESERVATION  
DIVISION  
LAND MANAGEMENT  
PROGRAM  
WATER AND LAND DEVELOPMENT

LOG NO: 15444 ✓  
DOC NO: 9509PM08



DEPARTMENT OF THE ARMY  
U.S. ARMY ENGINEER DISTRICT, HONOLULU  
FT. SHAFTER, HAWAII 96858-3440

REF ID: A1111111  
ATTENTION OF: September 18, 1995

during the survey, then the mitigation measures also need to be discussed with native Hawaiian groups or individuals, and we will need to see a summary of concerns before we make our comments on mitigation proposals.

Planning Division

If you have any questions please contact Patrick McCoy (587-0006) or Carol Ogata (587-0004).

Aloha,

DON HIBBARD, Administrator and  
Deputy State Historic Preservation Officer

PM:amk

Mr. Kenneth M. Kaneshiro, State Conservationist  
U.S. Department of Agriculture  
Natural Resources Conservation Service  
PO Box 50004  
Honolulu, Hawaii 96850-0001

Dear Mr. Kaneshiro:

Thank you for the opportunity to review and comment on the Draft Watershed Plan and Environmental Impact Statement for the Lower Hamakua Ditch Watershed Project, Island of 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. Based on the information provided, a DA permit will be required where the project will involve work in waters of the U.S. Please contact our Regulatory Branch for further information at 438-9258 and refer to file number P095-111.

b. According to the enclosed Federal Emergency Management Agency's Flood Insurance Rate Maps, panel numbers 155166 0200C (dated September 16, 1988), 155166 0205C (dated September 16, 1988), and 155166 0225C (dated September 16, 1988), the project sites are located in the following zones:

- (1) Zone X (unshaded; areas determined to be outside of the 500-year floodplain).
- (2) Zone A (areas inundated by the 100-year flood where base flood elevations and flood hazard factors have not been determined).

(3) Zone AE (areas inundated by the 100-year flood with a base flood elevation of 13 feet and 1,091 to 1,423 feet above mean sea level). The project area that includes the 1,091- to 1,423-foot elevation is the Honokaa drainage area.

(4) Zone AH (areas inundated by the 100-year flood with a base flood elevation of 1,012 to 1,457 feet above mean sea level in the Honokaa drainage area).

(5) Zone VE (areas inundated by the 100-year coastal flood with velocity hazards and a base flood elevation of 16 to 27 feet above mean sea level).

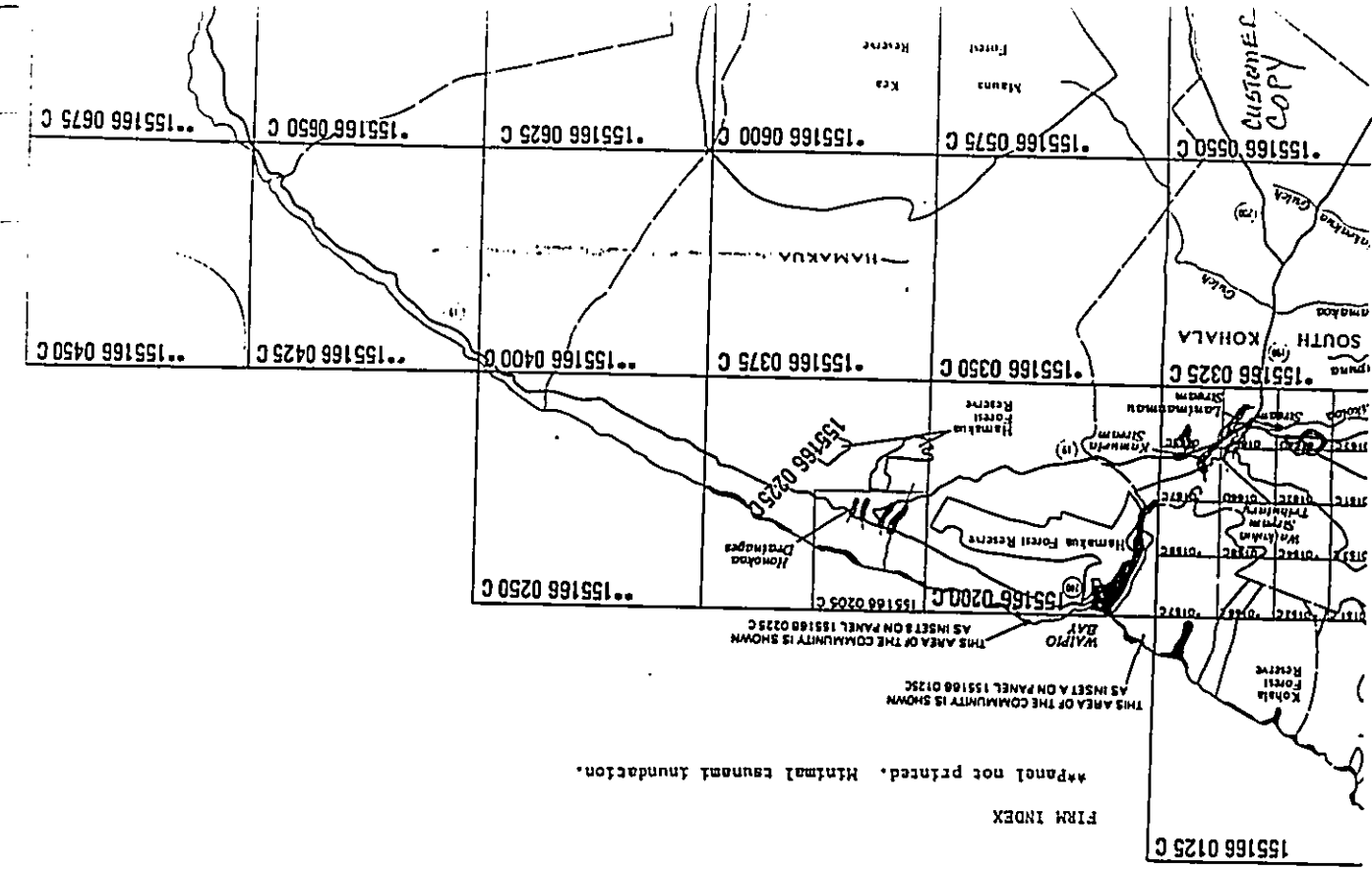
Should you require additional information regarding the flood hazard evaluations, please contact Ms. Jessie Dobinich of my planning staff at 438-7006.

Sincerely,

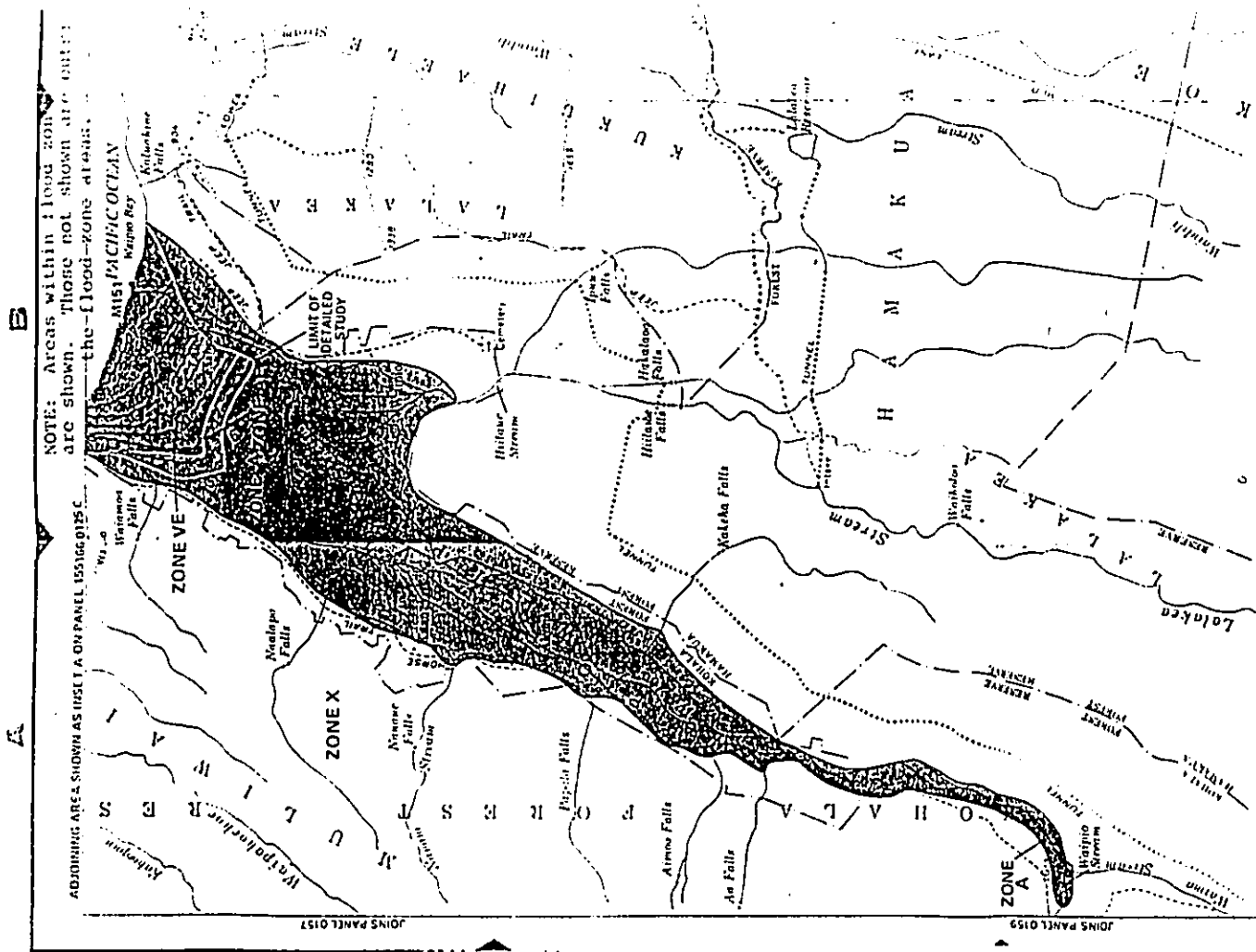
*Ray H. Jyo*  
Ray H. Jyo, P.E.  
Director of Engineering

Enclosure

D-11



RECEIVED AS FOLLOWS



**LEGEND**

UNLIT FLOOD ZONE AREAS (UNLIT AREAS)

ZONE A Flood zones with a base flood elevation of 10 feet or less above the ground surface.

ZONE VE Flood zones with a base flood elevation of 10 feet or less above the ground surface.

ZONE X Flood zones with a base flood elevation of 10 feet or less above the ground surface.

ZONE V Flood zones with a base flood elevation of 10 feet or less above the ground surface.

FLOOD ZONE AREAS (FLOOD ZONE AREAS)

ZONE A Flood zones with a base flood elevation of 10 feet or less above the ground surface.

ZONE VE Flood zones with a base flood elevation of 10 feet or less above the ground surface.

ZONE X Flood zones with a base flood elevation of 10 feet or less above the ground surface.

ZONE V Flood zones with a base flood elevation of 10 feet or less above the ground surface.

OTHER AREAS

ZONE A Flood zones with a base flood elevation of 10 feet or less above the ground surface.

ZONE VE Flood zones with a base flood elevation of 10 feet or less above the ground surface.

ZONE X Flood zones with a base flood elevation of 10 feet or less above the ground surface.

ZONE V Flood zones with a base flood elevation of 10 feet or less above the ground surface.

**FIRM FLOOD INSURANCE RATE MAP**

**HAWAII COUNTY, HAWAII**

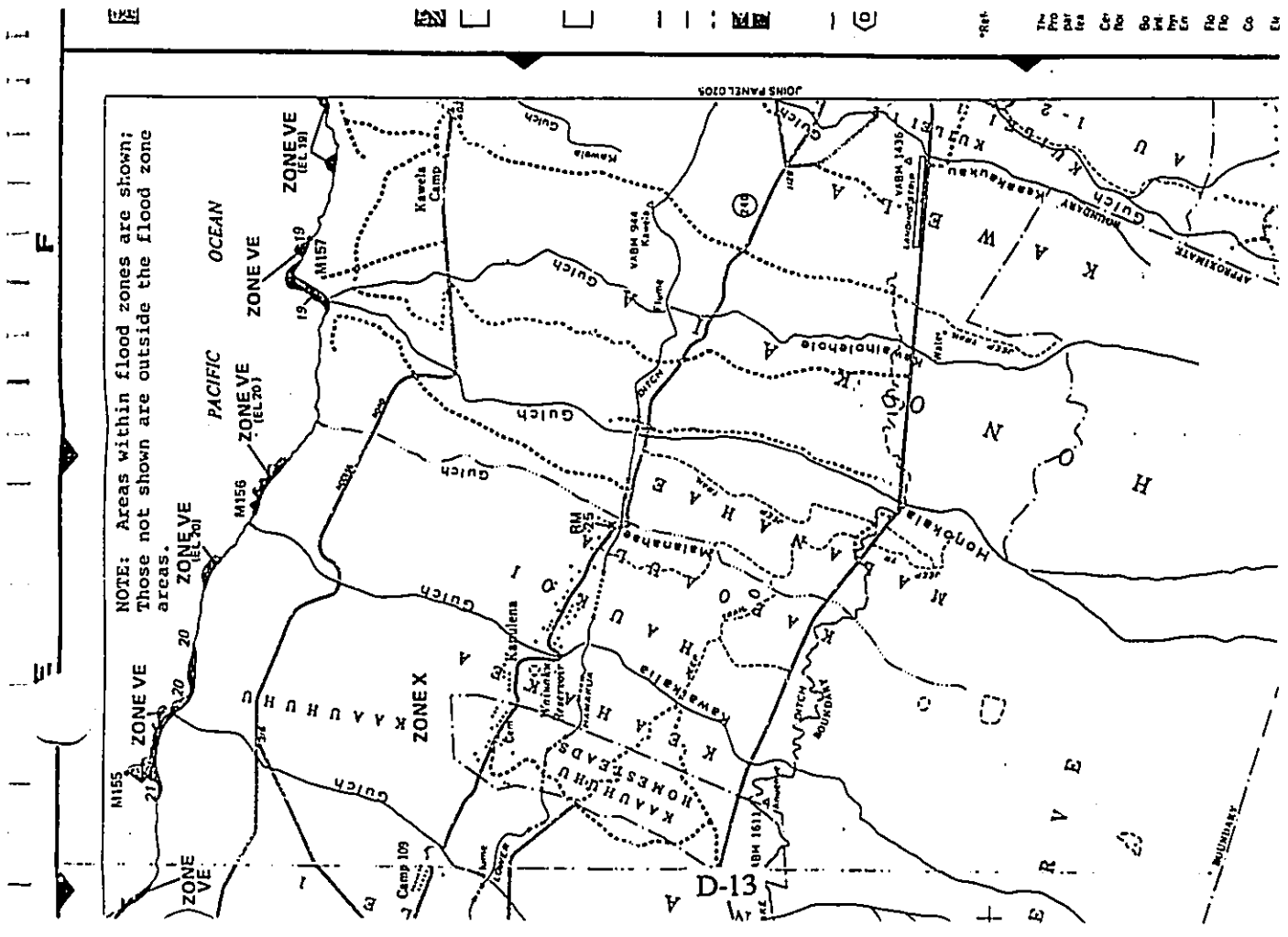
PANEL 200 OF 1900

COMMUNITY-PANEL NUMBER 155166 0200 C

MAP REVISED: SEPTEMBER 16, 1988

Federal Emergency Management Agency





**LEGEND**

SPECIAL FLOOD INSURANCE PREMIUM RATE ZONES (SFIRZ)

ZONE A Areas that are not in any other flood zone.

ZONE B Areas that are in any other flood zone.

ZONE C Areas that are in any other flood zone.

ZONE D Areas that are in any other flood zone.

ZONE E Areas that are in any other flood zone.

ZONE F Areas that are in any other flood zone.

ZONE G Areas that are in any other flood zone.

ZONE H Areas that are in any other flood zone.

ZONE I Areas that are in any other flood zone.

ZONE J Areas that are in any other flood zone.

ZONE K Areas that are in any other flood zone.

ZONE L Areas that are in any other flood zone.

ZONE M Areas that are in any other flood zone.

ZONE N Areas that are in any other flood zone.

ZONE O Areas that are in any other flood zone.

ZONE P Areas that are in any other flood zone.

ZONE Q Areas that are in any other flood zone.

ZONE R Areas that are in any other flood zone.

ZONE S Areas that are in any other flood zone.

ZONE T Areas that are in any other flood zone.

ZONE U Areas that are in any other flood zone.

ZONE V Areas that are in any other flood zone.

ZONE W Areas that are in any other flood zone.

ZONE X Areas that are in any other flood zone.

ZONE Y Areas that are in any other flood zone.

ZONE Z Areas that are in any other flood zone.

NATIONAL FLOOD INSURANCE PROGRAM

**FIRM**

FLOOD INSURANCE RATE MAP

HAWAII COUNTY, HAWAII

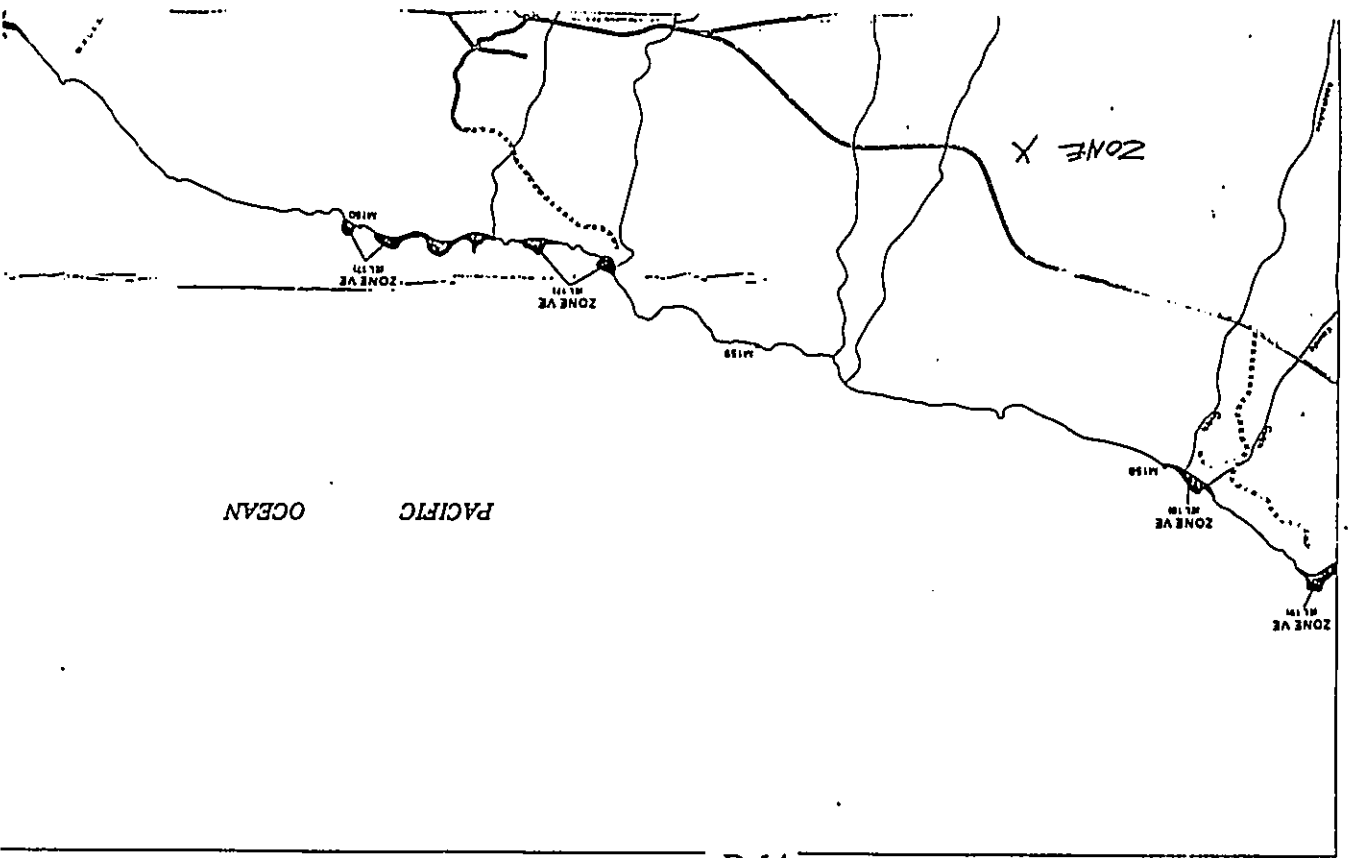
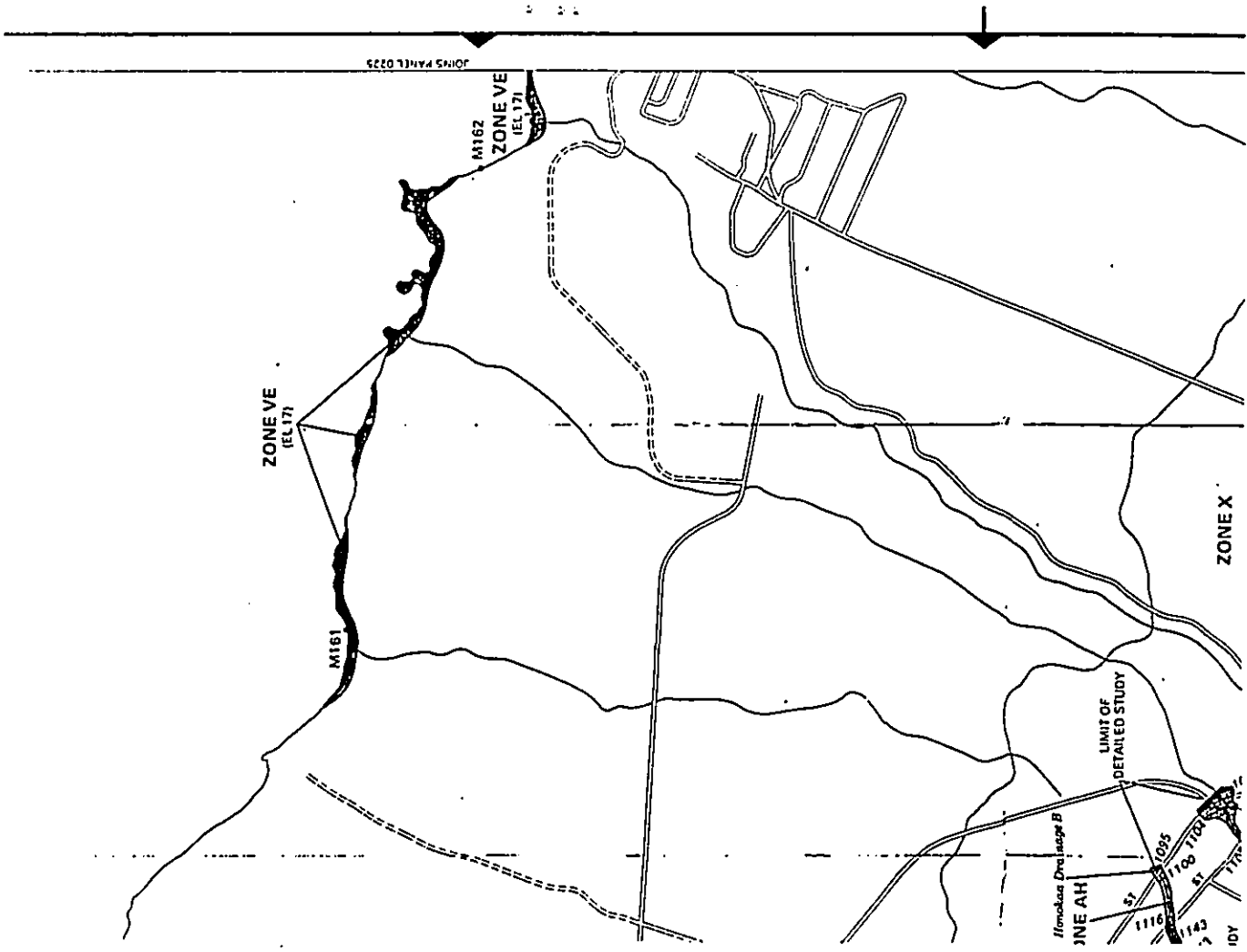
COMMUNITY PANEL NUMBER 155165 0005 C

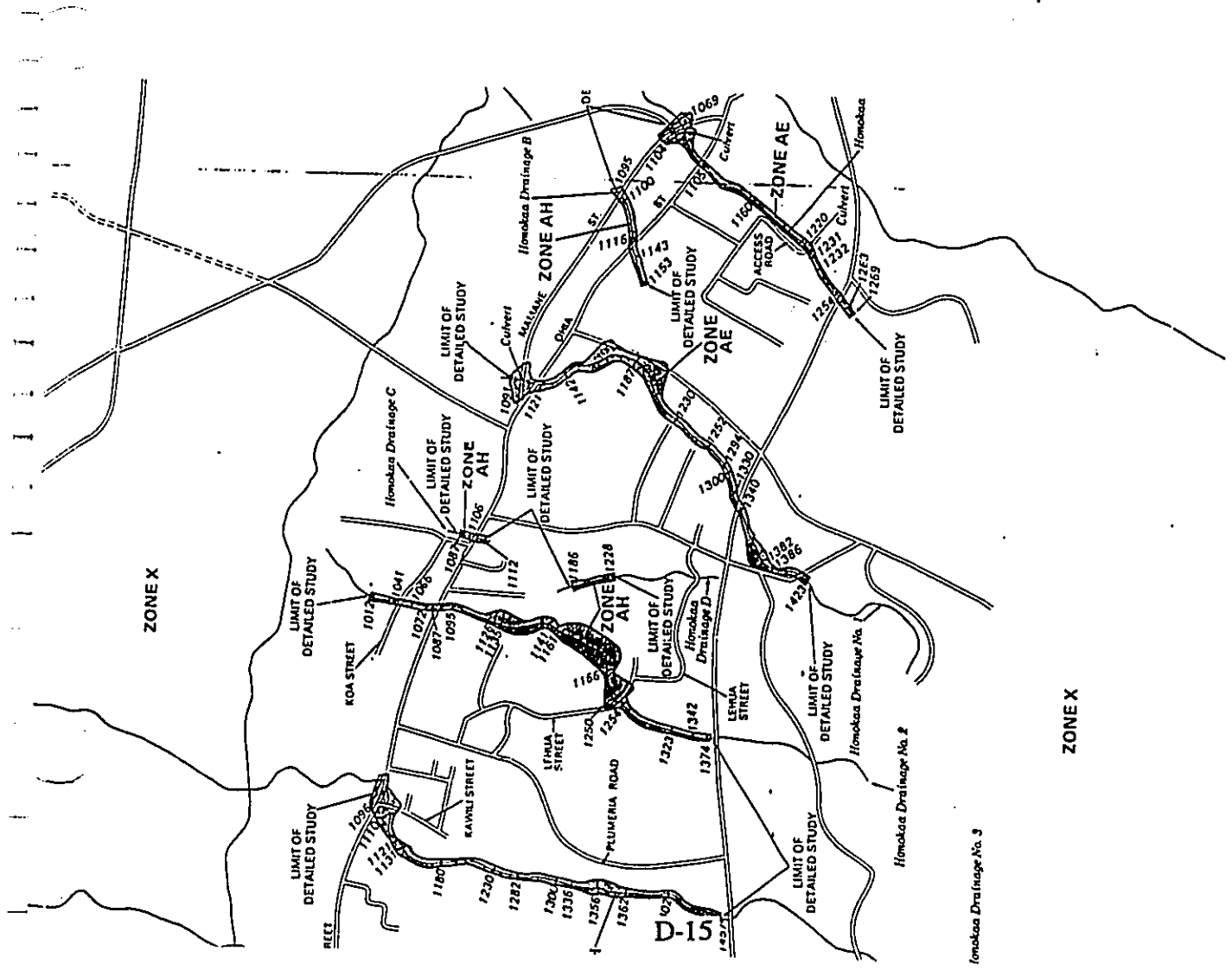
MAP REVISED: SEPTEMBER 16, 1969

Federal Emergency Management Agency

NOTE: Areas within flood zones are shown; those outside the flood areas are not included.

12 8 94 92 90 88 86 84 82 80 78 76 74 72 70 68 66 64 62 60 58 56 54 52 50 48 46 44 42 40 38 36 34 32 30 28 26 24 22 20 18 16 14 12 10 8 6 4 2





**LEGEND**

**UNDESIGNATED FLOOD ZONES**

- Zone A1: Areas of 100-year flood depth exceeding 4 feet, 100-year return period.
- Zone A2: Areas of 50-year flood depth exceeding 4 feet, 100-year return period.
- Zone A3: Areas of 10-year flood depth exceeding 4 feet, 100-year return period.
- Zone A4: Areas of 100-year flood depth exceeding 2 feet, 100-year return period.
- Zone A5: Areas of 50-year flood depth exceeding 2 feet, 100-year return period.
- Zone A6: Areas of 10-year flood depth exceeding 2 feet, 100-year return period.

**DESIGNATED FLOOD ZONES**

- Zone V: Areas of 100-year flood depth exceeding 1 foot, 100-year return period.
- Zone VE: Areas of 50-year flood depth exceeding 1 foot, 100-year return period.
- Zone VEI: Areas of 10-year flood depth exceeding 1 foot, 100-year return period.
- Zone VEII: Areas of 100-year flood depth exceeding 1 foot, 100-year return period.

**OTHER AREAS**

- Zone AE: Areas of 100-year flood depth exceeding 4 feet, 100-year return period.
- Zone AEI: Areas of 50-year flood depth exceeding 4 feet, 100-year return period.
- Zone AEII: Areas of 10-year flood depth exceeding 4 feet, 100-year return period.

**OTHER AREAS**

- Zone AH: Areas of 100-year flood depth exceeding 1 foot, 100-year return period.
- Zone AHI: Areas of 50-year flood depth exceeding 1 foot, 100-year return period.
- Zone AHII: Areas of 10-year flood depth exceeding 1 foot, 100-year return period.

**NATIONAL FLOOD INSURANCE PROGRAM**

**FIRM**  
FLOOD INSURANCE RATE MAP

**HAWAII COUNTY,**  
**HAWAII**

PANEL 225 OF 1900

COMMUNITY-PANEL NUMBER  
155166 0225 C

MAP REVISED:  
SEPTEMBER 15, 1988

Federal Emergency Management Agency

NOTE: Areas in flood zones are shown; those outside of the flood areas are not.





RECEIVED  
STAFF AND  
RECEIVED  
OFFICE

DEPARTMENT OF BUSINESS,  
ECONOMIC DEVELOPMENT, AND TOURISM

ENERGY DIVISION, 315 MERCHANT ST., RM. 110, HONOLULU, HAWAII 96813 PHONE: (808) 587-3100 FAX: (808) 517-3121

KA LAHUI HAWAII  
P.O. Box 1256  
Pahoa, Hawaii 96778

October 9, 1995

RECEIVED

95 OCT -9 P2:26

OFFICE OF ENVIRONMENTAL  
QUALITY CONTROL

Governor, State of Hawaii  
c/o Office of Environmental Quality Control  
220 South King Street Suite 400  
Honolulu, Hawaii 96813

U.S. DA Natural Resources  
Conservation Service  
P. O. Box 50004  
Honolulu, Hawaii 96850

Gentlemen:

Re: Hamakua Lower Ditch Watershed Project  
TRK: 4-3 to 4-8, 3rd Division - Hamakua

Ka Lahui Hawaii has been in the Hamakua project since the  
auctioning sale of 30,000 acres of prime lands.

Water is the crucial criteria resource in this  
project. We do not see that the excess water will  
enhance the return of water to Hilsue Falls in Waipio  
Valley.

Please furnish documents as to how the Hamakua Ditch water  
will resolve issues pertaining to water for the farmers in  
Waipio Valley.

Sincerely Yours,

*Clara Matthews*  
(Mrs.) CLARA L. KAKALIA  
Vice Chair, National Land  
Ka Lahui Hawaii

cc: Kia'aine M. Trask  
Clara Matthews, Chair  
National Land

066EIS

September 7, 1995

Mr. Kenneth M. Kaneshiro  
State Conservationist  
United States Department of Agriculture  
Natural Resources Conservation Service  
P.O. Box 50004  
Honolulu, Hawaii 96850-0001

Dear Mr. Kaneshiro:

SUBJECT: Draft Watershed Plan-Environmental Impact Statement for Lower  
Hamakua Ditch Watershed  
Hawaii County, Hawaii

We wish to inform you that we have no comments regarding the Lower Hamakua  
Ditch Watershed.

Thank you for the opportunity to submit any comments or recommendations.

Sincerely,

*Maurice H. Kaya*

Maurice H. Kaya  
Energy Program Administrator

MHK:aw



KAMEHAMEHA SCHOOLS BERNICE PAUHI BISHOP ESTATE

ANETAKASUBSISTENT GROUP  
HAWAIIAN ISLANDS REGION  
74-001 ALTI DRIVE, SUITE 311 KAILUA-KONA, HAWAII 96741  
TELEPHONE 808-325-5300 FAX 808-325-5316  
101 AUANI STREET, SUITE 311 HONO, HAWAII 96720  
TELEPHONE 808-949-1126 FAX 808-941-4442

October 13, 1995

Mr. Kenneth M. Kaneshiro  
State Conservationist  
United States Department of Agriculture  
Natural Resources Conservation Service  
P.O. Box 50004  
Honolulu, HI 96850

Dear Mr. Kaneshiro:

As the Kamehameha Schools Bishop Estate, Asset Management Group, manager for the Hawaii Island Region, I would like to express to you my gratitude for the time, effort and expertise you have expended in preparing the draft plan and Environmental Impact Statement for the Lower Hamakua Ditch Watershed Project.

D-18

As you know, Kamehameha Schools Bishop Estate ("KSBE") is one of the major landowners whose property would be affected by the implementation of your project. Our fundamental concern is the protection of KSBE's present and future rights to use and benefit from, our Hamakua water resource.

Unless both the federal and state governments can guarantee to KSBE that KSBE's present and future ownership of the Hamakua water resource will be formally recognized and that our present and future rights to the resource will be protected, KSBE will be unable to participate in the proposed Lower Hamakua Ditch Watershed Project.

Sincerely,

*Robert K. Lindsey*  
Robert K. Lindsey  
Manager  
Hawaii Island Region

RKL:aa



DEPARTMENT OF BUSINESS,  
ECONOMIC DEVELOPMENT & TOURISM

Central Pacific Plaza, 270 South King Street, 11th Floor, Honolulu, Hawaii 96813  
Mailing Address: P.O. Box 2159, Honolulu, Hawaii 96801

BENJAMIN J. CATERAN,  
COMMISSIONER  
SERGE NATA,  
DEPUTY COMMISSIONER  
RICK COOK,  
CHIEF OF STAFF

Telephone (808) 525-2111  
Fax (808) 525-2111

September 25, 1995

MEMORANDUM

TO: Kenneth M. Kaneshiro  
State Conservationist  
U.S. Department of Agriculture

FROM: *Robert K. Lindsey*  
Senior Advisor to Director

SUBJECT: Draft Watershed Plan - EIS for Lower Hamakua Ditch Watershed

The State Land Use Commission has prepared the attached comments regarding the subject project.

Thank you for allowing us to comment.

Enclosure

BENJAMIN A. CAYetano  
GOVERNOR



STATE OF HAWAII  
DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM  
LAND USE COMMISSION  
Room 104, Old Federal Building  
333 Merchant Street  
Honolulu, Hawaii 96813  
Telephone: 587-3822

BENJAMIN A. CAYetano  
GOVERNOR

BENJAMIN A. CAYetano  
GOVERNOR



STATE OF HAWAII  
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES  
P. O. BOX 118, HONOLULU, HAWAII 96810

SAM CALLEJO  
COMPTROLLER  
MARY PATRICK WATERHOUSE  
DEPUTY COMPTROLLER  
11/17/95 (P) 1652.5

September 6, 1995

SEP 27 1995

SUBJECT: Director's Referral No. 95-103-O  
Draft Watershed Plan - Environmental Impact Statement  
for Lower Hamakua Ditch Watershed

We have reviewed the subject plan and have no additional comments to our previous comments of June 5, 1995, except to suggest that the Final Environmental Impact Statement include the land use district boundaries map enclosed with our earlier comments with the project's boundaries shown.

EU:BS:th

Mr. Kenneth M. Kaneshiro  
State Conservationsist  
Natural Resources Conservation Service  
Department of Agriculture  
P. O. Box 50004  
Honolulu, Hawaii 96850-0001

Dear Mr. Kaneshiro:

Subject: Lower Hamakua Ditch Watershed  
Hawaii County, Hawaii  
Draft EIS

Thank you for the opportunity to review the subject document. The proposed project will have no impact on our facilities. Therefore, we have no comments to offer.

If there are any questions, please have your staff contact Mr. Ralph Yukumoto of the Planning Branch at 586-0488.

Very truly yours,

GORDON MATSUOKA  
State Public Works Engineer

RY:jj

COMMITTEE ON SELECT  
AGRICULTURE  
COMMITTEE ON FOREST  
COMMITTEE ON EDUCATION,  
SCIENCE AND TECHNOLOGY  
COMMITTEE ON GOVERNMENT  
OPERATIONS AND  
INFORMATION

**Congress of the United States**  
House of Representatives  
Washington, DC 20515-1102

**PATSY T. MINK**  
SECOND DISTRICT, HAWAII  
WASHINGTON, DC 20515-1102  
(202) 225-7000  
FAX: (202) 225-4981

**LAWRENCE MILKE**  
DIRECTOR OF HEALTH  
HONOLULU, HAWAII 96801  
95-078(A)/STO  
DocId: 95774231



**STATE OF HAWAII**  
DEPARTMENT OF HEALTH  
P.O. BOX 3378  
HONOLULU, HAWAII 96801  
October 11, 1995

Mr. Kenneth M. Kaneshiro  
State Conservationist  
United States Department of Agriculture  
Natural Resources Conservation Service  
P. O. Box 50004  
Honolulu, Hawaii 96850-0001

Dear Mr. Kaneshiro:  
This is in response to your letter dated August 28, 1995, to Governor Benjamin Cayetano in which you submitted a Draft Watershed Plan--Environmental Impact Statement for Lower Hamakua Ditch Watershed for review and comments. At this time, the Department of Health does not have any comments.

Sincerely,  
*Lawrence Milke*  
Lawrence Milke  
Director of Health

AB:ch

Kenneth Kaneshiro  
Hawaii State Conservationist  
Natural Resources Conservation Service, USDA  
P.O. Box 50004  
Honolulu, Hawaii 96850

Dear Mr. Kaneshiro:

Thank you for a copy of the Draft Watershed Plan - Environmental Impact Statement for Lower Hamakua Ditch Watershed, which I received on August 30, 1995.

I appreciate receiving this document for my review and my files.

Very truly yours,

*Patsy T. Mink*  
PATSY T. MINK  
Member of Congress



YUJUAN J. CAYTANO  
COMMUNICATIONS SECTION



ROY S. OSHIRO  
ACTING EXECUTIVE DIRECTOR

STATE OF HAWAII  
DEPARTMENT OF BUDGET AND FINANCE  
HOUSING FINANCE AND DEVELOPMENT CORPORATION  
877 DUKWAI STREET, SUITE 200  
HONOLULU, HAWAII 96813  
FAX (808) 541-8008

WE REPLY REFER TO:  
95: PPE/5362

September 14, 1995

Mr. Kenneth M. Kaneshiro  
State Conservationist  
U.S. Department of Agriculture  
Natural Resources Conservation Service  
P.O. Box 50004  
Honolulu, Hawaii 96850-0001

Dear Mr. Kaneshiro:  
Re: Draft Watershed Plan - Environmental Impact Statement for  
Lower Hamakua Ditch Watershed

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

D21 Thank you for the opportunity to comment.

Sincerely,  
  
Roy S. Oshiro  
Executive Director



DEPARTMENT OF WATER SUPPLY • COUNTY OF HAWAII  
25 AUPUNI STREET • HILO, HAWAII 98720  
TELEPHONE (808) 969-1421 • FAX (808) 969-6996

September 12, 1995

Mr. Kenneth M. Kaneshiro, State Conservationist  
United States Department of Agriculture  
Natural Resources Conservation Service  
P.O. Box 50004  
Honolulu, HI 96850-0001

DRAFT WATERSHED PLAN-ENVIRONMENTAL IMPACT STATEMENT FOR  
LOWER HAMAKUA DITCH WATERSHED

Thank you very much for the opportunity to comment on the Draft Watershed Plan - Environmental Impact Statement. For your information, this Department does use water from the Lower Hamakua Ditch at Hawi, Paaulo, and Kukuihaele in emergency drought situations or in the case of a well malfunction.

We would appreciate that this be mentioned somewhere within the Environmental Impact Statement.

Thank you for your consideration.

Milton D. Pavao, P.E.  
Manager

GGA

... Water brings progress...

BENJAMIN J. CAYTELINO  
GOVERNOR

FOR GENERAL EMERGENCY READINESS  
DIRECTOR OF CIVIL DEFENSE

ROY C. PRICE  
VICE DIRECTOR OF CIVIL DEFENSE



STATE OF HAWAII  
DEPARTMENT OF DEFENSE  
OFFICE OF THE DIRECTOR OF CIVIL DEFENSE  
3949 DRAKONO HEAD ROAD  
HONOLULU, HAWAII 96816-4105

October 31, 1995

Mr. Kenneth M. Kaneshiro, State Conservationist  
U.S. Department of Agriculture  
Natural Resources Conservation Service  
Hawaii State Office, Prince Jonah Kuhio  
Federal Building, Suite 4316  
100 Ala Moana Blvd.  
P. O. Box 50004  
Honolulu, Hawaii 96850-0001

Dear Mr. Kaneshiro:

DRAFT WATERSHED PLAN AND ENVIRONMENTAL IMPACT STATEMENT (PLAN-EIS):  
LOWER HAMAKUA DITCH WATERSHED

We appreciate this opportunity to comment on the U.S. Department of Agriculture, Lower Hamakua draft PLAN-EIS, Hamakua District, Hawaii County, Island of Hawaii. While State Civil Defense (SCD) does not have a proposal comments specifically directed at this draft PLAN-EIS, we do have a proposal that the State and County should consider in this application. The petition area is vulnerable to natural hazards such as earthquakes, volcanic activity and the threat of wind and torrential rainfall associated with tropical cyclones/hurricanes. This proposal entails that any future developers purchase and install outdoor warning sirens, and that siting, design and construction of structures within the petition area address the types of natural hazards that present a threat to the lives and property of future residents/occupants of the area. Appropriate structures can then be surveyed and evaluated for future use as a public shelter.

Our SCD planners and technicians are available to discuss this further if there is a requirement. Please have your staff call Mr. Mel Nishihata of my staff at 733-4300.

Sincerely,  
  
ROY C. PRICE, SR.  
Vice Director of Civil Defense

October 6, 1995

Dpt. of Agriculture  
Attn. Paul Matsuo  
P.O. Box 22159  
Honolulu, HI.  
96823-2159

Re: State EIS for LHD Watershed Project

Dear Mr. Matsuo,  
The following are issues that I feel should be addressed in the State Environmental Impact Statement for the Lower Hamakua Ditch Watershed Project.

1. Water Rights: The effect of the project on appurtenant, riparian, Hawaiian traditional, and o'pae rights should be addressed. In addition, the ownership of the ditch, the lands under the ditch, and any claims to the water in the ditch should be examined, as well as the absence of easements and how these issues will be resolved.
2. Low flow effects on Taro: The effect on Taro of diverting water should be compared to the benefits of not diverting water during low flow periods; not only for current crop acreage but also presuming that eventually all lo'i in the Valley will be planted. In addition, the social effects of preventing this resurgence of Taro culture should be studied.
3. Low flow effects on native aquatic species: Effects should be examined with and without diversions; not only on fresh water species but on salt water species as well.
4. Cultural and Historic Preservation: The full effects of this project on the preservation and restoration of the cultural and historic treasure that we have in Waipio Valley should be examined carefully.
5. Future increases in diversion: The possibility of more water being taken in the future once the ditch is rebuilt should be examined, and the effects of this increase on all issues noted. Alternately, methods to prevent a future increase should be proposed.
6. Need for the water: Actual need for the water should be shown. What is the difference in yield of actual proposed crops when irrigated or not irrigated? Why would these crops be grown here instead of on other abandoned irrigated land closer to market? Is this land actually available? Who will farm the land, and why are they not farming now? Why is no one using the water that is currently flowing down the ditch?
6. Waste: The issue of waste, both as leakage and dumping, should be carefully examined. The current practice of bringing 20 to 30 MGD down the tunnel, dumping the excess at Kaluwahine Falls before the main weir, and allowing 12 MGD to flow down the ditch to supply less than 2 MGD peak demand (all at no cost to users but costing taxpayers up to \$1000 a day) must cease immediately.

In conclusion, the future of Hamakua will be focused on what has always been the focus of Hamakua: not Sugar and The Ditch, but aquaculture in Waipio Valley.

Thank you for taking these issues into account.

Sincerely,  
  
Christopher Rathbun  
P.O. Box 1023  
Honokaa, HI.  
96727

REMAKON J. CATELINO  
GOVERNOR OF HAWAII



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

P.O. BOX 375  
HONOLULU, HAWAII 96809  
SEP 14 1995

WOMELD WILSON, CHAIRPERSON  
LAND USE AND NATURAL RESOURCES  
DEPT.  
GENERAL EXECUTIVE OFFICE  
SOLICITS THE DEVELOPMENT OF LAND  
AND NATURAL RESOURCES  
PLANNING AND OCEAN RESOURCE  
CONSERVATION AND ENVIRONMENTAL  
CONSERVATION AND RECREATION  
CONTRACTS  
CONSTRUCTION  
LAND MANAGEMENT  
STATE PARKS  
WATER AND LAND DEVELOPMENT

To Mr Kenneth Kaneshiro, State Conservationist  
USDA Natural Resources Conservation Service  
Hawaii State Office, PJKK Federal Bldg 4316  
P.O. Box 50004, Honolulu Hawaii, 96850-0001

From Henry A. Ross, P.O.Box 99, Kapaau, HI 96755 (Ph. 889-5587)

Re Draft Watershed Plan EIS, Lwr Hamakua Ditch

16 October 1995

Sorry for this late comment, but because of your page 31 remark that this project could not be implemented until the ownership issues etc. are resolved I suppose that you will accept this information anyway.

I am truly amazed how anybody can produce a draft EIS of more than 100 pages at great expense and totally overlook critical information that is easily obtainable and necessary for a proper evaluation of options. I made one phonecall to the DCCA Business Registration Office 586-2727 and got the following information pertinent to your project:

The owner of the Hamakua Ditch System (see also Bankruptcy Court files and a four volume report and inventory of the repossession auctioneer) is HAWAIIAN IRRIGATION COMPANY, LTD., FORMERLY HAMAKUA DITCH COMPANY, founded in 1904 with 100 shares of stock. Articles of incorporation in File No. 118518 D1 (74 pages) state as purpose of the company:

purchase, lease, acquire, own, build, construct, supply, operate on the island of Hawaii and elsewhere in said territory a system or systems of supply and irrigation water ditches, tunnels, canals, flumes, pipelines, artesian wells, reservoirs, dams, embankments, gates, lifts, feeders and leads and to tunnel and bore for, gather and conserve, store and impound water therefor and to supply, utilize and sell water therefrom. (Please verify as done by phone).

Reporting as required by law is up to date with a last statement for end 1994 reading as purpose: Distribute and maintain irrigation systems now known as Hawaiian Irrigation Company Ltd. (125,000 auth. shares)

President, CEO and Director: Francis Swanzy Morgan,

Vice President, Treasurer and Director: David Francis Morgan,

Secretary and Director: Faye F. Honma, P.O.Box 355, Paauilo 96766

Director: Paula L. Morgan, same address as David supra

The reason that Western Farm Credit Bank did not foreclose on the ditch company was said to be its heavy debt burden to creditors, WFCB left it to original owner Francis Morgan (see Dept of Ag. documents). David Morgan was indicated in newspapers as member of one of the soil and water or other commissions or boards on the Island of Hawaii.

The irrigation company seems responsible for illegally damming a break in the supply system with tons of concrete, damaging the Waipio falls.

Henry A Ross

Mr. Kenneth M. Kaneshiro, State Conservationist  
USDA Natural Resources Conservation Service  
Hawaii State Office  
PJKK Federal Bldg., Room 4316  
300 Ala Moana Blvd.  
P.O. Box 50004  
Honolulu, Hawaii 96850-0001

Dear Mr. Kaneshiro:

Draft Watershed Plan - Environmental Impact Statement  
for Lower Hamakua Ditch Watershed

This is in reference to your letter of August 28, 1995. Thank you for the opportunity to review the subject project.

We request that you coordinate the Waimea-Paauilo Watershed project with this project. We understand both projects are presently being undertaken by your office.

If you have any questions, please contact Andrew Monden of our Project Development Branch at 387-0227.

Sincerely,

MANABU TAGOMORI  
Manager-Chief Engineer

Dick



United States Department of the Interior

OFFICE OF THE SECRETARY  
Washington, D.C. 20240

ER 95/0683

NOV 24 1995

Mr. Kenneth Kaneshiro  
State Conservationist  
USDA Natural Resources Conservation Service  
Hawaii State Office  
300 Ala Moana Blvd.  
Honolulu, Hawaii 96850

Dear Mr. Kaneshiro:

The Department of the Interior has reviewed the Draft Watershed Plan - Environmental Impact Statement (DEIS) for Lower Hamakua Ditch Watershed (Watershed Project), Hawaii County, Hawaii. The following comments are provided for your consideration when preparing the final watershed plan and Final Environmental Impact Statement (FEIS).

GENERAL COMMENTS

The proposed Watershed Project would repair and modify the Lower Hamakua Ditch to provide irrigation water to 2,500 acres of cropland and 5 acres of aquaculture on the Hamakua Coast of the Island of Hawaii. Additional project features include provision of livestock water on 2,000 acres of pasture, restoration of Hakaloa Falls, and on-farm land treatment practices. In addition to the preferred alternative (Alternative 2) with the above features, the DEIS presents three other alternatives. Alternative 3 is similar in ecological effect to Alternative 2. The no action alternative (Alternative 1) is presumed to result in the failure of the Lower Hamakua Ditch within five years and a subsequent return to natural flow conditions in the stream system of Waipi'o Valley. Alternative 4 provides irrigation water from wells instead of the Lower Hamakua Ditch and would have the same effects on the stream system as Alternative 1.

The DEIS does not adequately address effects of the proposed Watershed Project on fish and wildlife resources. Without the Watershed Project, the Lower Hamakua Ditch would be abandoned within a few years, and natural flows in the Hamakua Ditch would return. These flows would enhance aquatic resource values to Waipi'o Valley streams. Therefore, we propose all ecological impacts associated with the proposed repair and continued operation of the Lower Hamakua Ditch be considered effects of the proposed project. The negative project impacts are primarily associated with the Waioa stream system in Waipi'o Valley. The range of project alternatives considered is too narrow. The FEIS should explore additional ways to enhance or restore the stream ecosystem of Waipi'o Valley while accomplishing the aims of the proposed project.

Mr. Kenneth Kaneshiro

SPECIFIC COMMENTS

Page 16-17. Chapter 2: Project Setting. Section 2.2: Vegetation and Wildlife The paragraph on page 16 (lines 25-27) and page 17 (lines 1-8) is taken from the Fish and Wildlife Service's (FWS) letter of June 6, 1995. The underlined sentence (lines 6-7) was based on incomplete information and should be changed. The presence of 'opae kala'ole (Atylodes blauskatal) does not indicate long-term habitability of a stream reach because these shrimp migrate much more quickly than fish or snails and can recolonize depopulated areas in a short time. We suggest the following sentence or one similar be substituted: This pattern suggests that some factor, such as lack of recruitment or transient unsuitability of habitat, has reduced populations of fish and snails in these streams.

The FWS no longer uses the term "category 2 or C2" to identify species for potential listing as an endangered or threatened species under the Endangered Species Act of 1973. All references to C2 species should be replaced by "species of concern to the FWS."

The correct local name for the Hawaiian hawk is 'io and not 'lo.

Page 25. Chapter 3: Watershed Problems and Opportunities. Section 3.3: Opportunities The information on lines 3 and 17 should be corrected to reflect that the intakes are designed to (and do) take all, not most, of the base flow of these streams. In addition, on line 5 the word "short" should be defined or substituted with "undetermined"; otherwise this sentence is misleading. The lengths of dry stream bed have not been measured and may be extensive. For example, U.S. Geological Survey (USGS) data show that flow of 1.1 million gallons per day (MGD) or less can occur over 1.5 kilometers of the stream bed below the Kawaiuli intakes.

Page 48-54. Chapter 5: Formulation and Comparison of Alternatives. Section 5.4: Effects of Alternative Plans. Fish and Wildlife Habitat Long-lived stream fauna, such as gobies and snails, are anomalously rare in the stream reaches below and above the intakes of the Lower Hamakua Ditch. We can not show causation without pre-Lower Hamakua Ditch faunal data. However, this pattern is consistent with the known effects of the Lower Hamakua Ditch on stream flows. Specifically, diversion of all of the base flow and much of the normal flow from Kawaiuli, Alakahi, and Koiava streams results in severe degradation of habitat and periodic drying out of the stream reaches below the intakes. These reaches would otherwise be expected to support large populations of stream animals. In addition, diversion of water into the Lower Hamakua Ditch may entrain larvae spawned upstream, reducing or eliminating reproduction of animals above the intakes. This information should be included in the FEIS.

Alternative 2 and 3 The information provided in this section does not adequately address impacts of the Alternate Plans on aquatic resources. The Alternatives 2 and 3 would continue the periodic dewatering of parts of the Waioa stream system during times of peak demand. In essence, those alternatives would continue to result in three tributary streams being intermittent rather than perennial, even though the average flows would

Increase over past levels. Because the density and persistence of aquatic populations are functions of the timing and severity of minimum flow events, the effects of these alternatives contrast sharply with the probable effects of restoration of perennial flows in all streams, as in Alternatives 1 and 4.

Provision of adjustable gates on the intakes does not mitigate adverse effects of construction work, and does not, in itself, assure some minimum flows would remain in-stream. Without redesign of the intake diversion to pass base flow, all or almost all of the water in the streams will continue to be diverted during periods when low stream flows coincide with high demand.

Threatened and Endangered Species Most of the discussion in this section should be included in the previous section (Fish and Wildlife Habitat). Only potential impacts to listed species (not candidate species) should be included in this section.

Alternatives 2.3 The assertion that "fish and other aquatic biota will benefit in the long term" is unsupported and questionable. Average flows are less important for long-lived species than minimum flows. Diversion of "maximum peak demand" is likely to dewater the streams if they are in base flow conditions because 1) the base flow estimate of 19 MGD is very imprecise and 2) gate control is unlikely to be accurate to within fractions of an MGD. In any case, diversion of any remaining water (<2 MGD) among three large streams is unlikely to allow survival of significant populations of aquatic animals in the stream beds.

Natural Stream Flows The FEIS should elaborate on the natural and Lower Hamakua Ditch-impacted flow regimes in Waioa Stream and its four tributaries (Kawaiulu, Alakahi, Koloave, and Waimea), and on the interaction between stream flow variation and projected timing of withdrawals. For example, the frequency and seasonal occurrence of base flow events in each stream could be contrasted with the worst-case demand schedule. Such information would form a basis for determining how the water not used by the proposed project could be allocated for maximum benefit to fish and wildlife.

Based on topography and hydrology, it appears that Kawaiulu and Alakahi are at base flow less often and thus contribute more surplus water to the Lower Hamakua Ditch. Waimea is essentially untapped by the Lower Hamakua Ditch. Dewatering associated with base flow withdrawals is therefore probably most frequent in Koloave. Our preliminary analysis of USGS gauge data suggests that base flow events are more common in the winter and are relatively brief in the larger streams.

Page 67. Chapter 7: Recommended Plan. Section 7.2: Measures to be Installed

Use of adjustable gates to closely regulate diversions from the streams depends on 1) accurate calibration of intake flow to the position of the gates, 2) accurate measurement of total flow in the Lower Hamakua Ditch, and 3) allocation of personnel to monitor and adjust the gates on at least a monthly basis. The structural, instrumental, and personnel measures necessary to assure that such adjustments are possible should be detailed in this section.

SUMMARY COMMENTS AND RECOMMENDATIONS

Because of the above-mentioned effects on native stream species of fish and wildlife, we do not support the preferred alternative (Alternative 2) identified in the FEIS. The negative effects of the Lower Hamakua Ditch on the stream ecosystems of Waipi'o Valley will continue to be severe unless sufficient minimum flows remain in the stream channels under all conditions such that populations of native fish and molluscs and other invertebrates can survive. In the absence of the project (i.e., no action alternative), populations of native stream organisms can be expected to increase to natural levels once the Lower Hamakua Ditch falls and the streams revert to normal flow patterns.

The Department of the Interior prefers the watershed plan and the proposed project be based on the ability of the system to yield water without negatively impacting the in-stream biota. Further, the project parameters should be based on the volume and timing of ditch flows that could be extracted from the streams in other than base flow conditions. Since the average flow in the ditch has been near 30 MGD for 85 years, this fact confirms the nearly constant availability of "surplus water" above the approximately 19 MGD base flow.

At this time, we are unable to propose arbitrary minimum flows less than natural base flows because of the paucity of knowledge regarding Hawaiian stream ecosystems. The historical base flows past the intake points in the three affected streams were: 9.5-9.7 MGD for Kawaiulu, 5.5-7.8 MGD for Alakahi, and 2.5-3.0 MGD for Koloave.

This project could support irrigated agriculture along the Lower Hamakua Ditch as well as restore fish and wildlife populations in Waipi'o Valley with project modifications. These modifications could include the following features:

Modifications of the stream intakes to pass base flows and withdraw only surplus flows, up to the maximum required for the project. Such a system of water withdrawals would yield more variation in flow within the Lower Hamakua Ditch and would entail occasional zero flows.

Reductions in the proposed acreage or modifications in water use plans to require water volumes consistent with surplus flow withdrawals.

Redesign of the intakes to allow planktonic larvae to pass downstream without being entrained into the Lower Hamakua Ditch and to facilitate upstream migration of stream animals.

Construction of storage impoundments along the Lower Hamakua Ditch to supply irrigation water during episodes of low flow.

We appreciate the opportunity to provide these comments. The FWS is available to further provide technical assistance to the Department of Agriculture on this project. Please contact Mr. Brooks Harper, Field Supervisor, Ecological Services Division, Pacific Islands Ecoregion, Honolulu, Hawaii at (808) 541-

Mr. Kenneth Kaneshiro

3441 regarding technical assistance and for any questions regarding these comments.

5

October 3, 1995

Department of Agriculture  
Attention: Paul Matsuo  
P.O. Box 22159  
Honolulu HI 96823-2159

Sincerely,

*James N. Muth*  
James N. Muth, Director  
Office of Environmental Policy  
and Compliance

Dear Mr. Matsuo:

Subject: EIS Preparation Notice for Lower Hamakua Ditch Watershed Project

**I. Access to Dams**

Among other items that I believe should be considered in this document is how access to the intake systems at the back of Waipi'o Valley is to be obtained. In the past, a series of well-maintained trails allowed ditch maintenance workers to gain access to the dams at the back of the valley. In recent months, however, these trails have become eroded and, where not eroded, overgrown to the point that anyone using the trails runs a serious risk of personal injury or death. Thus, gaining access to the dams will require rebuilding the trails or developing alternative access methods. In either case, the environmental impacts will be substantial and must be addressed as a part of any EIS.

**II. Right of Access**

Land at the back of Waipi'o Valley is in private ownership. How will the state gain legal access to the intakes to accomplish the repairs needed for restoring the ditch?

**III. Water Rights**

Does the state have any legal claim that would justify it removing water from one watershed for delivery to another? Will it need to obtain approval from the state Commission on Water Resource Management? If so, what type of approvals are required?

**IV. Traditional Uses**

For most of the 20th century, taro farming in Waipi'o Valley has not been aggressively pursued. Forecasts for future taro production should not be based, therefore, only on the demand for water needed in the recent past. Rather, the EIS should consider the prospect that all lands suitable for taro cultivation in Waipi'o Valley are in productive use and use this figure as the basis for arriving at an estimate of the maximum amount of water flow in Waipi'o that taro farmers will need. Only after calculating this maximum amount can the amount available for uses out of the valley be calculated.

**V. Employment**

Since the EIS preparation notice says a purpose of the project is "to provide employment opportunities for former Hamakua Sugar Plantation workers," the EIS should determine how many of those workers will be available for the newly created jobs by the time the project is completed. Is it reasonable, in other words, to expect that those workers will not have found employment in the two to five years (conservatively speaking) that it will take to accomplish this project? Already, as I understand it, many of the unemployed workers have found alternate employment or have left the area for good.

In this same vein, the EIS should consider how many jobs could be created by the increased cultivation of taro on the floor of Waipi'o Valley.

Thank you for taking these issues into account.

Sincerely,

*Patsummon*  
Patricia Tummons  
187-C Hokuai Street  
Hilo HI 96720



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
REGION IX  
75 Hawthorne Street  
San Francisco, CA 94105

October 10, 1995

We appreciate the opportunity to review and provide comments on the DEIS. Please send one copy of the Final Environmental Impact Statement to this office at the same time it is officially filed with our Washington, D.C. office. If you have any questions, please contact me at (415) 744-1584, or have your staff contact Edward Yates at 744-1571.

Kenneth Kaneshiro, State Conservationist  
USDA Natural Resources Conservation Service  
Hawaii State Office  
PJKK Federal Bldg. Room 4316  
Honolulu, HI 96850

Sincerely,

Deanna Wienlan, Director  
Office of External Affairs

MI# 2140: HAMAKUA.DEI

Dear Mr. Kaneshiro:

The Environmental Protection Agency (EPA) has reviewed the Draft Environmental Impact Statement (DEIS) for the project entitled Lower Hamakua Ditch Watershed, Hawaii County, Hawaii. Our review is provided pursuant to the National Environmental Policy Act (NEPA) [42 USC 4231 et seq.], Council on Environmental Quality (CEQ) regulations [40 CFR 1500-1508] and Section 309 of the Clean Air Act.

The Natural Resources Conservation Service (NRCS) proposes to repair the existing Lower Hamakua Ditch to provide irrigation water to 2500 acres of cropland and five acres of aquaculture land, and livestock water to approximately 2000 acres of pasture. Other project measures include assistance for improved irrigation practices and soil erosion prevention.

Based on our overall review, we have assigned the DEIS a rating of EO-2 (Environmental Objections-Insufficient Information). This EO-2 Rating is further defined in the attached "Summary of the EPA Rating System." We have assigned the EO-2 rating because the DEIS does not include a discussion of the environmental consequences of the proposed action and because the DEIS does not contain sufficient detail regarding mitigation for project impacts. EPA is especially concerned about potential impacts to riparian habitat, endangered species, surface water supply and possible leaching of agricultural pesticides into groundwater. Our detailed comments are attached.

EPA appreciates the willingness of NRCS to work with EPA in regard to preparation of a Final EIS that adequately assesses the impacts of the proposed action and alternatives. As discussed in phone conversations between our respective staffs, EPA recommends that the NRCS either release an administrative Final EIS for EPA's review or provide EPA and other interested parties with an additional comment period after the Final EIS and include NRCS's responses to those comments in the Record of Decision.

**SUMMARY OF RAJING DEFINITIONS AND FOLLOW-UP ACTION**

**Environmental Impact of the Action**

**LO: Lack of Objections**

The EPA review has not identified any potential environmental impacts requiring substantive changes to the proposal. The review may have disclosed opportunities for application of mitigation measures that could be accomplished with no more than minor changes to the proposal.

**EC: Environmental Concerns**

The EPA review has identified environmental impacts that should be avoided in order to fully protect the environment. Corrective measures may require changes to the preferred alternative or application of mitigation measures that can reduce the environmental impact. EPA would like to work with the lead agency to reduce these impacts.

**EO: Environmental Objections**

The EPA review has identified significant environmental impacts that must be avoided in order to provide adequate protection for the environment. Corrective measures may require substantial changes to the preferred alternative or consideration of some other project alternative (including the no action alternative or a new alternative). EPA intends to work with the lead agency to reduce these impacts.

**EL: Environmentally Unsatisfactory**

The EPA review has identified adverse environmental impacts that are of sufficient magnitude that they are unsatisfactory from the standpoint of environmental quality, public health or welfare. EPA intends to work with the lead agency to reduce these impacts. If the potential unsatisfactory impacts are not corrected at the final EIS stage, this proposal will be recommended for referral to the Council on Environmental Quality (CEQ).

**Adequacy of the Impact Statement**

**Category 1: Adequate**

EPA believes the draft EIS adequately sets forth the environmental impact(s) of the preferred alternative and those of the alternatives reasonably available to the project or action. No further analysis or data collection is necessary, but the reviewer may suggest the addition of clarifying language or information.

**Category 2: Insufficient Information**

The draft EIS does not contain sufficient information for EPA to fully assess environmental impacts that should be avoided in order to fully protect the environment, or the EPA reviewer has identified new reasonably available alternatives that are within the spectrum of alternatives analyzed in the draft EIS, which could reduce the environmental impacts of the action. The identified additional information, data, analyses, or discussion should be included in the final EIS.

**Category 3: Inadequate**

EPA does not believe that the draft EIS adequately assesses potentially significant environmental impacts of the action, or the EPA reviewer has identified new, reasonably available alternatives that are outside of the spectrum of alternatives analyzed in the draft EIS, which should be analyzed in order to reduce the potentially significant environmental impacts. EPA believes that the identified additional information, data, analyses, or discussions are of such a magnitude that they should have full public review at a draft stage. EPA does not believe that the draft EIS is adequate for the purposes of the NEPA and/or Section 309 review, and thus should be formally revised and made available for public comment in a supplemental or revised draft EIS. On the basis of the potential significant impacts involved, this proposal could be a candidate for referral to the CEQ.

\*From: EPA Manual 1640, "Policy and Procedures for the Review of Federal Actions Impacting the Environment."

**GENERAL COMMENTS**

1. Need for Impact Assessment. Section 102(2)(C) sets out NEPA's basic mandate that Federal agencies prepare a detailed statement on the "environmental impact of the proposed action." [42 U.S.C. 4322(2)(C)]. CEQ regulations further specify that EISs must include an evaluation of direct, indirect and cumulative effects which are caused by the action (40 CFR 1508.8(b) and 1508.7). *The DEIS does not include an environmental consequences section (40 CFR 1502.16), nor any discussion of the environmental impacts of the proposed actions or of the alternatives.* Section 5.4, "Effects of Alternatives," does include a general "scoping" type discussion of what impacts may be caused by the project but the document does not include the specific impact assessment required by NEPA. EPA strongly recommends that NRCS include the required discussion of environmental impacts in the FEIS.

In your efforts to produce a sufficient FEIS, you would be aided by closely following the recommended format for EISs that is set out in the CEQ regulations [40 CFR 1502.10]. The document should contain separate and complete sections on "Affected Environment," "Environmental Consequences," etc.

2. Need to Document Conclusions and References. If references to previous documents are used, the FEIS should provide a summary of critical issues, assumptions and decisions complete enough to stand alone without depending upon continued referencing of the other documents. The EIS should summarize the issues and conclusions of any documents prepared for compliance with relevant laws such as the Endangered Species Act or the Fish and Wildlife Coordination Act. The FEIS should, however, include in the appendices, documents such as Biological Assessments that are integral to the environmental review of the project. Further, the DEIS contains several conclusions that are not supported by documentation, reference or analysis. For example, on page 49 the DEIS states, without any supporting analysis or data, that, "Fish and other aquatic biota will benefit in the long term." The FEIS should include support and context for all such conclusions.

3. Need to Compare Alternatives. On pages 41-42, the DEIS includes a table which gives two or three word descriptions of the impacts of the various alternatives. Such brief descriptions, however, do not include enough specificity or analysis to enable the reader to judge or compare the alternatives. Instead, the EIS should "Devote substantial treatment to each alternative considered in detail, including the proposed action, so that reviewers may evaluate their comparative merits." [40 CFR 1502.14(b)]. For instance, the description of impacts for ground water quantity states simply, "Primary source for irrigation" for Alternative 1 and "Secondary source for irrigation" for Alternative 2. The FEIS should explain how each alternative will effect groundwater aquifers and whether there will be a negative impact on the aquifer and whether there may be any indirect or cumulative impacts on users of these aquifers. [As discussed below, the FEIS should also discuss groundwater quality.]



4. Need to Describe Mitigation Measures. CEQ regulations require that an EIS include "appropriate mitigation measures not already included in the proposed action or alternatives," and "means to mitigate adverse environmental impacts" (40 CFR 1502.14, 1502.16). The DEIS section on mitigation (p. 69) includes a brief listing of 5 measures to reduce environmental impacts but includes no specific or detailed discussion of these measures. The FEIS should include detailed discussion of such measures, including information on implementation plans, feasibility, cost, monitoring and expected level of effectiveness.

More specific recommendations are included below. These recommendations, however, are not comprehensive. As the much of the text of the DEIS is in a general terms, similar to a scoping document, our comments and recommendations are in general terms with examples to assist you determine what level of specificity is needed for the entire document.

#### FISH AND WILDLIFE

The DEIS does not contain the required assessment of project impacts to fish, plant and wildlife species. The discussion on page 29 is typical of the level of analysis in the DEIS where it is stated that, "Impacts of the alternatives ... will be assessed, and adverse impacts will be avoided or mitigated." The FEIS, however, must include specific discussion of the existing conditions, such as stream flow, existing species, and the condition of the habitat, along with a specific description of the impacts the project will have on those species.

On page 47 under "Fish and Wildlife Habitat," the DEIS does refer to a specific impact by stating that, "with return of stream flow in the Waipo Valley, all fish and aquatic biota will benefit by natural flow conditions." Such conclusions, however, must be supported by discussion, analysis and data whether or not the species are listed as endangered/threatened. The FEIS, for example, should discuss how different stream flow patterns of the various alternatives (including the No Action alternative) will effect fish species, such as the four endangered species listed on page 17 and on candidate endangered species, especially the 'O'opu alamo'o (*Lentipes concolor*). Effects of land use changes on wildlife caused by the preferred alternative are described in the DEIS by stating only that, "Effects will be essentially the same as Alternative 1 where lands are converted to agriforestry lands." The DEIS, however, should thoroughly describe the impacts from changes in land use that are essentially the project purpose. The FEIS, therefore, should discuss in detail the disturbance on plant and wildlife species from future utilization of idle farmland and the effects of increased use of chemical pesticides and fertilizers on those species.

#### WATER RESOURCES

##### Section 404

The DEIS does not state whether the project will affect wetlands or other waters of the United States. Wetlands could be affected if the irrigation flume construction were to involve any dredge and fill or if formerly irrigated land had been converted to wetlands. If such waters are affected by the project, the FEIS should discuss such project impacts and the applicant

must comply with Section 404(b)(1) of the Clean Water Act (CWA). To comply with the CWA, the proposed project must meet all of the following criteria:

- There is no practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem (40 CFR 230.10(a)).
- The proposed project does not violate State water quality standards, toxic effluent standards, or jeopardize the continued existence of federally listed species or their critical habitat (40 CFR 230.10(b)).
- The proposed project will not cause or contribute to significant degradation of waters of the United States, including wetlands (40 CFR 230.10(c)). Significant degradation includes loss of fish or wildlife habitat, including cumulative losses.
- All appropriate and practicable steps are taken to minimize adverse impacts on the aquatic ecosystem (i.e., mitigation) (40 CFR 230.10(d)). This includes incorporation of all appropriate and practicable compensation measures for unavoidable losses to waters of the United States, including wetlands. The FEIS should fully address the feasibility of "in-kind" habitat mitigation measures.

#### Water Quality

1. The FEIS should fully evaluate potential impacts to surface and groundwater quality.
2. The FEIS should discuss the proposed plan's compliance with State and local water quality management plans and State-adopted, EPA-approved water quality standards. EPA recommends that project planning be fully coordinated with the state of Hawaii to ensure protection of water quality and maintenance of beneficial uses.
3. The Federal Antidegradation policy (40 CFR 131.12) is designed to help implement the Clean Water Act (CWA), which is intended to restore and maintain the chemical, physical, and biological integrity of the Nation's waters [Section 101(a)]. The Antidegradation Policy states that where the quality of the waters exceed levels necessary to support propagation of fish, shellfish, and wildlife and recreation in and on the water, that quality shall be maintained and protected unless the State finds, after full intergovernmental coordination and public participation, that allowing lower water quality is necessary to accommodate important economic or social development. Even then, the State shall assure water quality adequate to fully protect existing uses.
4. Evaluate the potential of the proposed activity to cause adverse aquatic impacts such as increased siltation and turbidity; changes in the direction of stream flow, substrate, dissolved oxygen, and temperature; and habitat deterioration related to proposed flume construction and rerouting of streams.



UNITED STATES DEPARTMENT OF COMMERCE  
Office of the Under Secretary for  
Oceans and Atmosphere  
Washington, D.C. 20230

4

EPA COMMENTS - LOWER HAMAKUA DITCH DEIS, MECS, OCT. 1995

5. Discuss specific monitoring programs that will be implemented before and after the proposed action to determine potential impacts on water quality and beneficial uses, and whether protection of water quality can be guaranteed.
6. Identify critical fisheries habitat, especially spawning and rearing areas, and other sensitive aquatic sites such as wetlands. Outline existing beneficial uses of these areas, and disclose potential impacts from the proposed action.
7. Indicate what measures will be taken to protect critical fish and wildlife habitat areas from potential adverse effects of diversion of streams and increases in agricultural activities, including use of agricultural pesticides. The feasibility of proposed mitigation measures should be fully demonstrated.

#### Groundwater

1. The DEIS only contains one paragraph on page 12 to describe groundwater conditions. The FEIS should describe the area's geomorphology in detail, especially in regard to its use a drinking water source. The FEIS should state whether the area has been designated as a sole or principal source aquifer pursuant to Section 42 USC part 300h-6 and whether the project will conform to requirements designed to protect drinking water quality.
2. The DEIS states that 21,400 acres of the project area were cultivated for sugarcane production in the recent past. Sugarcane production in Hawaii normally entailed the application of long lived pesticides. Such pesticides may still be present in soils in the project area and may be subject to leaching into groundwater if such soils are irrigated by project water. The FEIS should: state whether these soils contain pesticides; describe the type and quantity of pesticides; and include analysis as to whether new irrigation could cause contamination of groundwater by these pesticides.

#### ENVIRONMENTAL JUSTICE/EXECUTIVE ORDER (EO) 12898:

The DEIS does not appear to specifically address the requirements of EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations (Federal Register, February 16, 1995, p. 7629). The EO provides that Federal agencies should fully analyze the environmental impacts of their actions on minority and low-income communities. Such analysis should include whether certain ethnic or low income groups use or value resources that may be affected by the project. An example of this may be the community that grows taro in the Waipio Valley. The FEIS should also identify all historical, archeological or cultural resources and identify project impacts on those resources.

October 13, 1995

Mr. Kenneth M. Kaneshiro  
State Conservationist  
USDA, Natural Resources Conservation Service  
P.O. Box 50004  
Honolulu, HI 96850-0001

Dear Mr. Kaneshiro:

Enclosed are comments on the Draft Environmental Impact Statement for Lower Hamakua Ditch Watershed Hawaii County, Hawaii. We hope our comments will assist you. Thank you for giving us an opportunity to review the document.

Sincerely,

Donna S. Wieting  
Acting Director  
Ecology and Conservation Office

Enclosure



NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION (NOAA)

COMMENTS ON  
DRAFT ENVIRONMENTAL IMPACT STATEMENT

FOR  
LOWER HAMAKUA WATERSHED HAWAII COUNTY, HAWAII

General Comments

Thank you for the opportunity to review the Draft Watershed Plan-Environmental Impact Statement, for the Lower Hamakua Ditch Watershed Project. NOAA has the following comments.

The Federal Coastal Zone Management Act (CZMA, 16 U.S.C. Section 1451 et seq.) requires Federal agencies to conduct their activities consistent with federally approved state coastal zone management programs (CZMP). Each coastal state with a federally approved CZMP reviews federal activities requiring federal authorization or funding for consistency with the CZMP.

The consistency requirement applies to federal actions reasonably likely to affect land or water uses or natural resources of the coastal zone. The CZMA has established that any federal action, whether within or outside the coastal zone, is subject to the consistency requirement if there are coastal effects. Direct federal actions must be consistent to the maximum extent practicable. Activities requiring federal licenses or permits, or federal assistance to state or local government must be fully consistent.

Hawaii has a federally approved CZMP and it is administered by the Office of State Planning (OSP). The DEIS does not include a consistency determination. A determination should be completed prior to the FEIS. Please contact Mr. John Nakagawa at 808/587-2878 or Mr. Douglas Tom at 808/587-2875. They will be able to assist you in meeting the federal consistency requirements for Hawaii.

In addition, under section 6217 of the Coastal Zone Act Reauthorization Amendments of 1990, Hawaii is developing a coastal nonpoint pollution control program. The U.S. Environmental Protection Agency issued guidance specifying management measures for sources of nonpoint pollution in coastal waters. One source category of nonpoint pollution is hydromodification. We encourage you to review this section to determine if any practices or sets of practices could assist the project.

Carol Wilcox P.O. Box 10558 Honolulu, Hawaii 96816  
Phone (808) 737-8410 FAX (808) 732-2164  
October 9, 1995

To: Governor, State of Hawaii, Office of Environmental Quality Control  
Kenneth Kanehiro, USDA Natural Resources, Conservation Service  
From: Carol Wilcox

Comments on HAMAKUA LOWER DITCH WATERSHED PROJECT EIS  
PREPARATION NOTICE

Thank you for the opportunity to comment on the preparation of this EIS.

I would like to suggest that two additional alternatives be considered in the scope of this work:

- The ditch be abandoned, no further action taken
- The ditch be dismantled, with water restored to the streams and valleys of origin.

Please project the economics of each of these alternatives, and, in addition, a) the cost of water by digging local wells where it appears water will be needed b) the cost of preserving the easements and rights of ways for future restoration of the ditch if it becomes economically feasible. These should be projected out over a reasonable period of time, lets say 30 to 50 years.

I'd like to suggest that the EIS question whether or not a realistic need for substantial amounts of water for agricultural irrigation has been demonstrated. It is my understanding that over the lifetime of these ditches the sugar companies generally did not find it viable to irrigate their crops, due to the porous nature of the soil, the slopes involved, and the generous rainfall in the area. Apparently most of the water was used at the factories or for fluming, and that a lot of it was just let to the sea. What has changed so that now irrigation is cost-effective?

The EIS should also try to determine the State policy regarding agricultural support and subsidy. This is an important question in light of amount of land and its geographic distribution which appears to be coming available through the closing of sugar companies. Will the state be subsidizing water, marketing, transportation, etc. for agricultural ventures at every site where the sugar industry has gone out of business, or is there a priority? If Hamakua is not a priority for state agricultural support, then that should be taken into consideration.

I'll be looking forward to the completed EIS. Mahalo.



REF:OCEA:SL  
STATE OF HAWAII  
DEPARTMENT OF LAND AND NATURAL RESOURCES

P. O. Box 621  
Honolulu, Hawaii 96809

DEC -4 1995

File No.: 96-175

Mr. Kenneth M. Kaneshiro  
United States Department of Agriculture  
The Natural Resources Conservation Service  
P.O. Box 50004  
Honolulu, Hawaii 96850-0001

Dear Mr. Kaneshiro:

Subject: Draft Watershed Plan - Environmental Impact Statement for  
the Lower Hamakua Ditch Watershed, Hamakua, Hawaii

Thank you for giving our Department the opportunity to comment on  
this matter. We have reviewed the materials you submitted and have  
the following comments.

Division of Aquatic Resources:

The draft EIS does not adequately address the potential impact the  
project could have on native stream animals (see addendum for  
specific comments). Current research suggests that any alteration  
to the existent flow, whether an increase or a decrease, will  
affect their amphidromous life cycle. There may be physical  
(spates and low flows) or chemical cues which regulate their life  
cycle.

We recommend that the applicant conduct an in-situ survey of the  
entire stream to thoroughly census the stream. We suggest using  
the DAR Point/Quadrat survey method, unless the applicant has an  
alternate methodology that would produce comparable results. It  
would be necessary to conduct surveys during both the wet and dry  
seasons, as well as during daylight and nighttime hours. The  
cursory survey the applicant conducted in 1995 is totally  
inadequate.

Since surveys simply represent a "snapshot" of a given point in  
time, it is important that a long-term monitoring program be  
initiated to assess the impacts of stream alteration on the life  
cycle of native stream animals. Included in this monitoring  
program should be a postlarval recruitment study and the seasonal  
study mentioned above. Aquatic Resources should be consulted  
during both the initial survey period, and the long-term monitoring  
phase.

Mr. K. Kaneshiro

-2-

File No.: 96-175

Division of Forestry and Wildlife

1) The opportunity exists to maintain stream flows to protect the  
native stream biota in the Lower Hamakua Ditch Watershed area.  
From this viewpoint, it is in the Lower Hamakua Ditch  
Watershed area. From this viewpoint, it is imperative that  
this be one of the objectives in maintaining the watershed  
area.

2) The removal of the temporary dam above Hakalaoa Falls would  
not only restore a water source, but it would also provide a  
biota that once flourished before the Falls was diverted in  
1989.

3) Water rights issues will crop up and will need to be resolved  
before the construction of the project can begin.

4) We have no objections to the proposed request.

In addition our Department's Division of Historic Preservation has  
already commented on this project in a letter dated September 28,  
1995 (attached).

Commission on Water Resource Management

In general, the CWRM strongly promotes the efficient use of our  
water resources through conservation measures and use of  
alternative non-potable water resources whenever available,  
feasible, and there are no harmful effects to the ecosystem. Also,  
the CWRM encourages the protection of water recharge areas which  
are important for the maintenance of streams and the replenishment  
of aquifers.

1) We recommend coordination with the County government to  
incorporate this project into the County's Water Use and  
Development Plan;

2) A Well Construction Permit and a Pump Installation permit from  
the Commission on Water Resource Management would be required  
before ground water is developed as a source of supply for the  
project;

3) Groundwater withdrawals from this project may affect  
streamflows. This may require an instream flow standard  
amendment;

Mr. K. Kaneshiro

-3-

File No.: 96-175

Mr. K. Kaneshiro

-4-

File No.: 96-175

- 4) If the proposed project diverts additional water from streams or if new or modified stream diversions are planned, the project may need to obtain a stream diversion works permit and petition to amend the interim instream flow standard for the affected stream(s);
- 5) Based on the information provided, it appears that a Stream Channel Alteration Permit pursuant to Section 13-169-50, HAR may be required before the project can be implemented;
- 6) An amendment to the instream flow standard from the CWRM would be required before any streamwater is diverted;
- 7) Based on the description of alternative in Section 5.3, alternatives 2 (repair of the ditch) and 3 (replacement of the ditch with pipeline) may require all surface water regulatory actions mentioned above for the Kawaihū, Alakahi, and Koiawe Streams. We can better reassess the applicability of the regulatory requirements as specific plans showing the configuration of the repairs become available.

Alternative 4 proposes the development of wells which would necessitate well permits and possibly amendments to the interim instream flow standards.

We recommend that Section 7.3 include a description of the Commission's requirements for well construction and pump install permits, and amendments to interim instream flow standards.

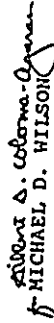
There is presently a pending after-the-fact stream channel alteration permit before the Commission concerning an emergency diversion on Hakalaoa stream which is the result of remedial actions to the 1989 failure of the tunnel system under Hakalaoa Falls. As stated in the draft, this has eliminated the Hakalaoa portion of the twin falls. With the demise of original applicant, Hamakua Sugar, the Commission has deferred action on the application until some type of plan is created by the current land owner, Bishop Estate, to restore Hakalaoa streamflow to its pre-tunnel failure flow. At this time, we offer no other comments on the ditch restoration work other than the possible regulatory actions required by statute mentioned above.

Finally, the report mentions that at least three non-county wells are currently being used. We cannot identify these wells and do not receive any monthly water use reports, as is required for source owners statewide under §13-168-7, which would verify this claim.

Thank you for your cooperation in this matter. Feel free to call Sam Lemmo at the Office of Conservation and Environmental Affairs at 587-0435, should you have any questions.

5/3/97

Aloha,

  
MICHAEL D. WILSON

Attachment



Stephen K. Yamashiro  
Mayor

William C. Davis  
Managing Director  
Henry Cho  
Deputy Managing Director

#### ADDENDUM

P. 16, l. 27 to p. 17, l. 6:

The Kohala Mountain does not contain most of the island's perennial streams. Most of the streams are located along the Hamakua Coast, from Hilo northward to Ooakaia.

None of the streams in this area have been adequately surveyed.

According to our records, the only surveys were conducted in Alakahi (5/68 and 10/68), Kawaiuli (10/68) and Kolaia (5/68).

The abundance of native shrimp and the rarity of native gobies and mollusks can simply be explained by the survey site location. Native stream organisms have a distinct longitudinal distribution by species within a stream.

The statement: "this pattern...snails into the stream" is very confusing. please clarify.

P.64, l. 16-20:

The applicant consulted with the Division of Forestry and Wildlife and U.S. Fish & Wildlife Service. For the last eleven years the Division of Aquatic Resources (DAR) has been involved in numerous studies on stream ecosystems and the results of their work needs to be consulted. Any current information on stream ecosystems resides with DAR personnel.

P. 67, l. 21:

There should be an administrative mechanism in place to assure that the promise by the applicant that the "excess of the needed flow be left in the stream..." be carried out.

P. 69, l. 17-18:

I prefer a monitoring program rather than a survey. Surveys provide a 'snapshot' in time, while a monitoring program provides a check on the dynamic nature of stream ecosystems.

C-5, l. 15-18:

A survey in June, 1995 above Walpio Valley is totally inadequate to determine the status of native fish and other in-stream biota. Let's be serious if we are to address the real issues about stream ecosystems.

## County of Hawaii

25 Aupuni Street, Room 215 • Hilo, Hawaii 96720-0215 • (808) 941-4011 • Fax (808) 941-4553  
KONA: 75-5706 Kula Road Highway, Suite 103 • Kailua-Kona, Hawaii 96740  
(808) 329-5226 • Fax (808) 326-5663

September 5, 1995

Mr. Kenneth H. Kaneshiro  
State Conservationist  
United States Department of Agriculture  
P.O. Box 50004  
Honolulu, HI 96850-0001

Dear Mr. Kaneshiro:


Thank you for sending me a copy of the draft Watershed Plan and Environmental Impact Statement (Plan-EIS) for the Lower Hamakua Ditch Watershed.

I appreciate the information and the opportunity to comment on the draft.

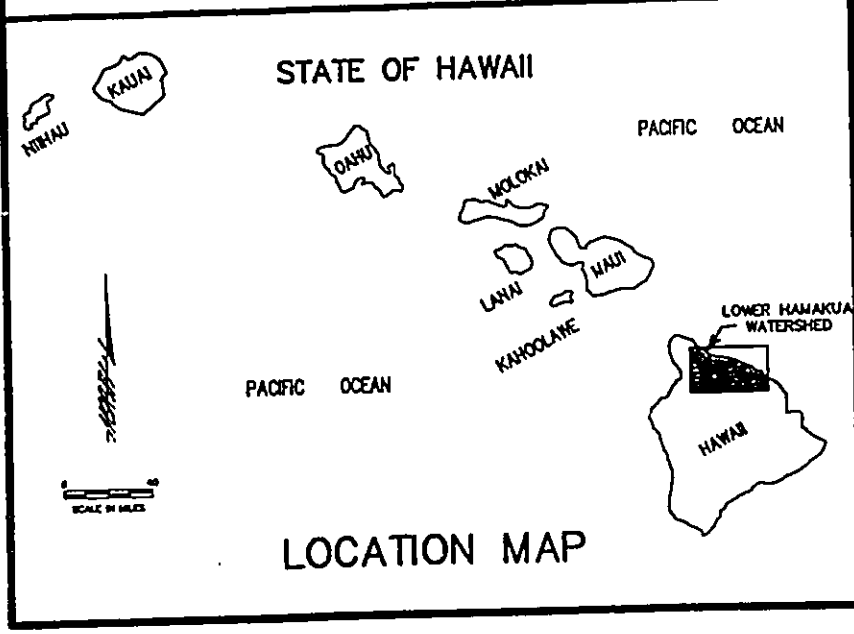
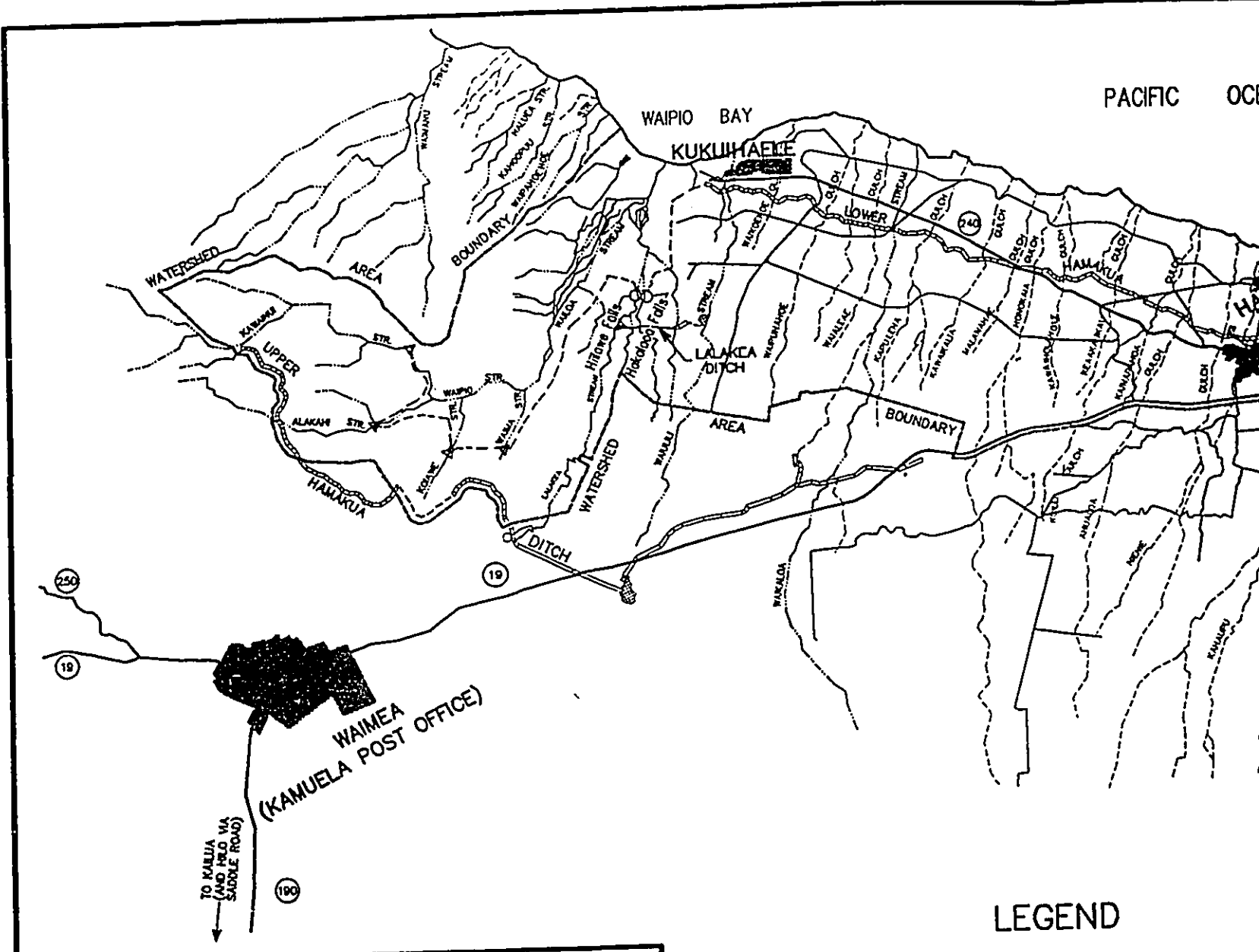
We are seeing that the Hamakua Coast is bouncing back from the loss of sugar operations and this project will provide additional employment opportunities for our people.

We look forward to working with you to bring this project to fruition.

Sincerely,

  
Stephen K. Yamashiro  
MAYOR

Reduced in file



**LEGEND**

- MAIN HIGHWAYS WITH NUMBER
- SECONDARY ROADS
- STREAMS
- GULCH FLOW LINES
- DITCHES/AQUEDUCTS/FLUMES
- TUNNELS
- RESERVOIRS
- WATER SUPPLY INTAKES
- TOWNS/SETTLEMENTS WITH NAME
- LOWER HAMAKUA DITCH WATERSHED AREA BOUNDARY

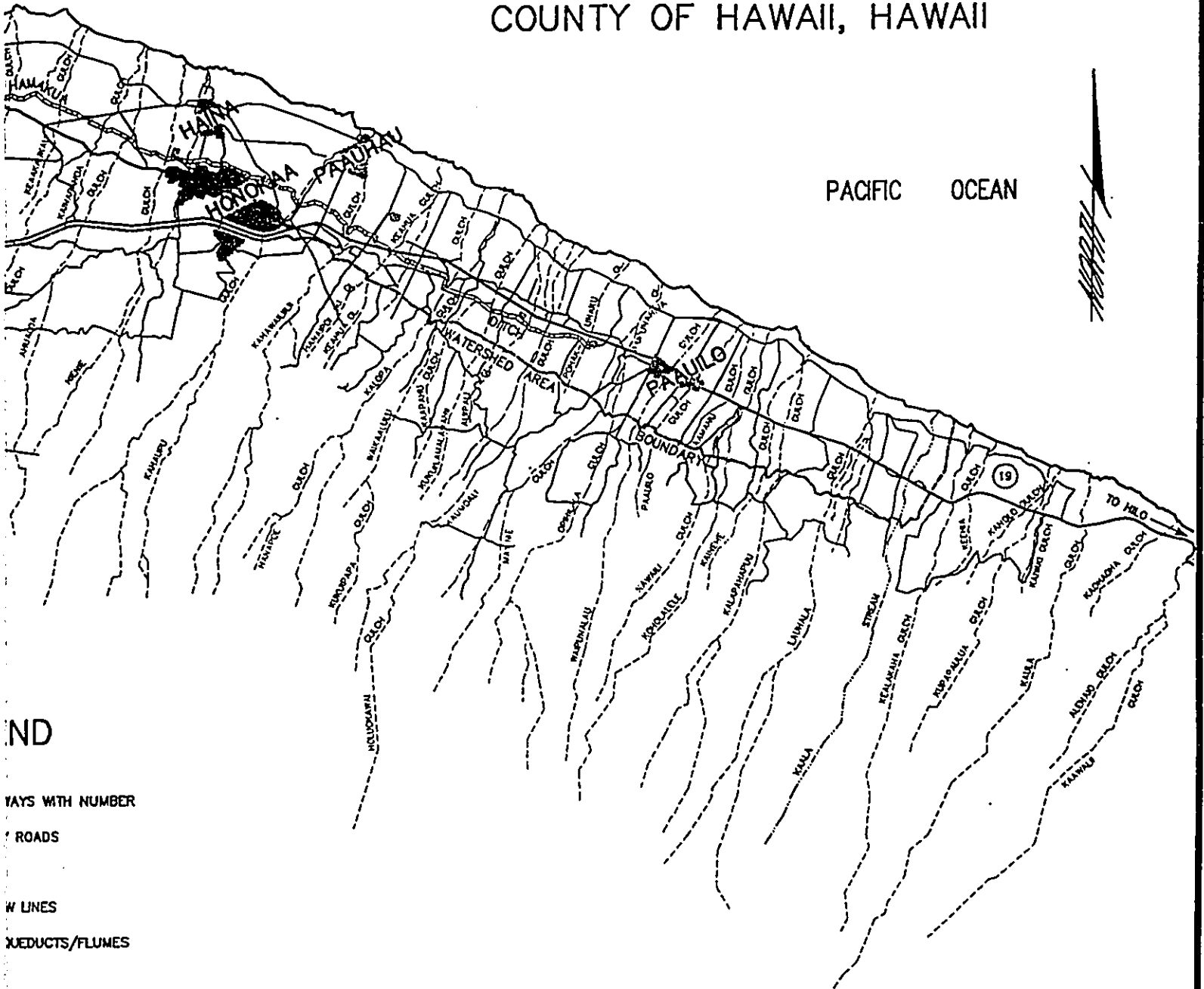
1  
2  
3  
4  
5  
6  
7  
8  
9  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60  
61  
62  
63  
64  
65  
66  
67  
68  
69  
70  
71  
72  
73  
74  
75  
76  
77  
78  
79  
80  
81  
82  
83  
84  
85  
86  
87  
88  
89  
90  
91  
92  
93  
94  
95  
96  
97  
98  
99  
100



PACIFIC OCEAN

# LOWER HAMAKUA DITCH WATERSHED AREA MAP COUNTY OF HAWAII, HAWAII

PACIFIC OCEAN



ND

WAYS WITH NUMBER

ROADS

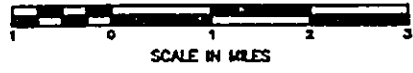
W LINES

XEDUCTS/FLUMES

PLY INTAKES

TLEMENTS WITH NAME

AKUA DITCH  
AREA BOUNDARY



SCALE IN MILES

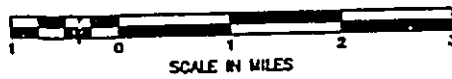
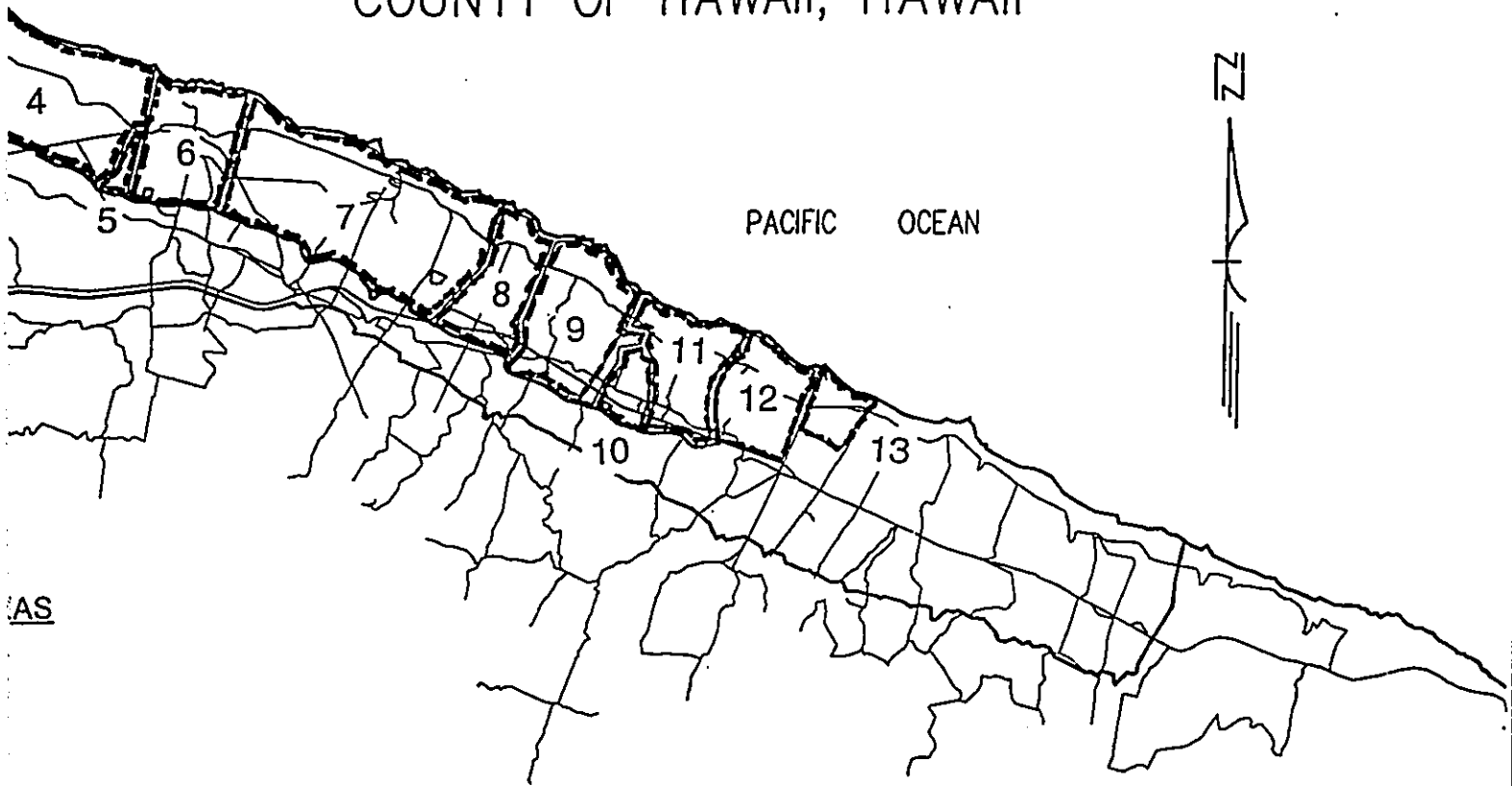
PREPARED BY: USDA, NATURAL RESOURCES CONSERVATION SERVICE  
HAWAII STATE OFFICE, HONOLULU, HAWAII

NOVEMBER 1998

Figure 2

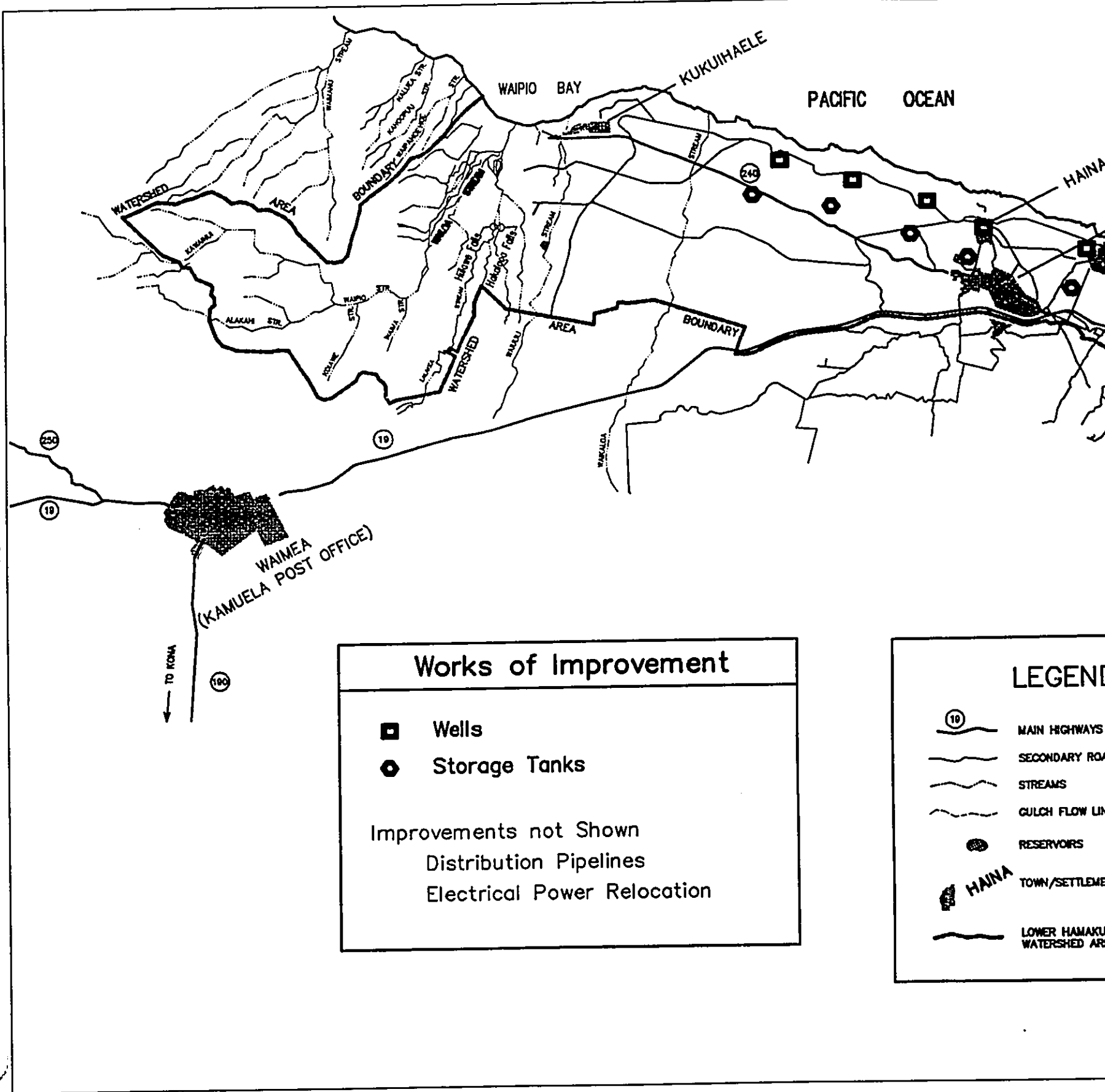


IRRIGATED CROPLAND EVALUATION AREAS  
LOWER HAMAKUA DITCH WATERSHED  
COUNTY OF HAWAII, HAWAII



PREPARED BY: USDA, NATURAL RESOURCES CONSERVATION SERVICE  
HAWAII STATE OFFICE, HONOLULU, HAWAII  
NOVEMBER 1998

Figure 3



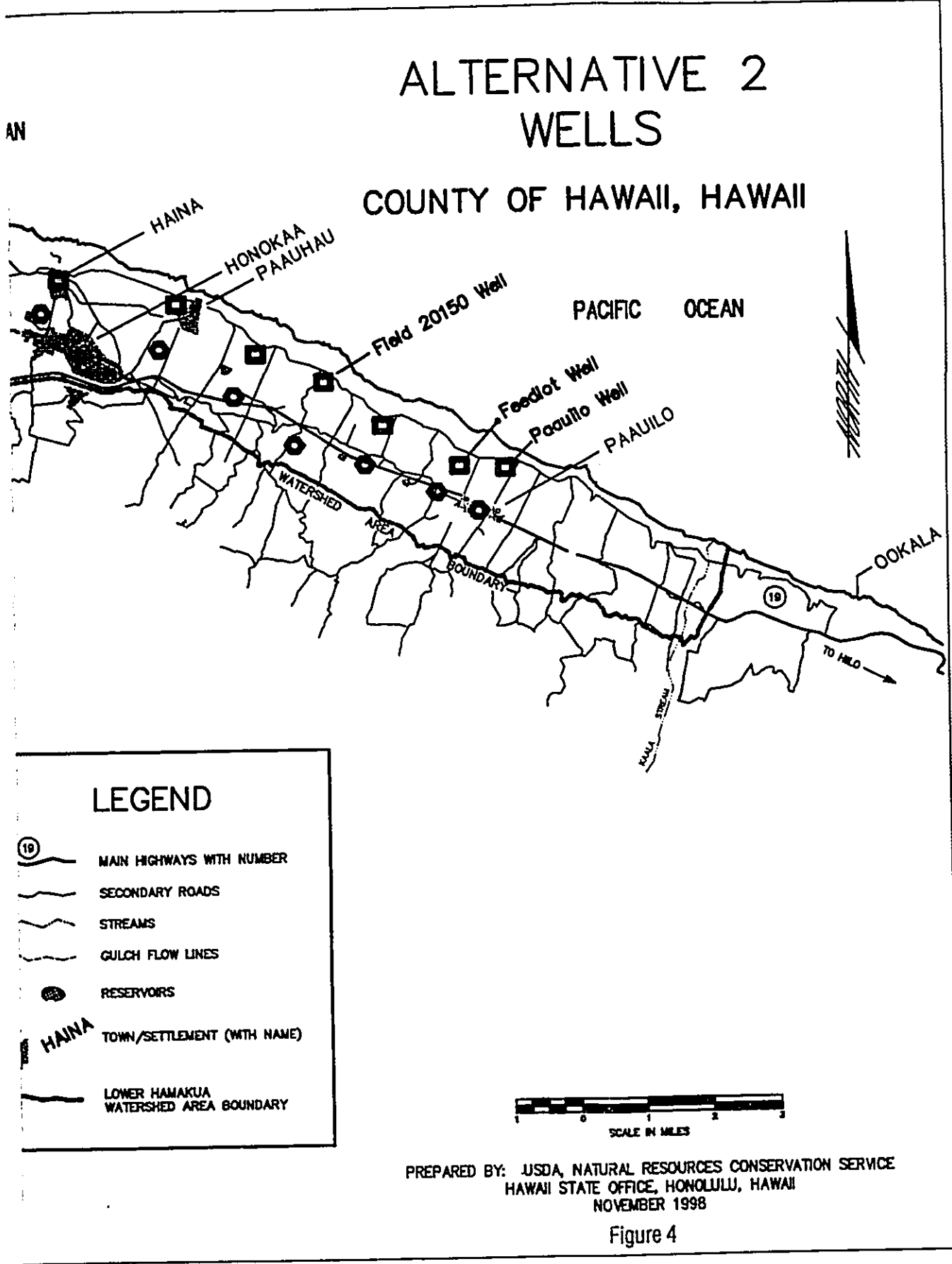
### Works of Improvement

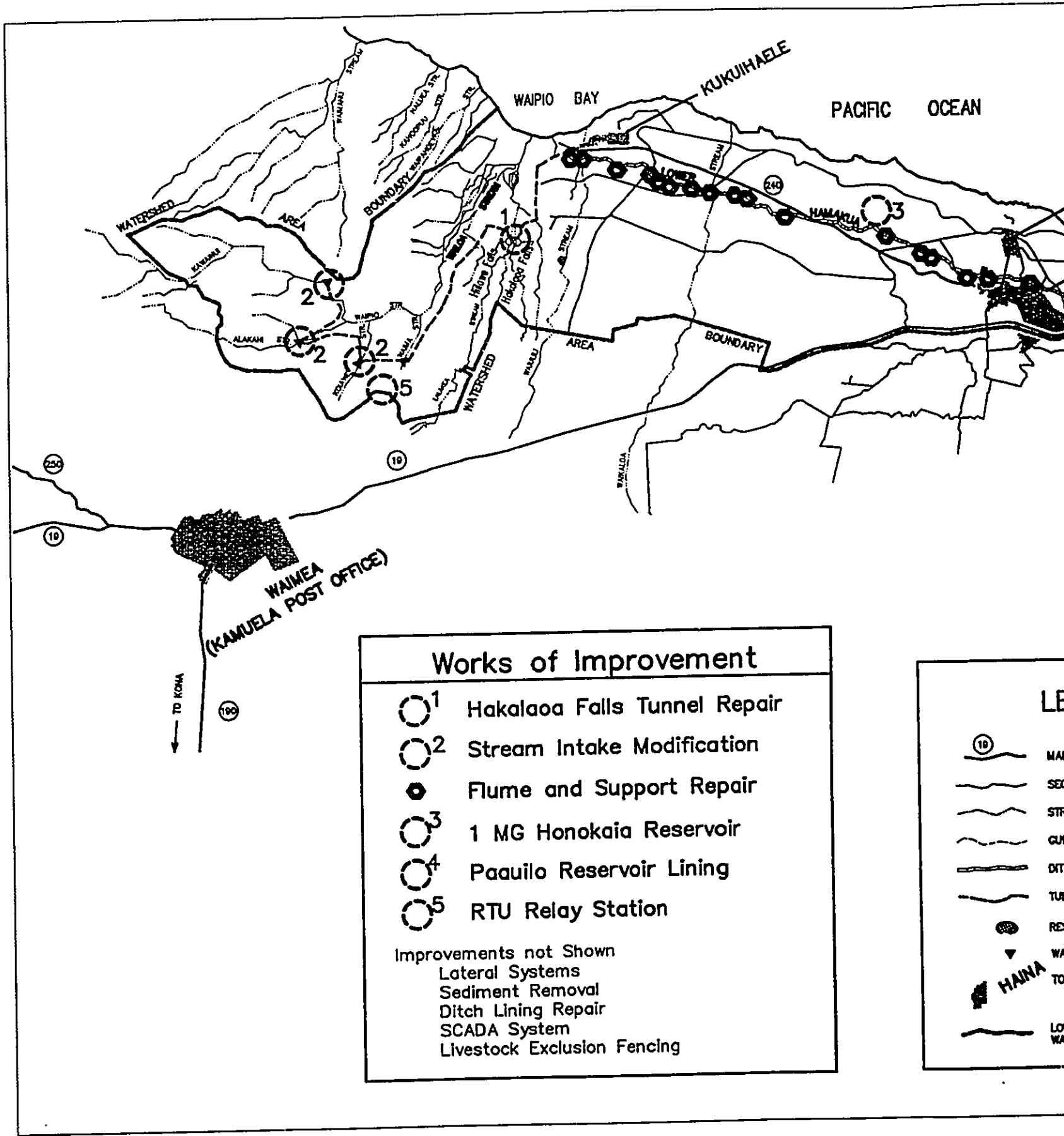
- Wells
- ◆ Storage Tanks







Improvements not Shown  
 Distribution Pipelines  
 Electrical Power Relocation











### LEGEND

- ⑩ MAIN HIGHWAYS
- SECONDARY ROADS
- STREAMS
- GULCH FLOW LINES
- RESERVOIRS
- HAINA TOWN/SETTLEMENT
- LOWER HAMAKU WATERSHED AREA

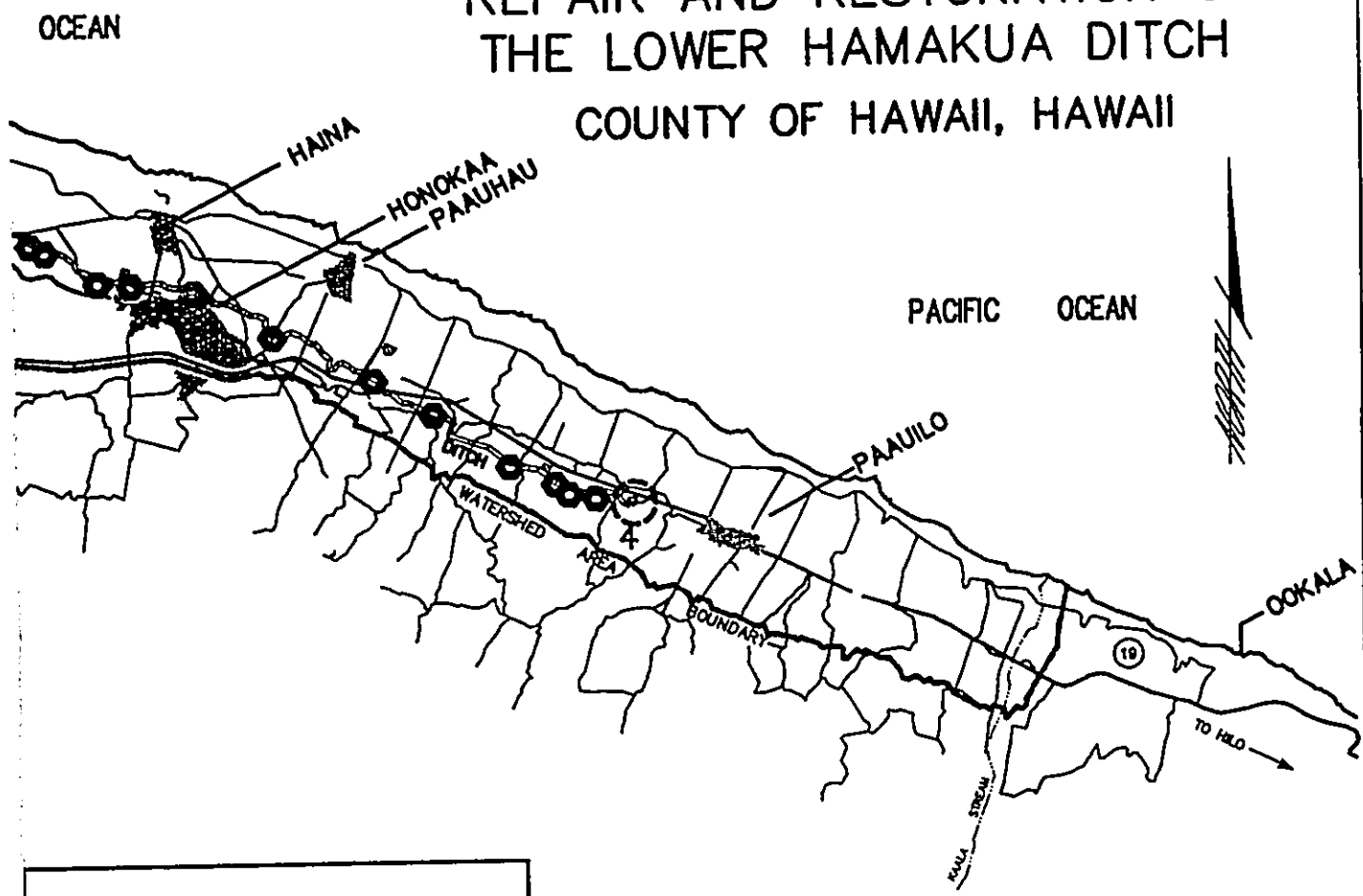














- ### Works of Improvement
-  Hakalaoa Falls Tunnel Repair
  -  Stream Intake Modification
  -  Flume and Support Repair
  -  1 MG Honokaia Reservoir
  -  Paauilo Reservoir Lining
  -  RTU Relay Station
- Improvements not Shown
- Lateral Systems
  - Sediment Removal
  - Ditch Lining Repair
  - SCADA System
  - Livestock Exclusion Fencing

- ### LE...
-  MA...
  -  SE...
  -  ST...
  -  CU...
  -  DT...
  -  TU...
  -  RE...
  -  WA...
  -  TO...
  -  LO WA...

# ALTERNATIVE 3 REPAIR AND RESTORATION OF THE LOWER HAMAKUA DITCH COUNTY OF HAWAII, HAWAII

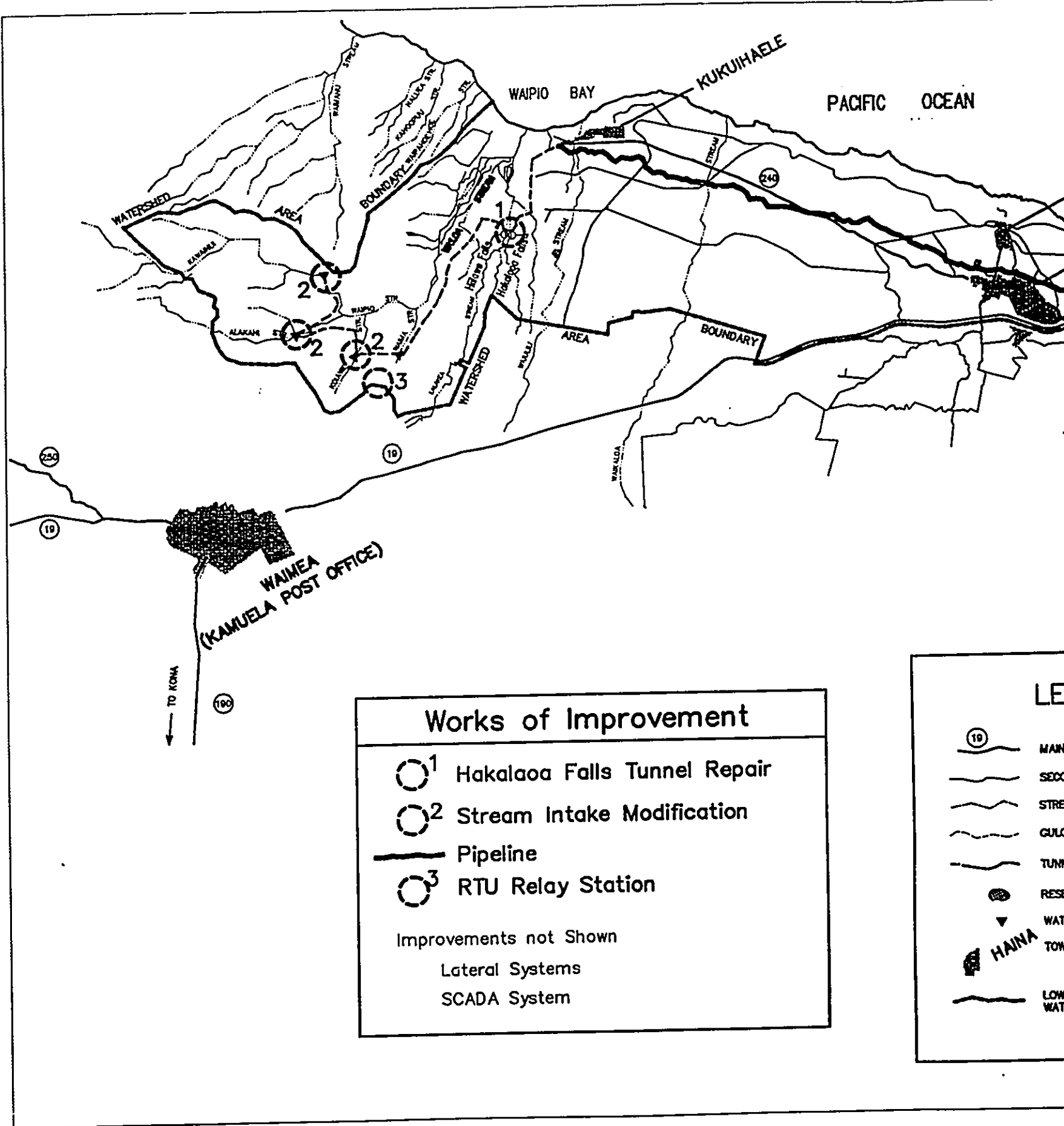


### LEGEND

-  MAIN HIGHWAYS WITH NUMBER
-  SECONDARY ROADS
-  STREAMS
-  GULCH FLOW LINES
-  DITCHES/AQUEDUCTS/FLUMES
-  TUNNELS
-  RESERVOIRS
-  WATER SUPPLY INTAKES
-  TOWN/SETTLEMENT (WITH NAME)
-  LOWER HAMAKUA WATERSHED AREA BOUNDARY



PREPARED BY: USDA, NATURAL RESOURCES CONSERVATION SERVICE  
HAWAII STATE OFFICE, HONOLULU, HAWAII  
NOVEMBER 1998  
Figure 7

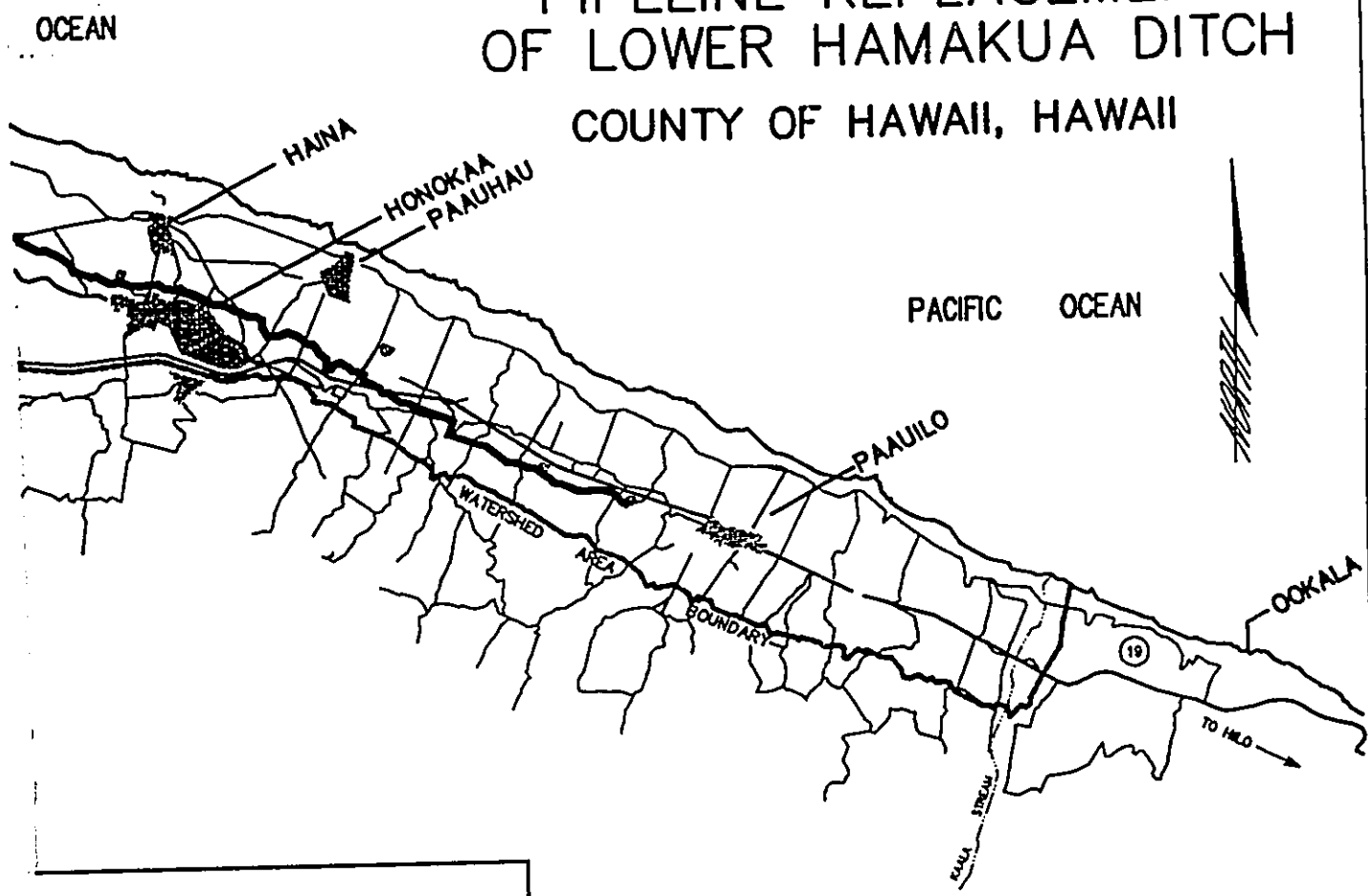


Works of Improvement	
	Hakalaoa Falls Tunnel Repair
	Stream Intake Modification
	Pipeline
	RTU Relay Station
	Improvements not Shown
	Lateral Systems
	SCADA System










Legend	
	MAIN
	SECO
	STRE
	CULC
	TUN
	RES
	WAT
	HAINA TOW
	LOW WAT

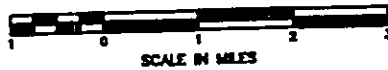


# ALTERNATIVE 4 PIPELINE REPLACEMENT OF LOWER HAMAKUA DITCH COUNTY OF HAWAII, HAWAII



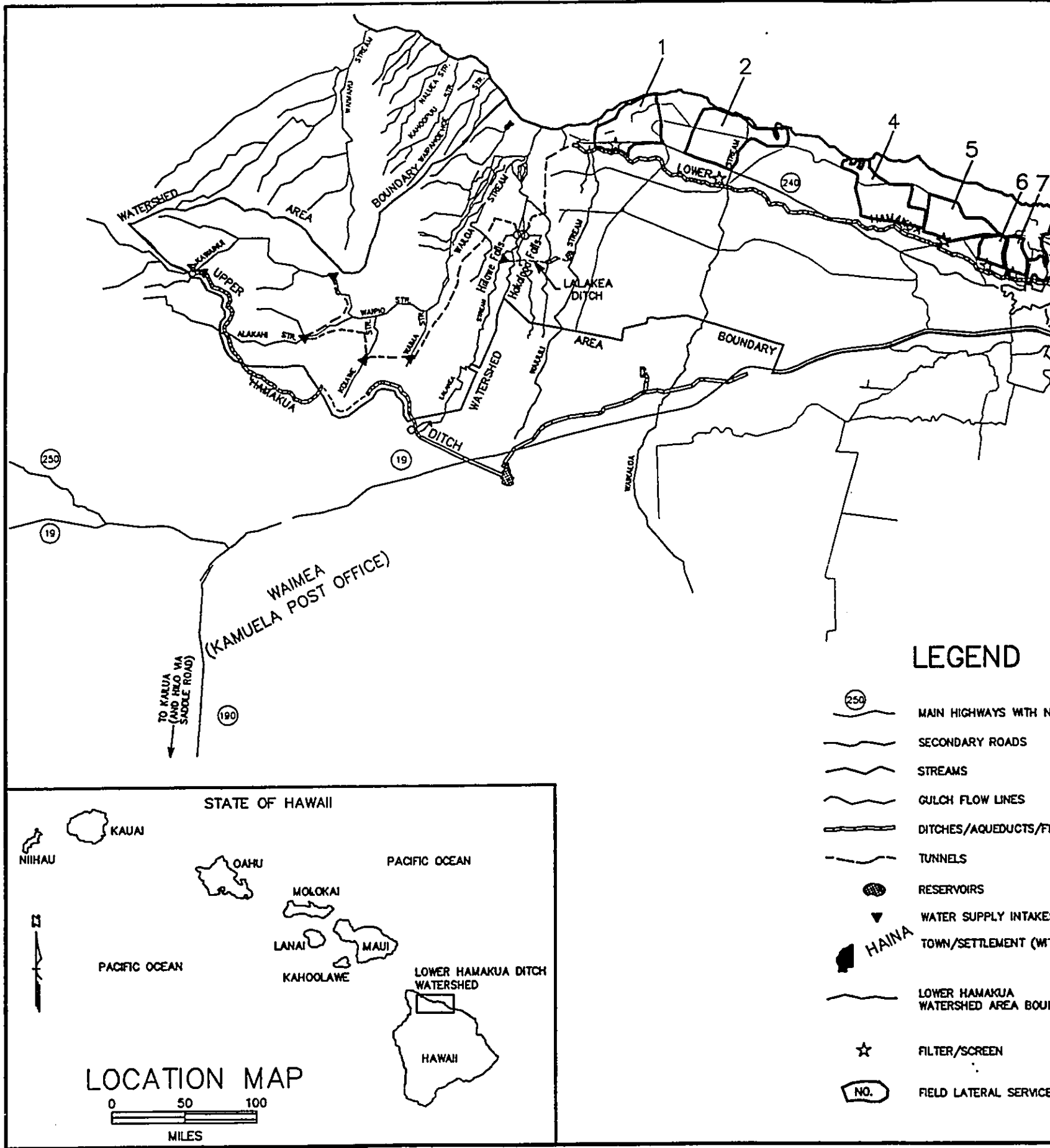
## LEGEND

-  MAIN HIGHWAYS WITH NUMBER
-  SECONDARY ROADS
-  STREAMS
-  GULCH FLOW LINES
-  TUNNELS
-  RESERVOIRS
-  WATER SUPPLY INTAKES
-  TOWN/SETTLEMENT (WITH NAME)
-  LOWER HAMAKUA WATERSHED AREA BOUNDARY



PREPARED BY: USDA, NATURAL RESOURCES CONSERVATION SERVICE  
HAWAII STATE OFFICE, HONOLULU, HAWAII  
NOVEMBER 1998

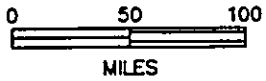
Figure 8



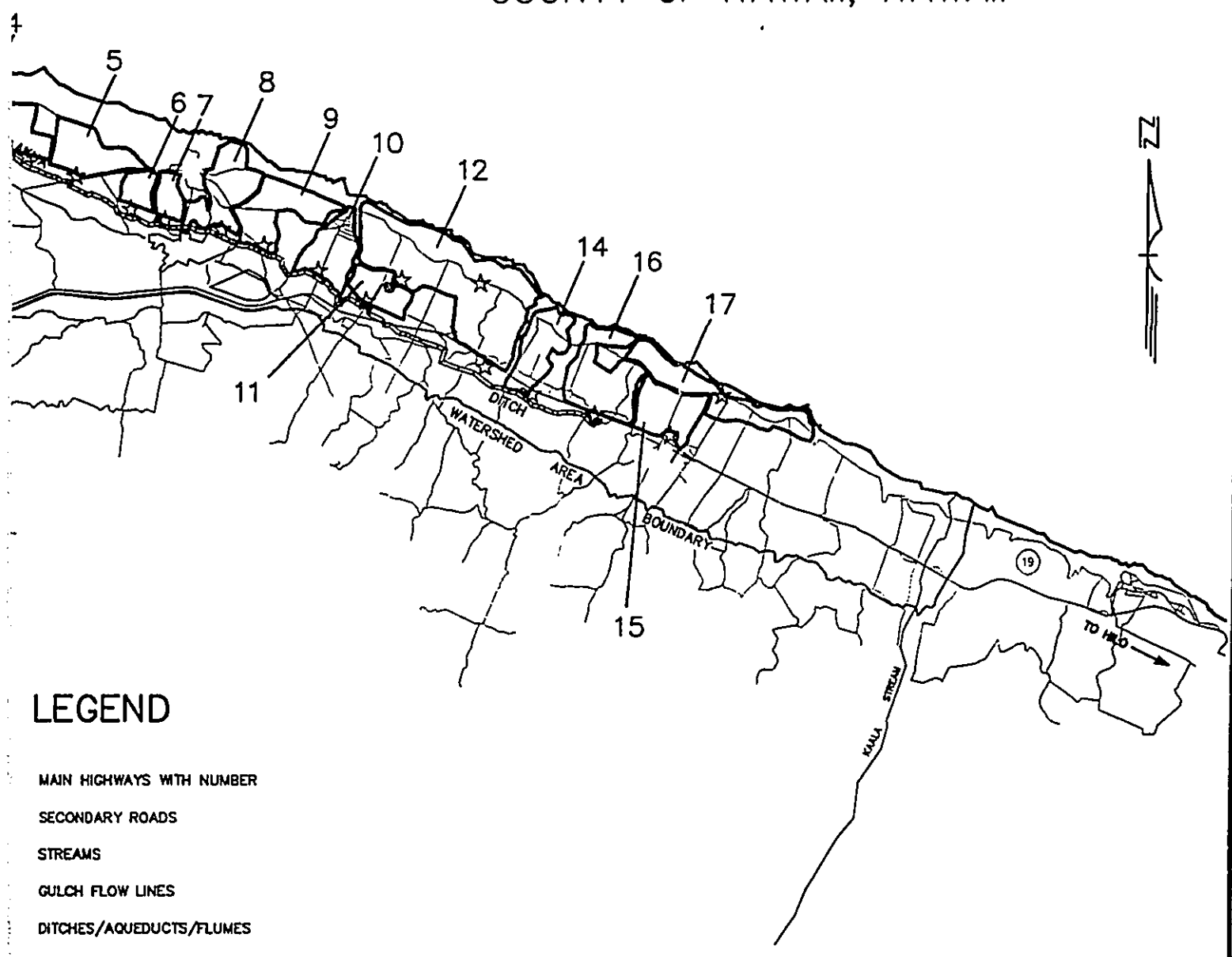
### LEGEND

- MAIN HIGHWAYS WITH NUMBERS
- SECONDARY ROADS
- STREAMS
- CULCH FLOW LINES
- DITCHES/AQUEDUCTS/FLUMES
- TUNNELS
- RESERVOIRS
- WATER SUPPLY INTAKE
- TOWN/SETTLEMENT (NAME)
- LOWER HAMAKUA WATERSHED AREA BOUNDARY
- FILTER/SCREEN
- FIELD LATERAL SERVICE (NUMBER)

### LOCATION MAP



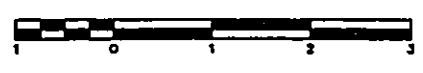
# LOWER HAMAKUA DITCH WATERSHED COUNTY OF HAWAII, HAWAII



## LEGEND

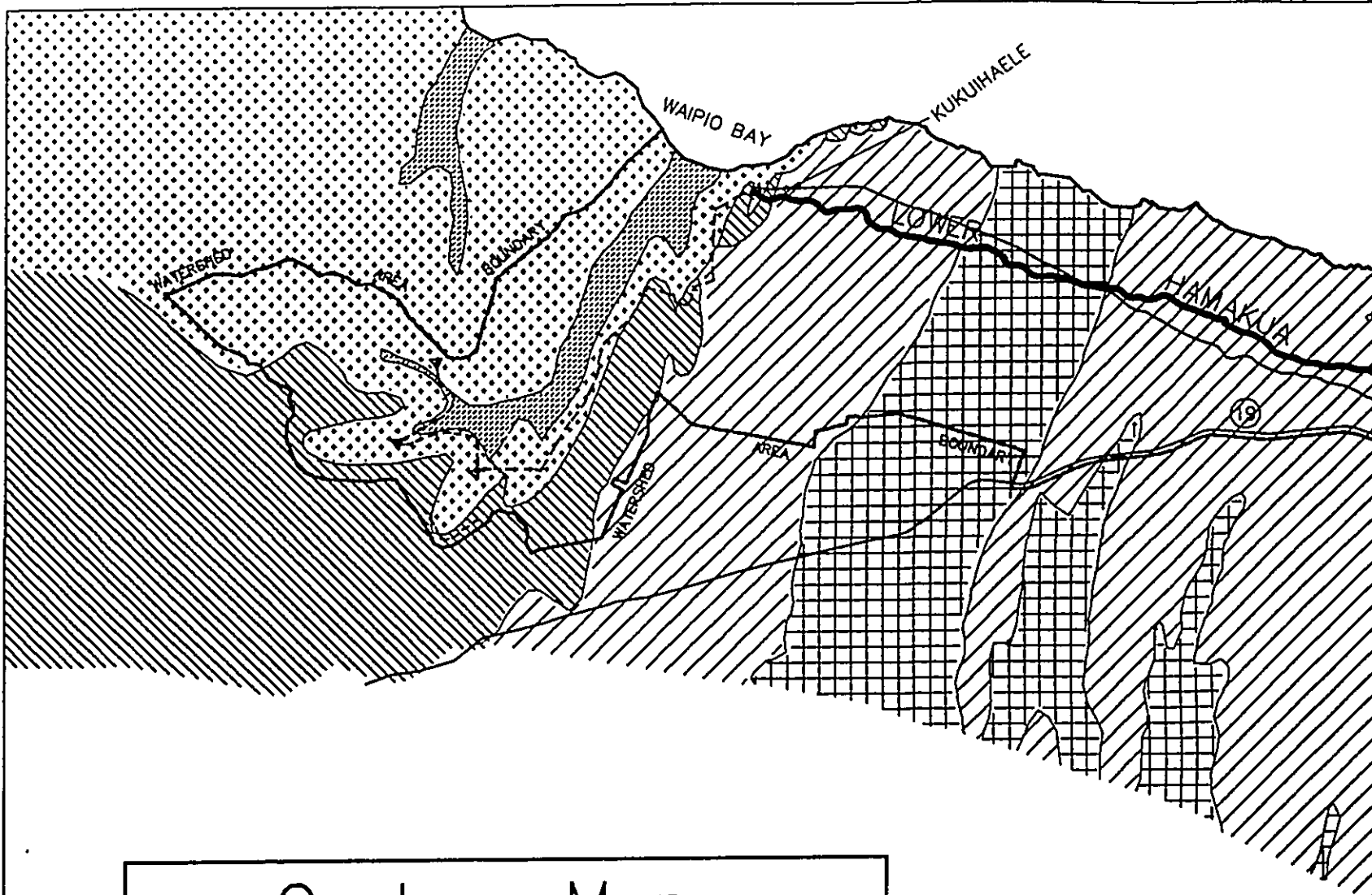
- MAIN HIGHWAYS WITH NUMBER
- SECONDARY ROADS
- STREAMS
- GULCH FLOW LINES
- DITCHES/AQUEDUCTS/FLUMES
- TUNNELS
- RESERVOIRS
- WATER SUPPLY INTAKES
- TOWN/SETTLEMENT (WITH NAME)
- LOWER HAMAKUA WATERSHED AREA BOUNDARY
- FILTER/SCREEN
- FIELD LATERAL SERVICE AREA

## FIELD LATERAL SYSTEMS HAMAKUA SUGAR COMPANY








PREPARED BY: USDA, NATURAL RESOURCES CONSERVATION SERVICE  
HAWAII STATE OFFICE, HONOLULU, HAWAII  
SEPTEMBER 1999

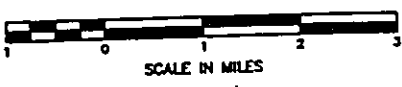
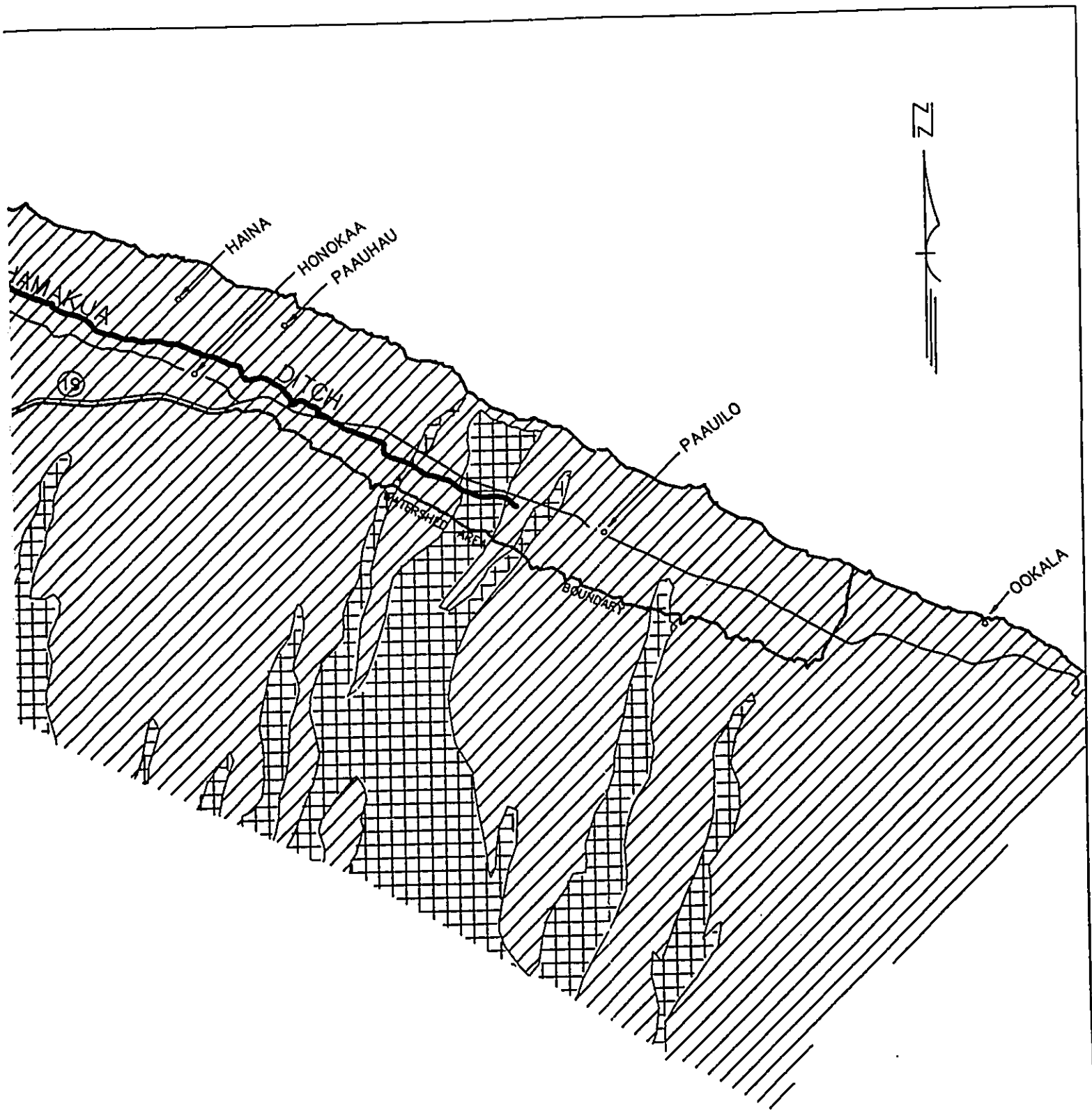
Figure 9



### Geology Map

	Hawi Volcanic Series
	Hamakua Volcanic Series
	Laupahoehoe Volcanic Series
	Pololu Volcanic Series
	Alluvium

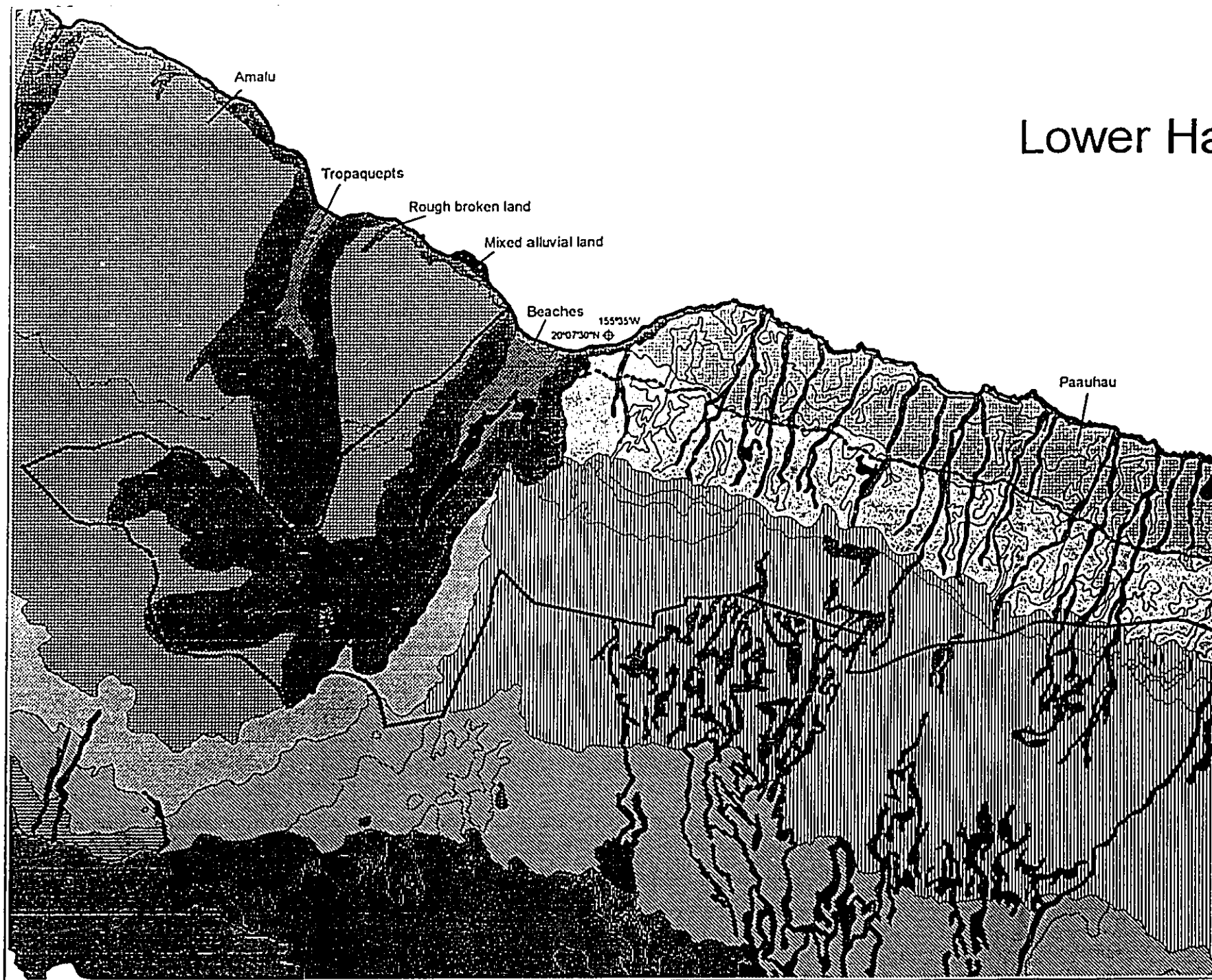
PREPARED BY:  
F













PREPARED BY: USDA, NATURAL RESOURCES CONSERVATION SERVICE  
HAWAII STATE OFFICE, HONOLULU, HAWAII  
NOVEMBER 1998






Figure 10

# Lower Ha



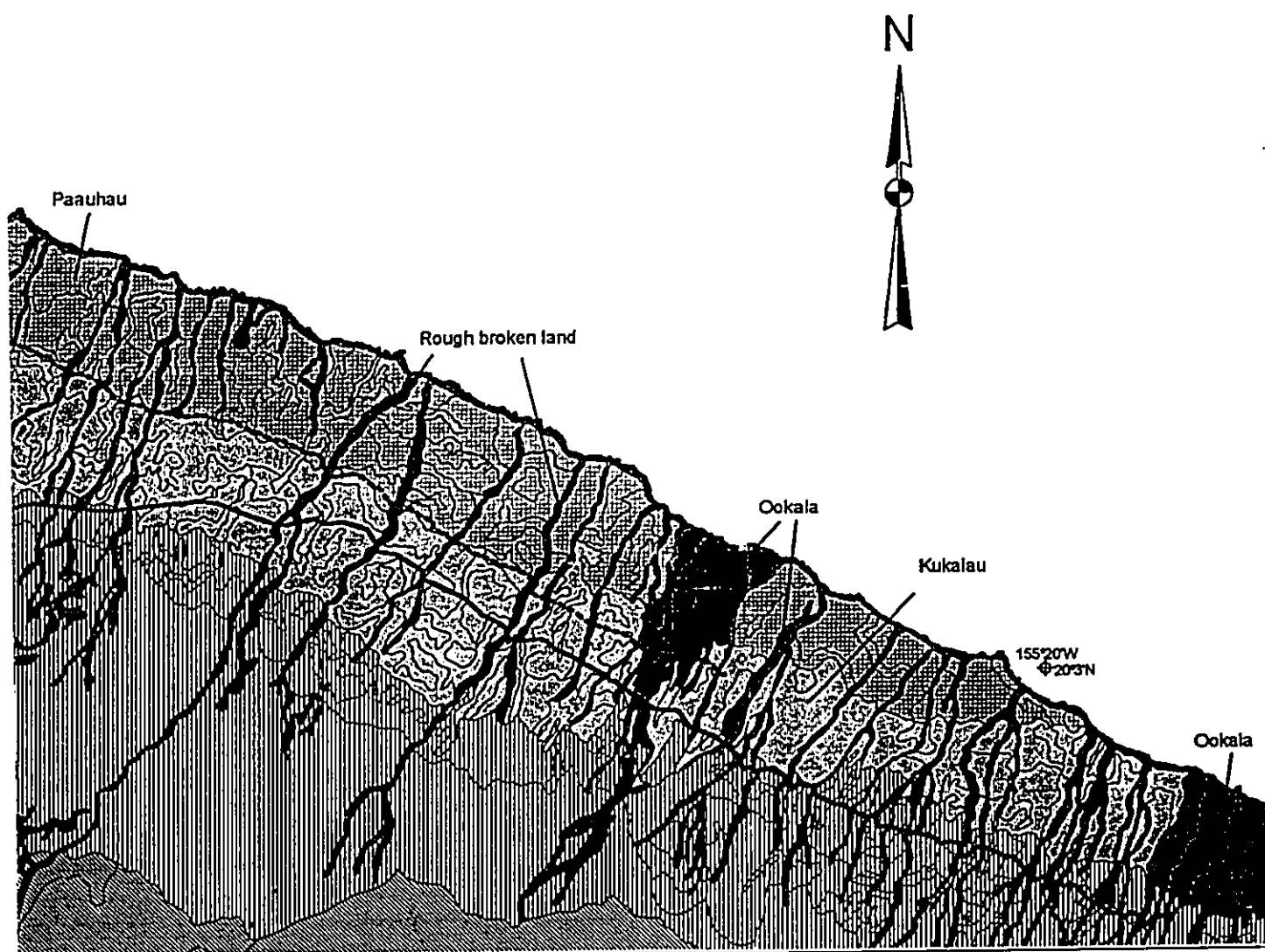
-  Alapai silty clay loam
-  Amalu
-  Beaches
-  Honokaa silty clay loam
-  Kahua silty clay loam

-  Kaiwiki silty clay loam
-  Kamaoa
-  Kikoni sandy loam
-  Kukaiiau silty clay loam
-  Maile silt loam





-  Mixed alluvial land
-  Ookala silty clay loam
-  Paauhau silty clay loam
-  Palapalai
-  Punohu

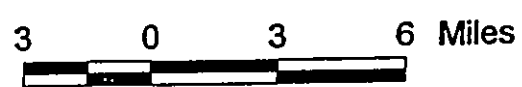
# Soil Series Map

## Lower Hamakua Ditch Watershed Area



alluvial land  
 a silty clay loam  
 iau silty clay loam  
 alai  
 u

-  Rough broken land
-  Tropaquepts
-  Umikoa silt loam
-  Waimea sandy loam

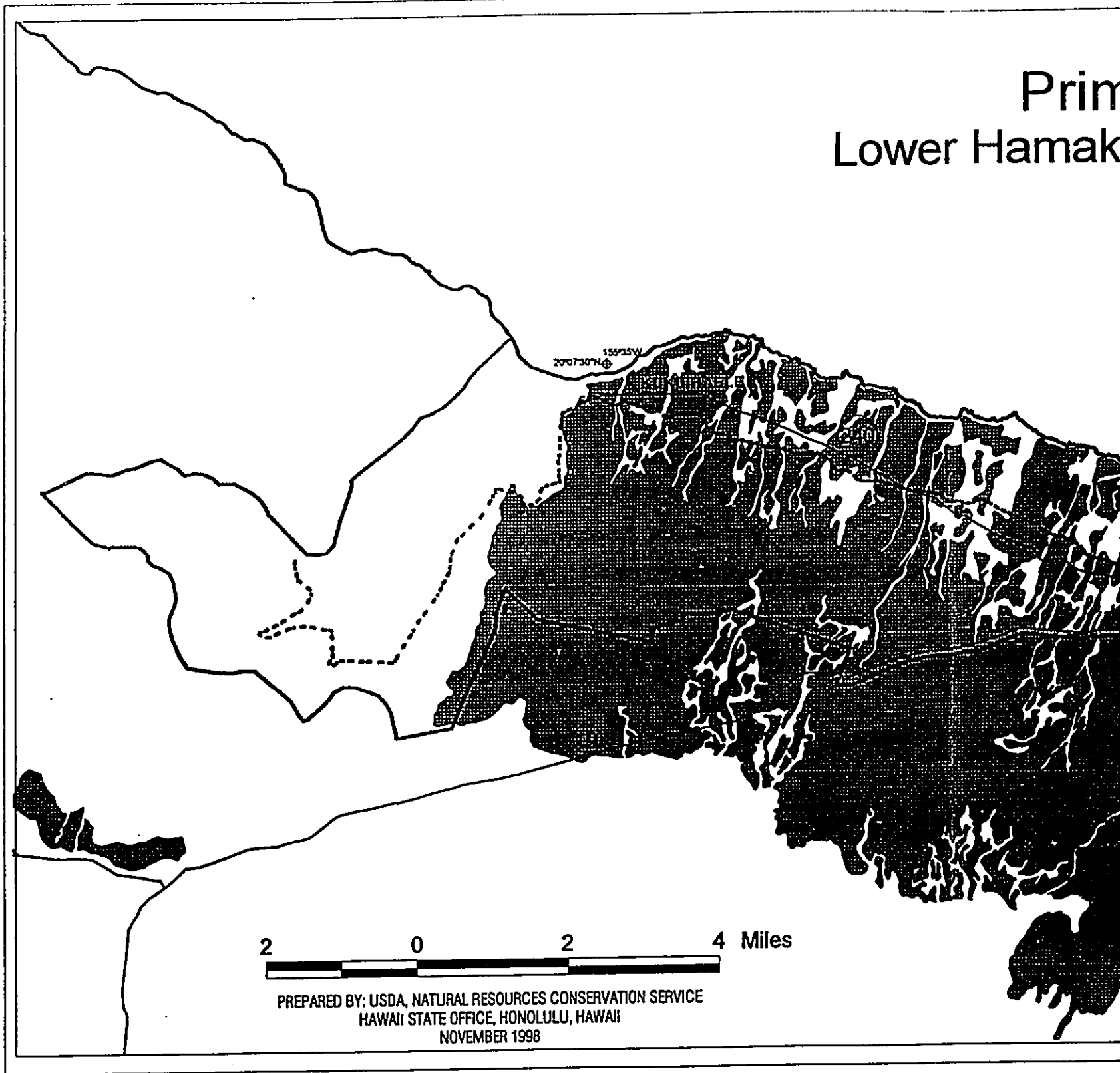


-  Lower Hamakua Ditch
-  Watershed boundary

PREPARED BY: USDA, NATURAL RESOURCES CONSERVATION SERVICE  
 HAWAII STATE OFFICE, HONOLULU, HAWAII  
 NOVEMBER 1998

Figure 11

# Prim Lower Hamak





# Prime Farmland of Hamakua Ditch Watershed Area

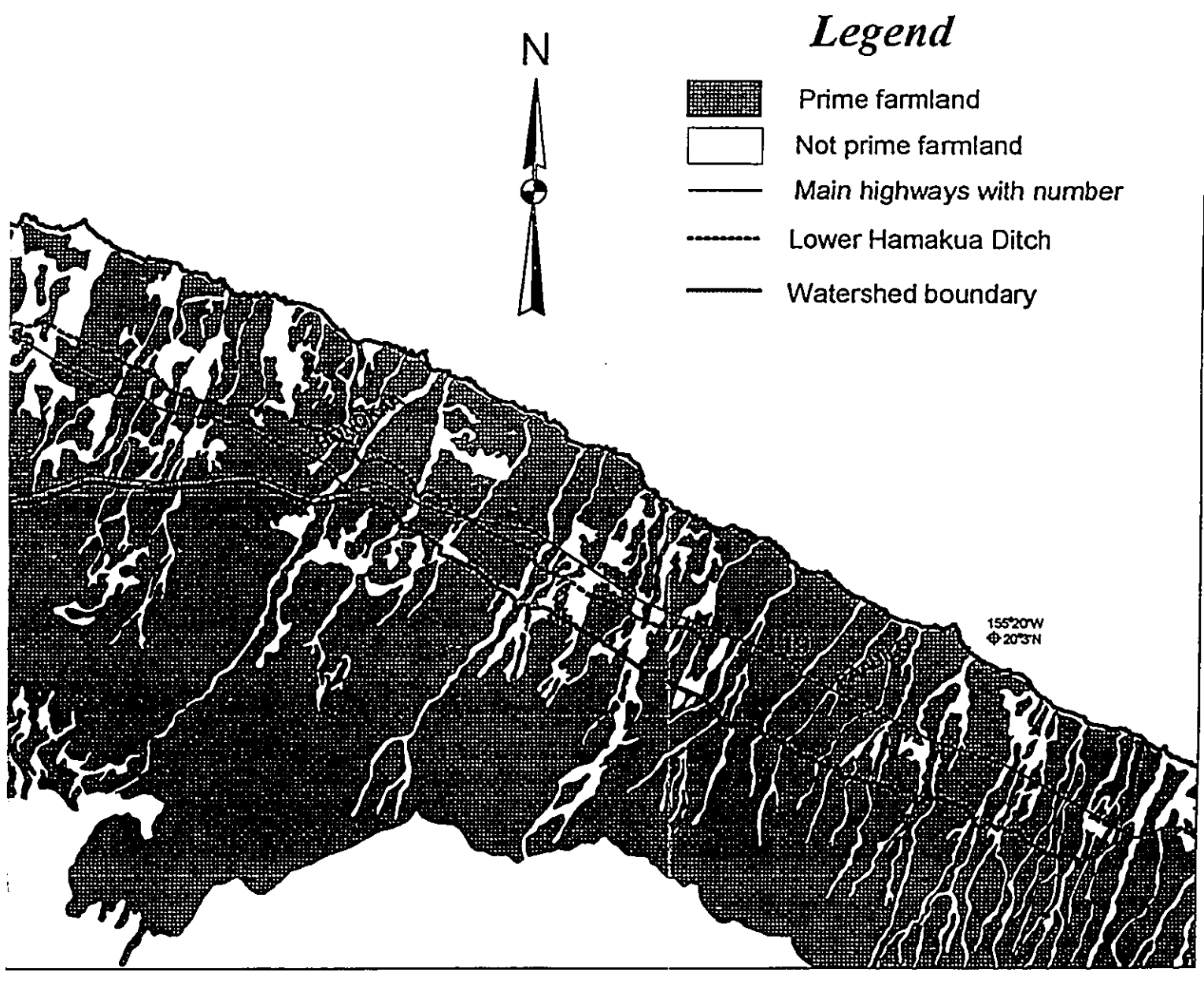
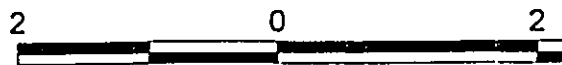
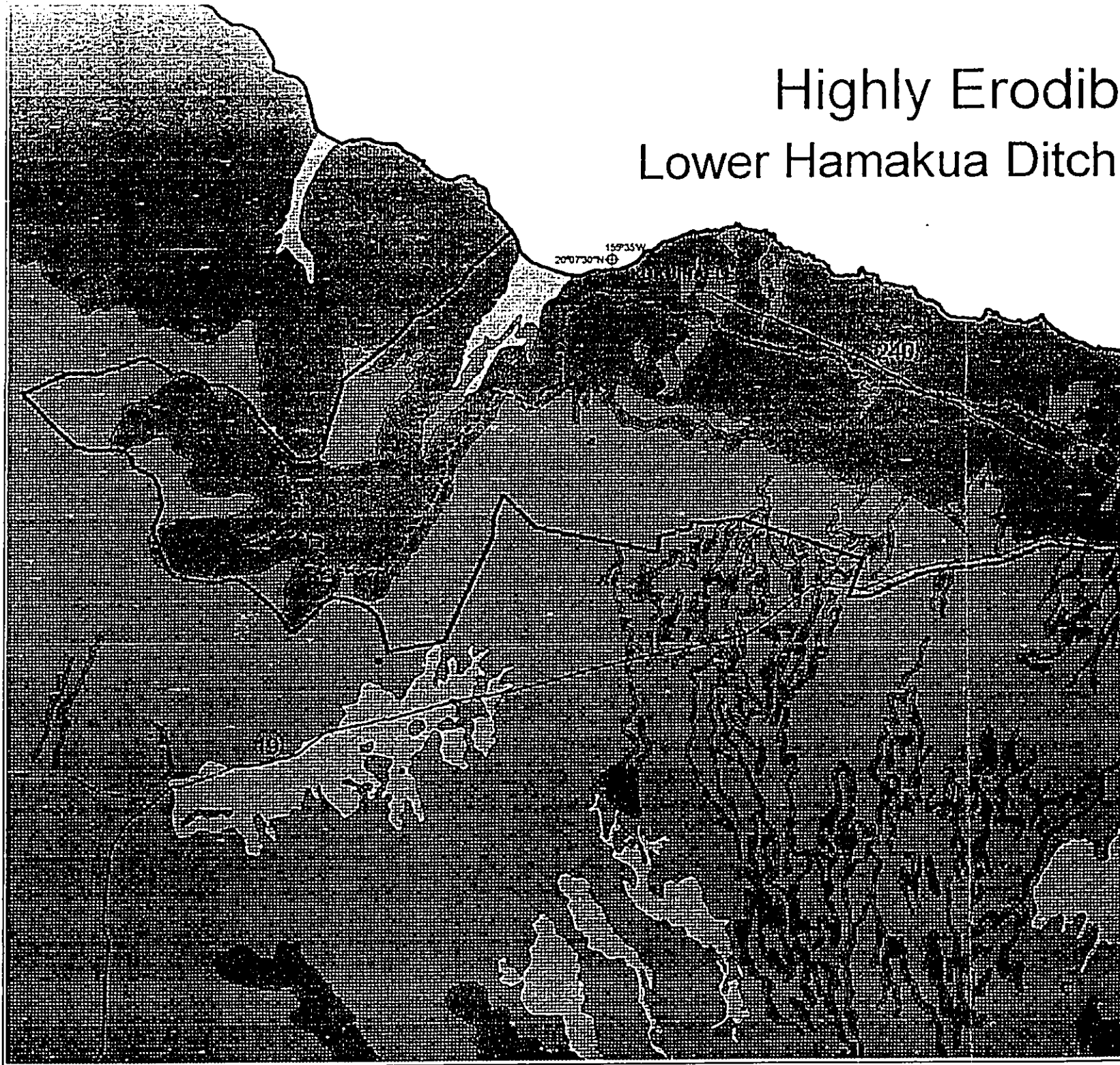


Figure 12


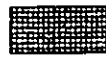




# Highly Erodible Lower Hamakua Ditch

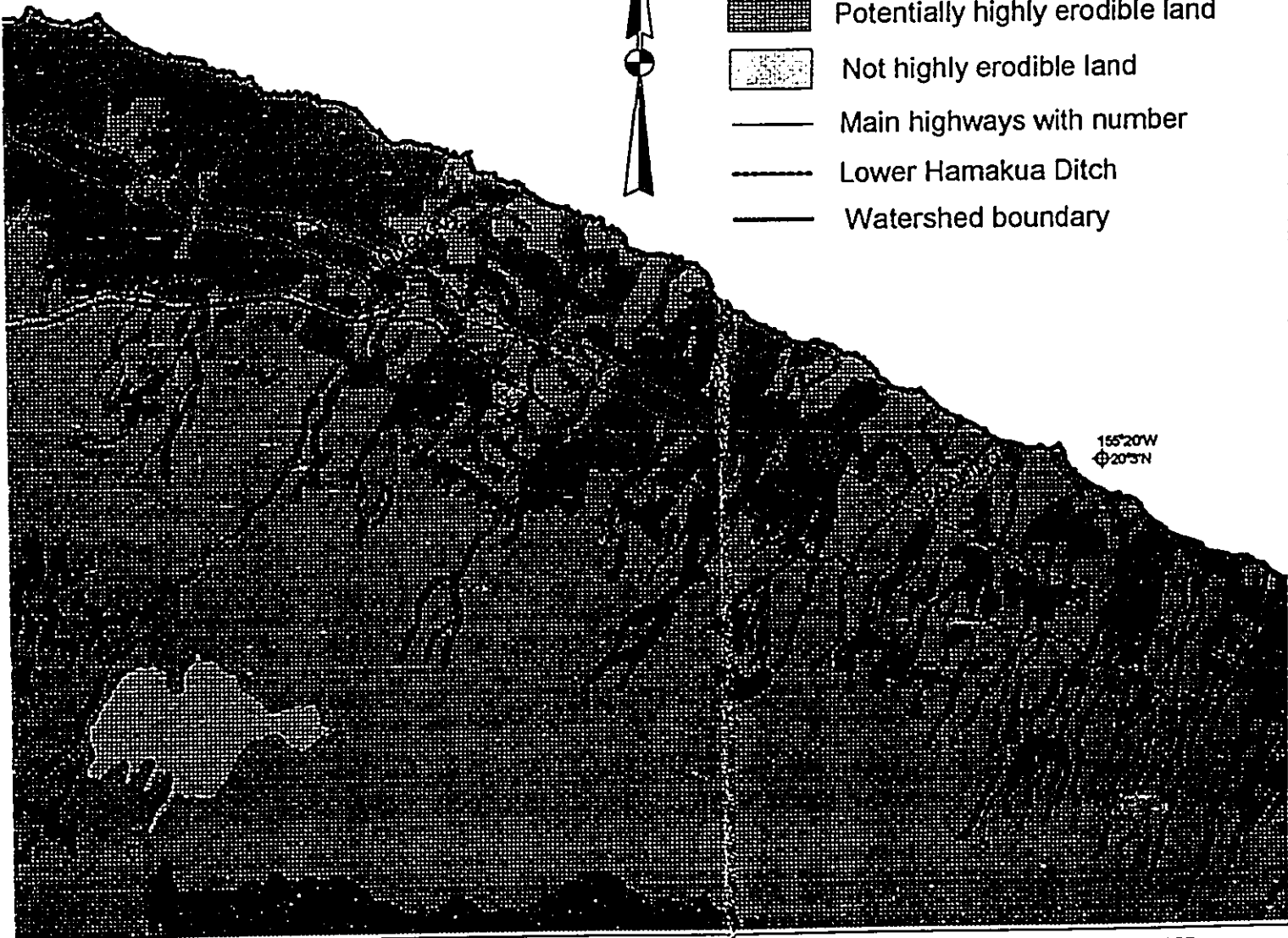


# Erodible Lands a Ditch Watershed Area

## Legend

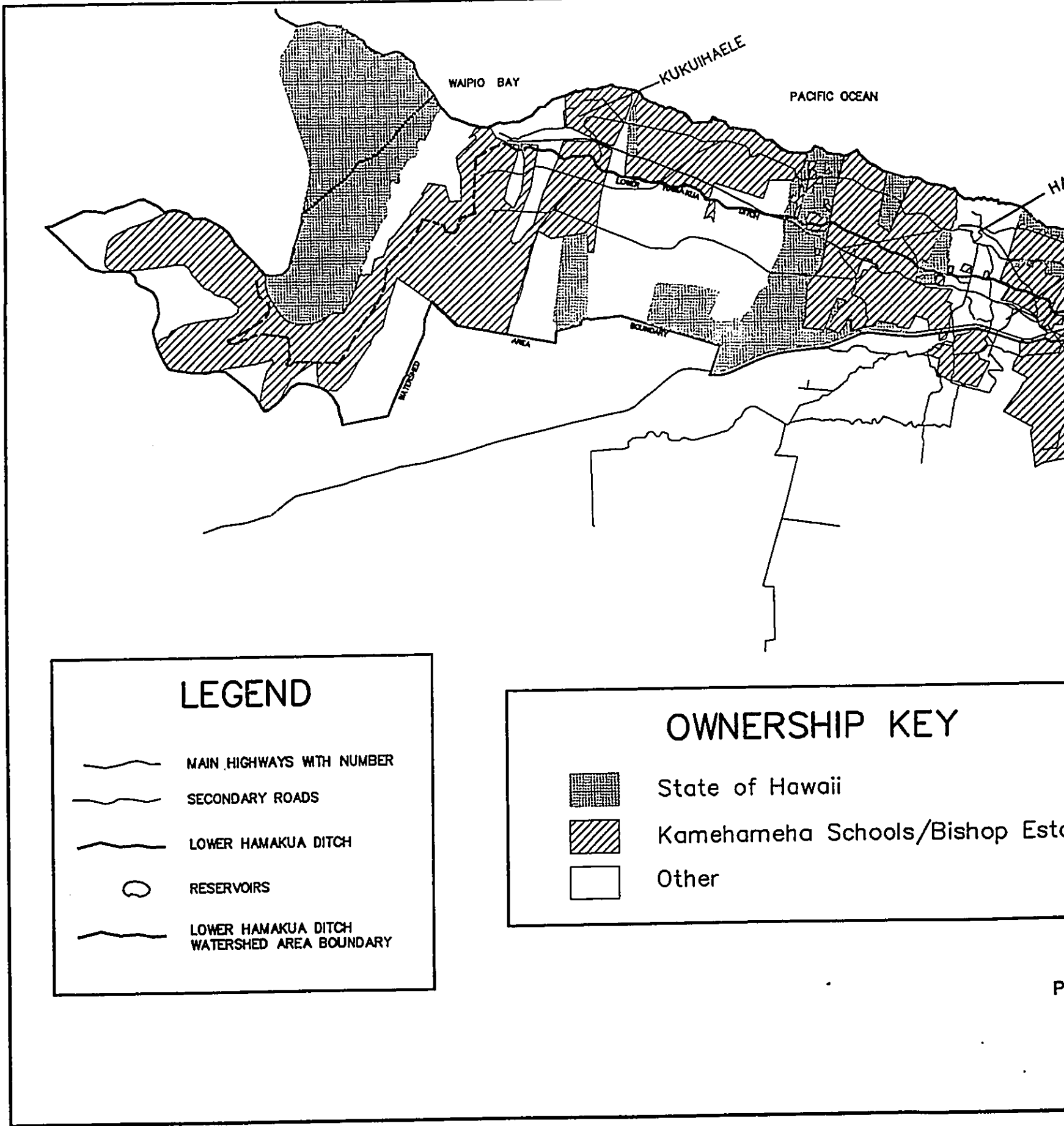


-  Highly erodible land
-  Potentially highly erodible land
-  Not highly erodible land
-  Main highways with number
-  Lower Hamakua Ditch
-  Watershed boundary








PREPARED BY: USDA, NATURAL RESOURCES CONSERVATION SERVICE  
HAWAII STATE OFFICE, HONOLULU, HAWAII  
NOVEMBER 1998




Figure 13



### LEGEND

-  MAIN HIGHWAYS WITH NUMBER
-  SECONDARY ROADS
-  LOWER HAMAKUA DITCH
-  RESERVOIRS
-  LOWER HAMAKUA DITCH WATERSHED AREA BOUNDARY

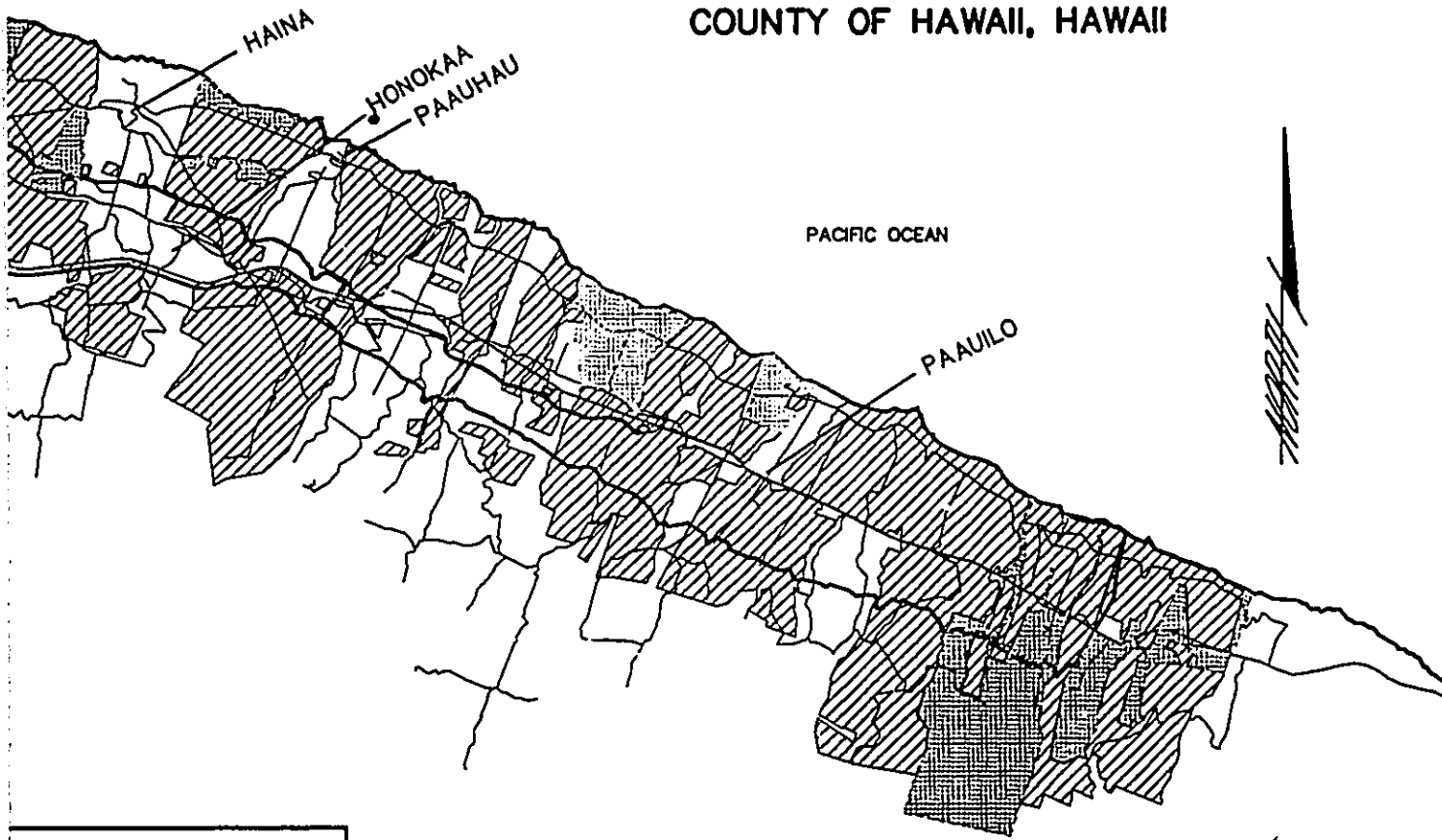
### OWNERSHIP KEY

-  State of Hawaii
-  Kamehameha Schools/Bishop Estate
-  Other

# LAND OWNERSHIP

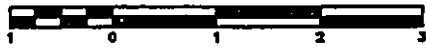
## LOWER HAMAKUA DITCH WATERSHED

### COUNTY OF HAWAII, HAWAII



KEY

s/Bishop Estate

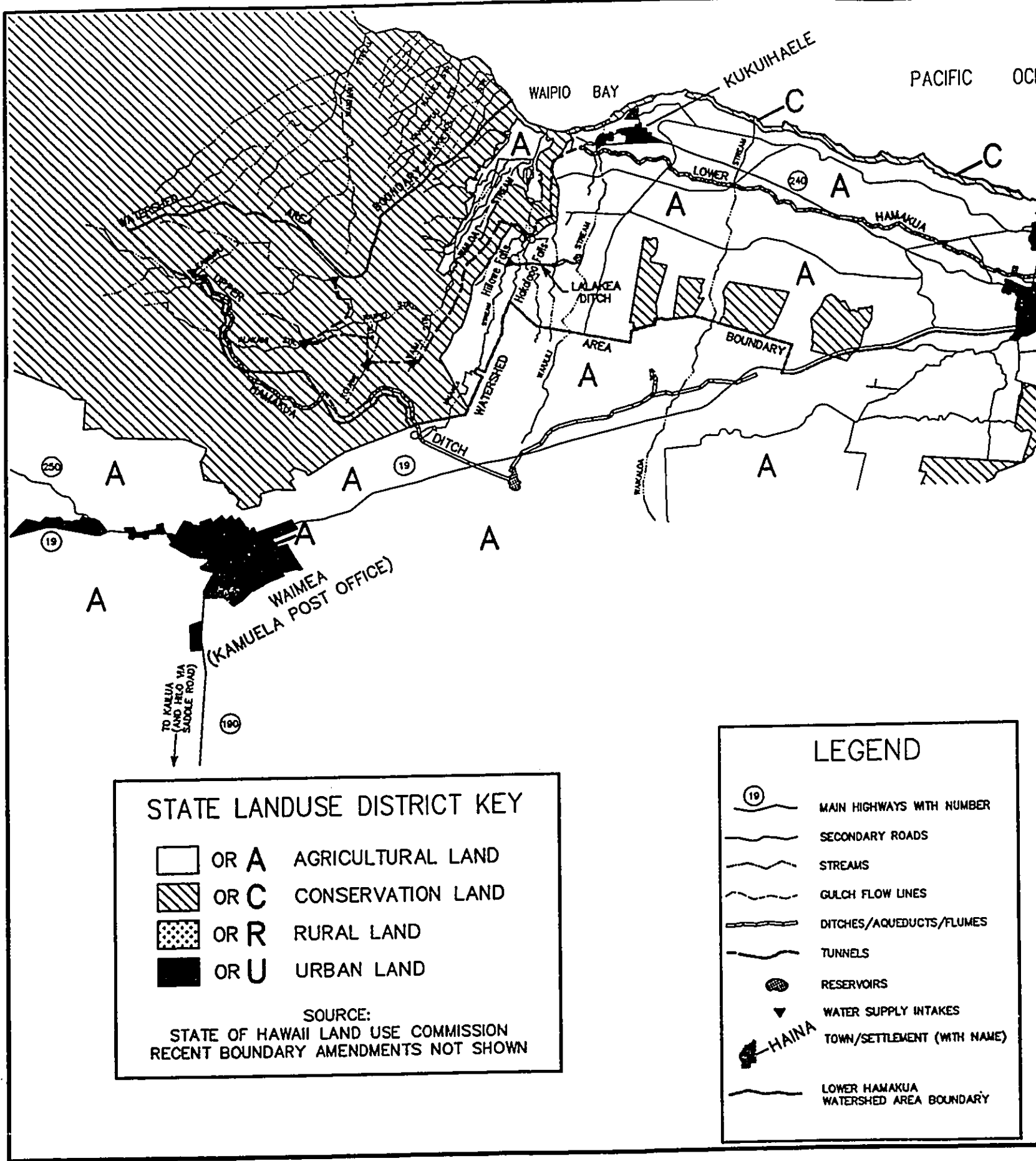


SCALE IN MILES

PREPARED BY: USDA, NATURAL RESOURCES CONSERVATION SERVICE  
HAWAII STATE OFFICE, HONOLULU, HAWAII

NOVEMBER 1998

Figure 14



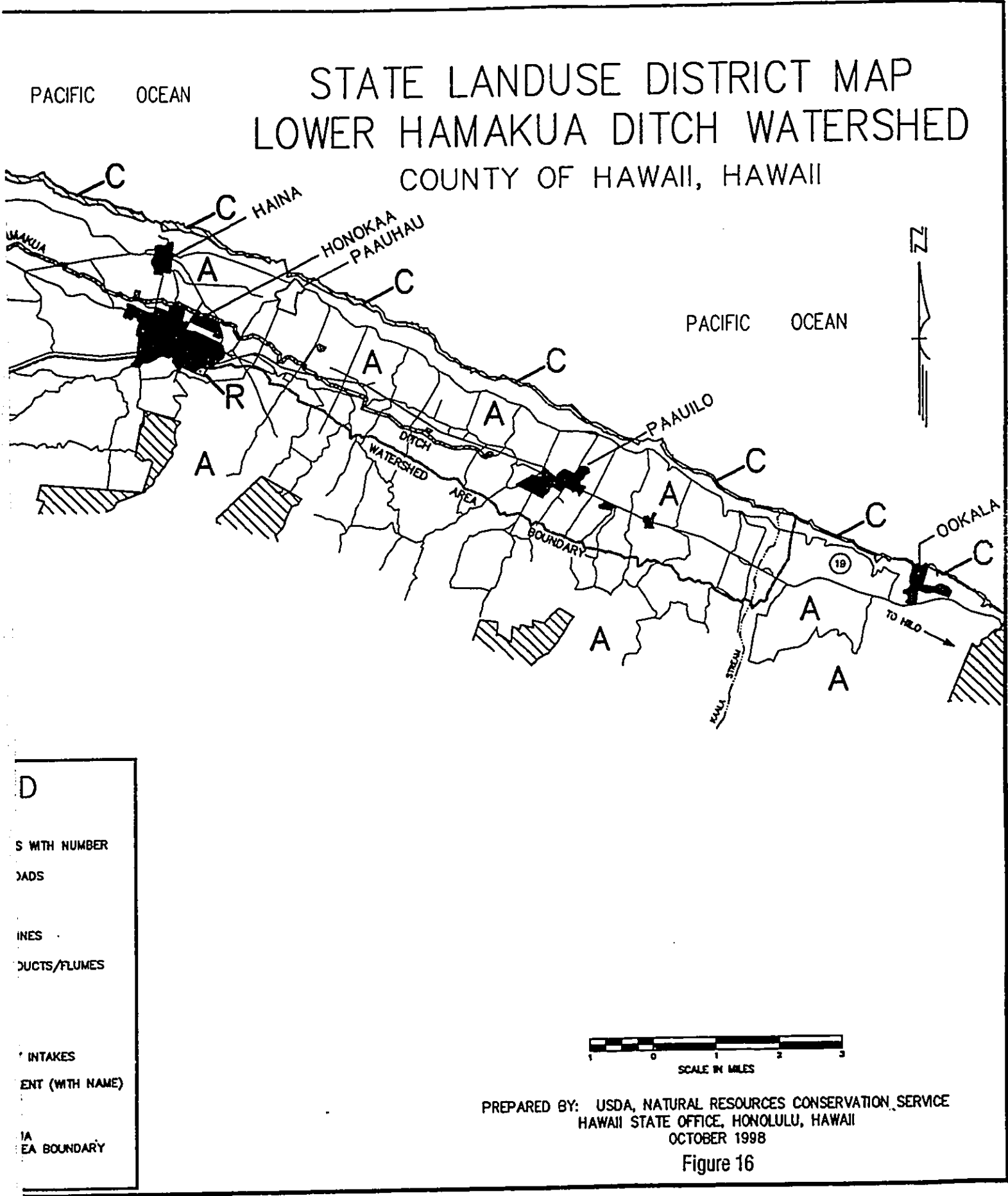
**STATE LANDUSE DISTRICT KEY**

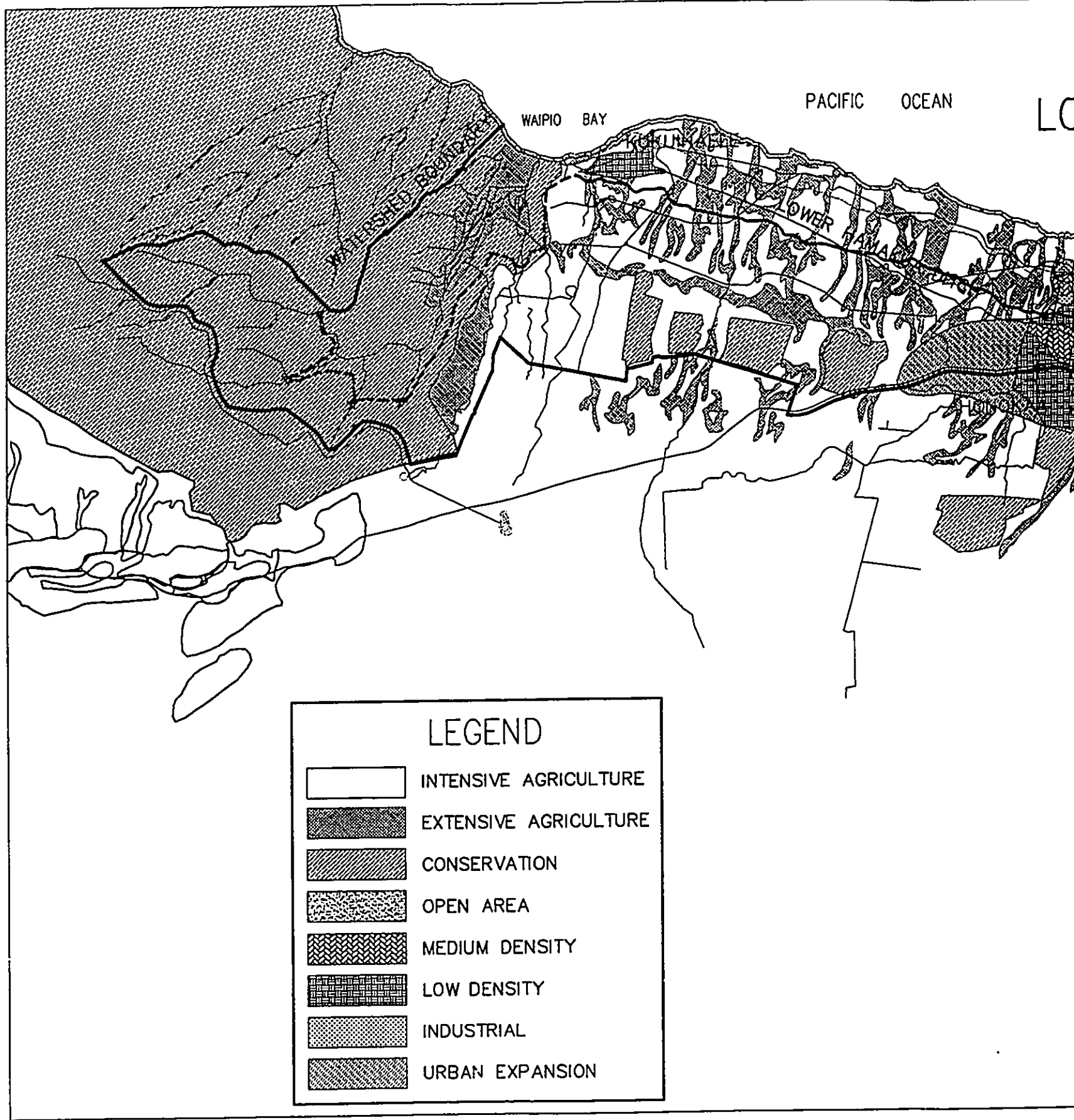
	OR A	AGRICULTURAL LAND
	OR C	CONSERVATION LAND
	OR R	RURAL LAND
	OR U	URBAN LAND

SOURCE:  
STATE OF HAWAII LAND USE COMMISSION  
RECENT BOUNDARY AMENDMENTS NOT SHOWN









**LEGEND**

	MAIN HIGHWAYS WITH NUMBER
	SECONDARY ROADS
	STREAMS
	GULCH FLOW LINES
	DITCHES/AQUEDUCTS/FLUMES
	TUNNELS
	RESERVOIRS
	WATER SUPPLY INTAKES
	TOWN/SETTLEMENT (WITH NAME)
	LOWER HAMAKUA WATERSHED AREA BOUNDARY





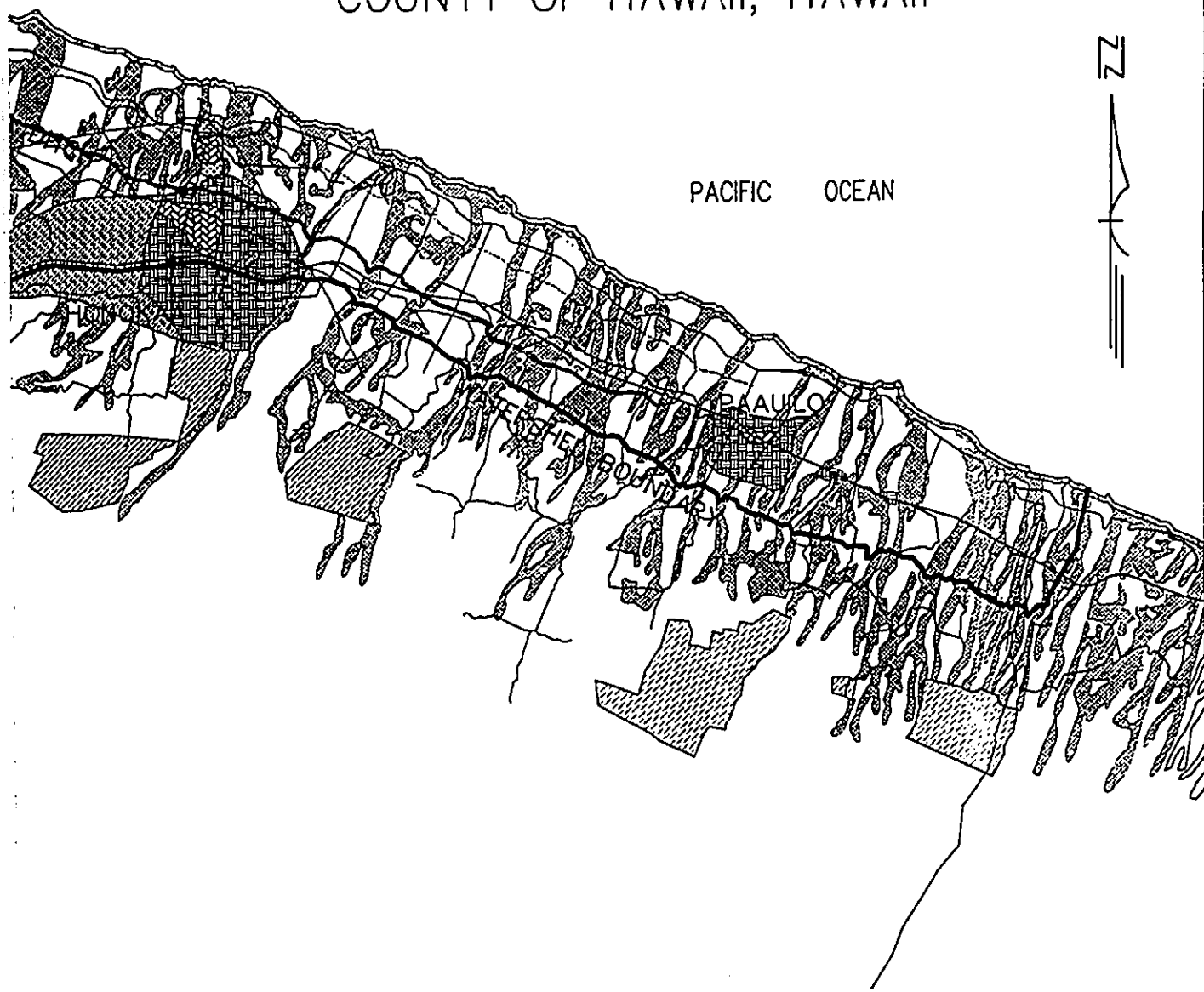
### LEGEND

-  INTENSIVE AGRICULTURE
-  EXTENSIVE AGRICULTURE
-  CONSERVATION
-  OPEN AREA
-  MEDIUM DENSITY
-  LOW DENSITY
-  INDUSTRIAL
-  URBAN EXPANSION

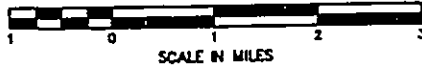


COUNTY LANDUSE DISTRICT MAP  
LOWER HAMAKUA DITCH WATERSHED  
COUNTY OF HAWAII, HAWAII

OCEAN



PACIFIC OCEAN

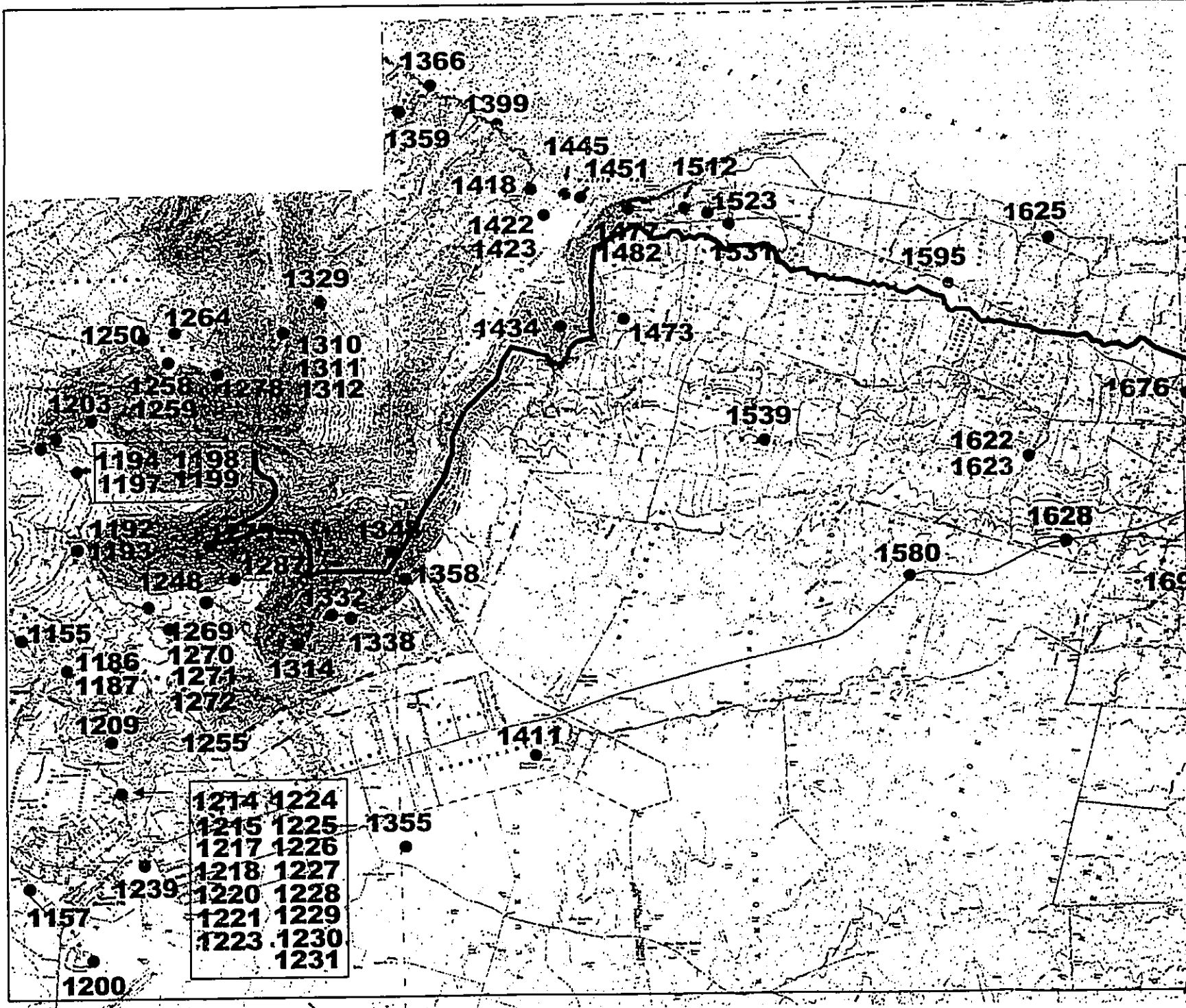


SOURCE: COUNTY OF HAWAII GENERAL PLAN 1989

Figure 17

RECEIVED AS FOLLOWS

# Hawai'i Natural Heritage Hamakua Ditch Parcel

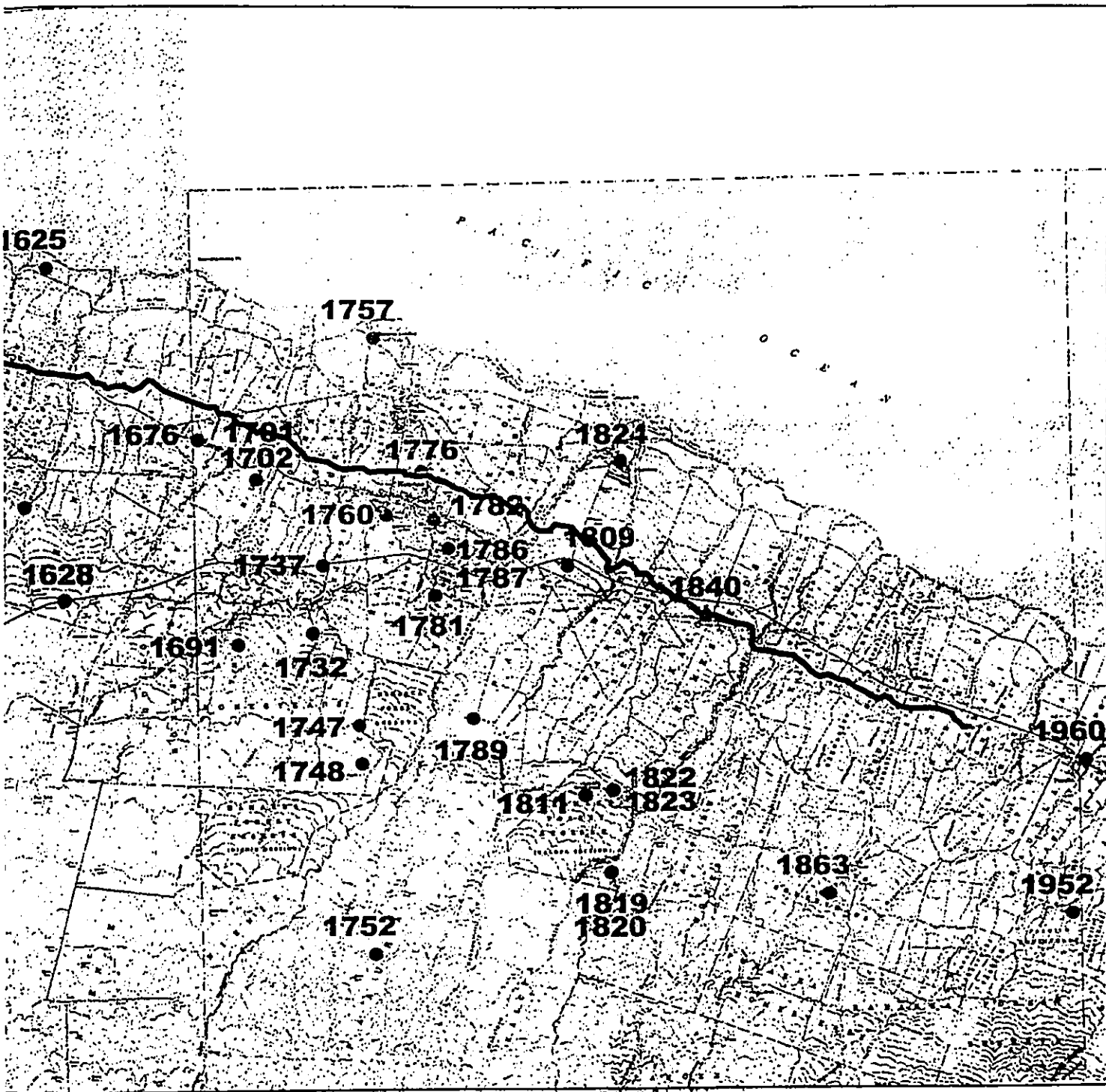


Kamuela, Kukuihaele, Honoka'a, and Kukaiau

RECEIVED AS FOLLOWS

14

# Heritage Program Ditch Parcel



and Kukaiiau Quads - Big Island

PACIFIC OCEAN

WAIPIO BAY

KUKUIHAELE

WATERSHED

AREA

BOUNDARY

LALAKEA DITCH

AREA

BOUNDARY

DITCH










WAIMEA (KAMUELA POST OFFICE)

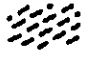



TO KAIKUA (AND PICO VA SADDLE ROAD)

LEGEND

EXISTING

PLANNED IMPROVEMENTS

-  MAIN HIGHWAYS WITH NUMBER
-  SECONDARY ROADS
-  STREAMS
-  DITCHES/AQUEDUCTS/FLUMES
-  TUNNELS
-  RESERVOIRS
-  WATER SUPPLY INTAKES
-  TOWNS/SETTLEMENTS WITH NAME
-  LOWER HAMAKUA DITCH WATERSHED AREA BOUNDARY

-  BENEFITTED AREA
-  FLUME IMPROVEMENTS (GENERALIZED)
-  HILAWA FALLS SITE
-  WATER SUPPLY INTAKE SITES

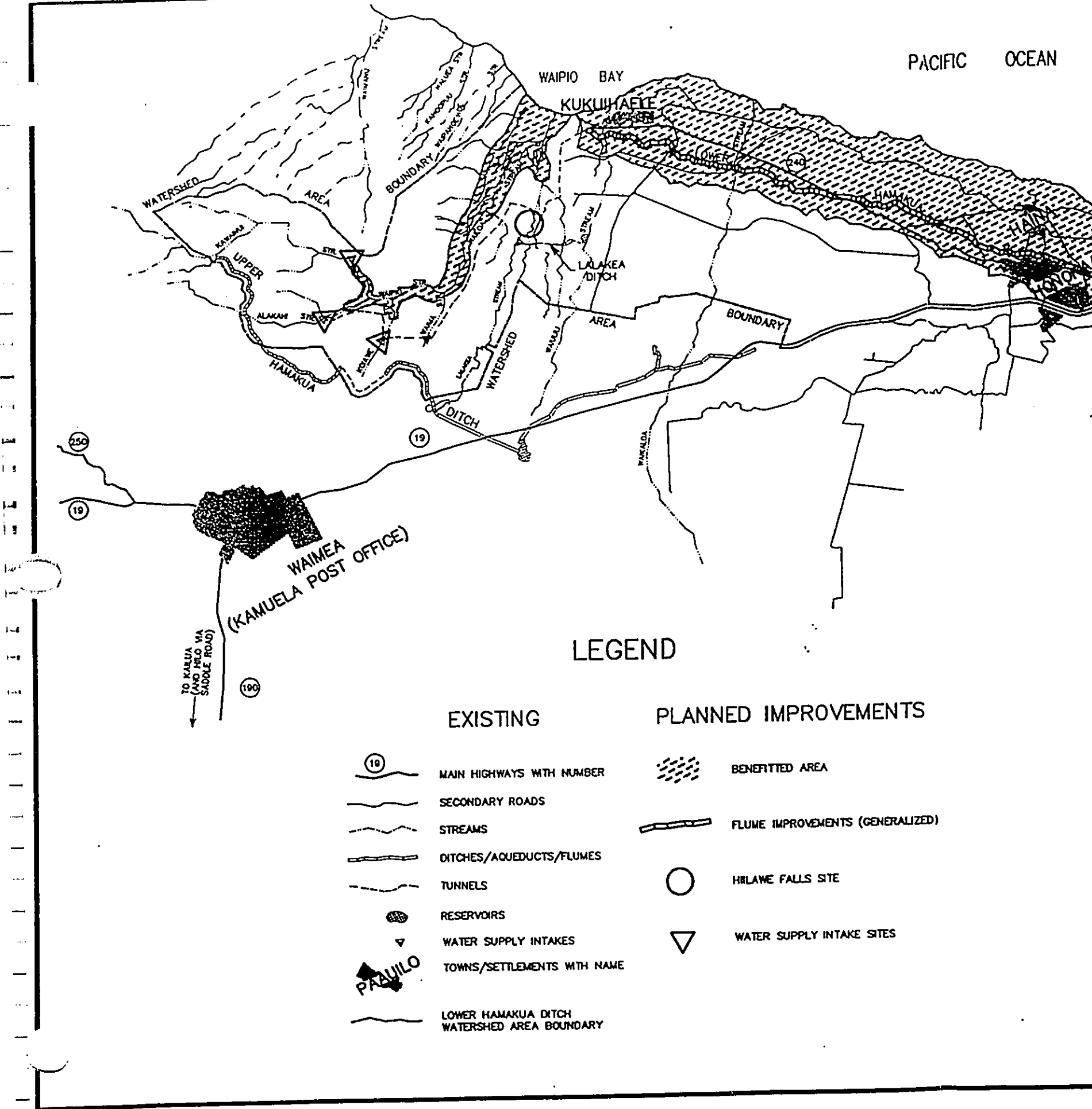
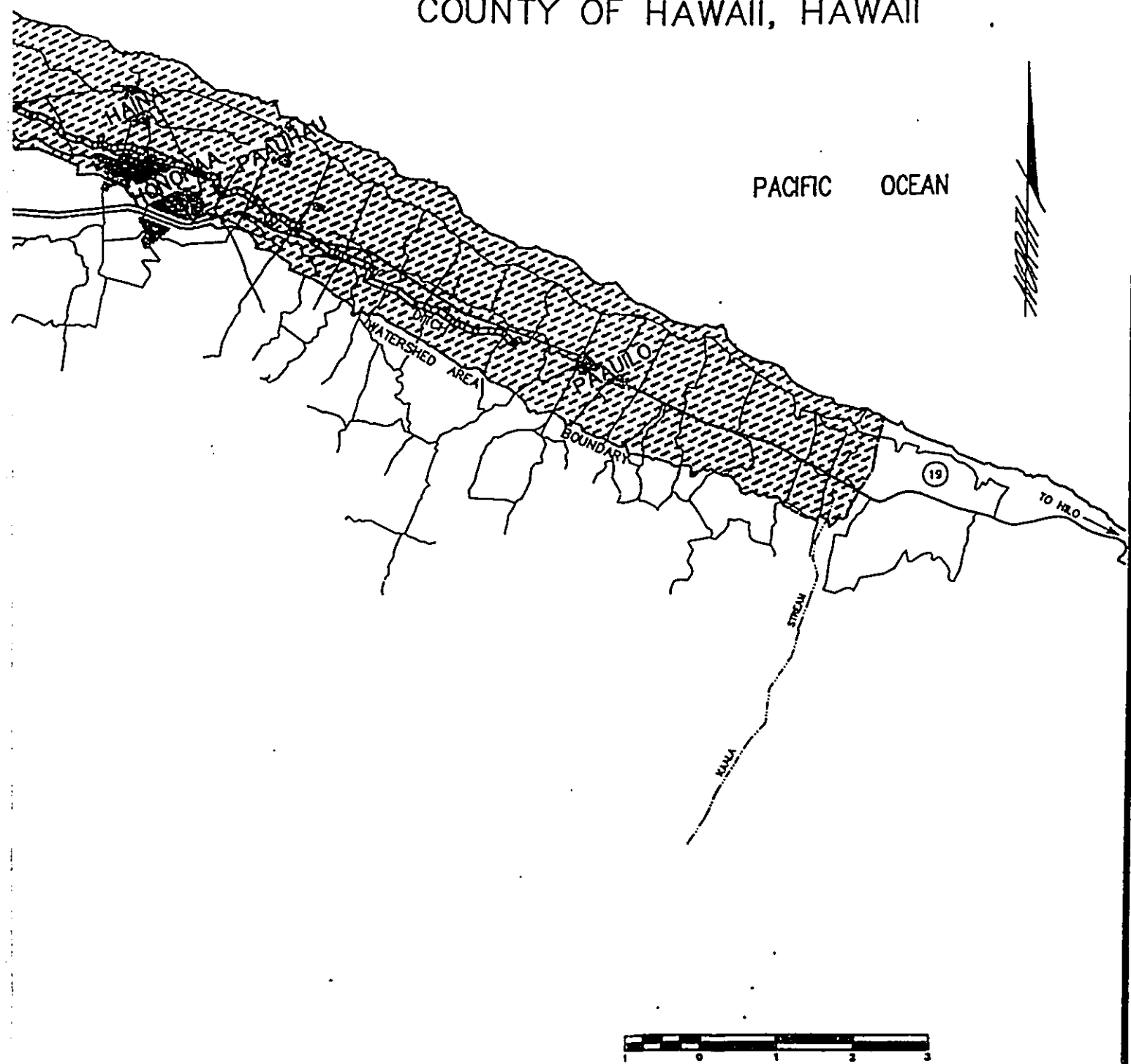


Figure 1.

PACIFIC OCEAN

# LOWER HAMAKUA DITCH WATERSHED PROJECT MAP COUNTY OF HAWAII, HAWAII

PACIFIC OCEAN



SCALE IN MILES

PREPARED BY: USDA, NATURAL RESOURCES CONSERVATION SERVICE  
HAWAII STATE OFFICE, HONOLULU, HAWAII  
AUGUST 1995