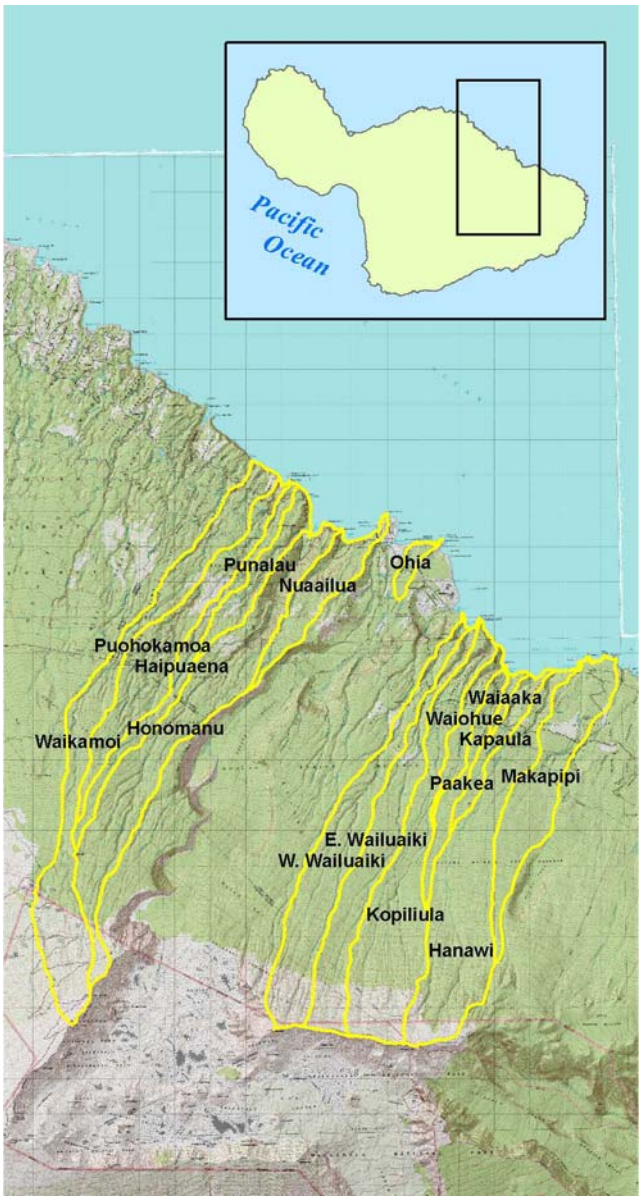
Compilation of Data Submissions, Part II

Hydrologic Units:

- Waikamoi (6047)
- Puohokamoa (6048)
- Haipuaena (6049)
- Punalau (6050)
- Honomanu (6051)
- Nuaailua (6052)
- Ohia (6054)
- West Wailuaiki (6057)
- East Wailuaiki (6058)
- Kopiliula (6059)
- Waiohue (6060)
- Paakea (6061)
- Waiaaka (6062)
- Kapaula (6063)
- Hanawi (6064)
- Makapipi (6065)



Island of Maui

May 2010
PR-2010-01

State of Hawaii
Department of Land and Natural Resources
Commission on Water Resource Management

INTRODUCTION

The Commission on Water Resource Management (Commission), at its December 16-17, 2010 meeting on the island of Maui, deferred action on the staff submittal on Petitions to Amend the Interim Instream Flow Standards For the Surface Water Hydrologic Units of Waikamoi (6047), Puohokamoa (6048), Haipuaena (6049), Punalau (6050), Honomanu (6051), Nuaailua (6052), Ohia (6054), West Wailuaiki (6057), East Wailuaiki (6058), Kopiliula (6059), Waiohue (6060), Paakea (6061), Waiaaka (6062), Kapaula (6063), Hanawi (6064), and Makapipi (6065), Maui.

Instead, the Commission directed staff to collect additional information that was categorized into short term, mid term, and long term considerations. The motion is provided as follows:

Short Term:
The Commission is giving guidance to staff to come back to the Commission in three (3) months with specific information so that it may consider the possibility of stream restoration that may be season dependent, and to direct staff to work with the various interests to identify minimum offstream needs during a wet season versus. the dry season, the benefits of seasonal stream restoration within the 19 streams based upon the stream hydrology and habitat, and the ability to accomplish seasonal restoration based on the stream infrastructure in the streams with diversions; and to identify which of the stream the diversions are that are capable of being altered to increase upstream recruitment and reduce downstream entrainment.

Mid Term:
Also within three (3) months, the Commission is requiring the Maui DWS to provide to the Commission a timetable, estimated costs, and possible funding sources for repair of the Upper Waikamoi flume; for HC&S to provide the Commission with alternative water recruitment ideas such as the catchment areas proposed during public testimony, and data on their wells including the capacity, the cost of pumping and the sustainable levels that can be pumped from those wells; and the Petitioners to provide documentation about specific interest within the community for new kalo loi including acreage, timetable and costs.

Long Term:
Maui DWS shall describe how they plan to begin the process of shifting the balance in the upcountry area from 85% reliance on surface water to a more even balance and the timetable and cost for implementing that process. The Commission doesn't expect an answer in thee months, but rather wants to know how (i.e., the process) Maui County intends to address Upcountry water supply issues in the long term (e.g., community plans, work groups, etc.). Similarly, HC&S shall describe information on alternative longer term processes, including locations, timetable and costs.

This Compilation of Data Submissions, Part II (PR-2010-01) presents all of the information that was submitted and assessed in the reconsideration of interim instream flow standards for these 16 surface water hydrologic units.

Each section begins with the initial information request letter from the Commission, followed by the information submitted by the party in response to the request. In some instances, due to the volume of data or a specific document, the original page size has been reduced. Please contact the Commission to request full-size copies of any documents. Copying charges may apply.

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5.0 Feb. 18, 2010 - Native Hawaiian Legal Corporation
6.0 Mar. 23, 2010 - Hawaiian Commercial & Sugar Company
7.0 May 2010 - Additional Information

1.0 Feb. 18, 2010 - Hawaii Division of Aquatic Resources

Division of Aquatic Resources (DAR) provided a synopsis of recommendations for streamflow restoration on select east Maui streams based on recalculation of the Hawaiian Stream Habitat Evaluation Procedure (HSHEP) model.

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

RUSSELL Y. TSUJI
FIRST DEPUTY

KEN C. KAWAHARA
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF AQUATIC RESOURCES
1151 PUNCHBOWL STREET, ROOM 330
HONOLULU, HAWAII 96813

April 1, 2010

Dear Ken Kawahara:

As the result of the December 19, 2009 ruling from the Water Commission to further document the stream flows required to protect native animal species in the East Maui streams, DAR engaged in a series of meetings with CWRM, USGS, Bishop Museum, and HC&S in to attempt to provide clear information in a useable format that will facilitate agreement on the appropriate restoration flows. This document provides a narrative that is intended to accompany the report cards and spreadsheets which show the information used in the latest ranking of the restoration potential for East Maui Streams.

In a general sense, DAR supports the following positions regarding restoration efforts in East Maui Streams.

- Minimum viable habitat flow (H_{min}) for the maintenance of suitable instream habitat is defined as 64% of Median Base Flow (BFQ_{50})(also defined as H90 by USGS studies). DAR expects that these flows will provide suitable conditions for growth, reproduction, and recruitment of native stream animals.
- Minimum viable connectivity flow (C_{min}) for the maintenance of a wetted pathway between the ocean and stream habitats is defined as 20% BFQ_{50}. These flows are expected to allow the animals to move among habitats. These flows are considered by DAR to be too low to expect suitable longterm growth and reproduction of native stream animals
- Seasonally adjusted flows, H_{min} during the wet season and C_{min} during the dry season may mimic the natural flow variability observed in Hawaiian streams and support most ecological functions required by the stream animals.
- Avoidance of entrainment at diversion locations is important to maximize populations of native stream animals while minimizing the negative impacts from stream diversions.
- Restoration of stream flow should reflect the water budget of the individual stream catchment. The use of trans-basin water diversions from ditches to restore stream sections should be avoided where at all possible.
- Co-mingling of stream and ditch flows should be avoided where at all possible to limit the potential spread of invasive aquatic species.
- Restoration of streams should be spread out in a geographic sense. This will provide a greater protection against localized habitat disruptions, a wider benefit to estuarine and nearshore marine species, and result in more comprehensive ecosystem function across the entire East Maui sector.

Based on the above philosophical management framework, DAR used several criteria to reassess the streams recommended for restoration in East Maui. First the amount of habitat units currently lost to diversion was considered. Greater amounts of habitat restored were considered a positive attribute. Second, seasonality (wet versus dry seasons) was considered by setting minimum connectivity flows during the dry season and minimum habitat flow during the wet season. Third, issues related to losing reaches were considered. Both Honomanū and Makapipi Streams were eliminated for consideration in consultation with CWRM, USGS, and Bishop Museum on the basis of losing reach concerns. Fourth, we considered restoration of the stream systems most biologically impacted by dewatering, assessed on the basis of missing faunal components. Fifth, the number and difficulty of modifications for diversions was considered. Our current assessment of this factor would be improved through consultation with HC&S, CWRM, and other experienced engineers and fish passage experts. Sixth, we also considered the efficient use of water in terms of the rate of Habitat Units restored per *cfs* of water returned. Seventh, we evaluated whether the restoration of stream flow along a given stream segment involved the co-mingling of stream and ditch water. Finally, we attempted to geographically distribute the streams proposed for restoration across the entire East Maui ecosystem.

The attached information is a synopsis of our recommendations for stream flow restoration on select East Maui streams and is based on recalculation of the Hawaii Stream Habitat Evaluation Procedure (HSHEP) model to include analysis of estimates for minimum connectivity and habitat flow for each stream segment to address seasonality. The recommendation for each stream and its diversions are included on the report card for each stream.

Additional information on the other 10 East Maui Streams are not included as DAR does not recommend habitat restoration actions in these streams as the habitat gains would be minimal and suggest to maintain them as status quo.

Note in the photographs and accompanying text that references of left and right bank are based on the orientation of looking upstream. We look forward to working with all parties to reclaim ecological habitat for native stream animals, and to provide connectivity for the inland return of young, and the downstream exit of new hatches into the nearshore estuarine nursery areas along this coastline. We believe that adoption of our recommendations would provide a significant return of ecological function based on a modest investment in flow restoration, and will continue to refine them in consultation with all parties.

Sincerely,

ROBERT T. NISHIMOTO, Environmental Program Manager
Division of Aquatic Resources

Attachments

References:

Higashi, Glenn; James Parham; Eko Lapp, Skippy Hau, Darrell Kuamo'o, Lance Nishiura, Tim Shindo, Troy Sakihara, Troy Shimoda, Robert Nishimoto, and Dan Polhemus. 2009. Report on Kōlea Stream, Maui, Hawai'i. Division of Aquatic Resources and Bishop Museum. Honolulu, HI. 36 p.

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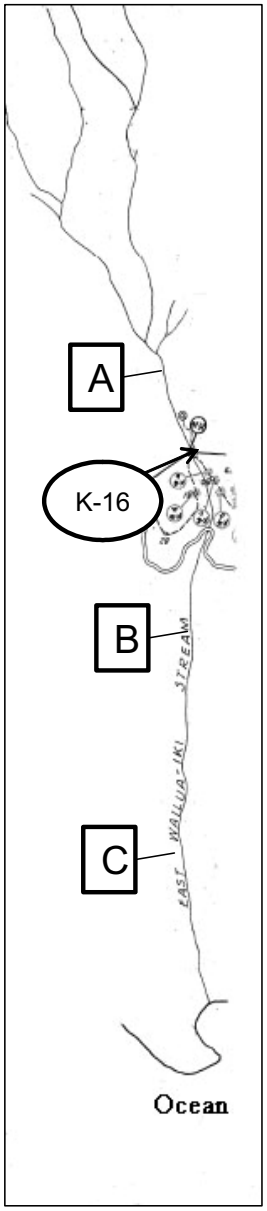
East Wailua Iki Stream

DAR Priority Rank: 1



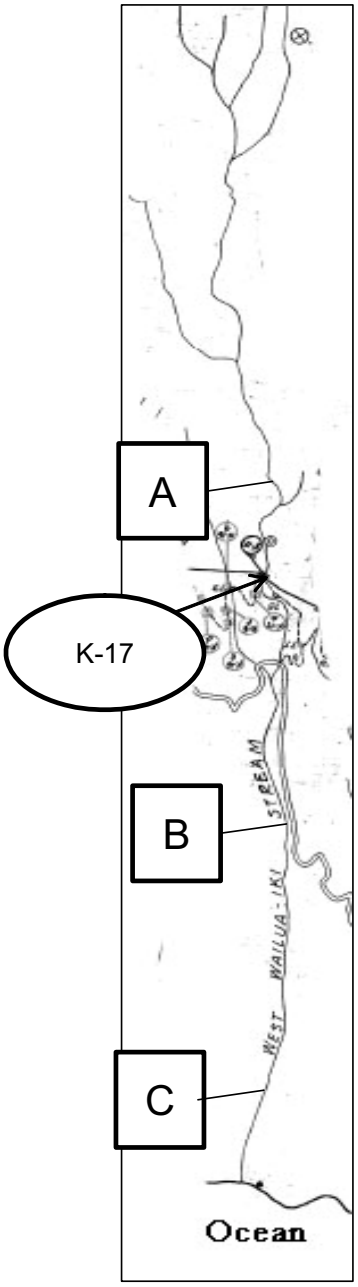
Area	Natural BFQ_{50} (cfs)	Diverted BFQ_{50} (cfs)	Wet Season H_{min} (cfs)	Dry Season C_{min} (cfs)	Habitat Units Restored (m)
A	5.8	5.8	No change	No change	951
Diversion K-16				Difficulty of diversion restoration: **Simple (1)** Provide passage in left bypass channel	
B	6.8	1.0	4.5 (+3.2)	1.4 (+0.2)	1,452
C	7.2	1.5			
Total Returned			3.2	0.2	2,402

Summary Information	Habitat Units (m)
Total Habitat Units in this stream	6,528
Total Habitat Units lost due to diversion(s)	4,375
Potential Habitat Units to be restored by this recommendation	2,402

DAR Recommendations - East Wailua Iki has great potential for restoration as increased stream flow would restore extensive habitats lost to flow diversion and the modifications needed for the diversion are limited. DAR recommends the release of 3.2 cfs of water during the wet season to provide for minimum habitat flows and 0.2 cfs of water during the dry season to provide connectivity. Modification would involve a v-notch on the upstream dam wall on the left bank on the diversion structure (K-16 Koʻolau Ditch). This would allow passage up and down stream without entrainment of native animals to the gravel basin and ditch system. These restoration actions would provide over 2.4 km of additional native animal habitat.

West Wailua Iki Stream

DAR Priority Rank: 2



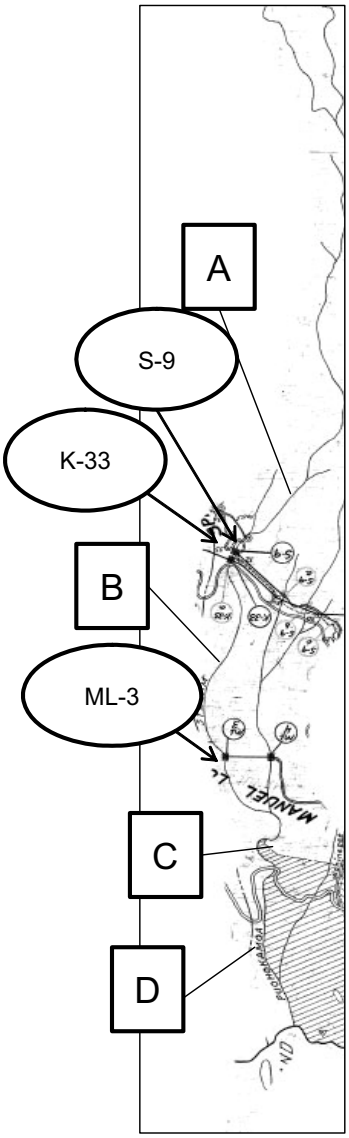
Area	Natural BFQ_{50} (cfs)	Diverted BFQ_{50} (cfs)	Wet Season H_{min} (cfs)	Dry Season C_{min} (cfs)	Habitat Units Restored (m)
A	6.0	6.0	No change	No change	886
Diversion K-17				Difficulty of diversion restoration: **Simple (1)** Provide passage on right side of channel	
B	6.8	0.8	4.5 (+3.5)	1.4 (+0.4)	1,331
C	7.2	1.2			
Total Returned			3.5	0.4	2,218

Summary Information	Habitat Units (m)
Total Habitat Units in this stream	5,703
Total Habitat Units lost due to diversion(s)	4,019
Potential Habitat Units to be restored by this recommendation	2,218

DAR Recommendations - West Wailua Iki has very good restoration potential as increased stream flow would restore extensive habitats lost to flow diversion and the modifications needed for the diversion are straightforward. DAR recommends the release of 3.5 cfs of water during the wet season to provide for minimum habitat flows and 0.4 cfs of water during the dry season to provide connectivity. Modifications to the diversion structure (K-17 Koʻolau Ditch) would involve a v-notch on the dam wall below the waterfall pool away from the ditch on the right bank. These restoration actions would provide over 2.2 km of additional native animal habitat.

Puohokamoa Stream

DAR Priority Rank: 3



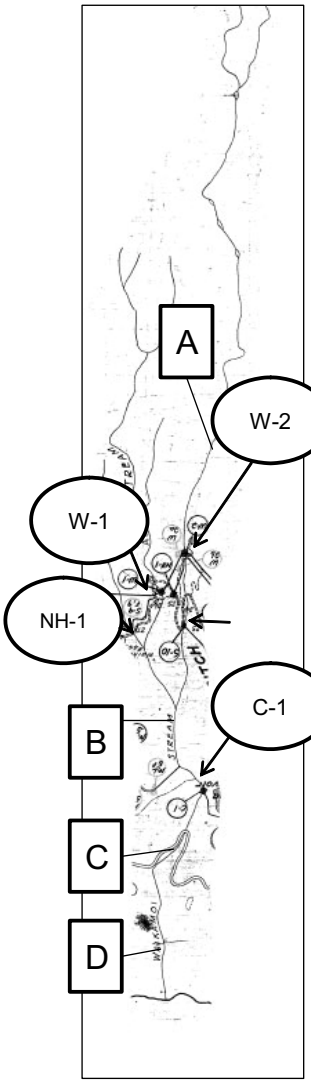
Area	Natural BFQ_{50} (cfs)	Diverted BFQ_{50} (cfs)	Wet Season H_{min} (cfs)	Dry Season C_{min} (cfs)	Habitat Units Restored (m)
A	6.4	6.4	No change	No change	668
Diversions K-33 & S-9				Difficulty of diversion restoration: **Moderate (2)** Two diversion each simple (1)	
B	8.4	2.0	5.4 (+3.4)	2.1 (+0.1)	635
Diversion ML-3				Difficulty of diversion restoration: **Simple (1)** Need to pass diversion	
C	12	1.1	7.4 (+2.0)	2.3 (+0.2)	1,498
D	11	2.1			
Total Returned			5.4	0.3	2,801

Summary Information	Habitat Units (m)
Total Habitat Units in this stream	11,955
Total Habitat Units lost due to diversion(s)	9,743
Potential Habitat Units to be restored by this recommendation	2,801

DAR recommendations - Puohokamoa Stream has the largest amount of habitat currently lost to diversions and the biota appears to be in the poorest condition. Restoration actions on Puohokamoa Stream would require modifications to three different diversions (ML-3 Manuel Luis Ditch, K-33 Ko'olau Ditch, S-9 Spreckels Ditch). The modifications to the diversions are relatively simple, with v-notches incorporated in the dam walls of all three diversions to allow flow downstream to provide suitable connectivity and instream habitat and to allow animal passage at the three diversion sites. DAR recommends the release of 5.4 cfs of water during the wet season to provide for minimum habitat flows and 0.3 cfs of water during the dry season to provide connectivity. These water releases would be apportioned among the different diversions. While Puohokamoa Stream would require more effort to restore than either East or West Wailua Iki Streams, a greater amount of native species habitat would be restored (2.8 km).

Waikamoi Stream

DAR Priority Rank: 4



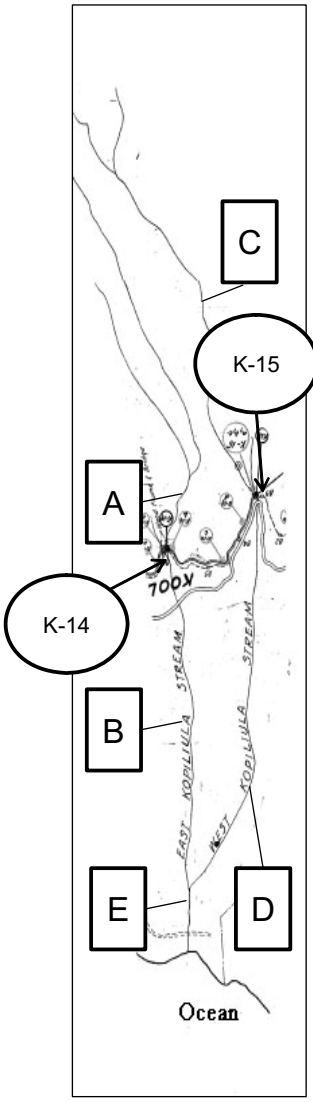
Area	Natural BFQ_{50} (cfs)	Diverted BFQ_{50} (cfs)	Wet Season H_{min} (cfs)	Dry Season C_{min} (cfs)	Habitat Units Restored (m)
No restoration requested for Diversion W-1 & NH-1 on Alo Tributary					
A	3.5	3.5	No change	No change	526
Diversion W-2 & S-10				Difficulty of diversion restoration: **Moderate (2)** Two diversion each simple (1)	
B	6.5	1.6	3.6 (+2.0)	1.7 (+0.1)	556
Diversion C-1				Difficulty of diversion restoration: **Simple (1)** Provide passage	
C	6.7	0.2	4.2 (+0.6)	1.3 (-0.4)	1,005
D	7.0	0.2			
Total Returned			2.6	-0.3	2,087

Summary Information	Habitat Units (m)
Total Habitat Units in this stream	11,955
Total Habitat Units lost due to diversion(s)	9,743
Potential Habitat Units to be restored by this recommendation	2,801

DAR Recommendations – Waikamoi has substantial habitat lost to flow diversions, yet the complexity of these diversion makes complete restoration more difficult. DAR recommends restoration actions be focused on the main channel of Waikamoi Stream and none on Alo tributary. DAR recommends the release of 2.6 cfs of water during the wet season to provide for minimum habitat flows and small amounts of water (0.1 to -0.3 cfs) during the dry season to provide connectivity. These water releases would be apportioned among the different diversions. Modifications in this restoration effort involve three of the five major diversion structures in the watershed (C-1 intake into Center Ditch, W-2 intake into Wailoa Ditch, S-10 Skimming Dam Intake into Spreckels Ditch). Modification of C-1, W-2 and S-10 intakes would involve a v-notch on each dam wall. Waikamoi Stream has additional diversions upstream of the Wailoa Ditch, but modifications of these diversions would provide less benefit to native species and are not proposed herein. The recommended restoration actions on Waikamoi Stream would result in the creation of over 2 km habitat for native species.

Kopili‘ula Stream

DAR Priority Rank: 5



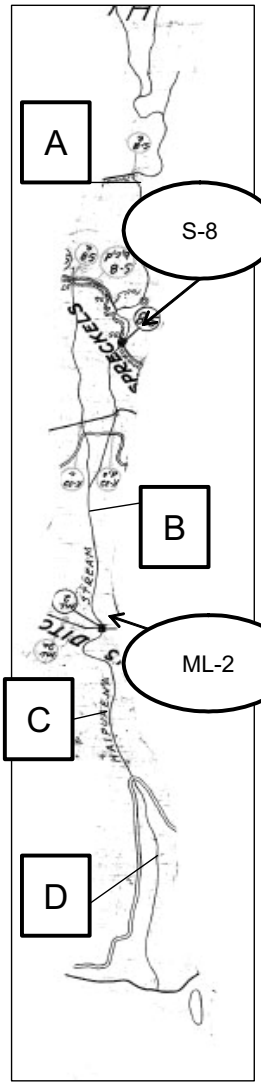
Area		Natural BFQ_{50} (cfs)	Diverted BFQ_{50} (cfs)	Wet Season H_{min} (cfs)	Dry Season C_{min} (cfs)	Habitat Units Restored (m)
Puakaa Tributary (East Fork)	A	1.1	1.1	No change	No change	300
	Diversion K-14				Difficulty of diversion restoration: **Simple (1)** Provide passage	
	B	2.2	1.1	No change	+0.1	0
Kopiliula stream (West Fork)	C	5.0	5.0	No change	No change	901
	Diversion K-15				Difficulty of diversion restoration: **Moderate (2)** Deal with issue of comingling flows	
	D	6.5	1.2	4.2 (+3.0)	1.3 (+0.1)	805
	E	9.5	2.8	5.8 (+0)	2.9 (+0.0)	
Total Returned				3.0	0.2	2,007

Summary Information	Habitat Units (m)
Total Habitat Units in this stream	9,257
Total Habitat Units lost due to diversion(s)	5,138
Potential Habitat Units to be restored by this recommendation	2,007

DAR Recommendations - Kopili‘ula Stream is located near East and West Wailua Iki Streams and would provide more habitat than either of those streams, but the modifications to the diversions are more extensive. DAR recommends the release of 3.0 cfs of water during the wet season to provide for minimum habitat flows and 0.2 cfs of water during the dry season to provide connectivity. Flow release would be focused on the K-15 Diversion. Modifications to restore flow and allow passage would involve two diversion structures (K-15 Ko‘olau Ditch, K-14 Ko‘olau Ditch on Pua‘aka‘a tributary) to provide for suitable habitat downstream and animal passage at the diversion site. The modification of the K-15 diversion structure would involve a box flume from the upstream area of Kopili‘ula stream bypassing the area of co-mingling of the ditch and stream water and downstream of the diversion wall. The K-14 modification will likely involve a v-notch on the dam wall farthest away from the ditch entrance. These restoration actions would result in an additional 2 km of native species habitat.

Haipua‘ena Stream

DAR Priority Rank: 6



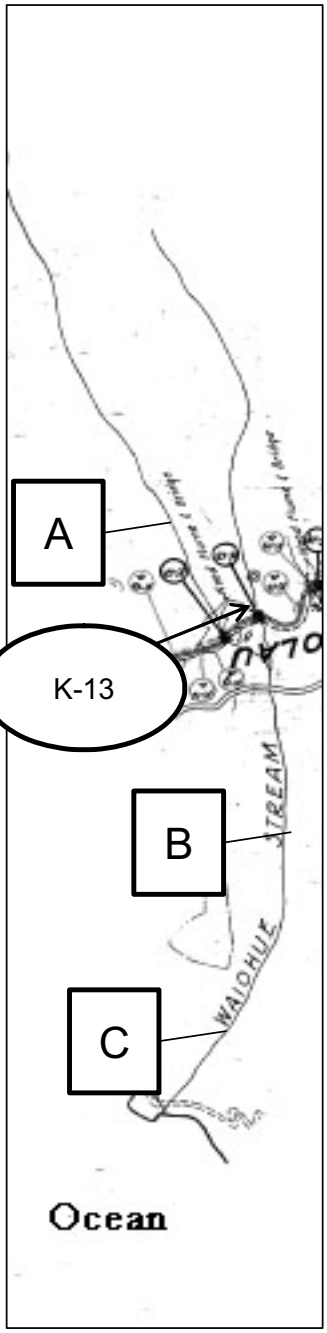
Area	Natural BFQ_{50} (cfs)	Diverted BFQ_{50} (cfs)	Wet Season H_{min} (cfs)	Dry Season C_{min} (cfs)	Habitat Units Restored (m)
A	3.6	3.6	No change	No change	0
Diversion S-8				Difficulty of diversion restoration: **Difficult (3)** No passage required	
B	4.3	0.8	2.8 (+2.0)	0.8 (+0)	548
Diversion ML-2				Difficulty of diversion restoration: **Difficult (3)** Need to bypass road	
C	4.9	0.5	3.3 (+0.5)	0.9 (+0.1)	951
D	5.5	1.1			
Total Returned			2.5	0.1	1,499

Summary Information	Habitat Units (m)
Total Habitat Units in this stream	5,968
Total Habitat Units lost due to diversion(s)	5,173
Potential Habitat Units to be restored by this recommendation	1,499

DAR Recommendations – Haipua‘ena Stream replaced Honomanū Stream based on the March 3, 2010 meeting with DAR, CWRM, Bishop Museum, and USGS agreement was reached regarding the recalibration of Honomanū Stream in the current HEP analysis, based on the consensus that the reach from the waterfall at the head of the canyon to the seaward terminus does not contain surface flow under base flow conditions. Haipua‘ena Stream has the potential to recover 1.5 km of lost native species habitat although the diversion modification are more difficult. Modifications would involve two diversion structures (ML-2 Manuel Luis Ditch, S-8 Spreckels Ditch) to provide for suitable habitat downstream and to increase upstream migration of native animals. DAR recommends the release of 2.5 cfs of water during the wet season to provide for minimum habitat flows and 0.1 cfs of water during the dry season to provide connectivity. These water releases would be apportioned among the different diversions. The modifications for ML-2 and S-8 diversions are complex in that the dam wall is supporting the road so the ability to achieve adequate fish passage will still require more analysis.

Waiohue Stream

DAR Priority Rank: 7



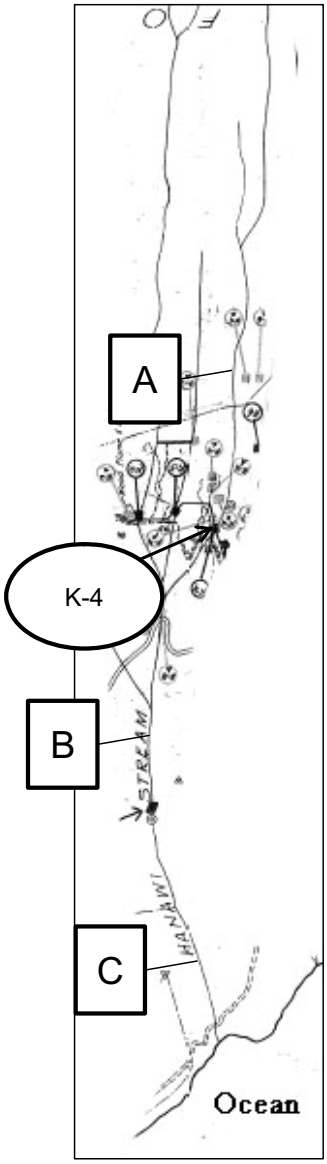
Area	Natural BFQ_{50} (cfs)	Diverted BFQ_{50} (cfs)	Wet Season H_{min} (cfs)	Dry Season C_{min} (cfs)	Habitat Units Restored (m)
A	5.0	5.0	No change	No change	562
Diversion K-13				Difficulty of diversion restoration: **Simple (1)** Provide passage at waterfall pool	
B	6.0	1.0	4.4 (+2.7)	1.3 (+0.1)	932
C	7.5	2.1			
Total Returned			2.7	0.1	1,494

Summary Information	Habitat Units (m)
Total Habitat Units in this stream	4,428
Total Habitat Units lost due to diversion(s)	2,718
Potential Habitat Units to be restored by this recommendation	1,494

DAR Recommendations – Waiohue is one of the better streams in the region biologically and would be enhanced by additional flow. DAR recommends the release of 2.7 cfs of water during the wet season to provide for minimum habitat flows and 0.1 cfs of water during the dry season to provide connectivity. Modification of K-13 intake into Ko‘olau Ditch would involve digging of channel to lower elevation for overflow water to go down the right bank. This restoration action would provide an additional 1.5 km of suitable habitat for native stream animals.

Hanawī Stream

DAR Priority Rank: 8



Area	Natural BFQ_{50} (cfs)	Diverted BFQ_{50} (cfs)	Wet Season H_{min} (cfs)	Dry Season C_{min} (cfs)	Habitat Units Restored (m)
A	4.6	4.6	No change	No change	1,296
Diversion K-4				Difficulty of diversion restoration: **Simple (1)** Provide passage on right side of diversion	
B	24	19	No change	0.1	0
C	26	21			
Total Returned			0	0.1	1,296

Summary Information	Habitat Units (m)
Total Habitat Units in this stream	7,585
Total Habitat Units lost due to diversion(s)	3,456
Potential Habitat Units to be restored by this recommendation	1,296

DAR Recommendations - DAR recommends no additional flow restoration for this stream except that necessary to provide a wetted pathway past the diversion structure (approximately 0.1 cfs). This restoration action would provide an additional 1.3 km of suitable habitat for native stream animals. The only modification would be to the K-4 intake into Ko‘olau Ditch to provide for animal passage and reduce entrainment of newly hatched larvae at the diversion site. This would involve at v-notch on the dam wall right bank. The lower section of Hanawī Stream is highly productive habitat for native stream animals and has large springs which provide flow and habitat even during drought periods. Overall, Hanawī Stream is an outstanding stream with a healthy and diverse population of native species, and therefore reconnecting the upper and lower sections would protect and enhance the ecological integrity of this particularly valuable stream.

Table 1. Recommended East Maui Stream Flow Ranks

						Rankings							Watershed Atlas Rating		
Stream	**Habitat Units** (HU in m)	**# of Diversions**	**C_{min} - dry season** (= 20% tbf)	**H_{min} - wet season - cfs at H90** (= 64% tbf)	**Terminal Falls**	**HU**	**Poorest Condition - Species**	**POD - Effort to fix**	**Efficient Water Use**	**Average**	**FINAL RANK**	**Geography**	**TWR**	**TBR**	**COR**
E. Wailua Iki	2,402	1	0.2	3.2	No	2	2	1	3	2	1	e	7	7	8
W. Wailua Iki	2,218	1	0.4	3.5	No	3	4	1	5	3.25	2	e	7	7	8
Puohokamoa	2,801	3	0.3	5.4	No	1	1	3	8	3.25	3	w	8	5	7
Waikamoi	2,087	5	0	2.6	Yes	4	6	3	2	3.75	4	w	7	7	8
Kopili‘ula	2,007	2	0.2	3	No	5	5	3	4	4.25	5	e	8	7	8
Haipua‘ena	1,499	3	0.1	2.5	Yes	6	3	6	5	5	6	w	8	5	6
Waiohue	1,494	1	0.1	2.7	No	7	7	1	7	5.5	7	e	7	8	8
Hanawī [(1)]	1,296	1	0.1	0	No	8	8	1	1	4.5	8	e	8	8	9
Total	15,804	17	1.4	22.9											

Hanawī [(1)] no flow amounts are provided as no change in current flow condition are recommended.

Habitat Units reflect the total amount of habitat for the native species of concern currently lost to flow diversion or barriers based on H90
# of diversion is based on the surveys by DAR and CWRM
C_{min} - dry season are the minimum flow to provide connectivity
H_{min} - wet season-H90 are the percent of habitat based on the USGS IFIM study for East Maui Streams
Terminal Falls are waterfalls at the mouth of a stream that restrict upstream movement of non-climbing species
In the ranking sections:
Habitat Units are the ranked order from column 1
Poorest Condition - Species ranks stream that are in the worst condition first and lack some native species
POD - Effort to fix the Point of Diversion (POD) and an estimate of the difficulty of providing fish passage. Diversion was scored 1 to 3 for increasing difficulty and resulting sum of all diversion scores were ranked lowest to highest.
Efficient Water Use was the ranking of HU/cfs at H90. More habitat per cfs scored better. Hanawi does not require water return thus we ranked it 8 (n/a).
Average was the average of the first four ranking columns.
FINAL RANK was the ranking of the average with West Wailua Iki ranked ahead of Kopiliula due to its easier diversion fix.
Geography show in which section of the area the streams were located in. We wanted to spread out the stream restoration if possible.
Watershed Atlas ratings are shown in the last three columns
TWR = Total watershed rating
TBR = Total biological rating
COR = Combined overall rating

Table 2. Habitat Units for the three categories of Native Species-ʻoʻopu, hihiwai, and ʻopae

	Habitat Units (HU in m)										
	ʻoʻopu							ʻopae			
Stream	ʻoʻopu akupa	ʻoʻopu naniha	ʻoʻopu nakea	ʻoʻopu nopili	ʻoʻopu hiʻukole	total ʻoʻopu	**hihiwai**	ʻopae ʻoehaʻa	ʻopae kalaʻole	total ʻopae	total of all spp
Waikamoi	0	0	208	142	1,049	1,399	325	363	0	363	2,087
Puohokamoa	12	3	405	288	1,178	1,886	426	443	45	488	2,801
Haipuaʻena	23	7	252	154	721	1,157	191	122	28	151	1,499
W. Wailua Iki	10	3	213	181	913	1,322	182	685	29	714	2,218
E. Wailua Iki	12	4	272	308	959	1,555	298	510	39	549	2,402
Kopiliʻula	5	1	152	152	863	1,174	165	651	16	668	2,007
Waiohue	7	1	192	173	651	1,024	206	241	23	265	1,494
Hanawī	0	0	25	14	587	626	17	652	0	652	1,296
Total	70	20	1,721	1,413	6,920	10,144	1,811	3,668	181	3,849	15,804

Habitat Units reflect the total amount of habitat for the three categories of native species: ʻoʻopu, hihiwai, and ʻopae and they are all based on H100 for the entire watershed therefore, the total of all species is larger that the total habitat units for the streams in Table 1. which reflects habitat units below and between the diversions.

Table 3. Points of Diversions on each stream and effort of modification for fish passage and entrainment

	Points of Diversion-effort of modification					
Stream	Diversion 1	Diversion 2	Diversion 3	Diversion 4	Diversion 5	Total
Puohokamoa (3)	(ML-3)=1	(K-33)=3	(S-9)=3			7
Waikamoi (5)	(C-1)=1	(S-10)=1	(W-2)=2	(NH-1)=3	(W-1)=3	8
Haipuaʻena (3)	(ML-2)=3	(S-8)=3				6
Kopiliʻula (2)	(K-15)=2	(K-14)=1				3
E. Wailua Iki (1)	(K-16)=1					1
W. Wailua Iki (1)	(K-17)=1					1
Waiohue (1)	(K-13)=1					1
Hanawī (1)	(K-4)=1					1

Streams listed with number and designation (EMI) of diversions considered for modification
Points of Diversion-effort of modification reflect the difficulty in modifying the diversions to allow fish passage on each stream starting at the lowest diversion
Diversions were scored 1 to 3 for increasing difficulty with resulting sum of all diversion scores

Table 4. East Maui Stream Habitat Units and Percentages

Stream	Potential Habitat Units restored by this recommendation (m)	Percentage of Habitat Units restored for each stream by this recommendation	Total Habitat Units by stream (m)	Percentage of potential Habitat Units restored in each stream (m)	Total Habitat Units lost due to current diversion(s) (m)	Percentage of current lost Habitat Units that will potentially be restored
East Wailua Iki	2,402	15.2%	6,528	36.8%	4,375	54.9%
West Wailua Iki	2,218	14.0%	5,703	38.9%	4,019	55.2%
Puohokamoa	2,801	17.7%	11,955	23.4%	9,743	28.7%
Waikamoi	2,087	13.2%	7,080	29.5%	7,013	29.8%
Kopiliʻula	2,007	12.7%	9,257	21.7%	5,138	39.1%
Haipuaʻena	1,499	9.5%	5,968	25.1%	5,173	29.0%
Waiohue	1,494	9.5%	4,428	33.7%	2,718	55.0%
Hanawī [(1)]	1,296	8.2%	7,585	17.1%	3,456	37.5%
Total	15,804	100.0%				

Hanawī [(1)] no change in current flow conditions are recommended. Habitat restoration is result of diversion modification.

2.0 Feb. 18, 2010 - Hawaiian Commercial & Sugar Company

Hawaiian Commercial & Sugar Company (HC&S) provided information on:

1) Appendix A: East Maui Irrigation (EMI) Telemetry System;
2) Appendix B: Water Lost from the EMI System;
3) Appendix C: HC&S Reservoirs;
4) Appendix D: East Maui Fields—Ditch Water Only;
5) Appendix E: H&CS Brackish Water Wells;
6) Appendix F: Alternative Water Sources;
7) Appendix G: Wet Season vs. Dry Season Water Needs;
8) Appendix H: Seasonal IIFS—Diversion Infrastructure; and
9) Appendix I: Upstream Recruitment/Downstream Entrainment.

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON

WILLIAM D. BALFOUR, JR.
SUMNER ERDMAN
NEAL S. FUJIWARA
CHIYOME L. FUKINO, M.D.
DONNA FAY K. KIYOSAKI, P.E.
LAWRENCE H. MIIKE, M.D., J.D.

KEN C. KAWAHARA, P.E.
DEPUTY DIRECTOR

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
P.O. BOX 621
HONOLULU, HAWAII 96809

February 18, 2010

Mr. Christopher Benjamin
Hawaiian Commercial & Sugar Company
P.O. Box 266
Puunene, Hawaii 96784

Dear Mr. Benjamin:

The purpose of this letter is to provide a detailed list of additional information that the staff at the Commission on Water Resource Management (Commission) needs concerning the interim instream flow standard (interim IFS) recommendations and adaptive management strategies for 19 east Maui streams presented at the Commission meeting on December 16-17, 2009, in Paia, Maui. As part of the motion that was approved at the meeting, interested parties, including Hawaiian Commercial & Sugar Company (HC&S), were to submit such information to the Commission within three (3) months.

Commission staff asks that the following list of specific information for the short-term, mid-term, and long-term time periods, in accordance with the motion, be submitted no later than **March 19, 2010**. A representative from HC&S should be prepared to present the information to the Commission at the next Commission meeting, which has yet to be scheduled.

- Description of the East Maui Irrigation (EMI) Company telemetry system and how it is organized by geographical areas. Indicate locations of the gaging stations that record instantaneous ditch flows. Provide a percentage of the total ditch flow, as recorded at Honopou, contributed by each geographical area.

- Amount of water lost from the EMI System due to system inefficiencies. If that information is unavailable, provide a timeline and estimated costs for developing a plan to address system losses.

- Map of the reservoirs on the HC&S plantation, with information on reservoir capacities, the plantation fields that each reservoir services, and whether the reservoirs are lined or unlined. For unlined reservoirs, estimate the amount of water lost from infiltration.

- List of the plantation fields that cannot be irrigated with ground water, along with the total acreage of these fields.

- Information on the 16 brackish water wells used to irrigate the plantation, including the State well number, well capacity, cost of pumping, and sustainable pumping levels. If monthly ground water use reports for some of these wells have not been provided to the Commission, explain the reasoning for such action.

- Alternative water sources for irrigating the plantation.

Commission staff would like to meet with HC&S representatives to further discuss the information presented above, as well as additional information that HC&S is willing to provide that would help the Commission in the evaluation of the pending interim IFS petitions. Staff would also like to discuss implementation of HC&S' plan to alter the diversion structures that would restore additional flow to Honopou Stream from the upper ditches. Please contact Dean Uyeno of the Stream Protection and Management Branch at 587-0249, or via email at dean.d.uyeno@hawaii.gov, to schedule a meeting in early March.

On behalf of the Commission, I would like to thank you in advance for your cooperation in this matter. Should you have any questions, please feel free to contact me at (808) 587-0214.

Sincerely,

KEN C. KAWAHARA, P.E.
Deputy Director

DU:ss

MAUI HC&S
HAWAIIAN COMMERCIAL & SUGAR COMPANY

RECEIVED
COMMISSION ON WATER
RESOURCE MANAGEMENT
2010 MAR 19 PM 5:00

March 19, 2010

Mr. Ken C. Kawahara, P.E.
Deputy Director
Commission on Water Resource Management
State of Hawaii
P. O. Box 621
Honolulu, HI 96809

Dear Mr. Kawahara:

Pursuant to your letter dated February 18, 2010 and the summary of the meeting minutes you distributed by letter dated January 8, 2010, we hereby submit the requested data. On the attached CD you will find the information formatted as follows:

- Appendix A: EMI Telemetry System
- Appendix B: Water Lost from the EMI System
- Appendix C: HC&S Reservoirs
- Appendix D: East Maui Fields—Ditch Water Only
- Appendix E: H&CS Brackish Water Wells
- Appendix F: Alternative Water Sources
- Appendix G: Wet Season vs. Dry Season Water Needs
- Appendix H: Seasonal IIFS—Diversion Infrastructure
- Appendix I: Upstream Recruitment/Downstream Entrainment

We appreciate the guidance you and your staff provided so that we could best fulfill your data request. Please do not hesitate to call if you need further information or clarification.

Sincerely,

Christopher J. Benjamin
HC&S General Manager

HAWAIIAN COMMERCIAL & SUGAR COMPANY A DIVISION OF ALEXANDER & BALDWIN, INC.
P.O. BOX 266 PUUNENE, MAUI, HAWAII 96784 TEL 808-877-0081 FAX 808-871-2149

Appendix A: EMI Telemetry System

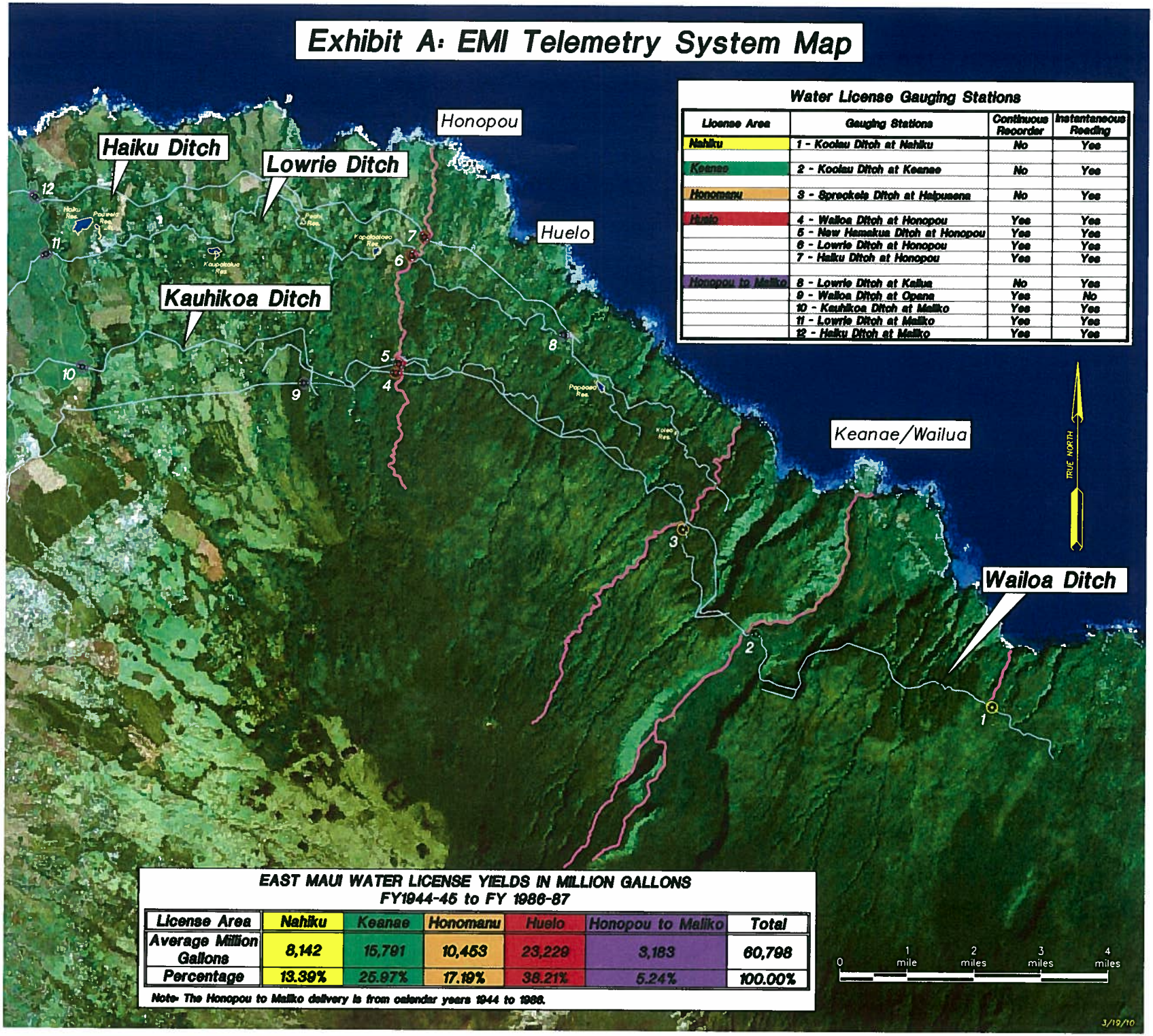
CWRM Request:
Description of the East Maui Irrigation (EMI) Company telemetry system and how it is organized by geographical areas. Indicate locations of the gaging stations that record instantaneous ditch flows. Provide a percentage of the total ditch flow, as recorded at Honopou, contributed by each geographical area.

Response:
Attached is a map (Exhibit A: EMI Telemetry System Map) showing the locations of the twelve (12) gaging stations utilized by HC&S/EMI to monitor and manage East Maui ditch deliveries, and a table noting additional information about each gauge, including the type and associated license area, as applicable.

Seven (7) of the gauges were formerly part of the system of nine (9) gaging stations operated and maintained by the U.S. Geological Survey (USGS) in East Maui to calculate the total amount of water diverted from each of the four state water license areas (see gauges 1-7 on the attached map). These 9 USGS stations were equipped with continuous gaging recorders; in addition, EMI installed and operated instantaneous telemetry equipment on 7 of the 9 stations. In 1986, when the last of the four long-term state water leases expired, EMI assumed the responsibility of operation and maintenance of the USGS gaging stations. At that time, two of the USGS gauges were discontinued, as the state began assessing a flat rate rental fee rather than one based on the specific amount of water collected in each license area and rates that varied by license area. EMI pays for the USGS to conduct quarterly discharge measurements and provide new rating curves, if necessary, for the four Honopou stations. The remaining 5 gauges shown on the map (numbered 8-12) were installed by EMI to better manage the system so as to enable the efficient and safe delivery of water to HC&S and other users.

The percentage of total ditch flow contributed by each geographical area, as recorded at Honopou, is provided on the attached table entitled "East Maui Water License Yields in Million Gallons". This is based on data from a forty-three year period, fiscal year 1944 through 1986. Per our discussion with CWRM staff, the license areas correlate to the requested 'geographical area'. We have also noted that there is a small percentage of additional water collected between the Honopou license boundary and HC&S.

Exhibit A: EMI Telemetry System Map



Water License Gauging Stations

License Area	Gauging Stations	Continuous Recorder	Instantaneous Reading
Nahiku	1 - Koolau Ditch at Nahiku	No	Yes
Keanae	2 - Koolau Ditch at Keanae	No	Yes
Honomanu	3 - Spreckels Ditch at Halpuneno	No	Yes
Huelo	4 - Wailoa Ditch at Honopou	Yes	Yes
	5 - New Hamakua Ditch at Honopou	Yes	Yes
	6 - Lowrie Ditch at Honopou	Yes	Yes
	7 - Haiku Ditch at Honopou	Yes	Yes
Honopou to Maliko	8 - Lowrie Ditch at Kailua	No	Yes
	9 - Wailoa Ditch at Opana	Yes	No
	10 - Kauhikoa Ditch at Maliko	Yes	Yes
	11 - Lowrie Ditch at Maliko	Yes	Yes
	12 - Haiku Ditch at Maliko	Yes	Yes

EAST MAUI WATER LICENSE YIELDS IN MILLION GALLONS
FY1944-45 to FY 1986-87

License Area	Nahiku	Keanae	Honomanu	Huelo	Honopou to Maliko	Total
Average Million Gallons	8,142	15,791	10,453	23,229	3,183	60,798
Percentage	13.39%	25.97%	17.19%	38.21%	5.24%	100.00%

Note- The Honopou to Maliko delivery is from calendar years 1944 to 1988.

0 1 mile 2 miles 3 miles 4 miles

3/19/10

Appendix B: Water Lost from the EMI System

CWRM Request:
Amount of water lost from the EMI System due to system inefficiencies. If that information is unavailable, provide a timeline and estimated costs for developing a plan to address system losses.

Response:
The EMI System consists of approximately 75 miles of ditch and tunnel, which is used to collect and transport surface water from Nahiku to Maliko gulch. Approximately 50 miles of the system is tunnel and 25 miles is ditch. The system is efficient in transporting water as the majority of it is lined (50 miles), thus reducing seepage, and evaporation losses are essentially eliminated in the 50 miles of enclosed tunnel due to the lack of exposure to sunlight or wind.

EMI conducts a regular program of inspection and repair/maintenance which results in the entire 75 miles of the system being inspected 40-50 times a year. Repair and maintenance activities are undertaken accordingly, as soon as weather conditions permit. These include removing any vegetation from the ditch banks, removal of silt and debris from ditches and tunnels, repairing leaks with concrete patches, rebuilding of ditch walls and floors with rock and concrete, as well as the maintenance of the 62 miles of road which provide safe access to the ditch system. Other repair projects in recent years include replacement of two wooden flumes. One of the flumes was replaced with high density polyethylene pipe and the other was replaced with stainless steel walls and floor. EMI's system of 12 telemetry stations (see Appendix A) enables remote monitoring of the entire ditch system, thus provides early identification of problems such as ditch blockage, tampering of ditch facilities and failure in the system, without having to be on-site.

Thus, the physical features of the ditch system as well as EMI's management practices serve to minimize the losses of water from the system. We were unable to identify a source citing typical standards for water loss in open ditch irrigation systems, however we note that according to the American Water Works Association (AWWA), municipal water systems, which are closed pipe systems, typically experience between 10-15% of unaccounted water loss (see "Survey of State Agency Water Loss Reporting Practices", AWWA, January 2002, pg. 13)

To accurately measure the losses in the EMI System, it would be necessary to measure every point of input on the ditch system, with gauges both upstream and downstream of every input point. For example, a gauge would have to be constructed in the ditch downstream of a stream diversion to measure what is actually diverted into the ditch from that source and one upstream of the diversion to determine the amount diverted prior to the stream diversion. There is no loss of water in that section of the ditch if the gauge downstream of a stream diversion is equal to the gage upstream of the next diversion. This calculation would need to be done for each 'interval' between sources of input. The

cost to establish such a gaging program to determine system losses in the EMI system would cost approximately $15 million dollars to install the gauges (based on the 355 registered stream diversions and the USGS cost of $21K to install each gaging station), plus $15 million/year to upkeep and maintain the gauges (per USGS estimates). In addition, update/replacement costs of approximately $3.5-$4 million every three years would need to be undertaken. It would also be impossible to establish gaging stations in the 50 mile section of tunnels so there would be gaps in the data.

Given the infeasibility of the above approach, we attempted to identify another study protocol that could serve to estimate system losses, albeit with less precision. We consulted a hydrologist who identified the following protocol as a tool to estimate system losses in an extensive ditch system such as EMI's. Water discharge measurements would need to be made in various sections of the ditch based on the type of lining—such as cut stone, concrete, solid rock or dirt—as the lining type affects permeability of the ditch and thus water losses. Based on these measurements, a calculation can be made to estimate the water loss in each type of lining. The water loss calculation can then be applied to the total length of ditch, based on lengths of ditch by lining type. Although this protocol would be more economically feasible than conducting actual loss measurements throughout the length of the ditch system, the result will not be very accurate due to the complexity of the EMI ditch system which includes varying topography, and varying lengths of variable types of ditch lining.

Watershed management activities undertaken by EMI also serve to sustain the amount of water produced in the watershed. EMI was one of the founding members of the East Maui Watershed Partnership (EMWP) along with Haleakala Ranch, The Nature Conservancy, Haleakala National Park, Hana Ranch, the County of Maui and the State of Hawaii. The EMWP was voluntarily established in 1991 to pool economic, technical and human resources in a combined effort to protect the 100,000-acre watershed to provide a source of clean, fresh water for household, agricultural and industrial use and to protect Maui's forest ecosystem for generations to come. Over the years, EMI personnel have actively participated as board members of the EMWP and members of the Executive Committee. EMI has provided funding for various programs including the initial development of watershed management protocol, which established the proper 'measuring sticks' to measure watershed management progress. The EMWP served as the model for the establishment of other watershed partnerships across the state. Today, there are nine (9) watershed partnerships on six islands.

EMI has also worked with the Maui Invasive Species Committee and The Nature Conservancy in alien weed removal and feral animal control projects, and with the State Department of Land and Natural Resources in controlling feral animals in the watershed through the public hunting program on State and EMI lands. All of these activities promote a healthy watershed which is essential for the continued source of reliable surface water.

Appendix C: HC&S Reservoirs

CWRM Data Request:
Map of the reservoirs on the HC&S plantation, with information on reservoir capacities, the plantation fields that each reservoir services, and whether the reservoirs are lined or unlined. For unlined reservoirs, estimate the amount of water lost from infiltration.

Response:
Per staff direction, this response addresses 36 reservoirs on the HC&S plantation that are used in conjunction with East Maui water.

Attached are: 1) a map entitled "HC&S Reservoirs—East Maui Water", indicating the location of the 36 reservoirs (Exhibit C-1); 2) a chart entitled "HC&S Reservoirs – Capacities (East Maui Water)", which provides information on the capacity, lining status, cost to line (if unlined) and estimated infiltration loss by reservoir (Exhibit C-2); 3) a table, entitled "HC&S E. Maui Reservoirs—Service Area", listing the plantation fields served by each reservoir (Exhibit C-3); and 4) individual maps illustrating the information on the aforementioned table (Exhibit C-4). We note that incorporating all the field service information on one map would have been confusing.

These 36 reservoirs range in size from 1 million gallons (mg) to 80 mg, and have a total maximum capacity of approximately 860 mg. In practice, however, HC&S does not normally operate the reservoirs at maximum capacity, for safety reasons as well as lack of available water. Total normal operating capacity of the reservoirs ranges approximately from 145 mg to 610 mg. Columns 3 and 4 of the attached Reservoirs Chart indicate the maximum storage capacities and the normal operating capacities of each of the reservoirs.

A brief background on the HC&S reservoir system will help to provide context on how the reservoirs are operated and used, which is a significant factor in estimating how much water seeps into the ground from infiltration.

The HC&S' reservoir system is a carry-over from the days of furrow irrigation, when reservoirs would be filled at night, and, in the morning, gates would be manually opened to allow water from the reservoirs to flow into the furrows until the end of the day, when the gates would be closed. Thus, reservoirs were sized to essentially provide one night's storage, and were located close to the fields. They are relatively small, sited just slightly above field elevation, serving limited nearby areas.

When HC&S invested in drip irrigation, a 12-year, $35 million project that was completed in 1986, HC&S was able to realize substantial water savings that enabled it to increase its cultivated acreage, creating additional economies of scale that enabled it to survive a period of time when many other sugar plantations were going out of business. The existing reservoir system, however, did not ideally support this new drip-irrigation system which requires sufficient pressure in the tubing (15 psi) to properly distribute the water. Larger, higher elevation reservoirs that provided sufficient head and storage would

be ideal, however the cost of reconfiguring and relocating reservoirs throughout the plantation would have been (and continues to be) cost-prohibitive. Instead, HC&S makes the best use that it can of the existing reservoirs, utilizing them as collection points for irrigation water and surge ponds during times of fluctuating ditch flows. Water typically does not sit in them for a long time. The reservoirs service as water storage facilities only during periods of heavy rainfall and high stream flow, and only for short periods of time. This occurs mainly in the winter or occasional large storm events in the summer, when available water exceeds the immediate needs of the sugarcane plants.

Five of the 36 reservoirs are lined, as noted in Column 5 on Exhibit C-2, the Reservoirs Chart. One is a concrete cistern and four are lined—two with concrete, one with shotcrete, and one with rubber and polypropylene.

The amount of water "lost" to the ground water aquifers due to infiltration from unlined reservoirs is a function not only the size of the reservoir and underlying geology, but also the water level in the reservoir and the duration that the water remains in the reservoir. In a farming operation, these last two factors are constantly changing. HC&S' farming practices call for getting water to the plant as soon as possible, and minimizing the amount of time water sits in a reservoir, thus minimizing seepage and evaporative losses. Therefore, the estimates of water loss from the reservoirs that we have provided are based on assumptions of normal operating practices.

The best available data we have to make these estimates are seepage runs that were conducted in the 1960s for several of the reservoirs, combined with the in-the-field knowledge and experience of HC&S personnel. Seepage runs were conducted for 28 of the 31 unlined reservoirs. The seepage runs were conducted over a three- to four-day period by utilizing a continuous gage height recorder which recorded the drop in water level over that period of time. There have not been any material modifications made to these reservoirs since that time.

For the three reservoirs for which seepage run studies were not conducted, we have estimated infiltration losses by comparing these reservoirs to those which did have seepage runs, based on their underlying geology, reservoir size, operational practices and experience.

Column 7 of the Reservoirs Chart indicates our estimate of infiltration losses in the unlined reservoirs, based on the above mentioned seepage run studies and assuming normal operating levels. As you can see, total infiltration from the 31 unlined reservoirs is estimated to be approximately 23-31 million gallons per day (mgd), or roughly 10% of East Maui delivery system capacity (surface water and pump water). The 23-31 mgd water loss represents an average. Most of these losses due to infiltration occur in times of high rainfall, when the water levels in the reservoirs are higher, and water sits in the reservoirs for a greater length of time. Both of these factors lead to greater infiltration. Conversely, during the summer season, it is infrequent that water availability exceeds the needs of the crop, thus there is rarely water to store. When reservoir levels are low and water does not sit long in the reservoirs, infiltration would be less than average.

Although denominated as "losses," infiltration from the reservoirs into the ground is an essential element of HC&S' water supply. In essence, the underground aquifers serve as the plantation's other 'reservoirs', where water is stored for use by HC&S when needed. It is the health of the underlying aquifers which makes possible the nearly year-round ground water pumping undertaken by HC&S to supplement surface water supplies. So HC&S' sustainability relies not on water just for the cane plant, but for its cane fields. As noted in the State Water Resources Protection Plan (WRPP), at page 7-36, leakage from reservoirs and ditches, together with percolation from irrigated fields, constituted a considerable amount of recharge

> *Throughout the era of sugar and pineapple plantations, artificial recharge was incidental to irrigation practices, but in some areas contributed largely to ground water recharge. Leakage from reservoirs and ditches, together with percolation from irrigated fields, constituted a considerable amount of recharge. Some agricultural users returned excess irrigation water to the ground water sources. For example, the McBryde Sugar Company formerly recharged the ground water body beneath Kauai's Hanapepe River Valley through a system of tunnels and shafts. At one time, it was hypothesized that return irrigation water was responsible for greater than 60% of the total recharge. However, a 1987 study by Mink and Yuen indicated that the figure was closer to 40%. Since the agriculture industry has shifted from plantations to diversified agriculture and some former crop lands have been developed for non-agricultural uses, the amount of water being applied for irrigation has decreased significantly, and it remains to be determined how the change in land use has affected ground water recharge.*

Although HC&S does not inject surface water into ground water aquifers, the continued importation of surface water to irrigate its sugar cane fields, including the use of reservoirs within the fields, has been critical to recharging the aquifers and thereby supporting HC&S' ability to pump ground water to supplement surface water sources

Column 6 on the Reservoirs Chart notes the estimated costs to line each of the unlined reservoirs. These cost estimates are based on a recent quote for the installation of polypropylene lining of $4 per square foot. An estimated total of $43.5 million would be required to line the 31 unlined reservoirs. However, lining the reservoirs would not in fact produce additional water supply/efficiencies for HC&S, but rather endanger a significantly larger and more important source of water that the plantation relies upon, its underground 'reservoirs' or the underlying brackish water aquifers, as described above. As you will note in Appendix E, which addresses HC&S' system of brackish water wells, HC&S has relied on these wells for over 70 mgd, on average. Appendix E also provides salinity information that indicates that higher usage of these wells could begin to degrade the aquifers.

Further, lining reservoirs will not result in operational efficiencies that one might expect. They would not provide additional water when it is needed the most by HC&S—in the summer months. Little water is stored, so little water is reclaimed. The reservoirs store water mainly in the winter months. Lastly, because the reservoir system was designed to support furrow and not drip irrigation needs, the stored water would have limited benefits due to the small sizes of the reservoirs, limited service and their less-than-ideal location for drip irrigation, at field-elevation.

Given the high cost of lining and the limited benefits that would result, but mainly the probable damage to the sustainability of the underlying aquifers that HC&S relies upon year-round, lining the reservoirs is not an effective nor practical means of reducing HC&S' reliance on stream water.

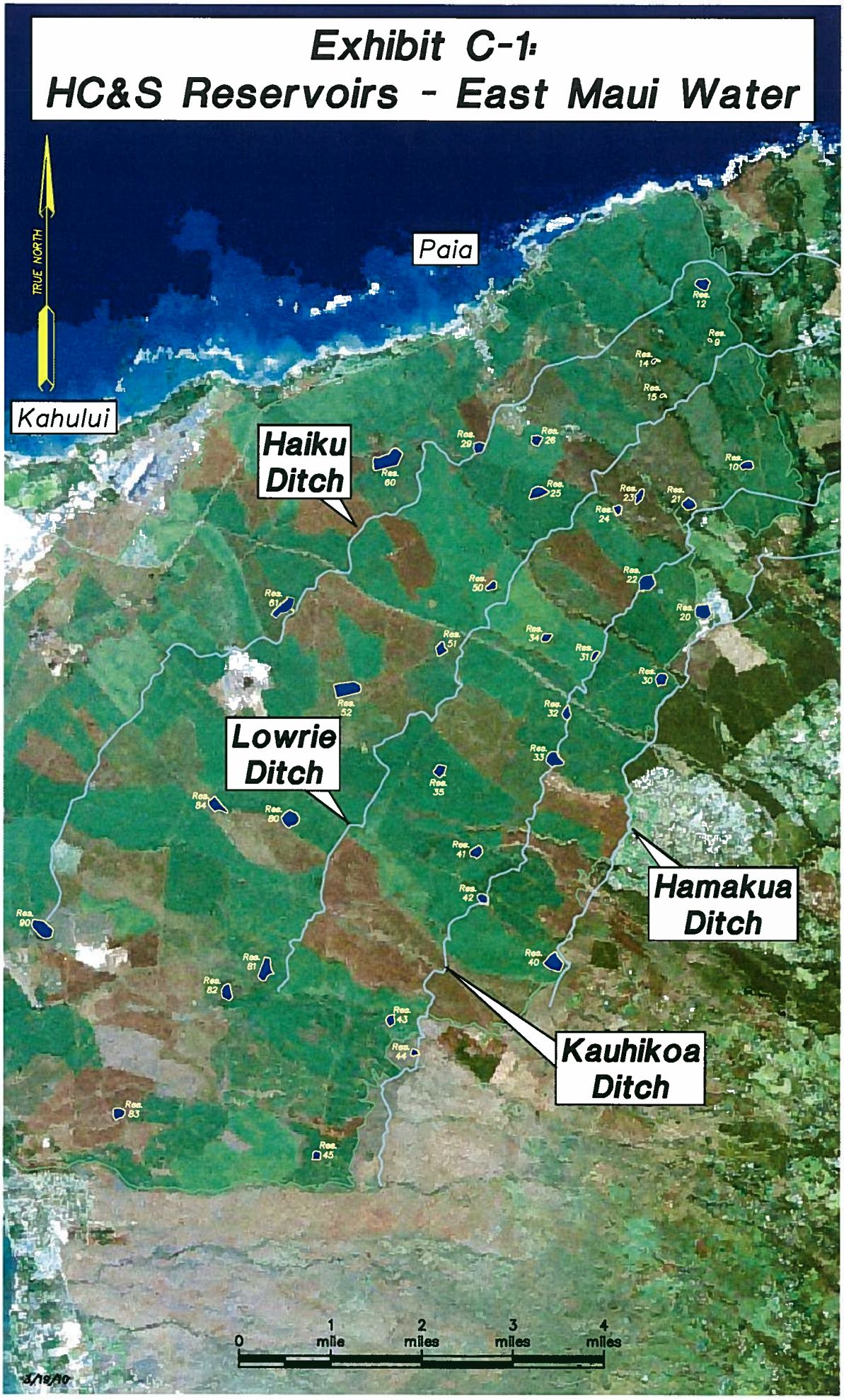


Exhibit C-1:
HC&S Reservoirs - East Maui Water
TRUE NORTH
Paia
Kahului
Haiku Ditch
Lowrie Ditch
Hamakua Ditch
Kauhikoa Ditch
Res. 12
Res. 9
Res. 14
Res. 15
Res. 29
Res. 26
Res. 60
Res. 25
Res. 10
Res. 23
Res. 21
Res. 24
Res. 50
Res. 22
Res. 61
Res. 20
Res. 51
Res. 34
Res. 31
Res. 30
Res. 52
Res. 32
Res. 33
Res. 35
Res. 84
Res. 80
Res. 41
Res. 42
Res. 90
Res. 40
Res. 81
Res. 82
Res. 43
Res. 44
Res. 83
Res. 45
0
1 mile
2 miles
3 miles
4 miles

Exhibit C-2: HC&S RESERVOIRS - CAPACITIES (East Maui Water)

Reservoir Number	State Dam ID Number *	Maximum Storage Capacity in Million Gallons	Range of Normal Operating Capacity in Million Gallons		Lining	Cost to Line	Range of Estimated Water Loss in Million Gallons/Day	
9	None	1.00	0.00	1.00	old concrete cistern	N/A	N/A	N/A
10	None	9.50	1.00	6.80	None	$889,630.57	0.40	0.40
12	None	13.40	1.00	7.90	None	$1,283,493.24	1.02	1.28
14	HI00068	9.50	1.60	6.80	None	$201,103.42	0.15	0.20
15	HI00069	8.30	1.90	7.20	None	$160,532.68	0.40	0.40
20	HI00070	48.80	2.30	7.70	None	$2,037,256.82	4.10	4.60
21	HI00071	18.60	1.80	13.90	None	$1,434,776.14	0.60	0.60
22	HI00072	43.80	4.60	38.80	None	$1,464,315.17	3.30	3.50
23	None	13.70	3.60	10.40	RUBBER and POLYPROPYLENE	N/A	N/A	N/A
24	HI00073	11.40	0.00	0.00	CONCRETE	N/A	N/A	N/A
25	HI00074	40.20	1.10	26.80	None	$1,753,173.01	1.50	1.50
26	None	9.60	2.30	6.70	None	$722,475.35	0.10	0.10
29	None	8.90	1.70	8.90	None	$841,919.12	0.35	0.40
30	HI00075	21.00	3.30	18.90	None	$1,738,139.16	0.30	0.35
31	None	5.10	0.00	1.00	None	$398,986.76	0.15	0.10
32	None	9.80	2.50	6.80	None	$710,005.65	0.10	0.20
33	HI00076	46.50	3.60	41.90	None	$1,677,859.87	0.10	0.20
34	None	8.10	2.90	4.40	None	$619,942.03	0.10	0.10
35	None	15.00	5.20	9.80	None	$915,898.94	0.40	0.40
40	HI00077	62.80	1.00	51.80	None	$2,839,318.25	0.10	0.30
41	None	8.90	1.70	4.10	None	$908,891.56	0.05	0.10
42	HI00078	10.40	1.00	8.30	None	$571,667.44	0.40	0.55
43	None	13.90	4.00	9.30	None	$571,152.05	0.50	0.55
44	None	3.60	1.40	2.50	CONCRETE	N/A	N/A	N/A
45	None	7.00	2.40	3.80	SHOTCRETE	N/A	N/A	N/A
50	None	8.40	1.00	7.20	None	$677,141.33	0.45	0.50
51	None	15.80	3.50	11.90	None	$1,202,256.00	0.40	0.50
52	HI00079	74.00	8.90	65.00	None	$3,736,169.36	2.60	2.70
60	HI00080	80.50	31.10	65.80	None	$4,177,329.29	1.70	3.50

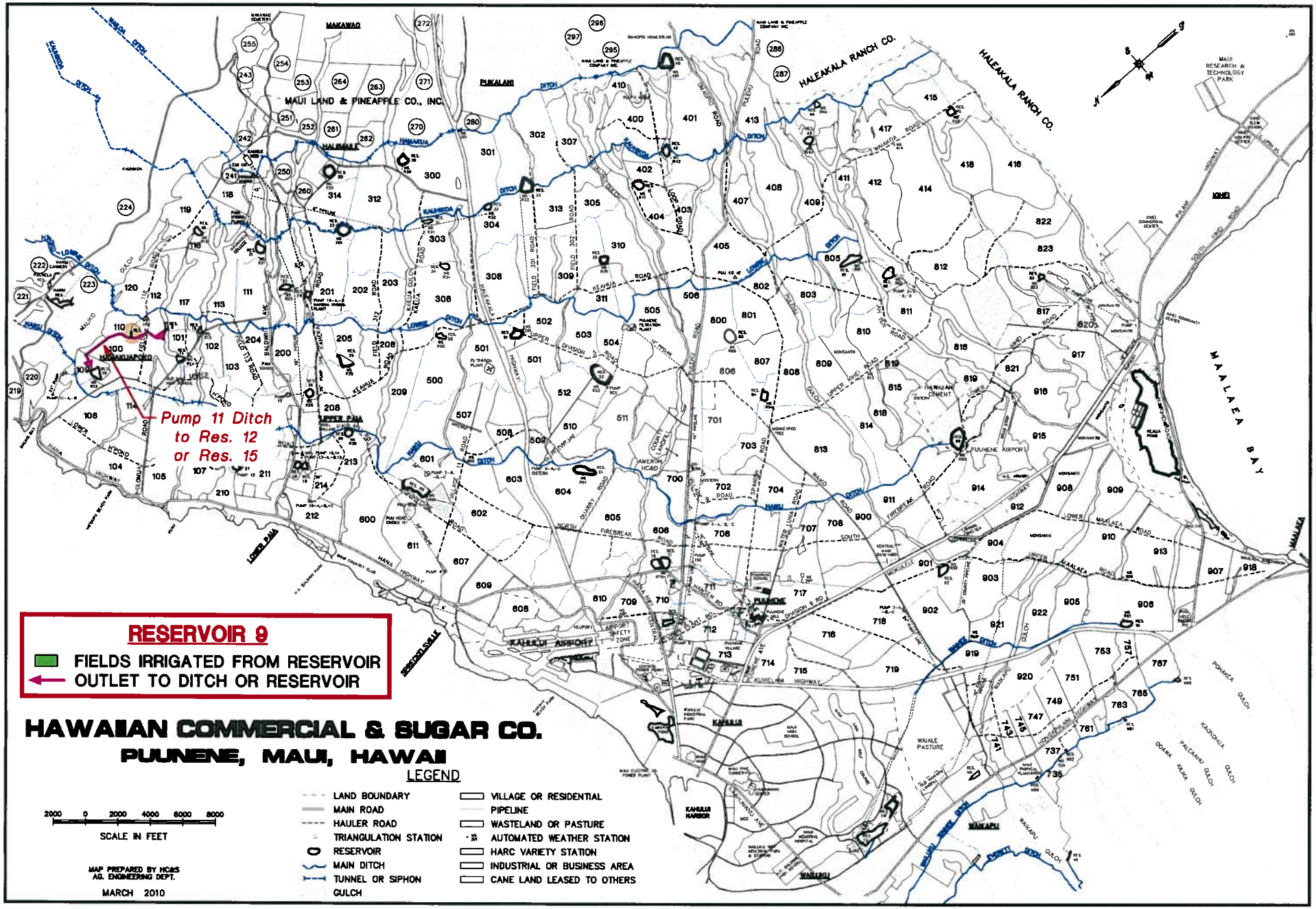
61	HI00081	53.10	11.70	30.40	None	$1,862,244.80	0.00	2.10
80	HI00085	41.10	9.80	26.00	None	$2,309,449.60	2.60	3.10
81	HI00086	36.70	13.10	27.70	None	$1,611,943.07	1.00	1.10
82	HI00087	17.90	5.20	13.90	None	$1,042,699.45	0.05	0.40
83	None	6.40	1.00	3.00	None	$694,227.79	0.20	0.45
84	HI00088	35.10	2.10	16.80	None	$1,525,880.25	0.10	0.40
90	HI00089	45.00	7.10	40.00	None	$2,976,611.70	0.10	0.35
36		**862.80**	**146.40**	**613.20**		**$43,556,489.87**	**23.32**	**30.93**

* State Dam ID Numbers assigned only to regulated reservoirs
Estimated water loss in million gallons per day ranges from 23.32 mgd to 30.93 mgd based on seepage test in the 1960's
=Water loss estimated due to no seepage test

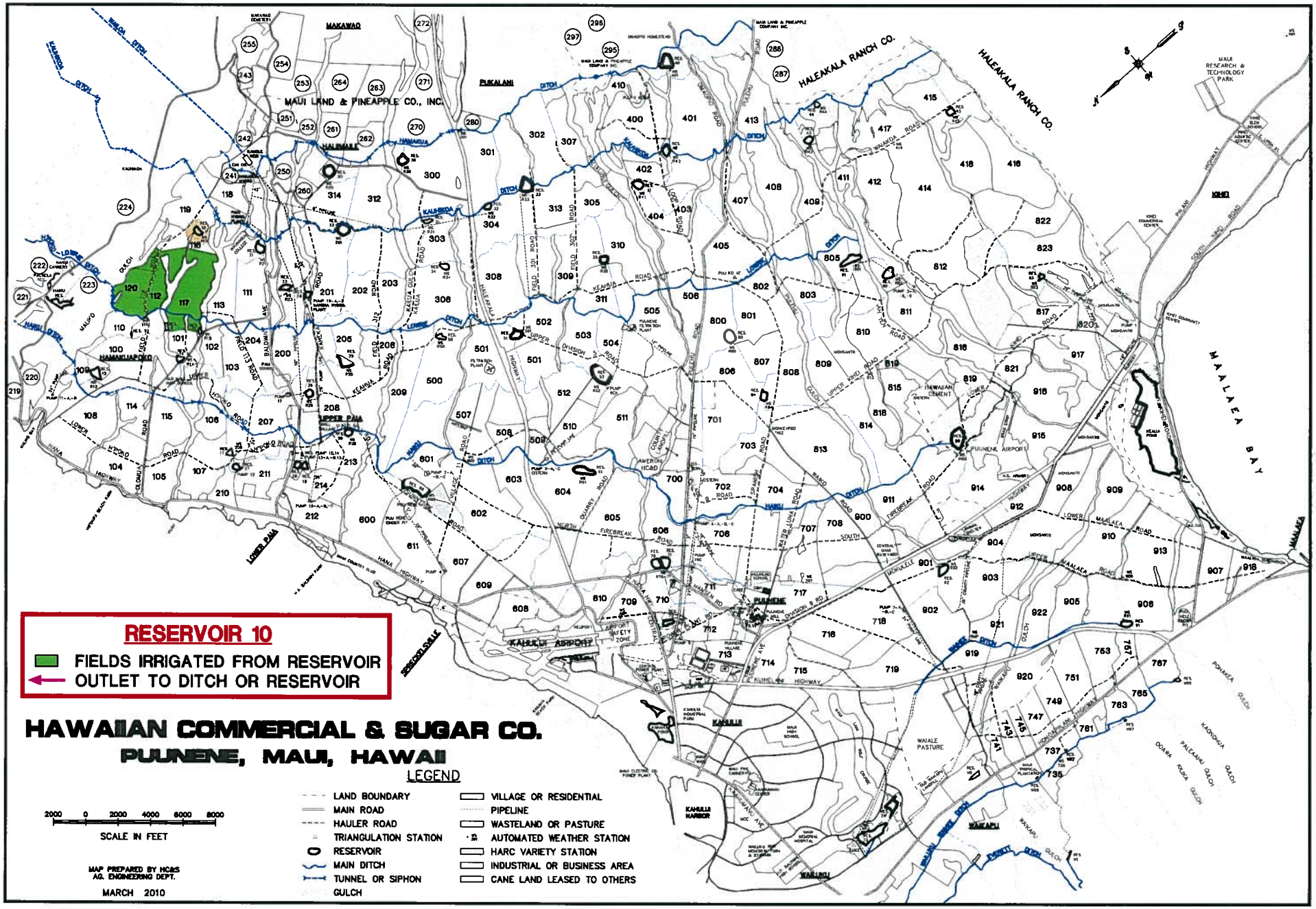
Exhibit C-3: HC&S E. Maui Reservoirs - Service Area

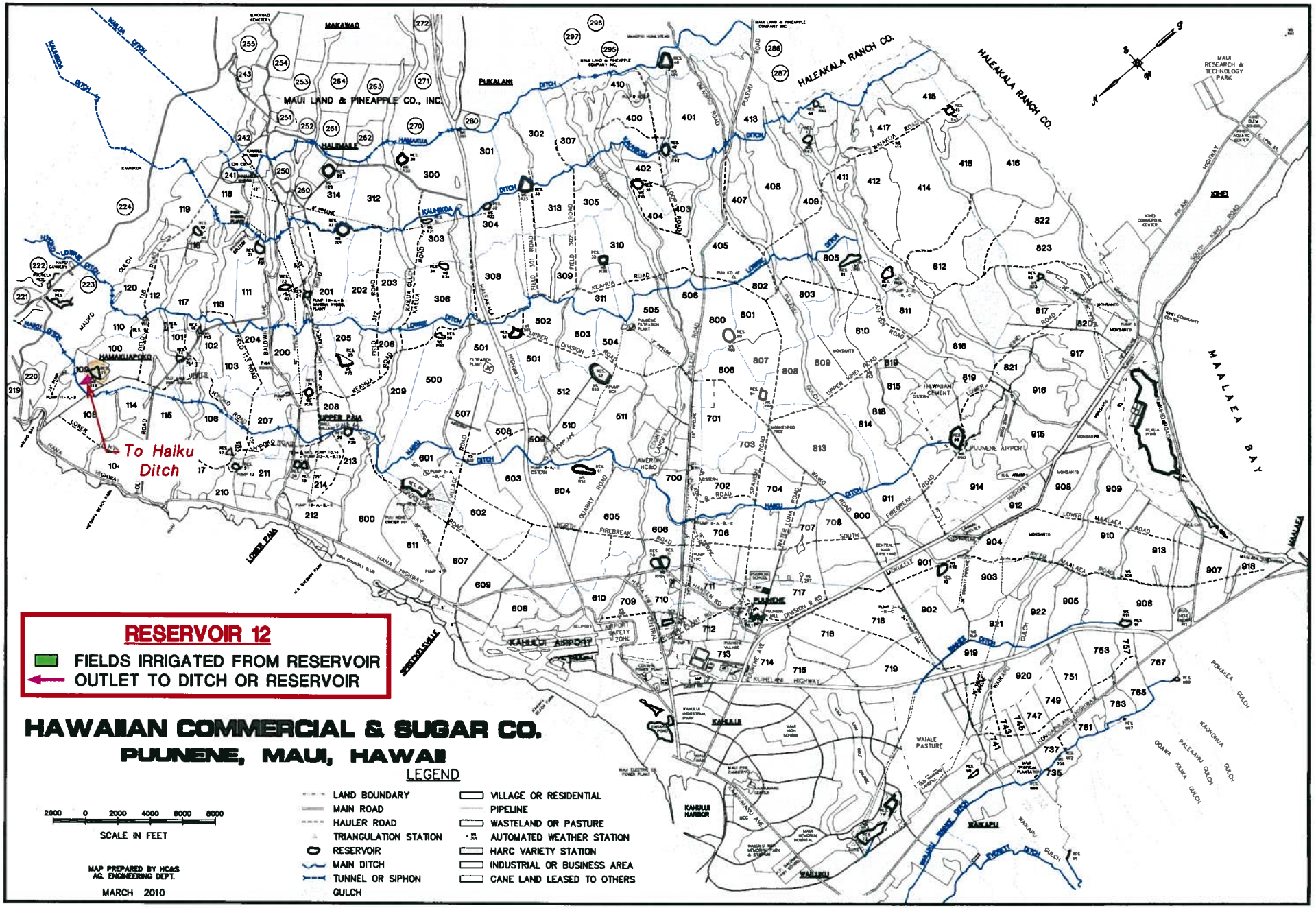
Reservoir #	Water Source (Main Ditch)	Fields Irrigated from Reservoir	Outlet to Ditch or Reservoir
9	H'POKO-LOWRIE	NONE	PUMP 11 DITCH TO RES. 12 OR 15
10	KAUHIKOA	1121, 1171, 1201	NONE
12	H'POKO-LOWRIE	NONE	HAIKU DITCH
14	PUMP 17 DITCH	NONE	HAIKU DITCH
15	H'POKO-LOWRIE	1012	PUMP 17 DITCH
20	HAMAKUA	3123	KAUHIKOA DITCH
21	KAUHIKOA	1112, 1132	H'POKO-LOWRIE DITCH
22	KAUHIKOA	2011, 2012, 2051, 2061	PUMP DITCH
23	KAUHIKOA	2002	TO RES. 24 AND LOWRIE DITCH
24	KAUHIKOA	NONE	LOWRIE DITCH
25	LOWRIE	NONE	TO RES. 26
26	LOWRIE	2081, 2082	HAIKU DITCH
29	HAIKU	2131	NONE
30	HAMAKUA	3003, 3031	KAUHIKOA DITCH
31	KAUHIKOA	NONE	PUMP DITCH
32	KAUHIKOA	3044, 3082	PIPE TO PUMP DITCH
33	KAUHIKOA	3045, 3091, 5021, 5031, 5041	PUMP DITCH
34	KAUHIKOA	2091, 3062, 5001	NONE
35	HAMAKUA	5051	PIPE TO PUUNENE POWER PLANT
40	HAMAKUA	4013, 4002, 4081, 4091, 4132, 4133	KAUHIKOA DITCH
41	KAUHIKOA	F.4042, 5061, 8001, 8011, 8021	NONE
42	KAUHIKOA	4031, 5061, 8001, 8011, 8021	RES.41 DITCH
43	KAUHIKOA	4093, 4112	NONE
44	KAUHIKOA	4171	NONE
45	KAUHIKOA	4161, 4181	NONE
50	LOWRIE	2093, 5003	HAIKU DITCH
51	LOWRIE	5014, 5015	RES. 52 DITCH
52	LOWRIE	5101, 5112, 5072, 5081, 5091	NONE
60	HAIKU	6071, 6082, 6091, 6112, 6113	NONE
61	HAIKU	NONE	PUMP TO HAIKU DITCH
80	LOWRIE	7022, 7041	RES. 84; TO PUUNENE MILL VIA CISTERN.
81	LOWRIE	8031, 8032, 8051, 8052, 8091, 8101, 8102, 8111,8081	TO RES. 82 OR 84
82	LOWRIE	8112, 8121, 8151, 8161, 8181, 8191, 8192, 8221, 8231	TO RES. 83 OR 84
83	LOWRIE	8171, 8172, 8201, 8211	NONE
84	LOWRIE	7001, 7011, 7012, 7021, 7031, 8131, 8132, 8141, 8142	HAIKU DITCH
90	HAIKU	9151, 9161, 9171, 7171, 7172	DITCH TO PUUNENE MILL SPRAY POND AND PUMP 19C.

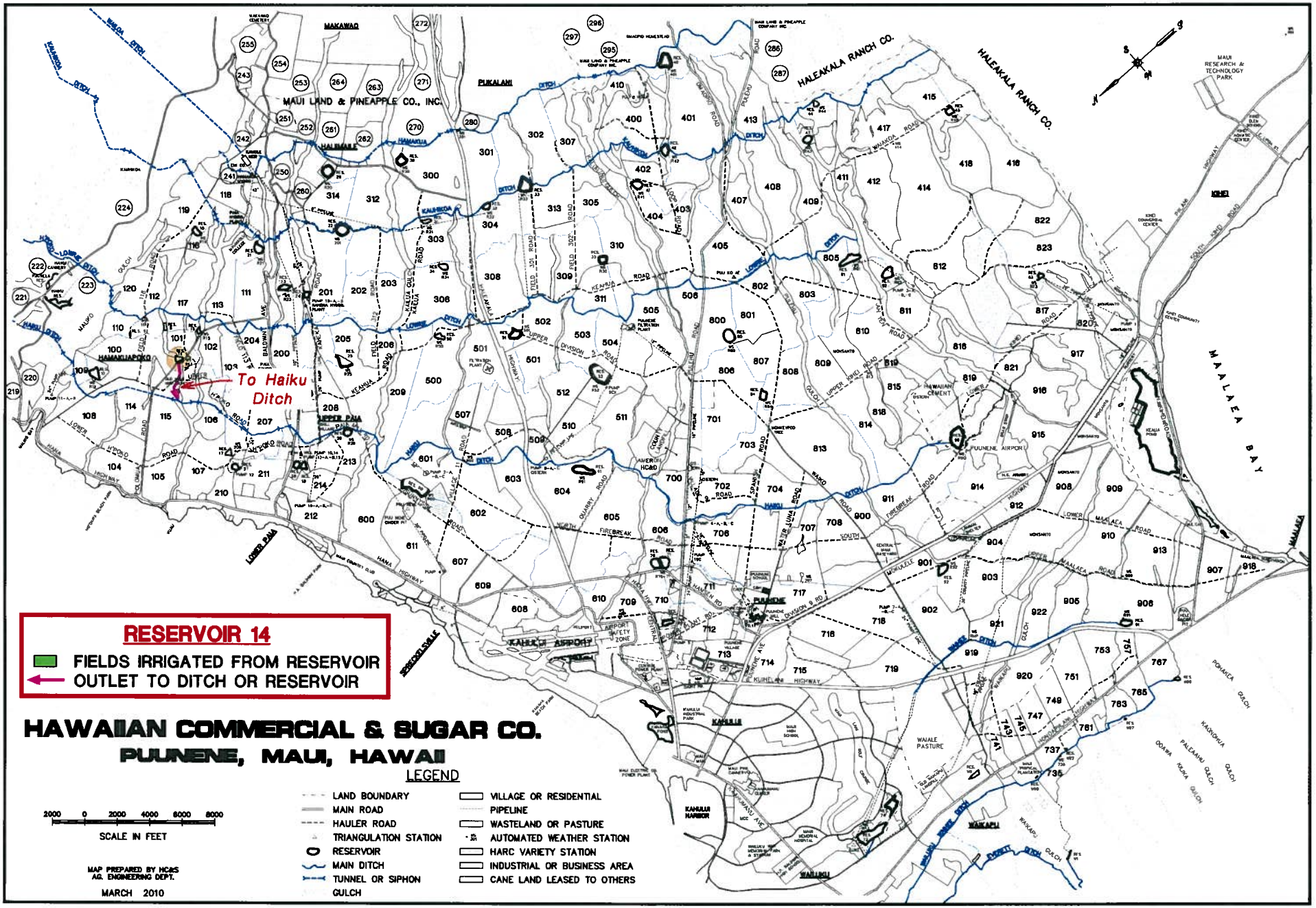
Exhibit C-4: HC&S Individual Reservoir Maps with Service Area

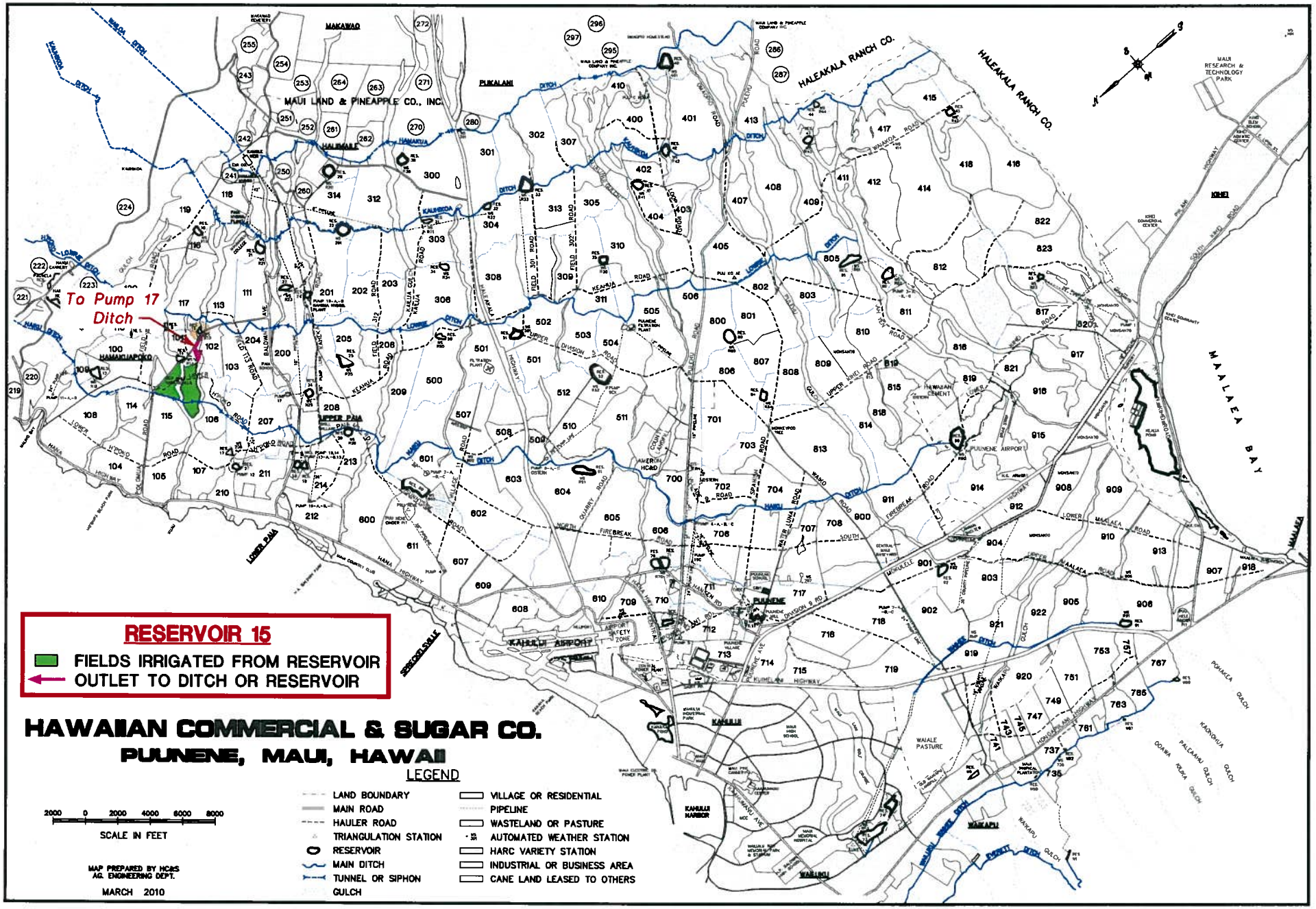


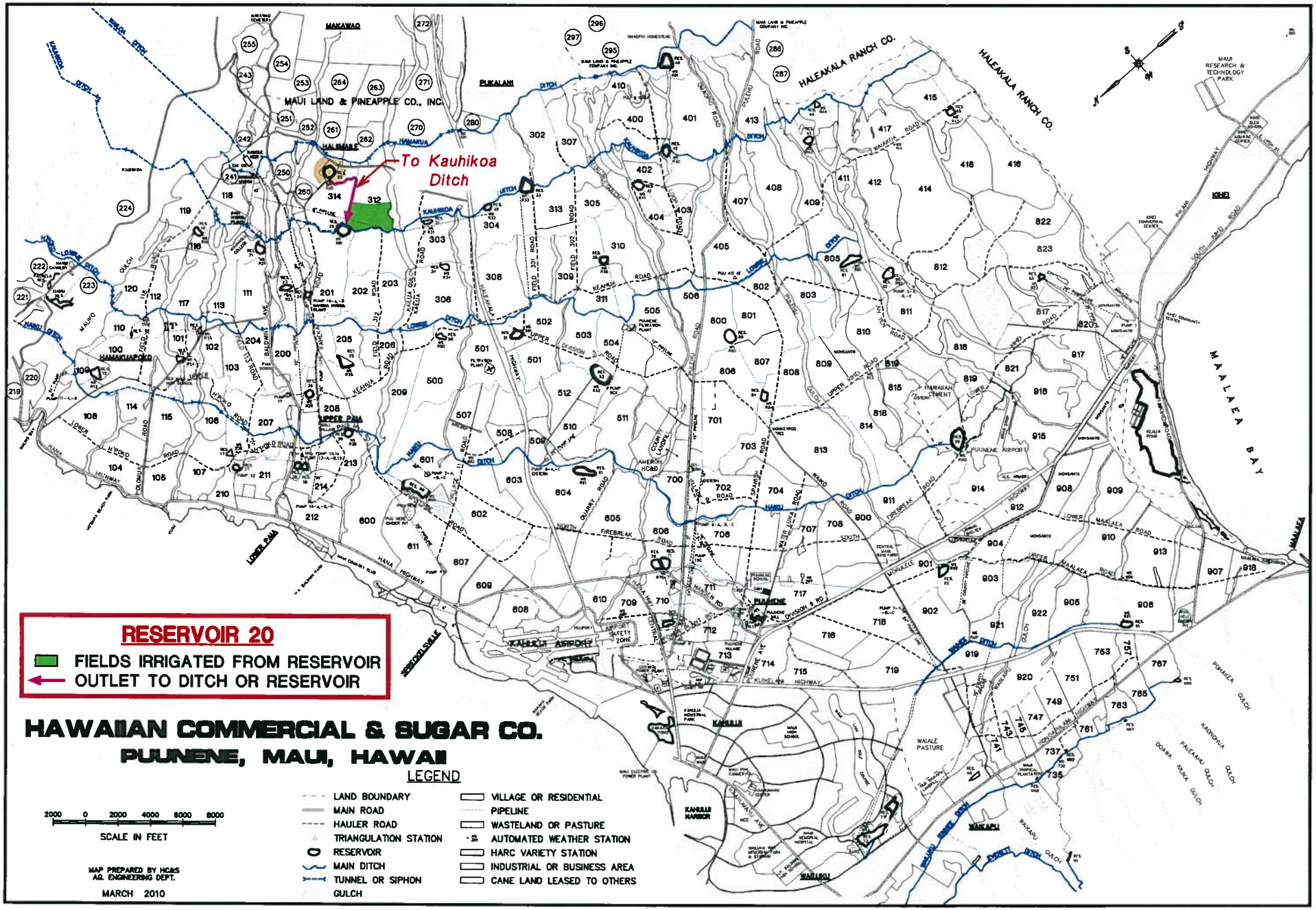
RESERVOIR 9
FIELDS IRRIGATED FROM RESERVOIR
OUTLET TO DITCH OR RESERVOIR
HAWAIIAN COMMERCIAL & SUGAR CO.
PUUNENE, MAUI, HAWAII
LEGEND
LAND BOUNDARY
MAIN ROAD
HAULER ROAD
TRIANGULATION STATION
RESERVOIR
MAIN DITCH
TUNNEL OR SIPHON
GULCH
VILLAGE OR RESIDENTIAL
PIPELINE
WASTELAND OR PASTURE
AUTOMATED WEATHER STATION
HARC VARIETY STATION
INDUSTRIAL OR BUSINESS AREA
CANE LAND LEASED TO OTHERS
2000 0 2000 4000 6000 8000
SCALE IN FEET
MAP PREPARED BY HC&S
AG. ENGINEERING DEPT.
MARCH 2010
Pump 11 Ditch
to Res. 12
or Res. 15
MAUI LAND & PINEAPPLE CO., INC.
HALEAKALA RANCH CO.
MAALAEA BAY
PUUNENE AIRPORT
KAHULUI AIRPORT
KAHULUI HARBOR
MAUI RESEARCH & TECHNOLOGY PARK


RESERVOIR 10
FIELDS IRRIGATED FROM RESERVOIR
OUTLET TO DITCH OR RESERVOIR
HAWAIIAN COMMERCIAL & SUGAR CO.
PUUNENE, MAUI, HAWAII
LEGEND
LAND BOUNDARY
MAIN ROAD
HAULER ROAD
TRIANGULATION STATION
RESERVOIR
MAIN DITCH
TUNNEL OR SIPHON
GULCH
VILLAGE OR RESIDENTIAL
PIPELINE
WASTELAND OR PASTURE
AUTOMATED WEATHER STATION
HARC VARIETY STATION
INDUSTRIAL OR BUSINESS AREA
CANE LAND LEASED TO OTHERS
2000 0 2000 4000 6000 8000
SCALE IN FEET
MAP PREPARED BY HC&S
AG. ENGINEERING DEPT.
MARCH 2010
MAUI LAND & PINEAPPLE CO., INC.
HALEAKALA RANCH CO.
MAALAEA BAY
MAKAWAO
PUKALANI
HALIMAILE
HAMAKUAPOKO
UPPER PAIA
LOWER PAIA
PUUNENE
KAHULUI
KAHULUI HARBOR
WAIKAPU
WAILUKU
KIHEI
MAALAEA
PUUNENE AIRPORT
KAHULUI AIRPORT
HAWAIIAN CEMENT
WAIALE PASTURE
MAUI RESEARCH & TECHNOLOGY PARK
SPRECKELSVILLE

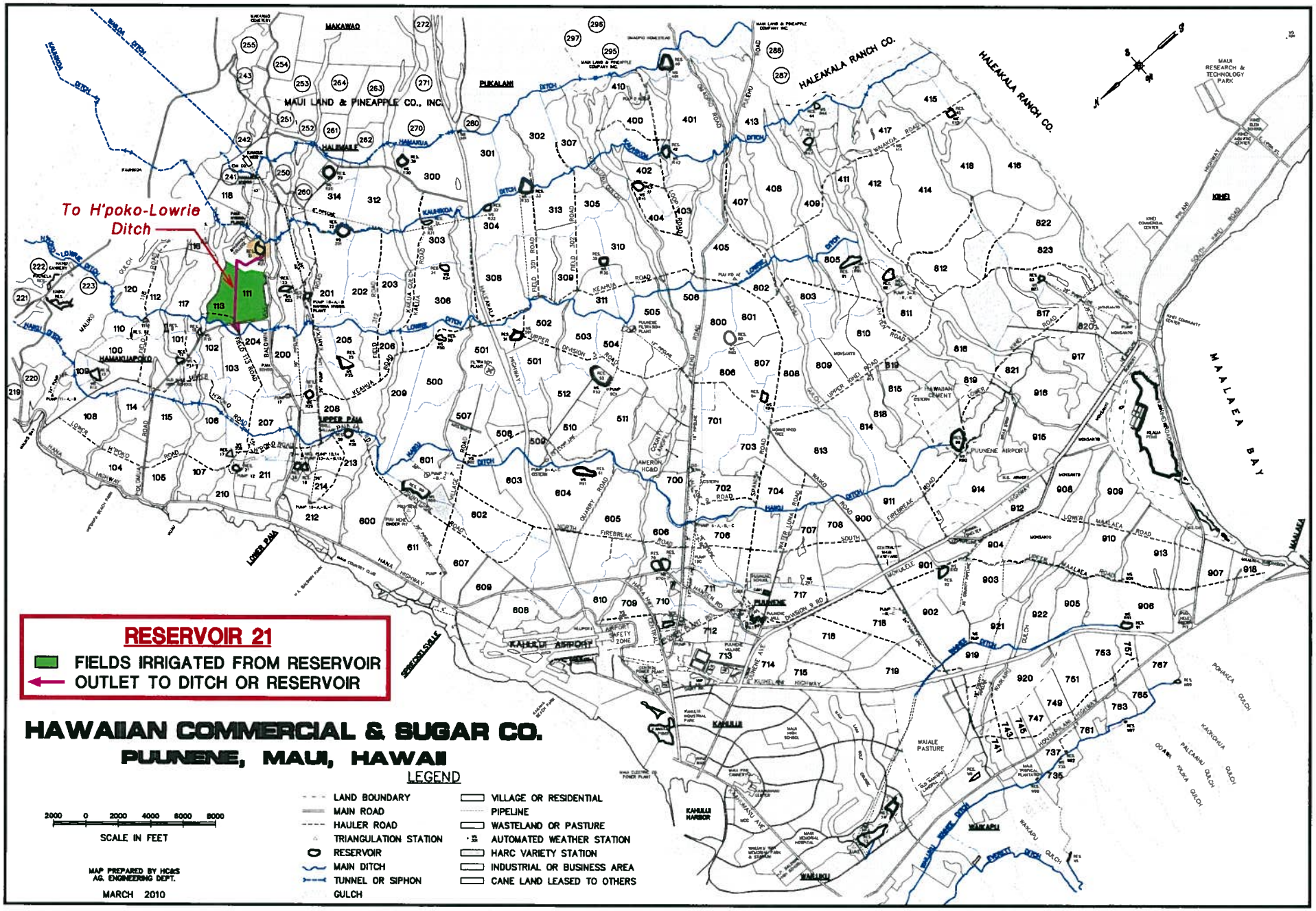

RESERVOIR 12
FIELDS IRRIGATED FROM RESERVOIR
OUTLET TO DITCH OR RESERVOIR
To Haiku Ditch
HAWAIIAN COMMERCIAL & SUGAR CO.
PUUNENE, MAUI, HAWAII
LEGEND
LAND BOUNDARY
MAIN ROAD
HAULER ROAD
TRIANGULATION STATION
RESERVOIR
MAIN DITCH
TUNNEL OR SIPHON
GULCH
VILLAGE OR RESIDENTIAL
PIPELINE
WASTELAND OR PASTURE
AUTOMATED WEATHER STATION
HARC VARIETY STATION
INDUSTRIAL OR BUSINESS AREA
CANE LAND LEASED TO OTHERS
2000 0 2000 4000 6000 8000
SCALE IN FEET
MAP PREPARED BY HC&S AG. ENGINEERING DEPT.
MARCH 2010
MAUI LAND & PINEAPPLE CO., INC.
HALEAKALA RANCH CO.
MAKAWAO
PUKALANI
KAHULUI AIRPORT
PUUNENE AIRPORT
KIHEI
MAALAEA BAY
KAHULUI HARBOR
WAILUKU
KAHULUI
PUUNENE
HANA HIGHWAY
KUIHELANI HIGHWAY
MAUI RESEARCH & TECHNOLOGY PARK

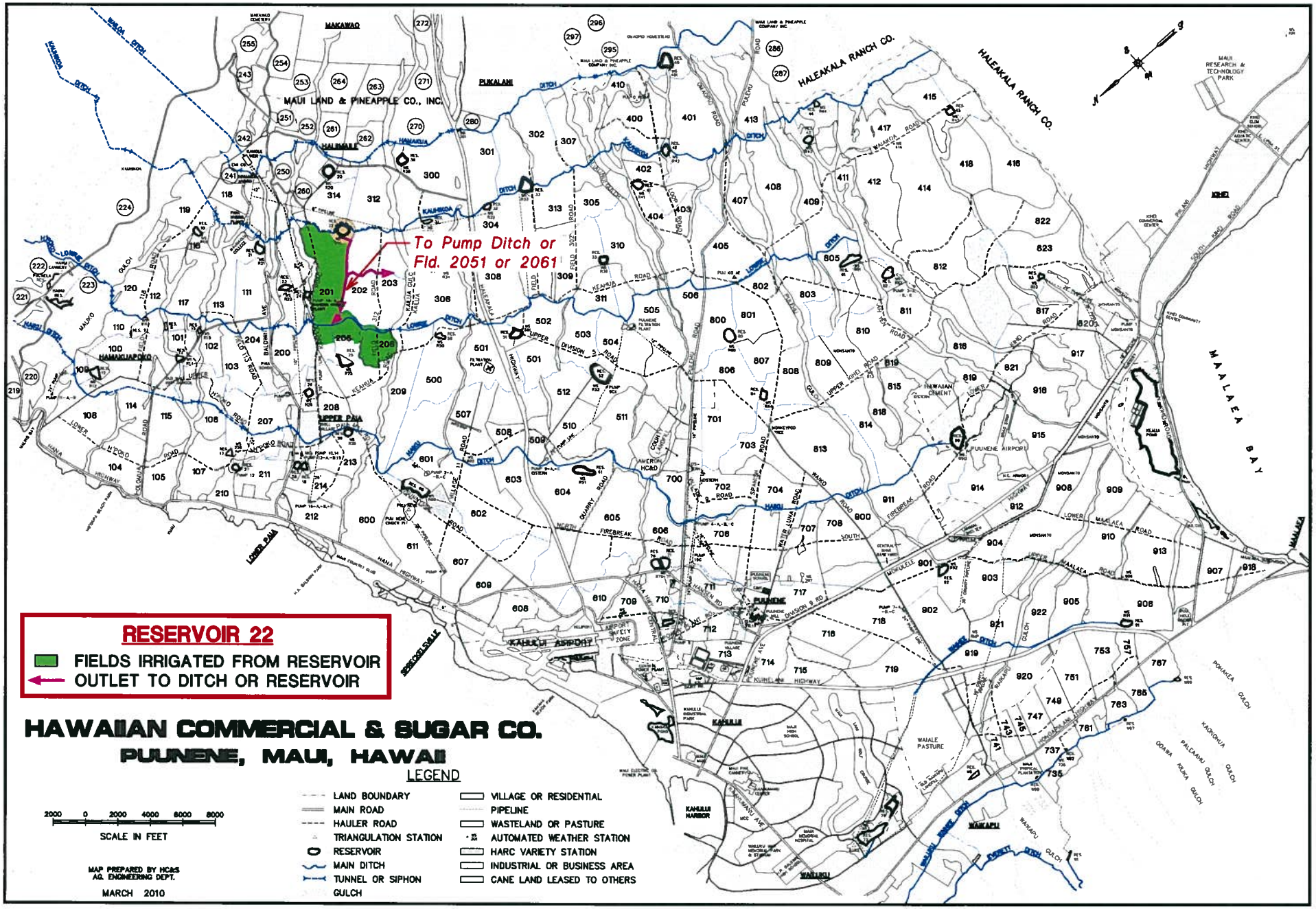

RESERVOIR 14
FIELDS IRRIGATED FROM RESERVOIR
OUTLET TO DITCH OR RESERVOIR
To Haiku Ditch
HAWAIIAN COMMERCIAL & SUGAR CO.
PUUNENE, MAUI, HAWAII
LEGEND
LAND BOUNDARY
MAIN ROAD
HAULER ROAD
TRIANGULATION STATION
RESERVOIR
MAIN DITCH
TUNNEL OR SIPHON
GULCH
VILLAGE OR RESIDENTIAL
PIPELINE
WASTELAND OR PASTURE
AUTOMATED WEATHER STATION
HARC VARIETY STATION
INDUSTRIAL OR BUSINESS AREA
CANE LAND LEASED TO OTHERS
2000 0 2000 4000 6000 8000
SCALE IN FEET
MAP PREPARED BY HC&S
AG. ENGINEERING DEPT.
MARCH 2010
MAUI LAND & PINEAPPLE CO., INC.
HALEAKALA RANCH CO.
MAKAWAO
PUKALANI
KAHULUI AIRPORT
PUUNENE
KIHEI
MAALAEA BAY
KAHULUI HARBOR
WAILUKU
WAIALE PASTURE

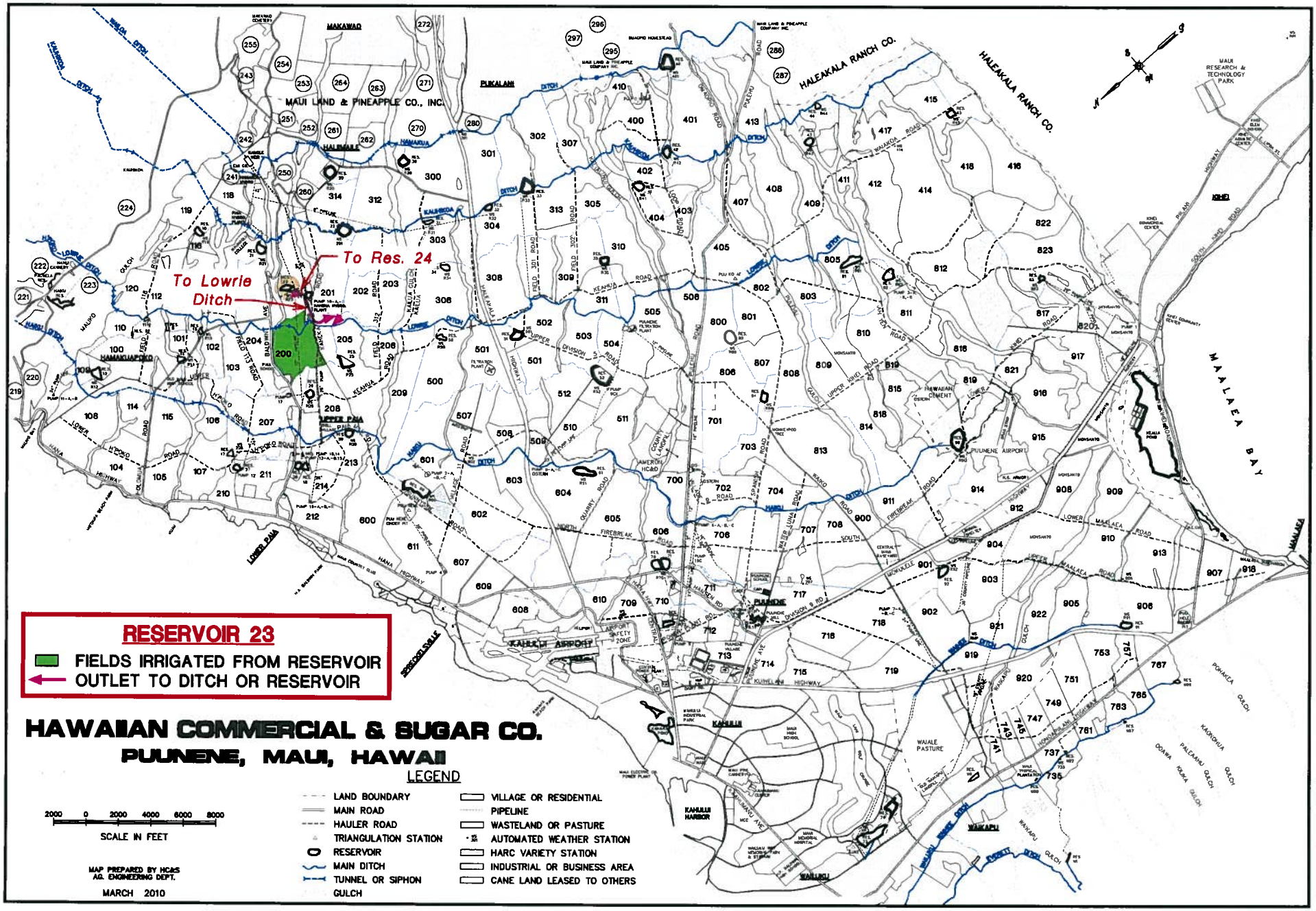

To Pump 17 Ditch
RESERVOIR 15
FIELDS IRRIGATED FROM RESERVOIR
OUTLET TO DITCH OR RESERVOIR
HAWAIIAN COMMERCIAL & SUGAR CO.
PUUNENE, MAUI, HAWAII
LEGEND
LAND BOUNDARY
MAIN ROAD
HAULER ROAD
TRIANGULATION STATION
RESERVOIR
MAIN DITCH
TUNNEL OR SIPHON
GULCH
VILLAGE OR RESIDENTIAL
PIPELINE
WASTELAND OR PASTURE
AUTOMATED WEATHER STATION
HARC VARIETY STATION
INDUSTRIAL OR BUSINESS AREA
CANE LAND LEASED TO OTHERS
2000 0 2000 4000 6000 8000
SCALE IN FEET
MAP PREPARED BY HC&S AG. ENGINEERING DEPT.
MARCH 2010
MAUI LAND & PINEAPPLE CO., INC.
HALEAKALA RANCH CO.
MAALAEA BAY
KAHULUI AIRPORT
PUUNENE AIRPORT
KAHULUI HARBOR
MAUI RESEARCH & TECHNOLOGY PARK



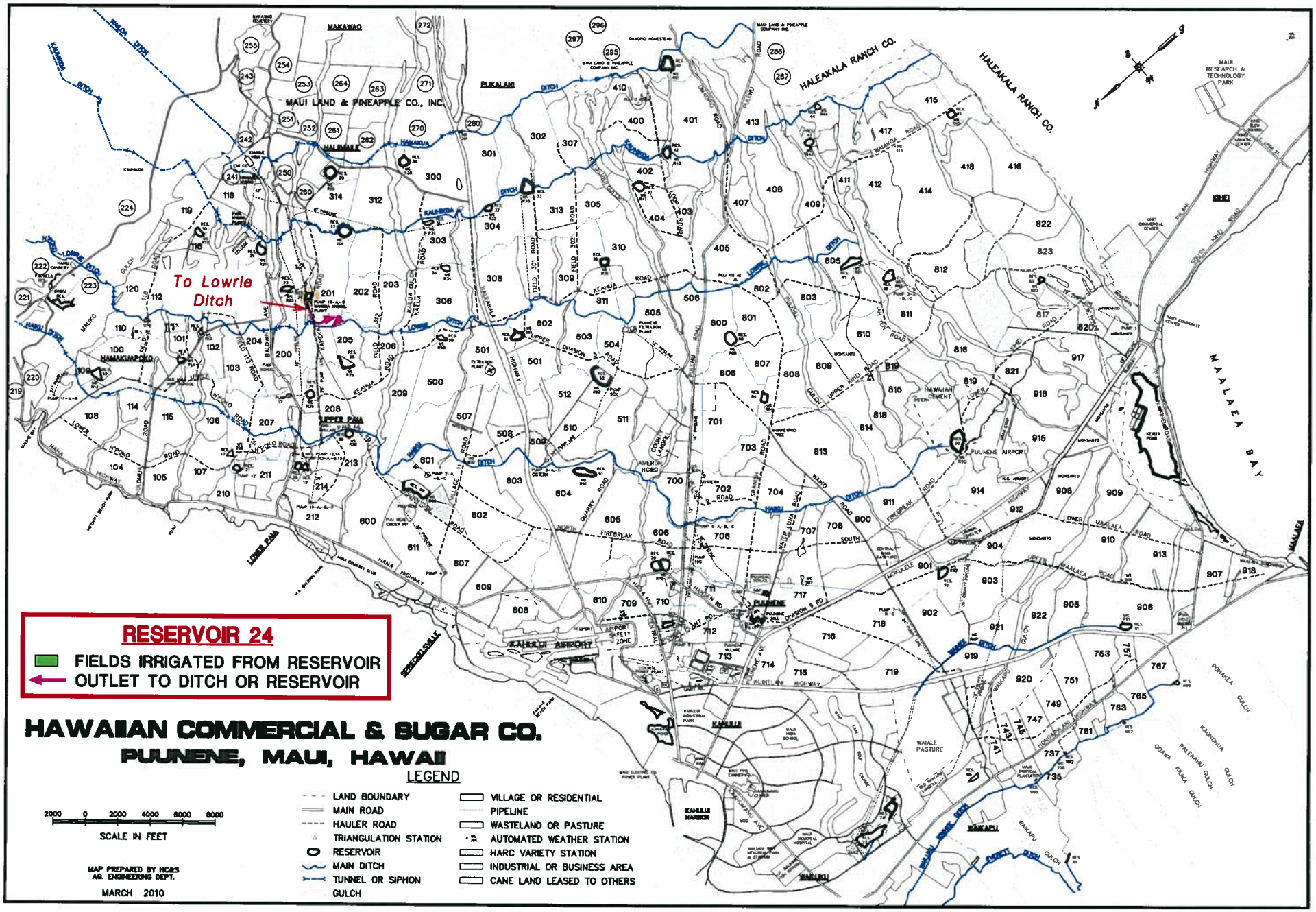
To Kauhikoa Ditch
RESERVOIR 20
FIELDS IRRIGATED FROM RESERVOIR
OUTLET TO DITCH OR RESERVOIR
HAWAIIAN COMMERCIAL & SUGAR CO.
PUUNENE, MAUI, HAWAII
LEGEND
LAND BOUNDARY
MAIN ROAD
HAULER ROAD
TRIANGULATION STATION
RESERVOIR
MAIN DITCH
TUNNEL OR SIPHON
GULCH
VILLAGE OR RESIDENTIAL
PIPELINE
WASTELAND OR PASTURE
AUTOMATED WEATHER STATION
HARC VARIETY STATION
INDUSTRIAL OR BUSINESS AREA
CANE LAND LEASED TO OTHERS
2000 0 2000 4000 6000 8000
SCALE IN FEET
MAP PREPARED BY HC&S
AG. ENGINEERING DEPT.
MARCH 2010
MAUI LAND & PINEAPPLE CO., INC.
HALEAKALA RANCH CO.
MAALAEA BAY
PUUNENE AIRPORT
KAHULUI AIRPORT
KAHULUI HARBOR
WAIALE PASTURE
MAUI RESEARCH & TECHNOLOGY PARK

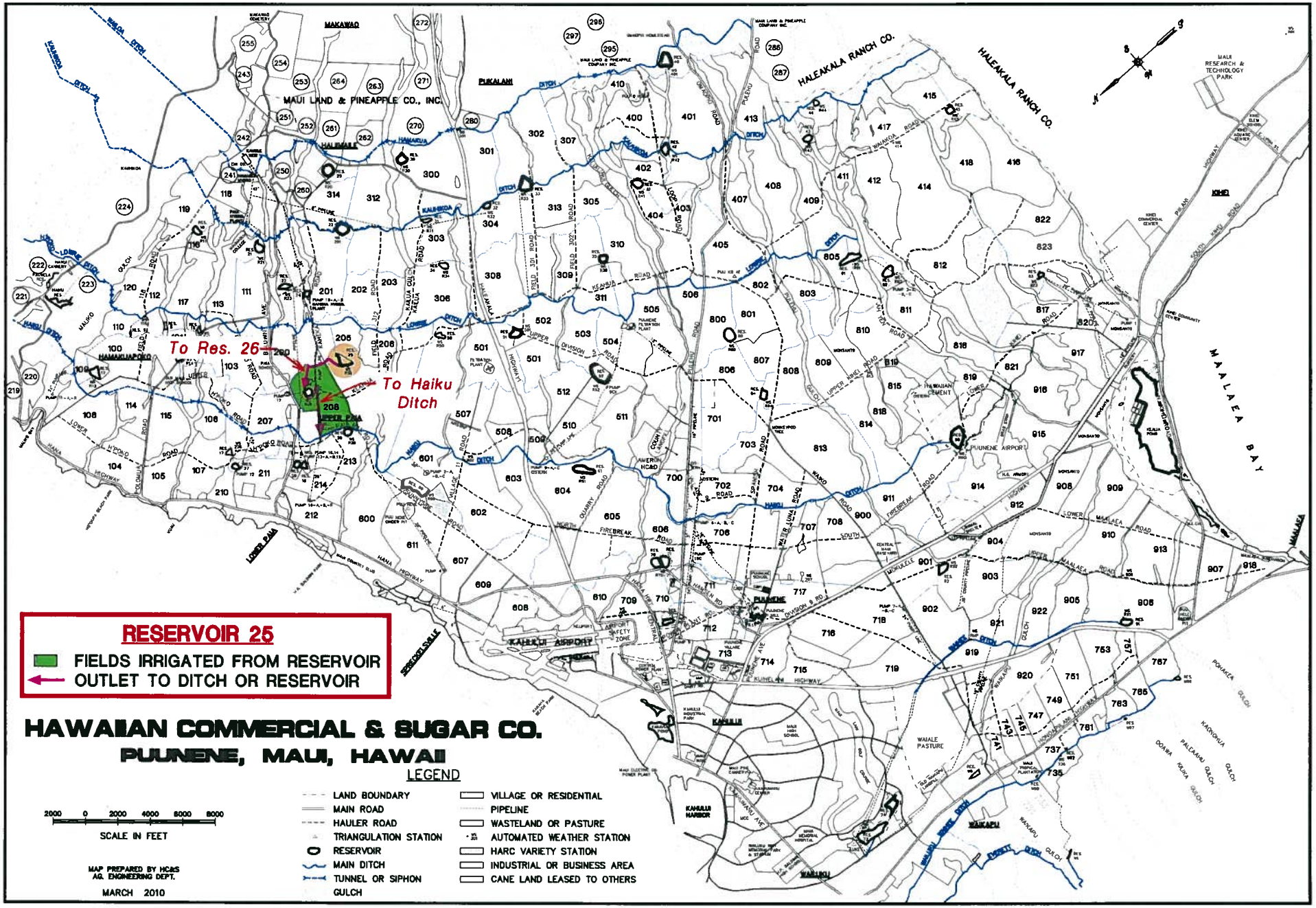

To H'poko-Lowrie Ditch
MAUI LAND & PINEAPPLE CO., INC.
HALEAKALA RANCH CO.
MAALAEA BAY
PUUNENE AIRPORT
KAHULUI AIRPORT
RESERVOIR 21
FIELDS IRRIGATED FROM RESERVOIR
OUTLET TO DITCH OR RESERVOIR
HAWAIIAN COMMERCIAL & SUGAR CO.
PUUNENE, MAUI, HAWAII
LEGEND
LAND BOUNDARY
MAIN ROAD
HAULER ROAD
TRIANGULATION STATION
RESERVOIR
MAIN DITCH
TUNNEL OR SIPHON
GULCH
VILLAGE OR RESIDENTIAL
PIPELINE
WASTELAND OR PASTURE
AUTOMATED WEATHER STATION
HARC VARIETY STATION
INDUSTRIAL OR BUSINESS AREA
CANE LAND LEASED TO OTHERS
2000 0 2000 4000 6000 8000
SCALE IN FEET
MAP PREPARED BY HC&S AG. ENGINEERING DEPT.
MARCH 2010


To Pump Ditch or
Fld. 2051 or 2061
RESERVOIR 22
FIELDS IRRIGATED FROM RESERVOIR
OUTLET TO DITCH OR RESERVOIR
HAWAIIAN COMMERCIAL & SUGAR CO.
PUUNENE, MAUI, HAWAII
LEGEND
LAND BOUNDARY
MAIN ROAD
HAULER ROAD
TRIANGULATION STATION
RESERVOIR
MAIN DITCH
TUNNEL OR SIPHON
GULCH
VILLAGE OR RESIDENTIAL
PIPELINE
WASTELAND OR PASTURE
AUTOMATED WEATHER STATION
HARC VARIETY STATION
INDUSTRIAL OR BUSINESS AREA
CANE LAND LEASED TO OTHERS
2000 0 2000 4000 6000 8000
SCALE IN FEET
MAP PREPARED BY HC&S
AG. ENGINEERING DEPT.
MARCH 2010
MAUI LAND & PINEAPPLE CO., INC.
HALEAKALA RANCH CO.
MAALAEA BAY
KAHULUI AIRPORT
PUUNENE AIRPORT
KAHULUI HARBOR
WAILUKU
MAKAWAO
PUKALANI
HAMAKUAPOKO
UPPER PAIA
LOWER PAIA
KIHEI

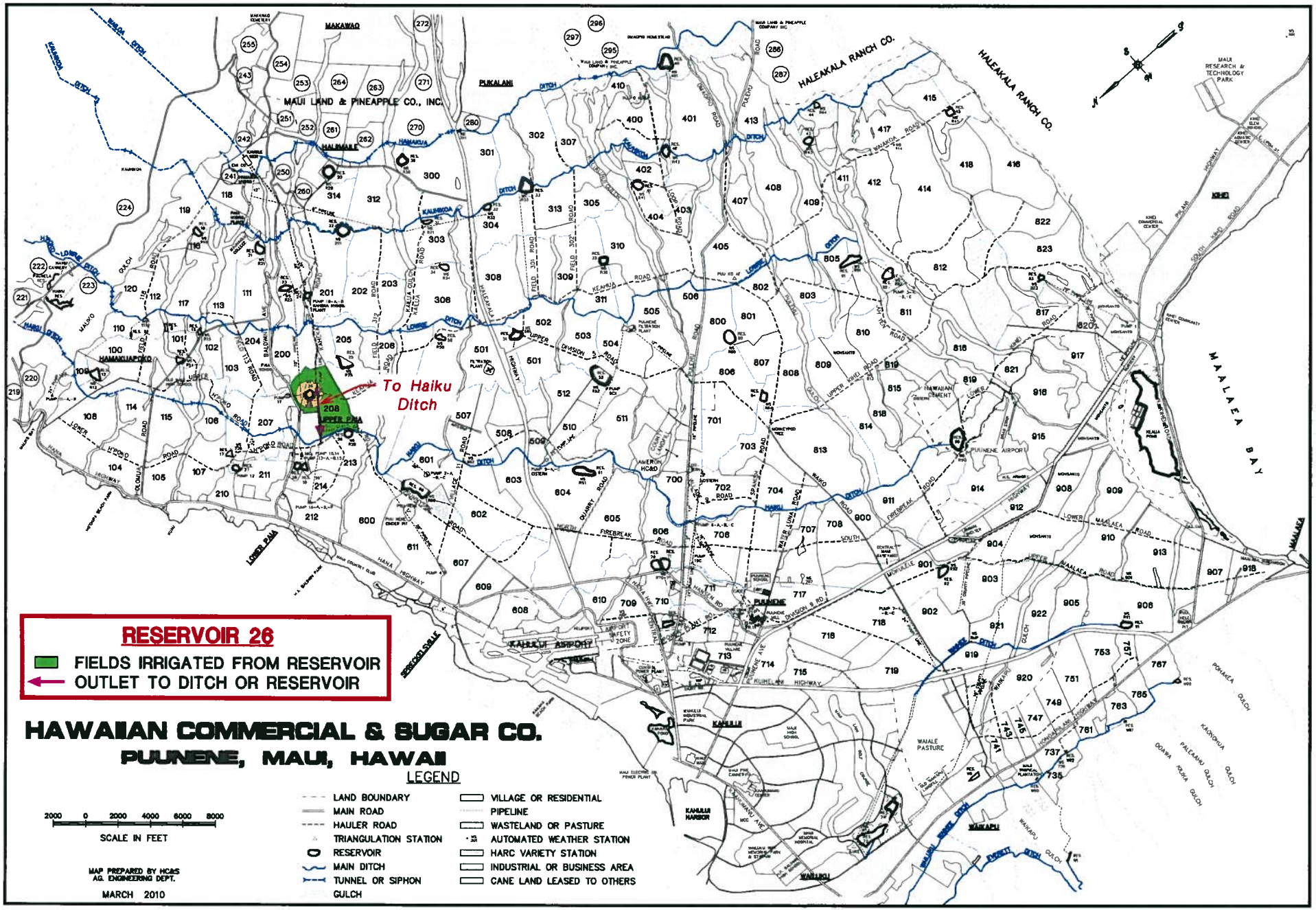


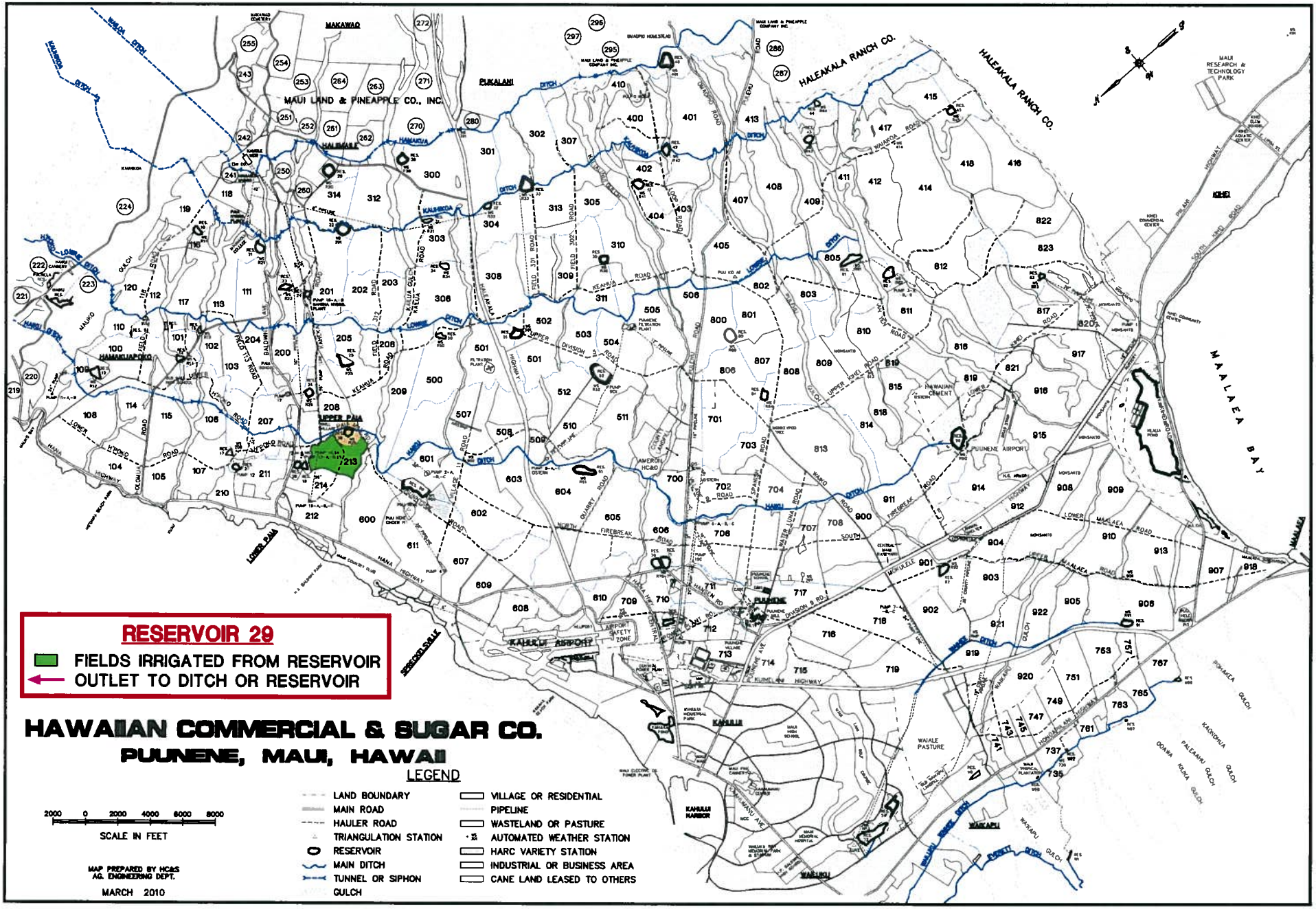
RESERVOIR 23
FIELDS IRRIGATED FROM RESERVOIR
OUTLET TO DITCH OR RESERVOIR
To Res. 24
To Lowrie Ditch
HAWAIIAN COMMERCIAL & SUGAR CO.
PUUNENE, MAUI, HAWAII
LEGEND
LAND BOUNDARY
MAIN ROAD
HAULER ROAD
TRIANGULATION STATION
RESERVOIR
MAIN DITCH
TUNNEL OR SIPHON
GULCH
VILLAGE OR RESIDENTIAL
PIPELINE
WASTELAND OR PASTURE
AUTOMATED WEATHER STATION
HARC VARIETY STATION
INDUSTRIAL OR BUSINESS AREA
CANE LAND LEASED TO OTHERS
2000 0 2000 4000 6000 8000
SCALE IN FEET
MAP PREPARED BY HC&S AG. ENGINEERING DEPT.
MARCH 2010
MAUI LAND & PINEAPPLE CO., INC.
HALEAKALA RANCH CO.
MAALAEA BAY
PUUNENE AIRPORT
KAHULUI AIRPORT
KAHULUI HARBOR
WAIALE PASTURE
MAUI RESEARCH & TECHNOLOGY PARK

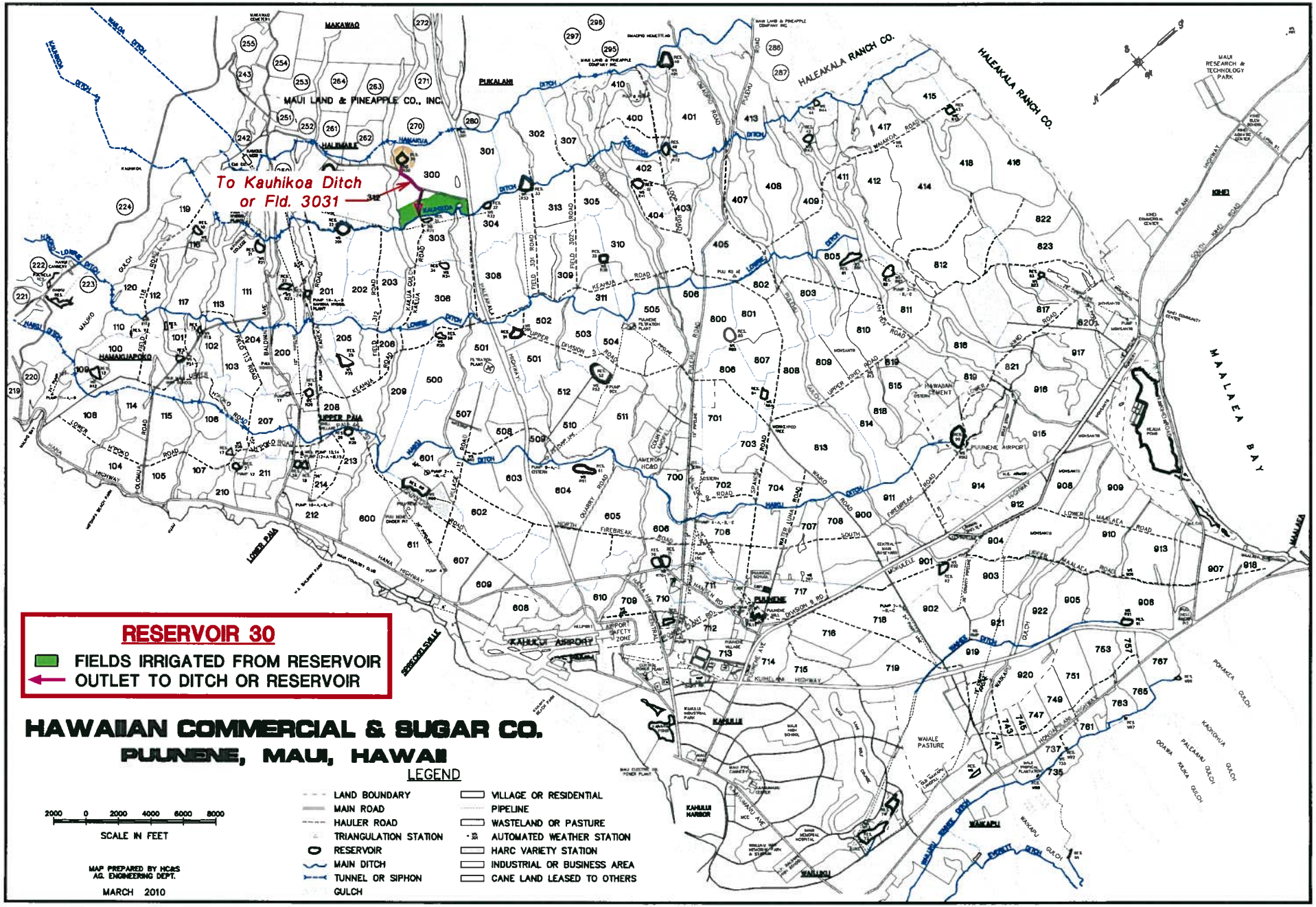

RESERVOIR 24
FIELDS IRRIGATED FROM RESERVOIR
OUTLET TO DITCH OR RESERVOIR
HAWAIIAN COMMERCIAL & SUGAR CO.
PUUNENE, MAUI, HAWAII
LEGEND
LAND BOUNDARY
MAIN ROAD
HAULER ROAD
TRIANGULATION STATION
RESERVOIR
MAIN DITCH
TUNNEL OR SIPHON
GULCH
VILLAGE OR RESIDENTIAL
PIPELINE
WASTELAND OR PASTURE
AUTOMATED WEATHER STATION
HARC VARIETY STATION
INDUSTRIAL OR BUSINESS AREA
CANE LAND LEASED TO OTHERS
2000 0 2000 4000 6000 8000
SCALE IN FEET
MAP PREPARED BY HC&S
AG. ENGINEERING DEPT.
MARCH 2010
To Lowrie Ditch
MAUI LAND & PINEAPPLE CO., INC.
HALEAKALA RANCH CO.
MAALAEA BAY
MAUI RESEARCH & TECHNOLOGY PARK
PUUNENE AIRPORT
KAHULUI AIRPORT
KAHULUI HARBOR
WAIALE PASTURE
MAKAWAO
PUKALANI
HALIMAILE
HAMAKUAPOKO
UPPER PAIA
LOWER PAIA
KIHEI
MAALAEA
WAIKAPU
WAILUKU
PUUNENE

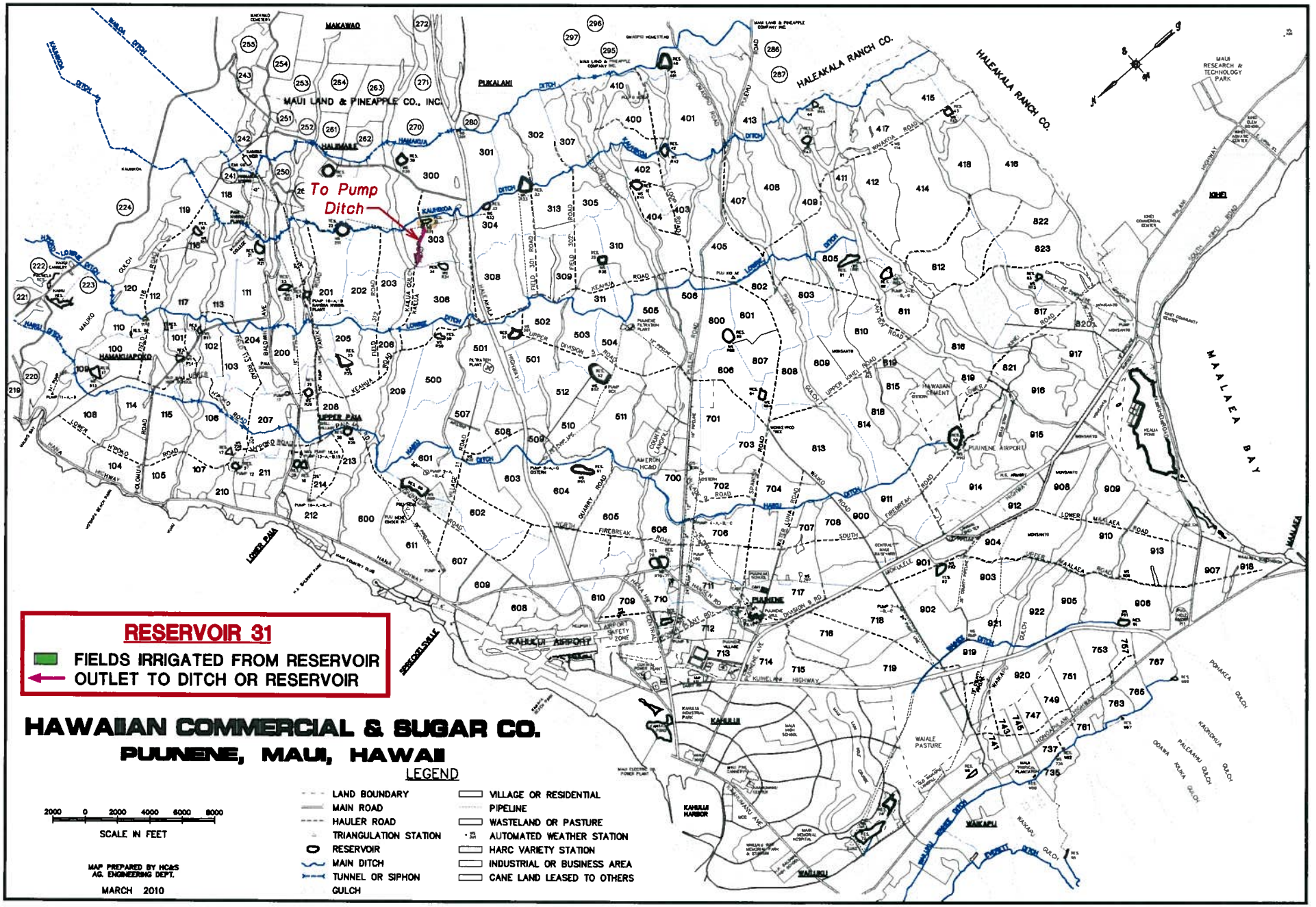


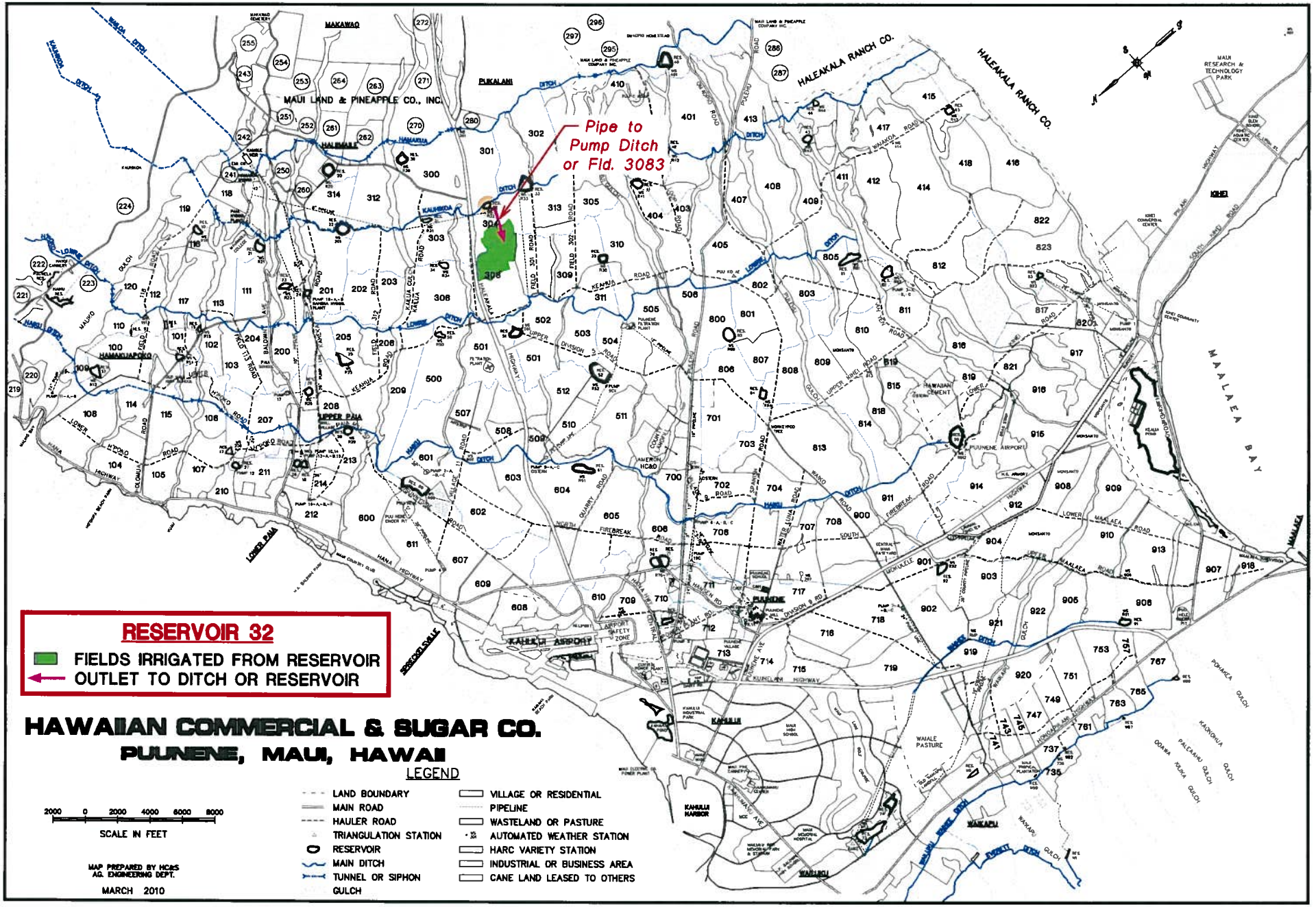
RESERVOIR 25
FIELDS IRRIGATED FROM RESERVOIR
OUTLET TO DITCH OR RESERVOIR
To Res. 26
To Haiku Ditch
HAWAIIAN COMMERCIAL & SUGAR CO.
PUUNENE, MAUI, HAWAII
LEGEND
LAND BOUNDARY
MAIN ROAD
HAULER ROAD
TRIANGULATION STATION
RESERVOIR
MAIN DITCH
TUNNEL OR SIPHON
GULCH
VILLAGE OR RESIDENTIAL
PIPELINE
WASTELAND OR PASTURE
AUTOMATED WEATHER STATION
HARC VARIETY STATION
INDUSTRIAL OR BUSINESS AREA
CANE LAND LEASED TO OTHERS
2000 0 2000 4000 6000 8000
SCALE IN FEET
MAP PREPARED BY HC&S AG. ENGINEERING DEPT.
MARCH 2010
MAUI LAND & PINEAPPLE CO., INC.
HALEAKALA RANCH CO.
MAALAEA BAY
PUUNENE AIRPORT
KAHULUI AIRPORT
KAHULUI HARBOR
WAIKAPU
WAILUKU
MAKAWAO
PUKALANI
HALIMAILE
HAMAKUAPOKO
UPPER PAIA
LOWER PAIA
KIHEI
MAUI RESEARCH & TECHNOLOGY PARK

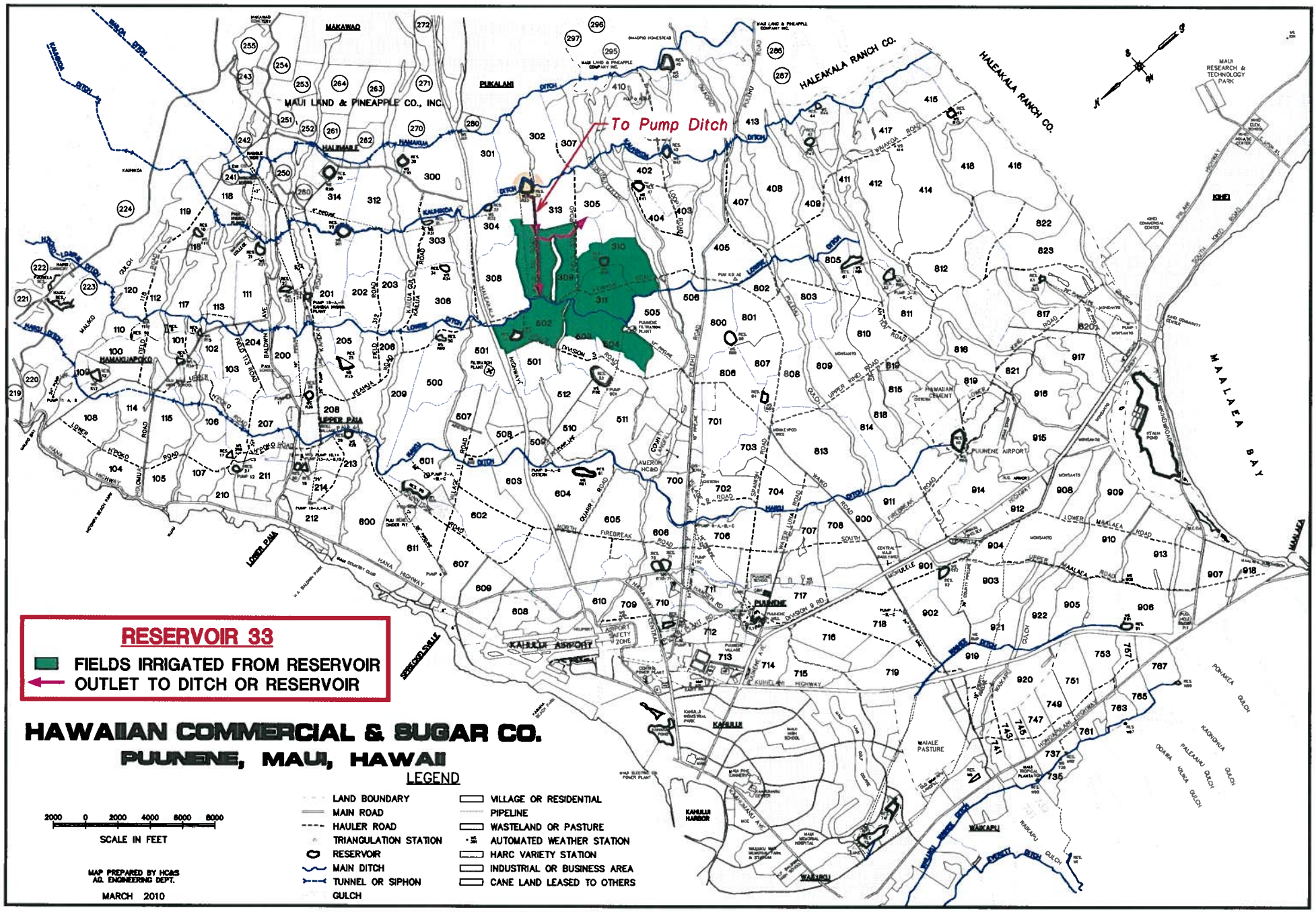

RESERVOIR 26
FIELDS IRRIGATED FROM RESERVOIR
OUTLET TO DITCH OR RESERVOIR
HAWAIIAN COMMERCIAL & SUGAR CO.
PUUNENE, MAUI, HAWAII
LEGEND
LAND BOUNDARY
MAIN ROAD
HAULER ROAD
TRIANGULATION STATION
RESERVOIR
MAIN DITCH
TUNNEL OR SIPHON
GULCH
VILLAGE OR RESIDENTIAL
PIPELINE
WASTELAND OR PASTURE
AUTOMATED WEATHER STATION
HARC VARIETY STATION
INDUSTRIAL OR BUSINESS AREA
CANE LAND LEASED TO OTHERS
2000 0 2000 4000 6000 8000
SCALE IN FEET
MAP PREPARED BY HC&S
AG. ENGINEERING DEPT.
MARCH 2010
To Haiku Ditch
MAUI LAND & PINEAPPLE CO., INC.
HALEAKALA RANCH CO.
MAALAEA BAY
MAUI RESEARCH & TECHNOLOGY PARK
PUUNENE AIRPORT
KAHULUI AIRPORT
KAHULUI HARBOR
WAIALE PASTURE
MAKAWAO
PUKALANI
HALIMAILE
HAMAKUAPOKO
UPPER PAIA
LOWER PAIA
KIHEI
MAALAEA
PUUNENE
KAHULUI
WAIKAPU
WAILUKU
HANA HIGHWAY
KUIHELANI HIGHWAY
SPRECKELSVILLE
HAWAIIAN CEMENT
AMERON HC&D
KAUHIKOA DITCH
HAMAKUA DITCH
LOWER DITCH
HAIKU DITCH
WAIKAPU GULCH
EVERETT DITCH
POHAKEA GULCH
KAONOHUA GULCH
PALEAAHU GULCH
OOAWA KIUKA GULCH


RESERVOIR 29
FIELDS IRRIGATED FROM RESERVOIR
OUTLET TO DITCH OR RESERVOIR
HAWAIIAN COMMERCIAL & SUGAR CO.
PUUNENE, MAUI, HAWAII
LEGEND
LAND BOUNDARY
MAIN ROAD
HAULER ROAD
TRIANGULATION STATION
RESERVOIR
MAIN DITCH
TUNNEL OR SIPHON
GULCH
VILLAGE OR RESIDENTIAL
PIPELINE
WASTELAND OR PASTURE
AUTOMATED WEATHER STATION
HARC VARIETY STATION
INDUSTRIAL OR BUSINESS AREA
CANE LAND LEASED TO OTHERS
2000 0 2000 4000 6000 8000
SCALE IN FEET
MAP PREPARED BY HC&S
AG. ENGINEERING DEPT.
MARCH 2010
MAUI LAND & PINEAPPLE CO., INC.
HALEAKALA RANCH CO.
MAALAEA BAY
MAUI RESEARCH & TECHNOLOGY PARK
PUUNENE AIRPORT
KAHULUI AIRPORT
KAHULUI HARBOR
WAIALE PASTURE
UPPER PAIA
LOWER PAIA
MAKAWAO
PUKALANI
HALIIMAILE
HAMAKUAPOKO
KIHEI
MAALAEA
PUUNENE
KAHULUI
WAIKAPU
WAILUKU
SPRECKELSVILLE
HANA HIGHWAY
HAWAIIAN CEMENT
AMERON HC&D
KAUHIKOA DITCH
LOWER DITCH
HAMAKUA DITCH
WAIKAPU GULCH
EVERETT DITCH
POHAKEA GULCH
KAOHOHUA GULCH
PALEAAHU GULCH
OOAWA KOLKA GULCH

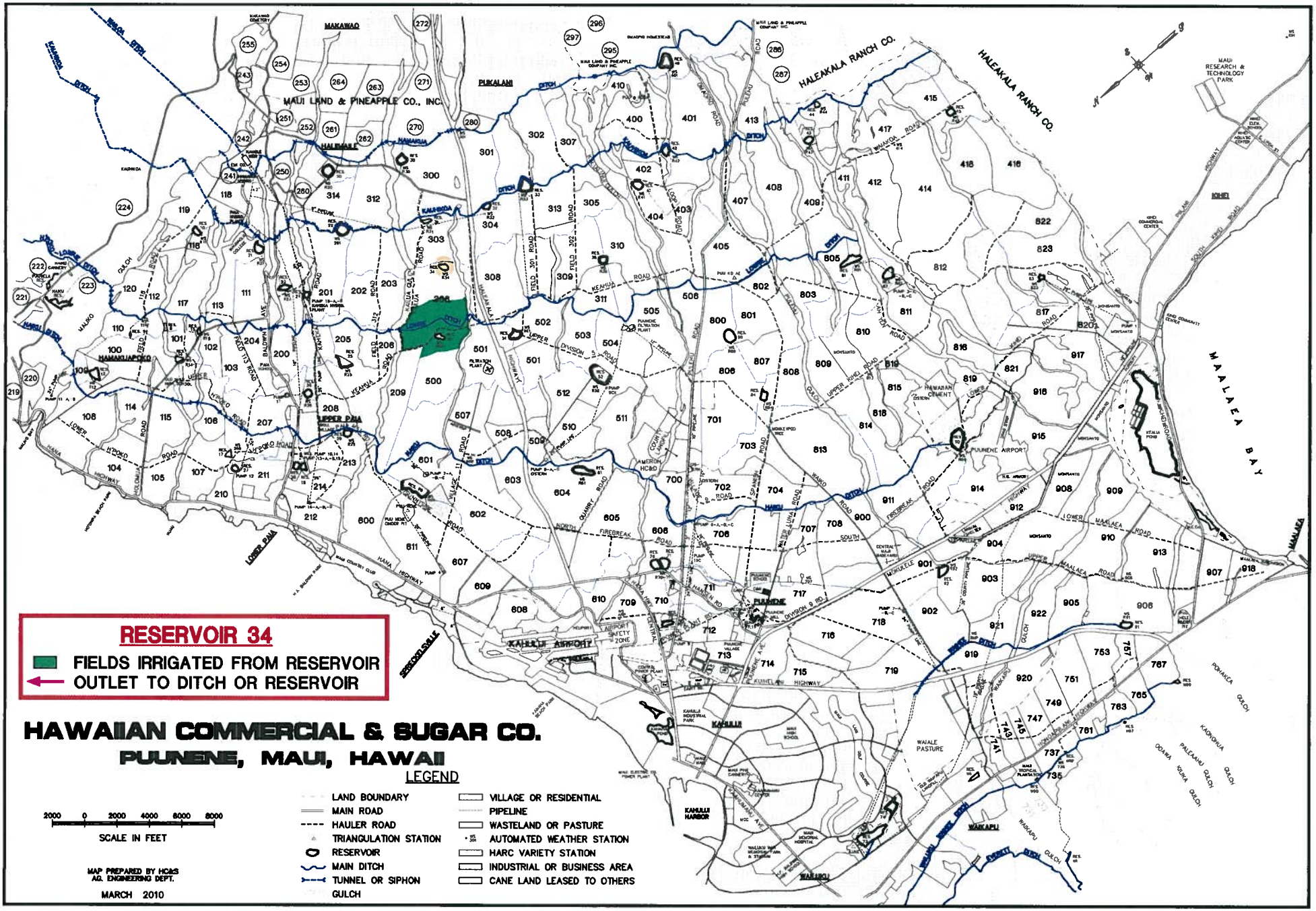

To Kauhikoa Ditch
or Fld. 3031
RESERVOIR 30
FIELDS IRRIGATED FROM RESERVOIR
OUTLET TO DITCH OR RESERVOIR
HAWAIIAN COMMERCIAL & SUGAR CO.
PUUNENE, MAUI, HAWAII
LEGEND
LAND BOUNDARY
MAIN ROAD
HAULER ROAD
TRIANGULATION STATION
RESERVOIR
MAIN DITCH
TUNNEL OR SIPHON
GULCH
VILLAGE OR RESIDENTIAL
PIPELINE
WASTELAND OR PASTURE
AUTOMATED WEATHER STATION
HARC VARIETY STATION
INDUSTRIAL OR BUSINESS AREA
CANE LAND LEASED TO OTHERS
2000 0 2000 4000 6000 8000
SCALE IN FEET
MAP PREPARED BY HC&S
AG. ENGINEERING DEPT.
MARCH 2010
MAUI LAND & PINEAPPLE CO., INC.
HALEAKALA RANCH CO.
MAKAWAO
PUKALANI
KIHEI
MAALAEA BAY
PUUNENE
KAHULUI AIRPORT
KAHULUI HARBOR
WAILUKU
WAKAPU
WAIALE PASTURE
MAUI RESEARCH & TECHNOLOGY PARK

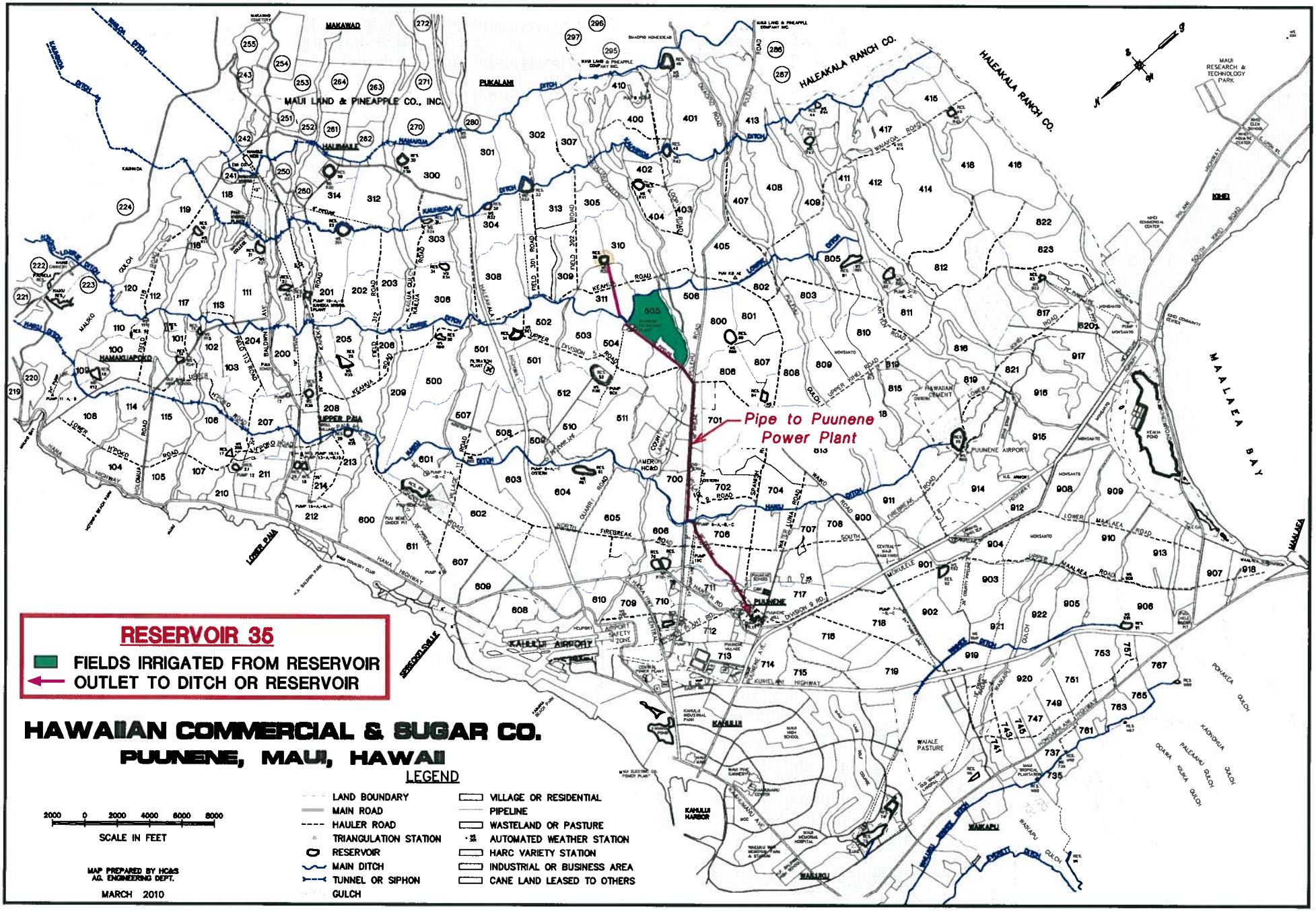

To Pump Ditch
RESERVOIR 31
FIELDS IRRIGATED FROM RESERVOIR
OUTLET TO DITCH OR RESERVOIR
HAWAIIAN COMMERCIAL & SUGAR CO.
PUUNENE, MAUI, HAWAII
LEGEND
LAND BOUNDARY
MAIN ROAD
HAULER ROAD
TRIANGULATION STATION
RESERVOIR
MAIN DITCH
TUNNEL OR SIPHON
GULCH
VILLAGE OR RESIDENTIAL
PIPELINE
WASTELAND OR PASTURE
AUTOMATED WEATHER STATION
HARC VARIETY STATION
INDUSTRIAL OR BUSINESS AREA
CANE LAND LEASED TO OTHERS
2000 0 2000 4000 6000 8000
SCALE IN FEET
MAP PREPARED BY HC&S AG. ENGINEERING DEPT.
MARCH 2010
MAKAWAO
PUKALANI
MAUI LAND & PINEAPPLE CO., INC.
HALEAKALA RANCH CO.
KIHEI
MAALAEA BAY
PUUNENE
KAHULUI AIRPORT
KAHULUI HARBOR
WAILUKU
WAIALE PASTURE


Pipe to
Pump Ditch
or Fld. 3083
RESERVOIR 32
FIELDS IRRIGATED FROM RESERVOIR
OUTLET TO DITCH OR RESERVOIR
HAWAIIAN COMMERCIAL & SUGAR CO.
PUUNENE, MAUI, HAWAII
LEGEND
LAND BOUNDARY
MAIN ROAD
HAULER ROAD
TRIANGULATION STATION
RESERVOIR
MAIN DITCH
TUNNEL OR SIPHON
GULCH
VILLAGE OR RESIDENTIAL
PIPELINE
WASTELAND OR PASTURE
AUTOMATED WEATHER STATION
HARC VARIETY STATION
INDUSTRIAL OR BUSINESS AREA
CANE LAND LEASED TO OTHERS
2000 0 2000 4000 6000 8000
SCALE IN FEET
MAP PREPARED BY HC&S
AG. ENGINEERING DEPT.
MARCH 2010
MAUI LAND & PINEAPPLE CO., INC.
HALEAKALA RANCH CO.
MAALAEA BAY
KAHULUI AIRPORT
PUUNENE AIRPORT
KAHULUI HARBOR

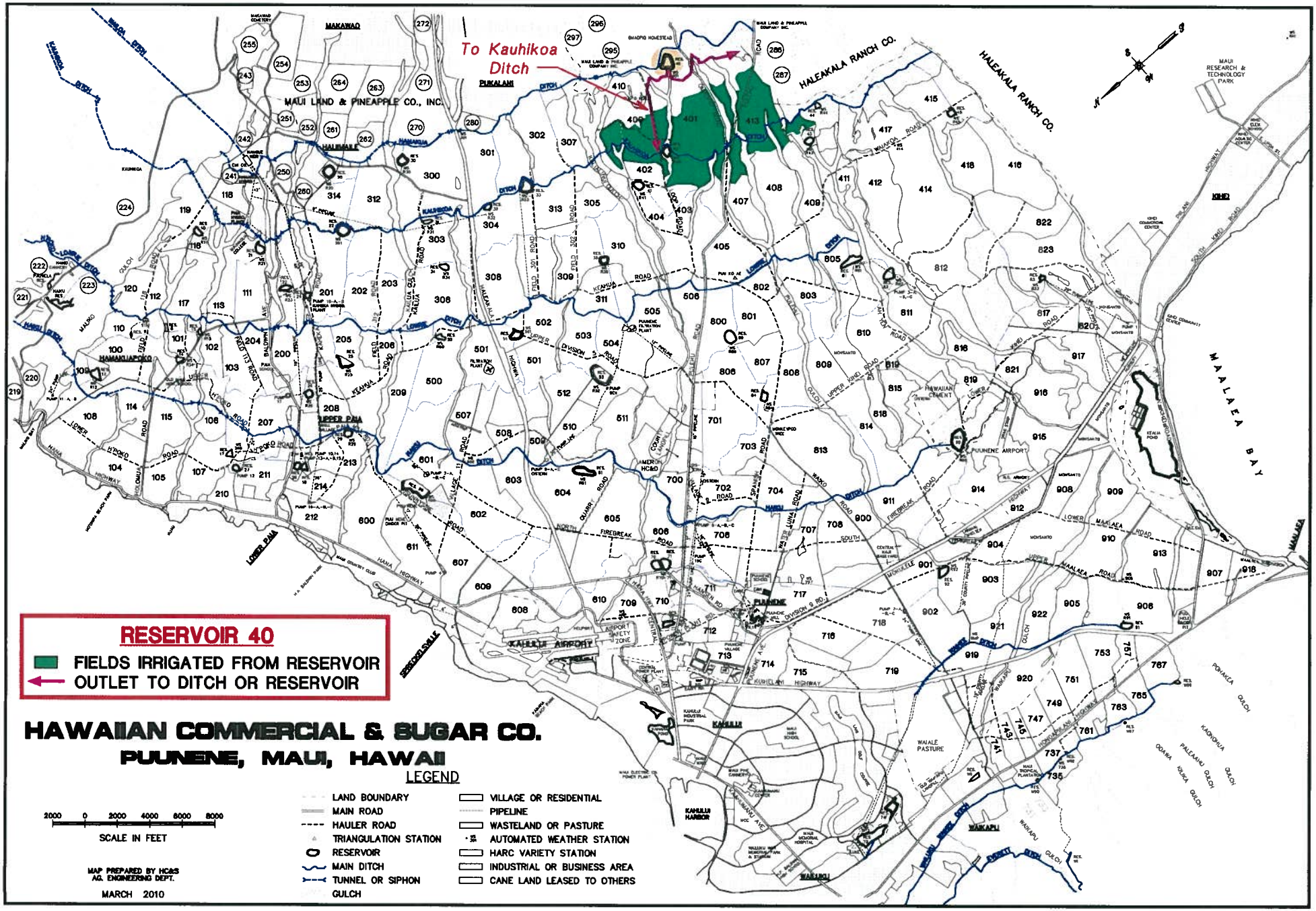


To Pump Ditch
RESERVOIR 33
FIELDS IRRIGATED FROM RESERVOIR
OUTLET TO DITCH OR RESERVOIR
HAWAIIAN COMMERCIAL & SUGAR CO.
PUUNENE, MAUI, HAWAII
LEGEND
LAND BOUNDARY
MAIN ROAD
HAULER ROAD
TRIANGULATION STATION
RESERVOIR
MAIN DITCH
TUNNEL OR SIPHON
GULCH
VILLAGE OR RESIDENTIAL
PIPELINE
WASTELAND OR PASTURE
AUTOMATED WEATHER STATION
HARC VARIETY STATION
INDUSTRIAL OR BUSINESS AREA
CANE LAND LEASED TO OTHERS
2000 0 2000 4000 6000 8000
SCALE IN FEET
MAP PREPARED BY HC&S
AG. ENGINEERING DEPT.
MARCH 2010
MAUI LAND & PINEAPPLE CO., INC.
HALEAKALA RANCH CO.
MAALAEA BAY
PUUNENE AIRPORT
KAHULUI AIRPORT
KAHULUI HARBOR
WAIAKU
WAIKAPU
KIHEI
MAKAWAO
PUKALANI
HALIMAILE
HAMAKUAPOKO
UPPER PAIA
LOWER PAIA
PUUNENE
KAHULUI

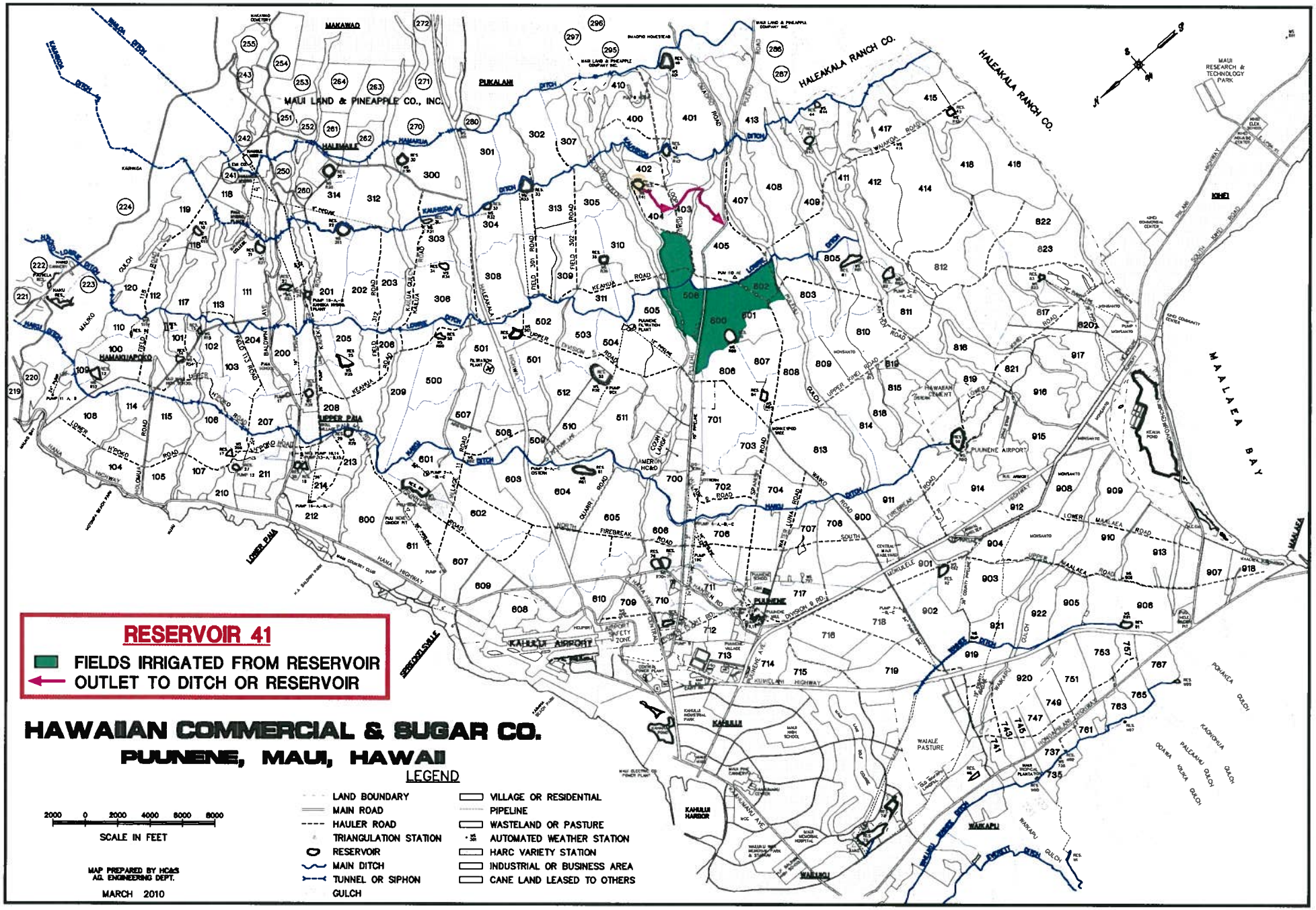

RESERVOIR 34
FIELDS IRRIGATED FROM RESERVOIR
OUTLET TO DITCH OR RESERVOIR
HAWAIIAN COMMERCIAL & SUGAR CO.
PUUNENE, MAUI, HAWAII
LEGEND
LAND BOUNDARY
MAIN ROAD
HAULER ROAD
TRIANGULATION STATION
RESERVOIR
MAIN DITCH
TUNNEL OR SIPHON
GULCH
VILLAGE OR RESIDENTIAL
PIPELINE
WASTELAND OR PASTURE
AUTOMATED WEATHER STATION
HARC VARIETY STATION
INDUSTRIAL OR BUSINESS AREA
CANE LAND LEASED TO OTHERS
2000 0 2000 4000 6000 8000
SCALE IN FEET
MAP PREPARED BY HC&S
AG. ENGINEERING DEPT.
MARCH 2010
MAUI LAND & PINEAPPLE CO., INC.
HALEAKALA RANCH CO.
MAALAEA BAY
MAUI RESEARCH & TECHNOLOGY PARK
PUUNENE AIRPORT
KAHULUI AIRPORT
KAHULUI HARBOR
WAIALE PASTURE
MAKAWAO
PUKALANI
HALIMAILE
HAMAKUAPOKO
UPPER PAIA
LOWER PAIA
KIHEI
MAALAEA
WAIKAPU
WAILUKU
KAHULUI
PUUNENE

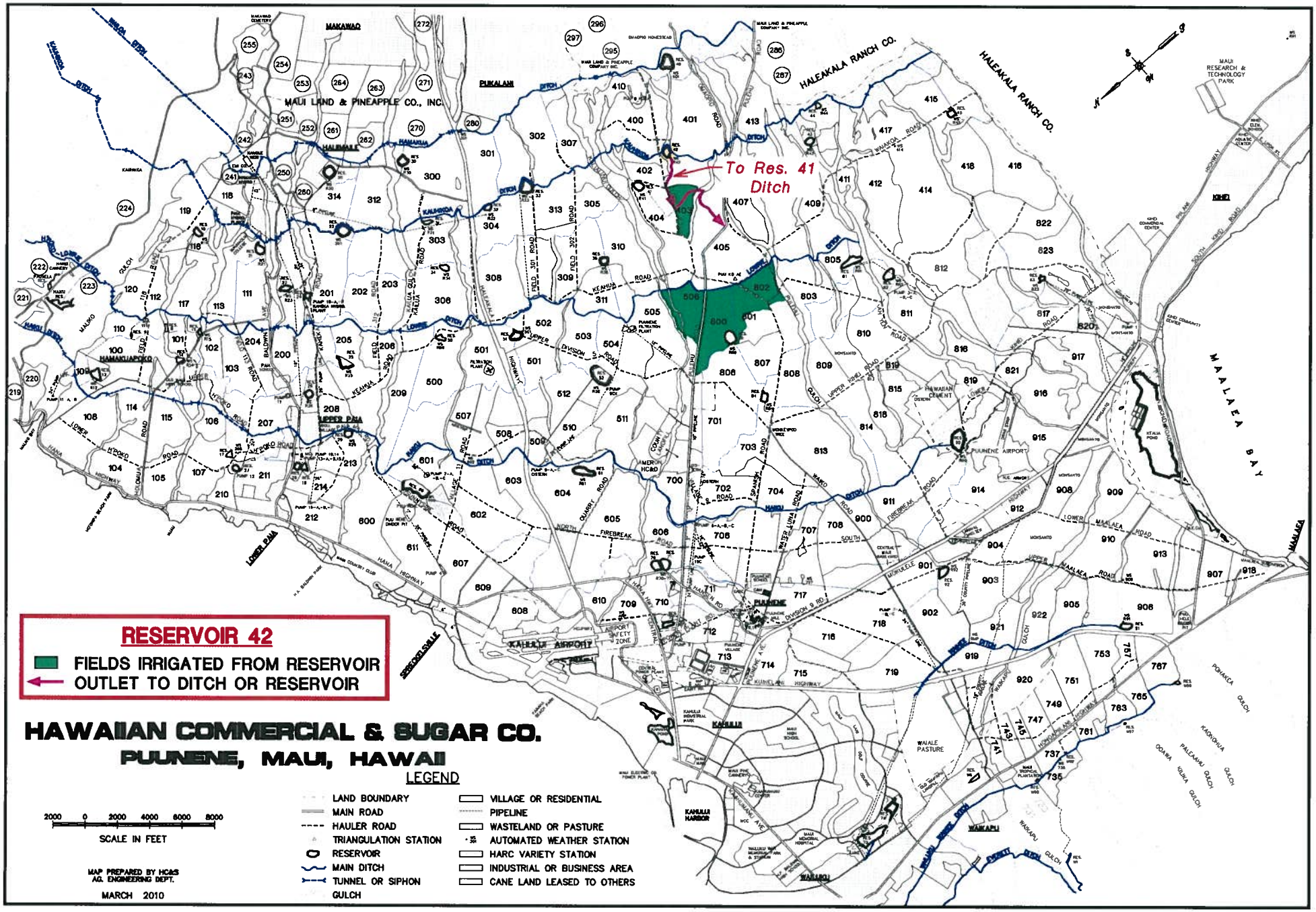


RESERVOIR 35
FIELDS IRRIGATED FROM RESERVOIR
OUTLET TO DITCH OR RESERVOIR
HAWAIIAN COMMERCIAL & SUGAR CO.
PUUNENE, MAUI, HAWAII
LEGEND
LAND BOUNDARY
MAIN ROAD
HAULER ROAD
TRIANGULATION STATION
RESERVOIR
MAIN DITCH
TUNNEL OR SIPHON
GULCH
VILLAGE OR RESIDENTIAL
PIPELINE
WASTELAND OR PASTURE
AUTOMATED WEATHER STATION
HARC VARIETY STATION
INDUSTRIAL OR BUSINESS AREA
CANE LAND LEASED TO OTHERS
2000 0 2000 4000 6000 8000
SCALE IN FEET
MAP PREPARED BY HC&S
AG. ENGINEERING DEPT.
MARCH 2010
Pipe to Puunene
Power Plant
MAUI LAND & PINEAPPLE CO., INC.
HALEAKALA RANCH CO.
MAALAEA BAY
MAUI RESEARCH & TECHNOLOGY PARK
PUUNENE AIRPORT
KAHULUI AIRPORT
PUUNENE
KAHULUI
WAIKAPU
WAILUKU
KAHULUI HARBOR
WAIALE PASTURE
MAKAWAO
PUKALANI
HALIIMAILE
HAMAKUAPOKO
UPPER PAIA
LOWER PAIA
SPRECKELSVILLE
KIHEI
MAALAEA

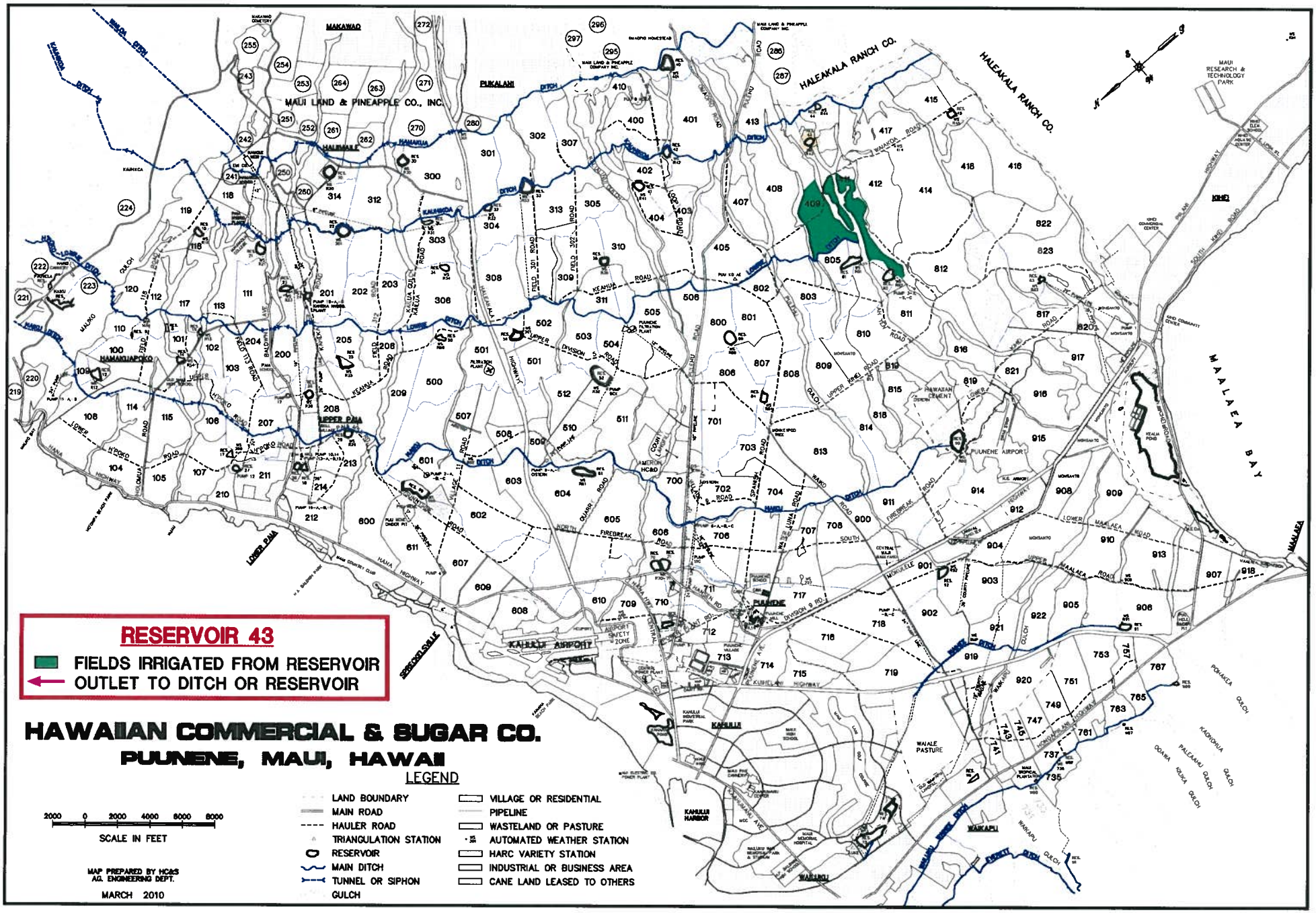


To Kauhikoa Ditch
RESERVOIR 40
FIELDS IRRIGATED FROM RESERVOIR
OUTLET TO DITCH OR RESERVOIR
HAWAIIAN COMMERCIAL & SUGAR CO.
PUUNENE, MAUI, HAWAII
LEGEND
LAND BOUNDARY
MAIN ROAD
HAULER ROAD
TRIANGULATION STATION
RESERVOIR
MAIN DITCH
TUNNEL OR SIPHON
GULCH
VILLAGE OR RESIDENTIAL
PIPELINE
WASTELAND OR PASTURE
AUTOMATED WEATHER STATION
HARC VARIETY STATION
INDUSTRIAL OR BUSINESS AREA
CANE LAND LEASED TO OTHERS
2000 0 2000 4000 6000 8000
SCALE IN FEET
MAP PREPARED BY HC&S
AG. ENGINEERING DEPT.
MARCH 2010
MAUI LAND & PINEAPPLE CO., INC.
HALEAKALA RANCH CO.
MAALAEA BAY
KAHULUI AIRPORT
PUUNENE AIRPORT
HAWAIIAN CEMENT
MAUI RESEARCH & TECHNOLOGY PARK
KAHULUI HARBOR
WAIALE PASTURE


RESERVOIR 41
FIELDS IRRIGATED FROM RESERVOIR
OUTLET TO DITCH OR RESERVOIR
HAWAIIAN COMMERCIAL & SUGAR CO.
PUUNENE, MAUI, HAWAII
LEGEND
LAND BOUNDARY
MAIN ROAD
HAULER ROAD
TRIANGULATION STATION
RESERVOIR
MAIN DITCH
TUNNEL OR SIPHON
GULCH
VILLAGE OR RESIDENTIAL
PIPELINE
WASTELAND OR PASTURE
AUTOMATED WEATHER STATION
HARC VARIETY STATION
INDUSTRIAL OR BUSINESS AREA
CANE LAND LEASED TO OTHERS
2000 0 2000 4000 6000 8000
SCALE IN FEET
MAP PREPARED BY HC&S
AG. ENGINEERING DEPT.
MARCH 2010
MAUI LAND & PINEAPPLE CO., INC.
HALEAKALA RANCH CO.
MAALAEA BAY
PUUNENE AIRPORT
KAHULUI AIRPORT
PUUNENE
KAHULUI
WAIKAPU
WAILUKU
MAKAWAO
PUKALANI
HALIIMAILE
HAMAKUAPOKO
UPPER PAIA
LOWER PAIA
SPRECKELSVILLE
KIHEI
MAUI RESEARCH & TECHNOLOGY PARK
WAIALE PASTURE
KAHULUI HARBOR



RESERVOIR 42
FIELDS IRRIGATED FROM RESERVOIR
OUTLET TO DITCH OR RESERVOIR
To Res. 41 Ditch
HAWAIIAN COMMERCIAL & SUGAR CO.
PUUNENE, MAUI, HAWAII
LEGEND
LAND BOUNDARY
MAIN ROAD
HAULER ROAD
TRIANGULATION STATION
RESERVOIR
MAIN DITCH
TUNNEL OR SIPHON
GULCH
VILLAGE OR RESIDENTIAL
PIPELINE
WASTELAND OR PASTURE
AUTOMATED WEATHER STATION
HARC VARIETY STATION
INDUSTRIAL OR BUSINESS AREA
CANE LAND LEASED TO OTHERS
2000 0 2000 4000 6000 8000
SCALE IN FEET
MAP PREPARED BY HC&S AG. ENGINEERING DEPT.
MARCH 2010
MAUI LAND & PINEAPPLE CO., INC.
HALEAKALA RANCH CO.
MAALAEA BAY
KAHULUI AIRPORT
PUUNENE AIRPORT
PUUNENE
KAHULUI
WAIKAPU
WAILUKU
MAKAWAO
PUKALANI
HAMAKUAPOKO
UPPER PAIA
LOWER PAIA
SPRECKELSVILLE
KIHEI
MAALAEA


RESERVOIR 43
FIELDS IRRIGATED FROM RESERVOIR
OUTLET TO DITCH OR RESERVOIR
HAWAIIAN COMMERCIAL & SUGAR CO.
PUUNENE, MAUI, HAWAII
LEGEND
LAND BOUNDARY
MAIN ROAD
HAULER ROAD
TRIANGULATION STATION
RESERVOIR
MAIN DITCH
TUNNEL OR SIPHON
GULCH
VILLAGE OR RESIDENTIAL
PIPELINE
WASTELAND OR PASTURE
AUTOMATED WEATHER STATION
HARC VARIETY STATION
INDUSTRIAL OR BUSINESS AREA
CANE LAND LEASED TO OTHERS
2000 0 2000 4000 6000 8000
SCALE IN FEET
MAP PREPARED BY HC&S
AG. ENGINEERING DEPT.
MARCH 2010
MAKAWAO
PUKALANI
MAUI LAND & PINEAPPLE CO., INC.
HALEAKALA RANCH CO.
HALEAKALA RANCH CO.
MAUI RESEARCH & TECHNOLOGY PARK
KIHEI
MAALAEA BAY
MAALAEA
HAMAKUAPOKO
UPPER PAIA
LOWER PAIA
PUUNENE AIRPORT
KAHULUI AIRPORT
PUUNENE
KAHULUI
KAHULUI HARBOR
WAILUKU
WAKAPU
WAILE PASTURE
HANA HIGHWAY
KUIHELANI HIGHWAY
MAUI LAND & PINEAPPLE COMPANY INC.
HAWAIIAN CEMENT
MONSANTO
HC&S
HALEAKALA DITCH
HAMAKUA DITCH
KAMAOA DITCH
KAMOKA DITCH
HONOMANU DITCH
KOLEA DITCH
WAIHOU-LOWER DITCH
WAIHOU DITCH
WAILUA DITCH
KAMAOLE DITCH
KAMAOLE-2 DITCH
KAMAOLE-3 DITCH
KAMAOLE-4 DITCH
KAMAOLE-5 DITCH
KAMAOLE-6 DITCH
KAMAOLE-7 DITCH
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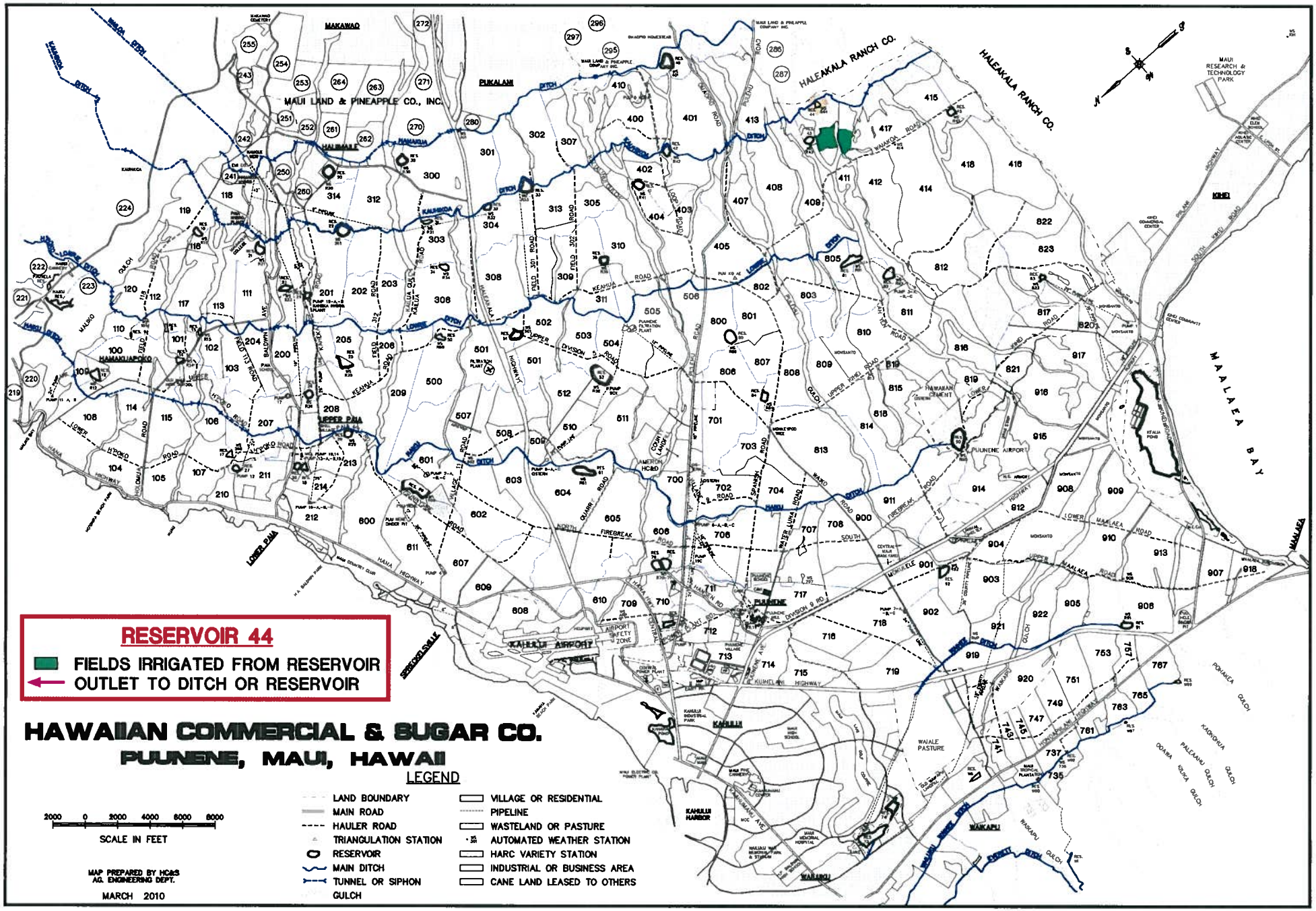
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MAIN ROAD
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TRIANGULATION STATION
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PIPELINE
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AUTOMATED WEATHER STATION
HARC VARIETY STATION
INDUSTRIAL OR BUSINESS AREA
CANE LAND LEASED TO OTHERS
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SCALE IN FEET
MAP PREPARED BY HC&S
AG. ENGINEERING DEPT.
MARCH 2010
MAUI LAND & PINEAPPLE CO., INC.
HALEAKALA RANCH CO.
MAALAEA BAY
MAUI RESEARCH & TECHNOLOGY PARK
PUUNENE AIRPORT
KAHULUI AIRPORT
KAHULUI HARBOR
WAIALE PASTURE
MAKAWAO
PUKALANI
HALIMAILE
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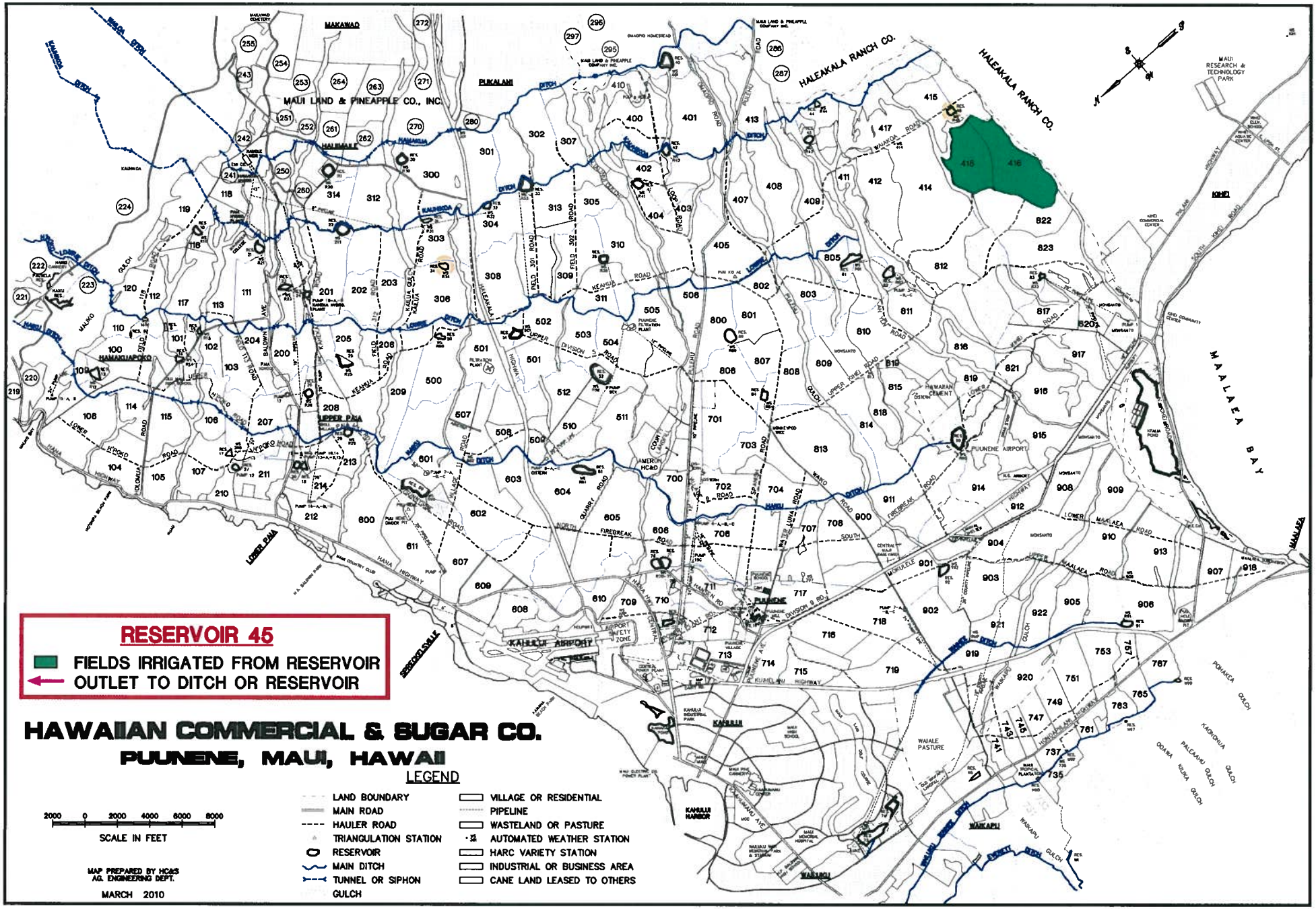
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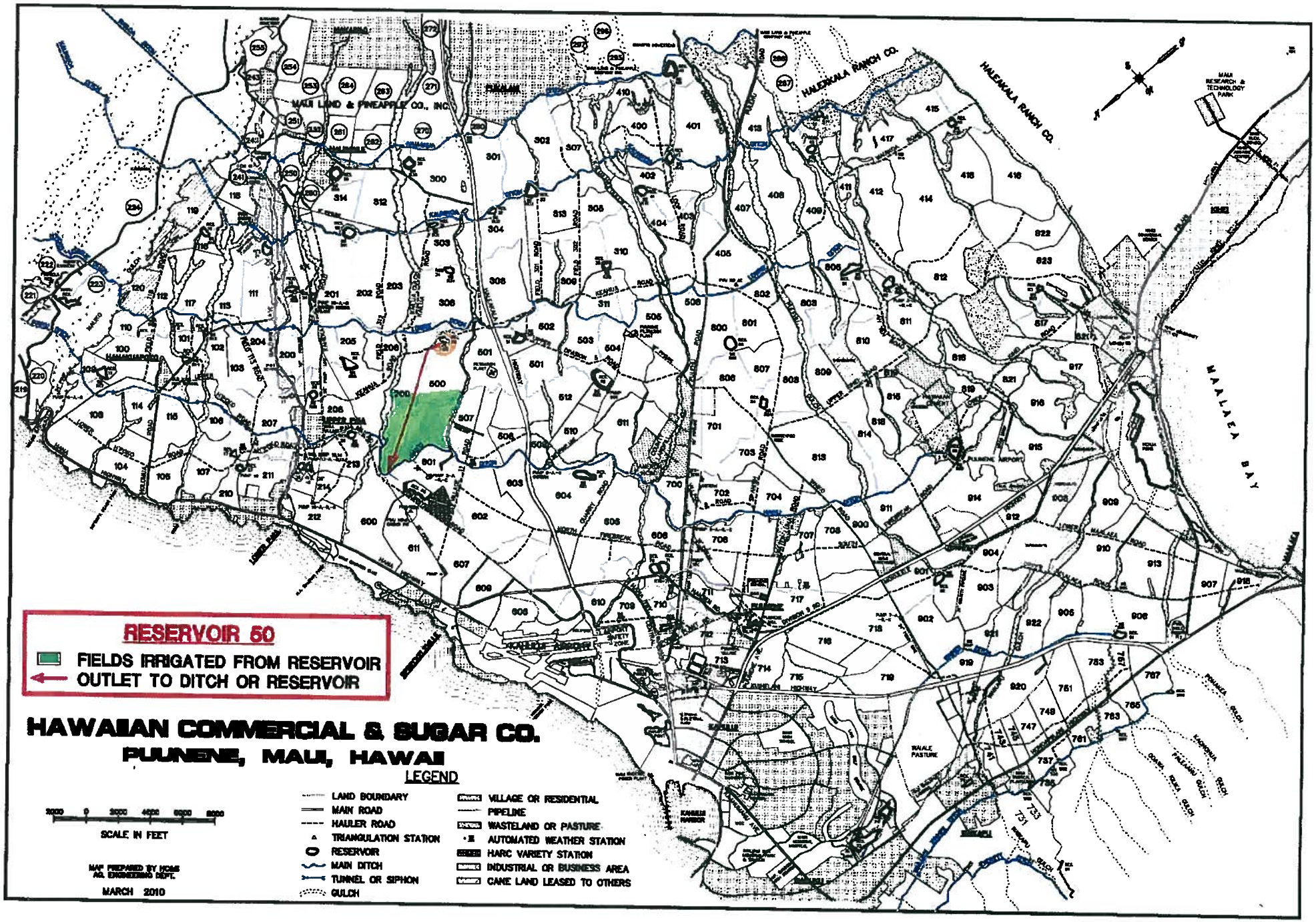
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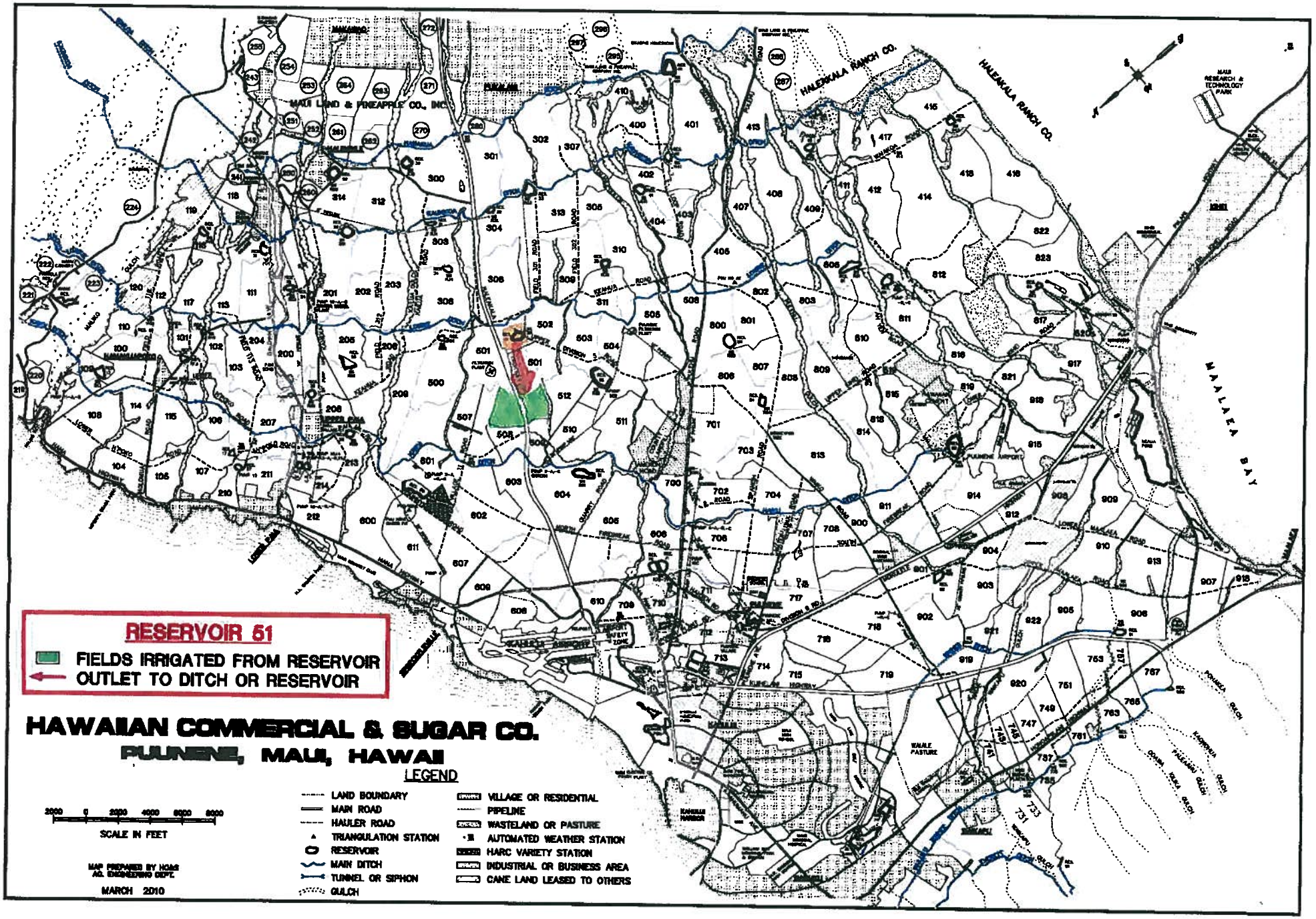
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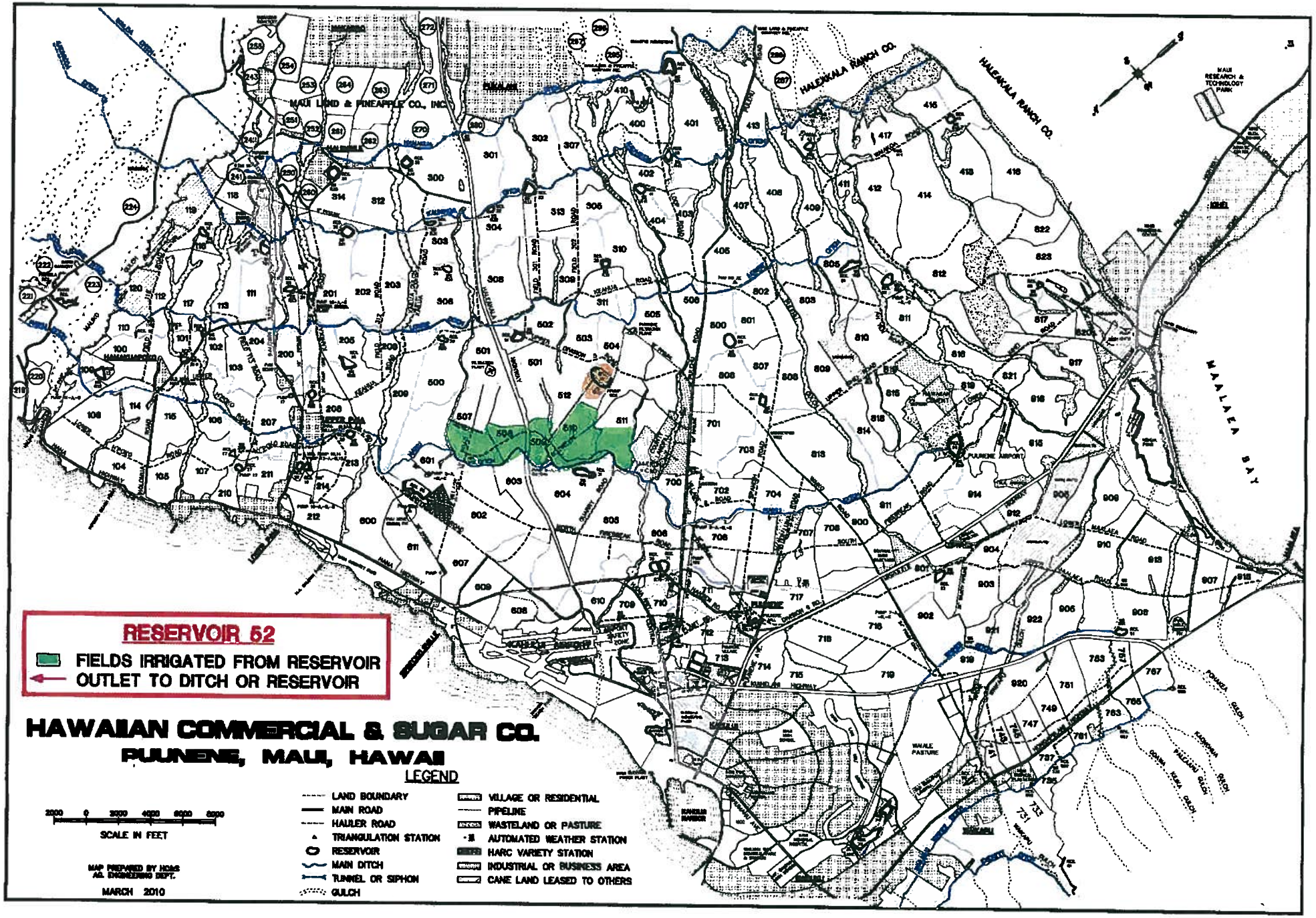
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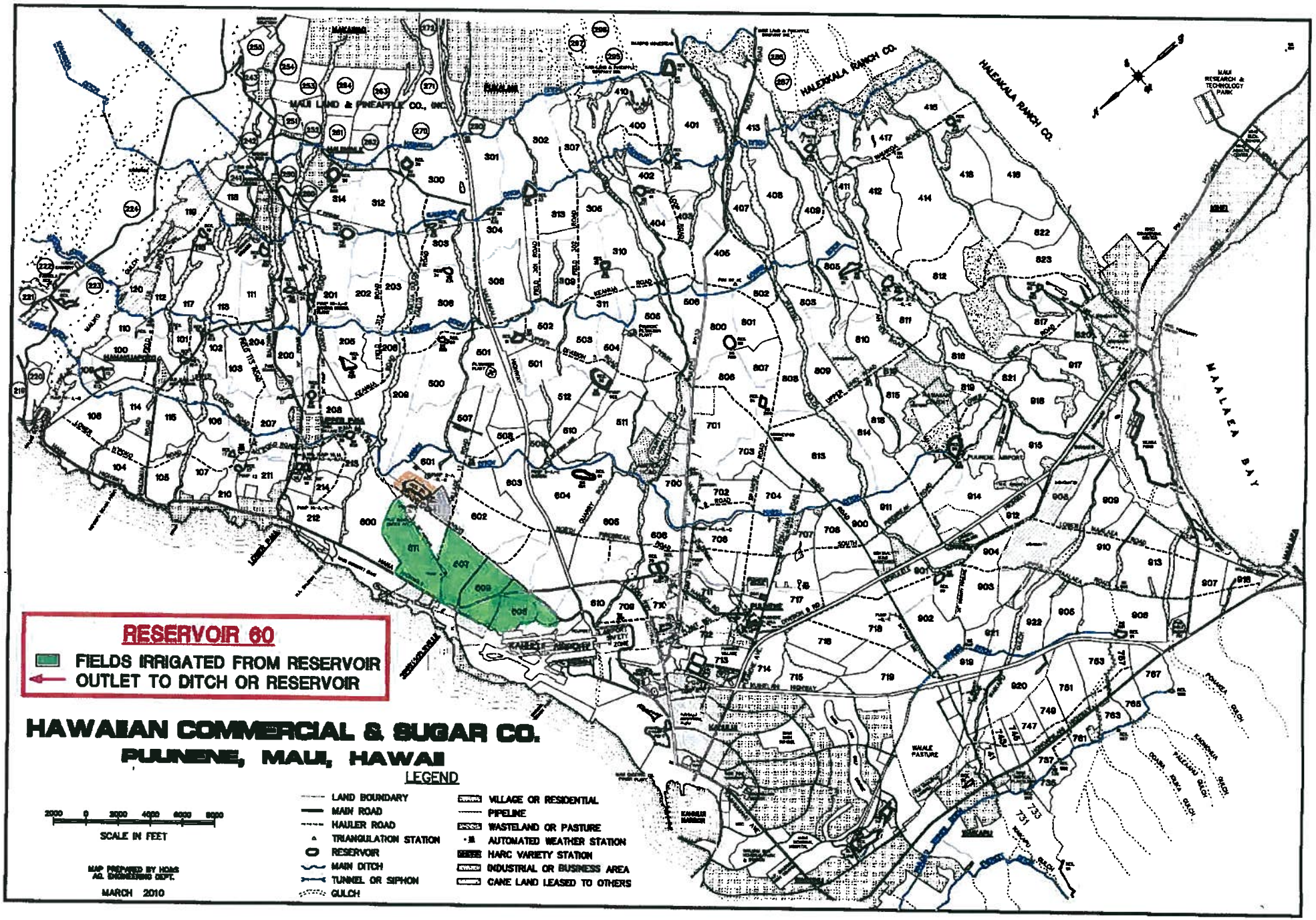
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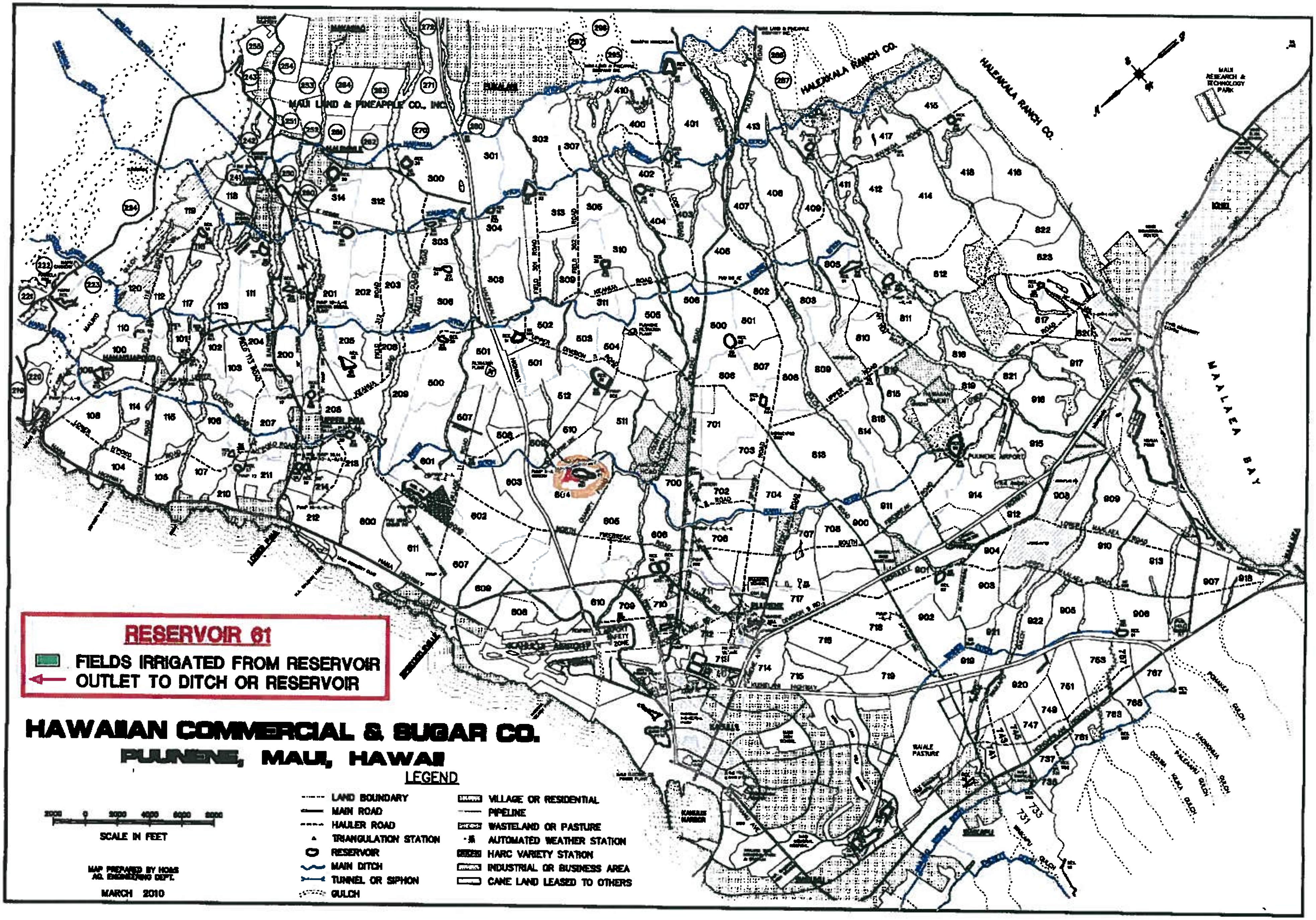
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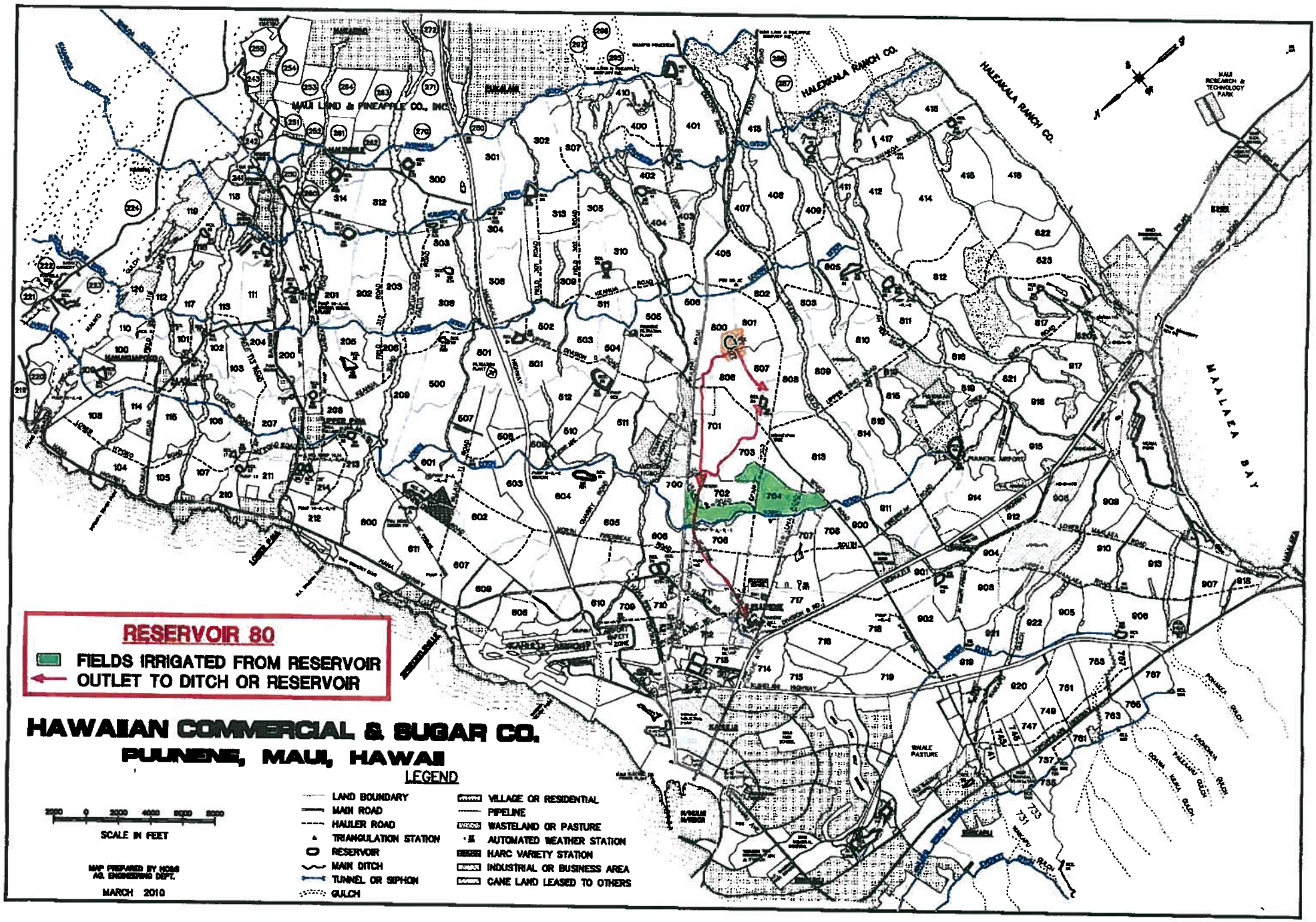
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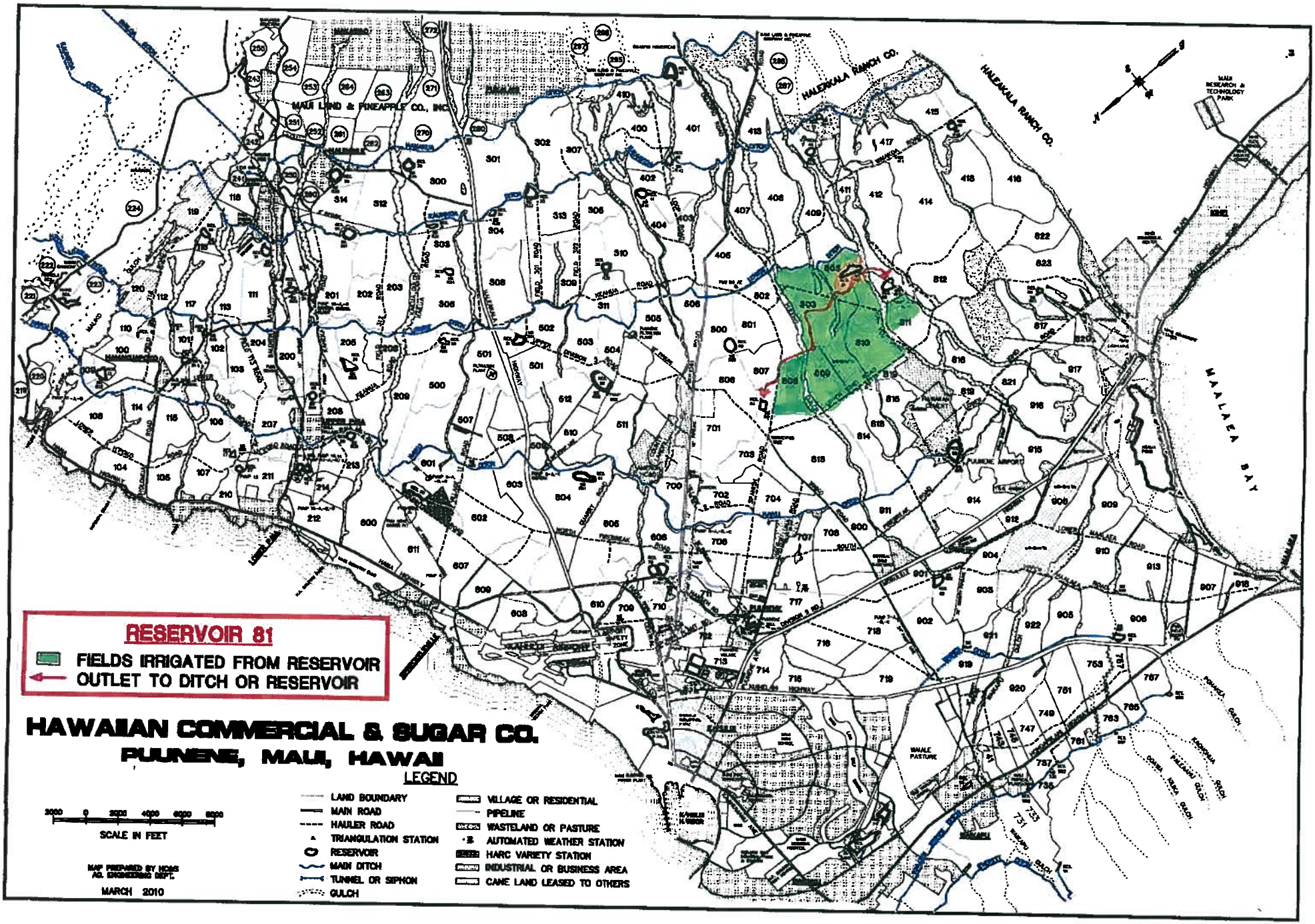
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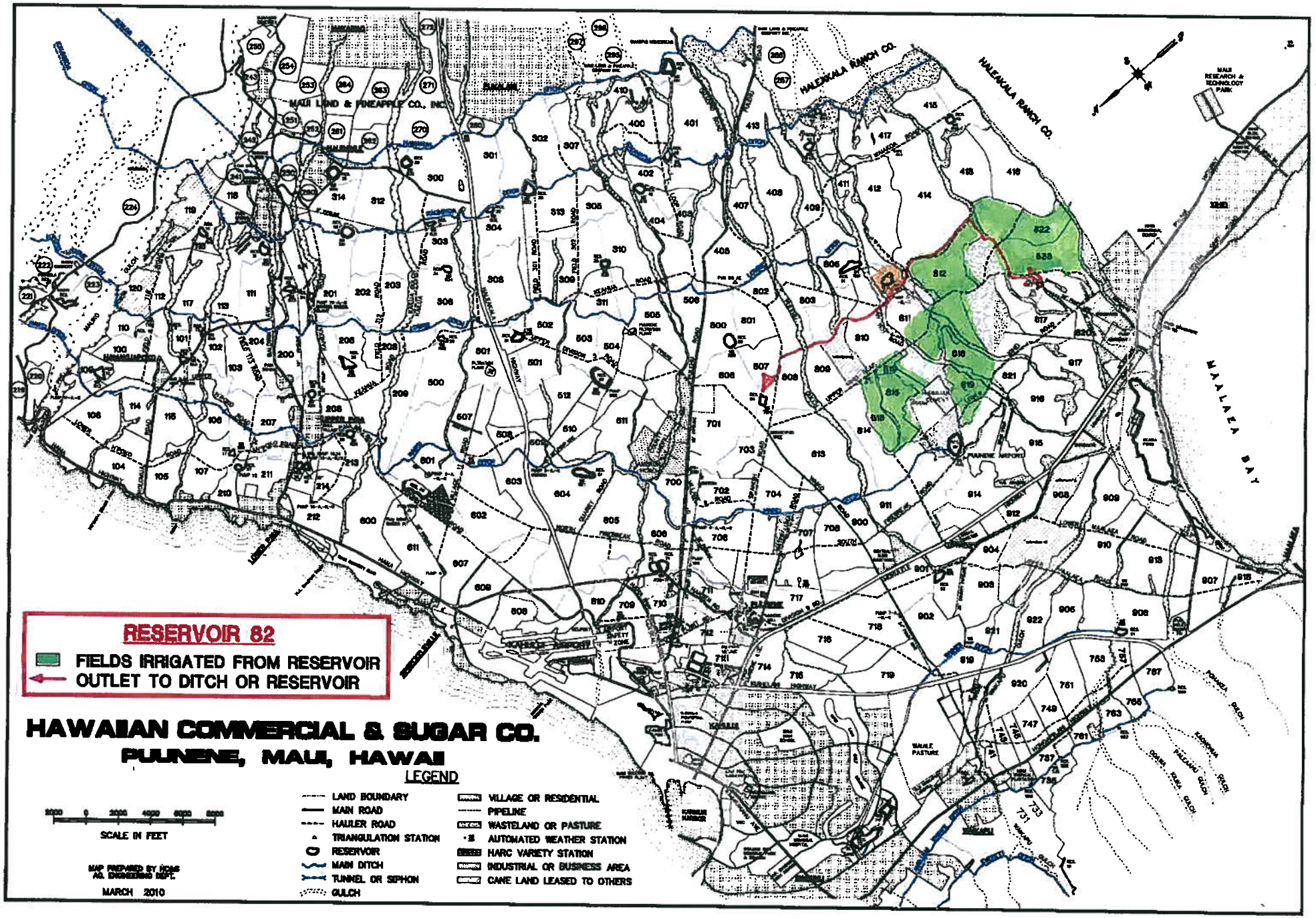
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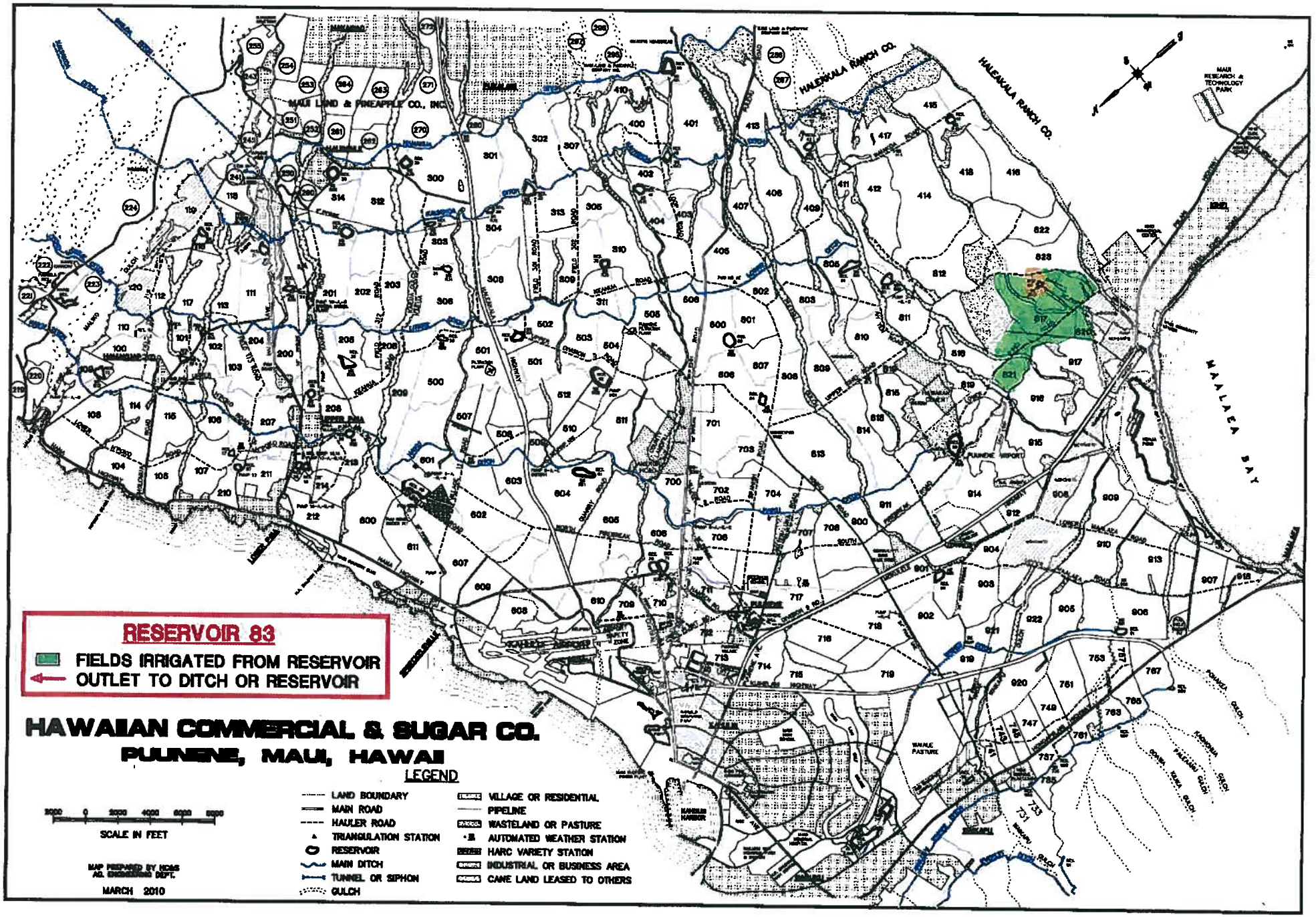
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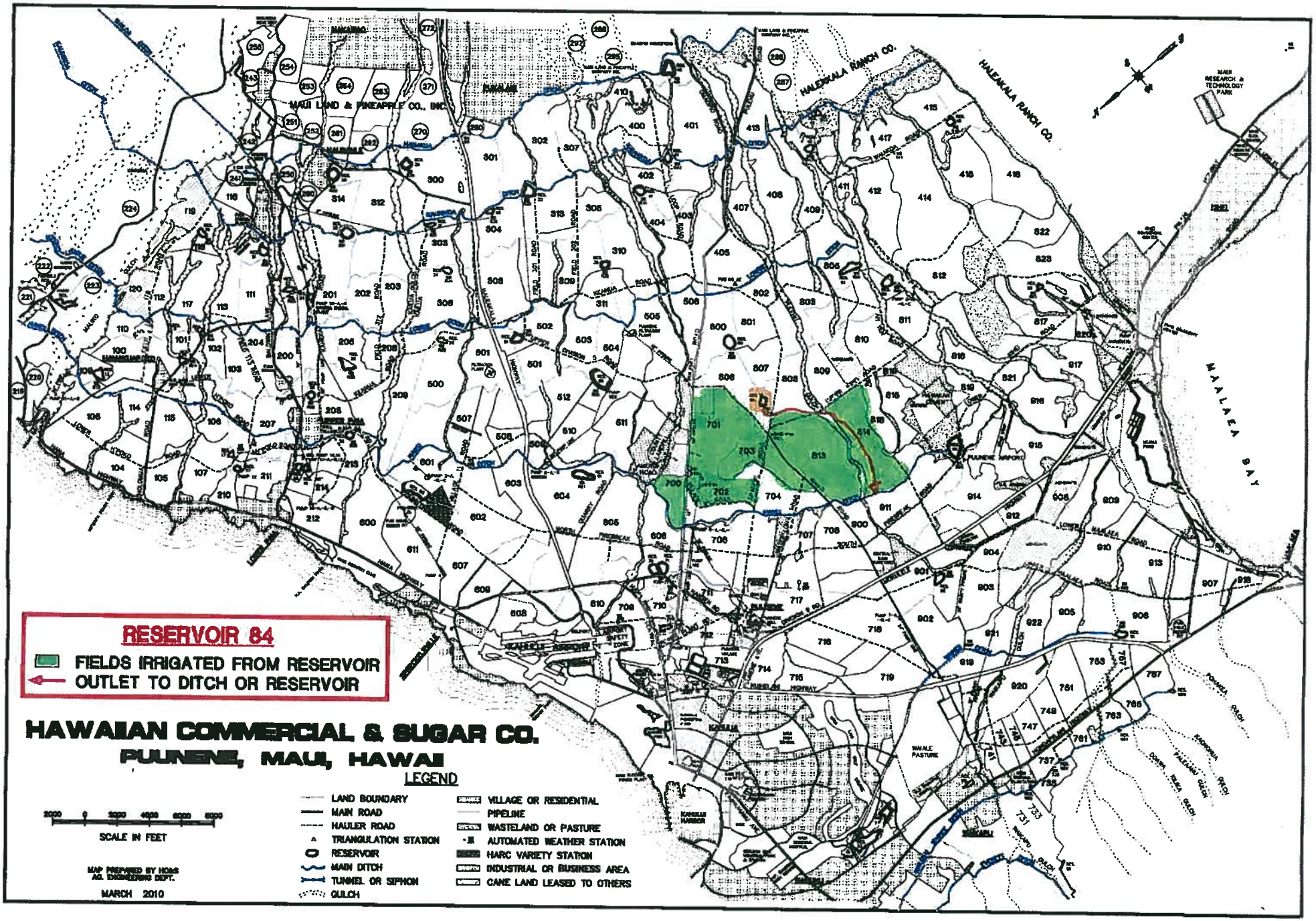
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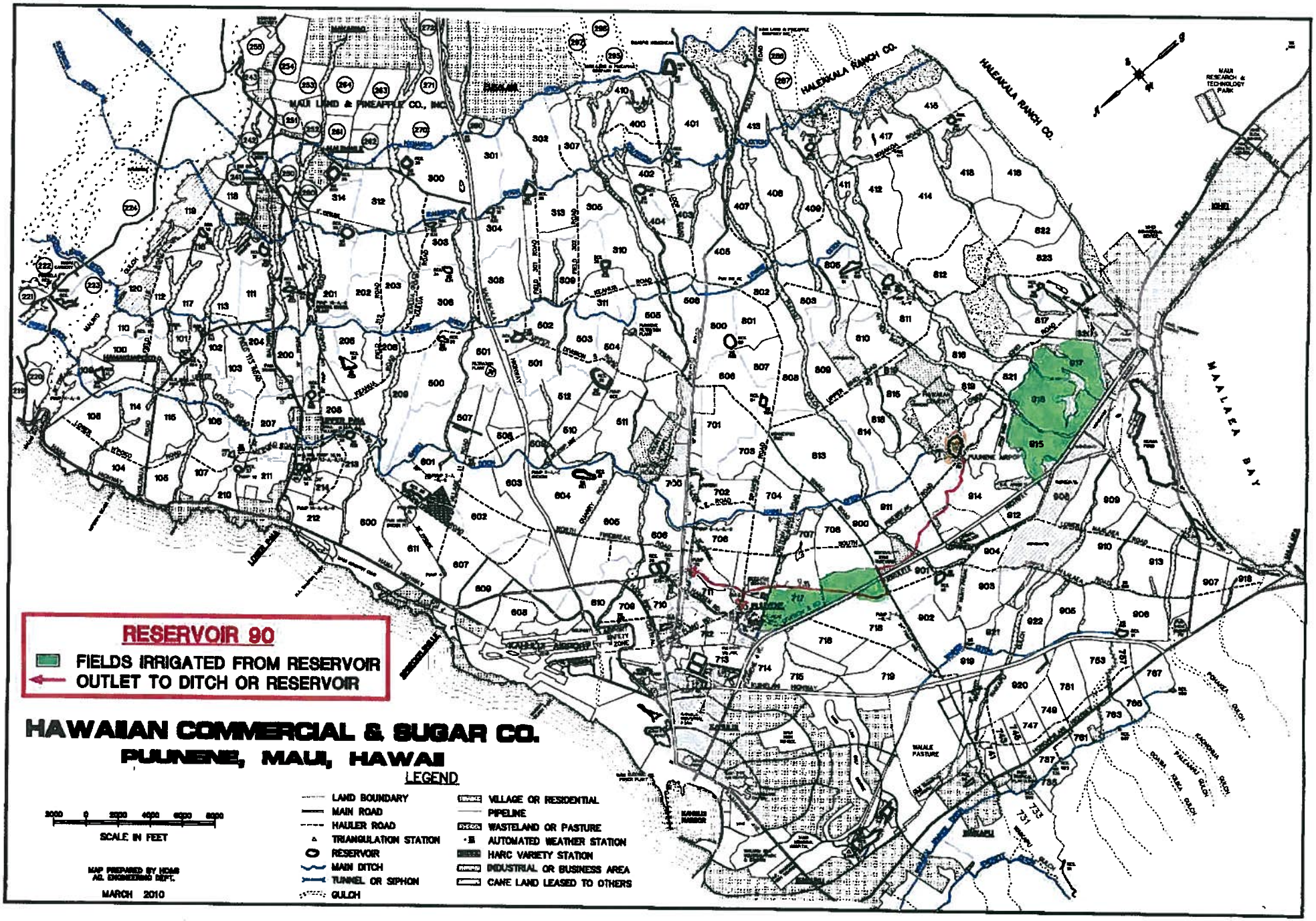
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Appendix D: East Maui Fields—Ditch Water Only

CWRM Request:
List of the plantation fields that cannot be irrigated with ground water, along with the total acreage of these fields

Response:
Attached is a map entitled "Exhibit D-1: East Maui Fields—Ditch Water Only", indicating the approximately 12,800 acres that cannot be irrigated with HC&S brackish water wells. Also attached is Exhibit D-2, a table, entitled "HC&S Fields—Ditch Water Only" that lists the individual fields and their respective acreages, totaled at the bottom. HC&S fields are divided into smaller irrigation units, or 'blocks'; each block may be served by different water sources. We have included the block numbers in this table as in some cases, it is a portion of a field, rather than an entire field, that does not have access to ground water and can only be irrigated with East Maui ditch water.

Exhibit D-1: East Maui Fields - Ditch Water Only

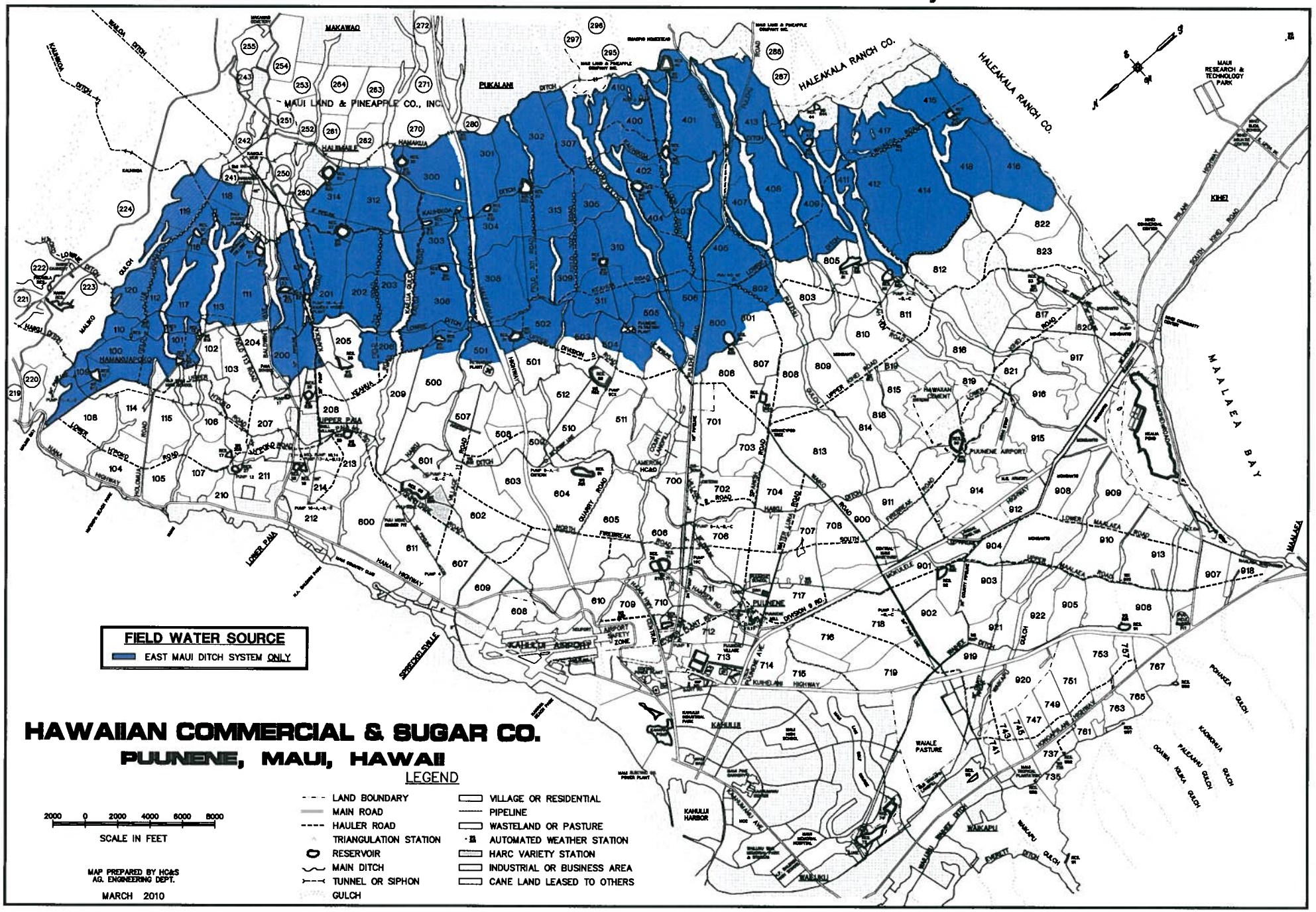


Exhibit D-2: HC&S Fields - East Maui Water

Field	Block	Acres
111	1	23.2
113	1	61.5
116	1	162.1
116	2	48.9
118	1	25.4
118	2	36.8
119	1	48.5
119	2	111.3
200	1	180.8
300	1	75.6
300	2	222.3
300	3	105.8
301	1	75.3
301	2	274.9
302	1	97.4
302	2	166.1
303	1	111.1
304	1	31.9
304	3	142.2
307	1	129.9
312	1	33.1
312	2	64.3
312	3	97.2
313	1	171.1
314	1	28.4
314	2	157.2
400	1	103.9
400	2	224.0
401	1	57.2
401	2	111.6
401	3	359.4
408	1	29.2
409	1	48.5
410	1	116.0
410	2	74.9
413	1	80.5
413	2	96.6
413	3	197.6
505	1	174.3
100	1	246.0
101	1	63.3
109	1	132.5
110	1	99.4
111	2	133.9
112	1	118.6
113	2	93.1
117	1	211.7
120	1	120.0
200	2	185.4
201	1	93.3
201	2	161.2
		6014.4

Field	Block	Acres
202	1	49.0
202	2	189.5
203	1	31.3
203	2	163.4
206	1	84.8
209	1	52.4
303	2	59.7
304	2	26.1
304	4	44.8
304	5	20.9
305	1	96.4
306	1	149.6
306	2	114.6
308	1	27.9
308	2	100.2
308	3	145.4
309	1	347.3
310	1	132.1
310	2	207.0
311	1	199.3
402	1	31.8
402	2	89.9
403	1	67.7
404	1	161.0
404	2	119.1
405	1	178.6
406	1	207.4
407	1	142.4
408	2	318.5
409	2	86.7
409	3	195.6
411	1	83.4
411	2	160.7
412	1	244.6
414	1	465.8
415	1	38.3
415	2	208.0
416	1	271.0
417	1	51.0
417	2	60.5
417	3	133.0
418	1	176.5
500	1	85.8
501	1	85.0
502	1	211.7
503	1	67.6
504	1	134.4
506	1	125.6
800	1	173.0
801	1	75.9
802	1	78.0
		6,770.2

Total Acres = 12,784.6

Appendix E: HC&S Brackish Water Wells

CWRM Data Request:
Information on the 16 brackish water wells used to irrigate the plantation, including the State well number, well capacity, cost of pumping, and sustainable pumping levels. If monthly ground water use reports for some of these wells have not been provided to the Commission, explain the reasoning for such action.

Response:
Attached is a map entitled "Exhibit E-1: HC&S Brackish Water Wells" indicating the locations of HC&S' 16 brackish water wells, and a table entitled "Exhibit E-2: HC&S Brackish Groundwater Well Information", which provides the requested information for each of the 16 wells. Note that Well #5 was taken out of use in 1992. With the conversion to drip irrigation, the high manganese levels in the water (resulting from the intersection of the well tunnel with an underground vein of manganese) causes plugging of the drip irrigation infrastructure when the mineral precipitates. Of the 15 wells in use, 8 are located in the Paia Aquifer System, 5 in the Kahului Aquifer System, and 2 in the Kamaole Aquifer System.

As directed by CWRM staff, the pumping cost figures in Column 7 on the attached table include the total cost to get the well water to the point of use. Each brackish groundwater well at HC&S is unique. Each well has from 1 to 3 underground pumps to get water to the surface. Discharge points can be specific fields, open ditches or reservoirs. In many cases additional booster pumps are required to get some or all of the water to another discharge point to fully utilize the well output. These booster pump discharge points can similarly be specific fields, open ditches or reservoirs.

The figures included in Column 4 on the attached table represent the capacities of the pump in each well. This capacity is the pump production for a 24 hour period.
All of the pumps are one speed; therefore the instantaneous output cannot be adjusted. Decisions are made on a daily basis whether to run individual well pumps, and for how long, in response to changes in surface water availability and crop needs. Not all wells are used on a daily basis due to power and groundwater availability limitations. While individual wells are being operated, visual checks of sump levels and equipment performance are conducted daily. Water samples are taken monthly to check for salt and conductivity levels. If problems are found with low sump levels, equipment performance or elevated salt or conductivity levels, immediate actions are taken to protect the well or the crop. If sump levels decrease or elevated levels of salt and conductivity are measured, the well pump is shutdown until these indicators return to acceptable levels.

Historically (based on data from 1986-2009), HC&S has pumped an average of approximately 72 million gallons per day (mgd) from these wells. Use from month-to-month, however, varies greatly depending on available ditch water and climatic conditions, and has ranged from a January average of about 27 mgd to an October average of nearly 112 mgd. Seasonal averages range from 'winter' use of 47 mgd

(November – April) to 'summer' use of 97.5 mgd (May – October). See attached Exhibit E-3 which is a salinity chart for HC&S brackish groundwater wells #3 (Kamaole aquifer), #6 and #19 (Kahului aquifer), and #17 (Paia aquifer). A pattern of rising total salt levels from 2007 is very evident for each of the wells, and correlates with the severe drought that occurred on Maui which resulted in significantly less surface water available to irrigate the overlying fields. Also evident are the peaks in salinity that occur in the summer months, when the pumping of HC&S' brackish water wells is the highest. Thus, Exhibit E-3 speaks to the potential impact of reduced recharge and higher levels of pumping for these three aquifers. At HC&S' current use patterns, however, long-term chloride concentrations have remained manageable for the irrigation of cane.

Whether these current pumping levels can be sustained in the future will depend on whether the same amounts of imported stream water will be available to contribute to the irrigation recharge of the underlying Paia, Kahului and Kamaole aquifers. A reduction in surface water importation coupled with an increase in ground water pumping will likely degrade the aquifer and result in increased salinities. HC&S is at this time unable to identify what that point of measureable degradation is but, again, the upward spikes in salinity that occur with the higher summertime use of the wells is a strong indicator of this correlation.

Other than HC&S' current use patterns and resulting salinities, there is otherwise no information on the actual sustainable yield of these brackish aquifers. The sustainable yield figures that do exist (see CWRM Water Resources Protection Plan, June 2008) were calculated primarily based on natural recharge (rainfall) and do not include irrigation recharge. Thus, although the sustainable yield for the Paia aquifer is cited at 7 mgd, HC&S has been pumping approximately 30 mgd from this aquifer for decades without long term increase in salinity levels. Similarly, the sustainable yield for the Kahului Aquifer system is stated to be 1 mgd and 11 mgd for the Kamaole Aquifer system, where long-term pumping by HC&S has averaged 35 and 8.4 mgd, respectively. (Please note that there are other active wells not owned or operated by HC&S. HC&S does not have data on total ground water withdrawals from these three aquifers.)

The significant importance of irrigation recharge to ground water availability is indicated in a scientific report published by the USGS in 2007, which reported that ground water recharge for central and west Maui decreased 44% from 1979 to 2004, largely due to the reduction in irrigation recharge as a result of the adoption of more efficient irrigation methods and decrease in sugarcane and pineapple acreage (withdrawal of Wailuku Sugar Company/Wailuku Ag and Maui Land and Pineapple). (See Engott and Vana, *Effects of Agricultural Land-Use Changes and Rainfall on Ground-Water Recharge in Central and West Maui, Hawai`i, 1926-2004*, USGS Scientific Investigations Report 2007-5103, at p. 31)

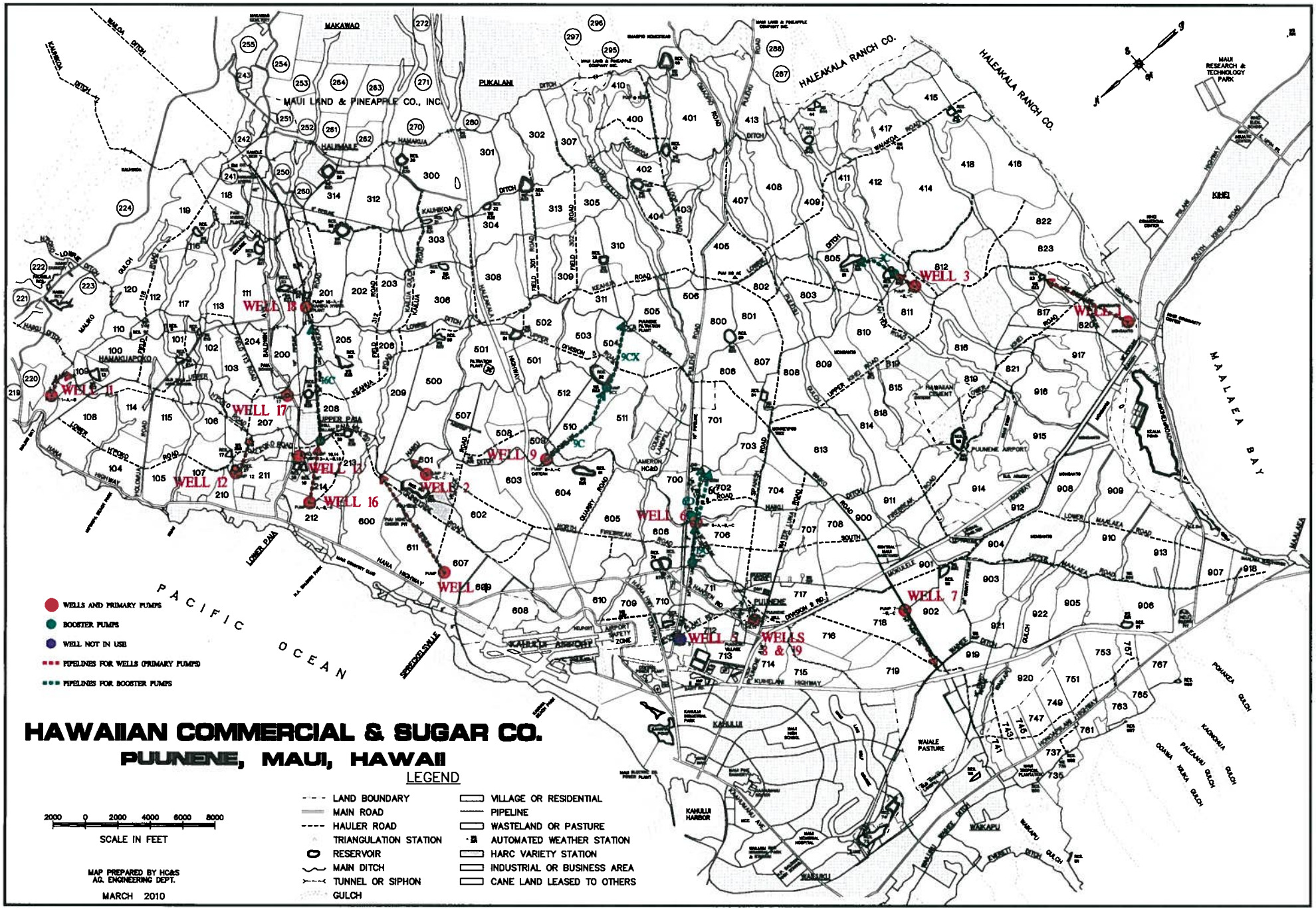
During roughly the same time period (1970 – 2005) ground water withdrawals in the `Iao Aquifer increased from 10 to 17 mgd, resulting in a decline in water level, a rise in the transition zone between the fresh and salt water, and an increase in chloride concentrations. (*Id.* at p. 1) This indicates that increases in ground water withdrawals,

coupled with a decrease in irrigation recharge with imported water results in degredation of an aquifer, as indicted by a rise in the transition zone and increased salinities.

In conclusion, we believe the current pumping levels of HC&S' wells can be sustained under current conditions. Given that the salinities of these wells do rise with higher levels of pumping, significantly increased pumping levels would raise serious concerns about degradation of these aquifers. Further, should there be a reduction in surface water importation for the aquifers utilized by HC&S, that would further cloud the sustainable yields of these aquifers in the future.

Regarding the monthly ground water use reports to the CWRM, you should have in your files reports of monthly use of these wells going back to January 1983. If you do not, please let us know. Also, HC&S has been submitting reports of the monthly use of its brackish water wells to the Commission on an annual basis pursuant to our understanding over the years of this reporting requirement. If you would like us to file on a monthly basis, we would be happy to do so.

Exhibit E-1: HC&S Brackish Water Wells



HAWAIIAN COMMERCIAL & SUGAR CO.

PUUNENE, MAUI, HAWAII

LEGEND

- LAND BOUNDARY
- MAIN ROAD
- HAULER ROAD
- TRIANGULATION STATION
- RESERVOIR
- MAIN DITCH
- TUNNEL OR SIPHON
- GULCH
- VILLAGE OR RESIDENTIAL
- PIPELINE
- WASTELAND OR PASTURE
- AUTOMATED WEATHER STATION
- HARC VARIETY STATION
- INDUSTRIAL OR BUSINESS AREA
- CANE LAND LEASED TO OTHERS

2000 0 2000 4000 6000 8000

SCALE IN FEET

MAP PREPARED BY HC&S
AG. ENGINEERING DEPT.

MARCH 2010

Exhibit E-2: HC&S Brackish Groundwater Well Information

Well	State #	PUMP	Capacity (MGD)	Power Use (KWH)	Power Required (MWH/MG)	Cost ($/MG)	Notes
1	4727-01		4.32	200	1.11	$ 138.89	Kamaole aquifer
2	5323-1	2A	9.77	300	0.74	$ 92.12	Paia aquifer
		2B	8.65	300	0.83	$ 104.05	Paia aquifer
		2C1	16.8	250	0.36	$ 44.64	
3	4825-01	3A	9.34	700	1.80	$ 224.84	Kamaole aquifer
		3B	9.23	700	1.82	$ 227.52	Kamaole aquifer
		3C	8	100	0.30	$ 37.50	
4	5424-01		8.88	550	1.49	$ 185.81	Paia aquifer
5	5226-01		9	450	1.20	$ 150.00	Kahului aquifer, not in use due to high manganese levels
6	5226-02	6A	9.2	350	0.91	$ 114.13	Kahului aquifer
	5226-02	6B	15	450	0.72	$ 90.00	Kahului aquifer
		6C	8.93	250	0.67	$ 83.99	
7	5128-02	7A	18.85	450	0.57	$ 71.62	Kahului aquifer
		7B	17.24	400	0.56	$ 69.61	Kahului aquifer
		7C	13.88	150	0.26	$ 32.42	
8	5227-04	8A	4.61	150	0.78	$ 97.61	Kahului aquifer
		8B	4.57	150	0.79	$ 98.47	Kahului aquifer
		8D	4.39	150	0.82	$ 102.51	Kahului aquifer
9	5224-01	9A	12.66	600	1.14	$ 142.18	Kahului aquifer
		9C*	12.33	600	1.17	$ 145.99	
		9CX*	7.26	250	0.83	$ 103.31	
11	5520-01	11A	3.39	150	1.06	$ 132.74	Paia aquifer
		11B	3.39	150	1.06	$ 132.74	Paia aquifer
12	5522-01	12A	7.08	450	1.53	$ 190.68	Paia aquifer
13	5422-01	13A	5	225	1.08	$ 135.00	Paia aquifer
		13B	5	225	1.08	$ 135.00	Paia aquifer
16	5423-02	16A	12.07	550	1.09	$ 136.70	Paia aquifer
		16D	8.57	450	1.26	$ 157.53	Paia aquifer
		16C	10.12	450	1.07	$ 133.40	
17	5422-02	17	9.18	600	1.57	$ 196.08	Paia aquifer
		17CX	3	170	1.36	$ 170.00	
18	5321-01	18A	13.01	1000	1.84	$ 230.59	Paia aquifer

Well	State #	PUMP	Capacity (MGD)	Power Use (KWH)	Power Required (MWH/MG)	Cost ($/MG)	Notes
		18B	13.48	1300	2.31	$ 289.32	Paia aquifer
19	5227-05	19A	5.47	150	0.66	$ 82.27	Kahului aquifer
		19B	5.38	150	0.67	$ 83.64	Kahului aquifer
		19C1*	4	100	0.60	$ 75.00	
		19C2*	4	100	0.60	$ 75.00	
		19C3	5	200	0.96	$ 120.00	
		19C4	5	200	0.96	$ 120.00	

Fuel Cost: **$ 125.00 per MWH**

Note: Pumps designated A, B and D are primary well pumps. Pumps designated as C are booster pumps necessary to get water to delivery points.

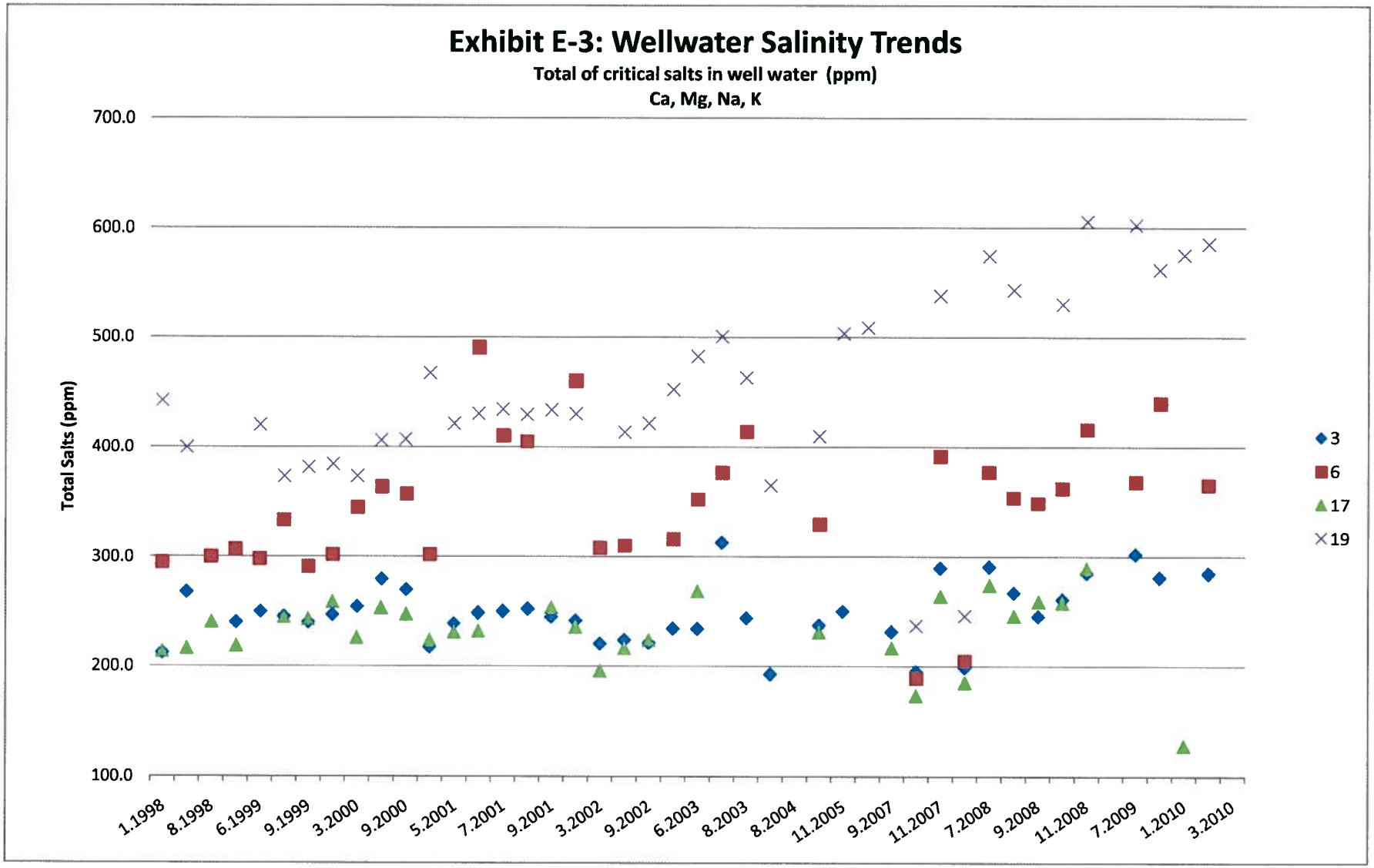


Exhibit E-3: Wellwater Salinity Trends
Total of critical salts in well water (ppm)
Ca, Mg, Na, K
Total Salts (ppm)
700.0
600.0
500.0
400.0
300.0
200.0
100.0
1.1998
8.1998
6.1999
9.1999
3.2000
9.2000
5.2001
7.2001
9.2001
3.2002
9.2002
6.2003
8.2003
8.2004
11.2005
9.2007
11.2007
7.2008
9.2008
11.2008
7.2009
1.2010
3.2010
3
6
17
19

Appendix F: Alternative Water Sources

CWRM Data Request
Alternative water sources for irrigating the plantation.

Response:
The following is a discussion of a number of alternative sources of water and their potential for offsetting some of HC&S' use of stream water. Of note, HC&S does currently recycle its mill water, using the water multiple times—first in the power plant as cooling water for the condensers, then it's used twice as wash water for cane, and lastly in the fields for irrigation. When HC&S converted to drip irrigation, this recycled mill water was found to clog the drip tubing. HC&S expended over $1 million for overhead sprinklers, to enable the continued reuse of recycled mill water in some fields.

Wastewater Reclamation

In Hawaii, Maui County has been a leader in wastewater reclamation. It is the only county that has adopted an ordinance mandating use of recycled water. Commercial properties located within 100 feet of a County recycled water distribution system are required to connect to the system. The County currently owns and operates three wastewater reclamation facilities. The facilities at Kihei and Lahaina produce R-1 water. The Wailuku-Kahului facility currently produces R-2 water. Both the Kihei and Lahaina facilities have distribution systems for the reclaimed water; the Wailuku-Kahului facility does not.

The County of Maui has identified the HC&S fields and the Puunene Mill as potential expansion areas for use of reclaimed water produced at the Wailuku-Kahului facility, but recognize that it must build a distribution system. The facility currently produces approximately 4.5 mgd of R-2 water with a minimal amount of current usage for landscape irrigation on a neighboring property. Several obstacles must be overcome to make reclaimed wastewater a viable alternative source of water for HC&S.

First, the infrastructure to distribute reclaimed wastewater from the Wailuku-Kahului facility must be built. To get the wastewater to HC&S, a minimum of 4 miles of pipeline will have to be constructed. As noted in the State Water Resources Protection Plan (WRPP) at page 7-30, recycled water distribution systems in particular are expensive to construct and operate. An estimated cost for this pipeline to get the water to HC&S is approximately $3 million. We have not factored in storage or other distribution infrastructure that may be needed.

Second, a number of regulatory approvals and issues will need to be resolved as the introduction of R-2 water into HC&S' irrigation ditches is prohibited without a National Pollutant Discharge Elimination System (NPDES) permit, since the ditches and associated reservoirs have overflows to other state water and are themselves considered state waters as well as "waters of the United States". If a NPDES permit is not obtained, a

separate closed wastewater irrigation system will need to be established to distribute the wastewater to the fields. Further, there could be worker exposure issues as plantation personnel will work around and with the wastewater. The required groundwater monitoring plan is likely to call for the construction of groundwater monitoring wells and the installation of lysimeters, potentially one for every 200 acres of irrigated area. Each well and lysimeter would need to be monitored on at least a quarterly basis

Third, depending on the nutrient and salt content of the reclaimed wastewater, and the consistency of the quality of the effluent produced by the County facility, HC&S may have to further treat the water or blend the reclaimed water with fresher sources before it can be used for sugarcane irrigation.

Fourth, use of R-2 water in the Puunene Mill cane cleaner is not a permissible use under current DOH guidelines.

Because of these obstacles, reclaimed wastewater is not a viable alternative source of water for HC&S in the near-term, but we are hopeful that further investments in the county treatment plant and a distribution system could make it a more viable candidate in the future.

Catchment

Pursuant to Commissioner Fujiwara's suggestion in the December 2009 CWRM hearing on the subject 19 East Maui streams, we have researched the catchment system built for the Gorilla Foundation in the West Maui mountains, above Mahinahina and mauka of the Honolua ditch system. This investigation was instructive. An area of approximately 100 feet by 200 feet was lined with a high density polyethylene material to capture rain runoff on a 4:1 slope in a location that averages 75 to 100 inches of rainfall annually. The rainwater is channeled into a 2 million gallon reservoir below the catchment area and was intended to serve the needs of a gorilla preserve and associated administrative buildings. However, the catchment system was never used by the Gorilla Foundation and now supplies enough water to irrigate approximately 50 acres of pineapple two or three days a year.

In an area with an average rainfall of 75 inches per year, which would occur at about the 600-800 foot elevation level in the western portion of the East Maui watershed, a lined one-acre catchment area will require 37 inches of rainfall (or half the annual rainfall) to capture 1 million gallons. Expanding catchment areas to capture more water would need to take into consideration potential impacts on the environment, as some of the captured water would otherwise have eventually flowed into East Maui streams (so there could be resulting decreases in stream flows), riparian habitats, and other downgradient uses.

Topography and vegetation would be important considerations in locating and designing a catchment system in the East Maui watershed. With a 4:1 slope deemed necessary to feed the captured water into a storage reservoir (a necessary part of a catchment system), given the terrain and heavy vegetation of the East Maui watershed, significant grading

and clearing will likely be needed to install catchment systems. The existing ditch system and the HC&S reservoirs are not likely candidates for storage. During the times that the catchment system is collecting water, the ditches would probably be full, and the reservoirs are at lower, drier elevations where it would be impractical to locate rain catchment systems.

To make a measureable contribution to HC&S' water needs, rainwater catchment facilities would have to be large and numerous, throughout the East Maui watershed—and they may not be feasible due to terrain, the need to clear forested areas, and the cost. Further, given the number and size of the facilities that would be needed to produce a meaningful amount of water, there could be significant consequences to the environment of the East Maui watershed.

Stormwater Reclamation

Another method of rainwater harvesting is stormwater reclamation – capturing runoff during heavy rain events.

The WRPP, at page 7-38, noted that the "fundamental challenge of most methods of stormwater reuse is that stormwater is primarily available in excess during the rainy season and most needed in the dry season. Therefore, it must be stored for at least a season, in sufficient quantity to justify the cost of construction of the impoundment. This relationship informs expectations regarding the size of storage needed."

This statement is certainly applicable to HC&S. During those rainfall events when stormwater would be captured, the EMI ditches would be full, water would be released into streams, and reservoirs would be full. Surface water impoundment facilities, therefore, would be needed for beneficial use of stormwater capture.

A analysis conducted in the late 1960's to early 1970's determined that a one billion gallon impoundment facility would provide HC&S with only a 10-day supply of irrigation water. As noted in the WRPP at pages 7-34 to 7-35, however, such large impoundment facilities can significantly impact the environment and ecosystem, and therefore, must be carefully planned, sited, designed, constructed and operated.

Desalination

The technology to desalinate water continues to improve and technological costs have decreased over time. Nevertheless, desalination is a very high energy user and thus still expensive.

Currently, desalination of a municipal scale is still deemed to be cost-prohibitive. Desalination for large-scale agricultural use likewise is not financially feasible at this time, but hopefully technology improvements may make desalinization an option at some time in the future.

New Wells

To truly be considered an alternative source to East Maui stream water, any new wells would have to be located where they are unlikely to have direct impact on stream flows. Additionally, the cost to pump the water out of the ground and to transport the water to locations of use must be economically practicable. Given those criteria, new wells are likely to be located close to existing HC&S wells. That raises the issue of aquifer degradation due to concentrated pumping, especially if increased pumping is coupled with a decrease in surface water importation to recharge the aquifer.

Weather Modification

Weather modification as a means to increase precipitation had been the subject of research and experimentation in Hawaii since the early 1950s. In 1953, the Territorial Cattlemen's Council, the Pineapple Research Institute, and the Hawaii Sugar Planters' Association jointly conducted an experiment in Keanae Valley by seeding warm clouds with water sprays from a ground-based installation to stimulate rainfall. Although some positive results were noted in increased size and number of raindrops, more work was needed before it could be considered for practical application.

Cloud seeding using chemical agents such as silver iodide is conducted around the world to induce rainfall during times of drought, to reduce the amount of fog around airports, and by major ski resorts to induce snowfall. Effectiveness and environmental impacts (e.g., toxicity of seeding chemicals to flora and fauna, 'stealing' rain from one area by inducing rainfall in another) are generally not conclusive and sometimes disputed. It should be noted that weather modification as a method of water augmentation was included in the 1990 Water Resources Protection Plan, but is not included in the 2008 WRPP.

Appendix G: Wet Season vs. Dry Season Water Needs

CWRM Data Request (per minutes):
Identify minimum offstream needs during a wet season versus the dry season

Response:
Our definition of "minimum needs" is based on the amount of water needed to sustain a viable sugar plantation at HC&S. With sugarcane, there is a high correlation between water application and sugar yields – the greater the amount of water applied, the higher the yield. While there is a certain amount of water required just to keep the cane plant alive, water application at that rate would provide such low yields that HC&S could not remain economically viable. That amount, therefore, could not reasonably be adopted as the standard for calculating "minimum need." Later in this Appendix G, we discuss the production levels that are necessary to sustain a viable sugar plantation, which then serve as the basis for identifying HC&S' minimum water needs.

With this in mind, attached is a table entitled "Monthly Water Needs and Availability" which is an analysis of HC&S' wet season vs. dry season water needs. It utilizes long-term data sets to develop historical averages, by month, for both demand and supply. The longest period for which data were available was used in all cases because this helps minimize the impact of any 'atypical' weather event, such as the recent drought. All data are based on at least a 24-year period ending in 2009.

The table in Exhibit G-I identifies water needs by month, then compares this to available water supply by month (from surface and well sources) to determine whether there is a deficit or surplus of water on average in any given month. This approach identifies important patterns, but is limited by its reliance on averages. This analysis is extremely helpful for demonstrating the relative seasonal needs for HC&S. It shows that water deficits during the summer months are significant, and that they occur when evapotranspiration—and therefore growth potential—are greatest. These findings support the concept of seasonal IIFS that would not affect summertime flow.

Calculation of Water Needs and Availability:
HC&S' water needs were calculated for each month of the year starting with the average daily evapotranspiration needs of the plant during that month (as determined by measurements from 12 meteorological stations throughout the plantation, which provide real time data). Included in the calculation of needs is water needed to account for effective application of water through the drip system and other irrigation practices, such as the flushing of salts and other minerals from the soil, system losses that occur in the transportation and storage of the East Maui water via the 75-mile EMI system and 36 HC&S reservoirs, and water needed for milling and power plant operations. HC&S currently needs 2 million gallons per day (mgd) for power plant operations (year round) and 6 mgd for milling operations (typically 8-9 months each year).

Average water availability was calculated for each month of the year using actual EMI ditch deliveries plus actual pumping records. Actual pumping is a good indicator of the long-term sustainable pumping levels based on HC&S' observations of salinity levels, power availability for pumping (pursuant to our firm power obligations to Maui Electric Company) and financial considerations. Note that summertime need for pumping is higher and increased summertime pumping is facilitated by a force majeure clause in our power contract that allows us to reduce power sales and increase pumping. Summertime pumping levels, however, are not feasible year round due to overall power delivery requirements, concerns for the sustainability of the brackish aquifer, and financial considerations. The last column in Exhibit G-I indicates the deficit or surplus when comparing water needs to water availability (both surface and well water).

It is important to note that rainfall data is not separately included in the calculation of water availability because of the complexity in translating rainfall data to the amount of water that becomes available for plant use. Most of the rains in the central valley of Maui fall in small daily amounts. Light rainfall does not penetrate the canopy of the cane fields and get to the roots of the plant where it can be effective. However, even these light rainfall amounts do lower evapotranspiration ("ET") by raising humidity and lowering solar insolation. Thus, because rainfall is already factored into ET rates, to then add rainfall as an additional water source would be, to some extent, double counting the effect of rainfall on water availability. On the other end of the spectrum, during heavy rainfall events some of the water sheetflows as surface runoff and is not taken up by the plants. The amount of runoff depends on the intensity of the rainfall and the moisture content of the soil preceding the rainfall event. There are events when rain falls in sufficient amounts over a period of time to be effective for plant and soil absorption. For these reasons, dividing total annual rainfall by 365 days and assuming that this amount was applied on a daily basis is erroneous. Notwithstanding the complexities of utilizing rainfall data, what can be determined with confidence is that even factoring in average effective rainfall amounts will not erase summer water deficits.

Findings:

The following conclusions are drawn from the attached analysis:

- The water needs of HC&S' sugarcane crop differ significantly between the wet and dry months of the year.
- At all times of the year, there is insufficient stream water to meet the full needs of the 30,000 acres of East Maui fields. Every month of the year, HC&S pumps its brackish wells to supplement available surface water supplies
- Even taking into account both surface and ground water, HC&S regularly operates at a total water deficit for these East Maui fields. Based on monthly averages, only November and December have, over the long-term, produced adequate water
- Incremental water loss in any month other than November or December will, on average, put HC&S further below its water requirements—and November would quickly move into deficit status with even a modest IIFS. As discussed previously, the impact of IIFS will be far less, on average, in the winter months than in the summer months due to the lower deficit and the lower rate of evapotranspiration, which reduces growth potential during that period.

- Nonetheless, even winter months can be dry. As an example this chart indicates that February average surface water deliveries are 123 mgd, yet in February 2010, actual deliveries were only 65 mgd.

Defining "Minimum Needs":
There has been extensive discussion regarding the proper means of calculating need. HC&S, like others, has a methodology based on evapotranspiration and several other agronomic factors. This methodology has been developed and refined over more than 30 years of practical experience with drip irrigation. Based on our understanding of other models, we believe that our methodology uses more accurate inputs—including evapotranspiration data that is both longer-term and includes more recent time periods, and is based on information collected at 12 stations across the HC&S plantation representing different microclimates—and using coefficients that more accurately reflect the realities of our farming conditions and crop. Additionally, our methodology has been field-tested over numerous years of application. Nonetheless, every methodology is ultimately subject to limitations, so the optimal means of assessing need is to review actual results.

As shown below, when HC&S has had adequate water availability, it has realized optimal yields—nearly 15 tons sugar per acre in 1987. When water availability falls, as it did for the 2009 crop, yields plummet. As the data show, HC&S' calculated need has generally not been met over the past 24 years. In fact, available water has been only 85% of needed water.

Crop Year[1]	Water Need[2] (GPAD)	Available Water[3] (GPAD)	Available as % of Need	Yields (Tons Sugar per Acre)
1987	8,234	8,732	106%	14.7
1986-2009	9,019	7,689	85%	12.1
2009	8,297	5,867	71%	8.2

1) Crop year represents the calendar year of harvest. Water Need and Water Available are calculated for the two prior calendar years, which is the period of growth for the crop.
2) Includes system losses, irrigation efficiencies and industrial (factory) needs
3) Ditch plus pump water

Rather than indicating that HC&S' "need" is overstated, however, these results demonstrate that the sugarcane plant can survive, but not thrive, with less than optimal water. The crop will benefit from as much water as it can receive. As a result, the question of need becomes an economic one—not the amount of water to keep cane alive, but the amount of water needed to keep the HC&S operation viable. Using a level of need based on matching evapotranspiration , actual results show that full water needs will not be met on a regular basis, but production levels of roughly 12 tons sugar per acre (TSA) can be achieved. Under current operating conditions, HC&S must achieve this level of yield or higher to have reasonable prospects for breaking even or reaching modest profitability. Granted, many variables influence profitability, such as sugar prices and energy prices, but over the long-term, 12+ TSA has proven to be the breakeven point. The loss of additional water, especially during summertime, will lower long-term expected yields below 12 TSA and jeopardize HC&S' viability. In total, this analysis reinforces the concept of preserving summertime flows via a seasonal approach to setting IIFS.

Exhibit G-1: Average Monthly Water Need and Availability

	Daily Evapotranspiration (ac-in) [1]	Effective Water Needed (GPAD) [2]	Gross Water Needed (GPAD) [3]	Industrial Usage (GPD) [4]	Total Water Needed (GPD) [5]	Average Surface Water Deliveries (GPD) [6]	Average Groundwater Pumping, 1986-2009 (GPD) [7]	Deficit (GPD)
January	0.1619	4,396	5,275	2,000,000	176,072,890	145,433,977	27,156,240	(3,482,673)
February	0.1837	4,987	5,984	2,000,000	199,483,030	128,589,836	38,719,743	(32,173,451)
March	0.2092	5,680	6,816	2,000,000	226,938,983	153,598,839	58,787,516	(14,552,628)
April	0.2395	6,504	7,805	8,000,000	265,569,806	188,280,096	57,555,461	(19,734,250)
May	0.2762	7,500	9,000	8,000,000	305,001,898	167,800,355	75,275,601	(61,925,942)
June	0.3188	8,656	10,387	8,000,000	350,760,324	148,413,934	94,345,600	(108,000,789)
July	0.3256	8,842	10,610	8,000,000	358,144,039	183,787,077	93,418,955	(80,938,007)
August	0.3186	8,651	10,381	8,000,000	350,567,674	173,202,635	99,211,500	(78,153,539)
September	0.2997	8,139	9,767	8,000,000	330,302,771	137,105,874	111,059,947	(82,136,950)
October	0.2474	6,718	8,062	8,000,000	274,033,305	145,310,096	111,759,660	(16,963,549)
November	0.2086	5,663	6,796	8,000,000	232,257,960	168,441,544	64,129,699	313,283
December	0.1635	4,439	5,327	2,000,000	177,793,369	160,344,317	36,250,658	18,801,607
Nov-Apr	0.1944	5,278	6,334	4,000,000	213,019,340		47,099,886	165,919,453
May-Oct	0.2977	8,084	9,701	8,000,000	328,135,002		97,511,877	230,623,125

Notes:

1 average evapotranspiration as measured by 12 meteorological stations throughout the plantation

2 conversion of ac-in to gpad (x 27,154)

3 effective water = 80% of gross water applied to account for system inefficiencies, installation and terrain inconsistencies

4 2 MGD needed for boiler operation and 6 MGD for factory operations

5 water needed to irrigate 30,000 acres inclusive of 10% system losses due to seepage and evaporation of transportation and storage system

6 based on EMI monthly surface water delivery reports (1986 - 2009)

7 average daily groundwater pumping (1986-2009)

Appendix H: Seasonal IIFS--Diversion Infrastructure

CWRM Data Request:

Identify the ability to accomplish seasonal stream restoration based on the stream infrastructure in the streams with diversions

Response:

The attached chart, entitled "19 Streams: IIFS Diversion Infrastructure", identifies all of the EMI diversions on the subject 19 East Maui streams and indicates where the existing diversion infrastructure would readily allow for seasonal adjustment to enable the implementation of a seasonal IIFS, that is a release of water during a portion of the year. These include diversions with a sluice gate that can be raised and lowered to regulate the amounts of water diverted to the ditch and left in the stream, or, in one case, a metal flange with an attached valve that can be opened or closed.

A number of EMI diversions on these 19 streams consist of a dam structure across the stream. There are no mechanisms on these diversion structures to adjust flows from time to time. Any modification of these structures to release more water into the streams would have to be permanent in nature, or a new structure built to allow seasonal adjustment. Permanent modifications to these structures, such as cutting a V-notch into the dam structure, while technologically feasible, may jeopardize the integrity of the structure and could not be easily adjusted, which is not consistent with the adaptive management approach. Engineering studies would have to be conducted for each diversion structure to be modified to determine what, if anything, would need to be done to preserve the integrity and safety of the diversion structure. Because such modifications or new structures would require altering structures within streams, permits from CWRM and the U.S. Army Corps of Engineers would be required. These types of diversion structures are noted on the attached chart as "No existing mechanism for seasonal releases."

Exhibit H-1: 19 Streams IIFS Diversion Infrastructure

19 Streams East to West	Spreckels Ditch	Koolau Ditch	Wailoa Ditch	New Hamakua Ditch	Waikamoi Skimming Dam	Manuel Luis Ditch	Center Ditch
Makapipi	No diversion	Sluice gate can release water into stream	No diversion	No diversion	No diversion	No diversion	No diversion
Hanawi	No diversion	Sluice gate can release water into stream	No diversion	No diversion	No diversion	No diversion	No diversion
Kapaula	No diversion	No existing mechanism for seasonal releases	No diversion	No diversion	No diversion	No diversion	No diversion
Waiakaa	No diversion	No existing mechanism for seasonal releases	No diversion	No diversion	No diversion	No diversion	No diversion
Paakea	No diversion	Sluice gate can release water into stream	No diversion	No diversion	No diversion	No diversion	No diversion
Puakaa	No diversion	Sluice gate can release water into stream	No diversion	No diversion	No diversion	No diversion	No diversion
Waiohue	No diversion	Sluice gate can release water into stream	No diversion	No diversion	No diversion	No diversion	No diversion
Kopiliula	No diversion	Sluice gate can release water into stream	No diversion	No diversion	No diversion	No diversion	No diversion
East Wailuaiki	No diversion	Sluice gate can release water into stream	No diversion	No diversion	No diversion	No diversion	No diversion
West Wailuaiki	No diversion	Sluice gate can release water into stream	No diversion	No diversion	No diversion	No diversion	No diversion
Waianu	No diversion	No diversion	No diversion	No diversion	No diversion	No diversion	No diversion
Nuailua	No existing mechanism for seasonal releases	No diversion	No diversion	No diversion	No diversion	No diversion	No diversion
Honomanu	Sluice gate can release water into stream	No diversion	No diversion	No diversion	No diversion	No diversion	No diversion
Kolea (East)/Punalau (East)	Metal flange with valve on diversion dam can release water into stream	Sluice gate can release water into stream	No diversion	No diversion	No diversion	Sluice gate can release water into stream	No diversion
Haipuaena	No existing mechanism for seasonal releases	No existing mechanism for seasonal releases	No diversion	No diversion	No diversion	No existing mechanism for seasonal releases	No diversion
Puohokamoa, (West, Middle, East Branches)	Sluice gate can release water into stream	No existing mechanism for seasonal releases	No diversion	No diversion	No diversion	No existing mechanism for seasonal releases	No diversion
Wahinepee	No diversion	No diversion	No diversion	No diversion	No diversion	No existing mechanism for seasonal releases	No diversion
Alo	No diversion	No diversion	Sluice gate can release water into stream	Sluice gate can release water into stream	No diversion	No diversion	No diversion
Waikamoi	No diversion	No diversion	Sluice gate can release water into stream	No existing mechanism for seasonal releases	No existing mechanism for seasonal releases	No diversion	Sluice gate can release water into stream

Appendix I: Upstream Recruitment/Downstream Entrainment

CWRM Data Request

Identify which of the stream diversions are capable of being altered to increase upstream recruitment and reduce downstream entrainment

Response:

In investigating modifications that could be made to diversion structures for the enhancement of upstream and downstream migration, EMI researched the modified diversion on Punalu`u Stream on Oahu that was recently constructed by Kamehameha Schools ("KS"). The total width of the Punalu`u diversion structure is 38 feet. Constructed within the diversion is an 8-foot wide diversion to provide water for KS users and one-foot wide bypasses on both sides to allow stream water to flow over the diversion and continue down the stream. The diverted water goes into a bar screen grating and then into a 24-inch diameter high density polyethylene pipe which transports water to downstream users. Flow from the pipe to the users is controlled by a valve. The amount needed by downstream users is typically less than the amount diverted; therefore, water back pressures in the pipe and out of the bar grating, back into the stream thus serving to keep the grate free of debris. The valve is equipped with solar panels, batteries and an astrological clock to automatically close for three hours after dusk each day, when migration of native amphidromous fish larvae is predominant. Total permitting, consulting and construction cost for the modified structure exceeded $500,000 and took 13 months to complete.

This Punalu`u design is not readily exportable to the East Maui streams. First, the Punalu`u diversion consists of a grating structure through which the water is dropped into the ditch. Most of the EMI diversion structures are not of this type so a completely new diversion structure would have to be constructed, rather than a modification of an existing structure such as at Punalu`u. Further, many of the East Maui streams at the locations of the diversion structures are significantly wider than Punalu'u stream. Both these factors would result in significantly higher costs than incurred at Punalu'u—multiples of the $500,000 cost, per diversion. Second, the stream channel at Punalu`u is well-defined, with cut-stone sides. The East Maui streams where EMI has its diversions have variable topographies and the channel areas are generally not well-defined, making construction of Punalu`u type diversion structures much more challenging. Third, unlike Punalu`u, EMI diversions do not feed the diverted water into a closed system (pipe with valve) thus it would be difficult to remotely control the release of water for the three hours each day.

Upstream Migration: There are methods other than increasing streamflow to enhance opportunities for upstream migration. Biologists seem to agree that the native amphidromous species tend to migrate in pulses, utilizing freshets to move upstream and downstream, and inhabiting pools in the intervals. Even when freshets overtop diversion structures, however, native stream animals may have difficulty in scaling the wall of the dam on its upstream migration.. Constructing 'fish ladders' along the side of the stream

channel (where migration appears to be concentrated) would enhance the ability of native stream species to move upstream. Fish ladders vary in design and costs. We have been advised that constructing cobble-type fish ladder along the edges of the dam would be relatively inexpensive, could be done quickly, and should be effective in enhancing upstream migration. Cobble-type fish ladders are possible on the following seven of the 19 East Maui streams: Hanawi, Kapaula, Paakea, Puakaa, East Wailuaiki, West Wailuaiki and Nuailua.

Downstream Entrainment. In our research of downstream entrainment of newly hatched larvae, we have been told that there have not been any quantitative studies of this phenomenon in Hawaii. Thus, while it may intuitively seem like a problem, the extent of the impact of this issue on the native stream species is not scientifically known. It could be that many of the larvae may find their way to the sea as freshets overtop intake structures along the length of the ditch system. But this too has not been studied or confirmed. Few adult fishes are found within the ditches.

The research of Lindstrom (1998) has demonstrated that downstream drift of larval goby fishes occurs year-round and is concentrated within the first three hours following sunset, and may be more strongly related to discharge events than to seasonal cues. Other researchers, including DAR biologists, have observed large numbers of post-larvae moving upstream along the channel edges. This and other research data were employed in the design of the diversion structure recently installed in Punalu`u Stream on O`ahu to accommodate both upstream migration and downstream drift of these native species. As discussed above, however, this Punalu'u design may not be structurally feasible nor is it economically practicable as a replacement for the East Maui diversions. Given the lack of scientific data that indicate that downstream entrainment is a significant problem for the native species, significant expenditures to prevent downstream entrainment would not appear to be a priority.

3.0 Feb. 18, 2010 - Maui Department of Water Supply

Maui Department of Water Supply (Maui DWS) provided:

1) Responses to the Commission's request for additional information;
2) Average monthly demand for Upcountry systems;
3) Consent Decree re The Coalition to Protect East Maui Water Sources et al vs. The Board of Water Supply et al; and
4) Instream flow standard assessment report data needs that had been previously submitted to the Commission.

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON

WILLIAM D. BALFOUR, JR.
SUMNER ERDMAN
NEAL S. FUJIWARA
CHIYOME L. FUKINO, M.D.
DONNA FAY K. KIYOSAKI, P.E.
LAWRENCE H. MIIKE, M.D., J.D.

KEN C. KAWAHARA, P.E.
DEPUTY DIRECTOR

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
P.O. BOX 621
HONOLULU, HAWAII 96809

February 18, 2010

Mr. Jeffrey Eng, Director
County of Maui
Department of Water Supply
200 South High Street
Wailuku, Hawaii 96793-2155

Dear Mr. Eng:

The purpose of this letter is to provide a detailed list of additional information that the staff at the Commission on Water Resource Management (Commission) needs concerning the interim instream flow standard (interim IFS) recommendations and adaptive management strategies for 19 east Maui streams presented at the Commission meeting on December 16-17, 2009, in Paia, Maui. As part of the motion that was approved at the meeting, interested parties, including Maui County Department of Water Supply (Maui DWS), are required to submit such information to the Commission within three (3) months.

Commission staff asks that the following list of specific information for the short-term, mid-term, and long-term time periods, in accordance with the motion, be submitted no later than **March 19, 2010**. A representative from Maui DWS should be prepared to present the information submitted to the Commission at the next Commission meeting, which has yet to be scheduled.

- Timeline, estimated costs, and possible funding sources for the determination of the Maui DWS System losses. Include losses from the flume, pipelines, and reservoirs.
- Timeline, estimated costs, and possible funding sources for the repair of the Upper Waikamoi Flume. Provide temporary means of reducing some of the more significant system losses on the Upper Waikamoi Flume during the development of the repair plan.
- A plan to begin shifting water use in Upcountry Maui from 85 percent reliance in surface water to a more even balance between surface and ground water. Include timeline, estimated costs, and possible funding sources for implementation of such plan.
- An outline of the possible actions that Maui DWS would take if Hawaiian Commercial & Sugar Company was to cease operation, which would directly affect surface water delivery from the East Maui Irrigation System to Maui DWS.

Commission staff would like to meet with Maui DWS representatives to further discuss the information presented above, as well as additional information that Maui DWS is willing to provide that would help the Commission in the evaluation of the pending interim IFS petitions. Please contact Dean Uyeno of the Stream Protection and Management Branch at 587-0249, or via email at dean.d.uyeno@hawaii.gov, to schedule a meeting in early March.

On behalf of the Commission, I would like to thank you in advance for your cooperation in this matter. Should you have any questions, please feel free to contact me at (808) 587-0214.

Sincerely,

KEN C. KAWAHARA, P.E.
Deputy Director

DU:ss

CHARMAINE TAVARES
Mayor

JEFFREY K. ENG
Director

ERIC H. YAMASHIGE, P.E., L.S.
Deputy Director

DEPARTMENT OF WATER SUPPLY
COUNTY OF MAUI
200 SOUTH HIGH STREET
WAILUKU, MAUI, HAWAII 96793-2155
www.mauiwater.org

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March 18, 2010

Mr. Ken C. Kawahara, Deputy Director
State of Hawaii
Department Land and Natural Resources
Commission on Water Resource Management
P.O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Kawahara:

RE: CWRM Request for Additional Information

Thank you for the opportunity to provide additional information pertaining to the pending decision on the petitions to amend the IIFS for the remaining 19 East Maui streams, as requested in your February 18, 2010 letter.

Enclosed are: (1) DWS Responses to CWRM's Request for Additional Information, (2) Average Monthly Demand for Upcountry Systems, (3) Consent Decree re The Coalition to Protect East Maui Water Sources et al vs. The Board of Water Supply et al, and (4) INSTREAM FLOW STANDARD ASSESSMENT REPORT DATA NEEDS, that was previously submitted to the CWRM.

Should you have any questions, please contact me at (808) 270-7816.

Sincerely,

Jeffrey K. Eng, Director

Enclosures: (1) DWS Responses to CWRM Request for Additional Information
(2) Average Monthly Demand for Upcountry Systems
(3) Consent Decree
(4) INSTREAM FLOW STANDARD ASSESSMENT REPORT DATA NEEDS

copy w/encls: Jane E. Lovell, Deputy Corporation Counsel

"By Water All Things Find Life"

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DWS RESPONSES TO
CWRM REQUEST FOR ADDITIONAL INFORMATION
March 18, 2010

- ***Timeline, estimated costs and possible funding sources for the determination of the Maui DWS System losses. Include losses from the flume, pipelines and reservoirs.***

1. The unaccounted for water for the DWS Upcountry Maui systems generated by the AWWA WLCC Water Audit Software is approximately 14%. This information is included in the FY 2009 Water Audit Report completed by the Maui County DWS, Water Resources & Planning Division.

   The Department has an on-going leak detection program. DWS hired its first conservation specialist in July 2007 and a second conservation specialist in November 2009. Among their duties is leak detection on the Department's 750+ miles of pipe, of which roughly 270 miles are in the Upcountry system. During FY 2009, a total of 50 miles of pipe were surveyed, of which 14.1 miles were in the Upcountry system. By FY 2011, we expect to increase the rate of survey to a total of at least 150 miles per year. At this rate, it would take 5 or 6 years to complete a survey of all DWS systems, assuming that most areas did not require repeat survey. The Upcountry system by itself would take approximately two years to completely survey.

2. Losses from the Waikamoi Flume and reservoirs cannot be accurately determined at this time without the installation of gauges or other flow measurement devices. However, DWS plans to consult with CWRM staff on the appropriate types of devices and their suitable locations.

- ***Timeline, estimated costs and possible funding sources for the repair of the Upper Waikamoi Flume. Provide temporary means of reducing some of the more significant systems losses on the Upper Waikamoi Flume during the development of the repair plan.***

A. The following is the information related to the timeline, costs and funding sources related to the flume repair:

   1. FY 2010 - $500,000 - Waikamoi Flume Rehabilitation Design: In the current fiscal year, DWS has already selected a design consultant (Kai Hawaii) to design the flume replacement. On March 8, 2010 the consultant and DWS staff inspected the flume system. The consultant's proposal is forthcoming.

   2. FY 2012 - $10,000,000 - Waikamoi Flume Rehabilitation Construction: Due to the magnitude of the projected costs, the DWS is actively seeking federal funding. It would be imperative that CWRM and the state of Hawaii support DWS' efforts.

County of Maui Mayor Charmaine Tavares, as well as Councilmembers Michael Victorino and Joseph Pontanilla, have made requests for federal funding through our congressional representatives.

B. In order to mitigate water losses from the Upper Waikamoi Flume, East Maui Irrigation Company personnel inspects the flume system and stream intakes on a regular basis. Any leaks are reported to DWS and repair crews are immediately dispatched to perform the repairs. DWS crews also perform periodic inspections.

- ***A plan to begin shifting use in Upcountry Maui from 85 per cent reliance in surface water to a more even balance between surface and ground water. Include estimated costs and possible funding sources for implementation of such plan.***

To shift from 84% surface water to 50% each ground and surface water would increase the cost of providing water for the Upcountry system by over $117 million more than the "Reference Strategy" over the 25 year planning period. The "Reference Strategy" is noted below in paragraph A. These costs include an increase of over $85 million in electricity costs. The impact of this increase in cost of service would be an extreme financial hardship for all DWS customers. Please keep in mind that DWS has a relatively small customer base to which it can spread its costs. With such an increase in cost of service passed on to its customers, some DWS customers, such as farmers and ranchers, could be put out of business.

A review draft of the Upcountry infrastructure chapter of the Water Use and Development Plan was completed in July of 2009, and is found on our web site. This draft considers five major strategies to meet anticipated Upcountry demands:

A. Incremental Basal Well Development (aka the "Reference Strategy"):
This involves continued use of existing surface sources, with basal groundwater wells added as needed to meet growing upcountry demands.

B. Expansion of Raw Water Storage Capacity:
This features one or more new raw water storage reservoirs to supplement the effective reliable yields of the existing Upcountry District surface water treatment systems. This was evaluated with various reservoir sizes, locations, and other parameters.

C. Drought Proof Full Basal Well Backup:
This involves the provision of sufficient new basal groundwater wells to meet 100% of projected Upcountry demands even in a drought situation. Various levels of drought were considered. It is important to note that this option does not envision reduction in the use of surface water, to be replaced by full time basal pumpage, but merely the construction of sufficient basal backup for drought situations.

D. Improved Kamole Water Treatment Plant Capacity:
This strategy features improvements to the existing Kamole Water Treatment Plant to provide additional volume and or drought period reliable capacity to mitigate impacts of anticipated reductions in Wailoa Ditch base flows from potential interim instream flow standard

amendments. Measures examined included expansion of installed filter capacity, improvements to the WTP intake structure, and addition of a raw water storage reservoir. This study determined that a 100 MG reservoir would be required to mitigate a 20 MGD reduction in Wailoa Ditch base flows. A 200 MG reservoir would be necessary to mitigate a 30 MG reduction in Wailoa Ditch base flows. Costs for such large reservoirs are uncertain at this time; however, costs up to $100 million could be expected.

E. Limited Growth with Extensive Conservation Measures:
For this strategy, several permutations of means to limit water consumption and demand on the Upcountry system were considered. It was concluded that even aggressive demand side management would be cost effective. However, demand side management alone would not suffice to meet the anticipated demands of the Upcountry District within the 25 year period. Limiting or relocating growth was examined with a view to providing land use planners and decision makers information on the cost impacts to serve water in different regions within this district.

The most cost effective strategy would include construction of a raw water reservoir in Lower Kula, followed by either improvement of Kamole Treatment Plant, or incremental basal development, depending upon various factors. The optimal size and relative cost effectiveness of a reservoir at the Kamole Plant varies in relation to the assumed cost of oil and assumed reductions in Wailoa Ditch flows as a result of any amended interim instream flow standards.

Full Basal Backup would be considerably more expensive than the other strategies.
Not only is this strategy the most expensive, public opposition would be perhaps one of its greatest impediments. CWRM should be aware that the last time DWS attempted a large-scale groundwater project in East Maui (the ten-well " East Maui Water Development Plan"), legal challenges produced twelve years of litigation resulting in the attached consent decree (The Coalition to Protect East Maui Water Sources et al vs. The Board of Water Supply et al).

In light of CWRM's request to review a plan to shift use from roughly 84% surface water to a more even balance between surface water and groundwater, a sixth strategy was examined. In this strategy, 50% of source use would come from groundwater, and 50% from surface water. The results of this analysis were that the proposed balance between surface and groundwater would cost over $117 million dollars more than the Reference Strategy, over the course of 25 years. This cost assumes that oil remains at $75 per barrel. If the cost of oil were to increase, the cost of relying on 50% groundwater would increase further. Again, we stress, that this cost is over and above the Reference Strategy. It is not the total cost of such a plan. As stated earlier, the addition of $117 million over and above the Reference Strategy costs may prove more than the community can reasonably bear. In addition, the proposed shift would result in roughly $85 million in increased electricity costs. We have concerns about the impacts such costs could have on both our customers and on the financial

viability of the system. Given that DWS takes only a fraction of the flows in the Wailoa Ditch, it would seem an inordinate expense to make such an adjustment.

For the Commission's information, we provide the following information on the status of some of Upcountry source development.

Incremental Basal Well Development:

1. FY 2009 - $765,000) - Funding approved and encumbered. Our consulting engineer (Austin, Tsutsumi & Associates) is currently investigating potential well sites. The project includes land acquisition and design.
2. FY 2011 - $1,100,000 - Proposed bond funding for construction of exploratory well
3. FY 2012 - $3,000,000 - Proposed funding for construction of well and transmission system

Expansion of Raw Water Capacity:
H.B. 2500, HD1, SD1 (State appropriations) includes $3.8 million for the Upcountry Maui reservoir. The County of Maui Mayor's Office is currently working on obtaining additional funding from the State and Federal government.

The DWS proposed FY 2011 CIP budget has included $1,000,000 in bond funding for this project. Also, the proposed FY 2012 CIP budget has included $14,000,000 and the proposed FY 2013 CIP budget has included $100,000,000.

Funding for either FY 2012 or FY 2013 has not been secured yet. However, U.S. Congresswoman Mazie K. Hirono is currently requesting the authorization amount of $100,000,000 for a 300-million gallon reservoir for Upcountry Maui (Lower Kula reservoir). The cost sharing will most likely be between the County of Maui and the U.S. Army Corps of Engineers.

- ***An outline of possible actions that Maui DWS would take if Hawaiian Commercial & Sugar Company was to cease operation, which would directly affect surface water delivery from the East Maui Irrigation System to Maui DWS.***

If East Maui Irrigation Company were to no longer maintain and operate the surface water ditch systems and intakes, it would be disastrous to DWS Upcountry customers. With the loss of 84% of its water sources, Upcountry Maui could see emergency water rationing among its domestic customers, farmers and ranchers shutting down their operations, and schools and medical facilities not able to function normally. The DWS does not possess the unique skills and knowledge it takes to maintain and operate the ditch and intake systems; therefore, taking over the systems is not a realistic consideration.

Average Monthly Demand
Upcountry Systems including
Kula Agricultural Park
(MGD)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2009	5.4	6.3	6.1	7.4	7.8	8.8	8.9	8.3	9.2	9.0	7.9	6.6
2008	6.3	6.0	7.6	7.5	8.1	8.7	8.6	8.5	8.4	8.4	6.9	5.5
2007	7.9	7.3	7.2	8.6	9.8	10.0	8.9	8.5	7.7	8.3	7.0	5.7
2006	7.6	6.2	6.3	7.3	7.9	9.6	10.6	10.6	9.6	7.9	6.8	7.1
2005	5.5	6.9	7.0	8.0	9.0	9.3	9.3	10.0	9.0	8.0	7.6	7.4

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Attorney for Plaintiffs
The Coalition to Protect East Maui
Water Resources, Hui Alanui o Makena,
The Sierra Club, Mark Sheehan

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IN THE CIRCUIT COURT OF THE SECOND CIRCUIT

STATE OF HAWAII

THE COALITION TO PROTECT EAST MAUI WATER RESOURCES, an unincorporated association; HUI ALANUI O MAKENA, a Hawaii non-profit corporation; THE SIERRA CLUB, a California non-profit corporation registered to do business in the State of Hawaii; MARK SHEEHAN; Plaintiffs, vs. THE BOARD OF WATER SUPPLY, COUNTY OF MAUI; DEPARTMENT OF WATER SUPPLY, COUNTY OF MAUI; COUNTY OF MAUI; GEORGE TENGAN, in his capacity as Director of the Water Department, County of Maui; and JOHN DOES 1-100; Defendants.	Civil No. 03-1-0008(3) (Declaratory Judgment and Other Civil Action) CONSENT DECREE; ORDER; EXHIBITS "A" AND "B"

emc/consentdecreefinal

CONSENT DECREE

RECITALS

WHEREAS, the Maui County Department of Water Supply has prepared a Final Supplemental Environmental Impact Statement ("FSEIS") for the East

Maui Water Development Plan ("EM Plan"), required by Court Orders entered in The Coalition to Protect East Maui Water Resources, et al. v. The Board of Water Supply, et al., Civil No. 93-0734(3), in the Second Circuit Court of the State of Hawaii;

WHEREAS, the FSEIS was accepted by the Board of Water Supply on October 15, 2002 and notice of this acceptance was published in the November 8, 2002 issue of *The Environmental Notice*;

WHEREAS, Plaintiffs the Coalition to Protect East Maui Water Resources, an unincorporated association; Hui Alanui o Makena, a Hawaii non-profit corporation; The Sierra Club, a California non-profit corporation registered to do business in the State of Hawaii; and Mark Sheehan, as Plaintiffs (hereafter collectively "Plaintiffs") filed a Complaint, on January 6, 2003 and an Amended Complaint, on January 7, 2003, for Declaratory and Injunctive Relief, to Enforce Court Orders and For Other Relief against Defendants the Board of Water Supply, County of Maui; the Department of Water Supply, County of Maui; County of Maui; and George Tengan, in his capacity as Director of the Water Department, County of Maui (hereafter collectively the "County Defendants") challenging, *inter alia*, the preparation of the SEIS and the acceptance of the FSEIS, the construction and implementation of the test program for the test well, the alleged failure to modify minimum stream flow standards prior to implementing the project, the alleged failure to establish correlative water rights prior to transferring groundwater out of the area and the alleged breach of the Public Trust Doctrine, among other claims;

WHEREAS, the County Defendants have denied the foregoing allegations in their pleadings;

WHEREAS, to avoid the expense, uncertainty and acrimony of further litigation, Plaintiffs and the County Defendants have determined that it is in the best interest of all concerned to resolve their differences amicably on the terms and conditions to follow;

NOW, THEREFORE, in consideration of the mutual promises, agreement and obligations hereinafter set forth, Plaintiffs and the County Defendants agree to the terms and conditions set forth in this Consent Decree, as follows:

TERMS AND CONDITIONS

1. Acceptance of the SEIS Limited to Phase I of the EM Plan

1.1 The acceptance of the SEIS for the EM Plan shall be valid for Phase I only of the EM Plan. "Phase I" of the EM Plan means Hamakuapoko Well No. 1 (State Well No. 5420-02) and Hamakuapoko Well No. 2 (State Well No. 5320-01), with an approximate installed capacity of 2 million gallons per day ("mgd") located in the Hamakuapoko region of the Paia Aquifer System, together with associated treatment facilities and transmission line extended to Paia, to carry the groundwater produced by these two wells, as safe drinking water, as part of the County water system.

2. Withdrawal of the Acceptance of the SEIS for the Remainder of the EM Plan

2.1 The acceptance of the SEIS for the remainder of the EM Plan (all Phases beyond Phase I, namely Phases II through VI) is hereby withdrawn and shall have no legal force or effect. The County shall publish in *The Environmental Notice* the withdrawal of any acceptance of the FEIS or FSEIS for the remainder (all phases beyond Phase I, namely Phases II through VI) of the EM Plan.

3. Phase I is Redefined as the EM Plan and the Remainder of the EM Plan is Withdrawn

3.1 Phase I of the EM Plan shall be redefined as the EM Plan in its totality or entirety. The County agrees to withdraw as a plan, project or program what are now known as the remaining Phases of the EM Plan, namely Phases II through VI.

4. Studies to be Conducted Before Any Further Effort is Made to Develop Groundwater Resources in the Agreed-Upon Portion of the East Maui Region

4.1 Any further efforts by the County Defendants to develop groundwater resources in the agreed-upon portion of the East Maui Region (described in Exhibit "A" attached hereto, which is a map delineating clearly the area referenced, hereafter, the "agreed-upon portion of the East Maui Region") will be treated as a completely new County project, commenced with a new planning process, new plans and, at the appropriate time, with the preparation of a new Environmental Assessment ("EA") or Environmental Impact Statement ("EIS") pursuant to Chapter 343, HRS. The parties expressly agree that neither this provision, nor any other part of this Consent Decree, refers or relates to the Haiku Well (State Well No. 5419-01), the Kulamalu Well (State Well No. 5317-01) or the Pookela Well (State Well No. 5118-02).

4.2 Before any new project is planned by the County of Maui to develop groundwater in the agreed- upon portion of the East Maui Region, the County will undertake a Cost/Benefit Study of the surface and groundwater resources available in the Central Maui Region, Upcountry Maui Region and East Maui Region and conduct a rigorous Cost/Benefit analysis, including the evaluation of economic and environmental factors, of developing and

transmitting these water resources. This Study shall address planning for stream restoration in the agreed-upon portion of the East Maui Region.

4.3 Before any new project is planned by the County of Maui to develop groundwater in the agreed-upon portion of the East Maui Region, the County will vigorously investigate and pursue the availability of surface water from the Waikapu (60101), Iao (60102) and/or Waihee (60103) hydrologic units for public use by preparing a report which shall include a rigorous analysis of the costs and benefits of making these water resources part of Maui's public water system.

4.4 If the report on the availability of surface waters in West Maui, referenced in § 4.3 above, does not result in a determination that a sufficient supply of water can be made available from these sources to meet the needs of County residents who can be served by these waters and should the Cost/Benefit Studies, referenced in §§ 4.2 and 4.3 above, not result in a determination that it would be more cost/beneficial to develop water resources outside the agreed-upon portion of the East Maui Region, then the County may re-commence planning for a project to develop groundwater resources within the agreed-upon portion of the East Maui Region.

4.5 Any new project planned by the County of Maui to develop groundwater in the agreed-upon portion of the East Maui Region shall be consistent with the Water Use and Development Plan for the Island of Maui and the State Water Code.

4.6 Copies of the reports, studies and analyses referenced in §§ 4.2, 4.3 and 4.4 above shall be provided to Plaintiffs upon their completion.

5. Consultation With East Maui Coalition and Other Plaintiffs

5.1 The County agrees to consult with representatives or designees of Plaintiffs with respect to any future plan to develop water resources in the agreed-upon portion of the East Maui Region, including but not limited to on the studies, reports, analyses referenced above, any new plan to develop groundwater in the agreed-upon portion of the East Maui Region and any new EA or EIS for this new plan. To facilitate this consultation, Plaintiffs agree to provide the Director of the Department of Water Supply with the name, current address and telephone number of one person through whom all of Plaintiffs may be deemed to have been contacted for the purposes of initiating this consultation.

6. Use of 36" Diameter Transmission Line

6.1 The County has represented that the 36" in diameter transmission line between Paia and the two Hamakuapoko Wells has been selected because of a prior contractual commitment to purchase the 36" pipes. The County, therefore, agrees as follows:

(a) the use of the 36" transmission line is not to be considered as a commitment to develop or transmit water resources more than can be produced by the two Hamakuapoko Wells in the agreed-upon portion of the East Maui Region;

(b) the 36" transmission line shall be used solely in connection with Phase I of the project, as described in § 1.1 above. Any other use of this Hamakuapoko to Paia 36" transmission line to transmit water shall require a new EA or EIS;

(c) for the first 200 yards of the transmission line after both of the Hamakuapoko Wells, in the Paia direction, 24" in diameter pipes shall be used in constructing the transmission line instead of pipes 36" in diameter, as a means of assuring that the capacity of the transmission line is limited to the approximate amount intended by Phase I of the EM Plan.

7. Future Use of EIS and SEIS for EM Plan

7.1 Should the County, at some time in the future decide to develop additional groundwater resources in the agreed-upon portion of the East Maui Region, the County shall not resubmit or incorporate by reference the EIS or the SEIS prepared for the former EM Plan. The County shall, at the appropriate time, prepare a new EIS for any new plan to develop groundwater resources within the agreed-upon portion of the East Maui Region. In any EIS prepared by the County, the County shall comply with Chapter 343 and the regulations promulgated thereto. The County shall not, without considerable pre-examination and comparison, use the EIS or SEIS prepared for the former EM Plan, or the studies or analysis prepared for these documents, in any new EA or EIS. Among the studies within the FSEIS which the County Defendants may reference in any further EA or EIS are (a) laboratory report test results for contaminants from former SEIS test well (State Well No. 5418-08); and (b) USGS studies and reports. Among the studies and research conclusions within the FSEIS which shall not be relied upon or used in any further EA or EIS are (a) the test results from the testing of the former SEIS test well (State Well No. 5418-08) with respect to the impacts of groundwater pumping on stream flows in the agreed-upon region; (b) the study of alternatives and the

costs and benefits of developing alternative water resources; (c) the costs and benefits of relocating the proposed EM Plan wellfield further mauka; (d) the study of the impact of the EM Plan on marine resources throughout the region; (e) the study of the impact of groundwater pumping on streams and existing wells; and (f) the study of the impact of agricultural contaminants on groundwater quality. The County shall consider factors such as: existing aquifers, groundwater resources, streams, diversions, wells, private and public water systems, location of cesspools, socio-economic impacts, the impact of groundwater pumping on marine resources throughout the region, and plans for stream restoration.

8. Use of the Test Well, the Test Well Data and Further Testing

8.1 The County Defendants and Plaintiffs have disagreed, with respect to the former SEIS test well (State Well No. 5418-01) located on Hogback Road in Haiku, about its construction, drilling and testing.

8.2 The County will work with the USGS and a representative of Plaintiffs to develop an additional test well in the agreed-upon portion of the East Maui Region to investigate whether developing additional wells in the agreed-upon portion of the East Maui Region and placing State Well No. 5418-01 into production may adversely impact stream flows in streams, in the agreed-upon portion of the East Maui Region. The County is authorized to construct an additional well in the agreed-upon portion of the East Maui Region, within one of the crosshatched areas shown on the maps attached hereto as Exhibit "B". This additional well shall only be used for the test purposes of gathering data and information. During the drilling of this well, a test protocol, agreed to by the parties hereto and the USGS, shall be

implemented, the purpose of which shall be to determine whether or not pumping groundwater by wells located in the agreed-upon portion of the East Maui Region may have an impact upon streamflow in streams in the agreed-upon portion of the East Maui Region. Thereafter, this test well shall be dedicated for use by the County Defendants as a monitoring or observation well to monitor or observe the performance of the aquifer in the agreed-upon portion of the East Maui Region. This additional well shall not be used for production purposes.

8.3 The former SEIS test well located on Hogback Road (State Well No. 5418-01) shall not be used for production purposes or for anything other than testing, monitoring or observation purposes unless and until the additional test well, referenced in § 8.2 above, has been drilled, a test protocol agreed upon by the parties hereto has been implemented, the results of this testing demonstrate that pumping of State Well No. 5418-01 will not have an adverse impact upon stream flow in streams in the region and the additional test well is dedicated for monitoring and observation of the performance of the aquifer in the agreed-upon portion of the East Maui Region.

9. Use of Data From Pumping of Two Hamakuapoko Wells

9.1 Actual data obtained from the pumping of the two Hamakuapoko Wells shall be employed in preparing the Cost/Benefit analysis referenced above and in deciding whether to begin planning any further project to develop groundwater resources in the agreed-upon portion of the East Maui Region.

10. Stream Restoration Shall Be a Component of any East Maui Water Development Plan

10.1 The County agrees that as long term agricultural water needs are reduced, a stream restoration program will be studied, developed and initiated by the County. As such, the County agrees that one component of any plan or program to develop further water resources in the agreed-upon portion of the East Maui Region must include the study, development and initiation, as may be applicable, of a stream restoration program in the agreed-upon portion of the East Maui Region.

11. Effect of This Consent Decree

11.1 This Consent Decree is entered into by the parties in order to resolve genuinely disputed issues. It is not intended to, and shall not, preclude any party from taking any position in the future, with respect to any legal or factual issues, claims, or defenses raised in the course of this litigation, including, but not limited to, the following issues: the adequacy of the EIS or SEIS for the former EM Plan, correlative water rights, stream flow, in-stream resources, ocean or marine resources, or out-of-aquifer transfer of groundwater from a non-designated management area.

11.2 This Consent Decree shall not be deemed as an admission of wrongdoing by any party. Neither the construction of the transmission line between the two Hamakuapoko Wells and Baldwin Park nor the transmission of water in this transmission line shall be deemed a waiver of Plaintiffs' or Defendants' claims or an admission, with respect to any future water developed by the County in the agreed-upon portion of the East Maui Region. Instead, the Consent Decree is the result of settlement negotiations, entered into in

good faith by all parties, for the purpose of ending the litigation and securing peace.

12. Dismissal of All Actions

12.1 Within ten (10) days of the entry of this Consent Decree by the Court, the Plaintiffs agree to dismiss, with prejudice, Civil Action No. 03-1-0008(3) and Civil Action No. 93-0734(3) subject to the Terms and Conditions of this Consent Decree and the preservation of the ability of any party to this Consent Decree to seek the enforcement of these Terms and Conditions in this Court.

12.2 All parties shall bear their own costs and attorneys' fees.

13. Press Release

The parties agree that they will work together on a joint press release to announce the conclusion of the litigation and the re-configuration of the EM Plan. The Sierra Club may issue its own press release if it so desires.

DATED: Wailuku, Maui, Hawaii 12.2.03

Isaac Hall, Esq.
Attorney for Plaintiffs
The Coalition to Protect East Maui Water Resources, Hui Alanui o Makena, and Mark Sheehan

Isaac Hall, Esq.
Attorney for Plaintiff
The Sierra Club

THE COUNTY OF MAUI

By: _____
ALAN M. ARAKAWA
Its Mayor

APPROVAL RECOMMENDED:

_____
George Y. Tengan
Director, Department of Water
Supply

APPROVED AS TO FORM AND LEGALITY:

_____
Jane E. Lovell, Esq.
Deputy Corporation Counsel
Attorney for Defendants
The Board of Water Supply;
Department of Water Supply, County
of Maui; County of Maui; George
Tengan, in his capacity as Director
of the Water Department, County of Maui

STATE OF HAWAII)
) SS.
COUNTY OF MAUI)

On this 3rd day of November, 2003, before me personally appeared ALAN M. ARAKAWA, to me personally known, who being by me duly sworn, did say that he is the Mayor of the County of Maui, a political subdivision of the State of Hawaii, and that the seal affixed to the foregoing instrument is the lawful seal of the said County of Maui, and that the instrument was signed and sealed on behalf of said County of Maui pursuant to Section 7-5.11 and Section 9-18 of the Charter of the County of Maui, and the said ALAN M. ARAKAWA acknowledged the said instrument to be the free act and deed of said County of Maui.

IN WITNESS WHEREOF, I have hereunto set my hand and official seal.

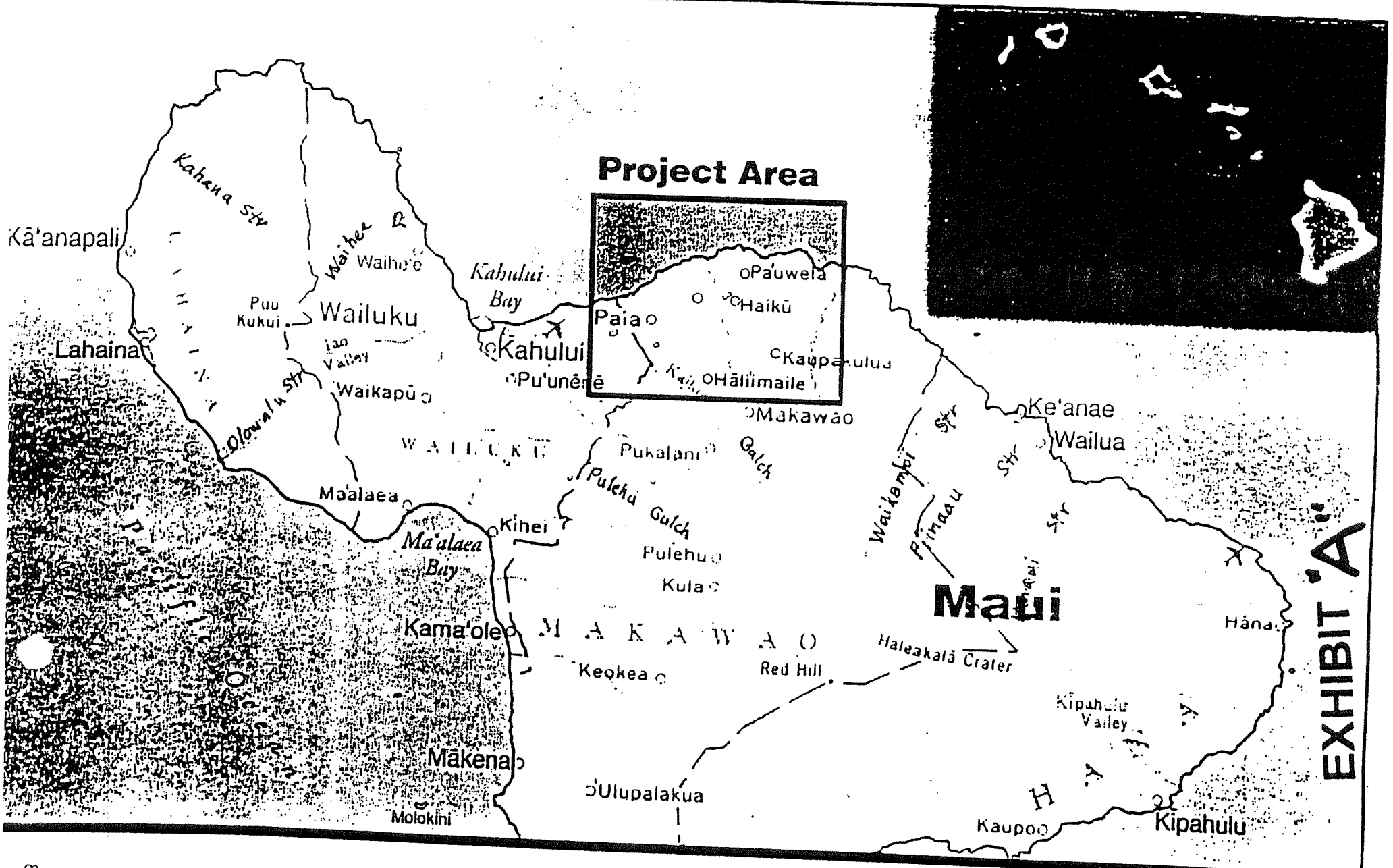
Notary Public, State of Hawaii
Second Judicial Circuit
Print/Type name: [illegible]
My commission expires: 10/19/06

VS

APPROVED AND SO ORDERED:

/s/ JOSEPH E. CARDOZA (SEAL)

Judge of the above-entitled court



SOURCE:
U.S. Geological Survey
Reston, Virginia, 1978

FIGURE 1:
Location Map

Supplemental EIS: East Maui W r
Development Plan

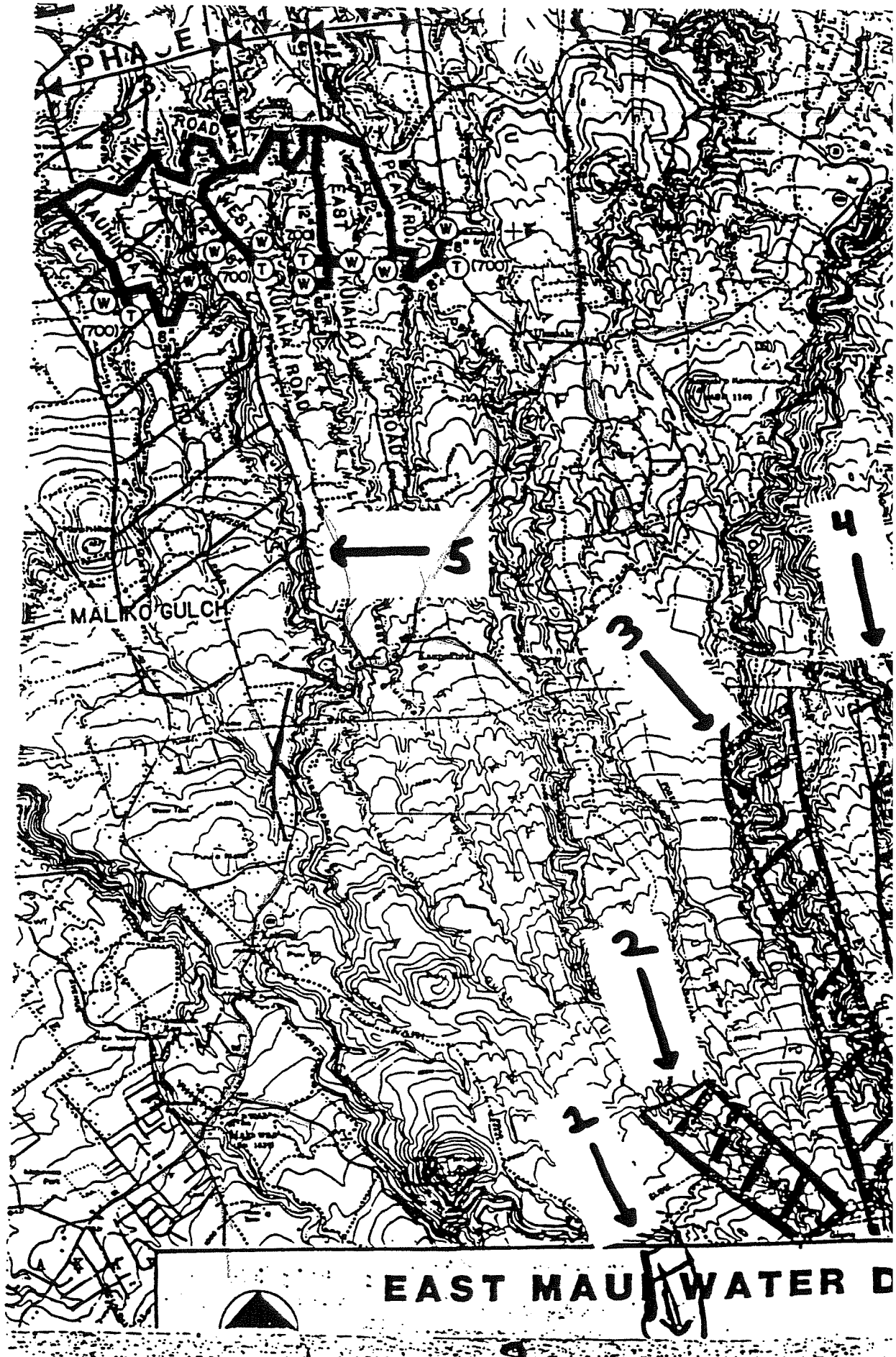


EXHIBIT "2"

EXHIBIT "B"

INSTREAM FLOW STANDARD ASSESSMENT REPORT

DATA NEEDS

Prepared for

Commission on Water Resource Management
Stream Protection and Management Division

Department of Water Supply
County of Maui

May 27, 2009

ENCLOSURE (4)

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INTRODUCTION

This document is prepared in response to a request by the State Commission on Water Resource Management for "Instream Flow Standard Assessment Report Data Needs". Information is provided in the order requested. Therefore, a general system description appears later in this document, in the section responding to questions on water supply and sources of water. The three figures that follow are intended to help orient the reader at the outset:

- Figure 1 Community Plan Districts on the island of Maui.
- Figure 2 The County of Maui Department of Water Supply's "Upcountry System" or "Upcountry Water District", showing five distinct sub-district areas, each served by a slightly different set of sources and waterlines during normal operating conditions.
- Figure 3 The Upcountry Water District overlaid on the Makawao-Pukalani-Kula and Paia-Haiku Community Plan boundaries.

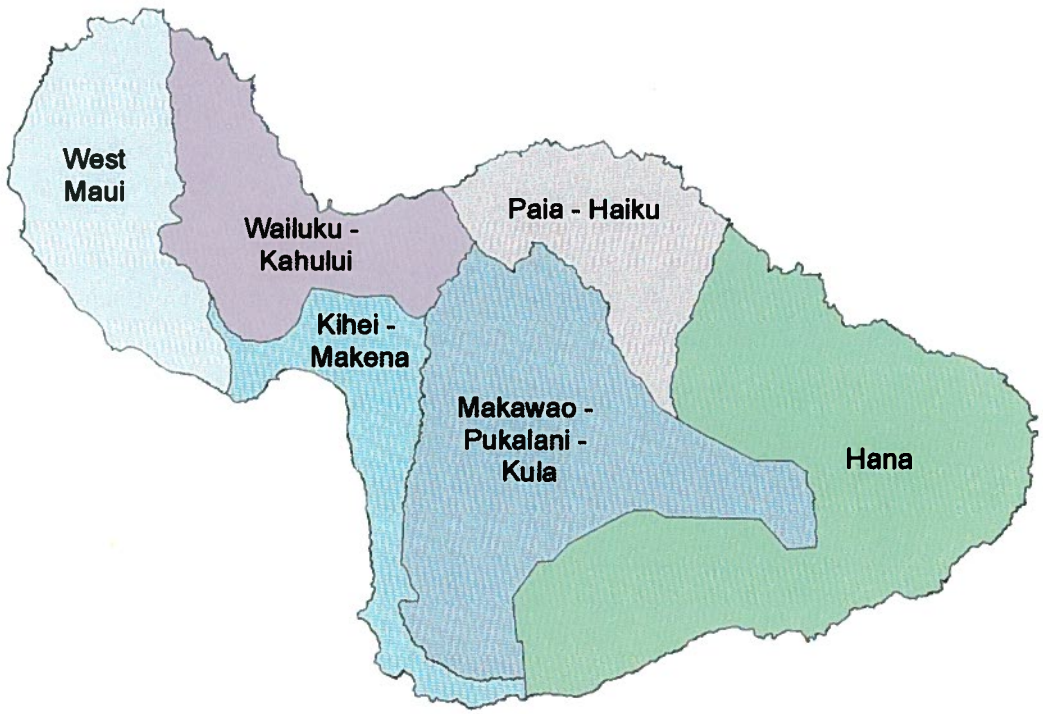


Figure 1 Community Plan Boundaries - Maui Island

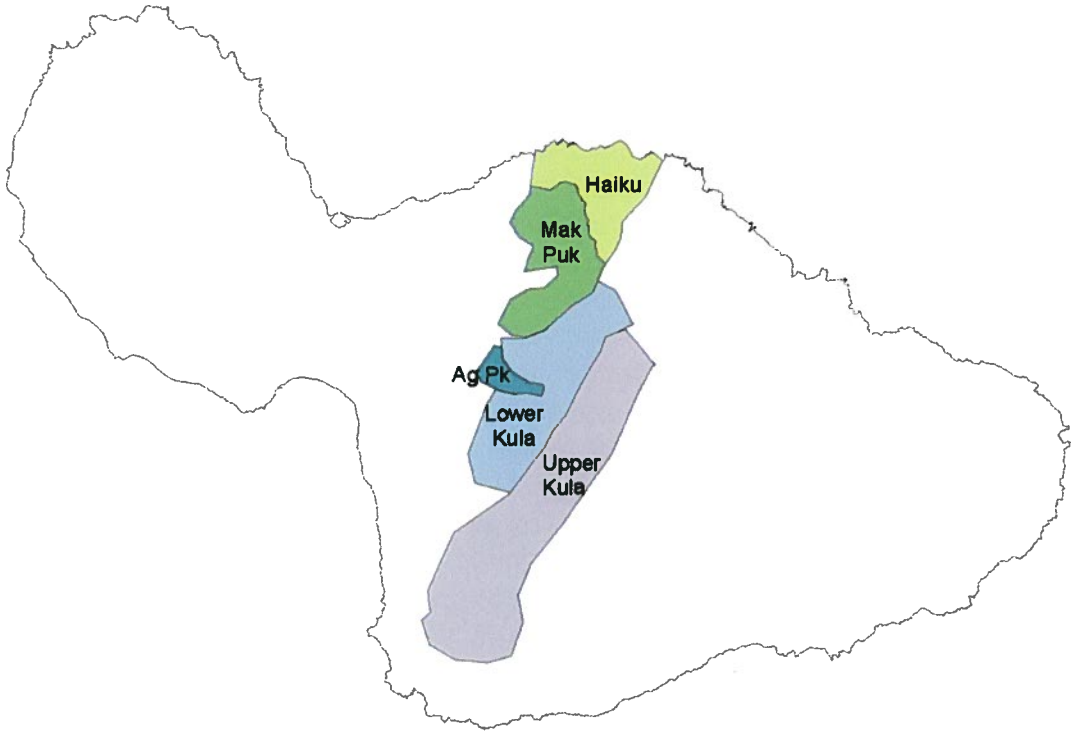


Figure 2 County of Maui Department of Water Supply - Upcountry Water District - Normal Operating Conditions

The "Upcountry Water District" may be operationally divided into five, or technically six sub-systems:

- Upper Kula (including Ulupalakua-Kanaio) - (shown in purple)
- Lower Kula (shown in blue)
- Makawao-Pukalani - (shown in green)
- Haiku-Kokomo - (shown in lime)
- Kula Ag Park - (shown in teal)
  (non-potable system, not connected to the other sub-systems)
- Opana/Awalau - (not shown - too small to show separately)
  (non-potable, not connected to other systems, serves only 4 meters)

These are described further in the section of this document pertaining to water supply and sources. The potable Upcountry systems are interconnected and rely on each other for backup. During dry seasons or droughts, water is frequently pumped from the lower systems to the upper. Similarly, during wet times, water may flow from higher service areas to lower. This is cost-effective, and also necessary. Lower pumping expense during wet seasons enables the Department to have the funds for uphill pumping during dry months, which would otherwise be cost-prohibitive. Surface water sources can also provide backup to areas normally served by groundwater during repairs or maintenance.

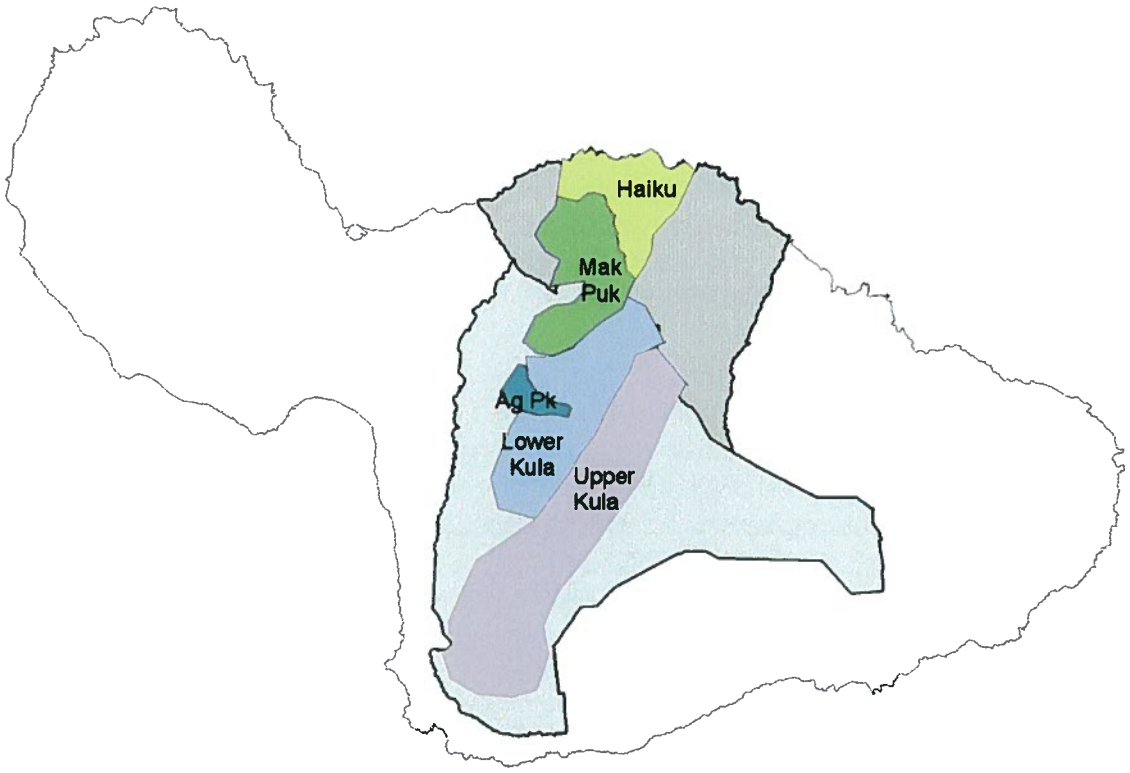


Figure 3 Upcountry Water District overlaid on Makawao-Pukalani-Kula and Paia-Haiku Community Plan District Boundaries

As shown in Figure 3 above, there is not a perfect one-to-one match between the Upcountry Water District or subdistricts and the Makawao-Pukalani-Kula or Paia-Haiku Community Plan District boundaries. Community Plan boundaries are political divisions used for land use planning. They do not shift with new source development or seasonal needs. Water Districts are areas which typically share a set of sources and transmission facilities. Their boundaries are determined by water sources and operational parameters. So it is not surprising that these would not match perfectly.

WATER USE

Historical trends

DWS historical water use is documented and characterized in various tables below:

- Figure 4 shows the historical metered consumption by the DWS Upcountry District (Makawao, Hali'imaile, Pukalani, Kula and Haiku).
- Figure 5 shows the historical metered consumption for the Makawao-Pukalani-Kula Community Plan District (Makawao, Hali'imaile, Pukalani and Kula).
- Figure 6 shows the historical metered consumption for the Haiku portion of the Paia-Haiku Community Plan District
- Figure 7 shows seasonal variation in consumption in the Makawao-Pukalani-Kula Community Plan District
- Figure 8 shows seasonal variation in consumption in the Paia-Haiku Community Plan District
- Figure 9 shows the historical water use by user class codes for the Makawao-Pukalani-Kula Community Plan District
- Figure 10 shows the historical water use by user class codes for the Haiku portion of the Paia-Haiku Community Plan District
- Figure 11 shows historical annual rainfalls for specified locations.

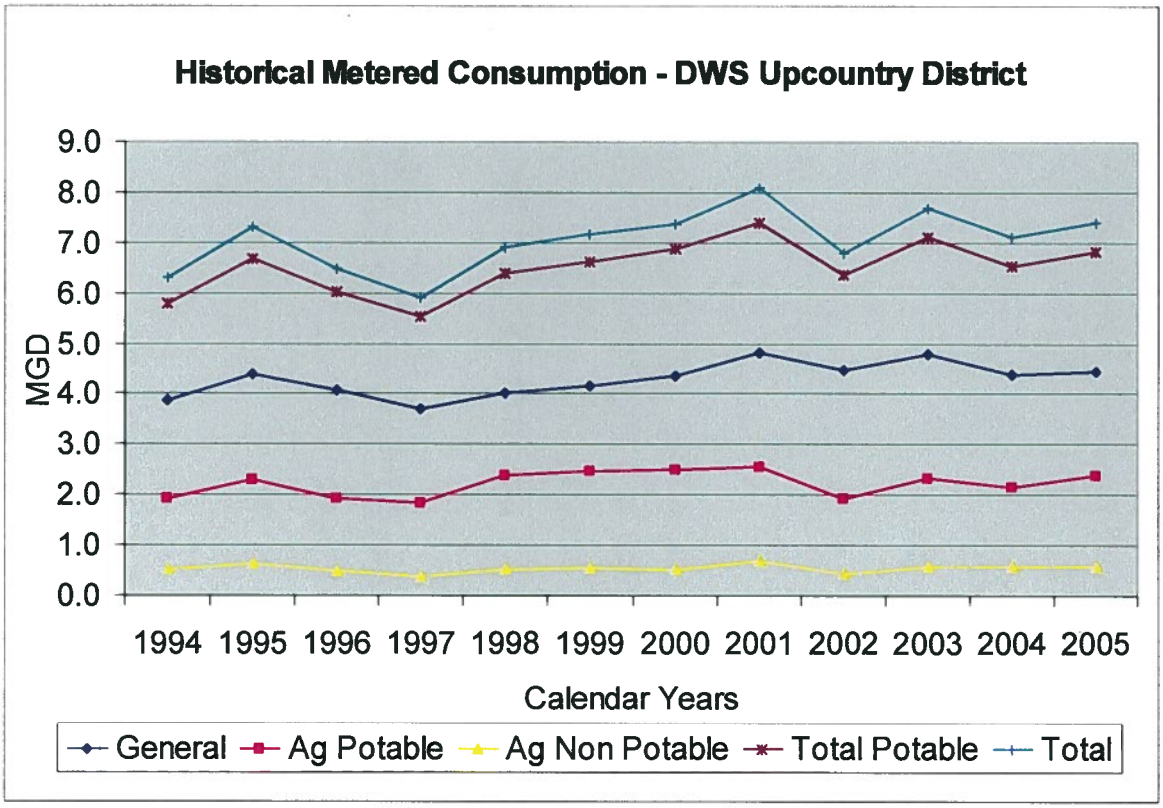


Figure 4 Historical Metered Consumption - Upcountry District

Table 1 Historical Metered Consumption for DWS Upcountry District (Makawao-Hali'imaile-Pukalani-Kula-Haiku)
Millions of Gallons per Day

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
General	3.871	4.382	4.083	3.693	4.003	4.146	4.370	4.823	4.461	4.778	4.387	4.441
Ag Potable	1.931	2.300	1.923	1.829	2.382	2.474	2.504	2.563	1.908	2.320	2.138	2.378
Ag Non Potable	0.504	0.634	0.481	0.374	0.512	0.555	0.505	0.690	0.433	0.582	0.575	0.571
Total Potable	5.802	6.682	6.007	5.521	6.381	6.620	6.873	7.387	6.368	7.098	6.525	6.820
Total	6.306	7.317	6.487	5.895	6.897	7.175	7.379	8.077	6.801	7.680	7.100	7.391

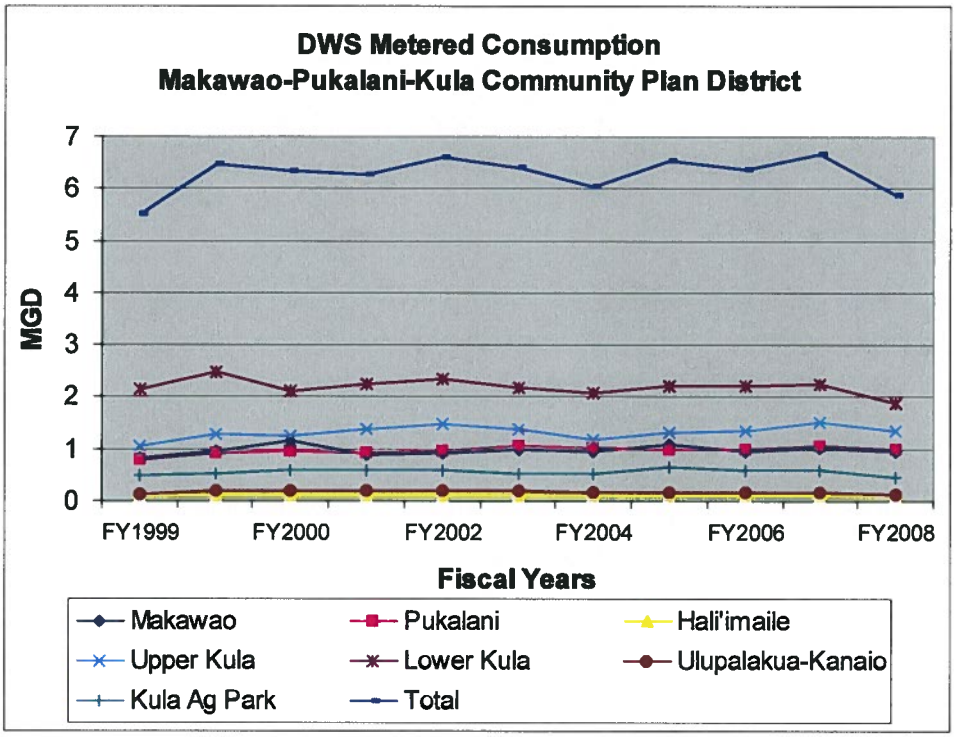


Figure 5 DWS Metered Consumption - Makawao-Pukalani-Kula

Historical metered consumption for the Makawao-Pukalani-Kula Community Plan District averaged about 6.286 MGD for the period shown. For FY 2008, average daily consumption was 5.89 MGD. Lower Kula dominates water consumption in this community plan district. Historical metered consumption for Haiku averages about 0.952 MGD for the period shown. For FY 2008, average daily consumption in the Haiku portion of the Paia-Haiku Community Plan was 1.075.

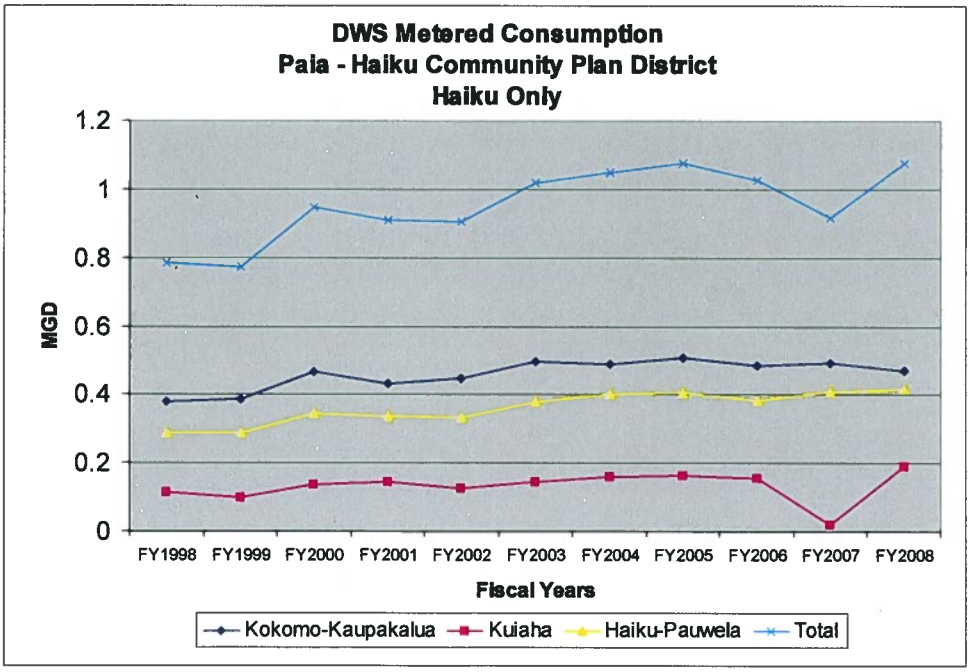


Figure 6 DWS Metered Consumption - Haiku

Figures 7 and 8 and Table 3 show water use from 2002 to 2006 by user class. Single Family and Agricultural uses account for the lion's share of consumption in these areas. Both areas demonstrate a strong seasonal variation in consumption, particularly in these two classes.

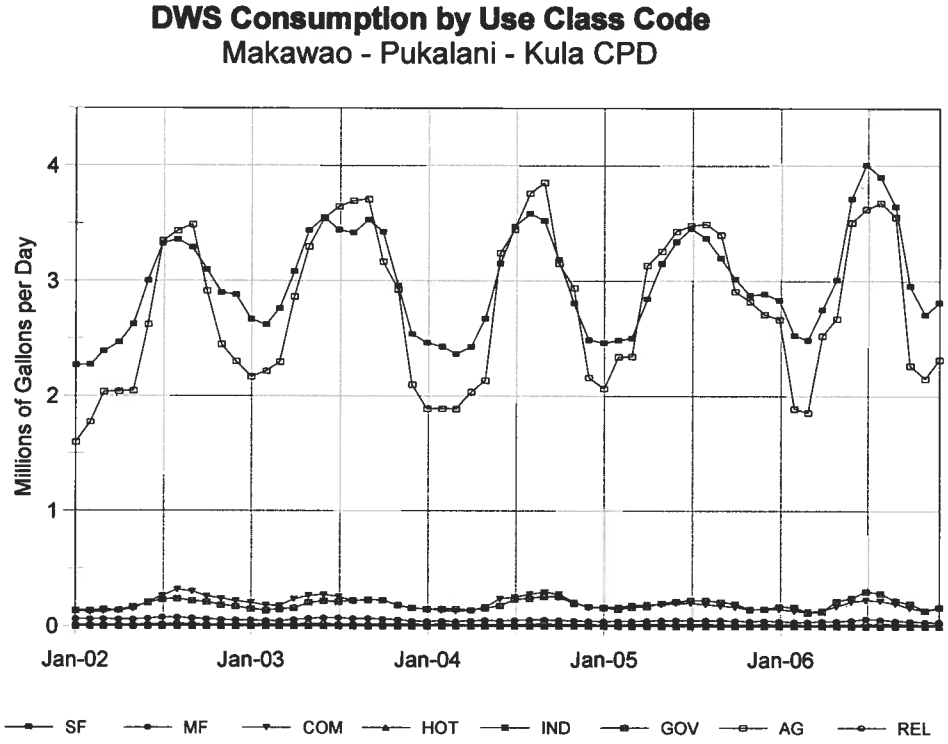


Figure 7 Makawao-Pukalani-Kula Consumption by User Class

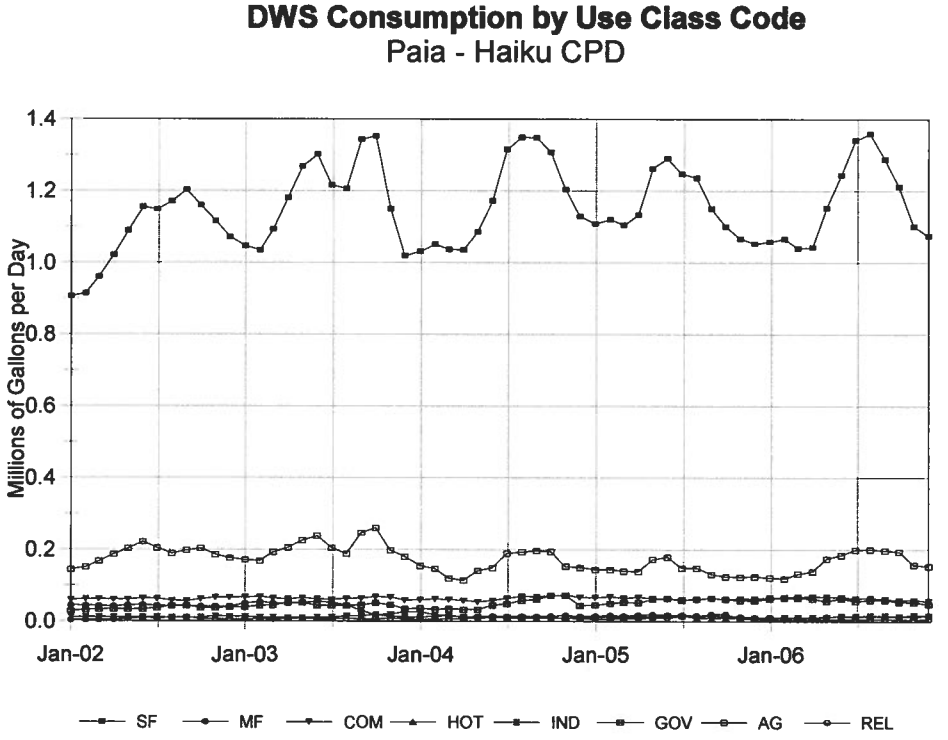


Figure 8 Haiku Consumption by User Class

Table 2 DWS Upcountry - Metered Consumption by Community Plan (Millions of Gallons per Day)

DWS Metered Consumption by Makawao-Pukalani-Kula Community Plan District											
	FY1998	FY1999	FY2000	FY2001	FY2002	FY2003	FY2004	FY2005	FY2006	FY2007	FY2008
Makawao	0.831	0.951	1.152	0.880	0.920	0.979	0.955	1.090	0.953	1.013	0.957
Pukalani	0.784	0.940	0.961	0.913	0.957	1.051	1.015	0.994	0.998	1.070	1.006
Hali'imaile	0.087	0.100	0.102	0.096	0.091	0.098	0.105	0.108	0.106	0.087	0.094
Upper Kula	1.050	1.289	1.256	1.380	1.497	1.383	1.205	1.337	1.344	1.515	1.348
Lower Kula	2.136	2.487	2.110	2.255	2.353	2.181	2.078	2.208	2.217	2.230	1.868
Ulupalakua-Kanaio	0.148	0.184	0.188	0.188	0.198	0.190	0.151	0.157	0.166	0.157	0.144
Kula Ag Park	0.479	0.516	0.580	0.578	0.585	0.529	0.527	0.647	0.605	0.585	0.473
Total	5.515	6.467	6.349	6.290	6.601	6.411	6.036	6.541	6.389	6.657	5.890

DWS Metered Consumption for Haiku											
	FY1998	FY1999	FY2000	FY2001	FY2002	FY2003	FY2004	FY2005	FY2006	FY2007	FY2008
Kokomo-Kaupakalua	0.380	0.385	0.465	0.431	0.446	0.496	0.488	0.507	0.483	0.491	0.470
Kuiaha	0.115	0.099	0.137	0.142	0.125	0.145	0.159	0.163	0.157	0.017	0.189
Haiku-Pauwela	0.287	0.289	0.345	0.337	0.334	0.378	0.402	0.404	0.384	0.409	0.416
Total	0.782	0.773	0.947	0.910	0.905	1.019	1.049	1.074	1.024	0.917	1.075

Total (including Haiku)	6.297	7.240	7.296	7.200	7.506	7.430	7.085	7.615	7.413	7.574	6.965

Figures 9 and 10 show the breakdown by use classes on an annual basis from 1994 through 2006. As shown in Figure 9, Single Family use has been growing faster than other uses in both Makawao-Pukalani-Kula and Paia-Haiku.

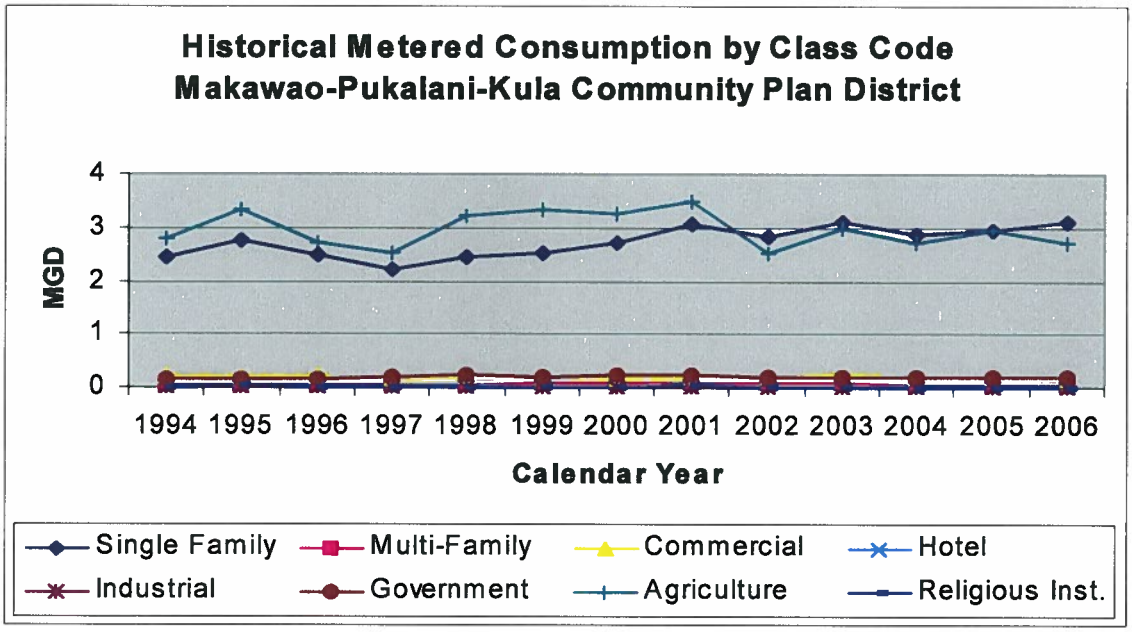


Figure 9 Historical Annual Consumption by User Class - Makawao-Pukalani-Kula Community Plan District (Makawao, Hali`imaile, Pukalani & Kula)

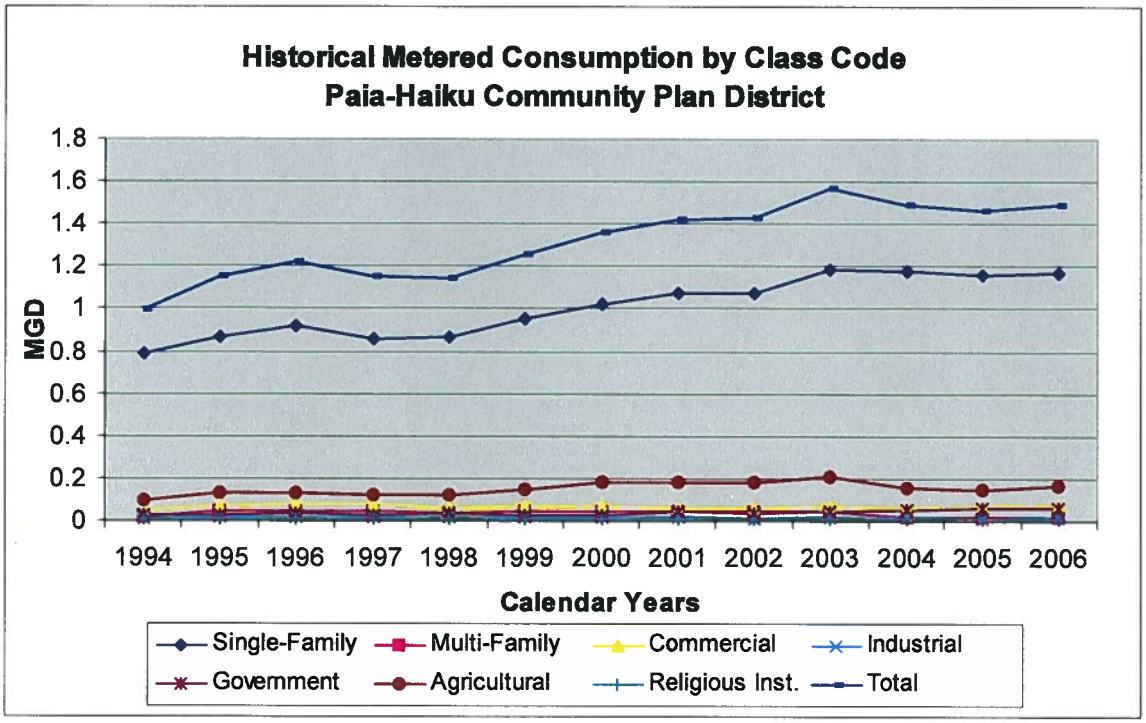


Figure 10 Historical Annual Consumption by User Class - Paia-Haiku Community Plan District - Haiku Only

Table 3 DWS Consumption by User Class (Millions of Gallons per Day)

DWS Historical Metered Consumption by User Class for the Makawao-Pukalani-Kula Community Plan District

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Single Family	2.446	2.756	2.496	2.221	2.443	2.526	2.716	3.066	2.828	3.122	2.89	2.97	3.118
Multi-Family	0.041	0.051	0.045	0.041	0.036	0.06	0.065	0.07	0.065	0.059	0.05	0.049	0.048
Commercial	0.183	0.19	0.207	0.136	0.185	0.208	0.16	0.187	0.208	0.219	0.205	0.177	0.171
Hotel	0.006	0.007	0.006	0.006	0.007	0.008	0.011	0.011	0.009	0.007	0.006	0.01	0.006
Industrial	0	0	0	0	0	0	0	0	0	0	0	0	0
Government	0.168	0.166	0.172	0.175	0.219	0.198	0.215	0.237	0.182	0.188	0.191	0.186	0.199
Agriculture	2.781	3.357	2.719	2.53	3.241	3.327	3.26	3.513	2.51	2.973	2.708	2.952	2.732
Religious Inst.	0.016	0.02	0.016	0.015	0.017	0.018	0.018	0.021	0.015	0.019	0.017	0.016	0.017
Total	5.642	6.546	5.662	5.123	6.149	6.345	6.445	7.106	5.817	6.588	6.066	6.361	6.291

DWS Historical Metered Consumption by User Class for the Paia-Haiku Community Plan District

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Single-Family	0.790	0.864	0.914	0.857	0.868	0.950	1.019	1.070	1.077	1.185	1.176	1.157	1.166
Multi-Family	0.016	0.044	0.047	0.043	0.037	0.040	0.041	0.047	0.043	0.040	0.014	0.016	0.014
Commercial	0.051	0.065	0.076	0.079	0.060	0.066	0.070	0.064	0.062	0.065	0.064	0.065	0.065
Industrial	0.012	0.013	0.018	0.016	0.021	0.019	0.018	0.016	0.012	0.015	0.014	0.012	0.014
Government	0.026	0.026	0.031	0.028	0.034	0.026	0.025	0.039	0.036	0.045	0.048	0.058	0.059
Agricultural	0.095	0.130	0.129	0.121	0.120	0.143	0.178	0.178	0.186	0.207	0.159	0.144	0.165
Religious Inst.	0.007	0.008	0.007	0.006	0.006	0.007	0.005	0.005	0.007	0.007	0.009	0.012	0.006
Total	0.998	1.149	1.223	1.150	1.145	1.251	1.356	1.420	1.425	1.565	1.485	1.464	1.490

Total (including Haiku)	6.640	7.695	6.885	6.273	7.294	7.596	7.801	8.526	7.242	8.153	7.551	7.825	7.781

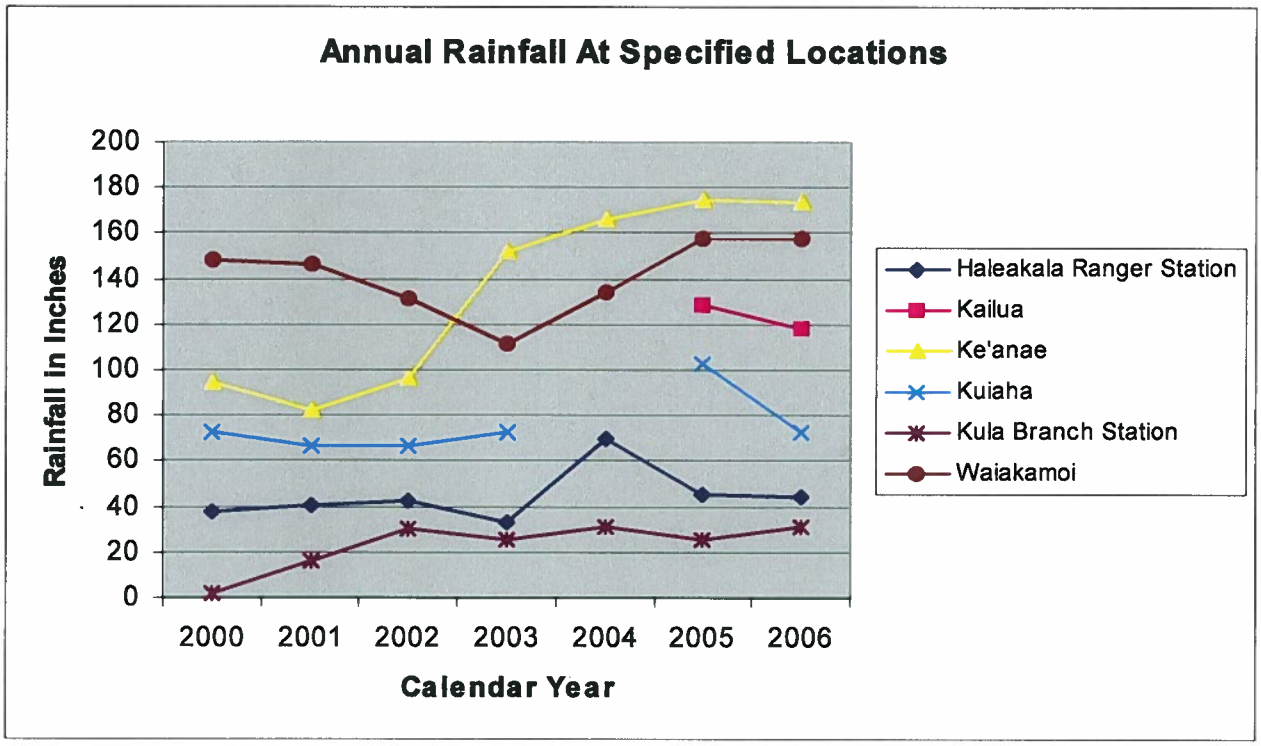


Figure 11 Annual Rainfall Source: U.S. Department of Commerce, National Oceanographic and Atmospheric Administration, National Weather Forecast Office, Honolulu

In general, mild temperatures, cool and northeasterly winds, and a rainy season characterize the months of October through April. A dry and warmer season characterize the months of May through September.

Data from the U.S. Geological Survey National Hydrography Dataset indicate certain trends during the following water years:

- During 1913 to 2002, there is an indication of generally decreasing rainfall.
- During 1933 to 2002, base flows increased from1933 to about 1940, and decreased after about 1960 to 2002.
- During 1953 to 2002, there is an indication of downward trends in rainfall.
- During 1973 to 2002, there was below average rainfall during the 1970s.
- During 2002 to 2005, rainfall increased annually in East Maui.

However, further study is needed to determine whether the downward rainfall trends will continue or whether the observed patterns are part of a long-term cycle in which rainfall may increase to previous levels during 1913 to the early 1940s.

(Source: *Trends in Streamflow Characteristics at Long-Term Gaging Stations; Scientific Investigations Report 2004-5080)*

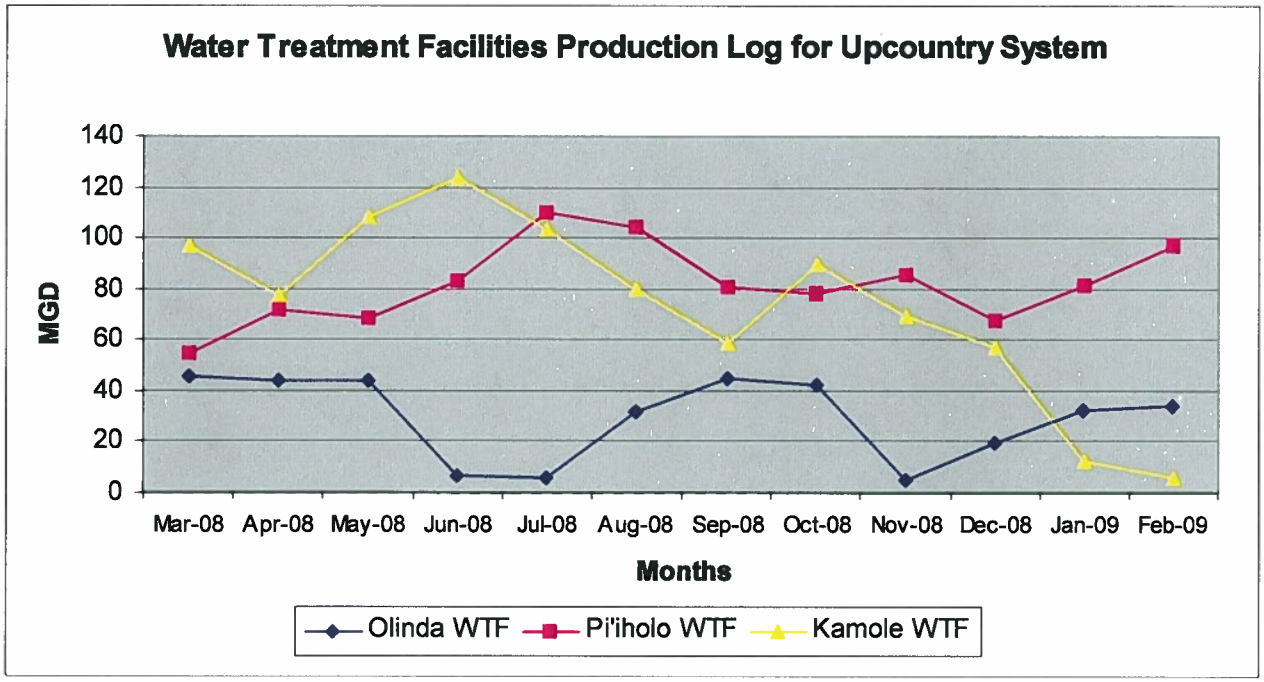


Figure 12 DWS Upcountry System - Monthly Production

The DWS Monthly Water Treatment Facilities Production Logs for the past twelve months ending February 2009 reflect the fact that lower elevation sources are pumped to higher elevation reservoirs during the early dry months.

Table 4 **DWS Monthly Water Treatment Facilities Production Logs for Upcountry Water System (Millions of Gallons)**

	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08	Oct-08	Nov-08	Dec-08	Jan-09	Feb-09
Olinda WTF	45.450	44.250	43.940	6.170	5.430	31.900	44.530	42.510	4.590	19.380	32.720	34.000
Pi'iholo WTF	54.588	71.224	68.274	82.697	110.276	104.550	80.330	77.778	85.443	67.360	81.347	96.578
Kamole WTF	97.034	77.265	108.330	124.053	103.608	80.018	58.232	89.929	69.196	56.574	12.028	5.323

Current Use

The total consumption for the Department of Water Supply's Upcountry Water District in 2008 was 6.966 MGD. This is further broken down into general and agricultural rate classes.

- General consumption by Makawao-Pukalani-Kula Community Plan District for fiscal year 2008 was 4.352 MGD.
- Agricultural consumption by Makawao-Pukalani-Kula Community Plan District was 2.614 MGD.

Future Demands

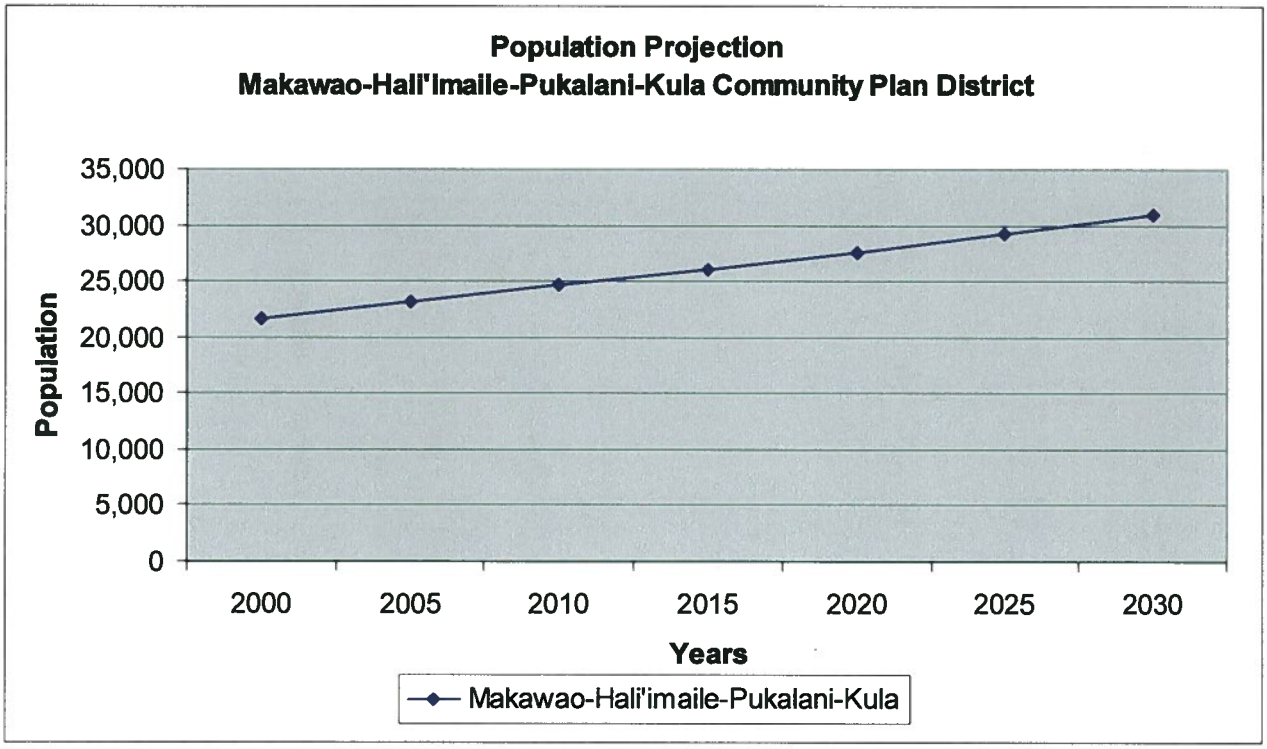


Figure 13 Population Projection - Makawao-Pukalani-Kula Community Plan (does not include Haiku)

Table 5 Community Plan Upcountry District (Makawao-Pukalani-Kula) Population Projection

2000	2005	2010	2015	2020	2025	2030
21,571	23,176	24,644	26,098	27,640	29,243	30,880

Baseline population projections for the Makawao-Pukalani-Kula Community Plan District show an increase of 9,309 or a 45.3% increase from 2000 to 2030.

Table 6 Demand for Resident and Non-Resident Housing Units - Makawao-Pukalani-Kula Community Plan District

Existing 2004 Land Use Database	2015 Housing Demand	2015 Need for Additional Units	2030 Housing Demand	2030 Need for Additional Units	Sum of Additional Units Needed to 2030
8,747	10,563	1,816	13,121	2,558	4,374

Upcountry Water District - Upcountry Water Service Request List (waiting list)
As of May 15, 2008, there were 1,312 applicants on the list for building permit applications, subdivisions and water service requests.

Urban development (planned/committed and planned designated) for Community Plan Upcountry District (Makawao-Pukalani-Kula) from Long Range Planning, Department of Planning, County of Maui:

- Hali'imaile Residential (A&B, Inc.) - 148 single family (SF) units
- Grove Ranch Lots - 9 SF units
- Kualono - 49 SF units
- Kulamalu Town Center - 14 SF units
- Cottages at Kulamalu - 12 SF units and 28 multi-family (MF) units
- Mauna Lani - 6 SF units
- Kauhale Lani Residential Subdivision - 156 SF units
- Barto Project Crook Estate Project District 3 - 54 SF units
- Department of Hawaiian Home Lands (DHHL) Waiohuli-Keokea subdivisions - per WATER CREDITS AGREEMENT made on December 9, 1997, the Department of Water Supply agreed to commit five hundred thousand gallons of potable water per average day to DHHL for DHHL home sites in the Makawao-Pukalani-Kula Community Plan District.

Urban development (proposed)

- Hali'imaile Expansion A&B, Inc. 400 - 1,200 SF units
- Hali'imaile Expansion (ML&P) - 1,500 units
- Kula Meadowood - 130 SF and 130 MF units
- Makawao Mauka Homes - 95 SF and 100 MF units
- Pukalani Uplands - 98 SF units
- DHHL Waiohuli-Keokea subdivisions - 1,100 SF units

Forecasted Demand

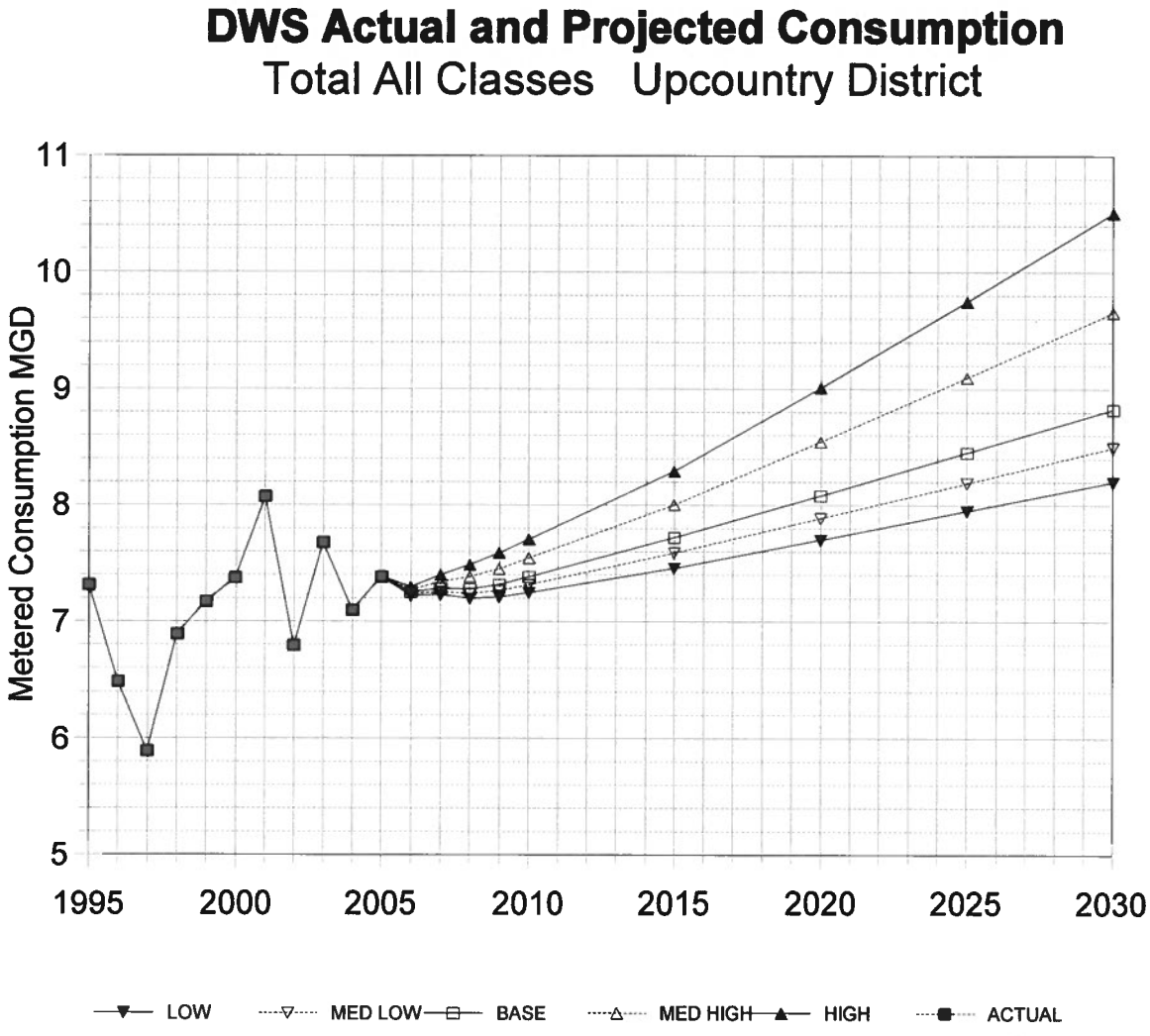


Figure 14 Community Plan District Unit Forecast 2006 Update for the Makawao-Pukalani-Kula District Water Use and Demand Draft, Econometric Model by Haiku Design & Analysis.

The guidelines for updating the Hawaii Water Plan indicate that a range of forecasts should be evaluated in planning for water supply. These are graphed in Figure 14 above, and shown in Table 7 below. Forecasts for the Upcountry Water District in general range from about 8.5 to 11 MGD by the year 2030, with the base case prediction at about 9.75.

Table 7 Upcountry Metered and Forecasted Demand

Historical Metered Consumption and Projected Consumption
Demographic Forecast (Base Case) (Millions of Gallons per Day)

		2005	2010	2015	2020	2025	2030
Upcountry							
	Low Case	4.441	4.483	4.754	5.041	5.313	5.577
	Medium Low Case	4.441	4.571	4.945	5.313	5.664	6.010
General	Base Case	4.441	4.659	5.137	5.577	6.010	6.444
	Medium High Case	4.441	4.754	5.313	5.837	6.379	6.921
	High Case	4.441	4.848	5.485	6.092	6.715	7.339
	Low Case	2.378	2.258	2.258	2.258	2.258	2.258
	Medium Low Case	2.378	2.292	2.326	2.361	2.397	2.434
Ag Potable	Base Case	2.378	2.326	2.397	2.472	2.551	2.634
	Medium High Case	2.378	2.343	2.433	2.530	2.633	2.744
	High Case	2.378	2.361	2.471	2.591	2.721	2.862
	Low Case	6.820	6.742	7.013	7.299	7.571	7.835
	Medium Low Case	6.820	6.863	7.271	7.674	8.061	8.444
Total Potable	Base Case	6.820	6.984	7.534	8.049	8.561	9.078
	Medium High Case	6.820	7.097	7.746	8.367	9.012	9.665
	High Case	6.820	7.208	7.956	8.683	9.436	10.201
	Low Case	0.571	0.573	0.573	0.573	0.573	0.573
	Medium Low Case	0.571	0.583	0.592	0.602	0.612	0.622
Ag Non Potable	Base Case	0.571	0.592	0.612	0.633	0.654	0.676
	Medium High Case	0.571	0.597	0.622	0.649	0.676	0.704
	High Case	0.571	0.602	0.633	0.665	0.699	0.734
	Low Case	7.391	7.315	7.586	7.872	8.144	8.408
	Medium Low Case	7.391	7.445	7.864	8.276	8.673	9.067
Total	Base Case	7.391	7.577	8.146	8.681	9.215	9.754
	Medium High Case	7.391	7.695	8.369	9.015	9.688	10.370
	High Case	7.391	7.810	8.589	9.347	10.134	10.935

WATER USE PURPOSE

Who is using the water and what is the water used for

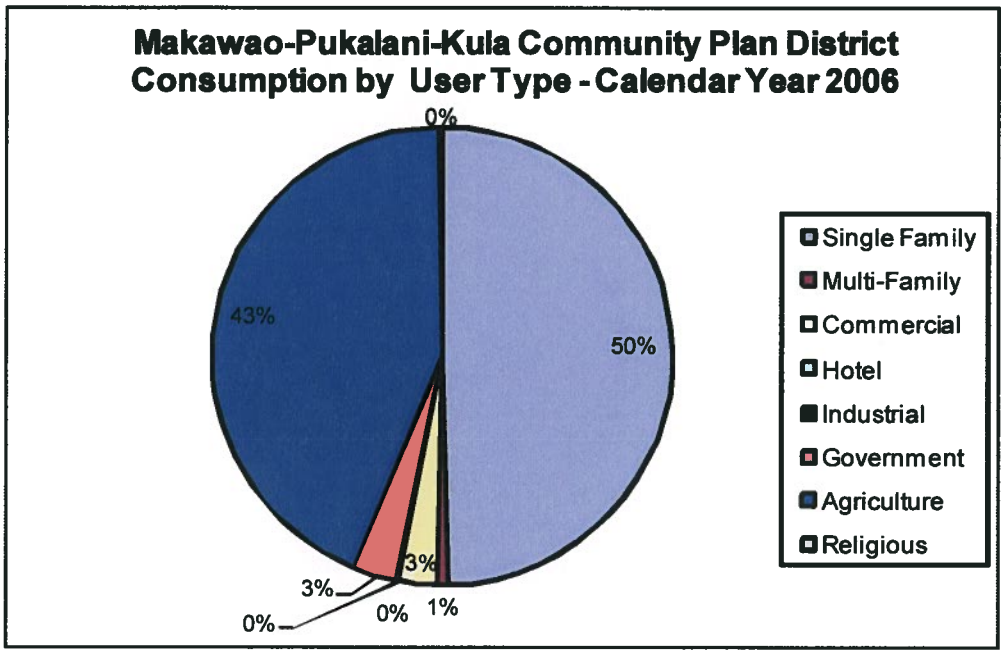


Figure 15 Makawao-Pukalani-Kula Community Plan District Consumption By User Type

Consumption by User Type - Calendar Year 2006
Makawao-Pukalani-Kula Community Plan District

- Single Family - 3.118 MGD
- Multi-Family - 0.048 MGD
- Commercial - 0.171 MGD
- Hotel - 0.006 MGD
- Industrial - 0.0 MGD
- Government - 0.199 MGD
- Agricultural - 2.732 MGD
- Religious - 0.017 MGD

General and Agricultural Water Meters Issued in DWS Upcountry District - FY 2008
Makawao-Hali'imaile-Pukalani-Kula-Haiku

- Regular (General) - 9,136 or 92.7%
- Agricultural - 717 or 7.3%

Agricultural Water Use

Table 8 Agricultural Water Use in Community Plan Upcountry District*

	Acres	Number of Farms
Pineapple	1,200	2
Vegetables and Melons Onions, Green Onion, Head Cabbage, Chinese Cabbage, Tomato, Beans, Lettuce, Taro, Cucumber, Zucchini, Herbs, Sweet Corn, Celery, Daikon, Egg Plant, Ginger Root, Parsley, Romaine Lettuce, Peas, Watercress, Radish, Dasheen and Sweet Potato	800	100
Fruits Bananas, Oranges, Persimmons, Avocado, grapes, Limes, Lemons, Cherimoya, Mango, Plums, Peaches, Loquat	600	150
Coffee	200	12
Protea, Nursery & Tropicals Protea, Nursery, Ginger, Heliconia, Nursery Operations and Turf	150	12
Livestock		
Cattle	93,000	120
Hogs		50
Other - Sheep, Deer, Goats		20

* Data from the Office of Economic Development, County of Maui and the Maui County Farm Bureau (includes some East Maui farms)

Hydroelectric Use

Although DWS does not utilize hydroelectric sources, this and other energy alternatives are being considered as an independent component of the Upcountry District Water Use and Development Plan.

Recreational and Ornamental Use

The Community Plan Upcountry District has one golf course, the Pukalani Country Club. It has a priva private well are used for golf course and landscape irrigation.

WATER REQUIREMENT

Minimum water requirement for current use

Table 9 Surface Water Purchases from East Maui Irrigation Company, Ltd. (Millions of Gallons per Day)

FY2005	FY2006	FY2007	FY2008	FY2009 *
7.169	7.126	7.622	6.607	5.227

* (FY 09 number reflects only 8 months - year to date July, 2008 through February 2009)

Decreased surface water purchases in FY2008 and FY 2009 may be attributed to several factors:

- Higher rainfall months from February 2009 to April 2009
- DWS price structure and price increases
- Lower defacto population
- Decreased economic activity associated with the current recession
- Appeals for conservation by DWS
- DWS conservation program implementation
- Adoption of newer and more efficient appliances

DWS Monthly Source Report

Pookela Well is used as a back up well in the Makawao-Pukalani-Kula Community Plan District. During fiscal year 2008, the DWS Monthly Source Reports showed an average of 0.188 MGD. For the one year period ending in February 2009, the report showed an average of 0.328 MGD.

Prioritize Water Use Purposes

In determining whether drought conditions are warranted, DWS monitors five components of the Upcountry water system:

- Wailoa Ditch flows
- Pi'iholo Water Treatment Plant and reservoir levels and flows
- Kamole Water Treatment Plant flows
- Waikamoi reservoir and Kahakapao reservoir levels and flows
- Olinda Water Treatment Plant flows

For the DWS Upcountry District (Makawao-Hali'imaile-Pukalani-Kula-Haiku), the Board of Water Supply Resolution No. 98-18 outlines actions for DWS to implement varying stages of a declaration of drought. Response actions are based on ditch flows, and water treatment plant and reservoir capacities. Actions may include voluntary and mandatory water use restrictions, operational controls, and public education and outreach activities.

During declaration of droughts and the drier months, DHHL makes requests to its lessees for water conservation.

In recent decades, agricultural consumers and farmers have been exempt from water restrictions during declarations of drought.

Currently, there are about 27,000 head of cattle in Upcountry Maui and Hana. Cattle require a minimum of 20 GPD or a total of 540,000 GPD. There are also about 6,000 head of deer being farmed. Deer require a minimum of 10 GPD or a total of 60,000 GPD. Although there are no current figures available, other livestock include pigs, sheep, goats, elk and horses. Without water livestock such as cattle die within a couple of days or less.

The U.S. Department of Agriculture offers post disaster programs that share with agricultural producers the cost of rehabilitating eligible farmlands damaged from natural disasters and provide emergency water conservation assistance. The funds are used for conservation practices and compensation for livestock and agricultural losses. Since 1999, more than $1,000,000.00 has been dispersed on Maui for drought related compensation.

Typically, during a drought, monitoring and enforcement are more lenient for homes using less than three or four hundred gallons per day. Drought enforcement has not had to reach the point where a more stringent life-line amount has had to be set.

No prioritization of uses has been set in Maui as of this draft. However, both Hawaiian Home Lands and preservation of Agriculture are typically deemed high-priority uses within the county. There is some concern as to whether potential future conflicts for drought supply will result from continued growth upcountry, combined with build-out of the Hawaiian Homes project and intended agricultural park.

Policies regarding allocation, distribution and reliability are under discussion, both as part of the Water Use and Development Plan (WUDP) Process and in other venues. However, it is doubtful that all such potential issues can be fully resolved in the upcoming iteration of the WUDP.

WATER SUPPLY

Sources of water

Surface water

- Wailoa Ditch - The Wailoa Ditch runs at approximately 1,100 feet and draws water from approximately 200 East Maui streams as far east as Makapipi. Water from this collection system is used in two areas of the system. The Kamole Weir Water Treatment Plant withdraws water from the Wailoa Collection System and is the primary source of water for Makawao,

Pukalani and Hali'imaile. During drought conditions, this plant can also serve water to Lower Kula, and ultimately even Upper Kula. This was also once the main source for the system to Haiku and eastward, and still backs up this region for pump failures or repairs and maintenance. Water for the Kula Agricultural Park is also drawn from a ditch downstream of the Kamole Weir Water Treatment Plant in the Omaopio region.

- Upper Kula Collection System - The collection system that serves the primary source for the Upper Kula system runs at about 4,200 feet and draws water from the Waikamoi, Haipuaena, Middle Branch Puohokamoa, West Branch Puohokamoa and Kailua Streams. Water from the collection system is treated at the Olinda Water Treatment Plant and serves the Upper Kula and Ulupalakua-Kanaio regions. When water is plentiful, it can also serve Lower Kula and even below. During a drought, this source is backed up by the Lower Kula and ultimately Wailoa sources, with Pookela as the supplemental source.
- Lower Kula Collection System - The Lower Kula collection system runs at about 2,900 feet and draws water primarily from the East and West Waikamoi, Honomanu, Haipuaena, West Branch Puohokamoa, Middle Branch Puohokamoa and East Branch Puohokamoa Streams. Water is treated at the Pi'iholo Water Treatment Plant and serves the Lower Kula area. During wet times, this water can serve the lower elevation areas of Makawao-Pukalani. During drought, this water can be used to supplement the Upper Kula system.
- Opana Stream at Awalau - This is a small source shared by Maui Land and Pineapple Company, Haleakala Ranch, Kaonuolu Ranch and DWS. DWS takes only a small portion of the water and it currently serves only four non-potable meters, with a total water use between 2,000 and 2,500 GPD.

Surface water purchases from the East Maui Irrigation Company, Ltd. have averaged 7,131,353 GPD during the four fiscal years, peaking in fiscal year 2007 with 7,622,079 GPD.

Ground water

Three wells currently serve the Upcountry system. The Pookela well serves as backup source for the surface water systems. While the Kaupakalua well could serve as additional backup with some capital expenditure, its main function is as the major source for Haiku. The Haiku well serves the lower elevations of the Haiku service area.

Table 10 Ground Water Capacity in the DWS Upcountry System

Well	Pump Capacity GPM	Well Capacity GPD	Function
Pookela	900	1,296,000	Backup well; can serve several system areas
Kaupakalua	1,020	1,468,800	Major source for Haiku sub-district
Haiku	320	460,000	Source for small portion of Haiku sub-district

Contractual Obligations and Agreements

- **MASTER WATER AGREEMENT** - The East Maui Irrigation Company, Ltd. and Hawaiian Commercial & Sugar Company, Ltd. and the Board of Water Supply of the County of Maui signed a master agreement on December 22, 1961. The agreement was extended for another 25 years.

- **WATER CREDITS AGREEMENT**
  The AGREEMENT between the STATE OF HAWAII, DEPARTMENT OF HAWAIIAN HOME LANDS, an agency of the Hawaiian Homes Commission, and the COUNTY OF MAUI DEPARTMENT OF WATER SUPPLY made an agreement on December 9, 1997.

  Highlights of the AGREEMENT:
  - DWS shall commit five hundred thousand gallons (500,000) gallons of potable water per average day to DHHL for the DHHL Homesites except during any drought affecting the Lower Kula area.
  - In consideration of its contribution for construction including (1) off-site Booster Pumping Station at Kula Kai Reservoir, and construction of transmission water main from Naalae Road to DHHL subdivision, and (2) construction of on-site reservoirs, booster pumps, and transmission lines, which shall be licensed to the DWS in perpetuity, DHHL shall receive from the DWS water credits as follows:
    a. Source Credits - No credits for source.
    b. Transmission and Storage Credits - No payments for transmission and storage components of the fees shall be required of DHHL by DWS
    c. Additional Credits - DHHL shall receive from the DWS an additional $1,561,600 credit for increasing the transmission and storage capacity of the DWS water system beyond current and planned DWS and future DWS and DHHL needs.

- **KULA AGRICULTURAL PARK WATER RESERVOIR AGREEMENT**
  The AGREEMENT between the County of Maui, East Maui Irrigation Company, Limited (EMI) and Alexander & Baldwin, Inc., through its division Hawaiian Commercial & Sugar Company was made on December 30, 2002.

  Highlights of the Agreement:
  - The County, among other things, has the right to withdraw up to1.5 million gallons of water per twenty four hour period to serve the needs of the Kula Agricultural Park.
  - The County to complete upgrades of the Park pumps and relocate them to A&B's Reservoir 40.
  - The County wishes to have the right to use such water to serve, in addition to the needs of the Park, agricultural needs of that certain Haleakala Ranch Company property located at TMK No. 2-3-02:7, to be used as an agricultural park.

- The County shall require users of withdrawn water to use their best efforts to limit their use of such water during times of water shortage.

Minimum amount of water supplied by the Upcountry water system during drought conditions

The following are estimated drought capacities for the Upcountry water treatment plants:

- Kamole Weir Water Treatment Plant - 4.5 MGD
- Olinda Water Treatment Plant - 1.2 MGD
- Pi'iholo Water Treatment Plant - 2.11 MGD

With an additional 100 million gallon raw water storage, there would be an additional 1.19 MGD or 3.3 MGD.

With an additional 300 million gallon raw water storage, there would be an additional 2.73 MGD or 4.84 MGD.

Po'okela Well is only used for drought and emergency backup.

The Upcountry water system is an interconnected system that uses about 90% surface water and 10% ground water. The use of surface water has been very cost efficient. During periods of low rainfall and surface flows, DWS uses a declaration of drought, operational controls, and public education and appeals of conservation. Typically, treated surface water from the Kamole Weir Water Treatment Plant is pumped to higher elevation reservoirs with its high lift pumps prior to the drier months.

Alternate water sources

- Hamakuapoko Wells - There are two wells each with a capacity of 720,000 GPD. During periods of low flow in the Wailoa Ditch, these wells can be pumped to the ditch downstream of the plant but upstream of the Kula Agricultural Park. At this point the ditch is called the Hamakua Ditch, but it is essentially a downstream portion of the same system. In exchange for pumping these wells to provide additional irrigation water in the ditch, an equivalent amount of water may be removed from the upstream, Wailoa Ditch portion for treatment at the Kamole Weir Water Treatment Plant.
- Recycled water from wastewater treatment plants are not currently available for the Upcountry water system. However, treated wastewater from Pukalani is mixed with wellwater and used to irrigate the Pukalani Golf Course.
- The USDA-Central Maui Soil and Water Conservation District is conducting a Stormwater Reclamation Planning and Engineering Study to examine possible design and siting for storage of surface water in the Lower Kula system area in support of the Hawaii Hazard Mitigation Plan and the County of Maui Drought Mitigation Strategy. The strategy program is administered by the State Commission on Water Resource Management. Funding is provided by a state appropriation. Technical assistance will be provided by the USDA Natural Resources Conservation Service. They will conduct data collection and technical analyses and prepare the study report. The study report should be completed by

September 2009.

- In addition, the Draft Final Candidate Strategies Chapter for the Upcountry District for the Water Use and Development Plan evaluates the following major options:
  - Incremental basal well development
  - Expansion fo raw water capacity
  - "Drought proof" full basal backup
  - Extensive conservation measures, with or without redirecting or restricting growth

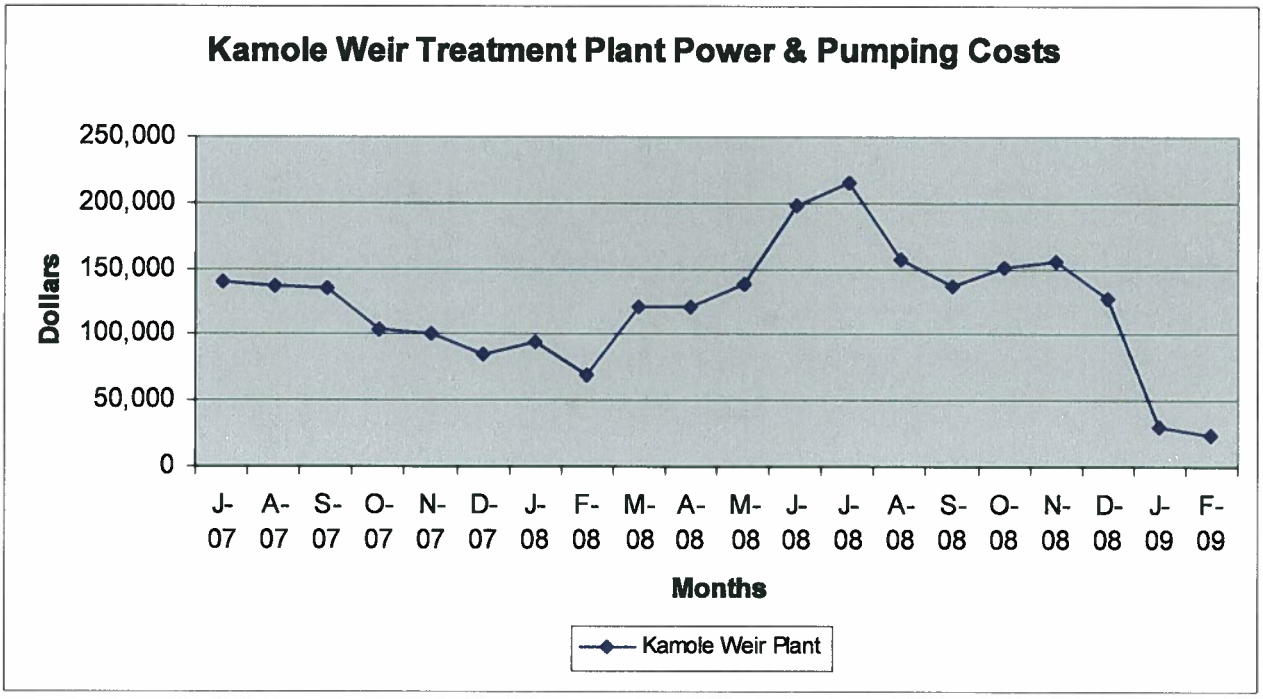


Figure 16 DWS Kamole Weir Treatment Plant Power & Pumping Costs (includes highlift pumps)

ECONOMIC IMPACT

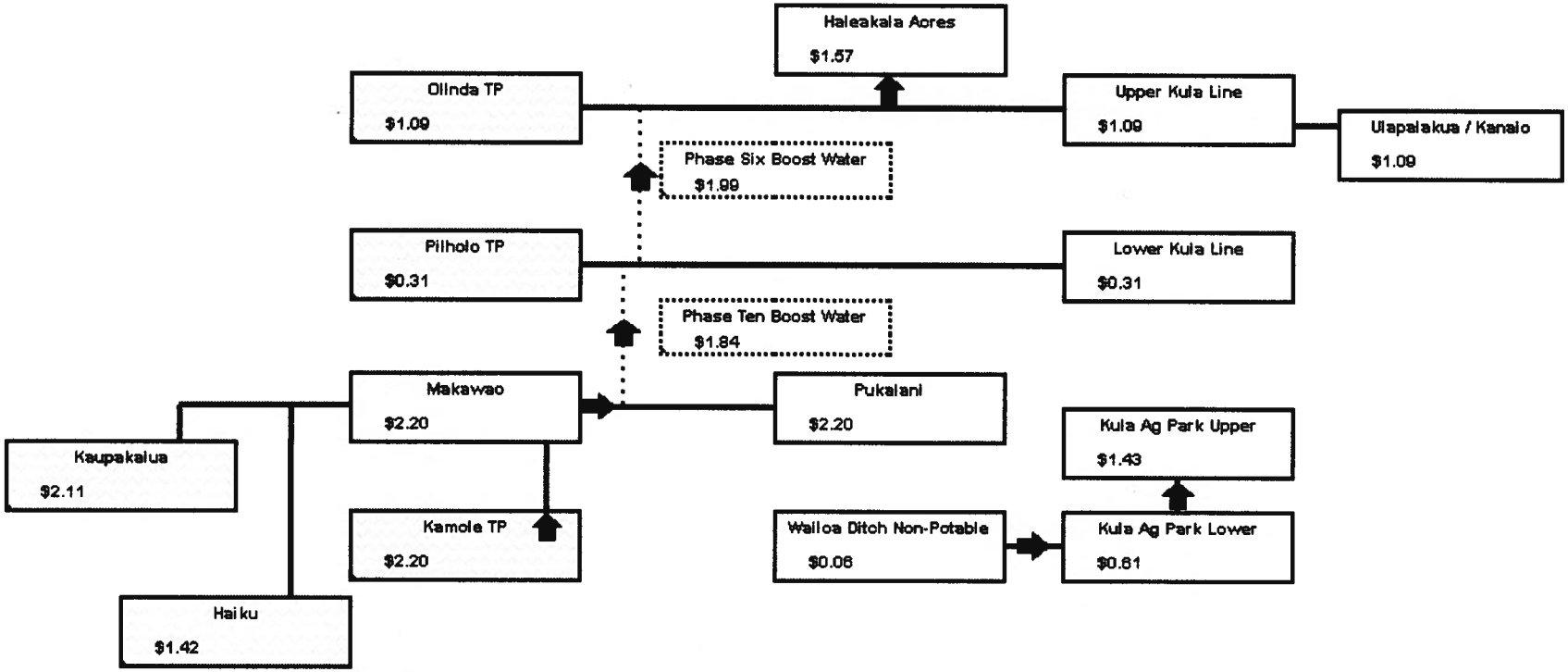
When water drops 25%, 50%, 75% or more

Power and Pumping Costs

Over 26% of DWS operating costs during 2007 were for power and pumping (more than 10.5 million dollars). With strong seasonal variation demands, power and pumping costs peak in summer months. Drought operations can run up hundreds of thousands in extra expenses. Power and pumping costs for the Kamole Weir Water Treatment Plant are higher than any others in the Upcountry system.

Figure 17 on the following page provides short-run marginal costs to serve 1,000 gallons of water at various elevations. These differences are almost entirely due to power and pumping.

Upcountry System Variable Operating Costs by Geographic Area (Short Run Marginal Costs)



The variable operating costs of producing and delivering water to each water tank on the DWS system was calculated. These costs are presented for several geographic areas in the chart below. Variable operating costs include the cost of electrical energy for water pumping and any other costs that vary directly with the amount of water produced.
The cost shown for each area is the calculated variable water production cost per thousand gallons for the year 2008.
Shaded boxes show water source production costs. Arrows show booster pumps. Dotted boxes show the additional costs of water boosted to higher elevations under some summer months and drought conditions.

Figure 17 Upcountry System Variable Operating Costs (Short Run Marginal Costs)

Table 11 DWS Power and Pumping Costs for Upcountry Water System Facilities

	N-07	D-07	J-08	F-08	M-08	A-08	M-08	J-08	J-08	A-08	S-08	O-08	N-08	D-08	J-09	F-09
Haleakala Acres Tank #36	782	795	1,004	1,448	1,467	1,066	1,029	1,372	1,328	1,202	1,589	1,334	997	754	867	608
Omaopio Steel Tank	83	84	89	147	93	93	149	98	164	172	103	105	162	149	86	120
Harry Field Tank #371	2,404	2,479	2,451	2,779	2,668	2,674	2,500	13,927	29,252	28,921	9,038	2,596	13,826	20,141	4,324	1,704
Mauka Estates Pump #1	43	44	46	47	47	46	49	48	48	49	50	49	49	47	47	45
Kealahou Tank 30K #401	43	42	47	47	47	47	46	50	49	48	49	49	48	47	47	44
Kula Kai Tank #358	3,199	2,746	3,483	3,350	3,578	3,628	3,654	17,063	29,959	29,525	5,802	3,796	15,675	19,388	3,637	2,038
Kula Ag Park A	9,718	6,054	7,854	7,898	10,174	10,622	10,812	14,021	12,640	12,795	15,732	14,789	11,640	7,857	5,008	3,251
Kula Ag Park B	12,024	7,326	10,339	10,085	12,946	12,137	12,570	15,294	15,114	15,588	17,416	17,975	13,291	8,609	6,106	4,877
Kula Ag Park Pump #3	26	26	28	28	28	28	28	28	28	28	28	28	28	28	28	28
Kamole Weir Plant	100,749	84,166	95,028	69,245	120,581	120,740	138,763	198,199	214,998	157,749	136,898	151,157	155,280	128,067	29,180	23,861
Maluhia Tank #255	3,224	6,468	3,108	3,147	17,733	17,228	22,989	69,263	78,763	22,121	3,102	9,071	50,175	30,629	3,102	3,102
Pookela Tank #256	3,083	4,968	2,395	3,661	19,247	12,985	15,947	43,489	48,327	15,308	9,677	11,835	31,607	18,999	2,311	2,327
1285 Makawao Ave.	0	0	0	0	0	133	106	116	116	127	120	120	106	101	96	80
Olinda Tank 50K #254	2,944	6,235	3,120	3,159	14,852	14,848	21,523	63,563	70,575	21,011	3,134	7,990	42,114		3,134	3,134
Piiholo Main Line	26	26	27	28	28	28	28	28	28	28	28	28	28	28	28	28
A/C Kamole Storage Tank	26	27	28	28	28	28	28	28	28	28	28	28	28	28	28	28
Kahakapao Reservoir	26	26	28	28	28	28	35	32	28	31	28	28	28	35	32	32
Lower Kula WTP	5,417	3,715	5,970	4,600	6,109	6,251	6,924	6,747	7,979	8,974	8,409	8,159	7,449	5,946	5,178	4,660
Haiku Well Pump Station	11,355	12,064	13,439	12,803	15,609	15,329	16,848	18,749	19,186	18,993	19,141	18,836	17,410	13,439	11,869	9,605
Olinda Road Pole #E69	46	46	50	50	50	50	50	52	52	52	54	52	51	50	49	46
Olinda WTP	13,323	9,743	13,771	11,324	15,305	16,142	17,035	14,598	2,611	4,434	24,662	22,199	11,466	5,801	12,111	10,128
Upper Kimo Tank	1,142	1,142	1,198	293	292	242	245	13,609	29,768	28,346	7,603	1,214	12,660	20,508	3,423	1,223
Lower Kula Booster	1,593	1,009	1,069	1,082	1,082	11,856	15,210	23,927	29,551	30,496	23,530	19,228	22,923	17,154	7,867	6,281
Kula Hwy. #3000	26	26	27	28	28	28	28	28	28	28	28	28	28	28	28	28
Kula Hwy. #2355	30	26	28	28	28	28	28	28	28	28	28	28	28	28	28	28
Kula Res. Lots Bstr. Pumps	498	531	666	790	678	710	700	591	674	635	721	654	708	636	552	414
Kaupakalua Road Well	972	30,226	48,724	48,120	52,745	54,685	64,631	71,466	76,650	75,101	78,311	77,435	61,414	51,744	45,672	35,206
Holomua Rd., H'Poko	211	170	232	191	191	241	248	262	277	289	228	162	325	1,559	126	152
Olinda Rd. #E12 Pookela	3,211	5,774	3,457	3,900	4,487	3,093	4,409	44,024	77,381	7,403	28,735	3,066	59,122	17,501	4,806	3,875
Hamakuapoko Well #2	343	259	329	292	292	292	248	318	337	351	355	408	553	3,029	256	227

Agricultural Costs
Whenever there is low rainfall and surface water flows, agricultural production and income decrease. Planting and irrigation schedules are altered producing lower crop yields. More agricultural produce must be imported. Imported produce lose freshness and have added packaging and transportation costs. Local restaurants also depend heavily on local produce which include vegetables, fruits and livestock.

Recent agricultural losses:

- During the 1996 drought that affected Hawaii, Maui and Molokai, there were heavy damages to agriculture and especially to cattle. State-wide cattle losses totaled at least $9.4 million.
- During the 1998-1999 drought, state-wide cattle losses were estimated at $6.5 million.
- During the 2000-2002 drought, state-wide cattle losses were projected at $9 million.
- A&B, Inc., mostly through HC&S, lost nearly $13 million in 2008 as a result of lower yields due to prior droughts.
- A&B, Inc. anticipates even greater losses in 2009 due to prior droughts.

Development and Construction Costs
Maui County Administrative, Title 16, Chapter 106, Water Meter Issuance Rule for the Upcountry system states that there is a finding of insufficient water supply developed for fire protection, domestic and irrigation purposes to take on new or additional services without detriment to those already served in the regulated area.

Until additional water sources are added to the Upcountry system, future development will be limited in the both the Community Plan Upcountry District (Makawao-Pukalani-Kula) and the DWS Upcountry District for water service (Makawao-Hali'imaile-Pukalani-Kula-Haiku).

All of the capital plans currently under analysis for the Water Use and Development Plan represent an expenditure beyond the Department's current rates and fees. To meet anticipated demands while accounting for drought and/or the need to pump, DWS will have to invest on the order of $9,000 per service for the source portion of the Water System Development Fee alone. The current fee of $6,030 covers source, storage and transmission. So even in the absence of drought, planning for drought-prone conditions is expensive.

Restricting offstream uses
Offstream users include domestic and municipal, irrigation, industrial and hydroelectric. The County of Maui and DWS currently use surface water for domestic, municipal and irrigation purposes.

- **Domestic and municipal uses**
  - Under existing conditions, the Upcountry system is already prone to seasonal restrictions, which are exacerbated during drought conditions. Further restrictions on such use could create negative impacts to the community.
  - Among the municipal uses served by the DWS system are hospitals, schools,

and other important community facilities. Increasing the severity of restrictions on the Upcountry system could ultimately reach the point of affecting these crucial services.

- In fiscal year 2008, the Upcountry system served 9,853 meters in the "Upcountry" communities, including Makawao, Hali'imaile, Pukalani, Kula, Ulupalakua-Kanaio and Haiku.
- The DWS Upcountry system also serves the Department of Hawaiian Home Lands, which would be adversely affected by further domestic and municipal restrictions.
- Continued use of surface water from East Maui streams is consistent with state land use designations.
- Continued use of surface water from East Maui streams is consistent with the Maui County General Plan. The General Plan objectives are "to provide an adequate supply of potable and irrigation water to meet the needs of Maui County's residents" and "to make more efficient use of the our ground, surface and recycled sources".
- Continued use of surface water from East Maui streams does not interfere with the right of DHHL. DHHL does not have its own potable water source. The WATER CREDITS AGREEMENT between DHHL and DWS on December 9, 1997 supports DHHL's Waiohuli-Keokea subdivisions by agreeing to provide 500,000 GPD of potable water.
- Despite considerable effort to improve operating efficiency, limit additional commitments, and encourage conservation, DWS has been unable to supply sufficient and reliable potable water to meet seasonal demands for its Makawao-Pukalani-Kula District customers.

- **Irrigation use**
  - Article XI, Section 3, of the State Constitution, states that "The state shall conserve and protect agricultural lands, promote diversified agriculture, increase agricultural self-sufficiency and assure the availability of agriculturally suitable lands".
  - The preservation of agricultural lands has been a key objective of the last several community plans for the Upcountry region. However, drought-prone conditions have already created problems for many farmers. Further restrictions to agricultural irrigation could have detrimental impacts to an already-staggering sector.
  - As noted earlier, the KULA AGRICULTURAL PARK WATER RESERVOIR AGGREEMENT gives the County of Maui the right to withdraw up to 1.5 million gallons per day from EMI's Hamakua Ditch. Non-potable water use for irrigation of agricultural farms requires that the water be pumped up to the park at varying points. The park has a total of 445 acres and supports 26 farms.
  - The majority of the farms on the Upcountry system utilize water that is treated at three water treatment plants. Most of these farms produce diversified agriculture or livestock.

Until more cost effective water sources are available for general and agricultural services served by the Upcountry system, the County of Maui and DWS continue to rely on surface

water from East Maui streams.

WATER USE EFFICIENCY

DWS has existing and pending programs to improve efficiency. Between fiscal years 2007 and 2008, the number of meters in the Upcountry system increased, while consumption dropped. In fairness, efficiency is only one of the factors that have contributed to this downward trend in consumption. The current downward trend in both general and agricultural consumption may be attributed to:

- Increase in rainfall during the months of February 2009 through April 2009
- DWS price structure and price increases
- Lower defacto population
- Decreased economic activity associated with the current recession
- Appeals for conservation by DWS
- DWS conservation program implementation
- Wet weather in recent months

Irrigation efficiency

- **Farm irrigation**

For most of the agricultural operations, including DHHL, on the Upcountry system, water use is potable. The exception would be the Kula Agricultural Park which uses non-potable water. Agricultural water rates are available for qualified operations. Most agricultural users utilize the most efficient irrigation techniques available.

The Natural Resources Conservation District has cooperative agreements with most of the Upcountry farmers for conservation and water as well as prevention of soil erosion. Although these agreements are voluntary, the NRCS provides expertise and assistance with improving efficiency.

- **Landscaping**

DWS co-funds operations of the Maui Nui Botanical Garden, and funded construction of its nursery and portions of other facilities and displays. They are a resource that provides expertise in the propagation and maintenance of native plants, promotes water conservation, irrigation and maintenance techniques, and serves as a major demonstration and educational facility.

DWS promotes conservation in its staff comment letters for discretionary projects by promoting:

- The use of climate-adapted native plants to conserve water and protect the watershed from degradation due to invasive alien species.
- The maintenance of fixtures to prevent leaks and the loss of water.
- The use of low-flow fixtures and devices in faucets, showerheads, urinals, water

closets and hose bibs.

- The prevention of over-watering by automated irrigation systems by providing rain-sensors on all automated controllers. Check and reset controllers at least once a month to reflect the monthly changes in evaporation rates at the site. As an alternative, provide more automated, soil-moisture sensors on controllers.
- Limiting irrigated turf by using low-water use plants and ground cover.
- The use of brackish water or reclaimed water for dust control and for non-potable uses during construction.
- Looking for opportunities to conserve water. For example, use a broom instead of a hose to clear debris.

Ways to decrease water use and water needs

The Maui County Department of Water Supply is developing and expanding its conservation program, which includes both supply-side and demand-side measures.

Past experiences

Supply-side measures to date include leak detection, preventive and predictive maintenance, use of reclaimed water and alternate system backups and resource protective measures.

Leak Detection: Though the County has long practiced leak detection, due to staffing it has historically been primarily reactive. Leak detection staff were sent out when a leak was suspected, either based on system performance, or flow and pressure monitoring undertaken as part of hydraulic model development or other efforts. The Department now has a proactive program. A preliminary water audit by district has been completed and eighteen miles of distribution line has been surveyed in the first quarter of this year (versus ten in the same quarter last year). We are in the process of hiring additional leak detection staff and expect the pace to increase. Leak detection equipment includes digital correlating loggers, a digital correlator, a leak detector and a line tracer. More detection equipment is also in the FY2010 budget. Systematic survey and detection of leaks may be supplemented by flow and pressure monitoring as needed. Several major leaks have been identified and repaired.

Preventive & Predictive Maintenance: This is two pronged. Facilities are regularly maintained and pumps are periodically calibrated. In the course of such maintenance, facilities are regularly checked for signs of wear. DWS also has a system inventory with age, diameter and material of lines and other facilities. Based upon the status and performance of system facilities, upon known inventory status and demand trends, DWS maintains a 30-year project list. This can help to reduce unaccounted-for water in the system by targeting old and substandard lines for replacement.

Reclaimed Water Use: About 3.905 MGD is in use county-wide with 1.8 MGD utilized in South Maui. As part of its Water Use and Development Plan process, DWS is currently investigating the costs and benefits of large scale capital investment to further expand this use to offset potable use.

Back-up Sources: In the event of a major leak, most areas of the system can be served by other sources so that any key portion of the system could be valved off as needed.

Watershed and Resource Protection: The Department spent $1,223,500 in FY2008. It has budgeted $1,252,500 for FY2009 and $1,256,000 for FY2010 to protect and monitor water resources, including more than $600,000 on watershed protection. DWS also has co-funded studies to monitor stream flow, duration, temperatures, aquatic and ecologic features of East Maui streams in the recent past. Department staff give talks and run ads on the importance of watershed protection as well as co-sponsoring events at the Maui Nui Botanical Garden facility.

Demand-side measures to date include fixture distribution, a tiered rate structure, educational programs, and regulations as well as resource protection. Ongoing planning efforts are evaluating the benefits and costs of increased aggressiveness in these efforts.

Fixture Distribution: To date DWS has given out 36,713 low-flow showerheads, 33,596 bathroom aerators, 21,567 kitchen aerators, 19,763 self-closing hose nozzles, and many more leak detection dye tablets, versus a customer base of about 35,000 meters. Despite what would seem like high market penetration, estimated savings based on these giveaways is only about half a million gallons per day. More aggressive fixture distribution programs under consideration include audits and direct install programs, as well as rebates and incentives for larger appliances.

Audits/Retrofits: The Department co-funded its first direct install retrofits in the late 1990s with low flow toilets. However, no large scale programs were funded. More recently retrofit trials of high efficiency toilets have been started in the Central District. If these continue to prove successful, retrofits will expand to the Upcountry district. Ongoing retrofit trials include:

- Ka Hale A Ke Ola, a homeless resource center with about 70 units and two dormitories - 74 toilets, two urinals, 76 showers and 76 faucets have been retrofitted, and almost immediately realized substantial water savings.
- Hale Makana O Waiale is a low income housing complex with 200 units. Two hundred showerheads, 200 bathroom and kitchen aerators will be replaced with more water efficient models.
- All DWS properties and the 5th and 9th floors of the county building are being retrofitted with 10 waterless urinals and 22 dual flush toilets.
- DWS staff are working with the Department of Parks and Recreation staff to retrofit aquatic facilities with more efficient fixtures and conserve water in other ways.

The Water Use and Development Plan in progress is evaluating the costs and benefits of high efficiency fixture rebates and direct installation programs. Ongoing trials will help to provide some preliminary data on the effectiveness of some of these options. Longer term options for the future may also include review of various means of sub-metering multi-family units and multi-purpose buildings. Studies indicate that metering un-metered units is among the most effective conservation measures, by billing explicitly for use rather hiding this cost in the rent.

Conservation Pricing: DWS currently has a tiered rate structure to encourage conservation. Data improvements under way could enable the Department to move forward a more

aggressive tier structure.

Regulation: The Maui County has the following existing regulations and rules that support conservation: 1) Prohibition of discharging cooling system water into the public wastewater system; 2) Requirements that low-flow fixtures are required in new development; 3) Requirements that all commercial properties within 100 feet of a reclaimed water line utilize reclaimed water for irrigation and other non-potable uses; 4) A water waste prohibition with provision for discontinuation of service where negligent or wasteful use of water exists; 5) A provision enabling the water director to enact special conservation measures in order to forestall water shortages. In addition, a comprehensive conservation ordinance has been drafted, and may be implemented in stages. Discussions with various consultants about how to phase such implementation is under way. Though the draft is fairly comprehensive, initial provisions enacted may focus on simple measures which have been proven effective - such as limited landscape watering days.

Education and Behavior Modification: Conservation marketing efforts include ads run on all local radio stations and newspapers to encourage water conservation. The permit review process is also utilized as an educational tool, with use-specific conservation tips and location-specific landscape tips included in each review. The Department participates in about 25 public events per year, such as the County Fair, Earth Day and Taro festivals. In order to provide demonstration and an ongoing educational facility with demonstration and learning, the Department funds the operations of the Maui Nui Botanical Garden.

The local paper, the Maui News, publishes a weekly update of water use, including past use, for all districts within the County of Maui. It also has surface water and storage capacities, and water treatment plant production (for Upcountry systems) and rainfall data.

Expanded education and marketing efforts under consideration include targeted marketing survey and campaign development, a hotel awards program, a building manager users group, and an agricultural users group.

In addition to the previously mentioned items, DWS also promotes the utilization of low-flow fixtures and devices, and the maintenance of fixtures to prevent leaks in its comment letters on discretionary projects.

Landscaping: Maui DWS co-funds operations of the Maui Nui Botanical Garden, and funded construction of its nursery and portions of other facilities and displays. This provides a resource for promoting expertise in propagating and maintaining native plant materials, helps to increase the potential marketability of appropriate plants, promotes a conservation ethic, provides training on appropriate propagation, planting, irrigation and maintenance techniques, and generally helps to increase the likelihood of successful appropriate landscapes with a "Hawaiian Sense of Place". It also helps protect watersheds by promoting native and non-invasive plants over potentially invasive species, providing for educational opportunities on the importance of the watershed and how to protect it, and serving as a major demonstration and educational facility. The nursery is also a source of native plants for the Department outreach projects and give-aways. The Department developed (with help from the arborist committee) and prints a brochure entitled "Saving Water in your Yard, What and How to Plant in your

Area", which is distributed by the Maui Nui Botanical Garden as well as by the Department at events and permit reviews. Future plans for landscape conservation include a conservation ordinance, landscape audit and retrofit program, and smaller satellite demonstration projects. DWS is also investigating the costs and benefits of major capital expenditure in reclaimed water transmission to offset use of potable water in South Maui landscapes. The pending conservation ordinance includes mandatory watering schedules and irrigation efficiency measures among other requirements.

Ongoing Planning Efforts: Source options considered as part of the Water Use and Development Plan process will include consideration of extensive conservation measures as a source supply. In order to displace or delay source development, an aggressive program is required. Preliminary design of such a program is ongoing as part of the Water Use and Development Plan process. Anticipated program elements include targeted audit and direct install programs, rebates and incentives, expanded conservation requirements for landscaping and other uses, expanded marketing efforts including user groups, such as a hotel awards program, a building manager information program, agricultural user working groups/services, as well as energy production and efficiency measures, continued watershed protection and restoration, and possible major capital expenditure to support reclaimed water use.

Future

- A second conservation specialist is currently in recruitment.
- A comprehensive water conservation ordinance has been drafted that would require more efficient landscape irrigation practices, as well as retrofit on resale and other measures. This ordinance is in draft form and undergoing review. Based on the advice of conservation professionals, it will be broken out in phases rather than attempt to pass the entire program at once.
- DWS will continue its implementation of a declaration of drought in varying stages as a management measure to control water use.
- The Water Use and Development Plan for the Makawao-Pukalani-Kula District, as well as other county districts, is considering extensive conservation measures as a supply source.
- Work is ongoing to fill data gaps and gather geographic and other information that will enable the Department to design a better-targeted and more steeply tiered water rate structure in the future.
- Expanded education and marketing efforts under consideration include targeted marketing survey and campaign development, a hotel awards program, a building manager users group, and an agricultural users group.

Future Changes

- **Changes in water use or needs**
  - The Maui County Farm Bureau does not envision major changes in farm acreage in the near future. Increase production will be dependent on the availability of water. However, it does anticipate a larger number of farmed deer.
  - As noted earlier, there are thousands of single family and multi-family units either planned/committed, planned/designated or proposed in the Makawao-Pukalani-Kula District. There are also hundreds of applicants on the Upcountry Water

Service list for subdivisions, building permit applications and water service requests. However, the previously mentioned Water Meter Issuance Rule for the Upcountry system prevents future development in the Makawao-Pukalani-Kula District until sufficient and new water sources are developed.

- **Changes in the capacity of the Upcountry water system**
  - The County of Maui SIX YEAR CAPITAL PROGRAM includes the following projects that will increase system capacity.
    - Waikamoi Flume Improvements (FY 2010-2012) will rehabilitate and reconstruct an old and leaking existing structure which may add a considerable amount of surface water for the Olinda Treatment Plant.
    - Upcountry water storage (FY2011-2015) for the Lower Kula system.
  - Other changes that will increase system capacity include:
    - Extensive conservation program to add source, including the retrofit of highly efficient low flow toilets as well as showerheads and kitchen and bathroom faucet aerators.
    - Cooperative ventures with the private sector for new ground water sources.
      1) ML&P's Pi'iholo Well - Although the well is completed, its production is lower than anticipated. Negotiations are ongoing.
      2) A&B, Inc. well for its Hali'imaile subdivision is still in its planning stage. Negotiations are ongoing.
  - Water Use and Development Plan, Upcountry District, Final Candidate Strategies (draft) will offer future alternatives for increasing system capacity. These strategies include:
    - Expansion of raw water storage at Kamole for the Kamole Water Treatment Plant or Lower Kula for the Pi'iholo Water Treatment Plant
    - Full basal groundwater backup well
    - Limited growth with extensive conservation measures and keep demands within surface water system capacity
    - Expanded Kamole Water Treatment Plant capacity and volume
  - Other measures that are considered in the plan include:
    - Watershed protection and restoration measures to help maintain healthy forests that add water to streams and the groundwater aquifers. DWS's current watershed grant funding includes the Tri-Isle RC&D, Maui Invasive Species Committee, The Nature Conservancy, and the East Maui Watershed Partnership. It also includes grant funding of the Leeward Haleakala Watershed Restoration Partnership.
    - Stream restoration measures that create a more balanced use of surface water. The County and DWS supports the establishment of instream flow standards for East Maui streams.

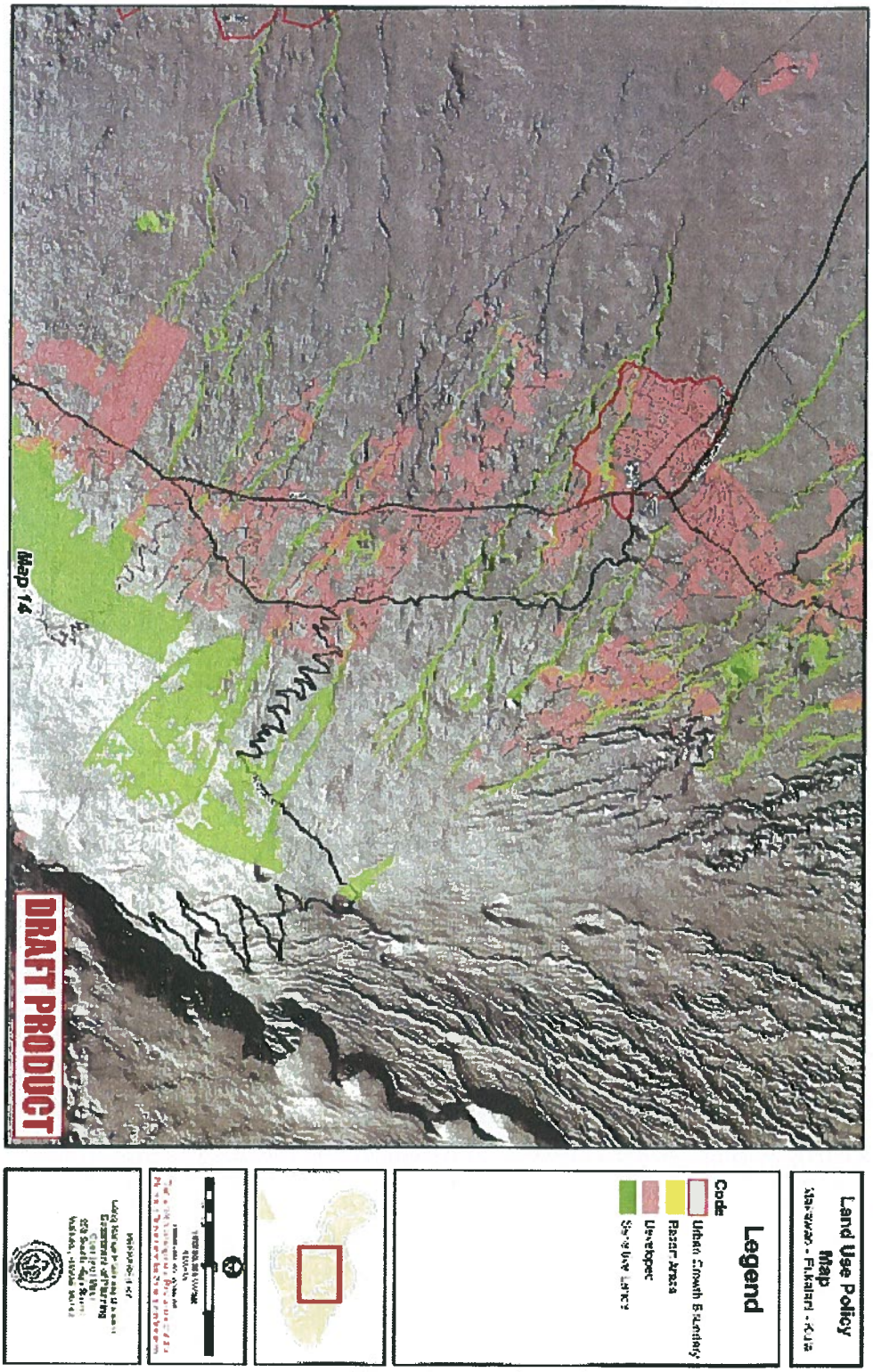


Figure 18 Land Use Policy Map for Makawao-Hali'imaile-Pukalani-Kula Showing Proposed Urban Growth Boundary

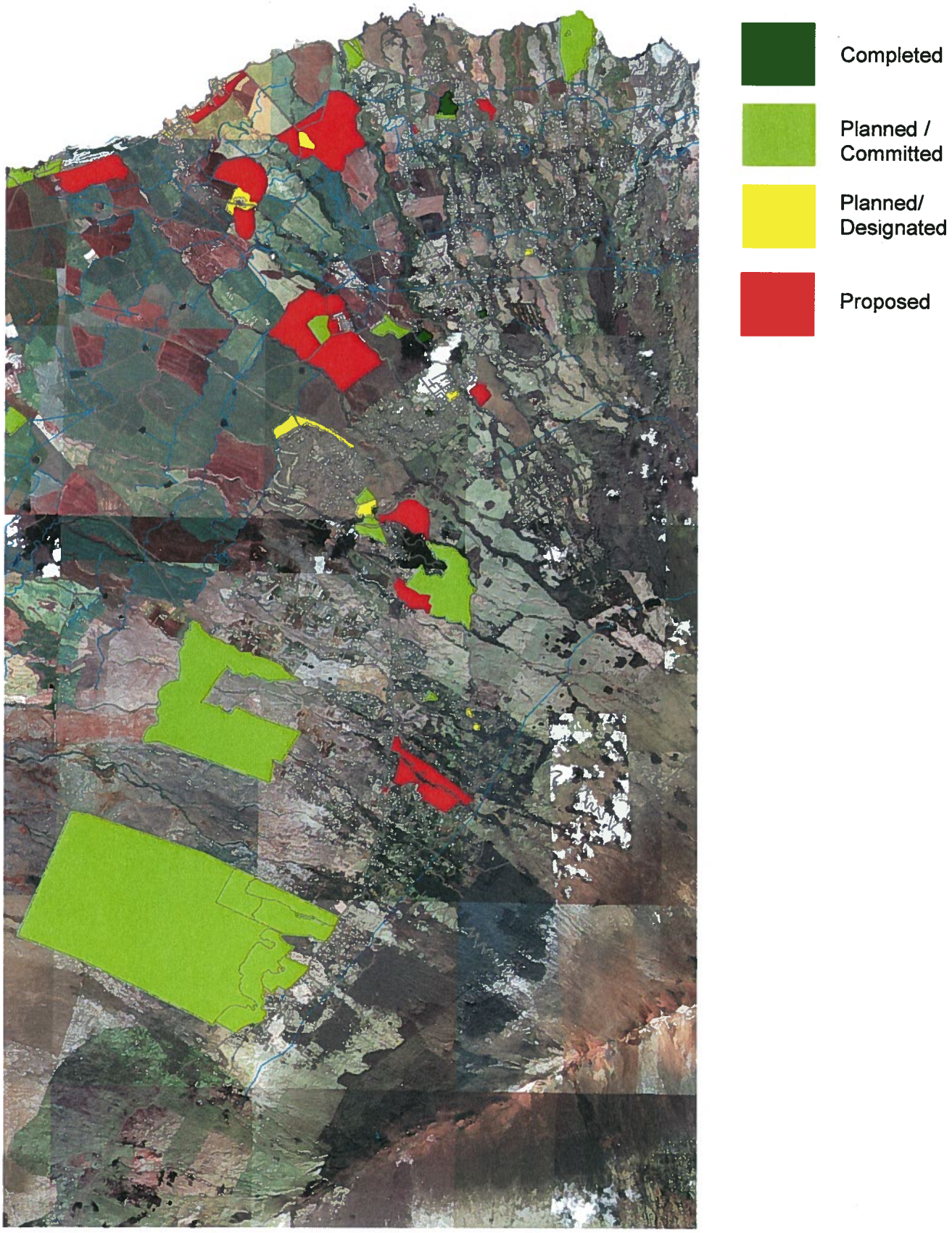


Figure 19 Planned Land Uses In Upcountry Region

4.0 Feb. 18, 2010 - Maui Land & Pineapple Company, Inc.

Maui Land & Pineapple Company provided responses to the Commission's request for additional information.

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON

WILLIAM D. BALFOUR, JR.
SUMNER ERDMAN
NEAL S. FUJIWARA
CHIYOME L. FUKINO, M.D.
DONNA FAY K. KIYOSAKI, P.E.
LAWRENCE H. MIIKE, M.D., J.D.

KEN C. KAWAHARA, P.E.
DEPUTY DIRECTOR

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
P.O. BOX 621
HONOLULU, HAWAII 96809

February 18, 2010

Mr. Jeffrey Pearson
Maui Land & Pineapple Company
120 Kane Street
Kahului, Hawaii 96733-6687

Dear Mr. Pearson:

The purpose of this letter is to provide a detailed list of additional information that the staff at the Commission on Water Resource Management (Commission) needs concerning the interim instream flow standard (interim IFS) recommendations and adaptive management strategies for 19 east Maui streams presented at the Commission meeting on December 16-17, 2009, in Paia, Maui. In accordance with the motion that was approved at the meeting, Commission staff is seeking additional information from Maui Land & Pineapple Company (MLP).

Commission staff asks that the following list of specific information be submitted no later than **March 19, 2010**. A representative from MLP should be prepared to present the information submitted to the Commission at the next Commission meeting, which has yet to be scheduled.

- An update on changes that have taken place, as well as future plans that directly affect water use since Haliimaile Pineapple Company, as staff understands is slated to restart pineapple operations, took over Maui Pineapple Company in December 2009.
- Information on any other lands that MLP has leased to third parties, including location, acreage, land use (i.e., agricultural or domestic), and water sources.
- Changes in water use from Hanawi pump and Kuhiwa well.

Commission staff would like to meet with MLP representatives to further discuss the information presented above, as well as additional information that MLP is willing to provide that would help the Commission in the evaluation of the pending interim IFS petitions. Please contact Dean Uyeno of the Stream Protection and Management Branch at (808) 587-0249, or via email at dean.d.uyeno@hawaii.gov, to schedule a meeting in early March.

On behalf of the Commission, I would like to thank you in advance for your cooperation in this matter. Should you have any questions, please feel free to contact me at (808) 587-0214.

Sincerely,

KEN C. KAWAHARA, P.E.
Deputy Director

DU:ss
Attachment

Maui Land & Pineapple Company, Inc.

RECEIVED
COMMISSION ON WATER
RESOURCE MANAGEMENT
2010 MAR 17 AM 8:34

March 16, 2010

Mr. Ken Kawahara
Department of Land and Natural Resources
Commission on Water Resource Management
P.O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Kawahara: Ken,

This letter is in response to your letter dated February 18, 2010 requesting additional information on Maui Land & Pineapple Company (MLP) use of water provided through the EMI ditch system. Also, on March 9, 2010, Stephen Nikaido and I participated in a conference call with Dean Uyeno and Commission staff on these same items.

MLP responses to your inquiry are as follows:

- *An update on changes that have taken place, as well as future plans that directly affect water use since Haliimaile Pineapple Company, as staff understands is slated to restart pineapple operations, took over Maui Pineapple Company in December 2009.*
  Response: Haliimaile Pineapple Company (HPC) purchased certain assets of Maui Pineapple Company and Maui Land & Pineapple Company and began pineapple operations under the new company beginning January 1 2010. HPC entered into a lease for approximately 1,000 acres in the Haliimaile area of Maui, with options to lease additional acreage in the Omaopia area. They also have a separate agreement to farm and harvest any remaining fruit on MLP property or property MLP leases on both on the east and west side of Maui. HPC intends to use the existing sources of water available on the east side for pineapple irrigation and processing of fresh fruit, including the water provided through the EMI ditch.

- *Information on any other lands that MLP has leased to third parties, including location, acreage, land use (i.e., agricultural or domestic), and water sources.*
  Response: At the present time MLP has not leased any other lands on the east side where water from the EMI ditch is directly used for agricultural uses.

- *Changes in water use from Hanawi pump and Kuhiwa well.*
  Response: Although MLP has not recently utilized water from the above mentioned sources, we fully intend to continue to keep theses sources as options for pineapple production by Haliimaile Pineapple Company. With surface water being an unreliable source, this stream pump and well add to our reliability of providing water for agricultural uses.

P.O. Box 187 • Kahului, Maui, Hawai'i 96733-6687 • 808-877-3351 • Fax 808-871-0953
mauiland.com

As always, MLP will cooperate in any way we can to help the Commission work towards a workable solution to this complex task of surface water use strategies for the remaining 19 east Maui streams. Please feel free to call me at 808 877-1606 should you request additional information.

Sincerely,

Jeffrey T. Pearson, P.E.
Water Manager
Maui Land & Pineapple Company

Cc: Garrett Hew, Hawaiian Commercial and Sugar
Doug McCluer, Haliimaile Pineapple Company

5.0 Feb. 18, 2010 - Native Hawaiian Legal Corporation

Native Hawaiian Legal Corporation (NHLC) provided:

1) A summary of declarants information by stream;
2) GIS-based maps of historic kuleana and loi in the east Maui region;
3) Declaration of William K. Johnson;
4) Declaration of Lihau Kekahuna;
5) Testimony of Davianna McGregor, Ph.D;
6) Testimony of Edward Wendt;
7) Testimony of Beatrice Pualani Kepani Kekahuna;
8) Kalo Kanu o Ka Aina, A Cultural Landscape Study of Keanae and Wailuanui, Island of Maui;
9) Volume I, Wai o Ke Ola: He Wahi Moolelo No Maui Hikina, A Collection of Native Traditions and Historical Accounts of the Lands of Hamakua Poko, Hamakua Loa and Koolau, Maui Hikina (East Maui), Island of Maui;
10) Volume II, Wai o Ke Ola: He Wahi Moolelo No Maui Hikina, Oral History Interviews with Families of Hamakua Poko, Hamakua Loa and Koolau, East Maui;
11) Declarations of Solomon Kaauamo, Sr., Paul R. Bodnar, and Paul K. Sinenci, Sr.; and
12) Testimony of Kekoa Nakooka-Akoi.

LINDA LINGLE
GOVERNOR OF HAWAII

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KEN C. KAWAHARA, P.E.
DEPUTY DIRECTOR

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
P.O. BOX 621
HONOLULU, HAWAII 96809

February 18, 2010

Mr. Alan Murakami
Native Hawaii Legal Corporation
1164 Bishop Street, Suite 1205
Honolulu, Hawaii 96813

Dear Mr. Murakami:

The purpose of this letter is to provide a detailed list of additional information that the staff at the Commission on Water Resource Management (Commission) needs concerning the interim instream flow standard (interim IFS) recommendations and adaptive management strategies for 19 east Maui streams presented at the Commission meeting on December 16-17, 2009, in Paia, Maui. In accordance with the motion that was approved at the meeting, Commission staff is seeking additional information from Native Hawaiian Legal Corporation (NHLC) and its clients.

Commission staff asks that the following list of specific information for the short-term, mid-term, and long-term time periods, in accordance with the motion, be submitted no later than **March 19, 2010**. A representative from NHLC should be prepared to present the information submitted to the Commission at the next Commission meeting, which has yet to be scheduled.

- Documentation about specific interest within the community for new kalo loi including acreage, timetable and costs.

Commission staff would like to meet with NHLC representatives to further discuss the information presented above, as well as additional information that NHLC is willing to provide that would help the Commission in the evaluation of the pending interim IFS petitions. Please contact Dean Uyeno of the Stream Protection and Management Branch at (808) 587-0249, or via email at dean.d.uyeno@hawaii.gov, to schedule a meeting in early March.

On behalf of the Commission, I would like to thank you in advance for your cooperation in this matter. Should you have any questions, please feel free to contact me at (808) 587-0214.

Sincerely,

KEN C. KAWAHARA, P.E.
Deputy Director

DU:ss

"Camille Kalama"
<cakalam@nhlchi.org>

03/19/2010 03:20 PM

To <Ken.C.Kawahara@hawaii.gov>, <Dean.D.Uyeno@hawaii.gov>, <Chui.L.Cheng@hawaii.gov>,
cc "Carleen Ornellas" <caornel@nhlchi.org>, "Alan Murakami" <almurak@nhlchi.org>
bcc

Subject Submittal to CWRM

Aloha,
Attached is our submission on the CWRM's request for information on lo`i potential. Included is:

(1) A summary of previous submittals on both kalo and gathering practices;
(2) Two declarations from Nahiku residents (also included in the summary);
(3) Two Maps showing historic lo`i based on L.C.A. records – maps provided by the Office of Hawaiian Affairs. The data summarized in these maps was included in the study by Kepa Maly;

We will also be sending over a copy of the report by Kepa Maly and a study by Davianna McGregor regarding historic land use in the Ko`olau area. The purpose of the historic information is to show potential areas for kalo production and other background information that was submitted to the BLNR in our contested case proceedings. We apologize in advance for any duplication. Mahalo, Camille

Declarant info by stream.xls

Historic Kuleana & lo`i (1).jpg

Historic Kuleana & lo`i (2).jpg

Johnson William K.pdf

Kekahuna Lihau.pdf

East Maui Declarant information*

Stream	Gathers				Would Gather				
Waikamoi	opae	hihiwai	o'opu	other (specify)		Problem	would grow kalo	# acres	problem
Barclay, Charles	x	x	x		opae	Insufficient water			
Kimokeo, Charnay	x	x	x	ferns, plants					
Kimokeo, Pualani	x	x	x	herbs, fern shoots, ti leaves, flowers & lei makin gstreamst	same	need constant flow of water.			
Kimokeo, Lincoln	x	x	x	prawns, herbs, fern shoots, ti lives, flowers & plants	same	low water pressure.			
Kimokeo, Jre	x	x	x	prawns, pig hunting					
Kimokeo	x	x	x	watercress, mountain kalo & haha	same	insufficient water			
Martin, Norman D.	x	x	x		same	insufficient water			
Kaauamo, Samuel				pupu kalo, pohole, haha, luau	Kuhiwa to Kolea	insufficient water			
Kaauamo, Solomon	x	x	x	haha, pulu, leko, pohole		lack of water			
Kaauamo, Leolani	x	x	x	haha, leka, pohole, haha		lack of water			
Pahukoa, B.	x	x				lack of water			
Wendt, Edward	x	x	x			not enough water			
	Gathers				Would gather				
Haipuaena	opae	hihiwai	o'opu	other (specify)		Problem	would grow kalo	# acres	problem
Barclay, Charles	x	x	x		opae	Insufficient water			
Kimokeo, Charnay	x	x	x	ferns, plants					
Kimokeo, Pualani	x	x	x	herbs, fern shoots, ti leaves, flowers & lei makin gstreamst	same	need constant flow of water.			
Kimokeo, Lincoln	x	x	x	prawns, herbs, fern shoots, ti lives, flowers & plants	same	low water pressure.			
Kimokeo, Jre	x	x	x	prawns, pig hunting					
Kimokeo	x	x	x	watercress, mountain kalo & haha	same	insufficient water			
Martin, Norman D.	x	x	x		same	insufficient water			
Kaauamo, Samuel				pupu kalo, pohole, haha, luau	same	insufficient water			
Kaauamo, Solomon	x	x	x	haha, pulu, leko, pohole		lack of water			
Kaauamo, Leolani	x	x	x	haha, leka, pohole, haha		lack of water			
Pahukoa, B.	x	x				lack of water			
Wendt, Edward	x	x	x			not enough water			
	Gathers				Would gather				
Punalau	opae	hihiwai	o'opu	other (specify)		Problem	would grow kalo	# acres	problem
Barclay, Charles	x	x	x		opae	Insufficient water			
Kimokeo, Charnay	x	x	x	ferns, plants					
Kimokeo, Pualani	x	x	x	herbs, fern shoots, ti leaves, flowers & lei makin gstreamst	same	need constant flow of water.			
Kimokeo, Lincoln	x	x	x	prawns, herbs, fern shoots, ti lives, flowers & plants	same	low water pressure.			
Kimokeo, Jre	x	x	x	prawns, pig hunting					
Kimokeo	x	x	x	watercress, mountain kalo & haha	same	insufficient water			
Martin, Norman D.	x	x	x		same	insufficient water			
Kaauamo, Samuel				pupu kalo, pohole, haha, luau	same	insufficient water			
Kaauamo, Solomon	x	x	x	haha, pulu, leko, pohole		lack of water			
Kaauamo, Leolani	x	x	x	haha, leka, pohole, haha		lack of water			
Pahukoa, B.	x	x				lack of water			
Wendt, Edward	x	x	x			not enough water			
	Gathers				Would Gather				
Honomanu	opae	hihiwai	o'opu	other (specify)		Problem	would grow kalo	# acres	problem
Barclay, Charles	x	x	x		opae	Insufficient water			
Kimokeo, Charnay	x	x	x	ferns, plants					
Kimokeo, Pualani	x	x	x	herbs, fern shoots, ti leaves, flowers & lei makin gstreamst	everything				
Kimokeo, Lincoln	x	x	x	prawns, herbs, fern shoots, ti lives, flowers & plants	everything				
Kimokeo, Jre	x	x	x	prawns, pig hunting					
Kimokeo, ?	x	x	x	watercress, mountain kalo & haha	same	insufficient water			
Martin, Norman D.	x	x	x		same	insufficient water			
Holokai, Puanenui	x	x			same	no water flow			
Kaauamo, Darlene	x	x	x	haha, gold fish, prawns	same	Insufficient water.			
Kaauamo, Cindy K.	x	x	x	prawns, gold fish, haha	opae, hihiwai		Yes	?	Insufficient water.
Kaauamo, Samuel				pupu kalo, pohole, haha, luau		insufficient water			
Kaauamo, Hannah K	x	x	x	pohole, leko, polu, haha					
Kaauamo, Solomon	x	x	x	haha, pulu, leko, pohole		lack of water			
Kainoa, Gladys	x	x	x	prawns, aholehole, mullet	same				
Carmichael, Daniel	x	x	x	fish		lack of water			

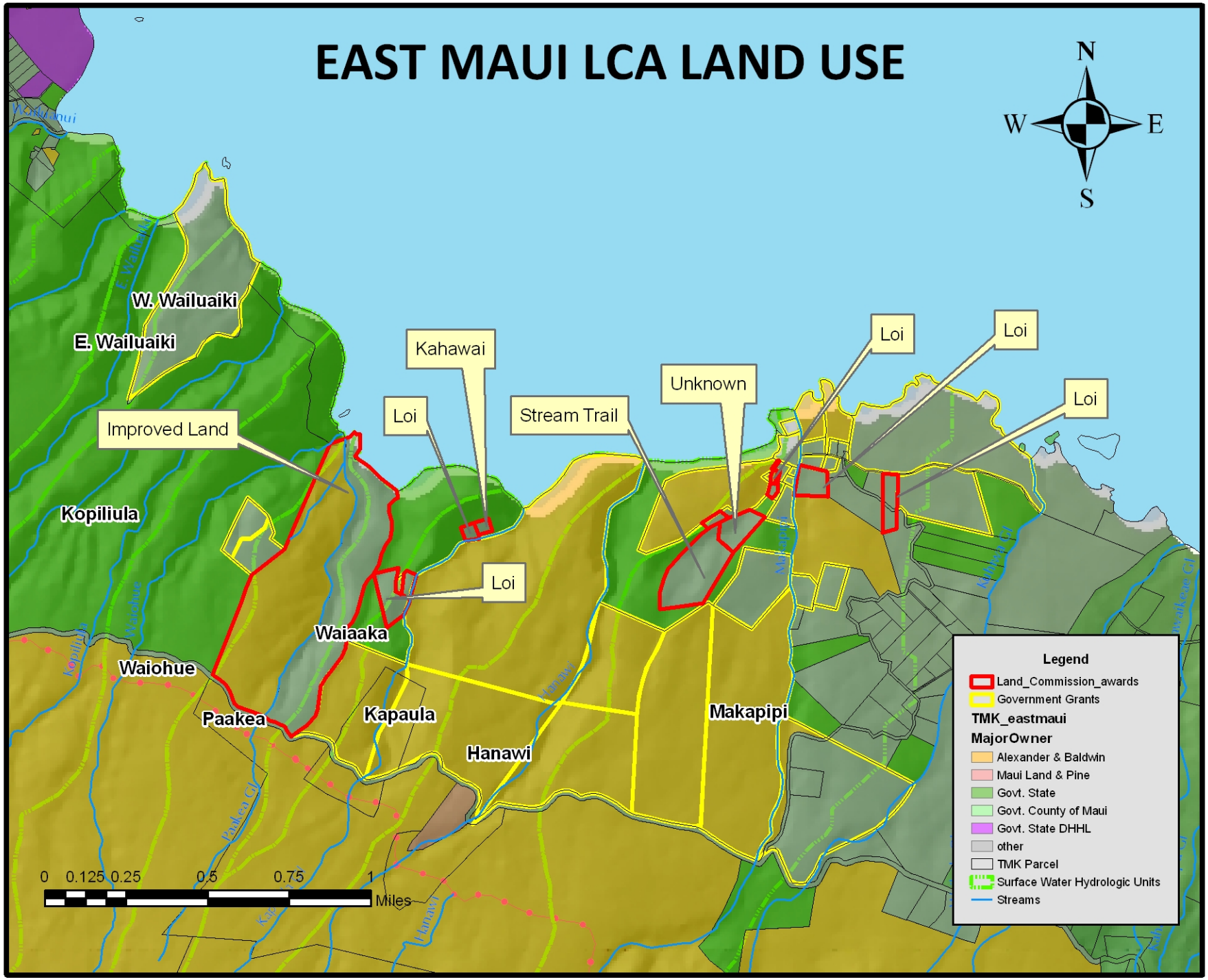
Smith, Benjamin	x	x	x		same				
Smith, Lucille L.	x	x	x						
Kaauamo, Leolani	x	x	x	haha, leka, pohole, haha		lack of water			
Kaauamo, Mary					opae, oopu, hihiwai				
Kaauamo, Frank									
Kekiwi, Puaala	x	x	x		opae	lack of water			
Kekiwi, Jerome, Jr.	x	x	x		opae, hihiwai, oopu	no flow when no rain			
Pahukoa, B.	x	x				lack of water			
Wendt, Edward	x	x	x		opae, hihiwai, oopu	note enough water			
Carmichael, Awapuh	x	x	x		opae	note enough water			
	Gathers				**Would Gather**				
Nuaailua	opae	hihiwai	o'opu	other (specify)		Problem	would grow kalo	# acres	problem
Barclay, Charles	x	x	x		opae	Insufficient water			
Kimokeo, Charnay	x	x	x	ferns, plants					
Kimokeo, Pualani	x	x	x	herbs, fern shoots, ti leaves, flowers & lei makin gstreamst	everything				
Kimokeo, Lincoln	x	x	x	prawns, herbs, fern shoots, ti lives, flowers & plants	everything				
Kimokeo, Jre	x	x	x	prawns, pig hunting					
Kimokeo, ?	x	x	x	watercress, mountain kalo & haha	same	insufficient water			
Martin, Norman D.	x	x	x		same	insufficient water			
Holokai, Puanenui	x	x			same	no water flow			
Kaauamo, Darlene	x	x	x	haha, gold fish, prawns	same	Insufficient water.			
Kaauamo, Cindy K.	x	x	x	prawns, gold fish, haha	opae, hihiwai				
Kaauamo, Samuel				pupu kalo, pohole, haha, luau		insufficient water			
Kaauamo, Hannah I	x	x	x	pohole, leko, polu, haha					
Kaauamo, Solomon	x	x	x	haha, pulu, leko, pohole		lack of water			
Kainoa, Gladys	x	x	x	prawns, aholehole, mullet	same				
Carmichael, Daniel	x	x	x	fish		lack of water			
Smith, Benjamin	x	x	x		same				
Smith, Lucille L.	x	x	x						
Kaauamo, Leolani	x	x	x	haha, leka, pohole, haha		lack of water			
Kaauamo, Mary					opae, oopu, hihiwai				
Kaauamo, Frank									
Kekiwi, Puaala	x	x	x		opae	lack of water			
Kekiwi, Jerome, Jr.	x	x	x		opae, hihiwai, oopu	no flow when no rain			
Pahukoa, B.	x	x				lack of water			
Wendt, Edward	x	x	x		opae, hihiwai, oopu	not enough water			
Carmichael, Awapuh	x	x	x		opae	not enough water			
	Gathers				**Would Gather**				
Ohia	opae	hihiwai	o'opu	other (specify)		Problem	would grow kalo	# acres	problem
Barclay, Charles	x	x	x		opae	Insufficient water			
Kimokeo, Charnay	x	x	x	ferns, plants					
Kimokeo, Pualani	x	x	x	herbs, fern shoots, ti leaves, flowers & lei makin gstreamst	everything				
Kimokeo, Lincoln	x	x	x	prawns, herbs, fern shoots, ti lives, flowers & plants	everything				
Kimokeo, Jre	x	x	x	prawns, pig hunting					
Kimokeo, ?	x	x	x	watercress, mountain kalo & haha	same	insufficient water			
Martin, Norman D.	x	x	x		same	insufficient water			
Holokai, Puanenui	x	x			same	no water flow			
Kaauamo, Darlene	x	x	x	haha, gold fish, prawns	same	Insufficient water.			
Kaauamo, Cindy K.	x	x	x	prawns, gold fish, haha	opae, hihiwai				
Kaauamo, Samuel				pupu kalo, pohole, haha, luau		insufficient water			
Kaauamo, Hannah I	x	x	x	pohole, leko, polu, haha					
Kaauamo, Solomon	x	x	x	haha, pulu, leko, pohole		lack of water			
Kainoa, Gladys	x	x	x	prawns, aholehole, mullet	same				
Carmichael, Daniel	x	x	x	fish		lack of water			
Smith, Benjamin	x	x	x		same				
Smith, Lucille L.	x	x	x						
Kaauamo, Leolani	x	x	x	haha, leka, pohole, haha		lack of water			
Kaauamo, Mary					opae, oopu, hihiwai				
Kaauamo, Frank									
Kekiwi, Puaala	x	x	x		opae	lack of water			
Kekiwi, Jerome, Jr.	x	x	x		opae, hihiwai, oopu	no flow when no rain			
Pahukoa, B.	x	x				lack of water			
Wendt, Edward	x	x	x		opae, hihiwai, oopu	not enough water			
Carmichael, Awapuh	x	x	x		opae	not enough water			
	Gathers				**Would Gather**				
West Wailuaiki	opae	hihiwai	o'opu	other (specify)		Problem	would grow kalo	# acres	problem

Barclay, Charles	x	x	x		opae	Insufficient water			
Kimokeo, Chamay	x	x	x	ferns, plants					
Kimokeo, Pualani	x	x	x	herbs, fern shoots, ti leaves, flowers & lei makin gstreamst	everything				
Kimokeo, Lincoln	x	x	x	prawns, herbs, fern shoots, ti lives, flowers & plants	everything				
Kimokeo, Jre	x	x	x	prawns, pig hunting					
Kimokeo, ?	x	x	x	watercress, mountain kalo & haha	same	insufficient water			
Martin, Norman D.	x	x	x		same	insufficient water			
Holokai, Puanenui	x	x			same	no water flow			
Kaauamo, Darlene	x	x	x	haha, gold fish, prawns	same	Insufficient water.			
Kaauamo, Cindy K.	x	x	x	prawns, gold fish, haha	opae, hihiwai				
Kaauamo, Samuel				pupu kalo, pohole, haha, luau		insufficient water			
Kaauamo, Hannah K	x	x	x	pohole, leko, polu, haha					
Kaauamo, Solomon	x	x	x	haha, pulu, leko, pohole		lack of water			
Kainoa, Gladys	x	x	x	prawns, aholehole, mullet	same				
Carmichael, Daniel	x	x	x	fish		lack of water			
Smith, Benjamin	x	x	x		same				
Smith, Lucille L.	x	x	x						
Kaauamo, Leolani	x	x	x	haha, leka, pohole, haha		lack of water			
Kaauamo, Mary					opae, oopu, hihiwai				
Kaauamo, Frank									
Kekiwi, Puaala	x	x	x		opae	lack of water			
Kekiwi, Jerome, Jr.	x	x	x		opae, hihiwai, oopu	no flow when no rain			
Pahukoa, B.	x	x				lack of water			
Wendt, Edward	x	x	x		opae, hihiwai, oopu	not enough water			
Carmichael, Awapuh	x	x	x		opae	not enough water			
				Gathers	**Would Gather**				
East Wailuaiki	opae	hihiwai	o'opu	other (specify)		Problem	would grow kalo	# acres	problem
Barclay, Charles	x	x	x		opae	Insufficient water			
Kimokeo, Chamay	x	x	x	ferns, plants					
Kimokeo, Pualani	x	x	x	herbs, fern shoots, ti leaves, flowers & lei makin gstreamst	everything				
Kimokeo, Lincoln	x	x	x	prawns, herbs, fern shoots, ti lives, flowers & plants	everything				
Kimokeo, Jre	x	x	x	prawns, pig hunting					
Kimokeo, ?	x	x	x	watercress, mountain kalo & haha	same	insufficient water			
Martin, Norman D.	x	x	x		same	insufficient water			
Holokai, Puanenui	x	x			same	no water flow			
Kaauamo, Darlene	x	x	x	haha, gold fish, prawns	same	Insufficient water.			
Kaauamo, Cindy K.	x	x	x	prawns, gold fish, haha	opae, hihiwai				
Kaauamo, Samuel				pupu kalo, pohole, haha, luau		insufficient water			
Kaauamo, Hannah K	x	x	x	pohole, leko, polu, haha					
Kaauamo, Solomon	x	x	x	haha, pulu, leko, pohole		lack of water			
Kainoa, Gladys	x	x	x	prawns, aholehole, mullet	same				
Carmichael, Daniel	x	x	x	fish		lack of water			
Smith, Benjamin	x	x	x		same				
Smith, Lucille L.	x	x	x						
Kaauamo, Leolani	x	x	x	haha, leka, pohole, haha		lack of water			
Kaauamo, Mary					opae, oopu, hihiwai				
Kaauamo, Frank									
Kekiwi, Puaala	x	x	x		opae	lack of water			
Kekiwi, Jerome, Jr.	x	x	x		opae, hihiwai, oopu	no flow when no rain			
Pahukoa, B.	x	x				lack of water			
Wendt, Edward	x	x	x		opae, hihiwai, oopu	not enough water			
Carmichael, Awapuh	x	x	x		opae	not enough water			
				Gathers	**Would Gather**				
Waiohue	opae	hihiwai	o'opu	other (specify)		Problem	would grow kalo	# acres	problem
Barclay, Charles	x	x	x		opae	Insufficient water			
Kimokeo, Chamay	x	x	x	ferns, plants					
Kimokeo, Pualani	x	x	x	herbs, fern shoots, ti leaves, flowers & lei makin gstreamst	everything				
Kimokeo, Lincoln	x	x	x	prawns, herbs, fern shoots, ti lives, flowers & plants	everything				
Kimokeo, Jre	x	x	x	prawns, pig hunting					
Kimokeo, ?	x	x	x	watercress, mountain kalo & haha	same	insufficient water			
Martin, Norman D.	x	x	x		same	insufficient water			
Holokai, Puanenui	x	x			same	no water flow			
Kaauamo, Darlene	x	x	x	haha, gold fish, prawns	same	Insufficient water.			
Kaauamo, Cindy K.	x	x	x	prawns, gold fish, haha	opae, hihiwai				
Kaauamo, Samuel				pupu kalo, pohole, haha, luau		insufficient water			

Kaauamo, Hannah K	x	x	x	pohole, leko, polu, haha					
Kaauamo, Solomon	x	x	x	haha, pulu, leko, pohole		lack of water			
Kainoa, Gladys	x	x	x	prawns, aholehole, mullet	same				
Carmichael, Daniel	x	x	x	fish		lack of water			
Smith, Benjamin	x	x	x		same				
Smith, Lucille L.	x	x	x						
Kaauamo, Leolani	x	x	x	haha, leka, pohole, haha		lack of water			
Kaauamo, Mary					opae, oopu, hihiwai				
Kaauamo, Frank									
Kekiwi, Puaala	x	x	x		opae	lack of water			
Kekiwi, Jerome, Jr.	x	x	x		opae, hihiwai, oopu	no flow when no rain			
Pahukoa, B.	x	x				lack of water			
Wendt, Edward	x	x	x		opae, hihiwai, oopu	not enough water			
Carmichael, Awapuh	x	x	x		opae	not enough water			
	Gathers				**Would Gather**				
Paakea	opae	hihiwai	o'opu	other (specify)		Problem	would grow kalo	# acres	problem
Barclay, Charles	x	x	x		opae	Insufficient water			
Kimokeo, Charnay	x	x	x	ferns, plants					
Kimokeo, Pualani	x	x	x	herbs, fern shoots, ti leaves, flowers & lei makin gstreamst	everything				
Kimokeo, Lincoln	x	x	x	prawns, herbs, fern shoots, ti lives, flowers & plants	everything				
Kimokeo, Jre	x	x	x	prawns, pig hunting					
Kimokeo, ?	x	x	x	watercress, mountain kalo & haha	same	insufficient water			
Martin, Norman D.	x	x	x		same	insufficient water			
Holokai, Puanenui	x	x			same	no water flow			
Kaauamo, Darlene	x	x	x	haha, gold fish, prawns	same	Insufficient water.			
Kaauamo, Cindy K.	x	x	x	prawns, gold fish, haha	opae, hihiwai				
Kaauamo, Samuel				pupu kalo, pohole, haha, luau		insufficient water			
Kaauamo, Hannah K	x	x	x	pohole, leko, polu, haha					
Kaauamo, Solomon	x	x	x	haha, pulu, leko, pohole		lack of water			
Kainoa, Gladys	x	x	x	prawns, aholehole, mullet	same				
Carmichael, Daniel	x	x	x	fish		lack of water			
Smith, Benjamin	x	x	x		same				
Smith, Lucille L.	x	x	x						
Kaauamo, Leolani	x	x	x	haha, leka, pohole, haha		lack of water			
Kaauamo, Mary					opae, oopu, hihiwai				
Kaauamo, Frank									
Kekiwi, Puaala	x	x	x		opae	lack of water			
Kekiwi, Jerome, Jr.	x	x	x		opae, hihiwai, oopu	no flow when no rain			
Pahukoa, B.	x	x				lack of water			
Wendt, Edward	x	x	x		opae, hihiwai, oopu	not enough water			
Carmichael, Awapuh	x	x	x		opae	not enough water			
	Gathers				**Would Gather**				
Kapaula	opae	hihiwai	o'opu	other (specify)		Problem	would grow kalo	# acres	problem
Barclay, Charles	x	x	x		opae	Insufficient water			
Kimokeo, Charnay	x	x	x	ferns, plants					
Kimokeo, Pualani	x	x	x	herbs, fern shoots, ti leaves, flowers & lei makin gstreamst	everything				
Kimokeo, Lincoln	x	x	x	prawns, herbs, fern shoots, ti lives, flowers & plants	everything				
Kimokeo, Jre	x	x	x	prawns, pig hunting					
Kimokeo, ?	x	x	x	watercress, mountain kalo & haha	same	insufficient water			
Martin, Norman D.	x	x	x		same	insufficient water			
Holokai, Puanenui	x	x			same	no water flow			
Kaauamo, Darlene	x	x	x	haha, gold fish, prawns	same	Insufficient water.			
Kaauamo, Cindy K.	x	x	x	prawns, gold fish, haha	opae, hihiwai				
Kaauamo, Samuel				pupu kalo, pohole, haha, luau		insufficient water			
Kaauamo, Hannah K	x	x	x	pohole, leko, polu, haha					
Kaauamo, Solomon	x	x	x	haha, pulu, leko, pohole		lack of water			
Kainoa, Gladys	x	x	x	prawns, aholehole, mullet	same				
Carmichael, Daniel	x	x	x	fish		lack of water			
Smith, Benjamin	x	x	x		same				
Smith, Lucille L.	x	x	x						
Kaauamo, Leolani	x	x	x	haha, leka, pohole, haha		lack of water			
Kaauamo, Mary					opae, oopu, hihiwai				
Kaauamo, Frank									
Kekiwi, Puaala	x	x	x		opae	lack of water			
Kekiwi, Jerome, Jr.	x	x	x		opae, hihiwai, oopu	no flow when no rain			
Pahukoa, B.	x	x				lack of water			

Wendt, Edward	x	x	x		opae, hihiwai, oopu	not enough water			
Carmichael, Awapuh	x	x	x		opae	not enough water			
	Gathers				**Would Gather**				
Hanawi	opae	hihiwai	o'opu	other (specify)		Problem	would grow kalo	# acres	problem
Barclay, Charles	x	x	x		opae	Insufficient water			
Kimokeo, Charnay	x	x	x	ferns, plants					
Kimokeo, Pualani	x	x	x	herbs, fern shoots, ti leaves, flowers & lei makin gstreamst	everything				
Kimokeo, Lincoln	x	x	x	prawns, herbs, fern shoots, ti lives, flowers & plants	everything				
Kimokeo, Jre	x	x	x	prawns, pig hunting					
Kimokeo, ?	x	x	x	watercress, mountain kalo & haha	same	insufficient water			
Martin, Norman D.	x	x	x		same	insufficient water			
Holokai, Puanenui	x	x			same	no water flow			
Kaauamo, Darlene	x	x	x	haha, gold fish, prawns	same	Insufficient water.			
Kaauamo, Cindy K.	x	x	x	prawns, gold fish, haha	opae, hihiwai				
Kaauamo, Samuel				pupu kalo, pohole, haha, luau		insufficient water			
Kaauamo, Hannah I	x	x	x	pohole, leko, polu, haha					
Kaauamo, Solomon	x	x	x	haha, pulu, leko, pohole		lack of water			
Kainoa, Gladys	x	x	x	prawns, aholehole, mullet	same				
Carmichael, Daniel	x	x	x	fish		lack of water			
Smith, Benjamin	x	x	x		same				
Smith, Lucille L.	x	x	x						
Kaauamo, Leolani	x	x	x	haha, leka, pohole, haha		lack of water			
Kaauamo, Mary					opae, oopu, hihiwai				
Kaauamo, Frank									
Kekiwi, Puaala	x	x	x		opae	lack of water			
Kekiwi, Jerome, Jr.	x	x	x		opae, hihiwai, oopu	no flow when no rain			
Pahukoa, B.	x	x				lack of water			
Wendt, Edward	x	x	x		opae, hihiwai, oopu	not enough water			
Carmichael, Awapuh	x	x	x		opae	not enough water			
2010 Data									
Johnson, William K.	x	x	x	haha, pulu, leko	same				
	Gathers				**Would Gather**				
Makapipi	opae	hihiwai	o'opu	other (specify)		Problem	would grow kalo	# acres	problem
Barclay, Charles	x	x	x				Yes	?	no constant water flow.
Kimokeo, Charnay	x	x	x	ferns, plants					
Kimokeo, Pualani	x	x	x	herbs, fern shoots, ti leaves, flowers & lei makin gstreamst	everything				
Kimokeo, Lincoln	x	x	x	prawns, herbs, fern shoots, ti lives, flowers & plants	everything				
Kimokeo, Jre	x	x	x	prawns, pig hunting					
Kimokeo, ?	x	x	x	watercress, mountain kalo & haha	same	insufficient water			
Martin, Norman D.	x	x	x		same	insufficient water			
Holokai, Puanenui	x	x			same	no water flow			
Kaauamo, Darlene	x	x	x	haha, gold fish, prawns	same	Insufficient water.			
Kaauamo, Cindy K.	x	x	x	prawns, gold fish, haha	opae, hihiwai				
Kaauamo, Samuel				pupu kalo, pohole, haha, luau		insufficient water			
Kaauamo, Hannah I	x	x	x	pohole, leko, polu, haha					
Kaauamo, Solomon	x	x	x	haha, pulu, leko, pohole		lack of water			
Kainoa, Gladys	x	x	x	prawns, aholehole, mullet	same				
Carmichael, Daniel	x	x	x	fish		lack of water			
Smith, Benjamin	x	x	x		same				
Smith, Lucille L.	x	x	x						
Kaauamo, Leolani	x	x	x	haha, leka, pohole, haha		lack of water			
Kaauamo, Mary					opae, oopu, hihiwai				
Kaauamo, Frank									
Kekiwi, Puaala	x	x	x		opae	lack of water			
Kekiwi, Jerome, Jr.	x	x	x		opae, hihiwai, oopu	no flow when no rain			
Pahukoa, B.	x	x				lack of water			
Wendt, Edward	x	x	x		opae, hihiwai, oopu	not enough water			
Carmichael, Awapuh	x	x	x		opae	not enough water			
2010 Data									
Johnson, William K.	x	x	x	haha, pulu, leko, pohole, aholehole, mullet, moi, akule, watercre	same	not enough water	Yes	10.22 acre	insufficient water
Kekahuna, Lihau	x	x	x	haha, pulu, leko, pohole, aholehole, mullet, moi, akule, watercre	same	not enough water	Yes	?	insufficient water; overgrown invasive plants

*Please note: the information is taken from the Declarations submitted in 2001 and again in 2008 at the last Public Fact Gathering Meeting. The "2010 Data" is from the declarations included in the current submittal. Please also note that where Declarants listed a range, i.e. "Kolea to Makapipi", their names and information were included for each stream within that range.


EAST MAUI LCA LAND USE
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Improved Land
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Miles
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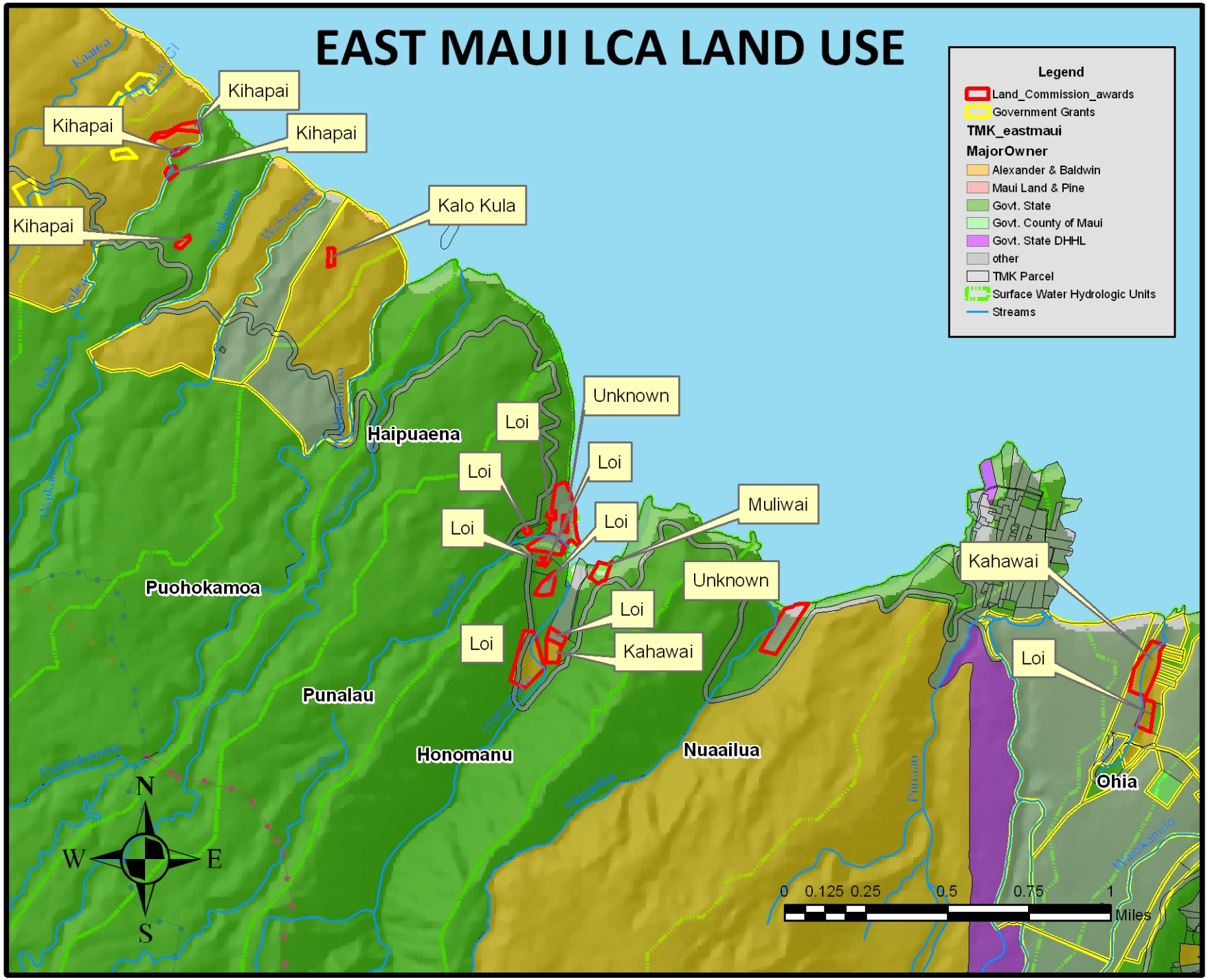
Maui Land & Pine
Govt. State
Govt. County of Maui
Govt. State DHHL
other
TMK Parcel
Surface Water Hydrologic Units
Streams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Legend
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MajorOwner
Alexander & Baldwin
Maui Land & Pine
Govt. State
Govt. County of Maui
Govt. State DHHL
other
TMK Parcel
Surface Water Hydrologic Units
Streams
Kihapai
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E
S
0 0.125 0.25 0.5 0.75 1
Miles

DECLARATION

Name William K. Johnson (248-7231)

Address 720 Lower Nahiku Rd.

Age 33

1. I/My family ☑ lives on and/or ☑ grows kalo on property I/we own adjacent to Makapipi Stream(s).
2. I/My family owns property adjacent to an 'auwai system connected to Makapipi Stream(s).
3. I/My family gather(s)/would gather and/or fish/would fish for (check all that apply):
   - ☑ o`opu in Hanawi / Makapipi Stream(s).
   - ☑ hihiwai in Hanawi / Makapipi Stream(s).
   - ☑ opae in Hanawi / Makapipi Stream(s).
   - ☑ haha in Hanawi / Makapipi Stream(s).
   - ☑ pulu in Hanawi / Makapipi Stream(s).
   - ☐ leko in Hanawi / Makapipi Stream(s).
   - ☑ pohole near Makapipi Stream(s).
   - ☑ aholehole in the nearshore waters below Makapipi Stream(s).
   - ☑ mullet in the nearshore waters below Makapipi Stream(s).
   - ☑ other (please specify): Moi, Akuli, Watercress in or around Makapipi Stream(s) but are unable to do so because there is insufficient water. (Describe problem in your own words): [redacted] Because no water what opai had is now gone, the prawns took over. Oopu and Hihiwai no longer [redacted] thrive, Fish at the water mouth has depleted, even on the out-[redacted] skirts of the river mouth, no food for them so no more fish.
4. I/My family would grow or increase current acreage by 1 or 2 acres of kalo irrigated by water from Makapipi Stream(s) but are unable to do so

because there is insufficient water in that stream(s). (Describe problem in your own words):
A branch of Makapipi runs through my property and it's dry, so unable to farm kalo

5. It would take me/my family ? months to begin production of kalo and restore 1022 acres of lo`i if stream water was restored.
6. The cost of restoring lo`i in ? Stream(s) would be around 3.
7.

DECLARANT

William K. [illegible] 01-31-20

Signature (Date)

248-8887
675-0430

DECLARATION

Name LIHAU KEKAHUNA

Address 2058 KANOE ST UNIT 1A KIHEI MAUI HI 96753 / or HCI BOX 108 LOWER NAHIKU Rd HAIKU MAUI HI 96708

Age 48

1. I/My family ☑ lives on and/or ☑ grows kalo on property I/we own adjacent to Makapipi Stream(s).
2. I/My family owns property adjacent to an 'auwai system connected to Makapipi Stream(s).
3. I/My family gather(s)/would gather and/or fish/would fish for (check all that apply):
   - ☑ `o`opu in Hanawi, Paula Stream(s).
   - ☑ hihiwai in Hanawi Stream(s).
   - ☑ `opae in Makapipi (TOP) Stream(s).
   - ☑ haha in Makapipi, Hanawi Stream(s).
   - ☑ pulu in Makapipi Stream(s).
   - ☑ leko in Makapipi Stream(s).
   - ☑ pohole near Makapipi Stream(s).
   - ☑ aholehole in the nearshore waters below Makapipi Stream(s).
   - ☑ mullet in the nearshore waters below Makapipi Stream(s).
   - ☑ other (please specify): Moi, Akule, watercress in or around Makapipi, Kuhiwa Stream(s) but are unable to do so because there is insufficient water. (Describe problem in your own words):

     No water - Below diversion & overgrown invasive plants

4. I/My family would grow or increase current acreage by unlimited/? acres of kalo irrigated by water from Makapipi, Kuhiwa Stream(s) but are unable to do so

because there is insufficient water in that stream(s). (Describe problem in your own words):

Below Diversion No water / overgrown invasive Plants

5. It would take me/my family Many months to begin production of kalo and restore WHAT Can of acres of lo`i if stream water was restored.
6. The cost of restoring lo`i in Makaipi Stream(s) would be around ?.
7.

DECLARANT

Harold K. Kekahuna Jan 31st 2010

Signature (Date)

NATIVE HAWAIIAN LEGAL CORPORATION
1164 Bishop Street, Suite 1205
Honolulu, Hawai'i 96813
Telephone. 521-2302

ALAN T. MURAKAMI 2285
MOSES K. N. HAIA III 6277

Attorneys for Petitioners
Na Moku Aupuni O Ko`olau Hui,
Beatrice Kekahuna and Marjorie Wallett

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BOARD OF LAND AND NATURAL RESOURCES

STATE OF HAWAI'I

In the Matter of the Contested Case Hearing Regarding Water Licenses at Honomanu, Keanae, Nahiku, and Huelo, Maui	)	DLNR FILE NO. 01-05-MA
	)	PETITIONERS' DIRECT EXPERT TESTIMONY OF DAVIANNA POMAIKAI MCGREGOR, Ph.D.; CERTIFICATE OF SERVICE
	)	Hearing
	)	Date. October 10, 2005
	)	Time. 9.00 a.m.
	)	Officer. Hon. E. John McConnell, Esq.

PETITIONERS' DIRECT EXPERT TESTIMONY OF
DAVIANNA POMAIKAI MCGREGOR, Ph.D.

Q. Please state your name for the record.

A. DAVIANNA POMAIKAI MCGREGOR.

Q. Where do you live?

A. I live in Kaiwiula, Kapalama, O`ahu and Ho`olehua, Moloka`i.

Q. Where do you work and what is your title?

A. I am a Professor of Ethnic Studies at the University of Hawaii, Manoa.

Q. What is your educational background and training?

A. I graduated from the University of Hawaii with a Bachelor of Education degree in Secondary Education in 1972 and a Bachelor of Arts degree in Asian/Pacific History in 1973. I did my graduate work at the UH, where I obtained a Master of Arts degree in Pacific Islands Studies in 1979. I also earned a PhD in Hawaiian and Pacific History from the University of Hawai'i in 1989.

Q. What was your doctoral dissertation topic?

A. The title of my doctoral dissertation is "Kupa`a I Ka 'Aina: Persistence On The Land." It examines the conditions of Hawaiians from 1898 to 1930, the first 32 years of direct U.S. rule over Hawai'i. It compared the conditions of Hawaiians in urban O`ahu with that of Hawaiians in rural Hawaiian communities on the island of Moloka`i, the moku of Hana, Maui and the ahupua`a of Waipi`o, Hawai'i.

Q. Did you prepare a *curriculum vitae* to reflect your education and training?

A. As part of my testimony, I have submitted my *curriculum vitae* which contains information on my academic training, my teaching, my research, and my publications.

Q. Have you previously been qualified to testify as an expert witness?

A. I have served as an expert witness regarding traditional Hawaiian subsistence, cultural, and religious customs and practices in the following Civil Cases: *Kelly v. 1250 Oceanside Partners*, Civ. No. 00-1-0192K (Haw. 3rd Cir.); *Office of Hawaiian Affairs, et al vs. Housing and Community Development Corporation of Hawaii, et al*, Civil No. 94-4207-11 SSM, 1994 - 2001; *Kamaka v. Department of Defense*; *Pele Defense Fund v. Paty*, Civ. No. 89-089 (Haw. 3rd Cir.); *Pele Defense Fund v. Campbell Estate*, Civ. No. 89-089 (Haw. 3rd Cir.); and *Hanakeawe v. Nansay Hawaii, Inc.,* Civ. No. 90-316 (Haw. 3rd Cir.). I have also testified as a cultural expert in the following criminal trespass cases. *State of Hawai'i v. Spalding* (Haw. 3rd Cir.); *State of Hawai'i v. Naeole* (Haw. 3rd Cir.); *State of Hawai'i v. Kaleo Patterson* (Haw. 3rd Cir.); *State of Hawaii v. Keli`ikoa* (Haw. 3rd Cir.).

Q. Have you ever been qualified before administrative bodies to testify as an expert?

A. I appeared as an expert before the State of Hawai'i Water Commission in the Waiahole Water Case, Docket No. CCH-0A95-1, and *In re Waiola O Molokai,* Docket No. CCH-MO96-1; before the Public Utilities Commission in Docket # 7259 Relating to Hawaiian Electric Light Company, Regarding Integrated Resource Planning, 1993; and before the Public

Utilities Commission in Docket # 6617 To Require Energy Utilities in Hawai'i to Implement Integrated Resource Planning, 1990.

Q. Have you had the opportunity to study the nature and extent of cultural, religious, and subsistence activity in which the Native Hawaiians have engaged to support themselves?

A. Yes. I first studied rural Hawaiian communities where Native Hawaiians comprised the majority of the population and continued to support their extended 'ohana through traditional Hawaiian subsistence farming, fishing, hunting, and gatheringcustoms and practices when I wrote my PhD dissertation. Subsequently, I conducted a number of studies of the traditional and customary practices of Native Hawaiians, which mirror long-held cultural practices of ancient Hawaiians in several rural communities throughout the state. While all have unique features associated with those communities, these traditions and customs I've recorded are resilient and persistent. In many instances, the continuation of these cultural practices is financially necessary for many families. These studies have taken me to East Maui,where I conducted extensive and expanded research, as well as Moloka`i and the Island of Hawai`i.

Q. What prompted your expanded research for East Maui?

A. In June 1993, the Hawai`i State Legislature approved what later became Act 156 to implement a preexisting statutory mandate requiring planning for the state's physical environment and for socio-cultural enhancement, which recognizes the significance of the state's "cultural landscapes." Accordingly, it established a task force to examine Hawaiian cultural landscapes. This task force was responsible for developing designation criteria, specifying activities and uses consistent with cultural landscape districts, developing procedures for definition of cultural landscape districts and their boundaries, and reporting their findings to the legislature.

Q. What happened as a result of this effort?

A. In January 1994, the DLNR Cultural Landscape Task Force reported back to the Legislature on the importance of landscape preservation within a vital daily living context. The Task Force defined cultural landscapes as geographic areas, which exhibit monolithic characteristics of an ethnic, economic or cultural nature. They reflect the interaction of cultural, economic, and natural forces on the environment. They are a definable area, which clearly defines the settlement or use of the land, water, and/or living systems (plants and animals) over a long period of time, as well as cultural values, norms, and attitudes toward the land, water and/or

living systems. These geographic areas possess a significant concentration, linkage or continuity of landscape components (i.e., vegetation, buildings and structures, archaeological sites, roads and trails, waterways, religious and natural features and resources), which are united by human use and past events and/or aesthetically by plans or physical development. Typically, these landscapes could involve abandoned villages or agricultural systems, taro-producing areas, sugar lands, ranches, fishing areas, traditional gathering areas, and entire islands.

Q. What were the recommendations of the Task Force?

A. The Task Force supported a model project focusing on the Ke`anae-Wailuanui area on Maui, because it recognized that this community is a taro-growing area with long continuity of use and with local support for preservation.

Q. What was the purpose of this model project?

A. The project involved a cultural landscape study to inventory and assess the resources of the Ke`anae-Wailuanui communities. The Maui County General Plan of 1990, on which the Hana Community Plan is based, has themes, one of which under "land use" is:

> To preserve for present and future generations existing geographic, cultural and traditional community lifestyles by limiting and managing growth through environmentally sensitive and effective use of land in accordance with the individual character of the various communities and regions of the County.

Maui County adopted the Hana Community Plan as part of its adoption of County General Plan in July 1994, under Section 2.80.050 of the Maui County Code. To implement the Hana Community Plan, the Maui County Planning Department initiated the resulting Ke`anae-Wailuanui Cultural Landscape study. The Hana Community Plan calls for county government to "compile special plans and studies necessary to implement the recommendations of the Community Plan." It also establishes the following goals, policies and implementing actions:

> Land Use: Preservation and enhancement of the current land use patterns which establish and enrich the Hāna Community Plan region's unique and diverse qualities.
>
> - Identify and inventory exceptional open space resources and viewsheds. Explore protective management measures such as covenants, easements, and other planning tools.
> - Explore alternative land use and overlay zoning designations that recognize and preserve the unique natural and cultural characteristics of each community within the Hāna region.
> - Encourage the availability of agriculturally suitable lands to provide opportunities for small diversified agricultural activities with residential tenancy for farmers.

Q. What was the specific goal of the Ke`anae-Wailuanui Cultural Landscape study of July 1995?

A. The goal was to describe and quantify conditions and traditions which have shaped the land and which still affect the patterns of land use. Land use management policies based on a broad foundation of knowledge of resources will better enable the community and its representatives in county and state government to make effective decisions appropriate to this and other rural and agricultural areas.

Q. What were the specific tasks of the study?

A. There were three major tasks: (1) identify the historic context of the landscape, through archaeological research to determine the depth of wetland taro cultivation and a literature search, including a summary of Land Commission Awards for the Ke`anae and Wailuanui ahupua`a, focused on agricultural or other uses of the claims; (2) identification of cultural landscape components, including farm land, crops, vegetation types, water control, gathering, hunting, home sites, ocean-related activities, and lands associated with Hawaiian legends; and (3) preliminary mapping using historical maps, aerial photographs, and detailed land classification maps to identify existing land use areas and the boundaries of the cultural landscape.

Q. What was the methodology for conducting this study and who was the team responsible for conducting the work?

A. The methodology is described on pp. 13-17 of the report. Basically, (1) Cultural Surveys Hawaii, Inc. conducted a literature search, including a review of aerial photographs, (2) Cultural Surveys Hawaii, Inc. and Group 70 conducted field surveys, including mapping of taro lo`i; and (3) I conducted personal interviews, relying heavily on kupuna (9 of 13 interviewees) from Ke`anae and Wailuanui.

Q. How reliable are the sources of oral history, as related by those Hawaiians you interviewed?

A. The oral history interviews were consistent with each other and were cross validated with the information gathered through the literature search and the field surveys.

Q. What are the cultural landscape area boundaries?

A. The team identified the Keanae-Wailuanui core Cultural Landscape area boundaries in Figure 3 of the report. The area encompasses the Ke`anae peninsula and runs southeast along the coast to the southeast ridge of Wailuanui Valley. On the west, it is bounded by the Ke'anae YMCA, Ke`anae Arboretum and the Palauhulu stream. Inland it extends 600 feet mauka of the Hana Highway, stretching from the YMCA camp to the ridge on the east side of Waikani Falls. The informants also identified a wider traditional cultural practices region shown in Figure 4 of the report, for fishing, hunting and gathering. This extends from Makapipi Stream and forest access road in the east, to Honomanu and the Kaumahina ridge on the west and mauka to Pohaku Palaha on the northern rim of the Haleakala Crater.

Q. In summary, what did these sources of information show?

A. The literature search documented the cultural and natural setting of the cultural landscape area, which has a rich and long history of supporting Hawaiians who tilled the land, grew taro and other food crops, and fished the nearshore ocean seas as far as 11 miles offshore. In the various land commission testimonies, maka'ainana from the Ke`anae-Wailuanui community described their agricultural pursuits in the 1840's. The field surveys, combined with the literature search, yielded information that enabled the team to map the cultural landscape - historic locations of buildings, taro lo`i, `auwai, and other cultural features of the communities that settled the area. The interviews helped me link current uses of land and streams by residents to their historic uses and verified those practices that continued to be followed along the traditions of their ancestors. The relative isolation of this cultural landscape enabled it and its residents to avoid or resist intensive modern land developments and retain many of the ancient traditions passed down through the generations of Hawaiians who resided in this area.

Q. Why was the Ke`anae-Wailuanui area selected for this cultural landscape study?

A. Aside from the land use planning angle I've previously mentioned, it was particularly appropriate because it is associated with a deep and long tradition of growing taro, the staple crop of Native Hawaiians for generations. The earliest Polynesian voyagers to Hawai`i brought taro with them. It has been linked mythologically to the origins of Hawaiians as a people. The plant itself has attributes which are embedded in the notion of the family and kinship relations. All parts of the taro plant are used for food. Much of the traditions surrounding the cultivation and use of taro have persisted in Ke`anae-Wailuanui to a much

greater extent than most other parts of Hawai`i. With such an intimate association with the people and culture of Hawai`i, Ke`anae-Wailuanui was a prime candidate for designation as a cultural landscape. Today, large-scale taro cultivation is confined to isolated areas in Hawai`i – Hanalei/Waioli, Hanapepe and Waimea on Kaua`i, Waikane/Waiahole on O`ahu, Onokohau, Waihe`e, Ke`anae-Wailuanui on Maui, and Waipi`o Valley on the island of Hawai`i. The taro landscape of Ke`anae-Wailuanui is a viable traditional economy which has maintained historic and cultural integrity, traditional lifestyles, and social continuity to an equal or greater extent than any of the other taro growing landscapes in Hawai`i.

Q. What physical attributes of Ke`anae-Wailuanui did your study examine?

A. The 1995 study identified 12 components for examination. They are listed on page 44 of the report. Among them are taro cultivation, the Ko`olau Ditch built and maintained by EMI, and cultural resources and use areas.

Q. What did you learn about the taro cultivation in Ke`anae-Wailuanui?

A. Wetland taro cultivation is the most important single component of the cultural landscape of Ke`anae-Wailuanui. Wetland taro cultivation requires a precisely defined, stable field system with a continuous and reliable source of water. The system must be designed so that cool, fresh water can be delivered constantly to every field. In this sense, a taro landscape is designed as a single system with interrelated elements (fields, streams and `auwai). Alteration of any of these elements could affect the entire system. The ancient Hawaiians who designed this landscape were limited in the degree to which they could alter the natural topography. They dealt with this constraint by flexibility of design. Seen as a whole, the taro landscape appears as a simple network of inter-connected rectangles defined by banks, which hold in water. Upon closer inspection, it is apparent that field design, water flow, and water delivery are a response to subtle variations in the natural landscape. A taro landscape is extremely complex in its internal workings.

Q. What areas of taro cultivation exist in Ke`anae-Wailuanui?

A. There are five major locations of active taro cultivation - Ke`anae peninsula, Wailuanui, Ke`anae Arboretum, Waianu Valley, and Lakini. An additional small area of cultivation exists at Waiokamilo Stream just makai of its crossing of Wailuanui Road. There are small lo`i on both sides of the stream. In addition, throughout the district old taro terraces can be found and taro still grows in the wild in the valleys, along streams. Informants speak of going

out and gathering lu`au leaves from the wild taro because it has a good flavor, distinct from the cultivated varieties. Some of the areas for the gathering of wild lu`au include Pi`ina`au, Nua`ailua, Kupa`u, Waipio, Awiowio, Pohole and Pahoa.

Q. Please describe the Wailuanui taro area.

A. This is the largest taro system of the cultural landscape, with 339 lo`i, that Cultural Surveys plotted off a 1982 aerial photograph in Figure 15. They lie mainly west of Wailuanui Stream and to the north and east below Hana highway. It is an area of mixed cultivation and uncultivated areas. There is also a smaller set of lo`i above Hana Highway in the area known as Lakini. See, Figure 21.

The essence of Wailuanui is water (wai = water). Wailuanui is best viewed looking mauka. The taro lo`i as seen from makai, are framed by the steep green slopes of the valley with Waikani Falls to the east and Waiokamilo Stream waters entering from the center and west. The lo`i themselves, as they ascend the slopes, decrease in size to accommodate the requirements of water control. Nowhere else in Hawai`i are such miniature fields still cultivated in this kind of topography with such integrity. See, p. 126.

Q. Please describe the Wailuanui `auwai system.

A. It is evident that at Wailuanui Valley, the `auwai and lo`i systems were constructed first and subsequent residences and circulation networks accommodated the already established systems. The pattern of cultivated lo`i at Wailuanui is likely close to what existed at the time of the Mahele, but for the time when rice was cultivated just prior to and after the dawn of the 20th century.

Cultural Surveys was able to produce a schematic of the `auwai as it takes water from Waiokamilo Stream and passes through Lakini. Figure 21. The water flows past these lo`i, partially returning back to Waiokamilo Stream, but mainly flowing under the existing Hana Highway to irrigate the valley lo`i below that point.

There is another major diversion of Waiokamilo Stream below Hana Highway that irrigates the extreme western end of the valley. See, Figure 22.

Cultural Surveys approximated the direction of flow in the `auwai system servicing the valley, as the system was complex and our team did not have the time or resources to make a definitive map of all aspects of it.

Q. Did you discover any major changes in the use of the valley for taro cultivation since the time of the Mahele?

A. Our team did not find any historic map of the valley. Taro cultivation is well documented for the entire area in the 1850's Land Commission Award documents. In Appendix A of the report, the various claims for Land Commission Awards in Ke`anae-Wailuanui are rendered in a table. The table illustrates the extent to which taro was grown on the claimed parcels. The table summarizes the testimonies submitted in support of the requests for Land Commission Awards and reflects the presence of taro cultivation at the time of the Mahele for these parcels. While it indicates what was happening on those parcels at that time, it does not indicate which of the pieces claimed were actually awarded by the Land Commission. Nevertheless, the table gives an accurate indication of the extent to which active taro cultivation existed and on which parcels in the valley. This activity also indicates where irrigation water from the streams was being applied in pursuit of this activity at the time of the Mahele.

Q. Did you discover any other evidence of the extent of taro growing in the valley during different times in history following the Mahele?

A. Apparently, as an 1896 map (Figure 9) of the lower section of the valley reveals, by then there was a sizable area devoted to rice cultivation, although much of the southeastern portion along Wailuanui Stream remained in taro. This pattern apparently persisted through 1903, according to a similar map of the area (Figure 10). Some of the residents I interviewed indicated that rice was preferred at that period because water temperature was not the crucial consideration as it is for taro cultivation, reflecting a diminished water supply to the valley for irrigation. Chinese farmers grew rice in significant parts of the valley between 1880 and 1927, when the market collapsed because of the competition from California.

A 1936 photograph (Figure 16) shows that a majority of the valley was under taro cultivation, with considerably less tree and bush vegetation than was present in 1994 when I conducted my field research. By 1966, in contrast, while all cultivated areas appeared to be in taro, there is a dramatic increase in forest growth along the periphery of the valley, compared to 1936, as Figures 17 and 18 reveal. Contrasted with current conditions, as depicted in the photographs taken in 2004 and this year in June, it appears that there is now substantially different, as well as fewer, areas of taro lo`i than was being actively cultivated in 1966.

This evidence shows there was apparently a period of decline in taro cultivation in the valley between 1936 and 1966, as well as between 1966 and 1994. However, while to varying degrees, the Wailuanui valley residents, especially Hawaiians, continued a tradition of taro cultivation that continues through the present. This cultural landscape is distinctive in terms of this long tradition, and continues on to this day, reflecting how critical taro production is to this community.

Q. Do you have an opinion as to whether the current taro cultivation reasonably approximates the amount of water used to cultivate taro at the time of the Mahele?

A. Yes.

Q. And what is that opinion?

A. While the rice cultivation earlier last century may have altered some of the pattern of lo`i in the valley, the broad pattern remains since both crops are wetland agricultural products and the irrigation system plays a critical role in their cultivation. The mechanics of irrigation systems must follow gravity. Residences are found on slightly elevated areas at the edges of the fields, not in the center of the lo`i, which would be the low spot and subject to periodic flooding. The roadway network serving these residences skirt the cultivated areas and does not cut into the system of lo`i. This pattern involves frequent tending and fits the horticultural character of Hawaiian agriculture where the cultivated fields are relatively small and are within walking distance of residences. It is a pattern developed before automobiles and mechanized agriculture. The field was central, not the residence. This pattern is found even in areas where residences are not nearby. See, p. 126.

There was far more taro cultivation in the valley in the 1800's than presently. There is also far less water flowing naturally into the valley as a result of the major EMI diversion into the Ko`olau Ditch mauka of Kupau and Akeke Spring. This reduction in taro production is significant compared to historic levels.

Q. On what basis doyou make this conclusion?

A. During the fieldwork for this study, which included field trips as well as interviews, it became apparent that the Ke`anae-Wailuanui communities have a long history of small commercial ventures associated with processing and marketing of local taro. Besides the People's Store, which once stood at Ke`anae landing, there were six separate poi mills, each in operation over a different span of time. Each sold local taro processed into poi to the community

itself and also exported taro. Taro was exported in two separate directions: to Hana and to Ha`iku/Kahulu/Wailuku. The Alama Poi Shop operated from the 1920's to the 1950's. The Ching Poi Mill operated in the 1930's through the 1950s, exporting poi to Kahului and Hana. The Ng family operated a mill that exported poi to Hana. The Alu family ran the Kupa`u Mill from the late 1930's to the early 1950's. The Lum Hoy Poi Mill exported poi to Wailuku from the 1930's through the 1940s. The last mill, Ke`anae-Wailua Poi Mill was started in 1975 by Mr. Ed Wendt and operated through 1984. The current level of taro production contrasts sharply with what historic records show.

Q. Do you have an opinion, based on your training, research, and expertise, whether the land uses of Wailuanui residents are linked to Hawaiian cultural mores and practices?

A. Yes.

Q. What is your opinion?

A. The land use patterns of the Ke`anae-Wailuanui region have been shaped by Hawaiian cultural mores and practices. The 'ohana values and practices of the community stress the conservation of natural resources for the benefit of present and future generations. Rules of behavior are based on respect of the 'aina, the virtue of sharing, and a holistic perspective of organisms and ecosystems that emphasize balance and coexistence. The Hawaiian outlook which shapes these customs and practices is lokahi or maintaining spiritual, cultural. and physical balance with nature. In the course of their travels through the various 'ili of the traditional cultural practices region, practitioners of Ke`anae and Wailuanui are able to renew their knowledge and understanding of the landscape, the place names, names of the winds and the rains, traditional legends, wahi pana, historical cultural sites, and the location of various native plants and animals. The region is thus experienced as a part of their 'ohana, necessitating the same care as would a member of their family.

Q. Do you have an opinion, based on your training, expertise, and research, on how important traditional and customary gathering of `o`opu, `opae, and hihiwai is to the Hawaiians of Wailuanui?

A. Yes.

Q. What is that opinion?

A. Ke`anae-Wailuanui is one of the few remaining areas in the Hawaiian Islands where 'opae can be gathered. Virtually every stream has 'opae at some time during the year.

However, it is easier to gather `opae in the tunnels of the EMI ditch system. The irrigation ditch itself is an excellent breeding area for the 'opae because it has flowing water year round. Some streams below the ditch, however, don't have enough flowing water to sustain the 'opae year round when the water is diverted into the ditch system. Commercial sale of 'opae is prohibited under a state law that went into effect in 1993. `Opae is still a popular delicacy among the families in the district. They also gather 'opae to share with family and friends outside and on different islands. 'Opae, the `a`aniu net used to gather it, and the methods of preparing it will continue to be a distinctive aspect of the cultural lifestyle for which Ke`anae-Wailuanui is known and distinguished.

`O`opu and hihiwai are becoming increasingly scarce in the Hawaiian Islands. Certain species of `o`opu are endangered and others are rare. They require pristine and flowing stream waters to exist. Ke`anae-Wailuanui is one of the few areas where they still can be found in sufficient size to be occasionally caught for subsistence food.

The gathering of hihiwai is also carefully managed. The location of the hihiwai is knowledge that has been passed down from generation to the next for their protection and proper management. It is not information that is made available to the general public.

Q. What is the geographic range of this gathering activity?

A. Family members of all ages engage in some level of gathering activity in the Ke`anae-Wailuanui district. Kupuna like Helen Nakanelua still go out and gathers 'opae with her homemade `a`aniu net in the 'auwai that runs through her property at Lakini. Waiokamilo Stream still has 'opae which is accessible to the kupuna. The Ka`auamo family is best known for theirtraditional and customary gathering activities. Awapuhi Ka`auamo Carmichael still goes out gathering for 'opae, hihiwai, and 'opihi from Kailua and over through Kuhiwa. Awapuhi Carmichael identified some of the area which she regularly accessed for gathering of `opae, hihiwai, and `o`opu:

> We have our own names. Kapa`ula, gather `opae. We use Puaakaa, we call it Kaunoa. Above the road, the ditch above the road, we use that stream, and then it branches off. Even Makapipi, we use Makapipi stream. We use all the way to the tunnel. We use it. Kuhiwa gulch is used by our family. Kuhiwa gulch we use also. Makapipi is just mauka. Kuhiwa is mauka.

Gathering from a variety of places is important in order to maintain the resources. The choice of place to gather is determined by the weather and other natural signs. Awapuhi Carmichael described the factors which affected her decision as to where to gather on a particular expedition:

> It depends on what we're getting, and how we feel . . . We never go to the same place. You know how the Hawaiians used to do, they don't go back to the same place, so can restore. It depends on the weather, and then we go by the moon, the stars. If use one place, then go to another place, depends on the moon and the stars. We go up far . . .We all go to the same places, although each of us have our favorite hole, places, where we go for opae, you know. All mauka for 'opae. And then below have the `o`opu and the prawns, they introduced the prawns, and hihiwai. Above the road is more the `opae. Above the road is where all the opae are. Above the main highway. And then below the road has hihiwai, `o`opu, you know.

Within the traditional cultural landscape area for Ke`anae-Wailuanui unoccupied areas with flowing pristine streams and the forested areas are integral to the livelihoods of the families in the district. For example, nobody lives in the area from Wailuaiki to Kopili`ula and over to Hanawi but there are many gulches and streams flourishing with hihiwai and `o`opu.

Q. What was the importance of subsistence gathering to the health of Hawaiian gatherers who engaged in this traditional activity – historically and in current times?

A. Through subsistence, families attain essential resources to compensate for low incomes. They can also obtain food items, especially seafood, that may be prohibitively costly under a strict cash economy. If families on fixed incomes were required to purchase these items, they would probably opt for cheaper, less healthy foods that would predispose them to health problems. In this respect, subsistence not only provides food, it also ensures a healthy diet.

Subsistence generally requires a great amount of physical exertion (e.g., fishing, diving, hunting) that is a valuable form of exercise and stress reduction and contributes to good physical and mental health. It is also a form of recreation that the whole family can share in. Family members of all ages contribute at different phases of subsistence, be it active hunting, fishing or gathering or cleaning and preparing the food for eating. Older family members teach the younger family members how to engage in subsistence and prepare the food, thus passing on ancestral knowledge, experience and skill.

Q. What was the pattern of these subsistence activities amongst those traditional and customary gatherers of Ke`anae-Wailuanui you interviewed?

A. Subsistence gathering, hunting and fishing is an integral part of the lives of the residents of Ke`anae-Wailuanui. There is general agreement among the informants that their traditional cultural practices region extends from Honomanu in the west to Makapipi in the east and mauka from Pohaku Palaha on the rim of the Haleakala crater makai to the shoreline, and into the ocean as far as the buoy 11 miles offshore. Additional areas are used by residents of Ke`anae-Wailuanui depending on where their family ancestors originated and established subsistence practices. For example, some families fish and gather as far as Kaupo or as far west as Honopou and mauka to Waikamoi. The location and distribution of water is the primary determinant of the distribution of natural resources. Traditional land use boundaries were defined in relation to the amount and location of water. The change of season from wet to dry does affect the distribution and availability of subsistence resources. When there is a lot of rain, the resources are more abundant and spread out over a larger area. During the dry period, the amount of resources shrink and they are distributed near to water sources.

Most subsistence areas can only be accessed by land through a trail or a dirt road. The Pi`ilani Trail affords an important route of access between `ili along the coastline. The Ke`anae-Wailuanui residents also use an extensive network of mauka to makai trails to carry out their subsistence activities. Hunters say that one can readily catch a decent sized pig without venturing far up the mountain. However, the network of trails allows access to upper regions where the larger animals roam. Fishing resources vary by ocean depth. Along the rocky shoreline fishermen gather crab, `opihi, ha`uke`uke, and other shellfish. In the reef, residents gather limu and catch squid, lobster, and reef fish such as 'uhu, kala, and manini. At greater depths bottom fish are caught such as weke, ehu, 'opakapaka and uku. In the bays, nets are used to surround 'akule. `Aholehole, `ama`ama and uouoa are also caught with gill nets. In the deep ocean and out to the buoy the fishermen troll for ono, aku, `ahi, marlin, and mahimahi. Ocean resources are accessed by land through mauka-to-makai trails and along the Pi`ilani Highway. Boats are also used for ocean subsistence activities. The launching areas are Honomanu Bay, Ke`anae Landing, Wailuanui Bay and Hana Harbor.

Resource gathering patterns are also influenced by ho`ailona or spiritual signs in natural phenomena. Ke`anae-Wailuanui residents stay alert to the direction and patterns of clouds, winds, rain, the flight of birds, rainfall and all natural elements to inform them about where the ideal place is to gather on any given day. They also keep track of the moon phases and the effect

on the shifts in the tides. Ancestral knowledge of the interpretation of place names in the district also informs Hawaiians about the special features or qualities of that particular area for subsistence and cultural use.

Q. Is this a traditional pattern of subsistence activity?

A. Traditional factors shape the pattern, nature and purpose of the ongoing subsistence fishing, gathering, farming and hunting activities. These include family and ancestral connections to particular features of the landscape; the distribution of water; access; the type of resource to be obtained; the life cycle of that resource; the diet and feeding habits of fauna; the weather and seasonal changes; and ho`ailona. The subsistence activities are also guided by traditional values and customs which include but are not limited to the following:

1. Only take what is needed.

2. Don't waste natural resources.

3. Gather according to the life cycle of the resources. Allow the resources to reproduce. Don't fish during their spawning seasons.

4. Alternate areas to gather, fish and hunt. Don't keep going back to the same place. Allow the resource to replenish itself.

5. If an area has a declining resource, observe a kapu on harvesting until it comes back. Replant if appropriate.

6. Resources are always abundant and accessible to those who possess the knowledge about their location and have the skill to obtain them. There is no need to overuse a more accessible area.

7. Respect and protect the knowledge which has been passed down intergenerationally, from one generation to the next. Do not carelessly give it away to outsiders.

8. Respect each other's areas. Families in Ke`anae-Wailuanui usually fish, hunt, and gather in the areas traditionally used by their ancestors. If they go into an area outside their own for some specific purpose, they usually go with people from that area.

9. Throughout the expedition keep focused on the purpose and goal for which you set out to fish, hunt, or gather.

10. Be aware of the natural elements and stay alert to natural signs, e.g. falling boulders as a sign of flash flooding.

11. Share what is gathered with family and neighbors.

12. Take care of the kupuna who passed on the knowledge and experience of what to do and are now too old to go out on their own.

13. Don't talk openly about plans for going out to subsistence hunt, gather, or fish

14. Respect the resources. Respect the spirits of the land, forest, ocean. Don't get loud and boisterous.

15. Respect family `aumakua. Don't gather the resources sacred to them.

Q. To what extent, if any, does taro cultivation relate to the traditional and customary gathering of `o`opu, `opae, and hihiwai?

A. These native aquatic marine species and taro rely upon pristine, clear, cold, free running streams that flow year round. All of the great historical taro growing areas of Hawai'i rely on pristine streams where native aquatic species thrive - Ke`anae-Wailuanui, Kahakuloa on Maui; Hanalei on Kaua`i; Waipi`o on Hawai'i, the windward valleys of Moloka`i. `O`opu, `opae and hihiwai have been a part of the traditional diet of taro farmers in these areas.

Q. Were you able to determine the degree to which traditional and customary gathering of `o`opu, `opae, and hihiwai in Wailuanui has changed since the 1890's?

A. Aunty Helen Nakanelua who was 83 in 1994 was born in 1911 and described how she used to go out and gather `opae with her grandmother who would have been born and learned how to gather `opae before the 1890's:

> And I used to go along with my grandma, with a five gallon can, you know those tall ones, and I pack some wood, and I pack salt, so that whenever my grandma goes with the upena net, do you have an idea what the upena net looks like and they have a little bag there? Some of the bags are small, but she used to have these long bags, and then she cleans that where I am, she takes that out, we clean it and we cook it in this can. Salt it and cook it there, the wood that I take we cook it. And after it's cooked, I begin spreading it on a table oil cloth and a mat I used to pack along and then she leaves me there I attend that opae while it's drying. By the time she comes back here, it's partly dried, I gather that `opae again, and separate it in another bag, because that's partly dried, and we continue on, she gets another bag to do the same thing, cook, so that by the time she ends up her day, most of the opae, except the last one she has is partly half dried already. Do you know how the upena look like? I show you, cause I have made some for me, because I use it.

Although Aunty Helen continues to gather `opae, it is not as plentiful as it had been in her youth. An indicator of the decline of `opae is the passage of a state law in 1993 which prohibits its commercial sale due to its scarcity.

Q. Do you have an opinion as to the importance of the Ke`anae-Wailuanui region to Hawaiian cultural history?

A. Yes.

Q. What is that opinion?

A. The most distinctive historic association of the Ke`anae-Wailuanui landscape is its unbroken relationship to the foundations of Hawaiian culture through the traditional cultivation of taro, the major component of the cultural landscape. The traditional cultural practices region is also significant as a surviving enclave of Hawaiian subsistence, cultural, and spiritual beliefs, customs, and practices. Rural Hawaiian communities like Ke`anae-Wailuanui are cultural kipuka - places where Hawaiians have maintained a close relationship to the land through their livelihoods and customs - that play a vital role in the survival of Hawaiian culture as a whole. There is a growing recognition that protection of the natural resources and the integrity of the lifestyle and livelihoods within rural districts is essential for the perpetuation of Hawaiian culture. However, the survival of these cultural kipuka and the traditions and customs related thereto are continually eroded by an ever increasing lack of water.

Q. Do you have an opinion on how significant the Ke`anae-Wailuanui region is as judged against federal criteria for cultural significance?

A. Yes.

Q. What is that opinion?

A. The Ke'anae and Wailuanui cultural landscape is significant under the four National Register criteria of significance and an additional Hawai'i state criterion. Under Criterion A, Ke'anae-Wailuanui is associated with significant events affecting broad patterns of history. The evolution of Hawaiian culture and society in the Hawaiian Islands over the past 1500 years was sustained by highly developed and well-managed systems of wetland taro cultivation. Ke'anae-Wailuanui is an extraordinary example of a highly developed historic Hawaiian wetland irrigation system which sustained the complex social organization and sophisticated customs and practices of the Native Hawaiian culture. The cultural landscape also includes the historic network of irrigation ditches and tunnels which were developed in the late

nineteenth and early twentieth centuries. The last completed segment of the Hana Belt Road is also in this cultural landscape.

Under Criterion B, Ke'anae-Wailuanui is associated with events which involved famous people such as the landing of Umi-a-Liloa's war canoes during his 14th century battle over Hana against Ho'olae-Makua and the staging of the battles between Kalaniopu'u and Kahekili in the 18th century.

Under Criterion C, Ke'anae-Wailuanui epitomizes the quality and integrity of a historic landscape centered around the historic wetland cultivation of taro. In addition, the 2 churches, its public school facility and the Waikani Bridge are also excellent examples of each of these types of historic architecture.

Under Criterion D, Ke'anae-Wailuanui provides excellent potential to yield information important in the prehistory and history on the origins, chronology and development of Hawaiian taro cultivation, as well as the complex social structures which both sustained and perpetuated by this kind of agricultural technology.

Q. To what extent are those that now gather and attempt to farm taro in the valley genealogically linked to the Hawaiians that lived in the valley during the 1800's?

A. The informants that I interviewed said that they lived and farmed lands that their ancestors had lived on and farmed in the 1800's.

Q. Do you have any opinion based on your training and education of whether there is any correlation historically between the amount of traditional gathering from the streams and the amount of fish and limu that could be taken from the coastal areas of the valley and the sea for subsistence purposes?

A. Yes.

Q. What is that opinion?

A. The abundance of aquatic and marine resources are dependent upon the pristine, clean, free flowing year round streams flowing into the ocean. The bays where the fresh water mixes into the ocean water are important spawning grounds for the fish. Moki Day, a Hawaiian fisherman from the area, described how the bays are important breeding grounds which deserve protection:

> You can consider all the shoreline area between here and Kaupo as breeding grounds for all these shoreline species of fish. They come into our rivers here because we have the fresh water, and they come in here and breed here and lay their eggs here.

According to the late Uncle Harry Mitchell, who had been a long-time resident of the area, the streams and the ocean together provided the breeding ground for `o`opu. He described the lifecycle of the `o`opu as follows:

> The first heavy rains usually arrived in August or September, carrying the `o`opu to the ocean where they spawned. Once they laid their eggs, the mother `o`opu died. The baby `o`opu, called hinano, would hatch and develop in the salt water from August/September through November. The salt water made them strong enough to climb up the stream where they would mature. About November, the hinano began to make their way up stream to the large fresh water pools in the mountains. Their migration upstream coincided with the arrival of the migratory birds from the north which fed upon the hinano as they made their perilous journey to the uplands. [i]

Q. Do you have an opinion on how significant the diversion of stream water from Wailuanui Valley by EMI has been on the ability of its residents to continue their tradition of taro growing and gathering from the streams and coastal areas?

A. Yes.

Q. What is that opinion?

A. The diversion of steams in the Ko'olau watershed, via the East Maui Irrigation (EMI) Company system, has reduced the surface water flow in the region mauka of the cultural landscape. The system currently provides most of the irrigation water for central Maui's large-scale agriculture and is the main source for county water supplies to upcountry Maui residents and farmers.

While the degree of reduction has not been quantified, the volumes of water carried by the ditch are significant and impact on the stream ecology in Ke`anae-Wailuanui is probable. Native endemic and indigenous species such as `o`opu and 'opae and hihiwai are likely to have been affected within the last few generations, with consequent impact on the traditional gathering practices that are part of the local lifestyle. During interviews for the study, some residents expressed concern over the impact of the diversion of water by EMI Co. on the ecology of the region. They also questioned the effects that the EMI diversion may have on the temperature and consistent flow of stream water to taro lands.

Q. Do you have an opinion on what positive steps should be taken to promote the perpetuation of the cultural landscape of Ke`anae-Wailuanui?

A. Yes.

Q. What is that opinion?

A. Provide incentives for taro growing, such as tax relief for parcels used for taro farming. Provide support to the community to maintain the water sources and the 'auwai, such as state and county support to clean and maintain the agricultural irrigation systems. Maintain the Pi`ilani Trail along the shoreline as well as the trails and unimproved roads running makai from the highway to the beach, and the trails and unimproved roads running mauka into the forest reserve should be maintained and their significance in the cultural landscape assessed. The watershed's forest should be protected. Access for cultural, subsistence, and spiritual customs and practices should be afforded to those residents of the community who will maintain traditions of respect and stewardship of the land and water resources. Develop the Ke`anae Arboretum to offer interpretation and education, with emphasis on practical and hands-on experience. Improve lookout points with better paving, approach signage, interpretive signage, landscaping and benches. Preserve and maintain the 2 large heiau and other cultural sites. Document and protect historic taro terraces. Perpetuate significant aspects of the cultural landscape without hampering changes beneficial to the community and its residents.

Q. Are you familiar with crucial definitions of traditional land divisions used by Hawaiians?

A. Yes.

Q. What are the land divisions that were common in delineating the various land uses made by Hawaiians?

A. The traditional Hawaiian land divisions according to Malo (1951:16-18) consist of the following district, subdistricts, land divisions and land parcels:

- island: *Moku-puni* (cut off surrounded).
- Large District: *Apana* (pieces) or *Moku-o-loko* (interior division), e.g. Hana.
- Sections: *`Okana* or *Kalana*, e.g. Honua`ula. [*`Okana* is also a district or sub-district and usually comprising several *ahupua`a*; *Kalana* is smaller than a district (Pukui & Elbert 1971: 113, 258).]
- Subsection within *`Okana*: *Poko*. [Dividing a District, or *ahupua`a* into two or more sections, e.g.: Hamakua Poko; Hamakua Loa]

- *Ahupua`a.* (running *mauka-makai,* from the mountains to the sea) [a sub-district land division, some contain a few hundred acres, others 10,000 acres, or more]
- *`Ili-`aina* [*`Ili-`aina*, a sub-division of an *ahupua`a*; *`ili lele*, a discontinuous *`ili-`aina*, consisting of two or more parcels of land in the same *ahupua`a* and having the same name]
- *Mo`o-`aina* [*mo`o-`aina* is a cultivated garden within an *`ili-`aina* or *`ili-lele*]
- *Pauku-`aina* (joints of lands) [*pauku-`aina* is a land section smaller than a *mo`o-`aina*]
- *Kihapai* (patches or farms) [dry land garden]
- *Ko`ele* [*ko`ele*, a cultivated garden, the produce of which went to the *ali`i* of the district or island]
- *Hakuone* (land cultivated by 'ohana with crops going to *konohiki)* [produce of which went to chief of the *ahupua`a*]
- *Kuakua* (broad *kuauna* or *kuaauna*, an embankment) [embankments between wet taro gardens, usually cultivated] (Malo 1951: 16-18). Information in brackets [ ] added.

---

[i] Harry Mitchell, April 22, 1988.

CERTIFICATE OF SERVICE

I hereby certify that two (2) copies of the foregoing document were duly served on Linda L. Chow, Deputy Attorney General, for Hearings Officer, The Honorable E. John McConnell on August 1, 2005, by hand delivery. I further certify that one (1) copy was served on the remaining parties as indicated, on August 1, 2005.

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DATED: Honolulu, Hawai'i, August 1, 2005.

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DEPT. OF LAND &
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STATE OF HAWAI'I

In the Matter of the Contested Case Hearing Regarding Water Licenses at Honomanu, Keanae, Nahiku, and Huelo, Maui	DLNR FILE NO. 01-05-MA PETITIONERS' DIRECT TESTIMONY OF EDWARD WENDT; CERTIFICATE OF SERVICE Hearing Date: October 10, 2005 Time: 9:00 a.m. Officer: Hon. E. John McConnell, Esq.

PETITIONERS' DIRECT TESTIMONY OF EDWARD WENDT

Q. Please state your name for the record.

A. Edward Wendt.

Q. Where do you live?

A. I live in the ahupua`a of Wailuanui in Maui Hikina (East Maui).

Q. What is your occupation?

A. I farm taro in Maui Hikina.

Q. Are you a member of Na Moku Aupuni O Ko`olau Hui?

A. Yes. I am also its current President.

Q. What is Na Moku Aupuni O Ko`olau Hui?

A. Na Moku Aupuni o Ko`olau Hui ("Na Moku") is a nonprofit corporation organized by Native Hawaiian residents of the Keanae-Wailuanui ahupua'a, which encompasses the Nahiku, Keanae, and Honomanu license areas. Na Moku was formed to promote the general welfare of the tenants and descendants of the original tenants of the ahupua'a of Keanae-Wailuanui in social, spiritual, cultural, educational and economic affairs, to preserve, protect, and enhance the quality of the life of the people within the Keanae-Wailuanui ahupua'a, and to provide a formal voice and organization through which the residents of the community can participate fully and more meaningfully in the determination and development of policies and decisions affecting their destiny. Na Moku's Articles of Incorporation, §§ IV(A),(B), and (D) reflect these purposes.

Thus, Na Moku's purposes encompass, on behalf of its members, asserting their appurtenant and riparian water rights, their rights as beneficiaries of the public trust, the Hawaiian Homes Commission Act, the trust created by Section 5(f) of the Admissions Act, and their constitutionally protected traditional and customary native Hawaiian practices for religious, cultural and subsistence purposes.

Q. What is the purpose of your testimony as President of Na Moku?

A. As President of Na Moku and with the approval of the Board and members of Na Moku, I retained the legal services of the Native Hawaiian Legal Corporation ("NHLC"), to assert the superior water rights of its members. Additionally, certain members of Na Moku who have property interests in the ahupua`a of Wailuanui have authorized the Native Hawaiian Legal Corporation to act as their attorney in fact to do so. NHLC has prepared a spreadsheet for Na Moku and its members which identifies members' property interests and the corresponding historical documentation which establishes that the lands to which these property interests attach were either in taro cultivation at the time of the Mahele and therefore have appurtenant rights to water or are entitled to water based upon the Native Hawaiian traditional and customary practice of taro cultivation. This information is contained within the written direct testimony of Teri Gomes, paralegal for the Native Hawaiian Legal Corporation. However, given certain past and recent incidents, Na Moku is concerned that releasing the identities and other relevant information of its members asserting these claims may result in retaliation and/or other reprisal.

As such, Na Moku, through its attorneys, will seek leave to file such identities and information under seal.

Q. What does Na Moku seek to accomplish with this information?

A. Na Moku seeks, on its members' behalf, to restore streamflow in streams within the Nahiku, Keanae, and Honomanu license areas to levels sufficient to assure and protect Na Moku members' appurtenant and riparian rights and their other traditional and customary rights embodied in Hawai'i's Constitution Article XI, §§ 1 & 7, Article XII, § 7, and HRS § 174C-63.

Q. Have you prepared photographic exhibits to truly and accurately depict the conditions of Wailuanui Valley and the mauka diversions affecting it?

A. Yes, Na Moku is submitting a series of photographs which truly and accurately depict the conditions as they existed in the fall of 2004 and June 2005 of the valley and of various points of diversion installed by East Maui Irrigation Company mauka of the Ko`olau Ditch above the valley. I intend to authenticate these photographs during my oral testimony in October 2005. Na Moku will submit those photographs as exhibits in this proceeding on August 15, 2005.

Q. As a native Hawaiian resident and taro farmer of Wailuanui do you engage in any other traditional and customary native Hawaiian activities?

A. Yes. As my parents, grandparents, great-grandparents, and other members of my `ohana and ancestors have done before me and passed on to me, I engage in traditional and customary native Hawaiian practices in and around my ahupua`a including its coastline and adjacent waters for religious, cultural and subsistence purposes. Unfortunately, my exercise of these traditions and customs has been substantially curtailed by low to no streamflow in streams within the ahupua`a.

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DATED: Honolulu, Hawai'i, August 1, 2005.

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DEPT. OF LAND &
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STATE OF HAWAI'I

In the Matter of the Contested Case Hearing Regarding Water Licenses at Honomanu, Keanae, Nahiku, and Huelo, Maui	)	DLNR FILE NO. 01-05-MA
	)	PETITIONERS' DIRECT TESTIMONY OF BEATRICE PUALANI KEPANI KEKAHUNA; CERTIFICATE OF SERVICE
	)	Hearing Date: October 10, 2005
	)	Time: 9:00 a.m.
	)	Officer: Hon. E. John McConnell, Esq.

PETITIONERS' DIRECT TESTIMONY OF BEATRICE PUALANI KEPANI KEKAHUNA

Q. Please state your name for the record.

A. BEATRICE PUALANI KEPANI KEKAHUNA.

Q. When and where were you born?

A. June 3, 1932 in the Hana Hospital in Hana, Maui.

Q. Who are your parents and grandparents?

A. My mother was Juliana Martha Koko. My father was Lokana Kepani, Jr. and his mother was Pi`i`ōhia, aka Piohia.

Q. What are the properties in Honopou in which you currently own an

interest?

A. In addition to other property in Honopou, my `ohana also acquired title to Royal Patent Grant 1082 to Kaimi. The Kingdom also granted Royal Patent Grant 3101 in two apana, consisting of two separated parcels, approximately 6 and 9.82 acres each, to my grandfather Kepani. Apana 1 of Grant 3101 now consists of 5.7 acres and is now TMK 2-9-01-6. LCAw. 5595-E:1, which surrounds Grant 1918:1, abuts Grant 3101:2. All of these parcels, except for Grant 3101:1, are, together with Grants 1082 and 3101:2, a part of the larger TMK 2-9-01-14, collectively consisting of 22.81 acres. The relevant tax map, now shows that Elizabeth Kepani and others in my `ohana own Grants 1082, 1918:1, and 3101:1 and 2, and LCAw. 5595-E:1. My father deeded his partial interest in TMK 2-9-01-14 to me and my sister Virginia Amaral effectively providing my sister and I with the legal authority to cultivate taro on these lands. This parcel is riparian to Honopou Stream.

Q. How do you use that TMK?

A. I farm a portion of this land with my cousin Marjorie Wallet and her `ohana, but the current stream flow does not allow us to cultivate taro as we wish.

Q. Who is the current owner of the kuleana on which your hale is located?

A. LCAw. 5459-X:2 to Imihia is designated as TMK 2-9-01-16. My dad deeded that parcel to Lokana Kepani Jr. my oldest brother, now deceased. His three sons, Clifford, Gary, and Thomas who all live and work in Honolulu. They have collectively given me permission to live on and farm this kuleana which is riparian to Honopou Stream.

Q. How do you use that kuleana?

A. I occupy the house on LCAw. 5459-X:2 to Imihia, where I also have 3 taro lo`i.

Q. Where are the lands located?

A. TMK sheet 2-9-01 depicts the area along the Honopou Stream. This land is located down an unpaved road makai of the main government highway.

Q. How did you end up living and farming on the lands you currently occupy?

A. I helped my `ohana raise taro in Honopou since I was a little girl. As an

adult, I continued to farm taro despite the lack of sufficient streamflow in Honopou Stream.

Q. What is your background in taro farming?

A. I grew up with my parents in Honopou, on the lands mentioned above along Honopou Stream. I had to work the lo`i as a child (keiki). I recall growing taro along the Honopou Stream on Grant 3101:2, Grant 1918:1, LCAw. 5595-E:1, and LCAw. 5459-X:2.

Q. How much taro did you grow back then?

A. As a girl, I remember that we kept about 25 lo`i in wetland taro on Grant 3101:2, Grant 1918:1, and LCAw. 5595-E:1. We had about 3 lo`i near the house on LCAw. 5459-X:2.

Q. What kind of taro did your `ohana grow?

A. Mainly lehua.

Q. How did you `ohana manage so many lo`i?

A. We planted in cycles to take advantage of the placement of the lo`i, `auwai, and the need to let each lo`i rest in between plantings. This pattern allowed the lo`i to stay rich and productive. If we didn't let the lo`i rest in between plantings, the crops would suffer.

Q. Were there other Hawaiian families that lived along the Honopou Stream when you were a girl?

A. Yes, people used to go mauka-makai in the valley, farming mauka and fishing along the shore.

Q. What kinds of fish would these residents of Honopou catch?

A. People would catch many kinds of fish for their diets – manini, po`opa`a, hīnālea, enenue, and moi. There was even a trail that went through our `aina for this purpose.

Q. Would they gather other kinds of foods?

A. Yes, they would gather limu along the shore and hihiwai, o`opu, and ōpae in the stream. There were lots of hihiwai, o`opu, and ōpae, when there was more water in the stream.

Q. What about today?

A. Now, no more. The water in the stream is dirtier, and there is less coming down all the way to the ocean.

Q. Where did you gather what you needed from the stream when you were a girl?

A. I just went to the stream right by our kuleana. For example, in the early morning, I'd fish for o`opu, as they slept in the sand. I didn't even use fish hooks; I just picked them from the stream. I also gathered ōpae `oeha`a, which lived in our lo`i and `auwai.

Q. How would you eat the o`opu?

A. We would dry them, lāwalu paha with salt.

Q. Where would you get salt?

A. We'd gather salt from the small natural pools, kāheka, near the sea.

Q. What other foods did you gather or grow?

A. I used to catch moi li`i during its season, with a safety pin. My father also grew sweet potato (uala), pumpkin (pāla`ai paha), squash, sugar cane, and various vegetables.

Q. How important was the stream and `aina to your `ohana?

A. It was vital to our culture and survival. The land sustained and gave life to the families along the stream.

Q. Have you sought the BLNR staff assistance to restore flow?

A. I don't understand why the Department of Land and Natural Resources (DLNR) staff won't act to help us taro farmers and Hawaiian cultural practitioners. They've known about our problem for years, yet refuse to take any action against A&B/EMI to put more water back into the streams. I've made complaints to several generations of these state employees without any result. They come out and visit, look at my problem, then do nothing. My attorneys have repeatedly described in detail my inability to grow more than a small amount of taro with the available water released downstream of the ditch. No one from the DLNR staff has taken any initiative to determine whether I can now grow the amount of taro I am trying and entitled to grow with the amount of water now in the stream. I have been frustrated for years by the failure of the State to address my and others water rights by requiring A&B/EMI to return

streamflow to Honopou Stream so I can grow as much taro on these lands as my father and grandfather before him once did. I asked all that time, but without any response. I am now forced to go to formal contested case hearings. That is not right.

Q. What financial burden has this placed on you and your family?

A. Taro farming, fishing, and gathering from the sea and coastline all contributed significantly to helping me offset the significant costs of feeding my family. It also allowed me to engage in the cultural traditions I learned from my elders and which I want to pass on to my keiki and mo`opuna. Denying me water in the stream has an immediate, direct, and significant effect on my ability to sustain my family with food and cash to pay for living costs and to pass on these cultural practices. In effect, the loss of water has signicantly adversely impacted my cultural heritage and my `ohana's self-sufficiency. I have to pay for the difference in food costs.

In the past 4-5 years, the price of poi available to me in the store costs $5 per plastic container and is shipped from Kaua`i. The poi from the Maui bags tasted better, but I can hardly get local poi anymore because the supply is so low, especially when you go into a store late in the day. Also, because I cannot find the hihiwai, o`opu, and ōpae, I am forced to buy other foods to substitute for those sources. This all adds to my food bill. Since I only have social security benefits, every little bit makes a big difference. I would much prefer to be able to rely more on what nature used to provide families like mine in Honopou to help me feed myself and my family.

Q. Has this situation imposed other costs on you?

A. I cannot afford to pay for any major costs of pursuing my legal claims, but I am obligated to pay for the costs of legal representation from the Native Hawaiian Legal Corporation. I have to ask for a waiver of that obligation because I cannot afford to pay for them. I also cannot afford to pay for any mediators, should any be appointed to mediate this dispute.

Q. What is your reaction to this situation?

A. I don't think it's fair, nor legal. I only want to get the water I am clearly entitled to get to farm taro and gather from the stream as my ancestors did. That's an entitlement the DLNR should have recognized and done something about long ago, instead of allowing A&B/EMI to continue victimizing me and my `ohana. The water I

am seeking comes from ceded lands the state is supposed to manage for my benefit and other native Hawaiians. The DLNR is not doing that job and is, in the process, ignoring Hawaiians. Given my superior rights, I should be able to pick up the phone, call someone at the DLNR, inform them that I am being denied a sufficient amount of streamflow and have the problem resolved quickly. Instead, I have to prove that water should be released from the diversions. The water diversions the DLNR is allowing are illegal and should stop so I get as much water as I need to grow taro and once again gather from the Honopou Stream as my ancestors did. Once my rights and the superior rights of others are satisfied then the DLNR may determine what, if any, amount of the excess can be diverted.

Q. Where have you seen these diversions on Honopou Stream?

A. Right below the main highway on the stream, EMI has a large concrete dam that diverts water into the Haiku Ditch. In place of the natural flow, EMI has installed 4 inch pipes to carry a fraction of the natural stream flow beyond the dam. A gate use to control the release of water into the stream from this diversion. My dad used to open and close that gate as he needed, but now only the 4 inch pipes over the dam allow for a fixed amount of water to flow downstream and that isn't nearly enough to satisfy my rights and the rights of others.

Q. How has this low flow specifically affected your `ohana?

A. We can't plant as much taro as we once did. I still grow taro on LCAw. 5459-X:2. I have started to restore the lo`i on LCAw. 5595:E:1, and a portion of Grants 1918 and 3101:2. However, the low flow has prevented me from going further. Although I and my `ohana want to open up more already existing taro lo`i on our property, there isn't enough water flow to do so. Also, my `ohana and I are unable to exercise other traditional and customary native Hawaiian rights in and around our ahupua`a, coastline and adjacent ocean waters for subsistence, cultural and religious purposes passed on to us by our ancestors.

Q. How many traditional taro lo`i could you plant on the lands you mentioned?

A. About 33-35 lo`i.

Q. How many do you now have planted?

Q. 1-2 lo`i.

B. What is the reason you do not have more lo`i planted in taro?

A. When there's not enough water, as now, and for the past several years, the taro will rot without sufficient flow through to keep the temperature down in the lo`i.

Q. What are you planning to do in this current situation?

A. I have to leave some lo`i fallow for good farming practices. I would try to open up 3 now, to see whether we can grow it. I am asking the DLNR to force EMI to release water from its ditch so enough water reaches the intake to my `auwai.

Q. What kind of taro will you plant?

A. I'd prefer Moi or Aweweo kalo because it can be used for both poi and and luau leaf, but there is more chance it would encounter problems with root rot, so I feel I have to wait until the decision in this case gives me the water I need.

Q. How many lo`i would you open if you had all the water you needed?

A. Maybe 20-25, so I can rotate crops at different times in different lo`i. That means I'll leave about a third fallow.

Q. Who would help you?

A. My cousin Marjorie Wallet, her daughter, Lyn Scott, and my 2 sons Sanford and Boniface. Only the DLNR and its partner A&B/EMI is stopping me from growing the taro I could grow.

Q. Didn't A&B/EMI put in an additional pipe in the past year to make it easier on you?

A. It put in an extra pipe to pass more water over its dam above me, but the additional flow does not provide what I really need. Garrett Hew's employees started measuring the difference in flow during an especially rainy period. As a result, the difference in flow was due more to the rain than the flow through the additional pipe. Flow measurements should be taken during the normal dry period to get a true picture. The regular additional flow from the pipe is not sufficient for me to open up more taro lo`i. I can't rely on the flow through this additional pipe given the costs and amount of work involved with adding more taro lo`i.

Q. It seems as though your roots in Honopou are very deep?

A. I am connected to that land by birth and heritage and will always live there. I believe in malama `aina, as my dad taught me as a girl, and apply it today in my

kupuna years. There is an old cemetery just above the old Honopu landing. No one is assigned to care for it, so I take care of it myself. This tradition of malama `aina is important to all Hawaiians like me who have tried to remain on the lands on which we were raised.

The many Hawaiian families, like mine, that once thrived on this coast depended on an abundant flow of water in the streams for our taro growing and gathering activities. Our ability to depend on this water was critical to our being able to survive off the land. However, the diversions undertaken by A&B/EMI with the State's blessing have all but extinguished that ability. The decline in water flow as a result has steadily made our situation worse, because we increasingly lose the ability to fend for ourselves and pushed into relying more on a cash economy for our basic needs. If we had more water flowing in the stream, the resulting farming and gathering activities we would no doubt pursue would help restore our confidence, security, and culture. Without it, we continue to feel burdened by the resulting loss in food and cultural activities so dependent on naturally flowing streams.

I am now 73 years old and have seen many negative changes to the stream and the activities we pursued as Hawaiians that relied on that stream flow. I want to grow more taro and pass on that knowledge to my children and grandchildren so they can continue to make the lands of my ancestors as productive as they once were. I cannot do that without the state and A&B/EMI restoring the stream flow to which we as Hawaiians superior rights. These rights continue to take a back seat to the economic motivations of a private sugar plantation. This is Hawai`i. Our rights are supposed to be enforced so we can keep our unique cultural practices alive and well.

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DATED: Honolulu, Hawai'i, August 1, 2005.

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KALO KANU O KA ʻĀINA

A CULTURAL LANDSCAPE STUDY
OF
KE'ANAE AND WAILUANUI,
ISLAND OF MAUI

Prepared by

THE COUNTY OF MAUI
PLANNING DEPARTMENT
250 South High Street
Wailuku, Hawaii

May 1995

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and
THE MAUI COUNTY CULTURAL RESOURCES COMMISSION
by the consultant team of
GROUP 70 INTERNATIONAL, INC.
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and
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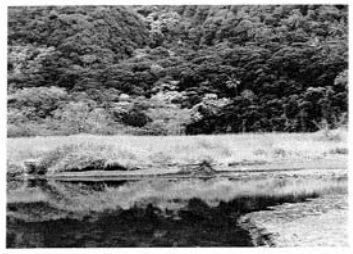
GLOSSARY

ahu	—heap, pile, collection, mass, altar, shrine; a traplike stone enclosure made by fishermen for fish
ahupua'a	—a traditional Hawaiian land unit extending from the mountain to the sea
akua	—god, goddess, spirit
ali'i	—chief, chiefess, nobility
apana	—piece, slide, portion, a *kuleana* land division may consist of several *apana*
archaeological feature	—the discrete remains of post activity preserved in the ground
artifact	—any object made by people
'aumakua	—personal or family god; protective spirit
'auwai	—ditch
heiau	—pre-Christian place of worship, shrine
historic	—in Hawaii, the period (post-contact) after the landing of Captain Cook in 1778
hui	—a group cooperative
'ili	—a small land unit, a subdivision of an ahupua'a
kahawai	—stream, river, ravine, whether wet or day; valley
kihapai	—garden
kīpuka	—an "island" of land (where there may be greenery) left surrounded by a lava flow
ko'a	—shrine, often consisting of circular piles of coral or stone, built along the shore or by ponds, or streams, used in ceremonies as to make fish multiply
konohiki	—headman of an *ahupua'a*, under the chief
kukui	—'candlenut'
kula	—plain, field, open country, pasture. An act of 1884 distinguished dry or *kula* land from wet or taro land

GLOSSARY (continued)

kuleana	—land holding of the common people; right, privilege, responsibility, jurisdiction, as in *kuleana'āina* (owned land - in land documents of 1860s)
kupūna	—elder
lelekawa	—Hawaiian sport of cliff leaping
lo'i	—a wetland taro field
loko	—fishpond
Mahele	—the division of lands among the crown, the government, and the *konohiki*
mahi'ai'ana	—cultivation of the land
makai	—towards the sea
maka'ainana	—common people
mauka	—towards the mountains
menehune	—legendary race of small people who worked at night building fishponds, roads, ditches, temples, and in Wailuanui a trail
mō'ī	—king, sovereign, monarch; according to Kepelino and Kamakau, a rank of chiefs who could succeed to the government but who were of lower than chiefs descended from the god Kāne
mo'o	—lizard, dragon, water spirit, genealogical line
muliwai	—river; river mouth; pool near mouth of a stream, as behind a sand bar, enlarged by ocean water left there by high tide; estuary
noni	—a tree used medicinally (*Morinda citrifolia*)
'ohana	—a kin group of extended families
pali	—cliff
poi	—Hawaiian staff of life-cooked taro pounded and mixed with water
ti	—a plant of which the leaf is used for serving food, hula skirts, and the root is used in making a drink (*Cordyline terminalis*)
tsunami	—tidal wave



...they have everything. They have the taro patch, they have the fishing ground, they have the 'opae, they have the o'opu...you know, they have everything what you want. It's that, you have to do it yourself, you see...you got to work hard for everything you want.

-- Mary Ka'auamo

This is the place. We're blessed, we took such good care of everything we had. Awapuhi said, and til tday I remember the word she used is "selfish." The word selfish is for the people over here, to protect the area...Selfish is because the area, we don't want it to get spoiled.

-- Kino Kimokeo

SUMMARY

This report's title - *Kalo Kanu o ka 'Āina* - is a poetic saying drawn from Mary Kawena Pukui's collection of Hawaiian proverbs and sayings, *'Ōlelo No'eau* (1983: 157). Literally, "taro planted on the land", but interpreted by Pukui as a metaphor of "natives of the land from generations back", the saying mirrors both the land and the people of the adjoining *ahupua'a* of Ke'anae and Wailuanui, located in the Ko'olau region of the Hāna District on the island of Maui.

The two *ahupua'a* have a long history of relative isolation from the rest of Maui. The local topography is rugged: deep valleys and high cliffs cut into the sides of the great shield volcano, Haleakalā; sea cliffs and boulder beaches stretch along the coast. Abundant rainfall creates perennial streams and encourages vigorous forest growth. Until the Hāna Highway was completed in 1926, the *ahupua'a* were largely inaccessible except by foot, horseback or boat. This physical isolation has insulated the community of Ke'anae and Wailuanui, allowing it to retain many characteristics of local indigenous culture which have been lost in more readily accessible areas of the state of Hawai'i. This is most strikingly evidenced in the expanses of taro patches spread across Ke'anae peninsula and Wailuanui valley. The sustained presence of cultural traditions within a relatively isolated context was a key criterion for the selection of the Ke'anae-Wailuanui community as the subject of a prototype cultural landscape study project.

This report presents a general inventory and analysis of the Ke'anae-Wailuanui cultural landscape and includes:

1. identification of the historic context of the landscape through literature and archival research;
2. identification and mapping of the boundaries and physical components of the cultural landscape;
3. recording of community history, traditions and insights through interviews, visits and resident-guided field trips;
4. description of historical trends and existing conditions;
5. assessment of integrity and significance;
6. recommendations applicable to economic activity, land use, design and preservation of cultural resources.

Methodology

The research team undertaking this study included archaeologists, ethnographers, architects and planners. This multi-disciplinary framework enabled a broader, more comprehensive approach. Investigative methodology included: archival searches, document reviews, aerial photo interpretation, field surveys and interviews.

Inventory

Five distinct localities in Ke'anae-Wailuanui in which taro is presently cultivated were identified during the study: Ke'anae Peninsula, Wailuanui, Ke'anae Arboretum, Waianu Valley and Lākini. (An additional small area of cultivation exists at Waiokamilo Stream just *makai* of its crossing of Wailuanui Road. Small taro *lo'i* are located on both sides of the stream. These *lo'i* were not examined during the present study.)

Comparisons with historic maps indicate notable continuity and integrity in these systems in both the configuration of the *lo'i* and the methods of irrigation. What has changed significantly over time is the extent of the areas in planting: taro cultivation has expanded and contracted several times with a long-term trend toward contraction due to population and economic changes.

The long settlement history has modified the landscape in many ways. The vegetation is predominantly of foreign or Polynesian introduction; most endemic or indigenous vegetation has retreated to the uplands. Changing technology, economics and lifestyles have affected systems of circulation and land use which date back to historic and pre-contact periods. Archaeological sites are present but only a few have retained their structural integrity. The dominant feature of the modified landscape under current or recent cultivation - the *lo'i* and *'auwai* systems - have historical and cultural value as well as significant economic value.

The architecture of the community manifests a certain consistency, although architecturally significant, historic residences are not generally evident and many buildings need repair. (According to county property records, there are 36 buildings older than 50 years. However, it is clear these records are incomplete: buildings no longer standing are still listed and several structures that clearly predate 1946 are not assigned construction dates.) The predominant residential architectural pattern is plantation style with newer construction incorporating elements from recent subdivision tract homes. The evolution of the local vernacular architecture has paralleled the community's evolution, taking advantage of new materials and techniques while retaining key elements such as generally small size and plantation design features.

Traditional Practices

Boundaries of areas where traditional subsistence activities are practiced were determined through a series of interviews with long-time residents. These traditional practices - including fishing, hunting and gathering - have persisted as valuable activities, benefitting the practitioners economically and culturally. Continuing access to the areas where these activities are practiced is a concern of the Ke'anae-Wailuanui community.

Integrity and Significance

The Ke'anae-Wailuanui cultural landscape shows a high level of integrity in the spatial organization of the taro fields, with the arrangement of the *lo'i* and the pattern of irrigation supply little changed since the system was built by the early Hawaiians. The spatial organization of a community physically isolated from other areas has resulted in a cohesive settlement characterized by integrity of settlement pattern and architecture. The physical setting retains a high degree of integrity. The location remains remote and rural. Tourists travel the Hāna Highway in increasing numbers, but development of suburbs or tourist attractions has not yet impacted the traditional landscape. In addition, the Ke'anae peninsula *lo'i* may also be the only example of wetland taro cultivation on an 'a'a flow.

Integrity is further manifested by the persistence into the end of the twentieth century of Hawaiian cultural and subsistence practices, and spiritual customs and practices. Rural Hawaiian communities such as Ke'anae-Wailuanui are "cultural *kipuka*", sources of regeneration and revitalization in modern Hawai'i. There is a growing recognition that

protection of the natural resources and the integrity of the lifestyle and livelihoods of "cultural *kipuka*" such as Ke'anae-Wailuanui are essential for the perpetuation of Hawaiian culture for future generations.

The Ke'anae and Wailuanui cultural landscape is evaluated as significant under the four National Register criteria of significance and an additional Hawai'i state criterion:

National Register Criterion A (properties that have association with significant events affecting broad patterns of history): Ke'anae-Wailuanui evidences the development of Hawaiian wetland irrigation systems. It is an example of a system demanding planning, organization of labor, clear definition of water rights and community cooperation. Hawaiian culture, as expressed in religion, art, language, dance, social structure and chiefly political system evolved over nearly fifteen hundred years in these islands, sustained by highly-developed and well-managed systems of wetland taro cultivation.

During the plantation era, Ke'anae and Wailuanui were impacted by the development of an extensive network of irrigation ditches and tunnels which diverted, collected, stored, and transported water from over 50,000 acres of the East Maui watershed. Additionally, many Chinese immigrants who left sugar plantations on Maui settled in Ke'anae-Wailuanui, engaged in rice cultivation and intermarried with Hawaiian women of the district.

The cultural landscape encompasses the last completed segment of the Hāna Belt Road which opened the Ko'olau region and Hāna to increased contact with the rest of Maui.

National Register Criterion B (associations with famous people): While the Ke'anae-Wailuanui region was not itself identified with notable Hawaiian personages, traditions identify it as the scene of significant events associated with some of these figures. During the 14th century, Wailualki and Wailuanui became a war canoe landing area in the early unification battles between Umi-a-Līloa and Ho'olae-Makua. In 1778, Kalani'opu'u and Kamehameha came aboard Captain James Cook's ship, the Resolution, while it anchored off Wailua during Cook's second voyage to the Hawaiian islands. This took place in the midst of a second series of unification battles involving the Hāna district.

National Register Criterion C (quality and integrity of a property in which it can be described as an excellent example of its type): The cultural landscape at Ke'anae and Wailuanui centers on wetland taro cultivation, the scale of cultivation, the layout of the fields, the *'auwai*, the source and delivery of water, the management and labor practices, the associated residential pattern, the continuity of use, and the setting of an isolated rural Hawaiian community. These systems have high integrity and are excellent examples of Hawaiian taro cultivation. The features show little or no influence of the period of rice cultivation from the 1880s to the 1930s.

Two churches dating to 1860, Ke'anae School, and Waikani Bridge all have been listed or have been evaluated as qualifying for listing on the State Register of Historic Places. Cumulatively, these components add to the significance of the cultural landscape.

National Register Criterion D (the potential for yielding information important in history or prehistory): Further studies of the cultural landscape and archaeological resources at Ke'anae-Wailuanui have a potential to yield information on the origins, chronology and

development of Hawaiian taro cultivation, as well as the complex social structures which both sustained and were perpetuated by the agricultural technology.

Criterion E (as defined by the State Historic Preservation Division): This criterion refers to traditional cultural significance. The Ke'anae-Wailuanui landscape qualifies under this criterion because it represents an important resource in the perpetuation of traditional Hawaiian cultural practices - such as taro cultivation, hunting, fishing, and gathering - and Hawaiian social interaction.

Recommendations

The apparent significance and integrity of the cultural landscape at Ke'anae and Wailuanui presents an opportunity to use accumulated experience to achieve the goals of the Maui County General Plan and the Hāna Community Plan. Recommendations generated by this study and report fall into three general categories:

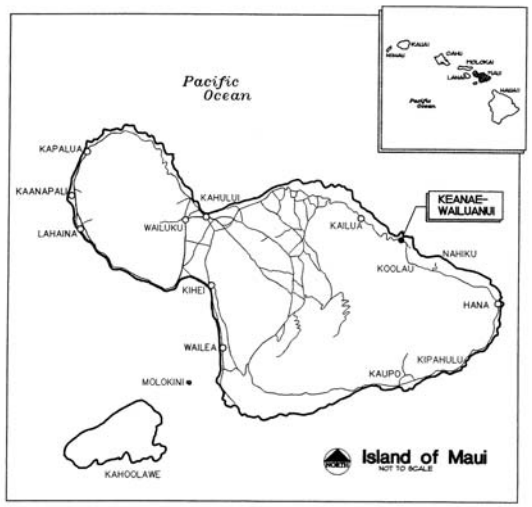
1. Land use management actions and decisions to support and maintain the taro cultivation systems and existing traditional land uses in the community.

2. Measures - including a managed approach to tourism - to protect and enhance the lifestyles, resources, environment and values of the community.

3. Potential treatments and further studies to identify, assess and map historic, archaeological and cultural resources.

I. PROJECT BACKGROUND AND GOAL

Waikani Falls, Wailuanui



Location Map

KE'ANAE - WAILUANUI CULTURAL LANDSCAPE Figure 1

I. PROJECT BACKGROUND AND GOAL

A. Project Background

This Ke'anae-Wailuanui Cultural Landscape project is an outgrowth of a concern among state, county and community groups in Hawai'i to protect portions of the Hawaiian landscape which continue to preserve the cultural activities which have characterized the rich history of these islands.

1. Cultural Landscape Task Force

In June of 1993, the Hawai'i State Legislature approved a bill, introduced by Representative Peter Apo, which found that, pursuant to the Constitution of the State of Hawai'i, it is within the power of the state to conserve and develop objects and places of historic or cultural interest. The bill, adopted as Act 156, refers to sections of the Hawai'i Revised Statutes requiring planning for the state's physical environment and for socio-cultural enhancement, recognized the significance of cultural landscapes and established a task force to examine Hawaiian cultural landscapes (1993 Hawai'i Session Laws, page 235, Act 156, Relating to Cultural Landscapes). The task force was to develop designation criteria, specify activities and uses consistent with cultural landscape districts, develop procedures for definition of cultural landscape districts and their boundaries, and report their findings to the legislature.

In January of 1994, the Hawai'i Department of Land and Natural Resources cultural landscape task force reported to the Hawai'i State Legislature on the importance of landscape preservation within a vital everyday living context. Cultural landscapes, as defined by members of this task force, are:

> Geographic areas which may be as small as a neighborhood, or may encompass an entire island which exhibit monolithic characteristics of an ethnic, economic or cultural nature.
>
> The portion of our heritage that reflects the interaction of cultural, economic, and natural forces on the environment.
>
> A geographically definable area which clearly defines the settlement or use of the land, water or living systems (plants and animals) over a long period of time as well as cultural values, norms, and attitudes toward the land, water or living systems.
>
> Geographically definable areas possessing a significant concentration, linkage or continuity of landscape components (i.e., vegetation, buildings and structures, archaeological sites, roads and trials, waterways, religious and natural features and resources) which are united by human use and past events and/or aesthetically by plan or physical development.

The task force identified a typology of cultural landscapes in Hawai'i, such as: 1) abandoned villages or agricultural systems; 2) taro-producing areas; 3) sugar lands; 4) ranches; 5) fishing areas; 6) religious and legendary sites; 7) fishponds; 8) traditional gathering areas; and 9) entire islands.

One of the task force's concluding recommendations was for support of a model project focusing on the Ke'anae-Wailuanui area on the island of Maui (Figure 1). They recognized this community as a taro growing area with long continuity of use and with local support for preservation (Department of Land and Natural Resources 1994 and National Register Bulletin 30).

2. The Maui County General Plan and the Hāna Community Plan

This cultural landscape study is an inventory and assessment of resources which are relevant to the Hāna Community Plan policies on land use, environment, cultural resources, and economic activity.

The first major theme of the recommendations for amendments to the Maui County General Plan in 1990 was to "protect Maui County's agricultural land and rural identity." Therefore, the first objective listed under land use in the General Plan is:

> To preserve for present and future generations existing geographic, cultural and traditional community lifestyles by limiting and managing growth through environmentally sensitive and effective use of land in accordance with the individual character of the various communities and regions of the County.

The Ke'anae-Wailuanui Cultural Landscape study was initiated by the County of Maui Planning Department pursuant to the Hāna Community Plan, adopted as part of the General Plan in July, 1994, under Section 2.80.050 of the Maui County Code. The Hāna Community Plan calls for government to "compile special plans and studies necessary to implement the recommendations of the Community Plan."

This study follows the recommendations of the Hāna Community Plan towards the following goals, policies and implementing actions.

Land Use: Preservation and enhancement of the current land use patterns which establish and enrich the Hāna Community Plan region's unique and diverse qualities.

- Identify and inventory exceptional open space resources and viewsheds. Explore protective management measures such as covenants, easements, and other planning tools.
- Explore alternative land use and overlay zoning designations that recognize and preserve the unique natural and cultural characteristics of each community within the Hāna region.
- Encourage the availability of agriculturally suitable lands to provide opportunities for small diversified agricultural activities with residential tenancy for farmers.

Environment: Protection and management of Hāna's land, water and ocean resources to ensure that future generations can enjoy the region's exceptional environmental qualities.

- Recognize residents' traditional uses of the region's natural resources which balance environmental protection and self sufficiency.

Cultural resources: Identification, preservation, protection and where appropriate, restoration of significant cultural resources and practices, that provide a sense of history and identity for the Hāna region.

- Identify, preserve and protect historically, archaeologically and culturally significant areas, sites, and features within the Hāna district.

- Promote the cultural resources of the Hāna region as an identifying characteristic of the people and the place.
- General site types and areas that should be flagged for preservation during development review include the following: Hāna Highway and historic bridges, fishponds, landings, habitation complexes, *lo'i* terraces and *'auwai*, plantation ditch systems, religious structures.
- Acknowledge and respect family ancestral ties to cultural resources.
- Encourage the restoration and use of *lo'i kalo* (taro terraces) found in the Hāna region.

Economic Activity: A balanced local economy which provides long-term viability and sustainability while meeting residents' needs and respecting the cultural and natural resources of Hāna.

- Utilize existing components of the local economy to establish a framework for balanced regional economic development.
- Encourage economic activities which are: of substantive economic benefit to the residents of the area; environmentally benign; and compatible with the cultural sensitivities of the residents of the Hāna region.
- Promote and maintain agriculture as a major economic activity with emphasis on a regional diversified agricultural industry.
- Maintain taro farming, ranching and floriculture as major economic activities and promote their economic viability and sustainability. Promote aquaculture and horticulture as economic activities.

B. Tasks of the Ke'anae-Wailuanui Cultural Landscape Study

Due to the mandates of the task force, as well as stated planning policies, the Maui County Planning Department allocated federal preservation services (certified local government) grant funding for a preliminary study of the cultural landscape at Ke'anae and Wailuanui. This study involved three general tasks:

1. Identification of the historic context of the landscape: Archaeological research to determine time depth of wetland taro cultivation and a literature search, including a summary of Land Commission Awards (LCAs) for the *ahupua'a* of Ke'anae and Wailuanui, focused on agricultural or other uses of the claims, as well as sources of ethnic influences on land use, such as rice cultivation in former taro lands, were to be noted.

2. Identification of cultural landscape components: Land currently and historically in use for farming, water control, gathering, hunting, homes, commercial and community buildings, and ocean related activities, as well as areas associated with legends and history were to be identified. Existing crops and major vegetation types were identified, along with existing traditional architectural styles and their functions. Interviews were to be conducted to determine traditional agricultural and gathering areas and practices.

3. Preliminary mapping: Historical maps, aerial photographs, and detailed land classification maps were to be used to identify existing land use area. Boundaries of the cultural landscape were to be determined.

C. Goal of the Ke'anae-Wailuanui Cultural Landscape Study

The goal of this Ke'anae-Wailuanui cultural landscape study is to describe and quantify conditions and traditions which have shaped the land and which still affect the patterns of land use. Land use management policies based on a broad foundation of knowledge of resources will better enable the community and its representatives in county and state government to make effective decisions appropriate to this and other rural and agricultural areas.

II. ORIENTATION TO THE STUDY AREA AND METHODOLOGY

Honomanū Valley

Nāhiku Landing Near Makapipi Stream

The Ke'anae-Wailuanui settlement is the second most populous area within the Maui County Hāna Community Plan region (Figure 2). The Hāna region encompasses approximately 145,000 acres of the eastern portion of the island of Maui, and contains a resident population of approximately 2,000 (1,895 in the 1990 census). The region's economy is based primarily on diversified agriculture, the visitor industry, government service and subsistence activities. The populated areas in this district are located within a few miles of the ocean, with the mountainous inland tracts largely left to wilderness or used as ranch land.

The context of the study area is the Ko'olau region on the windward coast of the Hāna District. Natural attributes of the area are detailed in Section III of this report.

Discernible within the Ke'anae-Wailuanui region are:

1) a central area of intensive land use where the human impact on the landscape is both currently and readily visible; this area also encompasses adjacent lands formerly intensively used for cultivation;

and

2) the extended land and ocean area still in use by the local population for traditional hunting, fishing and gathering; this second, more extensive area includes locales which were previously cultivated but have been abandoned.

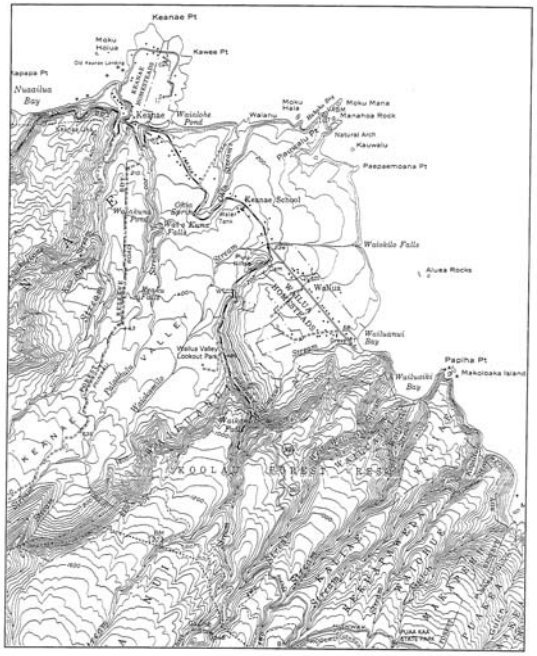
Cultural Landscape Boundary

This portion of the Ke'anae and Wailuanui landscape most clearly represents agricultural and residential land uses which include: areas of taro cultivation, irrigation networks, and the associated settlement and circulation systems. This central area of intensive contemporary use, manifesting continuity with the past, has been selected as the cultural landscape for purposes of this study (Figure 3).

As much as possible, the boundary of the cultural landscape follows natural features, such as ridges and streams. It begins on the west at the YMCA camp and includes all land *makai* (towards the ocean) of the Hāna Road extending to the southeast ridge of the Wailuanui Valley. All lands 600 feet *mauka* (towards the mountain) of the Hāna Highway stretching from the YMCA camp to the ridge on the east side of Waikani Falls are included. The Ke'anae Arboretum within Pi'ina'au Stream valley is also included. The boundary, as defined herein, includes all lands of both communities presently in taro cultivation as well as the connected residential community and major natural landmarks, including the coastline. Two extant heiau structures, Kukuiaupuni, near Ke'anae School and Makehau in Wailuanui, are major archaeological sites within the cultural landscape.

Included in the core cultural landscape are formerly cultivated rice lands at Kupa'u and in upper Ke'anae Valley. Also included are important and well-preserved former taro lands on the southeast side of Wailuanui Stream which are geographically connected to the presently operating Wailuanui system.

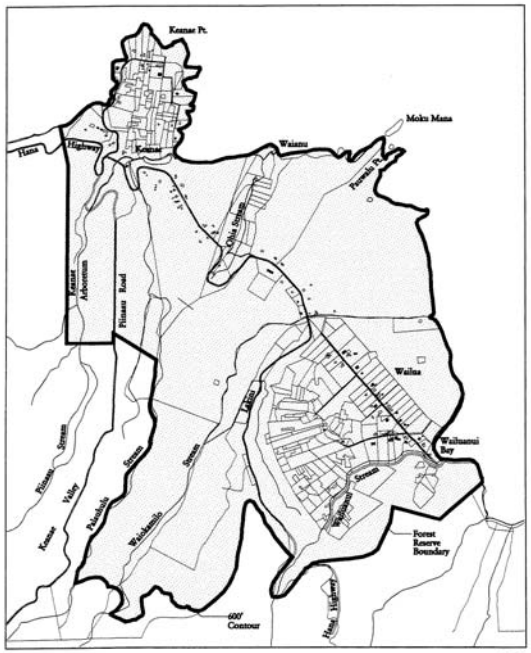
The Ke'anae-Wailuanui cultural landscape is traversed by the scenic Hāna Highway, which is also the only arterial road around East Maui.



Existing Conditions

KE'ANAE - WAILUANUI CULTURAL LANDSCAPE

Figure 2



Cultural Landscape Boundary

KE'ANAE - WAILUANUI CULTURAL LANDSCAPE

Figure 3

Traditional Cultural Practices Region

The region traditionally and customarily used and cared for by the Hawaiian families of Ke'anae-Wailuanui extends from Makapipi in the east to Honomanū in the west, and *mauka* to Pohaku Palaha on the northern rim of the Haleakalā Crater (Figure 4). The Makapipi stream and forest access road forms the boundary between Ke'anae-Wailuanui and Nāhiku on the east. The Kaumahina ridge above Honomanū forms the boundary on the West.

While the traditional ocean boundary for *ahupua'a* is the reef, or one mile out where there is no reef, most of the Ke'anae-Wailuanui residents who fish regularly go out as far as the offshore buoy, 11 nautical miles out at sea. (Civil Code of 1859, sections 384 - 396) The entire shoreline and near shore waters have abundant marine resources. Informants speak of fishing and gathering *opihi* by boat along the coast from Kailua in the west and over as far as the Hāna Airport, to a place called Honoma'ele in the east.

For the purpose of hunting and gathering, the 2,000-foot elevation is usually as high as most hunters and gatherers need to venture to get pigs. Nevertheless, informants indicate that they also go as high as the 3,000-foot elevation, frequently go into the Waikamoi area and up to Olinda, and have hiked up the *mauka* trail all the way into Haleakalā Crater through the Ko'olau Gap.

In addition, the families living in Ke'anae-Wailuanui are part of *'ohana* from Kailua, Nāhiku, Hāna and Kaupō. They have continued to exercise their access and gathering rights in those *ahupua'a*. For example, Awapuhi Carmichael said: "All I know is that my mom said that because they came from Kaupō all the way back, we use from Kaupō to Punalu'u, that's near Kailua. And we have always practiced our gathering rights that way, from Kaupō all the way to Punalu'u, by Kailua."

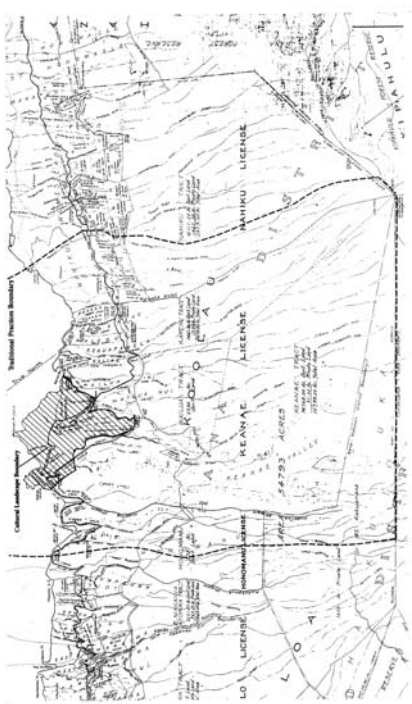
The area included within the boundaries described above, therefore, constitutes the traditional practices zone of the Ke'anae-Wailuanui cultural landscape, as established through custom, use, and practice for cultural, religious, and subsistence purposes by the people of Ke'anae-Wailuanui.

Methodology

Research procedures undertaken by the interdisciplinary team for the Ke'anae-Wailuanui cultural landscape inventory study included: 1) literature and document search; 2) field surveys; and 3) personal interviews. Members of the study team participated in all three methods of data collection.

Literature and document search included: library searches, review of State Historic Preservation Division files and reports, aerial photo analysis, Maui County data such as property records and archival documents, and photos and maps obtained from the State of Hawai'i and Bishop Museum archives. Team members shared any information they obtained.

Field Surveys were conducted between September and November 1994. An enlarged U.S.G.S. topographic map (1 in. = 500 ft. scale), Ke'anae Quadrangle, and a 1982 color aerial photograph of the same scale were utilized for location and orientation during fieldwork.



Area of Traditional Practices

KE'ANAE - WAILUANUI CULTURAL LANDSCAPE

Field investigation of architectural and botanical resources involved recording and photographing of sites, and verification on the ground of aerial photo interpretations and document file data. Coverage of architectural resources during field trips was basically limited to the areas under current habitation or cultivation.

Field investigation of archaeological and cultural resources - including taro cultivation areas - was accomplished during September and October 1994 and included interviews with local residents. Major emphasis was placed on defining, mapping and describing the taro-growing areas of Ke'anae and Wailuanui. The most intensive effort in field mapping was directed to the Ke'anae peninsula *lo'i* complex. In this case all *lo'i* were mapped with water flow, associated buildings and major *'auwai*. The main Wailuanui *lo'i* complex was mapped from the 1982 color aerial photograph. Also mapped were *lo'i* at Waianu and the Ke'anae Arboretum, and Mrs. Helen Nakanelua's *lo'i* at Lākini.

To place these presently cultivated areas in an historic context, effort was made to locate former taro lands. Field trips, in some cases guided by local residents, were taken to formerly cultivated lands, including Nua'ailua Valley, Ke'anae Valley *mauka* of the Ke'anae Arboretum, Waianu, Kupau, and forested lands adjacent to taro lands in Wailuanui on the southeast side of Wailuanui Stream, extending into the *'ili* of Ka'ake'e near the mouth of Wailuanui Stream.

Other field trips were taken to the coastline from Waianu to Moku Mana and to archaeological sites, such as Pu'uola Fishpond, two recorded *heiau*, the stone foundation of the Protestant church in Wailuanui, rice mills, poi factories, the Ke'anae stone quarry and prominent natural features in Ke'anae and Wailuanui. Also investigated were possible locations of formerly cultivated native plants such as *olonā*, which was mentioned frequently in the Land Commission Award documents (see Cultural and Historic Context section above).

During all phases of field work, an attempt was made to solicit the knowledge and expertise of Ke'anae and Wailuanui residents and former residents. Personal interviews and field trips with these residents were an integral component of this study. (During one field trip a tsunami alert was in effect and many long time residents reflected and shared their personal experience during the 1946 tsunami which resulted in two Ke'anae deaths.)

Other interviews were conducted with representatives of various agencies or private groups which have collected information about the region, including employees of the East Maui Irrigation Company, Department of Land and Natural Resources forestry personnel, and staff from the State Historic Preservation Division. These interviews, whether face-to-face or by telephone, provided valuable information about the area.

Community Interviews

From November 1 through 4, 1994, Dr. Davianna McGregor conducted in-depth interviews with *kūpuna* and subsistence practitioners in the Ke'anae-Wailuanui community to identify and map important cultural use areas.

To prepare for the interviews, Dr. McGregor reviewed documents and interviews that she had used as resources for the writing of a chapter on the Ko'olau region of Maui for her 1989 PhD dissertation, "Kupa'a I Ka 'Āina: Persistence on the Land". These included notes

from taped interviews with *kūpuna* of the Hāna district that had been conducted by Mary Kawena Pukui in 1961 and the transcription of an in-depth interview with the late Harry Kunihi Mitchell of Ke'anae-Wailuanui. This body of information described cultural practices and resource areas in the 1930s and 40s. Thus, they formed the basis for the interview format and served as a reference point for gathering information from the community informants regarding contemporary cultural and subsistence practices and use areas.

Interviews were conducted with 13 residents of the Ke'anae-Wailuanui community:

1. Moki Day, 50 years old, fisherman, taro farmer; (MD)
2. Charmaine Day, 36 years old, wife of Moki, president of the Ke'anae Wailuanui Community Association; (CD)
3. James Hueu, 80 years old, caretaker of the YMCA Ke'anae Camp; (JH)
4. Awapuhi Carmichael, 57 years, gatherer, genealogist for the Kaauamo *'ohana*; (AC)
5. Paul Sinenci, Jr., 27 years old, taro farmer, EMI employee, Kaauamo descendant; (PS)
6. Harry Pahukoa, late 50's, taro farmer, county worker; (HP)
7. Doug Chong, 40's, hunter; (DC)
8. Helen Nakanelua, 83 years old, taro farmer, gatherer; (HN)
9. Maggie Alu, 79, *kūpuna*; (MA)
10. Kaipo Kimokeo, 50's, caretaker of the Ke'anae Arboretum; (KK)
11. Enos Akina, 94, *kūpuna*, retired taro farmer, *la'au lapa'au* practitioner; (EA)
12. Apolonia Day, 72, *kūpuna*; (AD)
13. Mary Kaauamo, 82, *kūpuna*, taro farmer; (MK)

Initials of informants' names are used to identify their statements in the *Mana'o o ka 'Āina* section of this report.

A semi-structured interview format was used; however the interviews were free-flowing. Informants were asked to describe the background of their *'ohana* in Ke'anae-Wailuanui: where they live; where they cultivate taro; lands that they own and lease; who cares for the lands; who will care for the land in the future; and how long and for how many generations their *'ohana* had lived in Ke'anae-Wailuanui. They were also asked to share information regarding: Hawaiian *lā'au lapa'au* or medicinal plants; the locations of poi factories and stores; place names; and *mo'olelo* or traditional stories about places in the district.

During the interviews, informants were asked to point out on the U.S.G.S. quad maps for Ke'anae, Ha'ikū, and Nāhiku, the areas that they customarily use for hunting, gathering, fishing, recreation and taro cultivation, as well as historic sites. Informants indicated areas for hunting, fishing, stream and ocean gathering, forest gathering, taro cultivation, historic sites, swimming and surfing, and trails and roads used to access the resources.

Informants were also asked to share their concerns and suggestions about the designation and management of Ke'anae-Wailuanui as a cultural landscape district and the transfer of ceded public lands from the Department of Land and Natural Resources to the Department of Hawaiian Home Lands.

The interviews were transcribed and the information provided by the informants was categorized and summarized for inclusion in this report. Draft copies of this report were circulated among the informants for their review; their corrections and additions were included in this final report. Following a review of the interview transcripts and with their consent, the full transcription of the interviews will appear in a supplemental report. The micro-cassette tapes will be stored at the Maui County Planning Department.

III. NATURAL SETTING

Ke'anae Coastline

The Ke'anae-Wailuanui area is part of Maui's rugged Ko'olau coast. This region is dominated by deep valleys cut into the northeastern slopes of the now dormant Haleakalā volcano. These valleys generally have steep side slopes with narrow ridges between them forming sea cliffs along the coast. The shoreline along the valley floors is a combination of small boulder-strewn beaches and lava outcrop eroded by consistently strong waves. Today these valleys can be accessed by the Hāna Highway which winds along the coast on the edges of the sea cliffs and over the valley floors.

Located on the windward side of Maui, the Ke'anae-Wailuanui area receives a significant amount of rainfall and is considered to be within the wettest part of the island. The rainfall maxima of eastern Maui, the Hāna maxima, is located about 17 miles to the southeast of Ke'anae at approximately 2000 feet above sea level and receives between 300 and 350 inches of rain per year. Rainfall decreases both downslope toward the coast, to between 100 and 150 inches per year, and upslope to the summit of Haleakalā, which receives only 20 to 30 inches per year (Giambelluca *et al.*, 1986:15). The Ko'olau region is the watershed used by the East Maui Irrigation Company to supply domestic water to all of upcountry Maui (approximately 21,000 persons) and agricultural water to thousands of acres in drier parts of east Maui and to the central isthmus which joins the two mountain ranges comprising the island.

According to the *Atlas of Hawaii* (Armstrong, ed., 1973:58), the Ke'anae-Wailuanui area enjoys a climate characterized by equable temperatures with small seasonal variation. Temperatures range from an average (mean) minimum of 60 degrees Fahrenheit to an average (mean) maximum of 82 degrees Fahrenheit at 61 feet above sea level (Hāna Airport Station). At 2100 feet above sea level, temperatures range from an average (mean) minimum of 52 degrees Fahrenheit to an average (mean) maximum of 72 degrees Fahrenheit (Makawao Station).

The valleys along the northeastern coast of Maui have been created by streams fed by orographic rains carried in on the prevailing trade winds. As the most recent volcanic activity on Haleakalā, the Hāna Series, slowed and eventually ceased altogether, the streams had opportunity to cut into the slopes of the mountain and carry sediments from the eroding slopes onto the valley floors below. The current distribution of soil types and natural vegetation reflects this process.

The soil survey of the Hawaiian Islands conducted by the U.S. Department of Agriculture, identified four land or soil types within the Ke'anae-Wailuanui area; two within the upland slopes and two within the valley floors (Foote *et al.*, 1972: Sheet 121). The ridge tops and slopes are comprised predominately of *Rough Mountainous Land* (rRT) which is described as very steep land broken by intermittent drainage channels (Ibid:119). Scattered throughout the upland slopes are also soils classified as *Kailua Silty Clay* (KBID) which are well-drained soils developed in volcanic ash (*Ibid.*:52). It is within these areas that the upland forests thrive.

Vegetation in the upland forests, "below the upper elevation grass and shrublands at approximately 7,200 feet [are] a diversity of forest communities dominated by *'Ōhi'a lehua*

(Metrosideros polymorpha)" (East Maui Irrigation Company 1993:5). Much of the native forest cover in the lower elevations, which included *'Ōhi'a lehua*, *Koa* (Acacia koa), *kopiko* (Psychotria kaduana), and *hame* (Antidesma platyphyllum), has been largely replaced by introduced and naturalized species including; *kukui* (Aleurites moluccana, common guava (Psidium guaiava), strawberry guava (Psidium cattleianum), *hau* (Hibiscus tiliaceous), lantana (Lantana camara), False Staghorn (Dicranopteris sp.), treefern (Cibotium sp.), yellow foxtail (Setaria gracilis), Java plum (Eugenia cumini), Christmasberry (Schinus terebinthifolius), paperbark (Melaleuca leucadendra), and various species of Eucalyptus (Eucalyptus spp.).

On the valley floors, *Stony Alluvial Land* (rSM) predominates. This type of land consists of stones, boulders and soil deposited by streams along the bottoms of gulches and on alluvial fans (Ibid:120). In addition, the valley floors contain pockets of *Tropaquepts* (TR). Tropaquepts occur on nearly level flood plains and consist of poorly drained soils that are periodically flooded by irrigation in order to grow crops that thrive in water (Ibid:121). It is within these pockets that taro production occurs. Other vegetation on the valley floors include; *kukui*, guava, Christmasberry, lantana, *hau*, strawberry guava, Java plum, rose apple (Syzygium jambos), *'ōhi'a 'ai* - mountain apple (Eugenia malaccensis), *'ulu* (Artocarpus altilis), *waiawi* (Psidium littorale), and hilograss (Paspalum conjugatum).

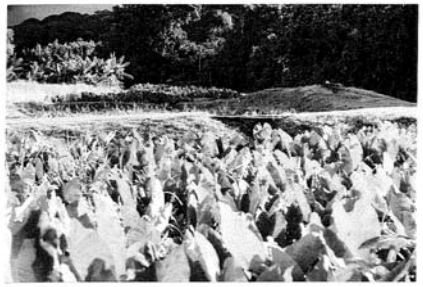
The Ke'anae-Wailuanui area is subject to a variety of storms which, although infrequent, occur throughout the Hawaiian Islands. These storms include cold front or winter storms, Kona storms, and hurricanes or tropical storms. The impact of such storms on the Ke'anae-Wailuanui region can be quite severe, for the orographic effect of Haleakalā traps storms carried in on the trade winds and collects the rains on the northern and eastern slopes. These heavy rains are channelled into the steep and narrow valleys creating flash floods which can cause landslides and washouts along the Hāna Highway and flooding of the valley floors. In a report on flood hazards for the Island of Maui, the villages of Ke'anae and Wailua are identified as having localized flooding problems and as having suffered damage to agricultural lands, as well as to private and public property (Department of the Army 1971:30).

Another source of flooding on Maui (and all of the Islands of the Pacific) is seismic sea waves, or tsunami. Since 1813, approximately 85 tsunamis have been observed in Hawai'i, seven of which are known to have caused fatalities (Cox 1987:n.p.). The Ke'anae region has suffered loss of life and considerable property damage caused by tsunamis. The most severe tsunamis were those that occurred on April 1, 1946, and May 23, 1960. During the 1946 tsunami, "waves up to 16 feet swept over the entire end of Ke'anae Peninsula" (Department of the Army 1971:31). Several newspaper articles described Ke'anae Peninsula as having been "swept clean" except for the stucco church which had been moved off its foundation. According to the late Harry Kunihi Mitchell, the tsunami obliterated sand dunes at Honomanū and seasonal sand beaches at Ke'anae and Wailuanui that have not reappeared since. A Civil Defense tsunami inundation map classifies the Ke'anae Peninsula and the coastal areas of all of the valleys in this region as being potential danger areas (*Ibid.* 1971:Plate 5).

Other natural disasters to which the Ke'anae-Wailuanui region is potentially subject are earthquakes and further volcanic activity. Damage from one locally generated

earthquake was reported on January 25, 1938, and included rock and mud slides across the Hāna Highway. The potential for further volcanic activity in the region is from Haleakalā, which is considered to be a dormant volcano, not an extinct one. The most recent activity was the 1790 eruption along the southeastern coast where the lava flowed into the sea and formed a part of what is now called LaPerouse Bay (Macdonald and Abbott 1970).

IV. CULTURAL & HISTORICAL CONTEXT



Ke'anae Loi

My people have been cultivators from very ancient times; it was by agriculture that they made a living for themselves, for their families, and for those dependent on them. For some it was a favorite occupation.
— Samuel Kamakau (*Na Hana a ka Po'e Kahiko*)

Mahi'ai'ana – cultivation of the land: the quietly proud words of the pioneering 19th century Hawaiian historian Samuel Kamakau articulate a heritage reaching long before Kamakau's time and which continues today in portions of the Hawaiian islands – including the lands of Ke'anae and Wailuanui on Maui. The taro *lo'i* carpeting the landscape of these two *ahupua'a* today represent a centuries-old relationship with the land enduring through the changes of history.

Prehistory to 1852

With no written documentation before the 19th century, the record of the earliest Hawaiian settlement of Ke'anae and Wailuanui remains obscure. It can be imagined, however, that the rich volcanic soil and abundant water sources of these *ahupua'a* would have captivated a people skilled at cultivation. Legends associated with Ke'anae and Wailuanui express the Hawaiians' sense of the unique origin of the *ahupua'a* resources. Typical is a Ke'anae legend about the gods Kāne and Kanaloa who travelled among the islands "establishing springs of water and seeing that they are kept clear for drinking purposes or for uses of the chief." In the uplands of Ke'anae the two gods discover that they lack water.

> They discuss whether it can be obtained at this height. "Oi-ana (Let it be seen)!" says Kanaloa; so Kāne thrusts his staff made of heavy, close-grained kauila wood (*Alphitonia excelsa*) and water gushes forth. (Beckwith 1970:64)

Other oral traditions passed down through generations until they were recorded in this century, give hints of the rich drama and social values that animated life in the two *ahupua'a* during the centuries before western contact.

At Wailuanui is recounted the dramatic story of a shark-man, known by the mark of a shark's mouth upon the back, who can change form from man to shark but who goes undetected until people realize that the man's warnings to swimmers are always followed by a fatal attack by a shark (Beckwith 1970:140).

> Pau-walu (Eight dead) lives at Wailua, Maui. He warns men as they go to the sea that eight will be dead before they return and a shark always kills eight of them as predicted. He is therefore suspected as a shark-man. Akeake the strong is born beside the stream Hau-ola and while yet a little boy starts about Maui fighting champions. After overcoming Lohelohe, he, with his companion Pakolea, spends the night at a friend's house named Ohia and learns about Pauwalu. The shark-man scoffs at so little an antagonist, but Akeake easily binds him, exposes the shark's mouth on his back, and casts him into the fire. (*Ibid.*:141)

And a legend of Ke'anae tells of a mysterious shark, an *'aumakua* or protective spirit:

> According to this story, two families in the area used to exchange food, a common practice, the couple living seaside at Ke-'anae giving fish and the couple living upland giving garden produce.
>
> One day the woman from the shore gave her sister-in-law on the hillside nothing but a fishtail in exchange for bananas and sweet potatoes. The woman took the fishtail home in her calabash, saying nothing about the scanty trade.
>
> That night both she and her husband dreamed of a shark, and when they woke up in the morning they found a live shark swimming around in the calabash, where only a tail had been the night before.
>
> The excited couple freed the shark in an upland pool and made offerings to it. During a heavy rain, the shark was washed down to the ocean, where...it lives to this day in an underground cave near the Ke-'anae wharf. (Lueras 1983:92)

The legend speaks of a reciprocity - the exchange of foodstuffs between Ke'anae folk working the land and the sea - necessary for the maintenance of life in the *ahupua'a* and of the consequences when the exchange relationship is not respected.

Visible today in Ke'anae and Wailuanui are many physical evidences of the works of the Hawaiians of old: complexes of taro *lo'i*, fishponds, and, in the uplands, agricultural terraces. A legend recounts the origin of the taro *lo'i* on the Ke'anae peninsula:

> Anciently...the peninsula was barren lava. But a chief, whose name is not remembered, was constantly at war with the people of neighboring Wailua and was determined that he must have more good land under cultivation, more food, and more people. So he set all his people to work (they were then living within the valley and going down to the peninsula only for fishing), carrying soil in baskets from the valley down to the lava point. The soil and the banks enclosing the patches were thus, in the course of many years, all transported and packed into place. Thus did the watered flats of Ke'anae originate. (Handy and Handy 1972:500)

While Ke'anae and Wailuanui may once have been rivals constantly at war, it would be warfare among other chiefly rivals that drew the two *ahupua'a*, if only peripherally, into the larger course of Hawaiian history.

Sometime in the 14th century, two brothers - sons of Pi'ilani, the ruling chief of Maui - became political rivals after their father's death at Lahaina. Lono-a-Pi'ilani, the eldest, had become the new chief of Maui and during the first years of his reign "all was well, and the people were content" (Kamakau 1961:22). But Lono-a-Pi'ilani became convinced that his younger brother, Kiha-a-Pi'ilani intended to seize the kingdom for himself. Kiha-a-Pi'ilani fled to Moloka'i and Lāna'i before returning in secret to Maui where, after numerous adventures, he married Kolea-moku, daughter of the chief of Hāna, Ho'olae-makua. Ho'olae-makua, recognizing Kiha's identity, refused to support him and declared his loyalty to Lono. Kiha-a-Pi'ilani, his anger "so great that he bided the day of vengeance when he would destroy

his enemies and take the whole of Maui" (*Ibid.*:27) sailed to Hawai'i to seek the help of his brother-in-law, 'Umi-a-Līloa, chief of northern Hawai'i island. 'Umi-a-Līloa, perhaps seeing the rivalry of the two chiefly brothers as an opportunity to extend his own power to neighboring Maui, vowed to support Kiha-a-Pi'ilani. Preparations for war were immense, apparently unprecedented in enormity at the time, a full year being spent making canoes and war implements. The target of the assault across the Alenuihaha Channel was to be Hāna and its chief Ho'olae-makua.

> There was no war prior to that time to compare with this one, in which there were so many canoes. The first ones reached Hana, Maui, while the last ones were still on Hawaii. (Kamakau 1961:29)

Ho'olae-makua and his forces successfully repulsed the first onslaughts of the Hawai'i canoes. According to Samuel Kamakau, when 'Umi-a-Līloa arrived on the scene and learned how "his canoemen were unable to go ashore and how they were held at bay by the mighty Maui warrior, Ho'olae-makua," he asked Kiha-a-Pi'i-lani,

> "Is there no other way of getting the war canoes ashore? we can fight them better on shore, for our present position is an unstable one." Kiha-a-Pi'ilani answered, "There is a small harbor at Ko'olau called Wailua-iki, and if all the canoes cannot land there, there is another landing at Wailua-nui." The blocked canoes turned about and sailed for Wailua-iki at Ko'olau. (*Ibid.*:29)

Kamakau reports that the canoes reached Wailua-iki where the "innumerable war canoes from Hawaii" were beached and the Hawai'i warriors "began to go overland to the site of battle" at Hāna. 'Umi-a-Līloa, Kiha-a-Pi'ilani and their forces defeated Ho'olae-makua in Hāna and then sailed on toward Wailuku to challenge Lono-a-Pi'ilani for primacy on Maui. Lono-a-Pi'ilani, trembling "with fear of death," died before they reached Wailuku and Kiha-a-Pi'ilani assumed reign of Maui. Thus, the reign of a significant figure in Maui history, Kiha-a-Pi'ilani, and the now very real threat of future invasions from across the Alenuihaha Channel, had their origins in the landing of the Hawai'i canoe fleet at Wailua.

Centuries later, the coast of the Wailua-Ke'anae area would be the backdrop for an historic first encounter involving new personages from Hawai'i island (again invading Maui) and one from further afar. In 1778, Kalani'opu'u, ruling chief of Hawai'i island, was in Ko'olau, Maui, engaged in a drawn-out battle with Kahekili, the chief of Maui. Among the Hawai'i island warriors with Kalani'opu'u was Kamehameha, the future king. Late in November 1778, Kalani'opu'u began receiving reports of a ship sailing southeast along the northeast coast of Maui.

> It was seen at Kahakuloa, and the news spread over the island, then at Hamakua, and at evening it was seen in Ko'olau. The night passed, and the next day the ship was anchored at Ha'aluea just below Wailua. (Kamakau 1961:97)

The Hawaiians believed the vessel to be the "'tower of Lono! Lono the god of our fathers!'" (*Ibid.*:97) but the ship was the *Resolution* commanded by Captain James Cook on his second, and fatal, voyage to the Hawaiian islands. Kalani'opu'u and his retinue travelled to Wailuanui where they set off in canoes to meet the ship anchored offshore. Most of the Hawaiian group stayed aboard the *Resolution* a few hours, but "six or eight spent the night

on the ship, one of them being the chief Kamehameha" (Kuykendall 1938:15). Neither Cook nor his men came ashore on Maui - provisions were bartered from Hawaiians paddling out to the ship in canoes - before the *Resolution* continued on its fateful voyage toward Hawai'i island. As for Kalani'opu'u, in 1781 the Hawai'i chief would be forced back to Hawai'i island when Kahekili regained possession of the Hāna district. (A tradition associates Kahekili with a Ke'anae cliff, Pali Ka-hekili, where the Maui ruler is said to have enjoyed the sport of *lelekawa* - cliff leaping.)

Kamehameha would attempt to regain possession of Hāna in 1786; he was unsuccessful then, but would succeed in 1790 at the beginning of his campaign to consolidate power throughout the Hawaiian islands. Local traditions note that no great battles were fought in the Ke'anae region during the unification campaign of Kamehameha. One reason given for this exemption from warfare, apart from the remoteness of the area, was the productivity of the agricultural fields which, the traditions suggest, acted as a supply breadbasket for warring factions on both sides.

The anonymous Hawaiians of Wailuanui and Ke'anae who observed the extraordinary sight off their coast in November 1778 could not have realized what they were witnessing: the initial moment in the unsettling of the traditionally-evolved Hawaiian society by the burgeoning presence of foreign visitors. During the first decades of the post-contact era, the isolated situation enjoyed by Ke'anae and Wailuanui may have spared them from the more baleful effects - the newly-introduced diseases to which the Hawaiians had no immunity - of the foreign presence. The first visitors seeking access to the more remote sections of Maui, the Protestant missionaries who had begun arriving in the islands in 1820, testified to the difficulties of travel around East Maui during the early 19th century; Jocelyn Linnekin recounts their predicament:

> The Hana region was known as "one of the most isolated places in these Islands, remote and difficult of access"...Because of the many treacherous ravines and unpredictable flooding, travelers usually rode on horseback to a point before Keanae, then completed the journey to Hana by canoe. The wild middle stretch of the Hana coast belonged historically to Koolau District. This section of the windward coast was impassable, except by footpath...Over land, Keanae was inaccessible - at least to haoles - from both Hana and Wailuku...Mission duty in Hana District was one of the most severe in the islands and took a heavy toll on the missionary families who served there. Before the Hana station was founded in 1837, missionaries reached East Maui no more than once or twice a year...Koolau [*i.e.* the area including Ke'anae and Wailua] was visited even less frequently than Hana. (Linnekin 1985:18)

With the establishment in 1837 of the Hāna station - by Rev. Daniel Toll Conde - increasing numbers of Hawaiians on East Maui were drawn into the congregation. By 1841 Rev. Conde could report attendances at his sermons of up to three thousand people, drawn from as far as Kipahulu and Ko'olau. It is likely that among the congregation at Hāna from Ko'olau were people from Ke'anae and Wailua. Construction of Ke'anae's own Protestant church would begin in 1857.

The Catholic mission had also been making inroads on Maui during the same period. In 1843, the arrest, instigated by the Protestant mission in Hāna - of a small group of Hawaiian women instructed in the Catholic religion at Kahīkinui would lead to a remarkable

incident in Maui history. A judge in Wailuku had ordered their arrest; the women were tied together and started on the ninety-mile trip to Wailuku to face the judge.

> As the forced march began, word quickly traveled ahead along the Kiha-a-Piilani Highway. Soon at every turn small groups of Catholics were gathering to profess their faith and be tied with the Kaupo converts. As the proud procession passed through Kipahulu, Wailua, Pu'uiki and Hamoa, it grew steadily in size. The new Catholics, dressed in their best, draped leis upon the prisoners, and fell in step. The procession continued on, enjoying the bountiful hospitality of communities along the trail, sometimes remaining two or three days in the same village, holding prayer meetings at every opportunity and bringing in new members at Wailua, Keanae, and Huelo. The procession was in a carnival mood when it finally neared Wailuku. It had been more than a month on the trail and had grown a hundredfold. (Wenkam 1970:51)

The judge, apparently unwilling to risk disciplining the now sizeable group, dismissed the case without judgement. The converts at Ke'anae and Wailua inspired by the 1843 procession may represent the first step in the establishment of the Catholic presence at Wailuanui.

The Organic acts of 1845 and 1846 initiated the process of the *mahele* - the division of Hawaiian lands - which introduced private property into Hawaiian society. In 1848 the crown and the *ali'i* (royalty) received their titles; the common people received their *kuleana* (individual parcels) in 1850. It is through records for Land Commission Awards generated at *mahele* that the first specific documentation of life in Ke'anae and Wailua, as it had evolved up to the mid-19th century, come to light. Much of Ke'anae and Wailuanui were retained by the Crown. However, Land Commission Awards were also granted to commoners within the two *ahupua'a* (as was the case throughout the Hawaiian islands), giving them fee simple title to parcels they were actively cultivating or living upon.

Twenty-one Land Commission Awards were recorded in Ke'anae and the adjacent Waianu Valley, and thirty-nine in Wailua. Locations of most of the Land Commission Award parcels are shown in historic maps of Ke'anae, Waianu Valley and Wailuanui (see Figures 8-11 below). Testimonies given by applicants and their neighbors for these awards reveal locations, boundaries, land usages, place names, length of occupancy - all indicating complex relationships to the land. (Information supplied in the award testimonies is presented in a table in Appendix A of this report.)

Predominant among the claimed land usages in Ke'anae and Wailuanui are 490 *lo'i*, irrigated taro patches, of various sizes. Clearly, wetland taro cultivation was the primary agricultural pursuit within the *ahupua'a* at mid-19th century, likely reflecting a long history of taro farming. Other crops mentioned include dryland taro and sweet potatoes. Several claims include pools and fishponds. In the more *mauka* reaches of the *ahupua'a* are claims for wooded or forested areas, *kula* (pasture land), and *hala* (pandanus) groves. Notable among of the claimed land uses is the number of *olonā* planting areas mentioned. *Olonā* appears in 16 of the Land Commission Award claims, suggesting a significant role in the life of the inhabitants of Ke'anae and Wailua.

> Chief among the cordage fibers in Hawaii was the bast of the *olonā*, a plant of the nettle family, scientifically known as Touchardia latifolia...Now rather rare,

this species of plant was formerly fairly abundant in the lower and middle forest zones of our mountains, principally in deep, cool, gloomy ravines. Here it received a kind of "cultivation" by the natives, good patches being searched out and cleared of weeds and obstructions...

> It was extensively used for making fish line, fish nets, koko or slings for carrying calabashes, and the network to which feathers were tied in making the famous Hawaiian feather capes and cloaks. The fiber is so strong that it could be used for several generations without apparent deterioration. Several nets and capes of olona fiber, now in B.P. Bishop Museum, which have had over a hundred years of use, are still in a good state of preservation. (Bryan 1965:132-133)

According to Samuel Kamakau

> *Olona* was highly prized by one and all. It was very valuable for trading, and planters raised it extensively...There are, however, few places where *olona* will grow, and hence not all people cultivated *olona*...
>
> Maui and Molokai people were noted in the old times for growing and scraping *olona* for making fish nets, and for twisting into fishing lines, and that was the source of wealth of those lands. (Kamakau 1976:44-45)

The people of Ke'anae and Wailuanui may have numbered among the Maui folk noted for growing and scraping *olonā* which provided a special "source of wealth" throughout the pre-contact period. However, none of the claimed *olonā* patches were awarded (Linnekin 1983:181) and, since they do not appear on subsequent maps locating Land Commission Awards in Ke'anae and Wailua, their exact locations remain undocumented.

1852-1925

During the second half of the 19th century further opportunities for land ownership opened in Ke'anae and Wailua:

> Royal Patent Grants, which originated after the Mahele, were sales of crown lands to individual applicants, with no restrictions on the buyer's identity. Beginning in 1855, Keanae [and Wailua] Hawaiians began to acquire Royal Patent Grants, either individually or as a cooperative group, or *hui*...Between 1855 and 1906, twenty-one such awards were made in the Keanae [and Wailua] area, involving a total area of 769.35 acres...All but one of the Royal Patent Grants went to Hawaiians. (Linnekin 1985:24-25)

Among the Ke'anae royal patent grants, four were awarded to *hui* consisting of 7 to 19 members for areas ranging in size from 43.5 to 115 acres (Linnekin 1983:182). These *hui* allowed Hawaiians of Ke'anae and Wailua access to *kula* lands - identified as Kalii and Pauwalu-*mauka*, Pahoa and Waianu, Pauwalu-*makai*, and Paehala - that had not been claimed at the Mahele.

> Historically, all the *hui* lands have been unirrigated except for a few taro patches immediately adjacent to streams. The lands of Pahoa and Pauwalu

> form a single raised, grassy plateau between Keanae and Wailua, cut by a narrow gulch called Waianu. Pahoa is the land west of Waianu, Pauwalu the east. Pauwalu-*mauka* and -*makai* refer to sections on either side of the state highway. There is no overlap between these areas and the *kuleana* lands. (Linnekin 1983:181)

Records from later in the nineteenth century indicate the *hui* lands were used as pasturage for horses, mules and cows but, as Linnekin notes, these lands would also play a significant role in sustaining the Hawaiian community:

> In Keanae, Hawaiians formed land *huis* to regain access to the upland *kula* after the Mahele instituted the principle of private and exclusive property. The *huis* effectively kept local lands in Hawaiian hands, and prevented their appropriation by foreigners who might turn the *kula* into sugar plantations, cattle ranches, or - in more recent times - condominiums. (*Ibid.*:185)

Later in the century, the Land Act of 1895 created homestead parcels from government land in Ke'anae and Wailuanui. An applicant, having built a house and cultivated a portion of the parcel during a 6-year probationary period, could secure the parcel in a 999-year lease. These land acts may have secured some stability for the Hawaiians of Ke'anae and Wailuanui after the 1850s, although they simultaneously served to concentrate a formerly dispersed population in Wailuanui.

Nevertheless, and despite their continuing physical isolation, Ke'anae and Wailuanui would be drawn into the social and economic changes transforming the Hawaiian kingdom. Both churches that are established today at Ke'anae and Wailuanui were built in 1860. Our Lady of Fatima Shrine, a part of Saint Gabriel's Church in Wailuanui, and Ke'anae Church were constructed with coral boulders and rocks strewn on the beach during extraordinary storms.

Hāna - the scene of power struggles among the ali'i into which the two ahupua'a had been drawn - once again would be the site of developments determining the future of Ke'anae and Wailua. In 1849, the first sugar works on the east coast of Maui were constructed at Hāna where sixty-acres of cane had been planted. By 1883 there were six separate sugar plantation on the Hāna coast.

At first the sugar plantations had been worked by Hawaiians of the district (contracted to work for up to ten years). As the sugar industry throughout the Hawaiian kingdom expanded, the need for increased numbers of field laborers prompted passage of contract labor laws. In 1852 the first Chinese contract laborers arrived at Hāna. Contracts were for five years, and pay was $3 a month plus room and board. Upon completion of their contracts, a number of the immigrants remained on Maui, many becoming merchants or rice farmers.

The Hawaiian islands were well-positioned for rice cultivation. A market for rice in California had developed as increasing numbers of Chinese laborers immigrated there since the mid-19th century. Similarly, as Chinese immigration to the islands also accelerated, a domestic market opened.

As was happening in other locales, in the early 1880s, groups of Chinese began leasing from the Hawaiians of Ke'anae and Wailua, former taro lands for conversion to rice farming. Sadly, the taro lands' availability throughout the islands in the late 1800s reflected the declining demand for taro as the native Hawaiian population diminished.

Historic photographs from the 1880s show Ke'anae and Wailuanui in the midst of these changes (Figures 5-7). According to local traditions, the wooden flume across Palauhulu Stream at Ke'anae peninsula shown in Figure 5 was called "*wai-kau-i-ka-la'au*" or "*kauaikau*" and was considered an engineering feat dating to the pre-contact period. A noted Ke'anae *kūpuna*, the late Harry Kunihi Mitchell, is reported to have explained that old canoes were used to make the flume which is also mentioned in several songs about Ke'anae.

The Ko'olau Ditch - drawing water to central Maui for irrigation of sugar cane and pineapple fields - was constructed during the last quarter of the 19th century. The ditch was not a single project but a series of systems developed over a period of time that was eventually connected into one system. The first ditch was built in 1876 by Japanese laborers and the last section was completed in 1923 (EMI records). No ditches were built past Honomanū before this century because the land to the east were crown lands.

Tax records for 1890 indicate rice land in Ke'anae and Wailuanui comprised 67.84 acres compared to 95.482 acres still in taro (Linnekin 1985:30). By 1892, 75 acres of Ke'anae and Wailuanui were planted in rice. Rice land in other Maui districts included 25 acres in Honokowai, and 150 acres among Waikapu, Wailuku, Waiehu, and Waihee (Coulter and Chun 1937:17).

Historic maps of Wailuanui and of the Ke'anae peninsula (Figures 8-10) show the patterns of rice paddies and taro *lo'i* at the end of the 19th and beginning of the 20th centuries. (Figure 11 map shows locations of Land Commission Awards and grants in Waianu Valley between Ke'anae peninsula and Wailuanui.)

The buildings - and their layout - of the rice plantations at Wailuanui and Ke'anae likely were similar to those described by John Wesley Coulter and Chee Kwon Chun (1937). Typically, the buildings were arranged in three groups.

> Two of the groups were near together, and the third a short distance away. The structures were of wood and had roofs of shingles or galvanized iron. They were on or near a stream, on land a little higher than the paddy fields surrounding them, and generally situated in a group of trees.
>
> The more conspicuous structures, one- or two-story buildings, were dormitories for laborers; they were box shaped, made of unplaned, unpainted boards...
>
> Near the dormitories stood a dining hall similarly constructed...
>
> Adjoining the dining hall was a spacious kitchen with a concrete or wooden floor. The most conspicuous object in it was a large rectangular stove built of cement and bricks, into the top of which were fixed large cauldrons...
>
> A short distance from the main buildings, a square box-like shack equipped with cold water facilities served as a bath house...

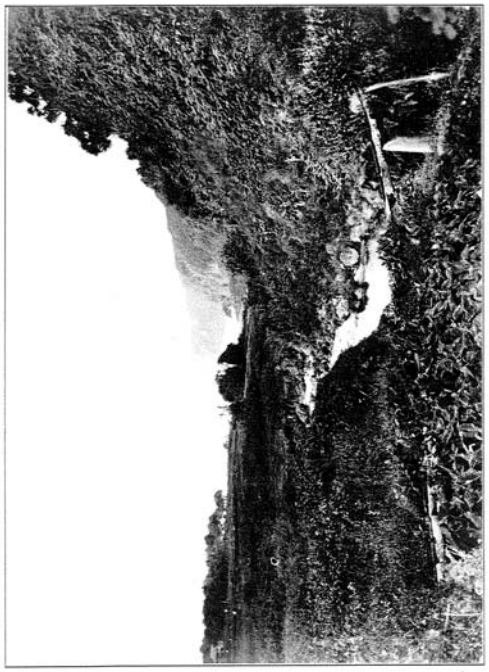


Figure 5
Wooden Flume Across Palauhulu Stream, Ke'anae Peninsula - ca. 1883 (C.J. Hedemann, Bishop Museum)
KE'ANAE - WAILUANUI CULTURAL LANDSCAPE

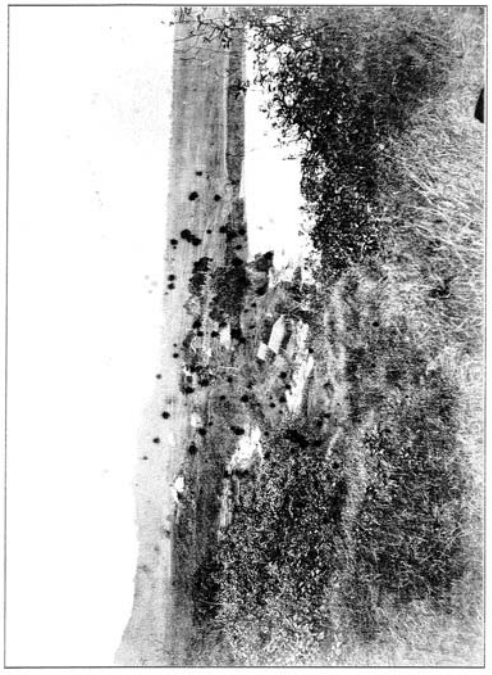
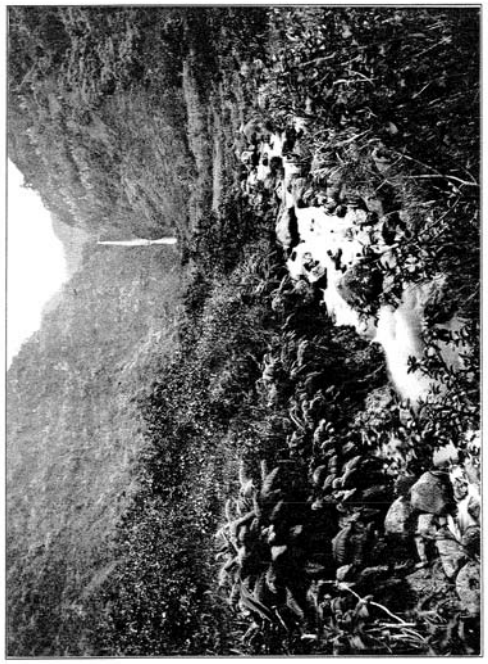
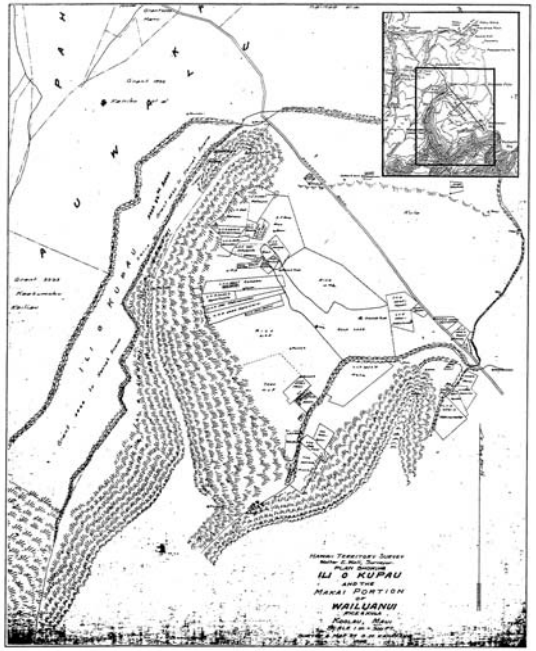


Figure 6
Thatched Houses Above Wailuanui Bay, Wailuanui - ca. 1880s (W.T. Brigham Collection, Bishop Museum)
KE'ANAE - WAILUANUI CULTURAL LANDSCAPE

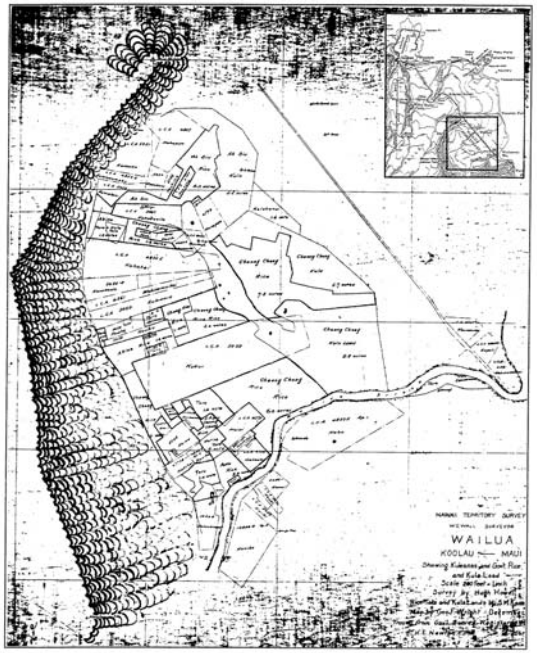


Waikani Falls and Wailuanui Stream, Wailuanui - ca.1880s (W.T. Brigham Collection, Bishop Museum) Figure 7
KE'ANAE - WAILUANUI CULTURAL LANDSCAPE

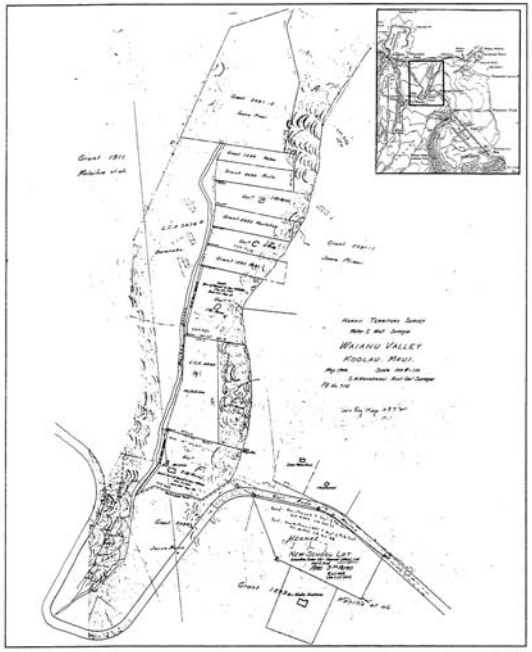
Ke'anae Peninsula - 1903 Map by S.M. Kanakanui No Scale Figure 8
KE'ANAE - WAILUANUI CULTURAL LANDSCAPE



Kupau 'ili and makai Portion of Wailuanui - 1896 Map by S.M. Kanakanui (R.M. #1760) No Scale
KE'ANAE - WAILUANUI CULTURAL LANDSCAPE Figure 9



Makai Portion of Wailuanui - 1903 Map by G.F. Wright (R.M. #2234) No Scale
KE'ANAE - WAILUANUI CULTURAL LANDSCAPE Figure 10



Waianu Valley - 1908 Map by S.M. Kanakanui (R.M. #2972)
KE'ANAE - WAILUANUI CULTURAL LANDSCAPE Figure 11

> Apart from the buildings used by the working force on the plantation, a small, painted cottage was the headquarters and home of the "boss" or manager...
>
> Of the buildings in the second group in the plantation unit, the more outstanding were the mill and granary. The former, near a stream, was a large frame building in which was housed machinery. In the early years of the industry water was the chief source of power, and a great mill wheel was conspicuous. In later years steam and gasoline engines were used to drive the machinery. In the granary were stored paddy and cleaned rice, and bran and rice middlings. A combined tool and implement shed was the remaining building in the second group.
>
> Close to the mill and granary, exposed to the trade winds, was the threshing floor. It was generally square, each side about 100 feet long, built of cement, and surrounded by a low wall, in one corner of which was an entrance...
>
> The third group of buildings, set off at a little distance from the other two, was composed of structures used to house work animals and animals raised for food for the plantation personnel. The former consisted of stables for horses and water buffalo, and the later included a pig pen and chicken house. There were also kennels for dogs (Coulter and Chun 1937:23-24).

Foundations of some of these buildings and relics of milling machinery remain at Wailuanui.

> Club house buildings were also elements of the Chinese farming communities:
>
> In large rice farming areas where there were a considerable number of wealthy planters, a Chinese club or society was formed and a commodious club house was built. Those who could afford it contributed sums of money towards the construction of the club house and others contributed labor during their time off from work in the fields. (*Ibid.*:51)

The Lin Hing Society was organized in Ke'anae and a two-story club house was built on the peninsula in 1908. (The club house was last used in the early 1950s and was demolished in 1981.)

Toward the close of the 19th century, the Nāhiku Rubber Company planted thousands of rubber trees in Nāhiku and the adjacent Wailuanui and Ke'anae forest areas. Their operations continued until 1912.

During the second half of the 19th century, a profitable inter-island steamship service had been established in the Hawaiian islands. By the 1880s, steamships regularly serviced the sugar plantation at Hāna, though the northeast coast of Maui between Maliko and Hāna was known to be particularly treacherous, with several vessels wrecked while loading (Thomas 1983:64). This may have led to the refusal of steamship companies to land at Ke'anae, forcing, in 1901, a Chinese merchant to begin running a junk from Ke'anae to accommodate the Chinese rice growers (Linnekin 1985:19). However, by the 1910s, Ke'anae was one of forty-seven landings serviced by ships of the Inter-Island Steam Navigation

Company (Thomas 1983:133). (According to local residents, steamship service to Ke'anae Landing was terminated in the late 1920s after the opening of the Hāna Belt Road, though the landing continued in use until the 1940s.)

New buildings were constructed during the early years of the 20th century. In 1912 a new Ke'anae School was built on property, acquired in November 1909, on the *mauka* side of the Hāna Belt Road. The original Ke'anae school had been located near the Congregational Church on the peninsula. The new school building had two rooms and a front lanai.

Rice farming declined sharply throughout the islands after the first decade of the 20th century: total acreage dropped from a high of 9,425 acres in 1909 to 1,130 acres in 1935. One Chinese continued to lease Ke'anae land for rice-growing in 1926 (Linnekin 1985:31). However, by the 1930s the rice industry had ceased entirely on the islands of Hawaii, Maui and Moloka'i (Coulter and Chun 1937:62).

It is unlikely that the abandoned rice fields of the late 1920s in Ke'anae and Wailuanui were immediately returned to taro production. The economic viability of taro farming remained a question.

1926-1946

In 1926 a cinder-paved stretch of road was opened connecting Ke'anae to Kailua. The previous year, the Territorial Government had authorized the road construction which was then accomplished by a work crew of prison inmates who were housed in a camp at Ke'anae (on the present site of the Ke'anae YMCA camp). The contemporary topography of the YMCA site, which slopes down to a large flat field, was created by quarry excavations for construction of the road. The completion of the Hāna Belt Road was accomplished with the construction of nine more bridges in the Keanae and Wailuanui cultural landscape area during 1926. This marked a new epoch in the life of Ke'anae and Wailua, the now easier access to and from the rest of Maui creating new pressures on the communities. In the social and economic spheres, as identified by Jocelyn Linnekin, there evolved a

> ...transition from farming to wage labor as the primary source of household income in Keanae - a shift that occurred after the opening of the Hana road...The 1890 commercial directory (the equivalent of today's telephone directory) lists twenty-eight Hawaiian taro planters, a storekeeper, a carpenter, and a policeman residing in Keanae. Between 1890 and 1920, Chinese rice planters and storekeepers make their appearance, but most Hawaiians are still engaged in taro farming. In 1920, three Hawaiians are listed as laborers, and there is a haole foreman for E.M.I. [East Maui Irrigation] living in Keanae. Between 1920 and 1930, the occupations of Hawaiian men in the village change dramatically. In the 1930 directory, taro planters and homesteaders are outnumbered by laborers and truck drivers employed by E.M.I., the road department, and the Keanae Prison Camp. (Linnekin 1985:76-77)

Population in the Ke'anae area was estimated to be 527 in 1930 (*Ibid.*:20).

A Mormon church building in Wailuanui on the *mauka* side of the Hāna Belt Road was constructed in 1934 and dedicated in 1935. It served a small Mormon community which had developed in the area.

The prison camp in Ke'anae continued in use through the 1930s and 40s. (In 1931, as the *Maui News* [30 June:1] reported, an investigative committee of the Maui Board of Supervisors found no perceptible laxity of supervision at the camp and "no evidence of the fact that sugar from the camp has been used in the making of intoxicating liquor.") In 1934 it was converted into a Civilian Conservation Corps camp. The federally-funded CCC program provided "jobs for islanders from other areas of the [territory], financing the planting of thousands of eucalyptus and assorted other trees on the upper slopes above Hāna as well as the mantle of ironwood trees on Ka-'uiki" (Lueras 1983:62). (According to several older residents of Ke'anae and Wailua, the lands toward the west were mostly grasslands prior to the work of the CCC. Species such as eucalyptus, Formosan koa and paperbark were used because these trees grew quickly. Native trees such as the Hawaiian koa (Acacia koa) grew too slowly for the purposes of the CCC.)

In December 1942, a year into the United States' involvement in World War II, the camp once again housed a group of prison inmates. About 40 inmates from Oahu Prison were quartered in Ke'anae to work the old Nāhiku Rubber Company's plantation. Officials expected the plantation, whose trees were last tapped in 1911 when the company failed, could yield 20,000 to 50,000 pounds of crude rubber annually. The plan had been initiated by Gov. Ingram M. Stainback who "did not view it as a commercial enterprise, but [as a means] to augment in a very small way the nation's supply of raw rubber" (*Maui News* Dec. 9, 1942:1).

But even before December 1941, the Territory of Hawai'i had been taking measures in preparation for a possible war with Japan:

> Throughout Hawaii's last year of peace, residents were told of measures being taken to protect them should war strike. Medical supplies were laid in, blood plasma was banked, and stocks of food were gathered with housewives being specifically ordered to buy up a supply for their own homes. Meanwhile, committees representing business, government, and the military all met, planned, and took first aid lessons. (Brown 1989:17)

The residents of Ke'anae and Wailuanui were also involved in precautionary measures. According to a local resident, two caves were dug in Nua'ailua where explosives were cached. The explosives were to be used to blow up the Hāna Belt Road in the event of a Japanese invasion. The war's peril was made real to East Maui when, on January 25, 1942, a Japanese submarine torpedoed the transport ship *Gen. Royal T. Frank* in the Alenuihaha Channel, leaving 29 persons killed and 33 survivors who were brought to Hāna. And while no invasion brought the war to the people of Ke'anae and Wailuanui, they were nonetheless vulnerable to the war's cost. In the words of the same local resident, the "young men left their taro fields [to fight in the war] and many never came back."

1946 to the Present

In the early morning hours of April 1, 1946, an earthquake in the Aleutian Islands generated a tremendous *tsunami*, tidal wave, that struck the Hawaiian islands about 6:30 a.m. The disaster hit all the islands; Ke'anae was not spared:

> The height reached by the waves at the head of the bay west of the peninsula was 17 feet, and that at the end of the peninsula 16 feet. Although the waves swept over the entire end of the peninsula, damaging several buildings and killing two persons, the wave heights were not great, considering that normal storm waves dash up nearly to the level of the top of the peninsula, 13 to 15 feet above sea level. (Shepard *et al.* 1950:434)

Fourteen persons died on Maui, total deaths on all islands numbered 159 (*Ibid.*:463). The two people killed on the Ke'anae peninsula were Walter A. Hardy (age 87) and Helen Tau'a (age 49). The 1946 *tsunami* also impelled many residents of the peninsula whose homes were destroyed to resettle along the Hāna Highway (Linnekin 1985:16).

Between 1819 and 1946, 37 *tsunamis* were recorded in the Hawaiian islands. Damage from the *tsunami* is recorded as "severe" in five instances - in 1837, 1868 (twice), 1877, and 1946 (*Ibid.*:401). These statistics suggest that the Hawaiian islands have long been subjected to periodic, sometimes severe *tsunami* inundation. The Ke'anae peninsula, because of its especially vulnerable position, likely has experienced episodes of destruction, similar to that of 1946, throughout its unrecorded past.

A 1959 study reported a population of 195 in the Ke'anae-Wailuanui (Linnekin 1985:20). Two years earlier, the Ke'anae area had been determined in a state population survey as the "most Hawaiian in the Islands" possessing the "greatest concentration of Hawaiians of any community in Hawaii, with 94.8 percent of the residents having pure- or part-Hawaiian ancestry" (Lueras 1975:A3).

In 1971, the six-acre Ke'anae Arboretum, operated under the jurisdiction of the Department of Land and Natural Resources, was developed by district forester Wesley H.C. Wong, Jr. The arboretum sits on land once farmed by the Hawaiians; during the 1940s, "territorial foresters planted a number of timber and fruit trees to make use of the fertile bottom land. The old taro patches were renovated in 1946 and put back into use by prisoners from the Ke'anae prison camp. This continued into the 1950s and then was abandoned when the prison camp was closed" (Frankel 1984:A17). The land had remained unused until the arboretum was created.

From October 1974 to October 1975, Jocelyn Linnekin conducted fieldwork in Ke'anae and Wailuanui for an ethnographic study, *Children of the Land*, published in 1985, which examined the structures and values shaping the lives of the Hawaiian population in the midst of modern complexities. According to Linnekin's field census, the total population of Ke'anae and Wailua in 1975 was 148, comprising 100 adults (18 and over) and 48 children. She notes that the "unbalanced age structure, with twice as many adults as children, does not seem auspicious for Keanae's future," especially since, of "fifty-one Hawaiian households, 65 percent are presently childless, and 27 percent are occupied by single persons." However, as her study shows, "this population is a response to limited opportunities for schooling and working inside [*i.e.* within the immediate Ke'anae-Wailua lands] and does not necessarily portend the community's demise" (Linnekin 1985:20).

Linnekin perceives the predicament confronting the Hawaiians of Ke'anae-Wailuanui, striving to maintain their identity in the 1970s and 80s:

> Taro is now far more important symbolically and as a market commodity than as a food staple. Although some villagers wax poetic over fish and poi, the outside monetary economy provides the staff of life, not taro. Keanae villagers are not subsistence planters. All but one of the taro farmers are part-timers, holding full-time salaried jobs. Of forty-eight household heads, eight men

> commute daily or weekly to jobs outside in construction or roadwork. Over half the households in Keanae are occupied by retirees who rely on pensions or social security for their livelihood. (*Ibid.*:34-35)

During the years following Linnekin's study up to the present, the economic viability of taro farming throughout the Hawaiian islands has grown sharply, increasing the possibilities for livelihood - and for the preservation of a distinct Hawaiian lifestyle and identity - within the Ke'anae-Wailuanui landscape. According to local residents, the community currently has seven families farming taro full-time. Other community members work for the state or county, for East Maui Irrigation Co., or commute to jobs outside the area. Because of the taro farmers' dependence on access to the area's water resources, water issues have been a long-standing focus of the community's concern. While strong demand for taro continues unabated, the future survival of taro farming in the two *ahupua'a* may hinge on the resolution of these issues.

Emblematic of the challenges facing the community of Ke'anae and Wailuanui as it strives to maintain its identity is the ongoing struggle to keep the Ke'anae School open. Enrollment at the school, in grades one through eight, was sixty-three in 1930, forty in 1965, twenty in 1969, and thirty-one in 1975. By 1991, enrollment had dwindled to fourteen in kindergarten through third grade. Newspaper headlines summarize the unfolding story:

> "Keanae School, State's tiniest, expected to close soon"
> (*Star-Bulletin* 31 May 1991:A7)
>
> "Parents want Keanae School despite small enrollment"
> (*Advertiser* 31 May 1991:A3)
>
> "Keanae, State's smallest public school, may close"
> (*Star-Bulletin* 1 June 1991:A3)
>
> "Maui parents plead to keep Keanae School open"
> (*Star-Bulletin* 18 June 1991:A4)
>
> "Keanae School on Maui, Hawaii's smallest with only 14 students, will remain open for the time being"
> (*Star-Bulletin* 29 June 1991:A3)
>
> "State's smallest school to lose 2 students, 10 left"
> (*Star-Bulletin Advertiser* 7 June 92:A18)

In 1994 the enrollment is "now down to a single class of 11 kindergartners to third graders" and the Maui school superintendent, citing operating costs of more than $200,000 a year, is considering closing the school (Kubota 1994:A3). Some Ke'anae residents "want state officials to reopen the school...to students in the fourth through the eighth grade" seeing the school as linked to local tradition that is "disappearing as Keanae School shrinks" (*Ibid.*:A3).

One recent hopeful sign in the Ke'anae-Wailuanui area has been the increase in population to 241 in 1990, an indicator of natural increase and young people returning to the community.

After the myriad changes experienced at Ke'anae and Wailuanui during the now more than two centuries of recorded history in the Hawaiian islands, the continuing presence of expanses of taro *lo'i* in the two *ahupua'a* during this last decade of the 20th century attests to the tenacity and perseverance implicit in the words of Samuel Kamakau: "My people have been cultivators from very ancient times..." The historical record can only document the economic, political and social forces that have pressed upon the people of the two *ahupua'a*. Perhaps the most enduring force remains the mythic identification - recounted in the story of Hāloa, born to Wakea and Ho'ohoku-ka-lani - of the taro plant with the origins of Hawaiian people, which is recounted below in Section V of this report.

V. TARO IN HAWAIIAN CULTURE AND WITHIN THE KE'ANAE-WAILUANUI LANDSCAPE

V. TARO IN HAWAIIAN CULTURE AND WITHIN THE KE'ANAE-WAILUANUI LANDSCAPE

The choice of a taro-growing area as the subject of a cultural landscape model study is especially appropriate in view of the intimate connection of taro cultivation to Hawaiian culture. Taro (*kalo; Colocassia esculenta*) was probably brought to Hawai'i by the earliest Polynesian voyagers and has been a staple crop on the islands ever since. Taro is intimately connected mythologically to the origins of Hawaiians as a people. There are different versions of this myth, but all of them make the connection between the first born Hawaiian and the taro plant. According to Mary Kawena Pukui:

> The first Haloa, born to Wakea and Ho'ohoku-ka-lani, became a taro plant. His younger brother, also named Haloa, became the ancestor of the people. In this way, taro was the elder brother and man the younger — both being children of the same parents. (in Handy and Handy 1972:80)

The physical attributes, the growth patterns and the propagation of taro all reflect the structure of Hawaiian kinship and an obvious relationship to the human body. The main plant in the center is the *makua* (parent), the smaller plants budding out of the *makua* are the *'ohā* (offspring). The center of the leaf where it connects to the stem is the growth center of the veins of the leaf and is called the *piko* (belly button). The stem is called the *ha*, which is also a word for breath, the basis of life. The cycle of planting is a reflection of the human life cycle. When the taro is harvested the *kalo* (corm) is cut right below the green top, the cut top is called the *huli* (turning, returning or transforming). The *huli* is replanted and the family of taro once again continues its growth cycle. The generations of taro are thought of interchangeably with the generations of Hawaiians as reflected in the saying "Kalo kanu o ka 'āina" – literally "taro planted on the land" but figuratively referring to successive generations of natives (Pukui 1983:157). Both the *'ohā* and the *makua* can be used as *huli*, but, as in a family, the *'oha* (child) must be separated — to become independent of the parent and — to become a parent itself. If it is not, it remains a dependent attachment, overshadowed by the leaves of the *makua*. Another saying, *"I maika'i ke kalo i ka 'ohā"* - "the goodness of the taro is judged by the young plant it produces" (*Ibid*:133), is a metaphor for the parents being judged by the behavior of their children.

All parts of the taro plant are used for food: the corm is cooked and eaten as table taro or steamed and pounded into poi; the stem can be steamed and used in various soup and stew dishes; the young leaves are used for *laulau* and *lu'au* dishes mixed with fish, squid, pork, chicken and beef. Generally, the leaves are not harvested from the plants designated for corm production because continuous cutting makes the corms soft and tasteless (*loli*). Taro growers who grow leaf for home use or commercial purposes always have specially designated *lu'au* patches. It is the traditional Hawaiian practice to use all the coarse green cuttings that are the by-product of the harvesting of the corms as food for the pigs. This green material, when cooked and fed to the animals, is highly nutritious. For this reason, raising pigs is traditionally in symbiotic relationship to taro production. In a traditional taro field no space is wasted. The *lo'i* are used for the taro and any extra space on the banks is used for subsistence, utilitarian and medicinal plants, such as bananas, *noni*, and ti.

The practice of taro cultivation most resembles gardening in its scale and methods. Much of the work is done by family members or an individual and is done by hand. The *lo'i* and banks are beautifully manicured, ostensibly for weed control but the result is

aesthetically like a garden. Yet, taro production remains viable even on this small scale because of its high per-acre productivity.

Nowhere else in the world was taro cultivation more developed than in Hawai'i (Kirch 1985:215). It was the staple for the hundreds of thousands of Hawaiians living here before European contact. It was grown in areas with sufficient rainfall (above 30-50 inches per annum) under dryland management. In areas of suitable water sources extensive and sophisticated irrigated systems were developed for its cultivation. The social requirement for the planning, development and maintenance of these irrigated systems was a stable political system and community cooperation. Although the cultivation and maintenance of individual fields could be the purview of single families or individuals, the maintenance of the water supply system, on which the entire system depended, had to be organized on a community level.

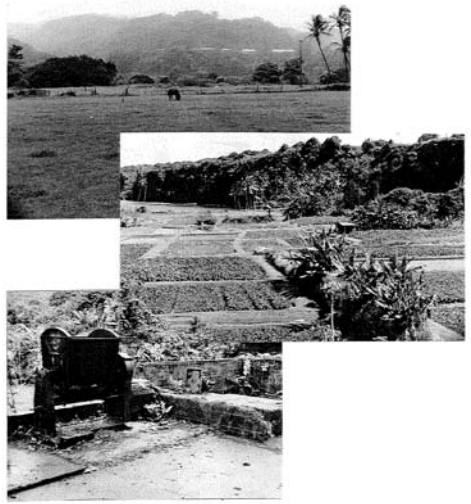
Although less than 100 varieties of taro survive today, there may have at one time been as many as 300 varieties in the islands, distinguished by leaf shape, corm, morphology, color and use. The labels of wetland and dryland taro do not refer to different taro varieties, but only to different cultivation practices. All varieties of taro can be grown in dryland fields and all but a few in *lo'i* (flooded fields). Today there are only a few widely-grown commercial varieties. For example, five varieties are grown in Ke'anae: Moi black, and Moi white, Light and dark Lehua, and Mokohe (short one). Mechanical devices are used, such as tillers and small tractors; in some cases PVC pipes have replaced earthen or stone *'auwai* and commercial fertilizers are routinely used. A typical taro crop will take from 10 to 14 months to mature. With modern farming methods taro is one of the most productive per-acre staple crops in the world. However, in spite of these modern overlays, the bulk of the labor is done by hand in the context of the family and the essence of traditional taro growing — community cooperation in management of water and land resources — remains an integral part of this lifestyle.

In pre-contact Hawai'i, during the late prehistoric era, as documented by archaeological studies, taro cultivation was practiced in virtually every suitable locality, including floodplains in windward valleys with perennial streams, open lava and beach flats near stream systems, and moist leeward slopes. Taro was such an important crop it was even grown in artificial micro environments created by mulching pits in lava fields.

Since European contact there has been a slow but steady decline in taro cultivation. In the late 19th and early 20th century, many of the large taro-growing areas were given over to rice planting. Taro cultivation returned on a smaller scale to these areas after development of the California rice industry. Today, commercial Hawaiian taro cultivation is confined to few areas in the islands: Hānalei/Waioli, Hanapēpē and Waimea on Kaua'i, Waikāne/Waiāhole on O'ahu, Honokohau, Waihe'e, Ke'anae/Wailuanui on Maui, and Waipi'o Valley on the island of Hawai'i.

The taro landscape of Ke'anae-Wailuanui manifests a viable traditional economy which has maintained historic and cultural integrity, traditional lifestyle and social continuity to an equal or greater extent than any of the other taro growing landscapes in Hawai'i. Physical isolation, economic constraints, the characteristics of the environment itself, and the traditional attitude of the community have all contributed to this integrity.

VI. INVENTORY OF CULTURAL LANDSCAPE COMPONENTS



VI. INVENTORY OF CULTURAL LANDSCAPE COMPONENTS

Typically, a cultural landscape is composed of physical elements which manifest the technological and cultural basis of human use of the land through time. In addition, as discussed above, this report recognizes that the landscape area traditionally utilized by the Ke'anae-Wailuanui residents for subsistence, cultural, and spiritual practices includes a broader and more extensive of natural resources and features. Therefore, in the course of the study of Ke'anae and Wailuanui, the following components of both the cultural landscape and the traditional cultural practices region were identified for examination:

A) Taro cultivation.
B) Other vegetation.
C) Circulation networks.
D) Buildings, structures, non-structural facilities, and objects.
E) Clusters.
F) Internal boundaries.
G) Ko'olau Ditch, East Maui Irrigation Company (EMICo).
H) Archaeological and historic sites.
I) Open areas.
J) Small-scale elements.
K) Viewing points.
L) Cultural resources and use areas.

Each component was investigated by appropriate members of the interdisciplinary research team. Results of their study are presented below and in the following section, *Mana'o O Ka 'Āina*.

A. Taro Cultivation

Considering its visual impact as well as its economic importance, wetland taro cultivation comprises the most important single component of the cultural landscape of Ke'anae-Wailuanui. Wetland taro cultivation requires a precisely defined, stable field system with a continuous and reliable source of water. The system must be designed so that cool, fresh water can be delivered constantly to every field. In this sense, a taro landscape is designed as a single system with interrelated elements (fields, streams and *'auwai*). Alteration of any of these elements could affect the entire system. The ancient Hawaiians who designed this landscape were limited in the degree to which they could alter the natural topography. They dealt with this constraint by flexibility of design. Seen as a whole, the taro landscape appears as a simple network of inter-connected rectangles defined by banks which hold in water. Upon closer inspection, it is apparent that field design, water flow, and water delivery are a response to subtle variations in the natural landscape. A taro landscape is extremely complex in its internal workings.

Taro cultivation has modified the landscape more than any other component. Significant aspects of the Ke'anae-Wailuanui cultural landscape directly attributable to taro cultivation and documented in this study include:

-the sodding, irrigation and transformation of a naturally barren and waterless lava rock peninsula into a cultivated wetland;
- a topographical pattern of step-like terraces blanketing coastal valley slopes
- diversion of stream waters out of their originating watersheds in order to create expansive, manmade, terraced wetlands;

- the naming of the region;
- the intricate and dispersed land ownership patterns;
- the resulting pattern of habitation and use.

Five distinct localities in Ke'anae-Wailuanui in which taro is presently under cultivation were identified during the study: Ke'anae peninsula, Wailuanui, Ke'anae Arboretum, Waianu Valley, and Lākini *'iti* (Figure 12).

Additionally, there are two small *lo'i* areas which are under cultivation near the junction of Hāna Highway and Waiokamilo Stream. There are a number of patches here which were not examined during the project. They have been under cultivation for over 100 years, according to local informants. They are not included among the five major taro-growing areas. The water for these patches comes from Waiokamilo Stream, downstream from the diversion that waters the northwestern portion of the Wailuanui system.

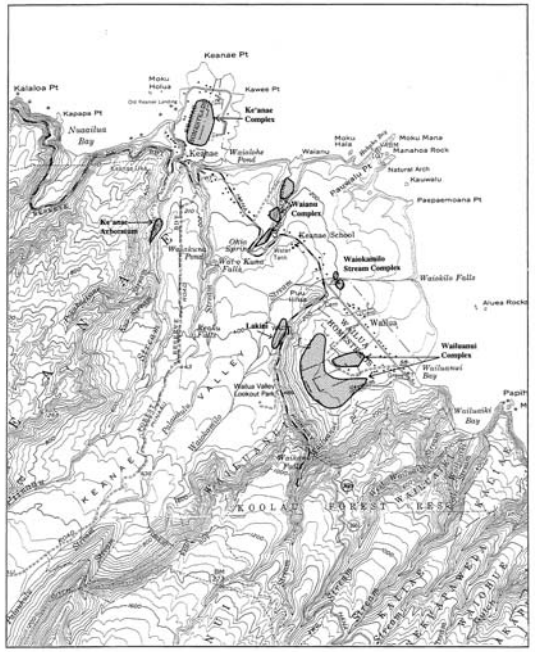
The five major localities and the two small *lo'i* areas watered by Waiokamilo Stream are described below. Adjacent to some of the five major taro growing areas are abandoned fields which are, in some cases, under forest cover, but are still preserved as intact *lo'i* systems. These abandoned components of the active systems are also described along with former cultivated lands *mauka* of Wailuanui in Kupa'u and west of Ke'anae at Nua'ailua.

1. Ke'anae Peninsula

The central portion of the Ke'anae peninsula contains the most tightly clustered concentration of taro *lo'i* in the area, totalling approximately 185 *lo'i* presently in production (Figure 13). All of these *lo'i* are irrigated by the *Ka wai kau o Ke'anae* - "the suspended water of Ke'anae" - a flume which is tapped from Palauhulu Stream. This present-day metal pipe flume - the descendent of the 19th century wooden flume shown in Figure 5 - in turn feeds an *'auwai* which runs through the center of the Ke'anae *lo'i*. This *'auwai* splits after it has flowed about 500 feet north from the flume. One branch continues for another 350 feet through the center of the *lo'i* system where it turns west and disperses into the western *lo'i*. The other branch turns east and then north to feed the *lo'i* in the northeastern segment of the system. It is reported that previously there were other sources of irrigation water for this system, but the present flume has been in operation throughout this century as indicated on the 1903 S.M. Kanakanui map (see Figure 8).

Water flows into the patches adjacent to the *'auwai* directly from the *'auwai* and also flows *lo'i* to *lo'i*, especially in the more *makai* areas of the system. This system is clearly of different design and configuration from a typical floodplain *lo'i* network. Ke'anae peninsula is a broad contoured 'a'a flow with much micro-variation in topography controlled by lack of uniformity in the underlying bedrock. Therefore, elevation from field to field is quite variable. This feature alone distinguishes it from a floodplain system, in which elevational change is minimal and uniform. In Ke'anae the fields were configured around the 'a'a bedrock outcrops, some of which are seen protruding from the banks.

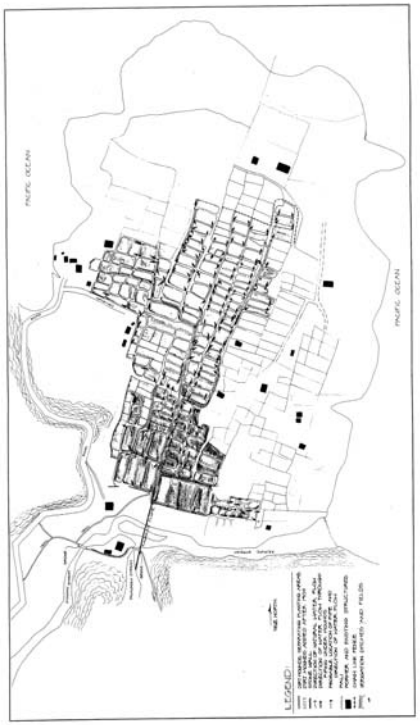
The *lo'i* themselves are surrounded by convex earthen banks. These banks serve as dividers between the fields as well as trails for foot traffic (one person, single file). The wider banks, some of which measure 8 to 10 feet, provide access for tractors and all-terrain vehicles (ATVs). These banks are kept stable with continuously mowed, broad blade grass covering. At the base of many of the banks, particularly in the *mauka* part of the system, stone alignments and walls are visible. These hint at an underlying stone terrace system probably



Taro Growing Areas

KE'ANAE - WAILUANUI CULTURAL LANDSCAPE

Figure 12



Ke'anae Peninsula Lo'i Complex (State site 50-30-07-3933)
KE'ANAE - WAILUANUI CULTURAL LANDSCAPE

Figure 13

buried beneath these high earthen banks which have been built up over centuries of weeding and maintenance. The banks are also used for cultivation of bush and tree crops; bananas grow on the wider banks, providing shade, and ti and *noni* are scattered along the narrower banks. To a certain extent, the banks are considered community throughways; but the management, use and ownership of each individual patch is clearly delineated.

Along the broader banks and on the corners of fields are worksheds of plywood and corrugated roofing, which are individually owned and house personal or family equipment for farming the adjacent *lo'i*. Some of these sheds are open, two or three sided, and serve as shelters during rain squalls. In a few cases the larger sheds serve as living quarters for families working the fields.

A new facet of the taro history of Ke'anae is the 5 to 6 year long fight against the yellow apple snail (*Pomacea canliculata*). Some farmers are successfully fighting the snail infestation with imported Cayuga Ducks (New York State ducks). The ducks are trained to leave their cages, head straight for the *lo'i*, to eat snails, and then return to their cages when signalled by a hand clap.

Continuity and Integrity

The map of the present-day *lo'i* of Ke'anae was plotted on the 1903 Kanakanui map which formed the base map. The Kanakanui map shows LCA awards as well as the boundaries of each *lo'i*.

It was clear from this mapping exercise that the layout of the fields and *'auwai*, and by implication, the configuration of the water flow through the system, has not changed since 1903. The mid-19th century LCA records also describe a system essentially the same as that seen today. Given the complex layout and the constraints of the bedrock typography it is likely that the configuration of the Ke'anae *lo'i* system has remained essentially the same since its initial layout long before European contact. Ke'anae farmers attest to the difficulties of mechanically altering fields and water flow: if one portion of the system is altered - e.g., a field is cleaned and made too deep - water flow to adjacent fields will be deleteriously affected. This suggests that the initial layout of the system, probably followed by a period of adjustment, could never be improved upon, even after the introduction of the mechanical conveniences and labor-saving devices of modern farming.

Another aspect related to the integrity of this Ke'anae system is the apparent lack of modification during the late 19th and early 20th centuries in a shift to rice cultivation. Because of the limitations imposed by the bedrock typography, by the location of the *'auwai*, by the requirement of gravity feed, these fields have remained small compared to other systems in Hawai'i (Hanalei, for example). These fields could not have been consolidated into larger units for rice cultivation and continue functioning as an integrated system.

All this evidence points to the high degree of historic integrity of the Ke'anae system, which also constitutes a unique cultural adaptation to a specific environment. It is interesting to note that the legend of the origin of the Ke'anae *lo'i* system refers to "... carrying soil in baskets down to the lava point. The soil and the banks enclosing the patches were thus, in the course of many years all transplanted and packed into place" (Handy 1985:110). The legend implies intensive planning and labor required to redesign an 'a'a flow into an irrigated landscape which has remained in delicate balance ever since. The authors

of the present study, participating in weeding and planting in these patches, could feel the 'a'a floor beneath the mud of the *lo'i*: disturbance or removal of this layer of mud would endanger the capacity of the *lo'i* to support a taro crop.

Historic Antecedents

Although the layout of the present system is essentially the same as that recorded in the 1903 Kanakanui map of Ke'anae peninsula, it is clear that the area of cultivated land has diminished considerably. For example, 183 *lo'i* are in production today, but there were a total of 265 plotted on the 1903 map. Differences can also be noted in a 1934 photograph of the Ke'anae peninsula (Figure 14).

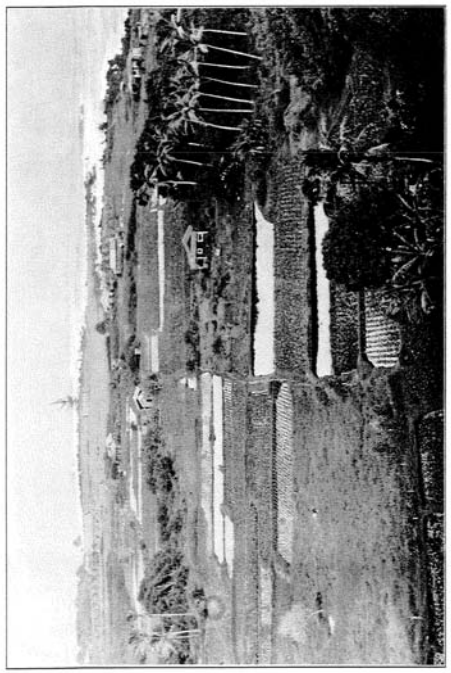
Many *lo'i* have been abandoned; the largest abandoned area lies on the east side of the peninsula, but there are also empty fields at the *makai* end just *mauka* of the Congregational church. *Lo'i* have been turned into house lots and yards, pasture, and citrus groves, and some have been taken over by thick growths of *hau*. The *mauka* end of the system appears always to have been well defined by topographic constraints and has been limited to the flats *makai* of Ke'anae Stream. Other smaller systems existed along the upper reaches of Pi'ina'au Stream but are not geographically connected to the Ke'anae peninsula system.

2. Wailuanui

The Wailuanui *lo'i* system (Figure 15) is much larger than the Ke'anae peninsula system. In some aspects, the Wailuanui system shares more characteristics with a typical floodplain system found elsewhere in Hawai'i. However, there are still many variations in the typography which have complicated the system of water delivery and challenged the ingenuity of its creators. Information on the water sources for the Wailuanui *lo'i* was gathered from field reconnaissance as well as discussions with local residents and information obtained from East Maui Irrigation Company, Ltd. (EMI).

There appear to be three sources of water for the irrigated fields at Wailuanui. The eastern source is Wailuanui Stream which is tapped from the pool at the base of Waikani Falls. This pool and stream, according to residents, have long been prone to periodic flooding which destroys the intake of the ditch at the pool. The problem has been partially remedied by the recent installation of a 300-ft. long buried pipeline which taps water from the pool from an underwater intake and parallels the stream within the flood zone. This pipe then empties into a partly concrete-lined *'auwai* which runs northwestward through heavy forest paralleling and downslope of Hāna Highway. There are small tributary streams that run into and augment the water in the *'auwai* from upslope. During the present study, this *'auwai* was followed for approximately 1,000 ft. to a point at which the water is tapped from the *'auwai* and runs downslope in a unlined ditch to feed the upslope patches at the south end (Keononalu) of the system. The original northwestern-trending *'auwai* continues parallel to the slope but is presently non-functional. It was followed for a short distance only. It is assumed to continue along the slope to the northwest. According to Mr. Sam Akina, this *'auwai* ends a short distance beyond where it is presently tapped. Along the unlined ditch are many well-constructed, rock-lined and walled, abandoned *lo'i* presently in forest. These abandoned *lo'i* are located immediately upslope from the presently cultivated Wailuanui system.

The second source of water is from Kualani Stream which parallels Waiokamilo Stream on its east side. The name "Kualani" appears on a map provided by EMI Co. Ltd. but



Taro Patches, 1934 Ke'anae, Maui (Bishop Museum)
KE'ANAE - WAILUANUI CULTURAL LANDSCAPE

Figure 14

is not mentioned in any other source of which we are aware. In Handy and Handy (1972:499) the stream is named "Hamau". Water from Kualani Stream is tapped to feed the Lākini *lo'i* of Mrs. Helen Nakanelua. The 'auwai then runs under the road to feed the central portion of the Wailuanui *lo'i*, dividing into three branches flowing northwest, southeast and straight *makai*. This source is considered to be very dependable. The ridge line at Lākini has been cut to bring water from a different watershed into the Wailuanui taro cultivation area. This system was established prior to contact, and should be counted among the engineering feats of the early Hawaiian cultivators of Wailuanui.

The third source is tapped from Waiokamilo Stream just as it crosses under the Hāna Highway at the junction with the Wailuanui Road. This *'auwai* circles back to the southwest, crosses under Wailuanui Road and feeds the northwest portion of the Wailuanui *lo'i*.

The Wailuanui system was not mapped in detail during the present fieldwork, however, portions of it were examined and documented through sketches and photographs.

The complexity of the Wailuanui system is testimony to the engineering ingenuity that shaped it. The system is by far the largest within the area, with 339 *lo'i* plotted off the 1982 aerial photograph. The design of the system is adapted to the variable topography, particularly the steepness of the terrain in the more *mauka* reaches. *Lo'i* banks were observed as high as 6 to 8 ft. The steepest part of the system today lies abandoned at the *mauka* end under the *hau* forest.

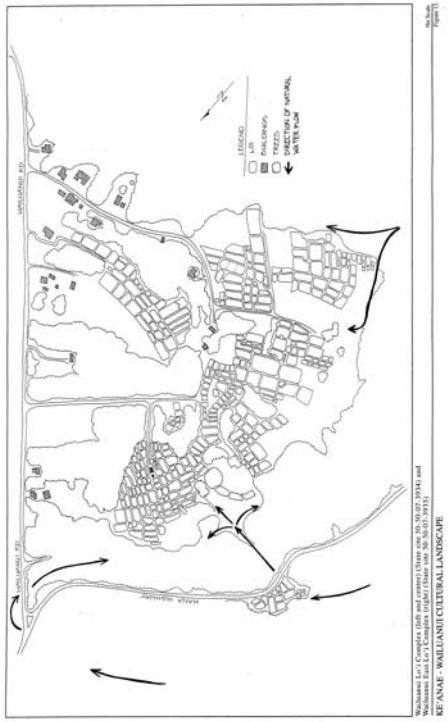
Generally, the fields are smaller at the upslope end with the larger fields to the east and southeast towards Wailuanui Stream. As the system functions today, it is confined between Wailuanui Stream and Hāna Highway in the Wailua Homesteads area. In contrast to the Ke'anae system, it displays uncultivated islands dispersed throughout. Similar to the Ke'anae system, it is separated from the main residential area.

Integrity and Continuity

Unfortunately, there is no detailed historic map of the Wailuanui *lo'i* system itself, however taro cultivation for the entire area is well documented in the 1850s Land Commission Award documents. According to an 1896 map of the *makai* portion of Wailuanui (see Figure 9), much of the central portion of the system was given to rice cultivation, although the southeastern portion fronting Wailuanui Stream remained in taro. In a subsequent 1903 map (see Figure 10) a similar pattern is shown, indicating mixed taro and rice cultivation in the northern portion of the system. According to some residents, rice growing was preferred in the larger patches because water temperature was not the crucial consideration as it is in taro cultivation. A 1936 photograph of Wailuanui (Figure 16) shows the system with considerably less tree and bush vegetation than is present today and the majority of the patches appear to be under taro cultivation. Two photographs of 1966 (Figures 17 & 18) show all of the planted patches in taro with a dramatic increase in forest growth along the periphery.

Historic Antecedents

Field reconnaissance during the study resulted in the discovery of two intact irrigation systems on the southeast side of Wailuanui Stream. A small but well-preserved system of abandoned terraces was found on the state property just south of Wailuanui Bay. A well-preserved *'auwai* was tapped from a tributary of Wailuanui Stream and runs northward along the eastern edge of the ridge separating this valley from the main valley of Wailuanui.



Waihanau Lo'i Complex (left and center) (State site 50-30-07-3934) and
Wailuanui East Lo'i Complex (right) (State site 50-30-07-3935)
KE'ANAE - WAILUANUI CULTURAL LANDSCAPE

No Scale
Figure 15

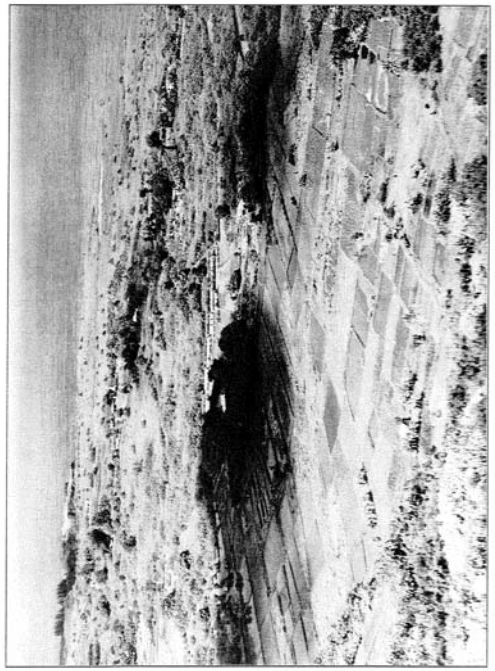


Figure 16
Wailuanui, ca. 1936 (Bishop Museum)
KE'ANAE - WAILUANUI CULTURAL LANDSCAPE

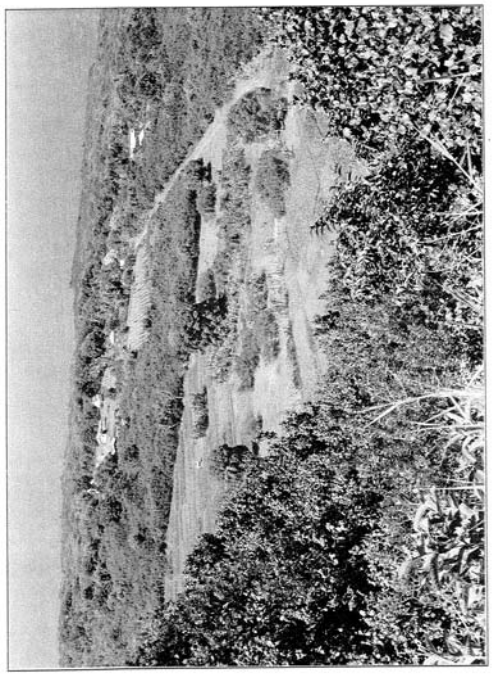


Figure 17
Wailuanui, Western Portion, June 8, 1966 (Bishop Museum)
KE'ANAE - WAILUANUI CULTURAL LANDSCAPE

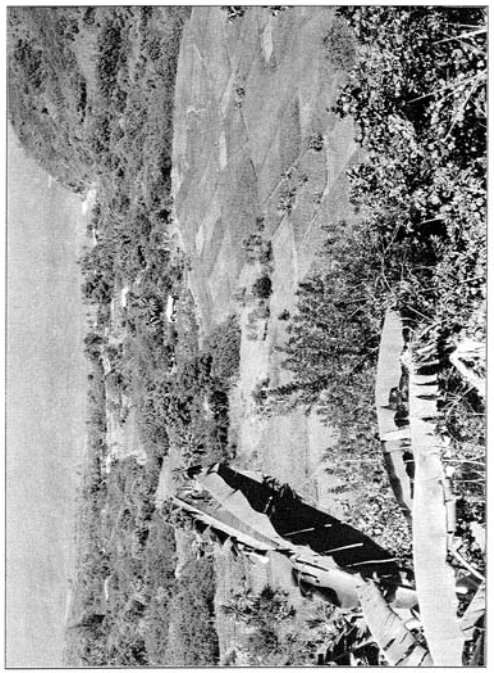


Figure 18
Wailuanui, Eastern Portion, June 8, 1966 (Bishop Museum)
KE'ANAE - WAILUANUI CULTURAL LANDSCAPE

This *'auwai* was cut directly from the soil and soft bedrock of the ridge. This *lo'i* system conforms to the location of six LCAs (4561:2; 5067; 5066; 5049:2; 4562:2; and 4772) indicated on the 1896 map.

Farther upstream, running all the way along the flat land on the south side of Wailuanui Stream, are well-developed abandoned terraces in thick forest. As many as six terrace levels were counted. The terrace walls are well constructed, some partly free standing and core-filled. An intact stone-lined *'auwai* was traced for more than 1,000 ft. Upslope of this *'auwai*, terraces were observed along the sides of two tributary streams, the flow which originally fed into the main *'auwai*. The *'auwai* was traced to within 300 ft. of the pool below Waikani Falls. Clearly, this *'auwai* tapped the pool although portions of the *'auwai* were removed by flooding.

Considering these abandoned *lo'i* systems on the southeast side of Wailuanui Stream, as well as abandoned *lo'i* on the northeast side of the stream upslope of those presently in cultivation, it is safe to estimate that at one time the Wailuanui system was nearly twice its present size. Interviews with local residents indicated no living memory of taro cultivation on the southeast side of Wailuanui Stream. Therefore, the area must not have been in cultivation within the last 50 to 100 years.

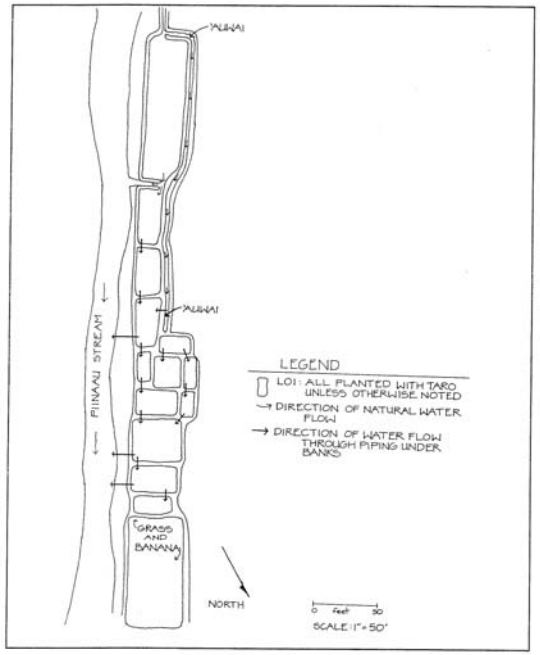
3. Ke'anae Arboretum

The *lo'i* system of Ke'anae Arboretum comprises 14 *lo'i* on the west side of Pī'ina'au Stream (Figure 19). As was documented earlier in this report, the arboretum was opened in the 1970s but its *lo'i* system, which comprises only 2 or 3 acres, is known to have been in existence much earlier, having once before been renovated (in 1946) by prisoners from the Ke'anae prison camp. The water for the system is tapped from the stream at a diversion, cut directly into bedrock, which lies 300 ft. *mauka* of the highest field. The water is channeled through a pipe over a 120 ft.-long portion of this route. The pipe empties into an open *'auwai* and then into the first field which is also the largest.

An examination and mapping of this system during the present fieldwork shows that the *lo'i* have been restored to their original configuration, delimited by the constraints of the physical setting. The fields are set in a linear pattern, parallel to Pī'ina'au Stream, along a flat natural terrace which lies 15 to 20 feet above the present level of the stream. This terrace is retained and separated from the stream by a large and impressive wall, incorporating huge boulders. The *lo'i* walls themselves are made of stone and average 1 to 2 feet high, with some as high as 3 feet. The water generally flows from patch to patch downslope, except for a separate *'auwai* that circles half-way around the upper field on the west side and continues down the west side of the *lo'i* to water three more fields. Some of the walls show core filling and in some cases PVC pipes are used for inner *lo'i* flow at the lower end of the system. These *lo'i* are not used for commercial or sustenance cultivation, but for demonstration and education purposes. Banana, breadfruit and ti are growing on the upslope bank of the *lo'i*. The *lo'i* are maintained by a full-time caretaker, a resident of Ke'anae.

Continuity and Integrity

The system appears to have retained its historic integrity. The configuration of the natural terrace on which the system occurs precludes any major alteration from the traditional system that would have been placed there. For example, the impressive retaining wall that separates the system from the stream bed and protects it from flooding is assumed to be part of the traditional design.



Ke'anae Aboretum Lo'i Complex (State site 50-50-07-3932)
KE'ANAE - WAILUANUI CULTURAL LANDSCAPE
Figure 19

Historic Antecedents

No Land Commission Awards were located on this west bank of Pī'ina'au Stream. However, a 1903 Ke'anae Flat Mauka map by S.M. Kanakanui (R.M. 2235) shows this system in cultivation. The fieldwork of the present project included a reconnaissance upstream of this *lo'i* system to locate other irrigated fields. Stream-side flats upstream for half a mile showed remains of small areas of irrigated terraces. These were not contiguous with the Arboretum *lo'i*. Downslope of the arboretum *lo'i* in the arboretum proper, are the remains of continuous, large terraced fields. Only traces of the outline of these fields remain today because they have been planted with various species of trees. Also, extensive sheetwash erosion has eliminated many of the terraces.

4. Waianu Valley

Waianu Valley is a fairly deep and straight gulch between Ke'anae peninsula and Wailuanui. The stream which courses this gulch is fed by 'Ōhi'a Spring which flows out of the ground at a major curve in the Hāna Road at the *mauka* end of the steep valley. The stream, which is certainly fed by other sources as well, has been referred to by Mr. James Hueu as "Waianu" above the spring, "Kaluanui" below the spring and "Kilo stream" close to the ocean. Other residents have also used the word Kilo to describe the *makai* portion of this valley.

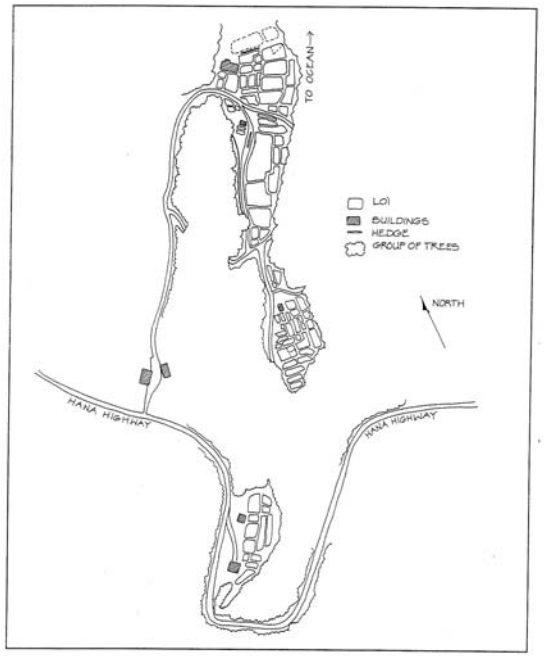
The *lo'i* system was not mapped or inspected in detail for this study. It was viewed from above on the east side of Waianu Valley and the *lo'i* system was mapped from the 1982 aerial photograph. The system consists of between 70 and 80 distinct *lo'i*, although more may have been hidden under vegetation or by shadows on the photograph. Figure 20 maps the layout of this system. At the upper end are small patches which are presently planted in watercress. These patches are easily visible on the *makai* side of the Hāna Road at 'Ōhi'a Spring. They have clearly been mechanically modified from their original configuration: the walls and *'auwai* incorporate stream gravel and boulders as well as soil, showing mechanical mixing. Downstream, the *lo'i* appear to be more intact; there are some larger *lo'i* in the central portion of the system, the largest of which measures 125 ft. *mauka*/*makai* paralleling the stream and 50 ft. east/west perpendicular to the stream. Most of the *lo'i* measure less than 50 ft. on a side and many are as small as 25 ft. Judging by the 1982 aerial photograph this system was in active use at that time. According to local residents, a shrimp-raising venture was attempted in the central and lower portion of the system, which resulted in the alteration of the original configuration of some *lo'i*.

Continuity and Integrity

It appears that most of the system is intact and maintains a traditional configuration, probably dating back to the 1850s and earlier. The upper part of the system appears to have been completely altered: the original *lo'i* configuration has been replaced with patches now used for watercress. These patches have been created by mechanical grading of the stream gravels. As mentioned, the central and lower portion of the system may have been altered for a shrimp venture, but the extent of this alteration is not known. Only a few of the patches are in traditional use for taro today. The 1982 aerial photograph shows many more patches in taro production than observed recently.

Historic Antecedents

Because of the steep configuration of the valley walls, particularly on the east side, taro production was limited to the valley bottom. There are probably not long-abandoned *lo'i*



Waianu Lo'i Complex (State site 50-50-07-3938) No Scale
KE'ANAE - WAILUANUI CULTURAL LANDSCAPE Figure 20

in the lower portion of the valley. Field search was not made to confirm this. Abandoned systems may occur in isolated areas on the west side of the stream, which is now forested, and a few abandoned systems could also occur upstream, *mauka* of the Hāna Road. A 1908 map of Waianu valley (see Figure 11) shows only two Land Commission Awards (LCAs) within the area of the *lo'i* system. Award documents mention taro cultivation, establishing the presence of the Waianu *lo'i* system in the mid-19th century and, likely, earlier.

5. Lākini *lo'i*

A small area of current *lo'i* cultivation lies *mauka* of Hāna Highway in the *'ili* of Lākini. This entire system is operated and maintained by Mrs. Helen Nakanelua (83 years) and her grandson, Kyle Nakanelua. These *lo'i* were visited on Oct. 6th, 1994 with gracious permission and guidance of Mrs. Nakanelua. The system was mapped and consists of 17 separate patches (Figure 21). The *'auwai* and banks are mainly of earthen construction, although stone foundations could be buried underneath the soil as was observed in portions of the Ke'anae system. Because of the typography, the banks were sometimes 4 ft. or more high and wide enough for several persons to walk together. This system is very well maintained. It is a crucial element of the Wailuanui system, although it is spatially separated. One of the more reliable water sources for the *makai lo'i* of Wailuanui flows through this system. Bananas, *'awa*, ti, noni, pumpkins and *pohole* fern are grown along the banks on the hillsides surrounding the *lo'i*. Mrs. Nakanelua's *lo'i* are the only ones in Ke'anae—Wailuanui that are not infested with the apple snail pest, since she is upstream of all the other patches.

Integrity and Continuity

It is documented through oral history that this system has been in cultivation for over 100 years. The mapping and inspection seems to indicate little or no alteration from a traditional Hawaiian *lo'i* system, except for the use of PVC pipes which appears in virtually every system in the area.

Historic Antecedents

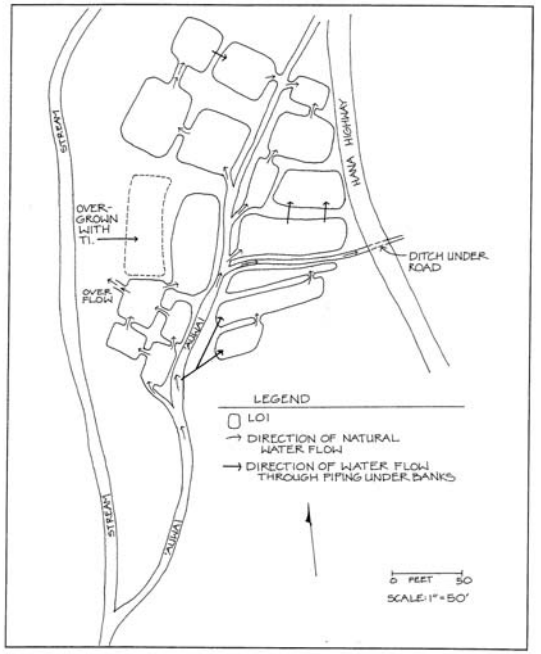
The Lākini *lo'i* have been in Mrs. Nakanelua's family for at least 140 years, and probably much longer. LCA 3472 recorded in 1849 was awarded to Kaihaa, who is Mrs. Nakanelua's great great great grandfather. This award describes a *mo'o* of *lo'i*. According to Mrs. Nakanelua there are more *lo'i* now in cultivation than there were in certain periods in her earlier life. It is likely that this system shares the same characteristic as the others in Ke'anae and Wailuanui, in that it was once much larger. It may have extended *mauka* and west from its present location.

6. Waiokamilo Stream *Lo'i* (Figure 22)

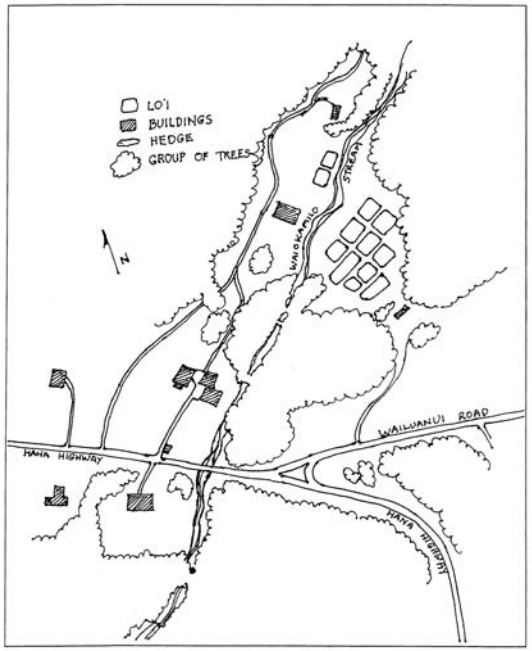
A small complex of *lo'i* is located on two sides of Waiokamilo Stream, a short distance behind the Harry K. Mitchell family compound. The group of *lo'i* - fed by water diverted from Waiokamilo Stream - is cultivated by two separate families. These *lo'i* have been cultivated for over 100 years, according to personal communications to Ke'anae resident Elaine Wender. These *lo'i* were not field checked by the study team and the layout shown in Figure 22 is based on interpretation of an October 1982 aerial photograph. This complex should be mapped in greater detail in the field at a later date.

7. Formerly Cultivated Lands in the *'ili* of Kupa'u

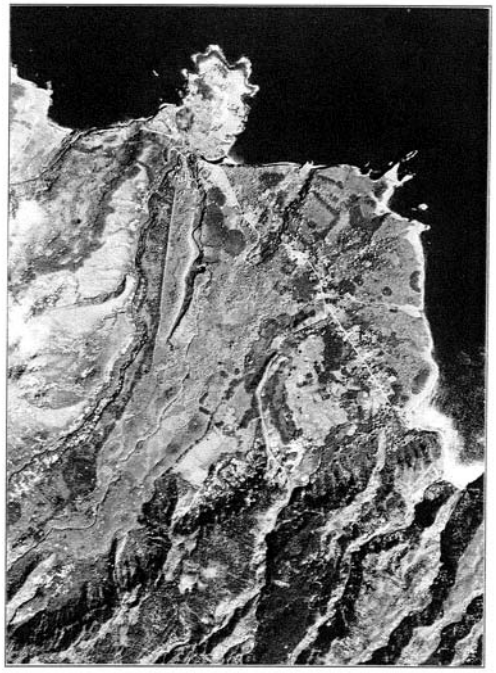
During fieldwork for the present study, the upstream end of East Waiokamilo Stream was inspected. Ke'anae residents Isaac and Gladys Kānoa accompanied the study team.



Lakini Lo'i Complex (State site 50-50-07-3936) No Scale
KE'ANAE - WAILUANUI CULTURAL LANDSCAPE Figure 21



Waiokamilo Stream Complex No Scale
KE'ANAE - WAILUANUI CULTURAL LANDSCAPE Figure 22



Ke'anae and Wailuanui September 23, 1950 (Bishop Museum) Figure 23
KE'ANAE - WAILUANUI CULTURAL LANDSCAPE

The stream is diverted; a well constructed and preserved abandoned *'auwai* runs along the base of a ridge. This *'auwai* once provided water to a large irrigated complex which was abandoned in the 1950s according to the Kānoas' testimony. The terraces are still visible in the 1982 aerial photograph. The irrigated area is estimated to cover approximately 30 to 50 acres. Presently, the terraces are quickly returning to forest. However, cultivated *lo'i* are clearly visible on a 1950 aerial photograph (Figure 23). This system is spatially separated from the Wailuanui system but shares the same stream source. It appears from the aerial photograph and from the observation of the surviving terraces that the fields were fairly large and the terrace walls were 1 to 2 ft. in height. Although there were no claimed LCAs in this area, the extent of this system, particularly the *'auwai* network, would indicate its long-term use. Similar to the other system of Ke'anae—Wailuanui, it probably has pre-contact origins.

8. Formerly Cultivated Lands in the Valley of Nua'ailua

Nua'ailua, where taro lands were still under cultivation in the early 1940s, is the next major valley to the west of Ke'anae. According to Mr. Isaac Kānoa Jr., Nua'ailua constitutes the western boundary of the Ke'anae-Wailuanui cultural area. Those farming the taro patches in Nua'ailua in the early 20th century resided in Ke'anae; its use for taro growing was discontinued when the young men of Ke'anae went off to serve in World War II. Recently Mr. Kānoa has used certain lands in the lower section of the old taro patches to grow the edible fern, while the shoreline in Nua'ailua valley is still used by fisherman. A sign at a trailhead on the *mauka* side of the Hāna Highway acknowledges that the upper region of the valley is also still used for collecting *lā'ī*, or the leaves of the ti plant (*Cordyline terminalis*).

The taro patches in Nua'ailua, which extend from a few hundred meters *mauka* of Hāna Highway and below the highway to near the inland edge of the boulder beach, have the appearance of considerable antiquity. The system of terraces was likely constructed long before the arrival of western civilization, by and for the local populace and probably includes some residential sites though none were identified in this reconnaissance.

The terraces below the highway are formed by long cross-slope walls roughly paralleling the stream; two levels were counted on the east bank. These north-south oriented terraces are then divided by short walls between and perpendicular to the long cross-slope walls, creating a rectangular pattern that steps down, from patch to patch toward the sea. Wild taro was observed in some patches. The patches appear to have been watered by patch-to-patch flow as no distinct *'auwai* was found; irrigation water was obtained from a tributary to the main stream near the east side of the road bridge. Some of the taro terraces are now buried beneath a new beach access road created by the dumping, in the valley, of fill derived from road repair work on the Hāna Highway.

Terraces above the highway on the east bank are small discontinuous wall sections, crudely constructed around medium-sized boulders on a small flood plain. These terraces are prone to severe flooding and may have been used for plantings other than taro. The west bank of the river is a talus slope with a cliff fifteen feet or higher cut by the river. This bank was free of sites in the areas inspected, except at an area just *mauka* of Hāna Highway where the *mauka*-most thirty feet of a three-foot high wall juts out from beneath a dense growth of *hau* (*Hibiscus tiliaceous*). The nature of the site was not determined. The far reaches of Nua'ailua stream were not investigated due to the possibility of flash flooding.

9. Other Formerly Cultivated Lands

According to informants, taro was cultivated in *'ili* or gulches and valleys along streams both *mauka* and *makai* of the Hāna Highway throughout the Ko'olau region. Some of the areas mentioned were: Pi'ina'au, above the arboretum; Awiowio; Pohole; Pāhoa; and Waipi'o. These patches were probably taken out of active production due to declining population and to consolidation of residences and taro patches into the Wailuanui area during the land awards of the late 1800's .

B. Other Vegetation (Figure 24)

1. Ornamentals

The Ke'anae-Wailuanui landscape has a garden-like quality, with both natural and cultivated ornamentals blending into taro *lo'i* and other cultivated fields. Because there are few fences the scenery has an open, uninterrupted character. The scale of cultivation is small and field sizes and distances from residences are generally short. Additionally, certain plants are found repeatedly in many yards and along roadsides. These plants include: many varieties of ti (*Cordyline terminalis*), various kinds of croton (*Codiaeum variegatum*), plumeria (*Plumeria acuminata* sp.), gingers (*Zingiber* sp.), heliconia, and various ferns, especially hapuu (*Cibotium menziesii* and *chamissoi*). The use of red ti as an ornamental is especially noticeable since this plant is used profusely throughout the region. It almost serves as a signature ornamental for the community.

In addition to the above plants, several tall fruit-bearing trees and palms are found repeatedly in residential areas. These are coconut palms (*Cocos nucifera*), mango (*Mangifera indica*), avocado (*Persea americana*) and various types of citrus, including tangerines and oranges.

It should be noted that plants used ornamentally frequently possess other traditional and current uses in Polynesian and Asian cultures. For example, the hala tree (*Pandanus* sp.) was used for basket weaving, cordage and medicine. Also, fruit-bearing trees and bushes as well as edible and medicinal herbs are often intermixed with more strictly ornamental plants. Banana varieties (*Musa* sp.), guava (*Psidium guajava, cattleianum*), and *noni* (*Morinda citrifolia*) are commonly found in gardens and along *lo'i kalo*, functioning as ornamental windbreaks or boundary markers. Other frequently used landscape plants are: Manila palm *(Veitchia merrillii)*, African tulip *(Spathodea campanulata)*, gardenia or kiele *(Gardenia Jasminoides)*.

2. Endemic or Indigenous Plants

The Ke'anae Wailuanui landscape has been subject to human intervention for centuries. Therefore, no significant stands of endangered endemic or indigenous plant colonies were identified. However, stands of *olonā* and *'ie'ie* growing in treetops, both indigenous plants of Hawai'i, can still be seen along the roadside from Wailuanui to Nāhiku.

3. Forest

Since the Ke'anae-Wailuanui area is isolated, with a small population, the cultivated landscape is relatively small and much of the region is covered with forests. The forest effectively represents the edge of human control of the landscape, the boundary between forest and field changing with the size of the population. In general, there seems to be a long-term decline in the area of cultivation over the last 100 years or more with the forest regaining much of the formerly cultivated lands.

Olona along Hana Highway

Home with ornamentals

The Ke'anae-Wailuanui landscape has been extensively modified by man. At the time of Western contact, the lower regions had already been stripped of the native wet rainforest cover of *'Ohia lehua* (*Metrosideros collina*), *Kopiko* (*Psychotria* spp.) and *Hame* (*Antidesma platyphyllum*). Much of the lowlands below 1,000 feet were cultivated or covered with Polynesian introductions such as *Hau* (*Hibiscus tileaceaus*) and *Kukui* (*Aleurites moluccana*). Much of the land was also in grassland. Mr. James Hueu recalls that the ridges between Ke'anae and Haiku were a mix of shrubs and grassland before the Civilian Conservation Corps (CCC) planted the area during the 1930s. Oral tradition indicates dry land cultivation and grazing in upper Ke'anae Valley (Figure 25).

The current forest cover is predominantly introduced species. On the Haiku side of the region, the most common trees are various species of Eucalyptus, Formosan koa and paperbark (*Melaleuca leucadendra*) that were planted by the CCC. Above Ke'anae peninsula, *Hau*, Christmasberry (*Schinus terebinthifolius*) *Kukui* and Guava (*Psidium guajava*) predominate. Moving towards Nāhiku the Para rubber trees (*Hevea brasiliensis*) planted around 1905 become noticeable. The predominant mix is still the CCC-introduced species such as Eucalyptus and paperbark.

Kukui nut (*Aleurites moluccana*), breadfruit (*Artocarpus communis*), coconut, and hala are noticeable in forested areas, even well above the Hāna Highway and outside of areas presently settled or frequented by residents. These trees may mark formerly settled areas or circulation routes in abandoned areas now overgrown with forest.

C. Circulation Networks

Circulation networks are generally dominated by major roadways for automobile traffic. This is certainly true for the Ke'anae-Wailuanui region. However, in a cultural landscape it is important to look at circulation patterns in light of the available technology and infrastructure over time. In an isolated place such as Ke'anae it is also important to evaluate historic methods of transport and movement in comparison to the current conditions. Before the Hāna highway was completed, the Pi'ilani trail the ditch trail and canoe were the main modes of transportation to and from Ke'anae. Canoe was the fastest way to get to Nahiku. To go to Hāna or Kailua, the ditch trail was faster than the old Pi'ilani trail. A trail along Kualani ridge, paralleling the current highway, was the route from Wailuanui to the ditch trail. Another trail down from the ditch trail to Ke'anae came out through the arboretum area.

The Hāna Highway (State Highway 360) is clearly the most important roadway in the region, providing a relatively convenient access to the more urban areas westward to Kahului and eastward to Hāna, the main settlement community in East Maui. This roadway right of way varies along its length but it is generally a two-lane roadway between 25 to 35 feet wide. Bridges along its route are generally narrow (about 20 feet) with occasional one-lane crossings. Before the highway was completed in 1926 the journey to the Ke'anae-Wailuanui region was accomplished over wagon roads or horse trails. An alternative means of travel was by steamer with a landing at Ke'anae when ocean conditions allowed. A report by the Hawaii Heritage Center notes:

> As early as 1900 the Maui News editorialized in favor of a good wagon road connecting Hāna and Central Maui. Five years later a rudimentary road in the Nahiku and Ke'anae areas was completed. Because of the extreme difficulty of the terrain, however, its cost was prohibitive and the roads were inadequate for

Ke'anae Valley - Line of CCC Planted Trees
Foreground - Introduced forest cover

Forest above Ke'anae Peninsula
Foreground - Abandoned loi kalo

frequent automobile traffic, The 1905 SPW report stated that "very rough country is encountered in these districts. On account of the great expense of road construction, the road has been made as narrow as possible in order to construct, with the money available, the maximum length of road."

East Maui's tourism potential was recognized as early as the turn of the century and was one of the incentives for the construction of a belt highway to Hāna. Development of the highway was accomplished in segments; construction proceeded at different times in different places depending on funding. As early as 1905 and 1908, concrete bridges were built near Nāhiku to support a proposed 60-mile long, paved road between Hāna and Kailua. A narrow road and bridges were constructed from Kailua to Nua'ailua by 1912. On the opposite side a road from Hāna to Nāhiku-Ke'anae was built by 1915. However, this road dead-ended in the Ko'olau Forest Reserve.

In 1914 Territorial Governor Lucius Pinkham disapproved further funding for the belt road. Construction recommenced during the 1920s when new bonds were floated to finance the road's completion. A.P. Low, County Engineer from 1916 to 1928 appears to have played an important role in the construction of the final Ko'olau segments of the Hāna Highway through the Ke'anae area. Once completed, the road became the primary means of access between Ke'anae and the rest of Maui. The completion of the road caused the decline and demise of the ferry service to Ke'anae.

There are two other important paved roads that play a significant role in area circulation: Ke'anae Homestead Road and Wailua Homestead Road. Ninety percent of all residences and public buildings in the region are located along these roadways and a short branch road off of Wailua Homestead Road.

Most of the other roads in the area are unpaved dirt roads better accessed by the four-wheel drive vehicles which are owned by many residents. These unpaved dirt roads are important to the local residents. Many serve to link residences and fields to the main roads. Other link hunting, gathering, fishing and other traditional practices areas to the main roads and make these areas readily accessible to the residents. This is especially true of roads that lead to the ocean along valley bottoms and roads such as Pi'ina'au Road and the various ditch service roads which provide access to *mauka* regions in upper Ke'anae Valley and other *mauka* areas.

A noticeable circulation pattern associated with the roads is the access to the taro. In both Ke'anae and Wailuanui the roads are generally located along the perimeter of the cultivated *lo'i*. While no historical records were found to explain the reason for this pattern it seems reasonable to speculate that this pattern reflects the fact that the *lo'i* were there before the vehicular roads. The *lo'i* are cultivated in small patches with multiple ownership. The water is shared through a single integrated network traveling from one *lo'i* to the next. Roadways built into this system would have altered the flow of water and taken up valuable lowlands that could be used for cultivation.

Circulation networks also involve walking paths. In contrast to the roadways, the walkway systems are integrated through the *lo'i*. In an area such as Ke'anae where fences are scarce and nearly everyone knows their neighbors, people walk through each others' lands and fields and the pedestrian circulation patterns extend beyond the paved roadways to footpaths along streams and through fields and vacant lands. The pedestrian system

probably developed in association with the indigenous taro culture, long predating the vehicular network. It reflects the community land management system of the native Hawaiian culture.

An additional circulation network component is the Ke'anae Landing (Figure 26) which constituted the area's link to sea-borne commercial transportation until the 1920s. Remnants of the landing are clearly evident along the road accessing the peninsula. Concrete stair remnants connect the flat area above the high-water mark and extend to mean sea level. Concrete footings with rusted metal anchors are still in place. These footings and anchors held the boom equipment used to load and unload goods onto the ferries, which, because of rough shoreline conditions, anchored offshore. A small boat would convey a rope and pulley system from the ferry to the landing where it could be connected to the boom. Goods were transferred back and forth with this system which was maneuvered to adjust for wave conditions. *Kupuna* James Hueu remembers watching these activities and helping in the operations. Some rusted chains and mechanical fragments from this system are still located at the landing. Anchors and footings similar to the Ke'anae Landing remnants are also found at Nāhiku Landing on the edge of the traditional practices area. Ke'anae Landing was placed on the State Inventory of Historic Places in 1992, designated site 50-50-07-2957.

Circulation networks support the pattern of land use. Historic maps show previous roadway and pedestrian path alignments that reflected earlier patterns. The 1903 Ke'anae map (see Figure 8) suggests the importance of the Ke'anae Landing during a time when the ferry was a major mode of transportation. The old King's Highway, the Pi'ilani Highway, follows alignments that reflect the influence of geography and the pattern of settlements at the time; coming to the shore at Wailuanui Bay and rising above the ridge before the approach to Nua'ailua Valley.

D. Buildings, Structures, Non-Structural Facilities, and Objects

1. Residences (Figures 27-31)

Ke'anae-Wailuanui is sparsely settled. Many of the residential structures are over 50 years of age. Figures 27 & 28 show the area's buildings with structures over 50 years of age identified. The residences of significance are all built of wood and designed in the plantation era style of architecture. Typical features of this style include hip roofs made of corrugated metal, wide overhangs, double hung windows with wide trim, and porches and verandas. Screen windows and doors are typical. Houses are generally built on posts with crawl spaces below. Crawl spaces are generally partly screened with horizontal or vertical, wooden slat aprons. Walls and floors are usually constructed with board and batten. Colors tend to be earth tones with a contrasting or complementary trim. Most houses are modest in size ranging from around 500 to 1,000 square feet with older homes tending to be smaller.

While newer homes in the area are generally compatible with the older homes in architectural style and scale, there are significant differences based on periods of construction. Older, traditional homes are those generally built before World War II.

a. Pre-1900

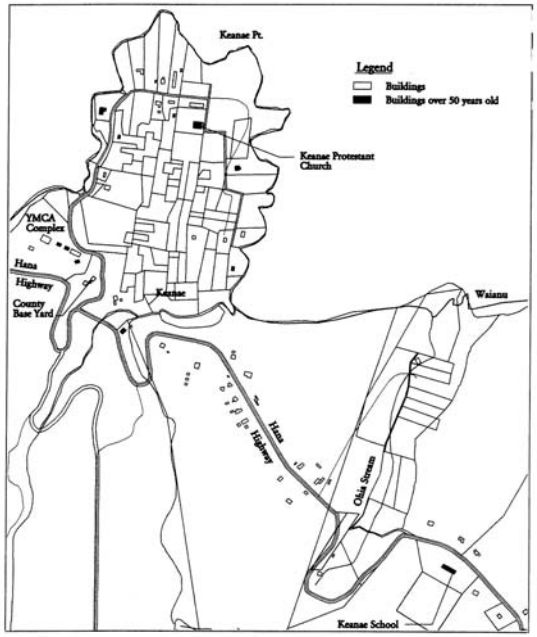
Historic photographs taken in the late 1800s and early twentieth century show traditional Hawaiian grass houses. An 1883 photo of Wailuanui show that most structures in this period were grass thatch houses with only a few wooden buildings (see Figure 6). It is likely that use of these grass houses began to decline around the turn of the century. Later

Ke'anae Landing

Nahiku Landing

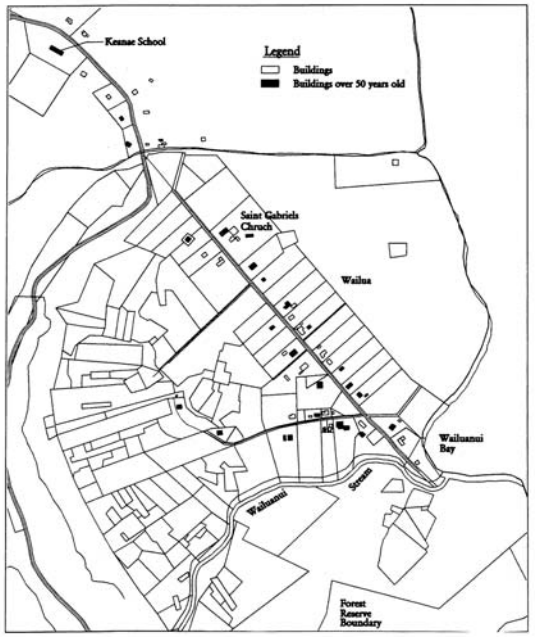
Ferry Landings

KE'ANAE - WAILUANUI CULTURAL LANDSCAPE Figure 26



Existing Buildings (Ke'anae) With Structures Over 50 Years of Age

KE'ANAE - WAILUANUI CULTURAL LANDSCAPE Figure 27



Existing Buildings (Wailuanui) With Structures Over 50 Years of Age

KE'ANAE - WAILUANUI CULTURAL LANDSCAPE Figure 28

The "old" house

House on Rice Mill Site

Older Homes 1900-1946

Newer Homes

Residences

KE'ANAE - WAILUANUI CULTURAL LANDSCAPE Figure 29

Residences

KE'ANAE - WAILUANUI CULTURAL LANDSCAPE Figure 30

Residences

KE'ANAE - WAILUANUI CULTURAL LANDSCAPE Figure 31

photographs and interviews indicate a settlement pattern into "regular" wooden homes in the early part of this century.

In Wailuanui, Enos Akina remembers growing up in "the old house" adjacent to the Apolonia Day residence before building his present house in the 1920s. Several of the older residents in their eighties and nineties speak of the same "old house" as the oldest in Wailuanui and the site from which many of them grew up and moved out into their own homes in the 1920s and 30s. The specific age of the old house is not known with certainty, but one account places its age at 134 years (Apolonia Day interview). Given other sources, this seems possible. The roof of this house has fallen in, but its character is still discernible in photographs and from remains (see Figure 29).

b. 1900-1946

All of the old houses still standing and occupied appear to date from this period. The Florentine Ramos house, dating from 1907, seems to be the oldest of these. A survey of Maui County building records indicated a preliminary count of 36 structures dated 1946 and earlier. This is surely an underaccounting as many structures have no construction date assigned to them. All of the residential structures in this period are of wood construction.

These older residences have metal hip roofs with occasional gable ends. They have vertical siding and are built on posts. Some of the vertical siding extends to the ground. Most have horizontal slats (1" x 3") across the crawl space below. An atypical feature of these older homes is the use of asphalt shingles on all or most of the walls of the buildings. This is not a common feature in Hawai'i residences and may reflect the need for additional protection against the rain in this wet Koolau district. The use of sheet metal siding on some other structures from this period seems consistent with this theory. These homes also have wider window trims (3" or wider) bordering the common double hung glass windows. These windows also tend to be smaller than those in newer homes. The living rooms of these older homes tend to be smaller and darker while porches are generally more substantial and are often partly enclosed. This seems to reflect an earlier lifestyle where activities often focused outdoors and the large porch served as both an indoor and outdoor space. Many of the older residences have a more complex shape and floor pattern than the newer homes. Shapes range from the simple rectangle to multiple polygons. This is probably reflective of changes and later additions as families grew and shrank. A final note of importance is the relationship of the house to the garage. The relationship of the older homes to the carport or garage is irregular. In many cases, there are no adjacent carports. In other cases there are free-standing carports nearby. In a few cases the carport is immediately adjacent. These differences are probably reflective of car ownership and use patterns of the residents and reflect a time when auto ownership was not such a universal phenomenon.

c. Newer Residences (Post WW II) (see Figure 31)

Most of the newer homes are compatible with or complementary to the older houses. However, there are significant differences. Roof designs tend more toward single pitches with gable ends. Roof materials have expanded to include wooden shingles, asphalt and tile along with traditional metal sheets. House construction material has begun to include masonry in some or all of the structure. Window trim has become narrower and less significant. Window styles have changed to jalousies and picture windows rather than the old sliding or double hung sashes. In most cases porch spaces have shrunk and function for access and circulation rather than as a living spaces. Living rooms have become larger, probably reflecting a more indoor lifestyle. Carports are either built into the house or immediately

adjacent. The influence of car ownership and television - which have affected employment and lifestyle patterns - is visible in the evolution of residential architecture. Newer homes are also more likely to have fences around them.

2. Public Buildings and Facilities

Public buildings and facilities are sites in and around which community activities are conducted, or which are focuses of community traditions. While none plays a central role in the Ke'anae-Wailuanui community, most have long histories as traditional meeting places for the citizenry. These buildings and facilities include: two churches, the Ke'anae School, the YMCA camp complex, and the Ke'anae Arboretum.

a. Churches

The two active churches in the study area - Ke'anae Congregational Church on Ke'anae peninsula and Saint Gabriel's Church in Wailuanui - were built around 1860 as part of the early missionary expansion on Maui. With their steeples, the church buildings are the tallest buildings in the landscape.

The Ke'anae Congregational Church is a good example of an early stone missionary church constructed with indigenous material (Figure 32). The church was constructed in 1860 but final improvements were not completed until 1863. It has smaller windows than Saint Gabriel's and short clipped eaves, influences from the New England missionary architecture. The rock walls are unpainted and frame rectangular double hung windows. Buttresses have been added to the walls to stabilize them. The corrugated metal roof is framed with wooden members. A small rectangular steeple projects above the entrance of the church.

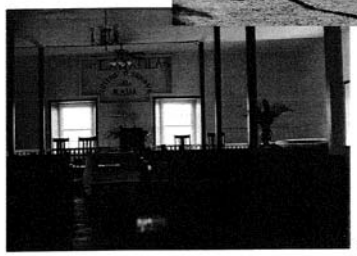
The church was renovated in the 1960s and asphalt tile shingles cover the wall below the gable roof above the stone wall. An inscription - "Lanakila Ihiihi O Iehova Ona Kaua" - was uncovered during the renovation. Translated, it means "Sacredness, Success of Jehova, the Son of God". Previously there was a society hall in this complex but it was destroyed in the 1946 *tsunami*. Presently, there is a newer structure that serves as a storage/meeting facility between the road and the historic church.

Saint Gabriel's Church (Figure 33) - located along Wailuanui Road near the entrance to Wailuanui from the Hāna Highway - is comprised of two sanctuary structures. Both are historic. The smaller structure, the white stuccoed church next to the cemetery, was built in 1860 and has been called the "miracle church" because of an incident at the time of its construction. A tradition recounts that a Protestant church was being built with coral rocks washed on to the shore during a series of unusual storms. But after the builders of this church selfishly kept all the rocks, claiming that it was on their side of the land, another storm washed all the rocks back into the ocean. Subsequently, rocks for the "miracle church" were washed back on to the Catholic side of the land and while none returned to the Protestant side.

The "miracle church" was the original sanctuary for Saint Gabriel's Church. It is associated with other early Catholic churches in the East Maui region: Saint Joseph's at

Back View

Front View



Interior of Sanctuary

Ke'anae Congregational Church

KE'ANAE - WAILUANUI CULTURAL LANDSCAPE

Figure 32

"Miracle Church" Our Lady of Fatima Shrine

"Miracle Church" - Interior

Saint Gabriel's Church, Wailuanui

KE'ANAE - WAILUANUI CULTURAL LANDSCAPE

Figure 33

Kaupō and Saint Peter's at Pu'uiki, just outside of Hāna. In 1937, the second and larger church building was constructed. In 1950, the original church was rededicated as the Shrine to Our Lady of Fatima.

Saint Gabriel's Church is constructed of materials similar to those used for Ke'anae Congregational Church but its architecture is different. It is one of the few stone churches in Hawai'i with a gambrel roof. The gambrel roof has raised speculation that the architect is the same Catholic priest, name unknown, who designed the only other church of this period with a gambrel roof: the Saint Joseph's at Kaupō. It is possible this represents the Belgian or French influence of the Catholic Church whose best known representative in Hawai'i is Father Damien.

The white stucco walls of coral limestone are reminiscent of Mediterranean architecture but the steep pitched roof shows a New England or Northern European influence. Some have said the design is Portuguese but its construction predates the arrival of Portuguese to Hawai'i. The blue stenciling on the interior walls is also a unique feature of this building. The first mass was held at Saint Gabriel's on Christmas day 1860. This church has just been renovated and is in excellent condition.

That Saint Gabriel's is Catholic and Ke'anae Church is Protestant may have been based on historic circumstances. To this day the residents of Wailuanui are predominantly Catholic and the residents of Ke'anae tend to be Protestant. The previously detailed episode regarding the 19th century march of Catholic converts through East Maui (see Cultural and Historic Context section above) may explain this religious separation, as several of these converts, according to some present-day Wailua residents, later settled in Wailuanui and built Saint Gabriel's Church.

Other churches were also founded within Ke'anae and Wailuanui but have not lasted (Figure 34). The oldest is the previously mentioned Protestant Stone Church ruins in Wailuanui. Today the stone walls still stand with doorways and window openings. The structure has no roof but, in proportions, fits into the classic church forms of the period. The ruins are hidden by a thicket of *hau*.

The Lin Hing Society building at Ke'anae has been referred to as "The Buddhist Temple" by many of the residents. While not exclusively religious, it supported some of the cultural and religious traditions of the Chinese residents of area. This structure was a two-story, wooden building and is largely destroyed, buried under roadwork fill.

The last historic period religious building was the Mormon Church meeting house which was a converted residence. Constructed in 1934, the facility is no longer active as a church. As recently as 1974 there were five church members. The former church building is a green and white wooden structure with wall shingles, located *mauka* of the Hāna Highway just west of Waiakamilo Stream. The building is currently used as a residence (Figure 34).

b. Ke'anae School (Figure 35)

Ke'anae School was originally located on the peninsula next to the Ke'anae Congregational Church. The present school site resulted from a land exchange in 1909 between the Territory of Hawai'i, Ben Laka Peniamana and Kamalawalu Wilkins and was built in 1912 by contractor Hugh Howell.

Protestant Stone Church Ruins-
Hau thicket

Mormon Meeting House

Religious Structures

KE'ANAE - WAILUANUI CULTURAL LANDSCAPE

Figure 34

Ke'anae School

Ke'anae Students

Public Buildings

KE'ANAE - WAILUANUI CULTURAL LANDSCAPE Figure 35

Ke'anae School is a long, elevated single story wooden structure with corrugated metal roofs. The main portion was constructed during the plantation era and its architecture reflects this period. The front facade is defined by a long lanai under the corrugated roof which connects rooms along the length of the building which open out onto the lanai. The gable roofs have vents on the ends. Walls are board and batten. The building colors are green and white, typical of plantation style architecture.

The school is a rare example of a surviving plantation style rural school built with simple wood construction. In the 1920s Maui County adopted a policy of building schools with masonry construction. As a result of this policy, most historic schools in Maui are of masonry construction. Ke'anae School was added to the Hawai'i Register of Historic Places in 1992.

From its earliest days the school served a widely scattered community and housed many grade levels. Many students lived with relatives nearby to avoid travelling over great distances by difficult trails. Students traveled from as far away as Wahinepe'e, at the 10- and 11-mile markers on the present Hāna Highway. The student population has changed with the population in the region. A 1907 Maui News article reported that Ke'anae School had 63 students. Presently, there are less than a dozen students from kindergarten through grade three. The older students travel daily to Hāna School to finish their education.

Ke'anae School is the smallest public school in the State of Hawai'i and there has been pressure to close it (see Cultural and Historic Context section above).

c. Ke'anae YMCA Camp Complex (Figure 36)

The YMCA camp complex began as a prison base camp for laborers building the Hāna Highway around the turn of the century. In 1934 the site was converted to a base camp for the Civilian Conservation Corps (CCC). Eventually, the YMCA received the lease in 1949. A portion of the site is retained for use as a base yard by the Maui County Public Works Department.

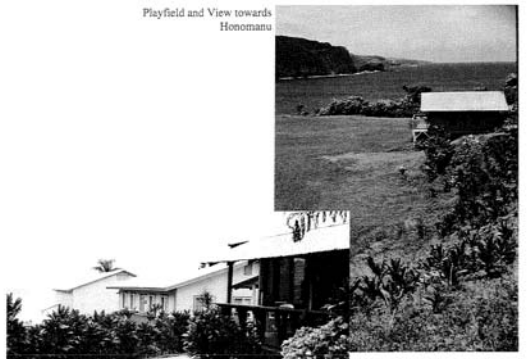
The YMCA complex is a group of wooden buildings constructed in the plantation style. The oldest remaining structure in the complex is the manager's residence which was built in 1934. Two other buildings are of comparable age, built in 1935 and 1939, and are used as offices and meeting/activity rooms for the YMCA. The newest building on the site was constructed in 1981. The largest building on the site is the gymnasium, which was re roofed and extensively repaired in 1994.

Despite the range of assigned dates of construction (from 1934 to 1981) the architectural styles are remarkably compatible. Mr. James Hueu recalls that the older structures were constructed between 1925 and 1928. These older structures have some railing and hurricane window details that are slightly different but, overall, the complex retains architectural integrity. All roofs are of corrugated metal and all structures are post on pier with hip and gable roofs. The color scheme is also consistent with this style of architecture.

d. County of Maui Corporation Yard

The County of Maui baseyard is used for storage and staging for county public works activities and responsibilities. Two older wooden structures are used for offices and

Playfield and View towards Honomanu



YMCA Complex

Kupuna Discussing Place Names at YMCA

Ke'anae YMCA Complex

KE'ANAE - WAILUANUI CULTURAL LANDSCAPE Figure 36

equipment storage. Though originally part of the YMCA complex, the yard has been a separate facility since 1949.

e. Ke'anae Arboretum

The Ke'anae Arboretum, along with Ke'anae landing, and the lookout points are significant non-structural public facilities in the cultural landscape area. The Arboretum is not classified as historic, as it was created in 1971 by the Department of Land and Natural Resources. However, it is a public facility and there are prehistoric *lo'i* in the arboretum. Deliberate plantings of trees in this area date from 1942 and today the arboretum possesses a wide variety of tropical forest flora from many parts of the globe such as Malaysia, Africa and South America. Most are introduced tropical species. A list of trees planted in the arboretum is included in the appendix of this report.

3. Roadside Stands

There are no retail commercial establishments serving the community in the Ke'anae-Wailuanui area. Historically, when the ferry was active and for a time thereafter, there were stores and warehouses near the Ke'anae Landing. Also, long-time residents recall neighborhood stores such as the Ching Store along the Hāna Highway that serviced the community. At one time there was also a movie theater located adjacent to Ching store.

Two permanent roadside stands are the closest equivalents to commercial stores currently operating in the area: "Uncle Harry's Hawaiian Crafts and Fresh Fruits" and "Waianu Store", both are located along the Hāna Highway, one *makai* and one *mauka* within a short distance of each other, on the upland area between the lower elevation areas of Ke'anae peninsula and Wailuanui Valley.

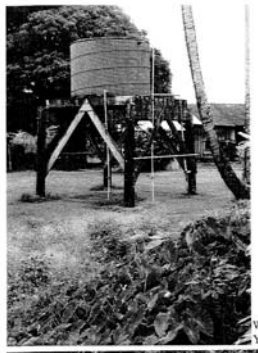
Both stands sell fruits, flowers, crafts, snacks, conveniences and drinks. The fruits and flowers are products of the local economy. While local residents also stop by, both stands are geared to drive-through resident and tourist traffic on the highway. The facilities are simple, free-standing wooden sheds located near adjacent residences. Colors and designs match the general pattern of the community. The parking spaces are flat, dirt and gravel areas. Waianu Store also provides picnic tables and benches in a shady place adjacent to the store.

4. Accessory Structures (Figure 37)

Many accessory structures are found in the landscape. Within the system of cultivated *lo'i* many small, free standing sheds are constructed to store supplies and tools. Some small shelters are also found in these fields. Several home sites in the area have small pig pens and chicken coops in the back yard between the house and the fields. Storage sheds, open carports and water catchment facilities are generally located near residences. These structures are generally made of wood and have corrugated metal roofs (Figure 37).

5. Bridges (Figure 37)

There are nineteen bridges which carry the Hāna Highway in the region claimed for traditional cultural practices by the residents of Ke'anae and Wailuanui. The distance covered by this winding road is less than six miles in a straight line; it measures approximately 10 miles on the ground. The number of bridges, occurring at an average of half-mile intervals, required to complete the Hāna Belt Road is unusual and evidences the significance of rain, topography, streams, and erosion which isolated the Ko'olau region from overland traffic for decades.



Water Tank - YMCA/County Corp Yard

Waikani Stream Bridge c. 1926

Accessory Structures and Bridges

KE'ANAE - WAILUANUI CULTURAL LANDSCAPE Figure 37

Seventeen of the 19 bridges found in this region are classified as historic in a federally mandated study:*Historic Bridge Inventory and Evaluation, Islands of Maui and Molokai* (Hawaii Heritage Center 1990). The remaining two bridges were constructed in 1930, but were rebuilt in 1974. The 17 historic bridges, grouped by date of construction, include:

1911 Honomanū, Nua'ailua
1916 Pi'ina'au, Palauhulu
1920 unnamed stream
1920 Waiokamilo
1926 Waikani, East Wailuaiki, Kapiliula, Puakaa, Kapaula, Hanawī, East Hanawī, Makapipi, Kūhiwa
1937 West Wailuaiki, Waiohue

In 1926, the year when nine bridges were constructed, Maui County used federal funding to complete the Hāna Belt Road and solidify reliable access from Hāna to Kahului, central and west Maui.

The Waikani Stream Bridge, across Wailuanui stream, is especially noteworthy; it is described in the *Historic Bridge Inventory and Evaluation* as:

> ...one of the most impressive bridges on Maui. The superstructure is typical of open railing, concrete design of that era...The substructure is visible from the road and the bridge itself is located at the head of a dramatic valley....The bridge has one spectacular span with a maximum span length of 83 feet. The structure length is 108 feet....the surface of the roadway is approximately 50 feet above the stream bed which curves and thunders down to Wailua Valley, and eventually into the Pacific Ocean....Built in 1926, the Waikani bridge is unique on Maui for its structure type of continuous concrete arch-deck. Seen from the side, the substructure is an excellent example of the arch-deck design. The bridge is one of the most aesthetically appealing on Maui. The dramatic use of the single 83 feet long arch gives the Waikani Bridge a spectacular appearance and compliments the dramatic rugged ravines and mountains of scenic Hana Highway....Waikani is aptly named, for it means sounding water. (Hawaii Heritage Center 1990:41)

The Waikani Stream Bridge, along with the Pi'ina'au Stream Bridge, the Palauhulu Stream Bridge, and the Waiokamilo Stream Bridge are all located within the smaller Ke'anae-Wailuanui cultural landscape boundary.

6. Cemeteries

Historic cemeteries are located next to the two remaining churches and are still in use by the local community. In the past other burial areas were also used. In Wailuanui there was a Chinese cemetery near the entrance to the valley, located on TMK parcel 1-1-04: 45. Moses Lum Hoy, who was born and raised in the area, stated that the cemetery was on the hillside because that is where Chinese typically place their burials. The site is presently abandoned; the remains have been reburied in other locations. There is a small private cemetery along the edge of the taro *lo'i* at Ke'anae peninsula.

The *Maui County Cemetery Directory*, prepared by Nanette Napoleon Purnell for the Maui Historical Society in 1990, documents these four cemeteries. The cemeteries project

field workers compiled data on tombstone inscriptions, but did not record unmarked graves, or early Hawaiian burials. Excerpts from the directory, listing names and dates as old as 1844 which were copied from tombstones, are included in Appendix H.

Other burial areas, some of which date to the precontact era, are located along portions of the Wailuanui shoreline. Mr. James Hueu also mentions finding many bones near the site of the YMCA camp and speculates that it was a burial or the site of some great battle in the past.

E. Clusters

Clusters are groupings of buildings and other features which result from function, social tradition, climate or other influences, cultural or natural. The Ke'anae-Wailuanui region has several types of clusters that are unique to the region.

One special cluster consists of the buildings in the YMCA camp area. There are five buildings associated with the camp and two buildings used by the County of Maui. This cluster of buildings was established around near the turn of century and three of the structures in the complex are over 50 years old. The most recent buildings have been constructed in the last fifteen years. Through many transitions in use, the site has remained in public or quasi-public use and the architecture has remained consistent.

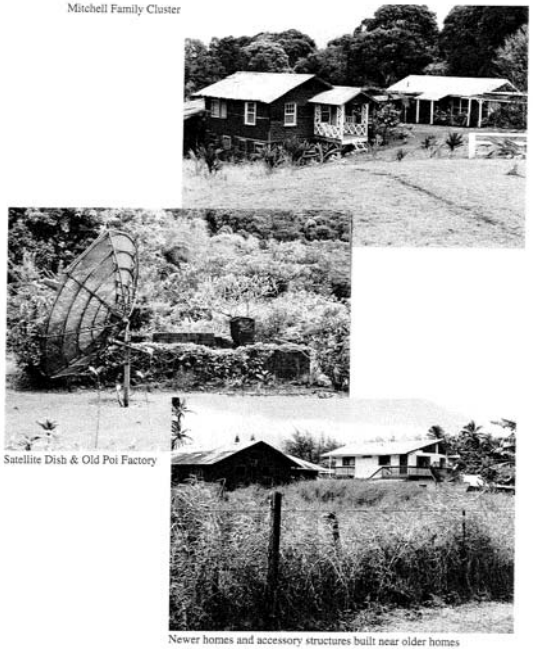
Religious clusters are associated with the two churches: Ke'anae Congregational Church on the peninsula and Saint Gabriel's Church in Wailuanui. Both churches have cemeteries next to their worship halls. There are also carports and caretaker cottage/meeting facilities at both sites.

Saint Gabriel's is a complex of five buildings including the 1860 "miracle church", a newer sanctuary, a priest's residence and two auxiliary buildings. A small cemetery has been placed adjacent to the miracle church which is officially called the Shrine in Memory of Our Lady of Fatima. It was recently restored with funds and labor provided by a private benefactor.

Another type of cluster is associated with agriculture and includes residences, carports, storage sheds and small structures. According to local residents, pigs were a common part of the area lifestyle. Pigs were fed the cut tops of the taro which was not used for replanting. This top was cooked with a mash called *haha* and fed to the pigs. The pigs, in turn, were cooked in an *imu* and eaten during *luau* for holidays and special events. Nearly every family had pigs, chickens and dogs, and the associated structures for their care and feeding.

In many instances there are newer houses and structures built on lots with older houses. Both roadside stands are free-standing structures on large lots with other structures and residences on them. Common additions are garages, storage sheds and newer homes in association with older residences. These clusters represent accommodations to evolving needs of extended families as family sizes and composition changed along with economic and lifestyle changes. Sometimes the older structures or houses are demolished or abandoned but in many cases they remain occupied until they become structurally unsound. The evolution is also seen in changes such as a satellite dish antenna being placed next to an old poi factory which is next to an old but occupied residence (Figure 38).

Mitchell Family Cluster



Satellite Dish & Old Poi Factory

Newer homes and accessory structures built near older homes

Residential Clusters

KE'ANAE - WAILUANUI CULTURAL LANDSCAPE Figure 38

F. Internal Boundaries

Most of the boundaries in the region are natural, such as streams, ridgelines, cliffs and the ocean. It is interesting to note that the *ahupua'a* on Maui extend from stream to stream, rather than from ridge to ridge as they do on O'ahu or from *pu'u* (hill) to *pu'u* on the island of Hawai'i or from *lae* (point) to *lae* on the island of Moloka'i.

Manmade boundaries that pertain to the cultural landscape are primarily roads, irrigation features and vegetation lines. There is a noticeable lack of fencing and walls, creating an open landscape. Fences in rural areas are generally the result of ranching, to keep animals in and poachers out. Ranching has not been a prominent use in the region and most people keep the few animals they own penned or tied to a post or tree.

Property boundaries are generally marked by vegetation lines, *lo'i*, *'auwai* or the edges of fields. Between residential homes a line of croton or a line of ti will frequently be the only indicator of a property boundary. The *'auwai* bringing water to the fields will often serve as a property boundary. Sometimes a row of loosely spaced rocks will also serve as a boundary.

G. Ko'olau Ditch, East Maui Irrigation Company (EMICo)

Within the East Maui watershed area, which extends from Haiku to Nāhiku and includes the valleys of Ke'anae and Wailuanui, an extensive ditch system has been developed to collect surface runoff. Construction of ditches, tunnels and aqueducts was begun in 1876 by Henry P. Baldwin, one of the founders of Alexander and Baldwin, who obtained a lease from King Kalākaua. This system of surface water diversion began with the construction of the Hamakua Ditch, with Kauhikoa and Ko'olau Ditches being added before World War II, and the Wailoa Ditch completed in 1923. The water is drawn to central Maui to be used for irrigation of sugar cane, pineapple as well as municipal water supplies. This system of water control and delivery, owned and operated by the East Maui Irrigation Company (EMICo), is one of the more complex and extensive in the State of Hawai'i (Figure 39).

Upstream surface waters are diverted far outside of the immediate cultural landscape limits. The only ditch system visible in the cultural landscape is that which crosses the cliff in upper Wailuanui Valley near the headwaters of Waiokamilo Stream. However, the EMI Company aqueduct system has had a profound impact upon the community. Today EMICo is an employer of some of the residents. The roads and trails constructed as part of the system are used by the community residents for collecting stream resources, forest gathering and pig hunting. The trail that follows the ditch was used as the main overland access between Hāna and Ke'anae before the construction of the Hāna Highway in the 1920s.

H. Archaeological and Historic Sites

Archaeological and historic sites of the Ke'anae-Wailuanui area are considered in this study as components of a cultural landscape. The emphasis is on characterizing the nature, condition and spatial patterning of these sites, and to define the extent to which they contribute to this landscape. No attempt was made to perform a systematic archaeological survey of any area. Background research on archaeological sites consisted of gathering information on previously recorded sites, known from earlier surveys. These surveys include: Thomas Thrum (1909), J.F.G. Stokes (1916), Winslow Walker (1931), Lloyd Soehren (1963), Inez Ashdown (1971), and some recent reconnaissance work connected to land use permits. Fieldwork consisted of relocation of a few easily accessible major sites, especially *heiau* (Sites 50-07-96 and 50-07-97). Also, one fishpond - Pu'u Olu - was inspected (Site 50-07-538). Most importantly, most of the effort in the field was expended in documenting existing and former

East Maui Irrigation Company Ditch

KE'ANAE - WAILUANUI CULTURAL LANDSCAPE Figure 39

lo'i systems. These are the major archaeological components of this particular landscape and have not been previously recorded as archaeological sites. These *lo'i* complexes are described elsewhere in this report. Each complex was given a state site number.

Figure 40 shows locations of all previously and newly recorded archaeological and historic sites - identified by state site numbers - within the Ke'anae-Wailuanui area. A table listing all previously and newly recorded sites is presented in the appendix of this report.

1. Previously Recorded Sites

There are 26 previously recorded archaeological and historic sites within the Ke'anae-Wailuanui area. Eighteen of these are archaeological sites, 6 are historic buildings, and 2 are bridges. The majority of the archaeological sites are *heiau*. This area seems to have had a comparatively large number of heiau recorded. Unfortunately, many of these have been destroyed.

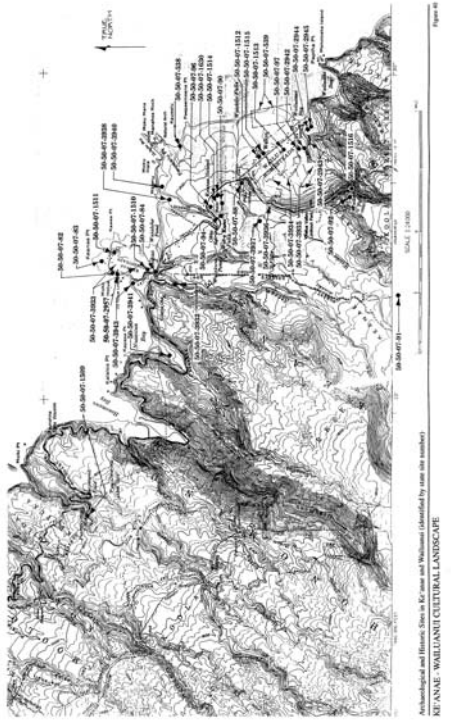
Two of the surviving *heiau* sites were inspected during fieldwork. Kukuiaupuni *heiau* (Site 50-07-96) was relocated, with the assistance of local residents, in a heavily forested area near Ke'anae School. The present configuration and condition appear similar to that described by Soehren (1963) and on the State-wide survey forms (1973-74). Two distinct structures are visible and both are intact. The other *heiau* inspected was Site 50-07-97, referred to as Makehau *heiau*. This locality is densely overgrown with *hau* and is marked by coconut trees. In the 1970s, eight coconut trees were counted. Apparently some have died in the last 20 years. The present inspection confirmed that the site is still present and in the condition previously described in the State-wide survey.

Also inspected was Pu'u Olu Fishpond (Site 50-07-538) which lies just south of Moku Mana island, behind a boulder beach. A well-preserved and well-constructed wall (*kuapa'a*) was observed on the southwest side, covered with *hala* and other thick vegetation. The inspection confirmed, to some extent, Soehren's description of 1963. This is, indeed, a traditionally constructed fishpond, probably the only one along the coast between Ke'anae-Wailuanui.

Another major site complex, worthy of mention as part of the Ke'anae-Wailuanui landscape, is the site identified as the Wailuanui Complex (Site 50-07-539). This site is located along the coast just north of Wailuanui Bay. It was not inspected as part of the present survey but has been described as containing 15 graves and 2 possible house sites. This complex probably represents the remains of prehistoric or early historic habitation associated with the adjacent canoe landing at Wailuanui Bay.

2. Newly Recorded Sites

During field reconnaissance to document presently used and abandoned irrigation systems, a previously unrecorded complex of archaeological sites was located at Kilo (Site 50-07-3940), east of the mouth of Ohi'a Stream (Waianu Valley). The sites found at Kilo consist of low terraces and a habitation enclosure measuring from 5 to 8 m. square. These appear to be isolated habitation sites. At this locality access to the coast would have been difficult, except down a steep cliff trail to Waianu Valley. Local residents mentioned an association of this site with a tale of robbers and kidnappers. Most of the coastal land between Kilo and Moku Mana island was covered and no other archaeological sites were encountered.



Archaeological and Historic Sites in Ke'anae and Wailuanui (identified by state site number)

KE'ANAE - WAILUANUI CULTURAL LANDSCAPE

Another site that was identified during the present fieldwork is a stone quarry on the cliff just *makai* of the YMCA camp, overlooking the Ke'anae peninsula (State site 50-50-07-3943). The site was pointed out by some local residents who stated that the quarry was in use in the 1920s for construction of the Hāna Road. At this quarry site, there is abandoned machinery, including a large winch and crusher (Indiana Road Machine Co., Fort Wayne Indiana, #9C13). A rectangular stone platform - measuring 8 ft. long, 4 ft. wide, and 3 ft. high - was identified as a possible grave of one of the quarry workers who died in a blasting accident. This locality also contains a World War II concrete gun emplacement.

In addition to the sites mentioned above, eight discrete present and former wetland taro complexes were recorded during the present fieldwork. These include the presently cultivated *lo'i* of Ke'anae and Wailuanui, as well as the former taro lands of the area from Nua'ailua to the east portion of Wailuanui. These sites were described earlier in this section of the report.

3. Archaeological Sites as a Landscape Component

Considering the previously recorded and newly recorded archaeological sites collectively, it is clear that the wetland irrigation systems (both presently in use and abandoned) represent the most significant archaeological element of the landscape. Major prehistoric habitation sites have not been located. They could be present, but still undiscovered, along the coastline between Ke'anae and Wailuanui or in the large unsurveyed *kula* land between the two communities. However, it is more likely that the pattern of settlement of Ke'anae and Wailuanui has been stable from the time of initial permanent settlement and the development of wetland agriculture. This pattern is of dispersed house sites on high ground throughout the irrigated areas. Surface archaeological traces of this former habitation pattern would be constantly altered and mixed by successive use. In Ke'anae, habitation layers would be expected along the coastal areas and on high ground surrounding the fields. In Wailuanui, habitation was probably concentrated exactly where it is today, in the *kula* land just *makai* of the irrigated fields and on the lava bluffs in the irrigated areas themselves. Coastal settlement would have been represented by sites like Site 50-07-539, clustered around Wailuanui Bay.

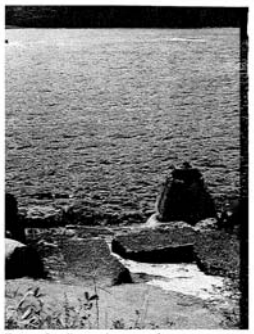
I. Small-Scale Elements

Small-scale elements are smaller structures and features of the landscape that reflect human presence and influence on the land. They range from signs and mail boxes to small water tanks and storage sheds. They do not dominate the landscape individually but together affect the character and texture of a place. They add detail and color to the dominant structures and facilities.

The most immediately evident small-scale elements in the Ke'anae-Wailuanui landscape are features related to the area's agricultural activities: water tanks, irrigation gates, plank bridges, ditches, flumes, utility sheds, pipes and culverts, as well as a couple of small roadside cattle pens and loading chutes (Figure 41).

There are very few signs in the area. Except for the Hāna Highway, Ke'anae Homestead Road and Wailuanui Road, the streets are not named. Signs are found at the County Corporation Yard, Ke'anae Arboretum, Ke'anae School, the two churches, the two fruit stands and the scenic lookouts. Most of the signs are small and unobtrusive.

Auwai - Lakini



Ke'anae Landing equipment anchors

Water Tank Behind Ke'anae School

Old Poi Factory Equipment-Lum Hoy Property

Small-scale Elements

KE'ANAE - WAILUANUI CULTURAL LANDSCAPE Figure 41

J. Open Areas

Open areas are lands that have no structures or are not under current cultivation. While agricultural fields are open spaces, they are not open areas in that the direct cultivation restricts other uses. Pasture land is a hybrid kind of area because the intensity of use is light.

Open spaces act as buffers between settlements and uses. They are characterized by a lack of structures or facilities signalling the direct influence of man. They function to maintain and define a level of density and characterize certain patterns of settlement. In a wet environment like Maui's Ko'olau Coast, open spaces, except fora few rocky coastal strips, generally become vegetated. In drier climates, open spaces would exhibit more of the underlying geology, such as sand, lava or depositional soils. In the Ke'anae-Wailuanui landscape, open, uncultivated areas become overgrown quickly. There is a clear pattern of vegetative succession with abandoned or uncultivated areas. In drier areas with less water grasses such as California grass (*Brachiaria mutica*) take over and eventually give way to guava and christmasberry. In wet areas such as abandoned taro *lo'i* the succession also starts with California grass but the transition is then into *hau* and Java plum (*Eugenia cuminii*). Areas that are used for grazing tend to remain as pasture and most of this pasture is Brachiaria or Panicum.

K. Viewing Points

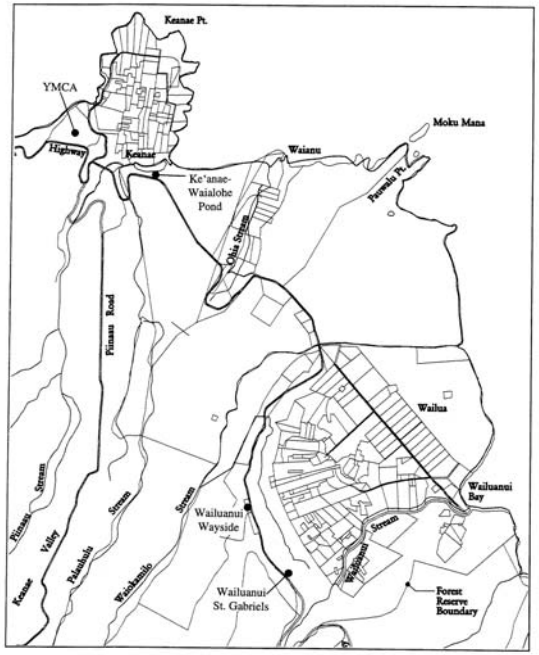
Viewing points are places that offer significant and panoramic views of the community and surrounding landscape. For visitors, viewing points function as scenic lookouts, affording a more holistic perspective on the land. For the local community, they may represent landmarks offering reference points for direction or orientation, and, occasionally, meeting places in times of emergency. In the Ke'anae-Wailuanui area, these viewing points, which are on high ground, were most recently used as assembling places for families during the tsunami alert of October 4, 1994.

Occasionally, there are historic events or cultural traditions associated with a viewing point but its value is generally unrelated to any site-specific association.

For Ke'anae-Wailuanui, important viewing points are found at Kaumahina State Park, the YMCA camp site, the view of Ke'anae peninsula from above Waialohe Pond, the Wailuanui Wayside Lookout and the Wailuanui Saint Gabriel's Lookout before Waikani Falls (Figure 42).

Kaumahina State Park: This site is at the edge of the traditional practices zone and represents the first real view of the cultural landscape region. It has the dramatic view of Ke'anae peninsula found on many post cards. Due to its distance from the central cultural landscape area, it is unlikely to be affected by changes in the cultural landscape. Additionally, the closer, intervening valleys of Honomanū and Nua'ailua are uninhabited and should not be affected by development in the foreseeable future.

YMCA Complex: This site provides panoramic views northwest towards Kailua and southeast to Nāhiku. Ke'anae peninsula is located below, and the site overlooks the old quarry and Ke'anae Landing. It is a popular gathering place for the community with ample parking, public facilities and open space. Changes to Ke'anae peninsula would impact views from this site. This site is also the gateway to the central cultural district.



Viewing Points

KE'ANAE - WAILUANUI CULTURAL LANDSCAPE Figure 42

Ke'anae/Waialohe Pond: This is a small (3 or 4 cars) lookout located above Ke'anae peninsula and Waialohe Pond. It provides the best view of the Ke'anae peninsula. Its primary shortcoming is inadequate parking.

Wailuanui Wayside Lookout: Located on the *mauka* side of the Hāna Highway, this lookout provides a spectacular view of the Ko'olau Gap of Haleakalā and the broad expanses of Ke'anae Valley as it winds its way below the Gap. Views of the waterfall and the East Maui Irrigation ditch system are clearly observable as well as the line of trees planted by the Civilian Conservation Corps in the 1930s. Wailuanui and Nāhiku are also visible from this site. This lookout provides the best views of the *mauka* areas that are part of the larger traditional practices zone which generally extends to the 3,000-foot elevation with occasional forays extending to the Haleakalā summit rim at Pohaku Palaha. Parking is in an unpaved area.

Wailuanui/Saint Gabriel's: This is the last major lookout before leaving the central cultural landscape region. It provides a spectacular view of Wailuanui Valley and its settlements. Nearly the entire amphitheater-like valley is visible with a picturesque view of Saint Gabriel's Church consisting of a New England-like postcard scene amid tropical vegetation. Parking is limited to 8-10 cars.

While spectacular views are found throughout the region, those just described represent exceptional public and quasi-public view sites that are important for the preservation of viewsheds (Figure 43). Viewsheds are the landscape that is being preserved and the viewing points are the locations from which the quality of the viewshed and its protection is evaluated.

L. Cultural Resources and Use Areas

The components described above are all elements within the Cultural Landscape Boundary. Cultural resources and areas used for the exercise of traditional Hawaiian cultural, subsistence, and spiritual customs, beliefs, and practices are important components of both the Ke'anae-Wailuanui Cultural Landscape and the Traditional Cultural Practices Region. These resources and use areas include:

1. *Wahi Pana*: These are sacred sites such as *heiau*, shrines, burial caves and graves and geographic features associated with deities and significant natural, cultural, spiritual or historical phenomenon or events. Edward Kanahele offered the following description of *wahi pana* in the introduction to *Ancient Sites of O'ahu* by Van James (1991):

> The gods and their disciples specified places that were sacred. The inventory of sacred places in Hawai'i includes the dwelling places of the gods, the dwelling places of venerable disciples, temples, and shrines, as well as selected observation points, cliffs, mounds, mountains, weather phenomena, forests, and volcanoes.

In addition to the archaeological sites listed in Appendix B, informants provided *mo'olelo* or legendary histories about the Moku Mana and Manahoa islets; the Kāne and Kanaloa springs in 'Ohi'a; the *'ili* of Wahinepe'e; Ke'anae peninsula; Ke'anae Arboretum; Waialohe Pond; the *'ili* of Wailuaiki; Polai; Kuo; Pohole; Waiohue Bay; Kapiha Point; and Pauwalu point.

View Toward Haiku - from
Ke'anae Landing

View of Wailuanui from
Saint Gabriel's Lookout

Ke'anae Loi from YMCA
Complex

Views

KE'ANAE - WAILUANUI CULTURAL LANDSCAPE Figure 43

2. Streams and Springs: These waters are important as habitats for native species of marine life, for taro cultivation, and for domestic use. The important streams and springs mentioned by the community informants included Hanawī spring and stream; Honomanū stream; Kāne and Kanaloa springs Kapa'ula Gulch; Kopili'ula stream; Makapipi stream; Nua'ailua stream; 'Ōhi'a spring; Palauhulu stream; Pi'ina'au stream; Kikokiko gulch; Wahinepee stream; Waialohe pond; Waianu stream; Wailuaiki stream; Wailuanui stream; Waikani Falls; Waiohue stream; Waiokamilo stream; Honopou stream; Kolea stream; and Kailua stream.

3. Shorelines, Reefs, Nearshore and Offshore Ocean: These areas are important for gathering of foods, medicine and for conducting cultural and spiritual customs. The entire shoreline, from Kailua to the Hāna Airport and out 11 nautical miles to the buoy is used by the fishermen of Ke'anae-Wailuanui for fishing, gathering of *'opihi*, and gathering *limu*. The community informants noted that the bays are especially important for the spawning of the fish. Some of the bays and landings noted as significant included Honomanū; Ke'anae Landing; Nua'ailua; Wailuaiki; Wailuanui; Waiohue; and Nāhiku Landing. Pu'u Olu fishpond was described as historically important and there was interest in restoring it for the propagation of fish.

4. Forests: Forests are important for hunting pigs and other animals; for gathering plants used for medicine, foods, ceremonial adornment, ritual offerings; and for the conduct of spiritual customs. Most of the area *mauka* of the Hāna Highway, from Honomanū to Makapipi is part of the Ko'olau forest reserve. The local residents are allowed to access the forests to exercise their subsistence, cultural, and spiritual customs, beliefs and practices.

5. Domains of *'Aumakua* or Ancestral Deities: Particular natural and cultural areas are important as traditional domains of *'aumakua* or ancestral spirits and deities, where Hawaiians renew their ties to ancestors through experiencing natural phenomena and witnessing *ho'ailona* or natural signs. Out of respect for the personal and private nature of spiritual and family beliefs and customs, interviews did not inquire about this aspect of cultural resources and use areas.

6. Trails and Dirt Roads: Trails and dirt roads are indispensable to afford access to the cultural resources and use areas, both *mauka* to forests and streams and *makai* to streams and the ocean. Informants identified the trails and four-wheel roads which they and their ancestors have customarily used on a map which is on file with the Maui Planning Department.

Community informants were asked to identify important cultural use areas and resources. These are described below in section VII - *Mana'o O Ka 'Āina*. Appendix D provides a compilation of place names and their significance.

VII. MANA'O O KA 'ĀINA

Enos Akina

Helen Nakanelua

Mary Kaauamo

James Hueu

VII. *MANA'O O KA 'ĀINA*

This section presents the insights of community residents who share their knowledge of traditional customs and practices in the Ke'anae-Wailuanui region. The residents also describe the important cultural and subsistence-use areas in the Ke'anae-Wailuanui landscape.

A. Traditional Life Ways

The resources used for traditional customs and practices in the Ke'anae-Wailuanui area are located at all elevations, from sea level up to the summit of Haleakalā. Rainfall in the area varies from 100 inches a year to over 300 inches a year in the rainforests. The forests above Ke'anae-Wailuanui are part of the East Maui watershed which is the largest single source of surface water in the state, with an average flow of 60 billion gallons a year harvested out of the Ko'olau region via the EMI Ko'olau Ditch. In addition, artesian water is harvested from wells within the watershed.

The area mauka of the Hāna Highway is dominated by the state-owned Ko'olau Forest Reserve and Hanawī Natural Area Reserve. Vegetation varies according to elevation. The upper elevations have grass and shrublands. The forest begins at approximately 7,200 feet and extends down to the coastline. This upper forest is dominated by 'ōhi'a lehua but includes native koa, kopiko and hame. Some of the most intact and extensive native forests occur here and support the state's greatest concentration of endangered forest birds. The forests are home to 12 native Hawaiian birds, native insects, snails, and other invertebrates. The native species and ecosystems provide a stable and beautiful watershed which would be nearly impossible to replace if destroyed.

The lower elevation forests are dominated by introduced species such as eucalyptus, java plum, kukui, 'ōhi'a 'ai, guava, and christmasberry. Much of this forest is a result of plantings by the Civilian Conservation Corps and of Polynesian and later introductions that have spread and gone wild. This altered forest system is also used by local residents to support their traditional practices.

In discussing what was special about the way of life in Ke'anae- Wailuanui, informants highlight their ability to make a living from taro cultivation, fishing, gathering, and hunting. Some of the comments included:

> *Life is easier here than the outside world. Here, can hunt, can fish, can farm.* (Charmaine Day)
>
> *Over here, I got free things to eat . . . That's how we live over here, 'opae, o'opu, hihīwai, 'opihi. The sea clear, we go get 'opihi, fish.* (Enos Akina)
>
> *We're lucky. This is the place. We're blessed, we took such good care of everything we had. Awapuhi said, and till today I remember the word she used is "selfish". The word selfish is for the people over here, to protect the area. Selfish doesn't mean that we going to make money, selfish is because the area, we don't want it to get spoiled. This is the difference between selfish and stingy. We have to be selfish.* (Kaipo Kimokeo)

> *Wailuanui they have everything. They have the taro patch, they have the fishing ground, they have the 'opae, they have the o'opu, they have the shell in the patch, you know, they have everything what you want. It's that, you have to do it yourself, you see . . . you got to work hard for everything that you want.* (Mary Kaauamo)

The informants emphasized that the natural resources continued to be abundant because they and their ancestors had taken deliberate measures to care for and protect the land, its forests, streams, shoreline, nearshore waters, and offshore ocean. Most importantly, the families in the district continued to honor and respect traditional Hawaiian cultural values and customs which guide subsistence harvesting of natural resources.

Such values and customs include but are not limited to the following:

1. Only take what is needed.
2. Don't waste natural resources.
3. Gather according to the life cycle of the resources. Allow the resources to reproduce. Don't catch fish during their spawning seasons.
4. Alternate areas to gather, fish and hunt. Don't keep going back to the same place. Allow the resource to replenish itself.
5. If an area has a declining resource, observe a kapu on harvesting until it comes back. Replant if appropriate.
6. Resources are always abundant and accessible to those who possess the knowledge about their location and have the skill to obtain them. There is no need to overuse a more accessible area.
7. Respect and protect the knowledge which has been passed down intergenerationally, from one generation to the next. Do not carelessly give it away to outsiders.
8. Respect each other's areas. Families in Ke'anae-Wailuanui usually fish, hunt, and gather in the areas traditionally used by their ancestors. If they go into an area outside their own for some specific purpose, they usually go with people from that area.
9. Throughout the expedition keep focussed on the purpose and goal for which you set out to fish, hunt, or gather.
10. Be aware of the natural elements and stay alert to natural signs, e.g. falling boulders as a sign of flash flooding.
11. Share what is gathered with family and neighbors.
12. Take care of the kūpuna who passed on the knowledge and experience of what to do and are now too old to go out on their own.

13. Don't talk openly about plans for going out to subsistence hunt, gather, or fish.
14. Respect the resources. Respect the spirits of the land, forest, ocean. Don't get loud and boisterous.
15. Respect family 'aumakua. Don't gather the resources sacred to them.

B. Subsistence Practices and Resources

Subsistence gathering, fishing, hunting, and gathering allows the residents of Ke'anae-Wailuanui to obtain a substantial amount of their basic needs outside of the cash economy. In addition, food, goods, and services are often exchanged, thereby extending the non-market subsistence network. All those who share in the network benefit from the practices of living off the land and the ocean. Informants shared the following information about their subsistence practices and the resources involved.

1. Gathering

Family members of all ages engage in some level of gathering activity in the Ke'anae-Wailuanui district. Like in most rural areas, families gather limu, 'opihi and other shellfish along the shoreline.

What is unique about the gathering activities in Ke'anae-Wailuanui is the abundance of marine stream life. Kūpuna Helen Nakanelua still goes out and gathers 'opae with her homemade 'a'aniu net in the 'auwai that runs through her property at Lākini. Waiokamilo Stream still has 'opae which is accessible to the kūpuna. The Kaauamo family is best known for their gathering activities. Awapuhi Kaauamo Carmichael still goes out gathering for 'opae, hihīwai, and 'opihi from Kailua and over through Kūhiwa. Paul Sinenci, a younger member of the Kaauamo 'ohana does extensive gathering with friends his age.

Awapuhi Carmichael identified some of the areas they regularly access for gathering of 'opae, hihīwai, and o'opu:

> *We have our own names. Kapa'ula, gather 'opae. We use Puaakaa, we call it Kaunoa. Above the road, the ditch above the road, we use that stream, and then it branches off. Even Makapipi, we use Makapipi stream. We use all the way to the tunnel. We use it. Kāhiwa gulch is used by our family. Kāhiwa gulch we use also. Makapipi is just mauka. Kāhiwa is mauka.*

Gathering from a variety of places is important in order to maintain the resources. The choice of place to gather is determined by the weather and other natural signs. Awapuhi Carmichael described the factors which affected her decision as to where to gather on a particular expedition:

> *It depends on what we're getting, and how we feel, the ocean. We never go to the same place. You know how the Hawaiians used to do, they don't go back to the same place, so can restore. It depends on the weather, and then we go by the moon, the stars. If use one place, then go to another place, depends on the moon and the stars. We go up far. Especially for hunting too, we go all the way up. We all go to the same places, although each of us have our favorite hole, places, where we go for 'opae, you know. All mauka for 'opae. And then below have the*

> *o'opu and the prawns, they introduced the prawns, and hihīwai. Above the road is more the 'opae. Above the road is where all the 'opae are. Above the main highway. And then below the road has hihīwai, o'opu, you know.*

Within the traditional cultural landscape area for Ke'anae-Wailuanui unoccupied areas with flowing pristine streams and the forested areas are integral to the livelihoods of the families in the district. For example, nobody lives in the area from Wailuaiki to Kōpili'ula and over to Hanawī but there are many gulches and streams flourishing with hihīwai and o'opu.

2. 'Opae

Ke'anae-Wailuanui is one of the few remaining areas in the Hawaiian islands where 'opae can be gathered. Virtually every stream has 'opae at some time during the year. The irrigation ditch is an excellent breeding area for the 'opae because it has flowing water year round. Some streams below the ditch, however, don't have enough flowing water to sustain the 'opae year round when the water is diverted into the ditch system.

Commercial sale of 'opae is prohibited under a state law that went into effect in 1993. Prior to that, certain families gathered 'opae for sale in Honolulu. The kūpuna explained that when they were growing up, the gathering of 'opae for sale was an important source of income for their parents and grandparents who did not hold full-time jobs. Helen Nakanelua described how she would accompany her grandmother to gather and dry 'opae for sale to the Otani market in Honolulu:

> *And I used to go along with my grandma, with a five gallon can, you know those tall ones, and I pack some wood, and I pack salt, so that whenever my grandma goes with the 'upena net, do you have an idea what the 'upena net looks like and they have a little bag there? Some of the bags are small, but she used to have these long bags, And then she leaves that where I am, she takes that out, we clean it and we cook it in this can. Salt it and cook it there, with the wood that I take, we cook it. And after it's cooked, I begin spreading it on an oil tablecloth and a mat I used to pack along. And then she leaves me there. I attend that 'opae while it's drying. By the time she comes back here, it's partly dried, I gather that 'opae again, and separate it in another bag, because that's partly dried, and we continue on. She gets another bag to do the same thing. I cook. So that by the time she ends up her day, most of the 'opae, except the last one she has, is partly half dried already. Do you know how the 'upena look like? I show you, cause I have made some for me, because I use it.*

Although 'opae is not gathered for commercial sale today, it is still a popular delicacy among the families in the district. They also gather 'opae to share with family and friends outside and on different islands. 'Opae, the 'a'aniu net used to gather it, and the methods of preparing it will continue to be a distinctive aspect of the cultural lifestyle for which Ke'anae-Wailuanui is known and distinguished.

3. O'opu and Hihīwai

O'opu and hihīwai are becoming increasingly scarce in the Hawaiian islands. Certain species of o'opu are endangered and others are rare. They require pristine and flowing

stream waters to exist. Ke'anae-Wailuanui is one of the few areas where they still thrive in sufficient size and abundance to be occasionally caught for subsistence food.

The gathering of hīhīwai is also carefully managed. The location of the hīhīwai is knowledge that has been passed down from generation to the next for their protection and proper management. It is not information that is made available to the general public.

4. Plants and Trees

Traditionally, the mountain area above Ke'anae, Wailuanui, and Kōpili'ula was forested with native trees and plants such as *koa* and *'ōhi'a lehua*. There was also sandalwood at Nāhīku. The plateau looking from Ke'anae and over toward Honomanū had grass, *pia*, and *'olena*. Beginning in 1934, the CCC project planted the foreign trees which are now dominant in the lowland forests.

Most native Hawaiian plants have some medicinal property. Native plants throughout the district are still used for medicinal purposes, such as the maile 'ie'ie, koali, noni, uhaloa, and pōpolo. Introduced plants such as honohono, laua'e, and even watercress also have medicinal properties and are used by the residents for healing.

Makou (*peucedanum sandwicense*) is a large parsley-scented herb which grows in only a few places in Hawai'i on the windward coastlines. The root was used for curing some diseases of children. James Hueu recounted how he had been recruited by two kūpuna, his father and brother when he was just 11 years old to climb the small islet called Keopuka for makou. It was collected for the Hawaiian herbalist, Dr. Kaonohi. He described the experience as follows:

> *But way back in 1931, two old men from Honolulu, they came up and they wanted this medicine. One of the old patients he used to live here, his name was Kalilimoku. So he knew, when he left here he was a young boy, he knew where the medicine was. My dad was living yet, my brother was supposed to climb that moku. You see that moku down there?* (Points toward Ha'ikū side, in the ocean.) *We call that Keōpuka, but it's Puohokamoa Bay, but we call it Keōpuka.*
>
> *When we went down there, I was young, I was only about 11 years old. So my brother was to climb, so I told my brother I think I better climb because you have a family and I'm a single boy. So I did climb and I brought that herb. And till today I ask all these lapa'au people. They don't know the name. The medicine they told me was makou. So I told Larry about it and then he made a song about it. It was about me going up on that moku. About that makou and that island. The herb is something like a dahlia, it grows like a dahlia plant. It grows something like a taro or a lily, and then certain times of the year, it dies. Then, certain times of the year, it grows. So when I went it just was growing, that's why I knew, but I didn't know what kind of herb that was, but my grandfather said that's the one. Anyway I tried, I taste, oh boy, it burn in my chest. So what for, I don't know. They came to collect that for a doctor by the name of Kaonohi. He was the first Hawaiian herbalist, from down Kāne'ohe or somewhere. That's what they came for. It grows only on that kind of moku. This think is like a dahlia. A dahlia grows something like a lily. The color is green. I never seen the flower. But the leaves are similar to taro. And in the*

bottom has a potato. I got the whole thing. The potato, but I don't know what part he used. That grows just like the 'olena, certain time of the year it dies.

A native Hawaiian black banana, as well as 'ie'ie and the Hawaiian bamboo were at one time used for weaving mats and hats of natural fiber.

Pohole, a native fern is popular for eating as a salad. It is blanched and mixed with tomatoes or with pake 'opae or mayonnaise. There is a pohole which is native to Ke'anae-Wailuanui. It is fuzzy and has to be rinsed and cleaned. Another type of pohole was introduced in the district from the Big Island by Mrs. Isaac Kānoa, Sr. The old folks prefer to eat the native variety. It has a different taste. They only gather it in the morning.

5. Fishing

The entire shoreline, reef and nearshore area has abundant marine resources. Those who have boats dive, fish and gather marine life from Kailua to Hāna and go out as far as the HO buoy, 11 nautical miles offshore. They gather 'opihi, crab, and other shellfish from the rocks; dive for squid and lobster and reef fish such as uhu; bottom fish for weke, ehu, 'ōpakapaka and uku; and troll for ono, aku, 'ahi and mahimahi. They occasionally surround akule in the bays such as at Honomanū. Āholehole, 'ama'ama, and ououa are also caught by Ke'anae fishermen who use gill nets. It is possible to use the hukilau method of surrounding and catching fish in any of the bays, but they don't do it because it depletes the fish resources.

Launching points for fishing are Ke'anae Landing, Honomanū Bay, Wailuanui Bay, and Hāna Harbor.

The bays where the fresh water mixes into the ocean water are important spawning grounds for the fish. Moki Day described how the bays are important breeding grounds which deserve protection:

> *You can consider all the shoreline area between here and Kaupō as breeding grounds for all these shoreline species of fish. They come into our rivers here because we have the fresh water, and they come in here and breed here and lay their eggs here. You go around here in certain seasons or certain times of the year and you see them, they come out in schools. I remember when we were small, before we even started grade school we used to go out with my grandfather and set net, and do all this fishing, you know, pole fishing, we used to hook moi. We seen 50 lb. moi already. They look like sharks in the water. But the only difference is that you see them as a school, a great big school, and there are these big huge monsters in there, and they're all in the waves, and I seen them. My brother and I have been fortunate to see them. And that's what I'd like to see again. And the only way to do that is to do this. And so I'd like to see the fishponds open up so we can restock the moi, and clamp down on fishing, block it up for a couple of years. They're hooking babies.*

The men and young boys can fish in any number of areas, all along the shoreline. For this reason, fishing down at Ke'anae, Honomanū, and Wailuanui is reserved for the kūpuna. It is easy for them to access these two areas. Unfortunately, outsiders who are unfamiliar with the variety of fishing and gathering spots also go to these easy areas, making it more

difficult for the kūpuna to get a good catch. Moki Day explained how the easily accessible areas are reserved for the kūpuna:

> *It seems like everyone here has their spot, where they go and harvest. Like Wailua Bay to Wailuaiki, this is an area that we keep for our kūpuna because it's easy to go to. If you are an 'ōpio or makua, well you have to hoof it. You haven't reached that age or to be honored in such a manner. That's why we have problems with the outside people because they come here and this is where they go. Because they see the 'opihi. Little do they know that it's for our kūpuna.*

There is interest among the members of the community in restoring the fishpond down near Pauwalu Point. On the map it is identified as Pu'uolu fishpond, however James Hueu says that the fishpond is called Pu'ulu fishpond. It has brackish water and is now swampy. The wild ducks used to go there every year. The fishermen believe that it would be worth restoring.

6. Hunting

The area above the highway is accessed for the hunting of wild pigs. On the Wailuku side, hunters usually go as far as Honomanū. Above Ke'anae, local residents can access the ditch road and look for pig tracks and then go deeper up into the forest once the tracks are sighted. Hunters go to Wahinepe'e and up as far as Waikamoi. Kupa'u is a popular hunting spot. However above Wailuanui, the gulches get deeper and harder to hunt. The hunters go as far as Makapipi. They access along the four-wheel drive road at Makapipi and go up mauka as far as Kūhiwa. There used to be a cabin above Kūhiwa for hunters to use for overnight stays. A hunting license is required. Most of the good hunting area mauka of the highway is part of the forest reserve and a stool test is required to get a license to hunt in there. Pigs are tracked using hunting dogs which pin a pig down to be killed using a knife.

7. Swimming and Surfing

Fresh water ponds are popular swimming areas. Probably the most popular is Ching's Pond, originally known as Pāhoa Pond. As the stream continues down to the ocean, there are pools and additional swimming places.

Along the shoreline, Wailuanui Bay, Ke'anae Landing, and Honomanū are popular swimming areas. Nua'ailua is a beach for both swimming and surfing. Honomanū and Wailua Bays are also popular surfing spots.

8. Trails

The Pi'ilani "Highway" Trail is the primary shoreline access route for gathering and fishing all around the island of Maui. It is a well engineered route that circumscribed the Island of Maui. In the Ko'olau region, it travelled just above the rugged coastline with numerous switchbacks descending into each valley and out the other side. It is a marvelous example of Hawaiian engineering skills, social commitment, and the ability to mobilize a large human work force.

In the Ke'anae-Wailuanui district it is still used, particularly from Wailuanui over to Wailuaiki and to Kalia'e and over to Kōpili'ula. Some areas of the trail are overgrown by dense forest and the local residents are interested in having the trail maintained for future generations.

There are several makai to mauka access trails and four-wheel drive roads between the highway and the shoreline. Informants emphasized their use of a trail at Kalia'e running makai from the highway to the beach. There are also trails which go down the face of the cliff at Kalia'e. A new landowner from outside had recently put up a fence and bulldozed his land there. He had tried to restrict community access, but the community insisted on maintaining their access and received representation by the Native Hawaiian Legal Corporation. There is also an access trail along the top of the cliff between Wailua Bay and Waiokamilo Stream. Another trail from Waiokamilo which goes down to Moku Mana and Ke'anae is somewhat overgrown, but still used.

Awapuhi Carmichael described some of the trails used by her family:

> *Kapa'ula gulch, there would be a road, there is a trail from the highway going down. We go all over here. From the road, we go down, on the ridge, not the gulch, (makai), right down to Waiohue, right down in the bay. And then there's the island there, and from here you go to Kōpili'ula too. All over here is the King's Highway, you can walk all along the shoreline. We have gathering rights all over here, along the stream. You can go either way. But for our family, we walk 'em. We walk, we walk from the main highway down and along the coast. We used to walk with my mom up until 1988 we walked this whole area, from the main highway down to the beach and to the rivers. And we used to take like a caravan. My brothers were in high school and they would carry the provisions and the 'opihi. And on the way back to the highway we would stop for 'opae. And my dad, he used to cut all the trails. Like he used to say, oh I think we should go to this part, like to Kōpili'ula. So then a day before he would go down and cut the trail. And then, you know, he had a four wheel jeep and we would go just up to Kalia'e and then walk from there to Kōpili'ula.*

Four-wheel drive roads are the primary access routes from the highway to mauka hunting and gathering areas. One of the main four-wheel drive roads used by local residents now begins at Pāhoa. Helen Nakanelua described how she and her grandmother accessed the streams mauka of the highway using this route:

> *You know where the arboretum is? There used to be a bridge there. But because the bridge was broken, the county did not want to build another bridge. So they brought the bridge to where the swimming pool is. So that's the road you go up to Pi'ina'au they call it. So looking from the school, you can see that trail that goes up on that mountain there. That's were we used to go on horseback until we get to Kōpili'ula, Wailuaiki, Wailuanui. Way up Pi'ina'au on the mountain, that's where they had a camp for all the irrigation company to live, and across there, you cross that kahawai, and there is that trail there to go. If you go by the school and you look, you can see it. Pi'ina'au is toward the mountain, you take the road to this way, you go to Wailuaiki, Wailuanui and all that, that the trail you take. To Pa'akeke from Pi'ina'au, but I went with my grandma, Wailuaiki, Kōpili'ula, that's where the end of the trail, when people go to Hāna, we go there and we stay there in a cave to get a car to go to Hāna. Now we would climb up that river, to get 'opae, every week we were doing that my grandma and I because my brothers and sisters, they didn't want to go to that kind of place.*

9. East Maui Irrigation Ditch Road

Before the main Hāna road was constructed, the ditch road was used to travel from Ke'anae-Wailuanui to Hāna or to Wailuku. According to Enos Akina,

> *If you go Hāna, telephone to the one who get car to go Kōpili'ula, wait for you. Go with horse along ditch trail to Kōpili'ula, leave horse, go on car. You like go outside, you go on the horse until Kailua. From Kailua on, you get car to go Wailuku. Come back, get the horse, come back. Bumbye they open this road, get car. Like go outside, go outside.*

Informants also referred to the EMI ditch road as the old road since it was regularly used for travel between Kōpili'ula and Kailua by their parents and grandparents. They are therefore still accustomed to using it for their hunting and gathering activities.

There are three ditches in the traditional practices area - the New Hamakua, Lowrie, and the Spreckels dam that falls into the Hamakua. In certain areas, one goes into another, like at Makapipi. The ditch trails goes right up to Opana and Ulumalu. James Hueu who used to work for EMI described the ditch system:

> *Ha'ikū is the lowest ditch. The top ditch is Wailoa. That's the one that comes from Nāhiku, from Māliko side. Then comes Kauhikoa. And then comes the Lowrie, then the Haiku ditch is the lowest. From Nāhiku to Waikamoi is Ko'olau ditch. And then when you get to Honomanū, you have the Spreckels ditch. The Spreckels ditch went by some where over there. And then right out there you see Manuel Luis. That's a Pokagi guy, Manuel Luis. Sometimes they change names on the way over, like they call it center ditch. But Manuel Luis starts from Kolea to Waikamoi. That's the Manuel Luis ditch. They did away with the New Hamakua Ditch, and that's Kauhikoa. We used to have a new Hamakua. We used to have the old Hamakua, but they did away. Then they put in that Kauhikoa. They replaced the old Hamakua.*

10. Water

Ke'anae-Wailuanui is part of the East Maui watershed where 48 streams originate. Of these, 35 are perennial, flowing to the sea year round, and 13 are intermittent, flowing year round in the upper elevation and intermittently at the lower elevations. East Maui Irrigation (EMI) collects, stores, and transports water from over 50,000 acres of the East Maui watershed, including from the Ke'anae-Wailuanui cultural landscape. The system, owned and built by EMI, consists of approximately 400 intakes (stream diversions), 7 reservoirs, 75 miles of aqueduct (50 miles of tunnel and 25 miles of open ditches), 60 miles of four-wheel drive jeep roads, and numerous miles of trails. The system provides irrigation water for agricultural plains in central Maui, county water to upcountry Maui residents and farmers, and domestic water for Kula, Pukalani, Makawao, Hali'imaile, Ha'ikū, and Peahi (Dept. of Water Supply, County of Maui: Draft Water Use and Development Plan for the Island of Maui (1992): 2-34).

Fresh water is an integral part of the cultural landscape for taro cultivation, the gathering of stream resources, recreation and domestic use. Awapuhi Carmichael explained:

> *All of our streams need to be protected for recreational and gathering purposes, because if we don't, then they'll divert all of the water, and then the streams will*

be empty. Fishes need water too. Certain fishes need water to spawn. That's why we're lucky, we have enough water for the fishes.

Water flows throughout the Ke'anae-Wailuanui landscape from both streams and springs. Stream waters from higher elevations are diverted into the East Maui Irrigation ditch system. The main sources of water for the taro patches of Ke'anae-Wailuanui are springs that arise below the ditch. There is continuing concern about the impact of water diversion upon marine life and taro cultivation. Some community members maintain that the diversion of water during dry times causes the taro patches, which are normally fed only by springs which arise below the ditch, to suffer from insufficient and warm water, leading, in some cases, to the rotting of the taro which thrives on constantly flowing running water.

Awapuhi Carmichael, the genealogist for the Kaauamo family discovered a letter written in 1881 to commissioners A.P. Carter and J.S. Walker by her ancestors to oppose the turning over of the water rights in Honomanū to Claus Spreckels. In part the letter reads:

> Keanae, Ko'olau / September 12, 1881 Hon. A.P. Carter a me Hon. J.S. Walker
> Na Komisina (Commissioners)
>
> 'O makou o na kemimike, ke nonoi aku nei i ko olua 'a'ole lilo ke kahi pono wai o na 'aina lei ali'i o Honomanu, Keanae, Wailua i na ona miliona.
>
> We are the committee members, we request of the two of you not to turn over the water rights of the crown lands of Honomanu, Ke'anae, Wailua to the millionaire (Claus Spreckels).
>
> Signed by: l. W. Kehuhu (Kahuhukaunihiakami Halemano), K. Makaena l.K. Hueu (John Kalawaianui Hueu), S. Kamakahiki, K.E. Maiailua, D.W. Napihaa, M. Kaleba, B.B. Kaliimoku, Kamanele, l.S. Lono, J. Kaluhiawa, Keli'i (Keli'iaukai), J.B. Kaakuamoku.

Historically, another 'auwai carried water into Ke'anae from a creek named Waihā̀owa. James Hueu told the story of how J.A. Chamberlain dug the 'auwai for his taro patch in Ke'anae:

> *The guy dug an auwai from there, irrigated his taro patch down Ke'anae and has his name under, J.A. Chamberlain. The name of that creek is Waihaowa. Waihā̀owa iki is the one above, so there must be a Waihā̀owa nui. Waihā̀owa means the separating water. So it was separated up there and then they met again up there. So this man, he dug a ditch to use in his taro patch and he named the ditch, the ditch name is 'auwai ho'omanawanui, and he put his name under, J.A. Chamberlain.*

In one of the 'ili between Ke'anae and Wailuanui is the 'Ōhi'a spring. James Hueu provided a description of the spring waters which feed this *'ili*:

> *Where the watercress is, that's the 'Ohi'a Spring. That's Waikane and Kanaloa. Well they call it 'Ohi'a Spring. Waikāne and Kanaloa is right under the road. There's two holes where the water comes out, right when you make that turn. Right under there is where.*

That stream, the Palauhulu stream, on the east side, until the other way, they call that Pāhoa-Waianu. Waianu is at that spring, Waikāne Kanaloa, and Pāhoa is that river.

In recent years there has been a problem with hau bushes overrunning the streams and clogging up the water. It affects the East Maui Irrigation system, state lands, and the taro farmers. During heavy rain debris gets caught in the hau bushes and causes flooding. There is general interest in having the streams cleared through a cooperative effort between the state, EMI and the taro farmers. A representative of EMI pointed out that the entire system would need to be cleared at one time to avoid flooding in any one section. The company feels that a government agency is in the best position to initiate and coordinate the clean-up with the cooperation of the state, EMI, and the taro farmers.

11. Taro

The Ke'anae-Wailuanui district is famous for its taro and the community is proud of this legacy. Informants proudly shared traditional family accounts of how their district was never touched by the wars between the Maui and Hawai'i chiefs during the time of Kamehameha I. According to the informants, their district was very important to the chiefs as a source of taro and poi and water. To ravage the landscape would have been reckless and wasteful. Moki Day provided the following insights:

Thousands of canoes came in for water and for poi. But Ke'anae Wailuanui were never touched by war. The people took food to Hāna and to Nāhiku by the Pi'ilanihale heiau where the war was. They carried the food to Nāhiku and came back to mahi'ai (farm).

This is the bread basket of Maui, this area here all the way to Kipahulu. There are more taro patches here than anywhere else on our island. So there's any valley that you can go in here and see taro patches, lo'i formations. These things are still here.

As noted in Section III of this report on the cultural history of the district, some of the historic taro patches in the district were converted to rice paddies beginning in the 1880's and through the 1920's. During that period, taro was primarily grown for home consumption rather than for commercial sale. James Hueu shared his insights on the origins of some of the taro patches in the district as follows:

They say, the Chinese make the taro patch. I say not. The taro patches were there before the Chinese ever came to Hawai'i. But because the Chinese came, they planted rice in the taro patches and they marry into the Hawaiian women. But they never did the taro patches. The taro patches were there long before that. I have two taro patches down here [at the YMCA camp]. It wasn't made by the old Hawaiians, I made 'em. I made that on the dry land. But over here, when we started the CCC camp, I saw terraces over here. So I think they had taro patches, long time ago. There's one taro patch over here on that land, Chamberlain's land, now it's Kepler's, it's a small taro patch. If you don't go around that taro patch, you didn't see Ke'anae. The name of that taro patch is Ke'anae. And they have some taro patches named Kalihi, they have Maka'iwa.

The taro patches had a name. Even me I don't know some of the names. But for Ke'anae, I knew that from way back. In the back of the Kepler house, that area is called Ke'anae. My son takes care of the patches. I told him, you take care of that patch, even if you not even get half a bag of taro, but that patch has history, so don't let it get filled up with grass.

Taro began to be produced for commercial sale to Hāna and to Wailuku beginning in the 1920s. However, many of the informants who are now producing taro for commercial sale indicate that their families mainly began to sell taro for poi after World War II. Before that, most of the taro in the district was grown for home consumption. Currently, many of the families sell taro to supplement their income from employment with the Maui county road crew, East Maui Irrigation Company, or jobs outside in Kahului or Wailuku. However, there are a few families whose sole source of income is from taro production.

Throughout the district old taro terraces can be found and taro still grows in the wild in the valleys, along streams. Informants speak of going out and gathering lu'au leaves from the wild taro because it has a good flavor, distinct from the cultivated varieties. Some of the areas for the gathering of wild lū'au include Pi'ina'au, Nua'ailua, Kupa'u, Waipi'o, Awiowio, Pohole and Pāhoa.

Given the current demand for poi, taro production is a profitable venture. There is a lot of interest in taro production. Taro is being farmed by kūpuna, mākua and 'ōpio. As the kūpuna are growing old their children and grandchildren are carrying on the work. As the mākua generation reach retirement age, they are beginning to return to their family lands to maintain and open up ancestral taro patches.

The cultivation of taro is currently a viable economic enterprise. However, informants also speak of the cultural and personal satisfaction of continuing to cultivate the taro lands of their ancestors. Kaipo Kimokeo described how he felt a spiritual connection to his ancestors when he worked with the taro:

Anyway, I got this job at the arboretum. We started to open the taro patch. Spiritually, I can see my family around me, because, that was the main food. So now, spiritually, I'm involved . . . spiritually motivated this way [to grow taro], because what I can see tells me. All these valleys. We supplied an army. We had all our taro patches. We supplied Kamehameha when he came here. Aunty Mary Kaauamo told me. I was asking her about the apowai taro. She told me that water is spiritual water. It doesn't touch the ground. That water, it can be used for medicine and things like that.

C. Cultural Practice and Subsistence Use Areas

The areas listed below were described as cultural practice, subsistence use, and recreational areas by the informants. It is not an inclusive list of all of the many places used, but it is a list of the areas for which information has been provided at this phase of the study. Additional information about these areas and other important areas should be gathered in future phases of this study.

According to James Hueu, University of Hawaii at Hilo professor of Hawaiian language Larry Kimura should be consulted regarding the names of places in the district and

the mo'olelo or historical legends connected to those names. He has conducted extensive interviews in Hawaiian with kūpuna informants. Notwithstanding, some mo'olelo about places in Ke'anae-Wailuanui were shared by informants and are included below in the description of specific areas. Informants - identified by initials following individual mo'olelo - were: Moki Day (MD); Charmaine Day (CD); James Hueu (JH); Awapuhi Carmichael (AC); Paul Sinenci, Jr. (PS); Harry Pahukoa (HP); Doug Chong (DC); Helen Nakanelua (HN); Maggie Alu (MA); Kaipo Kimokeo (KK); Enos Akina (EA); Apolonia Day (AD); and Mary Kaauamo (MK).

1. Areas within the Traditional Cultural Practices Region

Unless otherwise noted, the places discussed below are *'ili* located between Honomanū Stream and Makapipi Stream, the area described by informants as their *ahupua'a* and traditional cultural practices region.

Hanawī

Got hīhīwai, 'opae, taro, dryland taro, the kind 50 pounds. PS

Hanawī spring is a big spring. PS

Even Hanawī, we use Hanawī for gathering rights ...definitely, the Hanawī stream. Big springs is right here, ya. Here's the gate. Here's the pump. The trail would be right around there and right down to Hanawī. Hanawī, all the way down. From the ridge, then you go down to the stream. This would be the big waterfall, so you stop over here. There's a high waterfall. Here you also collect hīhīwai, till you get down to the beach. When you get down to the beach, you can have your gathering rights for 'opihi, and then you go fishing over there too. In fact this whole place over here, they use it for gathering rights. All along the shoreline, use for gathering rights. Too bad my dad is not you know, they were the only ones, our family used to walk from the mountain to the shoreline in all of these places. AC

Honomanū

People use it for everything. You can get anything in there. They gather pepeiao. The stream doesn't have much . . . cause sometimes we get water in the stream . . . and sometimes we don't get water in the stream. And then there's pohole. And they fish. Moki guys fish over there . . . and 'opihi. They launch over there, surround akule in that bay. CD

This side, got fern, get kukui nut, with the kukui nut we make inamona. PS

They fish there. And have gathering rights. AC

In about 1891, 1885-86, when Spreckels wanted to build the ditch, Spreckels wanted to close Honomanū. There were families here who wrote to the water commissioner, to oppose the diverting of the water from Honomanū, but they never listened. And its all documented. In fact, part of my family, the Kalilimoku, Napiha'a and that belongs to the Kānoa family, Hueu, Keli'i'auhai, most all of them is my family. They wrote to the commissioner, the water commissioner, about 1885-86. You know there's hardly any water that comes down, only if there's an overflow, then the water comes down. All of the water, they diverted the water from there. AC (see page 111)

Olinda is at Makawao. That's where they have the watershed. It comes up to Waikamoi. It comes on top of Honomanū. It has the pipeline, all up there. JH

Honomanū, you cannot go through the upper gate, you going to hit a dead end. If you follow the river at Honomanū, you go up there, it gets steep, then the Ko'olau ditch is up there. So you have to get on the ditch trail before you can get across and go right up. JH

Honomanū they go up too. O'opu. I think there's more 'opae than o'opu. I don't know if Honomanū has hīhīwai. In there easy to get up. Maybe the people who go tenting they go up. JH

Kapa'ula

Kapa'ula - gulch. There would be a road. There is a trail from the highway going down. It would be between Kapa'ula. We go all over here. From the road, we go down, on the ridge, not the gulch, (makai), right down to Waiohue, right down in the bay. And then there's the island there. And from here you go to Kōpili'ula too. All over here is the King's Highway, you can walk all along the shoreline. We have gathering rights all over here, along the stream. You can go either way. You can go on the mountain, too. AC

Kapa'ula - there is a four wheel drive road. Most all of it is EMI roads, and I have a key, so we drive up there. AC

Ke'anae

Ke'anae, the peninsula Ke'anae is a lava flow, and the taro patches down there were built. The dirt was hand-carried from the so-called "Devil's Hole". That's the reason why the hole is there. They took the dirt out of there and made their lo'i down below in Ke'anae. I do not know the chief or the konohiki, but I'm pretty sure there was one for the people to come together to move that much soil. MD

Get kupe'e down at Ke'anae side . . . still get everything - hīhīwai, 'opihi, whatever. Got to keep people from outside away, so that we can still have all these things. CD

Ke'anae point is also a good fishing spot. PS

Kōpili'ula

We go gathering there. We fish, get hīhīwai. Good diving grounds. The stream branches. Got hīhīwai, 'opae, bananas up Wailuaiki. PS

Kōpili'ula is one of the places that has big hīhīwai. There, Waiohue is another place. This is where my family has gone for generations. And I find myself chasing the general public out from these areas. I've chased Filipinos out. MD

Kupa'u

Waterfall by lookout - Kupa'u. EA

Kupa'u is just this side. The Ko'olau Gap is way up and Pi'ina'au, comes down. Get the gap coming down. Get the lodge up there . . . Waikau Cabin. From Waikau Cabin, you come down, then you come to the Ko'olau Gap. Waikamoi is up there. That gap comes right down. And that Kupa'u gap, that's the one get that bridge. Get that waterfall and then it goes around. That's the gap, right up here, we are talking about, Kupa'u. HP

Makapipi stream

One of the major streams, but the place stay empty. The place stay dry cause Maui Irrigation is taking the water. Up here get nice ponds - blue water, cold water. Better than Ching's pond. PS

Hunting- Makapipi is the main place. That's the place. Plenty guys go over here, all the Portuguese. Makapipi where says 4 wheel drive road. Can put a few over here. Got some hunting kind names too, such as what kind of tree grows there, or bush, or a Hawaiian name. PS

Moku Mana Islet

We have a place up here. We have the other rock out here by the point. Before Bird Island, by the point out there, get a rock that points straight up. He said the reason for that is that the gods had turned this man into the rock. Well I guess he used to fool around on the wife. The gods took pity on the wife and they turned him into this rock to show his erection for all time. I forgot the name of that guy. CD

Sometimes they say "bird island". I say it's not bird island, it's Moku Mana. And mana means, well that is double. And they get this Manahoa rock, is right in the back. And they get a natural arch there. And I told him, the legend about this. Moku Mana was a pretty girl. But this guy attacked her. That's why it split. Mana means two. They say bird island, I say nah. Those birds were living over here. That's why I told Larry Kimura, the name of this place nobody knows, but it's Manupaki'i. That's where those birds used to live. But when they had the lava flow and over here was a river When had the lava flow it was covered with lava so they went away. And they went to that Moku Mana. That's why when they were trying to cut the hill this side, those birds all came back. For about one week those iwa birds came back. The haole ask, why those birds? I said they don't want you to cut that hill down. Elaine Wender tried to stop them, but they went ahead and cut that cliff. Manupākiʻi is this. This point. What they have on the map? They no more name, only Larry Kimura has the name. Manahoa is the man. Mokumana is the woman. The legend says he attack her, that's why. JH

Go fishing, get 'opihi. Hahaha Bay - that bay got plenty 'opihi too. PS

Nua'ailua

In there too the kids go fishing and they go swimming or surfing over there. There's the legend of the shark that lives over there. CD

Get awa, fern, opae. Go surfing. Gather. PS

Do you have Nua'ailua in there? Below, that's taro. JH

'Ōhi'a Spring

Well the legend of Kāne and Kanaloa, sometime long, long ago there were two old men, they were going to drink 'awa. So they had the 'awa all pounded but they had no water. So one of them said, well I know how to get water. So he cut an 'ōhi'a branch, well they call the mountain apple 'ōhi'a, and then he punctured the wall. Out came the water. So the other old fellow said, oh if you can do it, so can I. So he punched the wall too, and the other water

came out. As the stream goes down, the name changes. From 'Ōhi'a, all the names change. The name of the stream was Waianu stream, as you go down, you have Kalua nui and at the bottom is Kilo. JH

Watercress is cultivated here by the daughter of James Hueu. JH

Pāhoa

Where the watercress is, that's the 'Ōhi'a Spring. That's Waikāne and Kanaloa. Well they call it 'Ōhi'a Spring. Waikāne and Kanaloa is right under the road. There's two holes where the water comes out, right when you make that turn. Right under there is where, even the water that is under there is good spring water and they call that Waiokuna Spring. That spring, you walk right up above the swimming hole. You go right up. There are some taro patches up there, but I haven't seen anyone plant taro. But there are taro patches up there. They call that Palauhulu stream. Waikuna pond is where they have a waterfall right there. That's Palauhulu stream. There are taro patches on the way down, not above the waterfall, cause its a high waterfall there, but below the waterfall. Below Waikuna, not too far from the main road. But I haven't seen anybody raise taro. But the taro patches are there. That land belongs to the state. That stream, the Palauhulu stream, on the east side, until the other way, they call that Pāhoa-Waianu. Waianu is at that spring, Waikāne-Kanaloa, and Pāhoa is that river. That hui land is 107 acres, but these are flat land, not taro patch. JH

Palauhulu Stream

Use all of Palauhulu stream, they have hīhīwai, maybe he could tell you. Palauhulu - way above Waikuna. Way above, past the Palauhulu pond. We use the reserve road as a reserve. AC

Pi'ina'au

Pi'ina'au flows all the time. Get 'opae, hīhīwai. PS

Pi'ina'au is above Palauhulu, and then it goes right through the forest to Kikokiko Gulch. AC

Kikokiko - waterfall - further up. EA

In fact at Pi'ina'au, our kūpuna say has taro. AC

Pi'ina'au and Kupau are the hunting areas. Below the ditch. Get forest line up there, and then get the gate. From there is forest already so you got to get hunting license and the state license and everything to go up above. But see, like us now, like how you were saying, that's our lifestyle that. When I was small, that's what we used to do. We go up hunting, we go catch 'opae, we go up there, we pick up wild taro, lū'au, all kind, watercress, everything, still get up there. But now when you go up there, just like they're the boss up there. Somebody stopped me, I never get license. License is not cheap too nowadays. You know, to be one hunter today, cost a lot of money. You got to take care your dogs. Cost a lot of money. And you got to buy hunting license, and you got to by hunting things for you to go hunt. Not like before, we just go. Today, you got to pay for all kind things. Yeah, I used to hunt with my dad when I was young, I was going to Ke'anae School. Me and my brother go hunting. That was our lifestyle, but now today you no can do the kind stuff like that, they shut you out. But now, when you go hunting like this, open to the public. The guys from Lahaina, Makawao,

they all can come over here hunt. So what they do now, they get the hunting club. You call this week, you like go Pi'ina'au, you call first, you get 'em. If I call too late, I no can get 'em, you get 'em. One hunter go up there. Like how I see, up Pi'ina'au get hunting area over here, hunting area over here and you get the license only for one guy. One group go inside. You can hunt all over. But they don't like, I don't know. Me I like go up there hunt and you go hunt over here, I go different place to hunt. You know what I mean, get plenty places to hunt, inside that area. But I don't know. Before I used to go that kind hunting club but I give up. You go up there, you only grumble, grumble, waste time. HP

Wahinepe'e
At Wahinepe'e - a woman hid under a stone when Kamapua'a was chasing her. JH

Hunting ground - pretty much. Hunting and gathering area. We go Wahinepe'e. We can go pretty much four different areas in Wahinepe'e - one of them is high falls, red flower, Manuel Luis, and one other one. By the ditch and above the ditch. PS

The trail begins by the highway. PS

Go along the stream to gather, also go along the ditch to gather. Lots of 'opae in the tunnels. PS

They used to have taro patches by Wahinepe'e, across from Wahinepe'e. Just before you enter the forest, there are some graves there. There's taro on the Wailuku side. PS

Wahinepe'e had pineapple field too. You know , he was one of the operators who came all the way over here to work. He was one of the operators. But he said was spooky, you know, our 'ohana graveyard. Down here is another one. Down here, you know the flat by the church. That's graveyard down there, and then they went bulldoze. They went bulldoze over here to clean this pasture out. But the graveyard is still there. They never push the rocks from there. KK

Waialohe Pond
Well, in the days of long ago, there used to be a lot of mullet in there. Mullet, āhole. But that place belong to my family. Had o'opu in there, and hīhīwai. So one time there's a haole guy,he came to be the director for the YMCA, so he goes to the library, he comes back, he says, Jimmy what is Lelekaua? I look at him, he says, what is Lelekaua? Well, you know the Hawaiians, that's their spot. They know how to dive, head first, lelekaua, they jump. I hear Kahekili was a master lelekaua. I said, oh yes. Kahekili was the champion lelekaua king. Oh I hear somewhere over here he jumped. I said, oh yes. He said where? I said at Waialohe. One day, he overestimated, he landed on the dry land and that was the end of Kahekili. I don't know if it is the truth or not, but his remains is hanging down in that pond. He look at me, he laugh. There's a cave and there are the two hanging down. I go in there with my canoe I used to tie my canoe to that rock. But one time, big water, one got lost, and had one more left. So when Napokā came, I told him, eh Nathan go in there and look. He told me no more. But I didn't go back to look in the pond, and in the cave. Hanging in the cave, there were two of these, the privates of Kahekili, hanging there, and I see 'em. I talk about it because I seen that. I used to tie my canoe in there, and I hook o'opu in there. They don't believe me, but I think there's only one lady living here and she's seen that. And she's about

88, 89 years. She's Mrs. Kulahiwa, and she's a pure Filipino lady. But when she got here, my aunt hanai her. I guess she seen that. But I say, I seen 'em, but if not there, well . . . JH

Where is the cave?

It's right down there in the Waialohe pond. That's a long pond, go right down to the ocean. It's really not a cave, it's kind of a hollow. The thing was hanging right in there. But I'm waiting for this boy to go dive. Maybe it broke off and it's down. It was hanging right there, and I seen 'em. JH

The mountain people used to bring 'olonā, potato, and they come down to the village to trade. The village people are fishermen. They supposed to give them fish. So one time the mountain guys came down, and these people, they were lazy or what, they never catch fish. So they stuffed old fish tails, bones, they put 'em all in the bag. So when they went back up there, they pulled out the bag, and out came all the tail of the fish. Somehow the tail of the fish turn into a shark, and they raised 'em up there. And so when grew kind of big, he came down through that river, Palauhulu stream. And he came down to Waialohe. Down Waialohe has a rock, and the color is reddish, and then they call that Luahi'u. And the shark came under there, and there's a cave from there, until Kepler's place, under Ke'anae. So this shark stayed under there. Once in a while he come here and then he go back. So if you go are related to the shark, no matter what, you swim in the ocean from that point, and they call it Hawini, but that is Huelo until Pauwalu, you don't have to worry about getting into the ocean. That's what this old man told me. And I kinda believe his story. Only a legend, but that story, I think he's right. And I know where that rock is, they call it Luahi'u and we were so afraid before to go swim in there. And that rock is right down there, before you go into the ocean, at the end of the pond. And anyway, that was the story that he told me. It's a red, long, it's a ledge, but right under there, they have a hole. But nobody went in there. But the shark used to live under there. When you go down there to Kepler's place, there's a inlet that goes in there, and it comes out. But I think now it's all covered. So that shark live under there. A lava tube that goes from Waialohe to down there, the landing. JH

What I heard Waialohe was, you know in the old days, you used to yell, you hear echo, eh. So lot of people think, eh that water went hear, that's why they call it the hearing waters, eh. But you yell and you hear your own self, and they think someone is answering you. But no, it's the echo, eh. Then somebody said, lohe is certain people, not hairy, olohe (lua masters). JH

Wailua Iki
We have a story and a chant about in Wailuaiki where she turns into a rock. Pele turned into a rock to hide from Kamapua'a. CD

One time there was a fisherman down at Wailuaiki. This fisherman went out fishing. Somehow this guy Kamapua'a changed himself into a man and the fisherman's wife, he was trying to make good with the fisherman's wife, but she didn't want. So another guy gave some kind of a signal to the fisherman. He came back. When he came up on shore, he attacked Kamapua'a. He changed himself into a pig. They call that eku, the pig. He tossed him up to that place Polai. That's the hill up there by Wailua. Then he went up there, he gave him another toss. He fly him up, here, they call that Kūō. Kūō mean, you know, he sort of cry. And he slid down the pali and he had a pohole. Pohole, that was the story of the legend. That's why they call it Pohole up there. But they got a place name up here they call Kūō. So when he landed up there he Kūō, he sob. Then on the hill up there, he slide down, that's

pohole, they get, watcha call in English, they call the skin pohole, not laceration, you slide and then you hemo skin. So the Hawaiian get all kind of legend. Most time it comes out. JH

Landed in Wailuaiki - Konohiki went out fishing with Kamapua'a. He saw beautiful Hawaiian girl, wife of konohiki. Fisherman said to divide fish. The fisherman flung Kamapua'a to Kupa'u and he landed at Pohole. He got scraped, got a strawberry or pohole, thus the place is pohole. There was no name for the fern. Called the fern pohole. AD

Kamapua'a also landed on a boulder in the arboretum. Kūō. Pig's cry when hurt. See pig tracks around the rock. AD

We go by trail, over the rocks to surf and its a fishing spot too. PS

But way down at the end, a person by the name of Adams has his land now. There are a lot of terraces. And they have a little creek there. They have o'opu, they have 'opae, and hīhīwai in there. You wouldn't believe it. In that main Wailua, I don't know, it's all polluted. But in that little river where Adams has his place, there's a name but, you don't have it on your map. Inside of West Wailuaiki, on the Wailuku side, its a spring water. It goes into a creek. It comes out right at the Wailuanui river. It doesn't come from way up. It just starts from someuhere in the hills. That Enos Akina, he used to get his drinking water from there, from the hill. But since they made pipeline over here, then he went to the county pipeline. He had pipe. He took it from way up. So with the pressure, he get the water to his house. From the top, not right by Adams. And there's no river above that. It must have just come out of the hill. When it comes down it runs off by where Adams bought his place. All my life here, I didn't see anyone using that land until Adams came. Then he made the people all shook up. JH

Wailuanui Bay/Stream
Get all kinds, go out so far and drop. In some places used to have land and then the land dropped. If you look down here at Wailua - land would go way out. If you go out there and look, get a part in the middle of the whole bay, can see the water kind of crest around there. It was all connected at one time, and I think an earthquake or something and the whole thing went drop. That's where the women used to go and do their lauhala. You got one area in the middle where it is part land which has fallen down. CD

Wailuanui has hīhīwai. JH

Wailuanui is hard to get to, there's a high waterfall, so you cannot get much. Maybe you go above the waterfall. Above the main road okay. But the 'o'opu cannot climb up a steep waterfall. I think the only one that can go up. I was talking with the guy, the one who comes around and he makes a study of 'o'opu, he told me the one that they call nopili and the one with the red tail, hi'ukole can go up. I said, well o'opu hi'ukole, even the sharks don't want to eat that. JH

We are known as Wailuanui, from Uncle Harry's to here, go on further, that's Wailuanui. From the school, go down to where they have the eating snack stand, the Wai'anu stand run by the Chongs. Ke'anae is further down. The intersection coming down from the YMCA, that is Ke'anae. But within Ke'anae, there are names for each place. Like here now, it is Wailua, but within Wailua we have a certain name for a certain area. Some they call it Puhu'a, that's the piece of land here. And some people call it Keone Nalu, that's a place where the road goes in

the right off the road coming in from the well, that belongs to Keone Nalu, that's where Aunty Maggie comes in. There are different names to different places. It's inside that has the areas that have the different names. On across on the other side, back of Charmaine, well that's Palolena, but it's within Wailua. They call that Palolena. And then this side over here where Akina has his taro patches, it is in Wailua, they call it, I can't remember now. We had different names to different areas. So that people will know within Wailua, there is that part named that and this is that part, it's not known as all Wailua. Otherwise people will not be able to find it. So if you say, in Wailua, Palolena, they know already where it is, they just go right across there, because they know where is Palolena. Oh, it's Makekā, it's on this side of Palolena. Makekā they call it, they have a name. And further on this way, up this way, they call 'em Puhu'a. See how all the different names. HN

Keonenalu, and that's Puhu'a below, here. And there's Hula, they call Hula, they have different places, the portions. All the different names. And so like where the section is that I have now, that I have turned over to Kyle, and he has somebody to take care of the land now, the people named that place Pikanoa, because that was the man. His first wife (deceased) was a relative of my grandmother. Because my grandmother was a relative of his first wife and she had kept this section for many years, Pikanoa's second wife, Alice Kahakuleana gave her the first choice to purchase the land. Instead, Helen Nakanelua and her husband, Paul, purchased this land. HN

And then I have another piece of land right down Wailua, across the river, they call that Palolena. It's taro land, but I haven't seen taro growing there. Palolena is across the Wailuanui stream. From Wailuanui, you have West Wailuaiki, East Wailuaiki. Keone Nalu is, as you go into Wailua, on the right hand side, you know the road junction, there's a road that goes inside. I have 2.933 acres at Palolena. JH

At Wailua, across the river is Palolena. Get one haole who bought one place over there. Makekā, up in Wailuanui. On top up Wailua stream, right next is that other bay, and then up top is Kalia'e. Then Wailuaiki, right after Wailuaiki, that's where that haole guy bought that area, come down. At Kalia'e, another haole guy bought, comes down from the road and goes down to the beach. JH

Waiohue
Fishing, 'opae. All the streams got 'opae, but us, we go to certain places, you got to move too. O'opu, yeah. All of these streams. Got fishing all along the shoreline. This is where they breed - by the stream water and the open water. The brackish water is where they breed. O'opu, mullet, moi, āholehole, the silver fishes, oama, they all go up stream too. Special kind of place over here. All the bays. PS

Waiokamilo Stream
We also use Waiokamilo stream. We go through the lookout, this road here, and go into what they call Waiokamilo. There are different names. That's what we call Moana. Above Wailua Lookout, that's Kupa'u, you got to go through Kupa'u, then you reach the stream. Then you go to Moana, that's another part, that's above. You got to go from Pi'ina'au, and then to Moana. Go on the Pi'ina'au road. Pi'ina'au road, this is the Ko'olau (ditch), the 4 wheel drive road, You go on the four wheel drive road, go across Palauhulu stream to get up here, some place up here. We go all the way up to Moana, we go up to the forest, and that's what we call Akeke. That would be in the forest. Moana to Akeke, and that would be in the forest. Akeke is springs, they call it banana springs. Now they call it banana springs, we go right up to there.

Go through Pi'ina'au, cross Palauhulu stream, get to below Waiokamilo, there is a water fall there, and then we go up to Akeke, they call it Banana springs now. AC

Its hard to tell you, because each section has a name. And all the old people know. Even in this village, each section, each rock has a different name. And if I made a mistake, then Moki would know because he uses the same. He goes to Moana. And that's what we call it, Moana. Way up above, yeah, we call it Moana. Then Moana goes into Akeke, the springs. AC

The springs just come out of the ground, and then there are taro patches. Let Moki explain. We go all the way up Pi'ina'au stream, all the way up to Kikokiko Gulch. Pi'ina'au Stream or Palauhulu Stream. Pi'ina'au goes into Palauhulu. They change the names so much from when we were little, Palauhulu goes up into Pi'ina'au. AC

2. Additional Areas of Traditional Cultural Practice

Unless otherwise noted, these areas are 'ili. While these 'ili are located outside of what the informants identify as their traditional cultural practices region, many of the families access these areas for subsistence gathering and fishing. In some cases families originated from these areas and still have family burials and kuleana lands there. Their parents, grandparents, uncles, and aunts continued to access those areas and passed on the knowledge about these areas and the resources in these areas to them.

Honopou
Honopou too. Get taro patches down there . . . more down by the ocean side. There is a stream. Honopou stream. From the highway down, there are taro patches. Now get taro patches all in here too. Old taro patches and pretty much I think its this whole green area. Get plenty trees now, but there was once all taro patches. PS

Kolea
Look for Kolea, Punalu'u, right over there has taro patches. Just past Wahinepe'e, at Punalu'u, makai of the road, on the Wailuku side. Kolea, even above had some terraces, and below. On the main road, but above in the forest, they had terraces, above the reservoir. JH

Makaiwa
Fishing, very good gathering. PS

This is a trail too - this is a ridge, go this way, I think it goes down again, I haven't gone down the trail for a long time. Go down from Kailua. Kailua is my place too. Come little bit more back, there's a gate from the highway, follow the ridge, we have a cabin over there for the EMI folks at Maka'iwa. PS

Māliko
We go to Māliko. PS

Ko'olau forest reserve. PS

Olinda
We go up Olinda - I pick maile, 'ohi'a, make lei, personal kind. PS

Ke'anae-Wailuanui has persisted into the end of the twentieth century as a center of traditional Hawaiian culture and lifestyle. While living in distinct households and cultivating individual patches of taro for their own families and for commercial sale, the residents share in the abundance of natural resources from Honomanū to Makapīpi. Together, they respect and care for the springs and streams that feed their individual lo'i kalo and sustain an abundance of gathering resources. Together, they continue to respect the balance of natural resources with their own needs, taking only what is necessary for their family's daily sustenance and respecting the reproductive cycles of the animal and plant life in the valleys along the Ko'olau coast of Maui. Their children have played together, attended school together and matured to adulthood, sometimes intermarrying.

The Hawaiian way of life has continued to thrive among the households and taro patches of Ke'anae-Wailuanui, despite the influx of retired Chinese plantation workers who farmed taro at the turn of the nineteenth century, and the post statehood settlement of outsiders seeking a quiet lifestyle in rural Maui. The persistence of the Hawaiian lifestyle in Ke'anae-Wailuanui has provided an important continuity for all Hawaiians, not just those living there, to their rich heritage (Figure 44).

Ke'anae - Wailuanui Community

KE'ANAE - WAILUANUI CULTURAL LANDSCAPE Figure 44

VIII. LANDSCAPE USE PATTERNS

Noni

A. Spatial Organization

1. Land Use and Settlement Pattern

The Ke'anae-Wailuanui area is sparsely settled in a linear pattern. Residences are found along major roadways and adjacent to cultivated lands. Homes are clustered in Wailuanui, Waianu, and Ke'anae. With very few exceptions, all houses and major buildings are found within 200 feet of the Hāna Highway, Ke'anae Homestead Road, Wailuanui Road or the main tributary road in Wailuanui. Aerial photographs show a relatively even pattern along these roadways. Setbacks from roadways are deep. Along Ke'anae Homestead Road and the roadway in Wailuanui, setbacks average 50 feet. Along the Hāna Highway, setbacks average 80 feet.

There is almost no clustering of public buildings and there is no clear sense of a town or community center, although the community gathers at the school, the YMCA and at the church halls. Community members have a clear sense of place and frequently refer to travel beyond the cultural landscape boundaries as "going outside". In the recent past, local stores and poi mills may have provided informal, but regular, community gathering places. The YMCA camp is located on a ledge above the cliffs at the entry to Ke'anae. The Congregational Church is sited on Ke'anae peninsula at sea level. As the crow flies, Ke'anae School is located roughly at midpoint between Ke'anae and Wailuanui. Saint Gabriel's Church and Our Lady of Fatima shrine are farther east on the sloping lands descending into Wailuanui.

Another general pattern is the building of houses on flat lands whether they are the bottomlands of Wailuanui, the peninsula at Ke'anae or the uplands of Ke'anae Valley. With a few exceptions, houses are not built on steep slopes or cliffs. Some public buildings, such as the Ke'anae School and Our Lady of Fatima Shrine, are built on level areas at the top of terraces or small hills, taking advantage of the perspective above the road.

Determinants of the settlement pattern include historic events and changes, and adaptation to taro cultivation and other agriculture. During the 19th century, the *Mahele* and the Land Act of 1895 precipitated a consolidation of the population at Ke'anae and Wailuanui; previously, the population had been more dispersed through the traditional use area. While these acts established individual property holdings, they may also have diminished the property rights of individuals who formerly had variable land uses within an *ahupua'a*. Within the 20th century, the abandonment of the Ke'anae Landing, after the opening of the Hāna Highway during the 1920s, shifted the locations of poi mills and storage buildings. The destruction of homes and lives during the 1946 tsunami doubtless caused a preference for building at a higher elevation (Homeowner's insurance now complicates such site selection further). Completion of the Hāna Belt Road and ever-increasing automobile traffic has caused residents, particularly those who work outside the cultural landscape area, to choose the convenience of residence along the Hāna Highway. School buses transport older school children to Haiku, Makawao, or Hāna.

The residential pattern seems related to agriculture and the closeness of the people to the lands they cultivate. The taro *lo'i* and the few other diversified crops that are grown are generally cultivated on relatively flat lands. Many of the people walk to their fields. Proximity increases efficiency in the closely tended taro fields.

2. Irrigation Systems and Circulation

It is quite clear that at Wailuanui and Ke'anae the *'auwai* and *lo'i* systems were constructed first and subsequent residences and circulation networks accommodated the already established systems. The pattern of cultivated *lo'i* at Ke'anae has remained relatively intact since at least the turn of the century according to early survey maps. In all likelihood this pattern existed at the time of the *mahele* when the lands were parceled out. At Wailuanui the individual *lo'i* system is not as intact as at Ke'anae but the overall pattern is similar. The differences probably developed due to the extent of rice cultivation from around 1880 until 1927. Wailuanui had a rice mill and more extensive rice cultivation than Ke'anae. There was probably some alteration to the *lo'i* pattern during this period. However, the broad pattern remains since both crops are wetland agricultural products and the irrigation system plays a critical role in their cultivation. The mechanics of irrigation systems must follow gravity. Residences are found on slightly elevated areas at the edges of the fields, not in the center of the *lo'i* which would be the low spot and subject to periodic flooding. The roadway network serving these residences skirts the cultivated areas and does not cut into the system of *lo'i*. This pattern involves frequent tending and fits the horticultural character of Hawaiian agriculture where the cultivated fields are relatively small and are within walking distance of residences. It is a pattern developed before automobiles and mechanized agriculture. The field was central, not the residence. This pattern is found even in areas where residences are not nearby. Mrs. Helen Nakanelua's Lākini *lo'i* are not located near any homes today. However, in the past there was a house nearby which has been destroyed by fire. Mrs. Nakanelua's relatives are buried next to the house site. In upper Ke'anae Valley, which was cultivated into the 1950s, Mrs. Maggie Alu and her husband lived on the land adjacent to the *lo'i* until they decided to close the poi factory they operated next to the cultivated area.

3. Viewsheds

From the vantage point of the Hāna Highway, Ke'anae is best comprehended looking towards the ocean: the *lo'i*, the houses, and palm trees framed by the rugged black lava coastline and the white surf give the peninsula its unique character. The tongue of land is held precariously above the ocean like the back of the mullet (*'anae*), to which it owes its name.

The essence of Wailuanui is water (*wai* = water). Wailuanui is best viewed looking *mauka* (inland). The taro *lo'i*, as seen from *makai*, are framed by the steep green slopes of the valley with Waikani Falls to the east and Waiokamilo Stream waters entering from the center and the west. The *lo'i* themselves, as they ascend the slopes, decrease in size to accommodate the requirements of water control. Nowhere else in Hawai'i are such miniature fields still cultivated in this kind of topography with such integrity.

The value of a cultural landscape is closely associated with its visual qualities. Concepts such as historical integrity, architectural consistency, settlement patterns and rural character - all important criteria for cultural landscapes - are most readily grasped from points within a landscape that offer a comprehensive view or series of views of that landscape. The preservation of viewsheds is potentially a goal for management of the cultural landscape.

In effect, the entire drive along the Hāna Highway comprises a significant viewshed. The lush vegetation, numerous streams and cultivated landscape along the highway route all suggest travelling through a garden. This garden-like quality is one of the dominant and

important qualities of the landscape. Flowers and fruit trees both cultivated and wild, dot the landscape on both sides of the road. Housing setbacks are wide and landscaping of individual lots enhance this quality. The well managed taro *lo'i* and yards blend with the natural landscape and generally provides a seamless view experience along the road that is equal to any in the State. Setbacks, landscaping, architecture, uses, borders, vegetation and natural features all play a part in creating this garden-like character.

4. Subsistence Use Areas

Subsistence gathering, hunting and fishing is an integral part of the lives of the residents of Ke'anae-Wailuanui. As discussed in the *Mana'o O Ka 'Āina* section, the pattern of subsistence use of the land is determined by: family and ancestral connections to particular land areas; the distribution of water; access; the type of resource to be obtained; the life cycle of the resource; in the case of animals, their diet and feeding habits; the weather; and *ho'ailona* or spiritual signs in natural phenomena.

There is general agreement among the informants that their traditional cultural practices region extends from Honomanū in the west to Makapipi in the east and *mauka* from Pohaku Palaha on the rim of the Haleakalā crater, *makai* to the shoreline, and into the ocean as far as the buoy. Additional areas are used by residents of Ke'anae-Wailuanui depending on where their family ancestors originated and established subsistence practices. For example, some families fish and gather as far east as Kaupo or as far west as Honopou and *mauka* to Waikamoi.

The location and distribution of water is the primary determinant of the distribution of natural resources. Traditional land use boundaries were defined in relation to the amount and location of water. The change of season from wet to dry does affect the distribution and availability of subsistence resources. When there is a lot of rain, the resources are more abundant and spread out over a larger area. During the dry period, the amount of resources shrink and they are distributed around water sources.

Most subsistence use areas can only be accessed by land through a trail or a dirt road. The Pi'ilani Trail affords an important route of access between *'ili* along the coastline. The Ke'anae-Wailuanui residents also use an extensive network of *mauka* to *makai* trails to carry out their subsistence activities. Hunters say that one can readily catch a decent size pig without venturing far up the mountain. However, the network of trails allows access to upper regions where the larger animals roam. Informants marked many of these trails the map which is on file with the Maui County Planning Department.

Fishing resources vary by ocean depth. Along the rocky shoreline fishermen gather crab, *'opihi*, *ha'uke'uke*, and other shellfish. In the reef residents gather *limu*, and catch squid, lobster, and reef fish such as *uhu*, *kala*, and *manini*. At greater depths bottom fish are caught such as *weke*, *ehu*, *'opakapaka* and *uku*. In the bays nets are used to surround *akule*. *Aholehole*, *'ama'ama*, and *uouoa* are also caught with gill nets. In the deep ocean and out to the buoy the fishermen troll for *ono*, *aku*, *'ahi*, marlin, and *mahimahi*. Ocean resources are accessed by land through *mauka-to-makai* trails and along the Pi'ilani Highway. Boats are also used for ocean subsistence activities. The launching areas are Honomanū Bay, Ke'anae Landing, Wailuanui Bay and Hāna Harbor.

Resource gathering patterns are also influenced by *ho'ailona* or spiritual signs in natural phenomena. The Ke'anae-Wailuanui residents stay alert to the direction and

patterns of clouds, winds, rain, the flight birds, rainfall and all natural elements to inform them about where is the ideal place to gather on any given day. They also keep track of the moon phases and the affect on the shifts in the tide. Ancestral knowledge of the interpretation of place names in the district also informs Hawaiians about the special features or qualities of that particular area for subsistence and cultural use.

B. Natural Determinants of Settlement and Construction

The natural environment of the region has clearly played a vital role in the development of its history and settlement patterns. Its influence has ranged from the type of agriculture practiced to the reduction of external influences for change.

1. Flatlands

The cultural landscape of Ke'anae-Wailuanui has been developed on the windward flanks of Haleakalā. The topography of the region is rugged and steep. The shoreline is predominantly sea cliffs and boulder beaches with few alluvial flatlands suited for cultivation. The heavy rainfall has carved deep valleys into the broad slope of the mountain. The limited amount of flat lands has directed human settlement onto these few areas due to the needs of agriculture. While archaeological evidence shows cultivation on steeper lands in earlier times, those fields have been abandoned for decades. Long time residents in their eighties and nineties do not remember seeing these steeper hillsides, flanking Wailuanui Valley along the Nāhiku side, in cultivation. It seems clear that these fields were abandoned over a hundred years ago. It is likely that other terraces, which were abandoned as population declined, are located in steeper, less accessible areas of the region.

Settlements and cultivation areas are found on the flats of Ke'anae, Wailuanui and in Ke'anae Valley. To a lesser extent there is some taro cultivation within the narrow valley bottoms of the smaller streams, but these are minor areas in comparison to the flats. This is a constraint of geography. In addition to these constraints, the flatlands are where the richer and deeper soils are generally located.

2. Rugged Terrain and Isolation

Due to its rugged terrain, the Ko'olau region of the Hāna District has been isolated from the flow of population and commerce that has affected much of the rest of Maui. Until the Hāna Highway was completed in 1926 there was no easy overland route to the region. Due to the rugged shoreline, large boats were unable to dock along the shore. Even with the construction of the Hāna Highway the region remains relatively isolated. These constraints have served to preserve the integrity of the cultural landscape as well as knowledge and values of the Hawaiian culture and lifestyle.

Even within the district, the steep cliffs and deep valleys have created clear distinctions between areas. Each valley or promontory has its own character and story. Despite the proximity of the two *ahupua'a*, Ke'anae and Wailuanui have different qualities. The rivalry between chiefs of the two *ahupua'a* mentioned in the legend may have been rooted in this geographic separation.

3. Rainfall

Rainfall has clearly affected the human settlement of the Ke'anae-Wailuanui landscape. Since the region's volcanic soils are porous and do not hold water well, it is due to the abundance of rainfall and the reliability of stream and ground water sources that the

region has developed wetland agriculture for its source of sustenance. The taro culture which defines the identity of Ke'anae and Wailuanui is only possible because of the abundance of rainfall. Other diversified crops which are grown for sale such as ginger, *pohole* and *hāpu'u* ferns are also plants that thrive on high rainfall.

The second impact of the rainfall is on the architecture of the area. Wide overhangs and corrugated roofs that come from the plantation era are responses to the climate, providing durability and protection from the frequent rains.

4. Slopes and Irrigation

The ample water sources and the slope of the land have resulted in an irrigation system that is highly efficient. Water sources are streams or springs and the irrigation system works by channeling diversions from these sources. Within the system, gravity directs the water flow from one field to the next.

Currently, two areas of the system are located *mauka* of the Hāna Highway: the small independent system that feeds the Ke'anae Arboretum *lo'i* and the more significant system in the Lākini property of Mrs. Helen Nakanelua which subsequently feeds the lower Wailuanui *lo'i*, *makai* of the Hāna Highway, the major portion of the system.

Archaeological evidence indicates the system of gravity-based irrigation fields formerly extended into the steeper slopes of Wailuanui and even higher elevations up Ke'anae Valley. As recently as 1950, cultivated fields and the associated irrigation system could be observed at the 400- to 500-foot elevation of Ke'anae Valley.

5. Ocean Access

The strong northeast trades, steep sea cliffs and lack of protected harbors along the coast have limited the accessibility of the region from the sea. Since there are no good harbors in the region, both the Nāhiku landing and the Ke'anae Landing are located on a part of the shoreline that is slightly protected from the wind by the peninsula or coastline. Outrigger canoes were frequently used for transportation before the construction of the road. Stories about the ferry, which operated until the Hāna Highway made it obsolete (*ca.* 1927), focus on ocean conditions when the ship unloaded its goods at the landings. Older residents recall times when rough seas made landing at Ke'anae impossible and the ferry went on to Hāna. Sometimes the goods were unloaded at Hāna and hauled back to Ke'anae by horses. At other times, the ferry would attempt a landing at Ke'anae on its return journey to Kahului. If wave conditions were still bad and a landing was again impossible, the people of Ke'anae-Wailuanui would be left without outside provisions or mail for two months since the ferry generally made only one trip a month.

6. Land Access

Before 1900, much travel in Hawai'i was by canoe, although there were many famous "runners" who specialized in running over difficult terrain at phenomenal speeds. A Maui high chief, Pi'ilani built a stone trail, the *Alaloa* or "long road" around Maui, and the Ke'anae-Wailuanui area still has remnants of that trail. An early traveler, George Bowser, recorded that "we went floundering and creeping along at anything but a lively pace" along the road (Bowser 1880:514). According to Enos Akina, the oldest living resident of this area at age 94, the road once went through every gulch where it had a wire bridge which could be walked across if the water was too deep or too strong for a horse to cross (Enos Akina in McGregor interview 1994). The steep topography and heavy rainfall have impacted the

engineering of the Hāna Highway and all the roadways in the region. Erosion is prevalent and roadbeds often wash out. Many bridges are needed to cross streams and gulches as the Hāna Highway winds up and down across the landscape. Between 1922 and 1923 the County of Maui began to make the road beyond Kailua. Prisoner labor was used to build this road, and a work camp for prisoners and free road gangs was established at Ke'anae in the area now forming the YMCA camp (Hawaii Heritage Center 1990:6). The road to Ke'anae was complete by 1924, and by 1928 the road work forged ahead to Hāna, still using the prison labor from the Ke'anae Prison Camp. The bridges in this area were completed by 1926. They cross the major perennial streams in the cultural landscape region. They are the Wailuanui, Waiokamilo, Palauhulu, and Pi'ina'au Stream crossings (see Appendix E for bridge details). Prior to bridge completion, vehicular travel outside of the cultural landscape area, or from Kahului to Hāna, was unreliable.

7. Building Materials

Building materials are predominantly local, likely due to the region's isolation as outside materials were not readily available. Stone was used to build churches and walls. *Hau* wood was commonly used for fence posts. Walls and berms for *lo'i* are made of basalt rock and dirt.

Available materials were limited in quantity and variety. The impact of the environment in this case is evidenced by the lack or abundance of specific materials; e.g., there is little coral in the sea here and coral is not generally used for walls, road fill or houses as it is in some other parts of the Hawaiian islands.

8. Vernacular Architecture

The vernacular architecture of Ke'anae-Wailuanui is related to the local *"kama'āina* (long-term resident) architecture" that has developed over time. Strongly influenced by the plantation style architecture which was dominant during that era, the specific vernacular of the region has some unusual features that are associated with its history, climate and people. An exception is the gambrel roof at Saint Gabriel's Church which represents a unique style found only in Wailuanui and the Catholic church at Kaupō. The use of asphalt shingles on the older residences is unusual and probably represents a response to the windy and rainy climate. The uniformity of building materials and colors is probably associated with the region's isolation which fosters the use of local materials and limits the variety of commercially produced materials. This may change as outside influences and access increase in the area.

The relative homogeneity of the architecture is probably also due to the pattern of long-term residence in the region, with a small community of families influencing one another over the generations. Architectural change occurs in incremental and compatible ways.

C. Taro Cultivation: Economy and Land Tenure

1. Poi Mills

During the fieldwork for this study, which included field trips as well as interviews, it became apparent that the Ke'anae-Wailuanui communities have a long history of small commercial ventures associated with processing and marketing of local taro. Besides the store which once stood at Ke'anae landing (People's Store/Ah Chan), there were six separate poi mills. Each was in operation over a different span of time. Each sold local taro processed into poi to the community itself and also exported taro.

Taro was exported in two separate directions: to Hāna and to Ha'ikū/Kahului/Wailuku. In most cases these poi mills or stores were located adjacent to the major thoroughfare. According to oral histories, the first poi mill in operation was the Alama Poi Shop on the *makai* side of the Hāna Highway, just east of its junction with the Ke'anae peninsula road. Operation of this mill probably began in the 1920s when the Hāna Road was being constructed, and continued into the 1950s.

Another mill - the Ching Poi Mill - was located across from the Ke'anae Lookout. It was part of a complex which included a theater, a coffee shop, and a store. A local resident recalls the theater building was still in existence during the 1950s but by then the poi mill was no longer in operation. Later the concrete pad for the poi mill was removed. This mill exported to Kahului and Hāna.

Farther east, halfway between Ke'anae and Wailuanui, across from Ke'anae School was another poi mill, said to be the second mill in operation. It was run by the Ng family. This mill exported poi to Hāna.

In Wailuanui, by the present Wailuanui Wayside Lookout Park, *mauka* of the Hāna Road, was the Kupa'u Poi Mill, run by the Alu family. This was in operation from the late 30s to the early 50s. Poi from this mill was exported to Wailuku.

The Lum Hoy Poi Mill, next to the existing Lum Hoy residence in Wailuanui, still contains the concrete pad and some machinery, although the building has no roof. This mill overlapped in time of operation with the Kupa'u Poi Mill and also exported to Wailuku. It was operated through the 1940s.

The last mill - called the Ke'anae-Wailua Poi Mill - was started in 1975 by Mr. Eddie (Kimo) Wendt. It was operational until 1984.

The communities of Ke'anae and Wailuanui were clearly of sufficient size to support small family-operated commercial ventures within living memory, dating back to the 1920s and 1940s. The viability of these poi mills or poi shops is a reflection of the fluctuations in population within the two communities, as well as a slow but steady decrease in taro production itself. These ventures have vanished as a result of the development of complex transportation networks and centralized markets.

2. Land Tenure in Ke'anae Peninsula Taro Fields

Given the greater availability of historical and local resident information on the Ke'anae *lo'i* system, this system was chosen as the "type-locality" for extensive mapping during the present study. All 194 *lo'i* presently or recently used for taro cultivation were mapped, with water delivery and water flow pattern indicated for each field.

Through the generosity and interest of two Ke'anae taro farmers this map was taken a step further to show the present pattern of land use and ownership. The owner and cultivator of each of the 194 fields was recorded and this information was collected on two separate color-coded maps. These maps are on file at the Maui County Planning Department.

The 194 *lo'i* in the taro complex at Ke'anae peninsula are divided among 21 separate owners. Generally, an individual owner's *lo'i* are not grouped in one place but are arrayed in

clusters over separate portions of the complex. The present ownership boundaries match the boundaries of the Land Commission Awards granted over 150 years ago.

It appears that, presently, six of the owners are also cultivators of their *lo'i* and that the remaining owners lease out their *lo'i* to others. There are 18 separate parties - either lessees or owners - who are presently cultivating the *lo'i* on Ke'anae peninsula. Most of these cultivators appear to have 12 or fewer patches; however, one individual seems to have 35 patches. Generally, each cultivator's *lo'i* are spread in separate clusters over the complex, similar to the dispersed pattern of *lo'i* ownership.

Thus, both the ownership and cultivator pattern of the *lo'i* show a lack of complete spatial contiguity. This is an expression of the traditional concept of land use. Here, although the land is owned by individuals, the right of passage anywhere in the system belongs to the community. In both patterns of use and ownership, the groupings of *lo'i* tend to be parallel to the lines of the water flow — not perpendicular. This pattern is probably related to - and may be based on - the traditional arrangements for water rights.

One of the most notable aspects of this analysis is the fact that there are only six owners who are also cultivators of *lo'i*, possibly indicating a general trend away from family-oriented farming. In only 35 *lo'i* are the owners and cultivators the same people. However, nine of these are not presently under taro cultivation (in lime trees, grass and papaya). Thus, out of a total 194 *lo'i* in Ke'anae, only 26 are cultivated by their owners.

D. Cultural Determinants of Land Use Patterns

The land use patterns of the Ke'anae-Wailuanui region detailed above have also been shaped by Hawaiian cultural mores and practices, some of which were communicated by the residents in the *Mana'o O Ka 'Āina* section of this report. The *'ohana* values and practices of the community stress the conservation of natural resources for the benefit of present and future generations. Rules of behavior are based on respect of the *'āina*, the virtue of sharing, and a holistic perspective of organisms and ecosystems that emphasizes balance and coexistence. The Hawaiian outlook which shapes these customs and practices is *lokahi* or maintaining spiritual, cultural, and balance with nature. In the course of their travels through the various *'ili* of the traditional cultural practices region, practitioners of Ke'anae and Wailuanui are able to renew their knowledge and understanding of the landscape, the place names, names of the winds and the rains, traditional legends, *wahi pana*, historical cultural sites, and the location of various native plants and animals. The region is thus experienced as a part of their *'ohana*, necessitating the same care as would a member of their family.

IX. INTEGRITY & SIGNIFICANCE

A. Period of Significance

The Ke'anae-Wailuanui region is important for several reasons. The period of significance parallels the general change of Hawai'i from an isolated precontact society to a rural community facing the pressures of the modern world and its global networks. For the purposes of this report, this is the period from precontact to 1945, the end of World War II. Significant structures built during this period are eligible for inclusion in the National Register (over 50 years in age). During this period the population gradually evolved from an isolated, traditional Hawaiian community to a modern, predominantly Hawaiian community which retains aspects of its traditional character. As explained below the region is significant as a "cultural ***kipuka***".

B. Integrity

The Ke'anae-Wailuanui cultural landscape is evaluated for integrity of spatial organization and physical components, and for historic associations that it attained during the period of significance. This landscape reflects the impact of an isolated, but socially integrated community based on subsistence and commercial taro cultivation and a general traditional rural economy.

1. Spatial Organization

The areas used for taro farming have not changed since the establishment of wetland cultivation in pre-historic times, although the total area under cultivation has decreased. Also, it seems the layout of the fields themselves, within the two major systems of Ke'anae and Wailuanui, has not changed since pre-history. For example, the layout of the Ke'anae *lo'i* follows the same pattern as that indicated for mid-19th century Land Commission Awards and, likely, has changed very little since their initial construction. The layout at Ke'anae appears to have not been significantly altered for the rice cultivation occurring there earlier in this century. In Wailuanui, the smaller fields, as shown by 19th- and early 20th-century maps, were never taken out of taro, even during the heyday of rice production. These characteristics distinguish the Ke'anae-Wailuanui taro landscape from that of Hanalei on Kaua'i. The Hanalei system, with its large squared-off fields, represents a landscape, originally planted in taro, which was redesigned for rice cultivation and which retained that design when taro replaced rice in this century. The Ke'anae and Wailuanui systems have never lost their character as a taro landscape.

2. Physical Setting

The physical setting of Ke'anae-Wailuanui contributes to its integrity as a cultural landscape. The region is isolated from urban centers and contains, within a small area, all the subtle and dramatic variations of a windward Hawaiian landscape. Ke'anae peninsula itself is an 'a'a lava flow surrounded by the ocean with no natural stream drainage. Waterflow was diverted to the peninsula by design of the pre-historic Hawaiians solely for the purpose of taro cultivation. This use of such a rugged landscape is unexpected. This may be the only example in Hawai'i of wetland irrigation on an 'a'a lava flow.

3. Historic Associations: Cultural *Kipuka*

The most distinctive historic association of the Ke'anae-Wailuanui landscape is its unbroken relationship to the foundations of Hawaiian culture through the traditional cultivation of taro, the major component of the cultural landscape. The traditional cultural

practices region is also significant as a surviving enclave of Hawaiian subsistence, cultural, and spiritual beliefs, customs, and practices.

Botanists who study the volcanic rainforest have observed that eruptions which destroy large areas of forest land leave oases of native trees and plants which are called *kipuka*. From these natural *kipuka* come the seeds and spores for the eventual regeneration of the native flora upon the fresh lava. Rural Hawaiian communities like that at Ke'anae and Wailuanui are cultural *kipuka* - places where Hawaiians have maintained a close relationship to the land through their livelihoods and customs - that play a vital role in the survival of Hawaiian culture. There is a growing recognition that protection of the natural resources and the integrity of the lifestyle and livelihoods within rural districts is essential for the perpetuation of Hawaiian culture.

Persisting through 20th century development, cultural *kipuka* such as Ke'anae-Wailuanui have depended upon undeveloped natural resources which provided an abundance of foods for the Native Hawaiians living there. Production in these districts was primarily oriented around home consumption. Small stores, often run by Chinese, provided some access to basic modern amenities such as kerosene, lanterns, tools, and coffee. Money to purchase basic provisions came from selling taro or fish or an occasional day's labor for a local entrepreneur or the government road crew.

Primarily, rural Hawaiians who lived in these districts were able to acquire the basic necessities for their families through subsistence activities upon the land by employing traditional knowledge and practices passed down to them from their *kupuna* (elders). Family knowledge about prime fishing grounds and the types of fish which frequent the ocean at different times of year usually assured Hawaiian fishermen of successful fishing expeditions. Taro and other domestic crops were planted by the moon phases to assure excellent growth. Seasonal fruits and marine life was part of their diet. Native plants were used for healing illness. Cultural knowledge in general informed Hawaiian families about how their ancestors had coped with the natural elements and assisted them in understanding and adjusting to the natural elements and resources of their district. Hawaiians in these districts continued to trace unbroken lineal descent from the original Hawaiians who had settled their district as well as to the spiritual life forces and ancestral deities of the land itself.

The comprehensive knowledge of local resources and traditions shared by the residents of Ke'anae and Wailuanui in the *Mana'o O Ka 'Aina* section above give evidence of the possibility for the survival of the Hawaiian culture through the dynamic forces of political and economic change during the twentieth century.

C. Significance

Federal and state criteria for determining historic significance were applied to the Ke'anae-Wailuanui cultural landscape.

National Register Criterion A

Criterion A applies to properties that have association with significant events affecting broad patterns of history. The broad pattern of history that most represents the essence of this landscape is the development of Hawaiian agricultural systems. Wetland irrigations systems, in general, were developed and maintained as public works only in the context of a system based on planning, organization of labor, clear definition of water rights and community cooperation. Hawaiian culture, as expressed in religion, art, language, dance,

social structure and chiefly political system, developed over nearly fifteen hundred years in these islands with the sustenance provided by the highly-developed and well-managed systems of wetland taro cultivation. Nowhere else in the Pacific did the cultivation of this staple crop reach such a degree of development. Because of the importance of taro in Hawaiian culture and history, and because of the degree of integrity with which the Ke'anae-Wailuanui landscape manifests this development, this landscape is eligible under this criterion. This landscape also qualifies in consideration of the time-depth of agricultural development represented by the abandoned irrigated networks which fringe the Wailuanui system to the south and southeast.

The Ke'anae-Wailuanui cultural landscape also bears the evidence of the early competition between the American board of Foreign Missions, of the Calvinist tradition, and the Roman Catholic missionary efforts. After the mid-nineteenth century the intensity of this rivalry subsided as religious pluralism evolved in the kingdom. However, a result of the rivalry is represented in the two remaining church buildings in the area: the Protestant Church in Ke'anae and the Catholic Church in Wailuanui. There is a local anecdote regarding the remains of a stone church which was once a construction effort in Wailuanui not far from Saint Gabriel's and the "miracle church". Under the hau trees the unfinished building can be located and is still in relatively good condition. Stories told by several old timers say that the structure is part of a Protestant church that was never completed. The rocks for the church were washed away when the Protestants selfishly announced their intent to keep the coral rocks that were washed onto the shore during the first of a series of unusual storms by claiming that the rocks were on their side of the land. Another storm washed all the rocks back into the ocean. Subsequently, rocks for the "miracle church" were washed on to the Catholic side of the land and none on the Protestant side. Ultimately, the Protestant Church was built in Ke'anae and the Catholic Church was built in Wailuanui, both in 1860, although the Ke'anae church did not hold its first service until 1863.

The region's participation in the immigrant and plantation heritage tie it to this important historic period of Hawai'i's history. While the headquarters of the major players and companies in the region were generally based in Hāna, Haiku, or Wailuku, Ke'anae-Wailuanui has rich associations with this history. The role of Japanese immigrant workers in the construction of the East Maui Irrigation Company (EMI) ditch through the region was an important factor in Japanese immigration to Maui. Additionally, many Chinese plantation workers at the completion of their contracts, left the plantations and moved to Ke'anae and Wailuanui to lease the wetland irrigation systems there to grow rice. Oral histories document the interaction of immigrant Chinese and native Hawaiians. Historic features associated with rice cultivation still remain.

The widespread recognition of the spiritual as well as physical basis which taro provides for the Hawaiian culture, adds significance to the traditions of taro growing evident in the cultural landscape area. The largely Hawaiian population and persistence of many aspects of traditional Hawaiian lifestyles make the area a cultural *kipuka* - a repository from which a renewal of a more traditional Hawaiian society can be drawn.

National Register Criterion B

Criterion B refers to associations with famous people. Though no significant personages are specifically identified with the area, there are accounts of incidents involving famous persons in the vicinity, from time to time. In pre-contact events during the 14th century, Wailuaiki and Wailuanui became the war canoe landing area in the battle for Hāna

which was a part of the early unification battles between Umi-a-Liloa and Ho'olae-Makua. Three centuries later battles between Kalani'opu'u, Chief of the Big Island, and Kahekili, Chief of Maui, were fought in the Ko'olau region. Kamehameha was one of the warriors under Kalani'opu'u during these battles. In 1778 Captain Cook's second voyage to Hawai'i occurred during this period; Ke'anae and Wailua were along his sailing route. Kalani'opu'u and his entourage came aboard Cook's ship - the Resolution- while it anchored off Wailua and Kamehameha spent a night aboard the ship.

National Register Criterion C

This criterion refers to the quality and integrity of a property in which it can be described as an excellent example of its type. The Ke'anae-Wailuanui cultural landscape is undoubtedly an excellent example of a landscape whose main focus is wetland taro cultivation. There is both purity and continuity of form expressed in the scale of cultivation, the layout of the fields, the *'auwai*, the source and delivery of irrigation water, the management and labor practices, the associated residential pattern, the continuity of use and the setting of an isolated rural Hawaiian community. The current research has established that the configuration of the Ke'anae system of irrigated taro patches has not changed since it was mapped in 1903, and the Land Commission Award records, ca. 1850, describe a system essentially the same as that seen today. It is also an excellent example because of the beauty and variety of its natural setting. Also to be considered as part of this landscape are the excellent examples of abandoned, but still intact, wetland irrigated systems, along the south and southeast perimeter of the Wailuanui *lo'i*. Here, ancient rock terraces, as many as six levels, and intact *'auwai*, represent "fossilized" versions of the present working systems.

Ke'anae-Wailuanui has good examples of buildings that are representative of those typically constructed in Hawaii from 1850 to 1945. Both Ke'anae Church and Our Lady of Fatima Shrine are in good repair. Both have gone through recent restoration work by the congregation and friends of the churches. Wooden domestic and public structures dating from the early decades of the 20th century also exist in the dispersed settlement pattern typical of rural landscapes.

Waikani Bridge has been evaluated as being of high significance (Hawaii Heritage Center 1990: 40). Its continuous concrete arch deck makes it an excellent example of this type of design and one of the most aesthetic on the island of Maui. The bridge was also among the last constructed to complete a reliable road between population centers on Maui.

In proportion to the total number of residential structures in the community, the number of residences built more than 50 years ago also establishes the area's value and integrity as a cultural landscape. Although some of these structures are in disrepair, many are occupied and in reasonable condition. They provide a physical record of the past along with a record of the evolutionary adaptation of domestic architecture with available materials and environmental and social conditions. Many of these houses are occupied by the original residents or families who built them and this provides a further value in its historical continuity.

National Register Criterion D

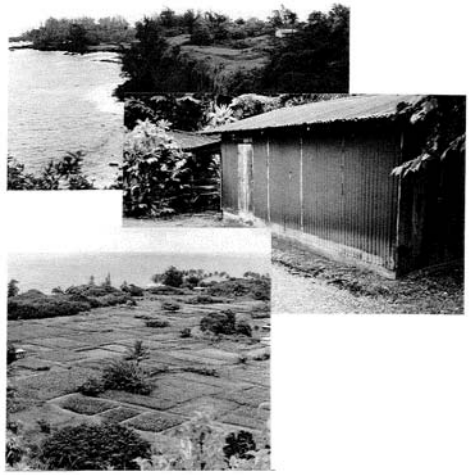
This criterion refers to the potential for yielding information important in history or prehistory. The Ke'anae-Wailuanui landscape qualifies under this criterion because of its potential for yielding information on the origins, chronology and development of Hawaiian taro cultivation and the development of the associated Hawaiian community. The integrity

and apparent time depth of the irrigated agricultural systems, combined with an absence of modern development in most areas and continuity of cultural traditions, indicate that further research has a high potential to yield information on both taro cultivation and early Hawaiian social development.

Criterion E (as defined by the State Historic Preservation Division)

This criterion refers to traditional cultural significance. The Ke'anae-Wailuanui landscape qualifies under this criterion because it represents an important resource in the perpetuation of traditional Hawaiian cultural practices - such as taro cultivation, hunting, fishing, and gathering - and Hawaiian social interaction.

X. POTENTIAL IMPACTS ON THE CULTURAL LANDSCAPE



X. POTENTIAL IMPACTS ON THE CULTURAL LANDSCAPE

Both the research consultant team and the Maui County Planning Department staff have noted current issues and activities which may jeopardize the integrity of the cultural landscape found at Ke'anae and Wailuanui. While there may be other future threats to the significance of the area, the current concerns noted fall into four categories which are discussed below. Changing administrative jurisdiction, the increasing popularity of travel along the Hāna Highway by tourists, road and bridge improvements, and use of water resources are either currently affecting or have the potential to affect the cultural landscape. Several of the recommendations in the following section of this report are suggested as means to mitigate these impacts.

A. Transfer of State Lands to Department of Hawaiian Home Lands Jurisdiction

On October 28, 1994, as part of a settlement agreement, the State of Hawai'i transferred 16,518 acres of land to the state Department of Hawaiian Home Lands (DHHL) along with an agreement to provide nearly $600 million in funding to develop these lands. Twenty-four parcels - totalling 242.3 acres - in the Ke'anae-Wailuanui region were included in the final transfer: two parcels on Ke'anae peninsula, one parcel in Ke'anae Valley and 21 parcels in Wailuanui (Figure 45). These parcels include *kula*, coastal and taro lands.

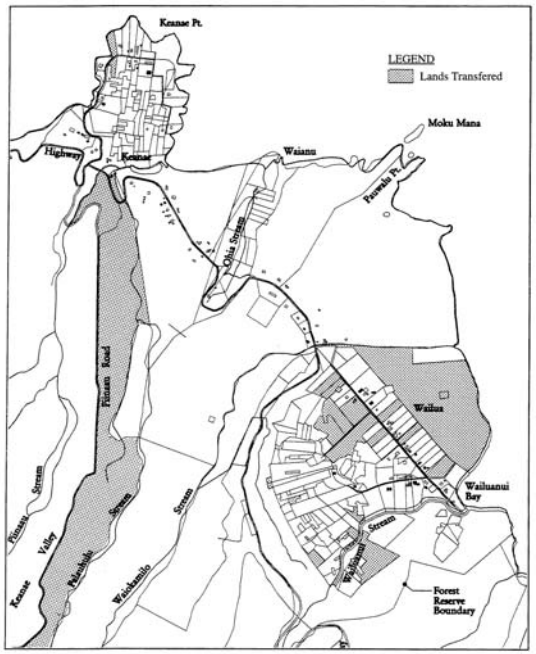
DHHL distributes 99-year leases of house lots to qualified applicants of at least 50% Hawaiian ancestry. Awards of leases are made on a first-come, first-served basis and the waiting list of applicants has long exceeded the number of lots available. No priority is assigned to applicants on the basis of geographical or family affiliation. In discussions of the land trust with Ke'anae and Wailuanui community members during the present study, there was a consensus among the informants that the ceded public lands in the Ke'anae-Wailuanui area should benefit the families who have lived in the community for several generations.

It has been established in court cases that the counties have no land use jurisdiction over DHHL lands. Maui County regulations and personnel do not regulate or control development on DHHL lands. The parcels involved in the transfer are scattered throughout critical areas of the Ke'anae-Wailuanui cultural landscape area and potential development of these parcels could have a major impact on the character, quality and integrity of the landscape.

Hawaiian Homeland developments are usually designed as single-family, small-lot subdivisions. However, at Ke'anae and Wailuanui, residential lots have been tied traditionally to agricultural lots and there has been a strong relationship between homes and the taro cultivation on nearby lands. The upcoming lease assignments and conditions may serve to strengthen or weaken these connections which are important to the preservation of the rural, agricultural lifestyle and systems that are currently in place. Several of the parcels included in the transfer are currently used for pasture or are fallow taro lands that could be brought back into cultivation. If used primarily for house sites, development of these lands may begin to erode some of the agricultural roots of the community.

B. Tourism

Hundreds of tourists daily take the scenic Hāna Highway which has been described in this report as a significant viewshed. Tour publications, hotel concierges, and television



Lands Transferred to Department of Hawaiian Home Lands

KE'ANAE - WAILUANUI CULTURAL LANDSCAPE Figure 45

stations publicize the charms of the road to Hāna with its 52 bridges and stunning views. Some tourist-oriented publications recommend a drive down onto the Ke'anae peninsula. A Ke'anae taro farmer has estimated that a tour van comes down the road to the peninsula every 20 minutes during the daytime. While there is certainly scenic beauty on Ke'anae peninsula to be experienced by tourists, the need of the residents to conduct undisturbed their daily labor-intensive farming activities must be considered. Other, less intrusive, opportunities for tourists to examine the Ke'anae-Wailuanui landscape are available: panoramic views from the lookout above Ke'anae and from the two lookouts above Wailuanui provide a far better perspective over the mosaic of taro lands. Additionally, the state park at Waianapanapa, a customary stop for tourists to Hāna, provides far more spectacular views of the same type of black lava dramatically meeting the ocean as at Ke'anae peninsula, along with paved parking and acres of public shoreline access.

Public facilities in the Ke'anae-Wailuanui portion of the Hāna Highway are at capacity or overburdened. Parking at the overlooks, as well as at the Ke'anae Arboretum, is inadequate for the number of visitors attempting to use them. Additionally, roadside picnic, rubbish and restroom facilities are limited to a few state parks, which appear to be experiencing an increasing maintenance burden. Swimming in pools along the route to Hāna is also encouraged by tourist-oriented media, but potential impacts on the streams from human use have not been addressed by the tourist industry.

C. Highway Improvements

The Hāna Highway winds along the north shore of Maui, crossing numerous streambeds by means of approximately 50 bridges, several of which were built in the early 1900s and are only one lane wide. Improvements to the Hāna Highway, including bridge replacement, are an ongoing project of the state Department of Transportation Highways Division. The department has had prepared an *Historic Bridge Inventory and Evaluation: Islands of Maui and Molokai* (1990) which documents nineteen historic bridges (over 50 years old) located in the Ke'anae-Wailuanui cultural landscape area. At least one of these bridges, Waikani Stream Bridge, has been established as significant architecturally and historically, having a high degree of integrity. Road improvements and replacement of any of the bridges in the area will affect the integrity of the cultural landscape: Ke'anae and Wailuanui would be made more accessible to increasing numbers of tourists in larger buses, and more susceptible to development, including residential subdivisions for commuters to more urban areas.

D. Water Use

The diversion of streams in the Ko'olau watershed via the East Maui Irrigation (EMI) Company system, has reduced the surface water flow in the region *mauka* of the cultural landscape. The system currently provides most of the irrigation water for central Maui's large-scale agriculture and is the main source for county water supplies to upcountry Maui residents and farmers.

While the degree of reduction has not been quantified, the volumes of water carried by the ditch are significant and impact on the stream ecology in Ke'anae and Wailuanui is probable. Native endemic and indigenous species such as *'o'opu*, *'opae* and *hīhīwai* are likely to have been affected within the last few generations, with consequent impact on the traditional gathering practices that are part of the local lifestyle. During interviews for the

present study, Ke'anae and Wailuanui some residents expressed concern over the impact of the diversion of water by EMI Co. on the ecology of the region. They also question the effects that the EMI diversion may have on the temperature and consistent flow of the water to taro lands. Other residents view EMI Co. as a steady economic mainstay of the community. The ditch system itself has also been used by residents for access to hunting and gathering areas.

In the future the diversion of water may become an important issue as both agricultural and residential uses increase on East Maui.

XI. RECOMMENDATION

XI. RECOMMENDATIONS

Landscapes are dynamic by nature and will change with technology, human needs, cultural practices and beliefs. The purpose of this inventory has been to identify what is historically and culturally notable about the contemporary settlement at Ke'anae and Wailuanui. It appears that a high degree of cultural and historical significance can be attributed to the existing distribution of features throughout the landscape, particularly to the taro fields and the irrigation system that feeds them.

This cultural landscape study can be used for land-use planning and decision-making purposes by individual land owners and lessees, by potential developers, and by state and county agencies whose work affects the region. If these decision-makers follow the recommendations of the Hāna Community Plan in retaining the cultural identity of the region and promoting economic activities which are environmentally benign and compatible with the cultural sensitivities of the area, then significant portions of the cultural landscape will be preserved and their continued traditional use assured.

The following policy recommendations are offered as potential steps in an on-going effort to preserve the integrity of the Ke'anae-Wailuanui landscape while accommodating its dynamic nature.

Economic Activity

A. Taro Cultivation

1. The perpetuation of taro cultivation in Ke'anae and Wailuanui as a viable economic activity is critical for the future maintenance of the cultural landscape. For this to happen, there must be continued incentives for taro growing and community support which encourages maintenance of the water sources and *'auwai* on which the cultivation depends.

2. In response to requests from taro farmers, the Maui County Council has provided tax relief for parcels used for taro farming as of April 18, 1994 (Ordinance No. 2315, amending Sections 3.48.175 and 3.48.590 of the Maui County Code). This policy and others which provide economic incentives for taro farming should be continued.

3. In ancient Hawai'i, responsibilities for maintenance of the irrigation systems were delegated by the administrative chief or *konohiki*. Today, the community must act in cooperation to achieve this maintenance. State or county agencies should be identified to assist in coordinating the cleaning and maintenance of agricultural irrigation systems.

B. Subsistence Activities

1. Access. The traditional trails, especially the Pi'ilani Trail along the shoreline, as well as the trails and unimproved roads running *makai* from the highway to the beach, and the trails and unimproved roads running *mauka* into the forest reserve should be maintained and their significance in the cultural landscape assessed. The residents continue to exercise their rights of access for gathering, fishing, and hunting via these roads and trails.

2. Watershed Management. In accord with the East Maui Watershed Management Plan and the varied cultural and subsistence uses of the watershed by the Ke'anae-Wailuanui community, the forest in the watershed should be protected. Access for cultural, subsistence, and spiritual customs and practices should be afforded to those residents of the community who will maintain traditions of respect and stewardship of the land and water resources.

C. Tourism

1. The Department of Land and Natural Resources Division of Forestry and Wildlife (DLNR/DOFAW) created the Ke'anae Arboretum as an educational and recreational facility for both local residents and visitors. It appears that the location and the environment of the Ke'anae Arboretum and its functioning *lo'i* are ideal for presentation of the theme of taro growing and other traditional Hawaiian practices. The arboretum could be developed to offer interpretation and education, with emphasis on practical and even hands-on experience. These elements could be developed to minimize the adverse impact of visitors to the taro-growing areas of Ke'anae and Wailuanui, which are so important to the economy of the community. The development of this facility could be a source of further part- or full-time employment of local residents. DLNR/DOFAW has indicated that they are open to the discussion of planning options for further educational development of the arboretum with the Ke'anae and Wailuanui community.

2. With regard to the viewing points, it is noted that the lookout points above Ke'anae, Wailuanui and the Ko'olau Gap, like the roadside stands and Ke'anae Arboretum, are the facilities that specifically accommodate tourist needs in the area. To enhance public facilities and to mitigate tourism impact on the community, lookout points should be improved with better paving, approach signage, interpretive signage, landscaping, and benches.

3. The two historic churches could be included in any tourism and/or educational plan for the area; however, the church administrations should be consulted before the churches are featured in any general tour information or directional signage. Inclusion of the churches in a tourism plan also raises the dilemma of encouraging tourists to leave the Hāna Highway and travel into the heart of the local communities, potentially disrupting the daily activities of the community.

Land Use

A. Department of Hawaiian Home Lands (DHHL)

1. Assignment of DHHL leases and land use conditions tied to homestead awards should consider impacts on traditional cultural practices. Mitigative conditions for agricultural use should be included where practical. When possible, members of the existing community who wish to engage in agriculture or others interested in traditional and/or environmentally benign agricultural pursuits should be given some preference in the assignment of awards.

2. Lands transferred to the DHHL are vacant or under agricultural leases. Developing or subdividing land currently in agricultural use or having the potential for agricultural use should be discouraged. If any subdivision is planned, design should be distinctively rural, to blend successfully with existing conditions.

B. County/State Controls

1. Land use regulations should encourage the availability of agriculturally suitable lands to provide opportunities for small diversified agricultural activities with residential tenancy for farmers.

2. State and county agencies should explore protective management measures such as covenants, easements and other planning tools for exceptional open space resources and viewsheds.

3. County government should establish zoning standards with varying minimum lot sizes to prevent improper use and reflect the different kinds of agricultural activities within the agricultural district.

4. Re-establishment of a small grocery store, or other local commercial enterprises which provide essential services or cater to domestic needs of the residents would enhance the sense of community within the area. Any such development would necessitate some design constraints and specific limits on size.

Environment

1. Many invasive species of plants have already taken hold in the rain forest of the Ko'olau region, and care should be taken prior to introducing any new species - ornamental or agricultural - to the region.

2. Private and public agencies should explore methods to ensure that groundwater and surface water resources are preserved and maintained at capacities and levels to meet the current and future demands of each area in the Hāna District.

Design

1. Significant view corridors should be identified and protected.

2. A dominant architectural style at Ke'anae and Wailuanui is not as well established or readily visible as it is at Haleiwa, Lahaina, or other more developed areas. Additionally, architectural details are less important in the rural landscape than are the relationships of the landscape features and the scale, building materials and siting of structures within it. New development in this rural cultural landscape should be attentive to design in terms of siting relevant to: landforms and existing buildings, setbacks, maintenance of existing landscape features, and relationships to viewsheds.

3. Road width, drainage improvements and siting should be considered in terms of the rural cultural landscape as well. Roadways should have a minimum

pavement width of 16 feet and should not exceed 20 feet in width, in accord with the Hāna Community Plan. Standard curbs, gutters and sidewalks should not be required.

4. Existing bridges should be retained to maintain the integrity of the cultural landscape as well as the identity of the Hāna region. Whenever a wider or stronger bridge is established as necessary, the old bridge should be retained as an element of the design - e.g. as a turnout for scenic purposes, or as a portion of the newer bridge.

5. The Department of Hawaiian Home Lands (DHHL) and any other potential developers should work with Maui County and the Ke'anae-Wailuanui community in establishing guidelines and site planning to ensure that development on DHHL parcels is consistent and compatible with the existing community and cultural landscape. New development components - including lot sizes, lot coverage, setbacks, subdivision layout, settlement patterns and architecture - should be compatible with the nature of the existing community.

Cultural Resources

1. There are two large, intact, documented *heiau* structures within this landscape which are impressive reminders of the power of ancient religion and politics in this land. Both of these have associated names, and both lie neglected under thick forest vegetation. Individual landowners should consider taking steps necessary to preserve and maintain these and other sites as sources of interest to the community and visitor.

2. Archaeological survey is appropriate to further define the pre-historic antecedents of the wetland taro system in Wailuanui. Excellent examples of terraces, fields and *'auwai* lie in forest on the south and southeast side of the presently cultivated areas. Mapping and description of these sites as well as the adjacent residential areas could be the first step in their preservation, and in developing a greater understanding of the social dynamics which created them.

3. Among the resources gathered is wild taro growing in abandoned taro terraces in the valleys along streams. Abandoned taro terraces within the cultural landscape should be prioritized for documentation and designated for protection.

4. It is noted that several of the parcels transferred to DHHL contain known archaeological and important agricultural features. Some of the parcels have not been surveyed in detail but show a high potential for such features due to hydrogeological characteristics of the land. It is recommended that before any development plans are made for the lands, a more detailed archaeological survey be conducted to ensure the protection of potential sites on these parcels.

5. The Pi'ilani Trail is the best example of a traditional trail which was maintained for fishing and gathering activities until quite recently. In the Ko'olau region it is found just above the coastline with numerous switchbacks

descending into each valley; it is constructed with cuts into the steep slopes which are faced with rock revetments. The trail is an excellent example of early Hawaiian engineering skills, social commitment, and organization: it should be identified and preserved for future generations. Part of its preservation should focus on low-key local use rather than promotion or signage for general use. Maintenance of the Pi'ilani Trail is also helpful to the local economy in providing access for subsistence activities.

The landscape at Ke'anae and Wailuanui has been shown to be culturally significant and management options should be considered. It appears that there may be some threats to the integrity of the traditional landscape and community lifestyle from the recent transfer of lands to DHHL, from the increases in tourism, from potential sale of large parcels in the region to non-agricultural interests and from the ongoing economic difficulties of diversified subsistence and intensive cultivation farming. Implementation strategies should be developed to perpetuate the significant aspects of the cultural landscape without hampering changes beneficial to the community and its residents.

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APPENDICES

A. TABLE OF LAND COMMISSION AWARDS - KE'ANAE TO WAILUANUI

A. Table of Land Commission Awards — Ke'anae to Wailuanui

Compiled by Victoria S. Creed, Ph.D.

The table below presents information from the Native Register (NR), the Foreign Testimony (FT) and the Native Testimony (NT). In all cases the document which contained the most specific details about land use within a parcel was used in this table. In general, the NR is much more specific than are the FT and the NT. For instance, where the FT and NT would document a *mo'o*, the NR might specify a *mo'o* with 10 *lo'i*. Where LCAs have a letter after the number, no NR document was found and all the information comes from the FT and NT. The number of pieces claimed is derived from the FT and NT. This table makes no attempt to show which pieces were awarded.

LCA#	Claimant	Location	Claimed Use	# of Pieces
2441	Tito Kealina	Keanae, Lalaloa	19 *lo'i*, *kula*, upland wooded area, *olonā* area, houselot	7 pieces
2442	Kaea	Keanae Analoa Kiapu Analoa mauka	 6 *lo'i*, *kula*, forested area *kula* a *hala* grove pasture	3 pieces
2443	Kamakau	Keanae Palolena Pololua	 *'ili* land	
2443B	Kanehaku	Keanae Pololua Kanemakue	 2 *lo'i*, pond, *kula*, forested area *olonā*, forested area	2 pieces
3472	Kaihaa	Pauwalu	*mo'o* (*lo'i*) pasture	2 pieces
3472B	Bareneba	Keanae Waianu Pahoa Koleamoku Kuapohaku Kalihi Waiaolohe Kukuiohoku	 *'ili* *'ili* 2 *lo'i* 1 *lo'i* 1 *lo'i* 1 *lo'i* clump *olonā*	7 pieces

LCA#	Claimant	Location	Claimed Use	# of Pieces
3499	Kiowai	Wailua Keonalu Paehala Pauhala Waiele Paakamaka Paolena Kealaalaea	1 *lo'i* 1 *lo'i* *kula*, houselot *hala* grove 7 *lo'i* 5 *lo'i* 27 *lo'i* *kula*	6 pieces
3701	Makaonaona	Wailua	2 stream branches	
4537 See 4587	Hoonoho	Wailua Keonoaulu	 *mo'o*	
4537B See 4587B & 6778	Kapahukaa	Wailua Waikani Waeli Piikalawa	 *mo'o* kihapai (3), 3 *lo'i* houselot	6 pieces
4561	Wahinemaikai	Wailua Waieleiki Kakee Koili Paulae	 *'ili*, *mo'o*, *lo'i* *mo'o* *mo'o* houselot	5 pieces
4562	Wailaahia	Wailua Kaakee Maulu Palolena	 4 *lo'i* houselot, *mo'o* 7 *lo'i*	4 pieces
4587	Hoonoho	Wailua Keononalu Paakamaka Paehala	 *mo'o* (12 *lo'i*) & *kula* 1 *lo'i* houselot	3 pieces
4587B	Kapahukaa	Wailua Waikani	 *mo'o*	
4665F	Naeole	Keanae Kapae Kanemakue	 land, pasture houselot	3 pieces

LCA#	Claimant	Location	Claimed Use	# of Pieces
4665G	Ehu	Keanae Kalihi Kukuiohoku Pahoa 1 Pahoa 2	 *'ili*, 2 *lo'i*, houselot 9 *lo'i*, *olonā* 6 *lo'i*	7 pieces
4665H	Ohiki	Keanae Waiaolohi Leo Pahoa Kawaaune	 10 *lo'i*, muliwai, sweet potato *kula*, taro *olonā kula* *olonā*	3 pieces
4665I	Kauakahi/ Kalawaia	Keanae Kipapa Kapae Waianu Keanae mauka	 *'ili* Houselot 2 *olonā* *olonā* *olonā*	5 pieces
4665K	Kanuku	Keanae Panaewa Makaiwa Kuoo Kapae	 *'ili*, pasture, 2 *lo'i* 1 *lo'i* *olonā*	5 pieces
4725	Moo	Wailua Paakamaka	 9 *lo'i* & *kula*	
4726	Makaole	Wailua Paulae Waileku Kaala Kalaioa	 9 *lo'i* & *kula* *olonā* dry taro *'ili*	2 pieces
4726B	Makaole	Wailua Kaala Kalaioa	 dry taro *'ili*	
4729	Moo II	Wailua Makaku Paulae Palolena Maulu	 3 *lo'i* 2 *lo'i* 3 *lo'i* houselot	4 pieces

LCA#	Claimant	Location	Claimed Use	# of Pieces
4772	Naiwi	Wailua Makuku Waieli Keononalu Kalimapuhi Waikani Maulu Kaahu	 houselot *lo'i*, 5 "kiowai" /pools/, houselot *lo'i* *lo'i* *lo'i* 3 *lo'i* *lo'i*	4 pieces
4773	Nakihei	Wailua Kalimapuhi Paakanaka	 9 *lo'i* 1 *lo'i*	2 pieces
4774	Nalimanui	Wailua Kealia	 houselot, *mo'o*	1 piece
4779	Naiapea	Wailua Keononalu Paakamaka	 8 *lo'i*, *kula* 10 *lo'i*	2 pieces
4787	Namakaimau	Wailua	houselot	
4832	Kamahine ma	Far mauka	 *olonā* for six persons	
4847	Malaelua	Keanae Huo/Kuo Kalihi Ololokeahi Paehala Pohakuokane Lolokeahi	 *'ili*, 8 *lo'i* 2 *lo'i*, houselot 1 *lo'i* houselot 1 *lo'i* 1 *lo'i*	6 pieces
4848	Kuluhiwa	Keanae Ololokeahi Waianu "Pilaniolipi"	 *'ili*, *kula* *'ili*	3 pieces
4848B	Kane	Keanae Wailoea Kipapa Kanemakue Wailoea mauka	 *'ili* 2 *lo'i* houselot "*pauku*"	4 pieces

LCA#	Claimant	Location	Claimed Use	# of Pieces
4848C	Keliinea	Keanae Kuo Waianu	 *'ili*, pasture *olonā*	3 pieces
4848D	Umikanaha	Keanae Makaiwa Manonui	 *'ili* pasture	2 pieces
4848E	Maewaewa II	Keanae Lalaola II Ololokeahe	 *'ili* 1 *lo'i*	2 pieces
4848F	Maewaewa I	Keanae Kekaele & Kukuiolono	 *'ili*	
4848G	Mu	Keanae Pohakuokane Lalaola Haleakea Waiapuka Kaaunaku Lonowai	 *'ili*, pasture 2 *lo'i* 1 *lo'i* *olonā*, 4 *kihapai* *olonā* (2, 3) *olonā* (4)	8 pieces
4848H	Kailio	Keanae Kealokekua Makaiwa Kanemakue	 *mo'o* 5 *lo'i* houselot	3 pieces
4853C	Umaikealani	Wailua Waialuaiki Kahu Waieli Palolena	 houselot 2 *lo'i*, *lo'i* 2 *lo'i*, 1 *lo'i*, 4 *lo'i* 1 *lo'i*	7 pieces
4853D	Naha	Wailua Palolena Paulae	 *'ili*, *olonā* 2 *lo'i*	2 pieces
4853E	Kahahahei	Wailua Waeli Paakamaka Waiapuka	 *mo'o*, houselot *olonā* 2 *lo'i*	2 pieces

LCA#	Claimant	Location	Claimed Use	# of Pieces
4853F	Kahaaiea	Wailua Palolena Paakamaka Paehala	 *mo'o* *olonā* *olonā*	3 pieces
4853G	Kuheleaumoku	Keanae Keononalu Kakee Kapae Wailua Keononalu Kaku Kapae Kalaalaea	 *mo'o* *olonā* *olonā* *mo'o* *olonā* *olonā* houselot	4 pieces
4853K	Poolai	Wailua Kukuihoku Waiapuka Waeli	 2 *lo'i* *mo'o*	4 pieces
4853L	Kaopea	Keanae Koleaamoku Waioea Makaiwa	 *'ili* 2 lois houselot	3 pieces
4854	Mamaekawaha	Keanae Kipapa Waioea	 *'ili*	2 pieces
4856	Kaihu	Keanae Hakakea Waiolea Waianu	 *'ili* 4 lo'i, *kula* 2 *lo'i* *olonā*	3 pieces
4857 See 4665H	Naohiki / Ohiki			
4859	Kikowahine	Keanae Pahoa Keanae	 *olonā* *olonā*	
4865	Kapali	Wailua Kealia Paulae	 *mo'o* houselot	2 pieces

LCA#	Claimant	Location	Claimed Use	# of Pieces
4866	Kaholawaa	Wailua Keononalu Waieli Paulae Paakamaka	*mo'o* *lo'i* (2) 4 *lo'i* houselot	5 pieces
4867	Wahapuu	Wailua Keononalu	*mo'o* of kalo	1 piece
4874 See 4853H	Makea	Keanae Paihala	*'ili*	
5030	Kekahuna	Wailua Keononalu Paehala Palolena Paulae	*mo'o* (10 *lo'i*) houselot	4 pieces
5043B	Manu	Wailua Kuokoa	houselot, 3 *lo'i*, *lo'i(s)*	3 pieces
5049	Kaiwa	Wailua Paakamaka Kakee	*mo'o* houselot	2 pieces
5051	Kamanu	Wailua Keononalu Pauwalu Paakamaka Kaeli/Waieli Waielinui	*mo'o* (26 *lo'i* & a *kula*) *lo'i* *lo'i* houselot, 3 *lo'i* 3 *lo'i*	4 pieces
5052	Kuiki	Wailua Palolena	2 *mo'o* (14 & 15 *lo'i*), house lot	2 pieces
5054	Kaiwikaola	Wailua Waieli	2 *mo'o*, house lot	3 pieces

B. TABLE OF KE'ANAE-WAILUANUI ARCHAEOLOGICAL SITES

LCA#	Claimant	Location	Claimed Use	# of Pieces
5055	Kamai	Wailua Kalolena /Palolena Waikani Paakamaka Kalimapuhi Kakee	11 *lo'i* 11 *lo'i* 2 *lo'i* 4 *lo'i* houselot	4 pieces
5056	Kumulani	Wailua Keononalu	21 *lo'i* & *kula*	1 piece
5058	Kaulia	Wailua Waieli	22 *lo'i* (2 *mo'o*)	2 pieces
5059	Kuikui	Wailua Pukalawa	*'ili*	1 piece
5060	Kalawaia	Wailua Waieli	10 *lo'i* & *kula* houselot	2 pieces
5062	Kahakauwila	Wailua Keononalu Waikani Waieleiki	20 *lo'i* & *kula* *olonā* 1 *lo'i*	3 pieces
5064	Keahi	Wailua Waikani Palolena Keononalu Waieli nui Kalii	*'ili* *'ili* 1 *lo'i* 4 *lo'i* *ahupua'a*	4 pieces
5064B	Kaluahinanui	Wailua Waikani Palolena	2 *mo'o* 2 *lo'i*, *lo'i*	3 pieces
5065	Kiaha/ Kaohilae	Wailua Maulu Paikalawa Keononalu	houselot houselot *mo'o*	2 pieces
5066	Kaumiumi	Wailua Kaakee Palolena Kaonoulu	*mo'o* *lo'i* (2) 2 *lo'i*	4 pieces

LCA#	Claimant	Location	Claimed Use	# of Pieces
5066B	Kaohilau	Wailua Kaononalu		
5067	Kalama	Wailua Kaakee Wailua Maulu	10 *lo'i* & *kula* 25 *lo'i*, *kula* & houselot 1 *lo'i*	2 pieces
5068	Kauiki	Wailua Waieli nui Keononalu	24 *lo'i* & *kula* 2 *lo'i*	2 pieces
5068B	Kakahunaaiole			
6769B	Ohule	Wailua Waieli Kaliai	6 *lo'i* *'ili*	
7784	Kahaukomo	Keanae Nausailua	*'ili*	1 piece
10828B	Kaniho	Wailua Palolena Kalimapuhi Kealaalaea Wailuaiki Piikalawa	*mo'o*, 3 *lo'i* *mo'o* *'ili* *'ili* fish pond	6 pieces
11043B	Kaumauna	Wailua Waieli Keononalu Kalimapuhi Piikalawa	*mo'o* 2 *lo'i*, *kihapai* *'ili* houselot	4 pieces

B. Table of Ke'anae-Wailuanui Archaeological Sites

(BM A— = Bishop Museum Maui site number)

Archaeological Sites	State Site # & Form Information	Thrum (1909)	Stokes (1916)	Walker (1931)	Soehren (1963)	Ashdown (1971)	Cultural Surveys Hawaii (1994)
Kukuiolono *heiau* (Ke'anae)	State site 50-50-07-82 (BM A4-1)			Kukuiolono on point of Ke'anae peninsula, Heiau site destroyed or not found. (Walker 1931:167) (possibly Kukuipuni of other references ?)	"Pahinahina heiau was indicated on an unknown date (Walker 1931, p. 167, site 82). (This site was pointed out to J.F.G. Stokes in 1916, who said it was 150 feet from the sea at Keanae Point. The site was not identified on this survey" (Soehren 1963:200)		Not investigated during present study
Lalaola *heiau* (Ke'anae)	State site 50-50-07-83 (BM A4-2)			Lalaola, on point of Ke'anae peninsula. Heiau site destroyed or not found. (Walker 1931:167)	"Lalaola heiau (Walker 1931, p. 167, site 83) was said to have stood on land of the same name on the Keanae peninsula. Its site was pointed out to J.F.G. Stokes, but the structure had been destroyed long before." (Soehren 1963:201)		Not investigated during present study

Archaeological Sites	State Site # & Form Information	Thrum (1909)	Stokes (1916)	Walker (1931)	Soehren (1963)	Ashdown (1971)	Cultural Surveys Hawaii (1994)
Pakanaloa *heiau* (Ke'anae)	State site 50-50-07-84 (BM A4-3)	"Pakanalo - 'Keanae. A war heiau dedicated to Kanehoalani." (Thrum 1909:39) "The temple of Pakanaloa, has a tradition claiming entire absence of the thunder to the effect that its Kahu, Kanehoalani, died within its walls. The people of Hamakualoa, disappearing at its destruction, searched till they found his body in the temple at Keanae." (Thrum 1929:48)	"Pakanaloa, on upper slopes of Keanae, not far from sea; has a platform heiau; not seen." (Stokes in Thrum 1918:125)	Pakanaloa, upper slopes Keanae peninsula, "said to have been a war heiau to Kanehoalani". Heiau site destroyed or not found. (Walker 1931:167)	"Pakanaloa heiau is said to have been a platform heiau located on the upper slopes of Keanae peninsula. It was seen by J.F.G. Stokes in 1916. The site was not identified on this survey or by Walker (1929, p. 167, site 84)." (Soehren 1963:202)	"In Ke'anae stone platforms like temple named Pakanaloa are known to Kahuna Kanehakili was heiau of that name." (Ashdown 1971:44)	Not investigated during present study

Archaeological Sites	State Site # & Form Information	Thrum (1909)	Stokes (1916)	Walker (1931)	Soehren (1963)	Ashdown (1971)	Cultural Surveys Hawaii (1994)
Kaluanui *heiau* (Wailua)	State site 50-50-07-95 (BM A5-9)	Kaluanui - listed; "No particulars learned of these Keanae temples." (Thrum 1909:39)	"Kaluanui, a small heiau, 41 x 42 ft., on land of same name, at Wailua nui, below a *koa* is known as Ohia, one-third of a mile from sea; on side of taro patch; of two sections, enclosure and platform, the latter running into the hill and seeming to have continued up the slope. Said to have been for sacrifice, and that the drums are heard." (Stokes in Thrum 1918:-125)	Kaluanui - "Location: At Kaluanui on the east side of taro patches a third of a mile from the sea. Description: Combination of enclosure with higher terrace on one side. The enclosure measures 15 x 29 feet and the terrace at the south end is 11 feet wide. The west side is 6 feet wide and 4 feet high. Stokes in 1916 saw an oval pit in the terrace pavement near the southern end, 6.5 feet long, 4 feet wide, and about 2 feet deep. This can not now be seen." (Walker 1931:170)	"Kaluanui heiau was reported by Stokes in 1916 and by Walker in 1929 (site 95), but could not be located on this survey. The structure was described as being in two sections, an enclosure measuring 15 by 29 feet and an adjoining platform or terrace extending to the hillside and possibly continuing upward. Stokes was informed that the heiau was for sacrifice, and that drums were sometimes heard there." (Soehren 1963:203)		Not investigated during present study

Archaeological Sites	State Site # & Form Information	Thrum (1909)	Stokes (1916)	Walker (1931)	Soehren (1963)	Ashdown (1971)	Cultural Surveys Hawaii (1994)
Kamokukupeu *heiau* (Wailua)	State site 50-50-07-88 (BM A5-2)			Kamokukupeu; Heiau sites destroyed or not found (Walker 1931:167)	"Kamokukupeu heiau was reported by Walker (1031, p. 167, site 88) to be above the road on the east side of Kamilo Stream, but was not found. Presumably it was destroyed, but Walker makes no mention of its condition. It was not located on this survey." (Soehren 1963:212)		Not investigated during present study
Kawalimukala *heiau* (Pauwalu)	State site 50-50-07-90 (BM A4-7)			Kawalimukala at Pauwalu; Heiau sites destroyed or not found. (Walker 1931:167)	"Kawalimukala heiau was reported by Walker (1931, p. 167, site 90) but not located. It is said to be above the road in the land of Pauwalu. It was not located on this survey." (Soehren 1963:206)		Not investigated during present study

Archaeological Sites	State Site # & Form Information	Thrum (1909)	Stokes (1916)	Walker (1931)	Soehren (1963)	Ashdown (1971)	Cultural Surveys Hawaii (1994)
Kukuiopuni *heiau* (Ke'anae)	State site 5050-07-96 (BM A5-6) This site is known as Kukuiaupuni heiau. Walker reported it in 1931 (p. 171). ... The heiau is situated on a small knoll in very dense vegetation consisting of guava, hau, mango, rose apple, ferns, ti, and unidentified grasses. Kukuiaupuni is a platform heiau of irregular shape. Its approximate dimensions are 26 x 18 m. It is in fair condition. Distinct boundaries cannot be seen on the N side (except the NW corner), the E end of the S side, and the E side of the heiau. The main platform is fairly level and is paved with waterworn basalt rocks (average diameter of ~.2 to 0.3 m.). The platform ranges from 0.9 to 3 m. in height on the S, and from 1.4 to 3 m. in height on the W. (Hawaii Register of Historic Places 1973).	"At Keanae, Kukuiopuni (not Kuikuiaupuni as formerly listed [in Thrum 1909:39]), was a sacrificial *heiau* of large size, of platform character, with entry way, located at Pauwalu adjoining Waihea-nui, the foundation of which only remain. Kanekauolono, on land of same name, was a small *heiau* near the shore, now destroyed, also one called Lalaola, on land of same name." (Thrum 1917:60)		"Kukuiaupuni, Location: At Pauwalau [Pauwalu?] on the top of the slope 300 feet south of the road and 500 feet southwest of the school. Description: A terraced platform facing NW. by N. and with a height of 12 feet at this point. Length 50 feet width 42 feet. The other platform is about 200 feet away and measures 47 x 51 x 5 feet (Walker 1931:-171). [This site is listed in the "Wailuanui Region" of Walker 1931].	"Kukuiaupuni heiau was described by Stokes in 1916 and by Walker (1931, p. 171 site 96) as a terrace 50 feet long and 42 feet wide, extending northwest by west from the top of a hill, and standing from 8 feet to 12 feet high on the down hill side. Its surface was then greatly disturbed and no interior features could be ascertained. The entire area is now thickly covered with trees and brush, and the structures is in very poor condition. Traces of a low wall were observed around portions of the pavement, and a few waterworn stones were seen among the rubble on this survey" (Soehren 1963:-205).	"At Ke'anae stands the Heiau Kukuio-Puni, with its entry way at Pu'u Walu adjoining Wai-kea-nui." (Ashdown 1971:54)	Located behind Ke'anae School, covered by dense growth of trees. Condition is little changed from earlier descriptions.

Archaeological Sites	State Site # & Form Information	Thrum (1909)	Stokes (1916)	Walker (1931)	Soehren (1963)	Ashdown (1971)	Cultural Surveys Hawaii (1994)
Kupau *heiau* (Kupa'u) (according to P. Sinenci in McGregor interview 1994 - this is a *wahine heiau*)	State site 50-50-07-91 (BM A5-1)			"Kupau above the road in Keanae valley toward the ditch trail 84 feet of terrace wall is all that remains." (Walker 1931:167) [this description is contained in the list of "Heiau sites destroyed or not found"]	"Kupa'u heiau was reported by Walker (1931, p. 167, site 91) as being almost completely destroyed, with only 84 feet of terrace wall remaining. No other particulars are given. Its location is presumably in the land of the same name, which has the Tax Map Key (1-1-08:67) suggested above. It was not located on this survey." (Soehren 1963:211)		Not investigated during present study
Kualani *heiau*	State site 50-50-07-92 (BM A5-3)			"Kualani on top of ridge on west side of Waiokane Falls." (Walker 1931:167)	"Kualani heiau was reported by Walker (1931, p. 167, site 92) as standing on top of the ridge west of Waiokane Falls (Waikani of USGS map), but no further particulars are given. The site was not located during this survey." (Soehren 1963:213)		Not investigated during present study

Archaeological Sites	State Site # & Form Information	Thrum (1909)	Stokes (1916)	Walker (1931)	Soehren (1963)	Ashdown (1971)	Cultural Surveys Hawaii (1994)
Kukuiopuni cont'	"In the NW corner, the height ranges from 0.4 to 0.9 m. On the S and W, the platform sides slope down and much rubble is present. Just N of the NW corner is a wall oriented E-W. It is of multiple-stacked waterworn basalt rocks. The wall averages 1 m. in width and ranges from 0.8 to 0.9 m. in height. It is not certain whether the wall is part of the heiau." (Hawaii Register of Historic Places 1973)						Not investigated during present study

Archaeological Sites	State Site # & Form Information	Thrum (1909)	Stokes (1916)	Walker (1931)	Soehren (1963)	Ashdown (1971)	Cultural Surveys Hawaii (1994)
Kamilo *heiau* (Wailua)	State site 50-50-07-93 (BM A5-8)			Kamilo - "Location: At Kawalos on the north side of the stream in a dense grove of hau and puhala. Description: A small enclosure 22 x 25 feet built of rough basalt and some pebbles. Walls 3 feet high and 3 feet thick." (Walker 1931:168)	"Kamilo heiau was reported by Walker (1971, p. 168, site 93) as lying on the north side of a stream, presumably Waiokamilo. It was an enclosure measuring 22 feet by 25 feet with 3 feet high and 3 feet thick built of rough basalt. The site was not located on this survey." (Soehren 1963:207)		Not investigated during present study
Ohia *heiau*	State site 50-50-07-94 (BM A4-5)			Heiau of Ohia - "Location: At Ohia in the valley three quarters of a mile from the sea. Description: Stones removed to build pig pen, and outlines thus lost. Probably an agricultural heiau built by a chief Kaimuki." "(Information obtained by Stokes in 1916)." (Walker 1931:169)	"Ohia heiau was reported by J.F.G. Stokes in 1916 to be in the land of the same name and attributed to a chief named Kaimuki. The structure was destroyed to provide stones for building a pig pen. ... The site was not located by Walker (1931, p. 169, site 94) or on this survey." (Soehren 1963:204)		Not investigated during present study

Archaeological Sites	State Site # & Form Information	Thrum (1909)	Stokes (1916)	Walker (1931)	Soehren (1963)	Ashdown (1971)	Cultural Surveys Hawaii (1994)
foundation platform of a grass house near Paepaemoana Pt.	State site 50-50-07-538 (BM A4-11)				Near Paepaemoana Point. On the grass covered flat about 200 feet from the top of the sea cliff, is what may be the foundation of a grass house. A rectangular area about 18 feet by 24 feet is covered with rough cobbles, except for a portion about 9 feet by 12 feet which is still fairly smooth and appears to have been delineated by large stones set carefully around the perimeter. The whole is greatly disturbed, mostly by cattle which graze in the area. (Soehren 1963 :208)		Possibly modern? A local resident related that Woody Brown, a well known surfer lived here for a while in the 1950s-1960s in a thatched house built for his use.

Archaeological Sites	State Site # & Form Information	Thrum (1909)	Stokes (1916)	Walker (1931)	Soehren (1963)	Ashdown (1971)	Cultural Surveys Hawaii (1994)
Makehau heiau (Wailua)	State site 50-50-07-97 (BM A5-4) This site is known as Makehau heiau. Walker reported it in 1931... Despite Soehren's comment of "complete ruins" the vegetation prevented the inventory survey team from verifying (1963:214). This heiau could not be mapped by the inventory team because of the extremely dense growth of hau that completely covers it. There are also 8 palm trees growing here. The approximate size of the heiau is 24 x 12 m. The inventory team could see a platform and a possible enclosure through the hau but could not accurately determine their sizes. (Hawaii Register of Historic Places 1973)	Makehau - listed; "No particulars learned of these Keanae temples." (Thrum 1909:39)	"Makehau heiau, on flat land of same name, at Wailua nui, mauka of main lower road, and one hundred and fifty feet south of Makehau road. Disturbed; of platform character, 43 x 72 remaining with indications that it extended to greater width. Eight coconut trees on platform, said to have been planted by Kaniho, who took care of the temple, and was remembered as an old man by Kalo, the guide and informant." (Stokes in Thrum 1918:-125)	Makehau - "Location: At Makehau on a level piece of land 1/4 of a mile from the Wailua road and 150 feet in from the Makehau road. Description: Said to have been a heiau of two platforms of which only the upper preserves much of its original outline. It measures 72 x 43 feet and is 5 feet high. The eight coconuts growing on it were said to have been planted by Kaniho, the last kahu of the heiau. Waterworn stones and pebbles on the platform." "(Information obtained by Stokes in 1916)" (Walker 1931:172)			"Located Makehau heiau in Wailuanui. The condition of the site is little changed from earlier descriptions; it is still overgrown with very dense hau. The coconut trees are still present, but of very old age and beginning to die"

Archaeological Sites	State Site # & Form Information	Thrum (1909)	Stokes (1916)	Walker (1931)	Soehren (1963)	Ashdown (1971)	Cultural Surveys Hawaii (1994)
Wailuanui complex (Wailuanui)	State site 50-50-07-539 This site was named Wailuanui Complex by the inventory the features in 1963. ... The complex covers an area of about 520 x 180 m. The features include 15 graves and two possible house sites. More features in the area were seen; however time did not allow the inventory team to map or record them. Most of the features are within 25 m from the edge of the cliff (Hawaii Register of Historic Places 1973). T. Denham conducted a field inspection on 4/29/93 and recorded 5 additional features, not previously recorded (a wall, a terrace and 3 modified outcrops). "It appears likely that additional features are present within the complex, and inland on the current complex boundaries" (SHPD letter Log no. 8374, Doc. No. 9305KD07, May 27, 1993)						Not investigated during present study

Archaeological Sites	State Site # & Form Information	Thrum (1909)	Stokes (1916)	Walker (1931)	Soehren (1963)	Ashdown (1971)	Cultural Surveys Hawaii (1994)
Pu'u Olu Pond [fishpond] (Pauwalu)	State site 50-50-07-538 (BM A4-9)				"Pu'u Olu Pond [fishpond] appears to be almost an arm of the sea, cut off by a large gravel and sand bar. It lies at the mouth of a small, steep valley south of Pauwalu Point and is about 100 feet in diameter. No flow of water was observed, and the depth does not appear to be great. Most of the surface is covered with pond scum. Some portions of a fairly massive stone wall can still be seen bordering the north side of the pond." (Soehren 1963:208)		Located fishpond and observed sections of *kuapā* on the W and SW sides. Fresh spring water was flowing into the pond from beneath the west wall (pond level was low with base of the west wall exposed). Searched for house site on the SE side of the pond and for modern shrine erected in the vicinity to commemorate the late "Uncle Harry" Mitchell; these sites were not found.

Archaeological Sites	State Site # & Form Information	Thrum (1909)	Stokes (1916)	Walker (1931)	Soehren (1963)	Ashdown (1971)	Cultural Surveys Hawaii (1994)
Portion of Wailuanui complex	State Site 50-50-07539 (BM A5-5) This feature category represents the 15 graves found in Wailuanui complex. They are situated in an area of about 27 x 13 m. The graves range in size from 1.2 x 1.4 m. to 4 x 2.5 m. All are rectangular or roughly rectangular in shape. The graves are in fair condition. Only rock alignments are visible on all graves. The visible rocks are waterworn basalt. It could not be ascertained how the graves were constructed. Soehren reported in 1963 that these are probably historic graves. Excavation should be carried out to determine when they were placed here. The graves are situated next to Feature B, a possible house site. In fact, one grave site on the platform of the house site. No artifacts or midden were found (Hawaii Register of Historic Places 1973).						Not investigated during present study

Archaeological Sites	State Site # & Form Information	Thrum (1909)	Stokes (1916)	Walker (1931)	Soehren (1963)	Ashdown (1971)	Cultural Surveys Hawaii (1994)
small house platform overlooking Puu Olu (Puuwalu)	State site 50-50-07-538 (BM A4-10)				"A small house platform overlooks Puu Olu pond from the east side of the valley. The platform, or terrace, is about 12 feet by 15 feet and is built on the slope of the valley a few feet from the pond and about 10 feet above it. The side toward the pond is faced with waterworn stone. The site commands a fine view of the natural arch under Pauwalu Point." (Soehren 1963:209)		

Archaeological Sites	State Site # & Form Information	Thrum (1909)	Stokes (1916)	Walker (1931)	Soehren (1963)	Ashdown (1971)	Cultural Surveys Hawaii (1994)
terrace wall (Wailuanui)	State site 50-50-07-2944 The wall is comprised of both natural outcrop boulders and stacked wall sections, constructed from cobbles and small boulders. Several sections of the wall are washed out. The area above the wall is generally flat. Along the wall feature, ... a midden scatter was noted under an overhanging boulder. Opihi shells, kukui nuts, dark brown bottle glass, clear glass, and a white-ware bowl sherd were observed. ... The amount and types of artifacts observed here suggest a possible late nineteen/early 20th century habitation site. The proposed route will be positioned along the eastern (downhill) side of the retaining wall (Field Inspection of Revised Road Easement Route for Mike Adams, Wailua, Koolau, Maui, Jan. 13, 1993).						
agricultural terrace on Wananalua Church property (Wailuanui)	State site 50-50-07-2945 ... an agricultural terrace wall occurs to the northeast side of the proposed route ... road route [curved] in this area [to avoid] the terrace (Field Inspection of Revised Road Easement Route for Mike Adams, Wailua, Koolau, Maui, Jan. 13, 1993).						

Archaeological Sites	State Site # & Form Information	Thrum (1909)	Stokes (1916)	Walker (1931)	Soehren (1963)	Ashdown (1971)	Cultural Surveys Hawaii (1994)
Portion of Wailuanui Complex (Feature A)	State site 50-50-07-539 (BM A5-6) This feature is a possible house site, situated about 2380 m N of the graves and feature B in a thick growth of Christmas berry and guava. ... The inventory team observed a very deteriorated wall which abuts a natural aa ledge and a possible platform extending E from the S end of the wall. The wall is of multiple-stacked construction and is built with aa. It ranges from 0.7 to 0.9 m in width and from 0.4 to 0.6 m. in height. The possible platform is about 9 m in length and ranges from 0.4 to 0.6 m in height. No E border cold be seen. The interior slopes toward the S and includes many natural aa outcrops. The natural aa ledge which appears to be the N border of the feature ranges from 1.3 to 1.5 m in height. There was evidence of construction on the ledge, perhaps to build it up further (Hawaii Register of Historic Places 1973).						Not investigated during present study

Archaeological Sites	State Site # & Form Information	Thrum (1909)	Stokes (1916)	Walker (1931)	Soehren (1963)	Ashdown (1971)	Cultural Surveys Hawaii (1994)
Ke'anae Arboretum Taro Complex	State site 50-50-07-3932						Described in this report
Ke'anae Peninsula Taro Complex	State site 50-50-07-3933						Described in this report
Wailuanui Taro Complex	State site 50-50-07-3934						Described in this report
Wailuanui East Taro Complex	State site 50-50-07-3935						Described in this report
Lākini Taro Complex	State site 50-50-07-3936						Described in this report
Kupa'u Taro Complex	State site 50-50-07-3937						Described in this report
Waiamu Taro Complex	State site 50-50-07-3938						Described in this report
Kilo Habitation	State site 50-50-07-3940						Described in this report
Nua'ailua Taro Complex	State site 50-50-07-3941						Described in this report

Archaeological Sites	State Site # & Form Information	Thrum (1909)	Stokes (1916)	Walker (1931)	Soehren (1963)	Ashdown (1971)	Cultural Surveys Hawaii (1994)
Portion of Wailuanui complex (Feature B)	State site 50-50-07-539 (BM A5-7) This feature is a possible house site. Because a dense growth of hau covers almost the entire structure, the inventory team was unable to accurately map the feature. Only the NE corner of an enclosure and a large rectangular platform are visible. The enclosure walls are of multiple-stacked construction and are built with aa. In the NE corner, they range from 1 to 1.3 m in width and from 0.2 to 0.6 m in height. On the E side of the enclosure is a deteriorated platform. The platform measures about 15.5 x 4.8 m. At the NE and SW corners, the platform ranges from 0.2 to 0.4 m in height. Most of the E side of the platform is deteriorated and grass-covered. A grave outline measuring 2.7 x 1.7 m is situated on the platform in the center and is half obscured by the hau (Hawaii Register of Historic Places 1973).						Not investigated during present study

Archaeological Sites	State Site # & Form Information	Thrum (1909)	Stokes (1916)	Walker (1931)	Soehren (1963)	Ashdown (1971)	Cultural Surveys Hawaii (1994)
Kanekauo Lono *heiau*						"Heiau Kanekau-o-Lono is on land of that name at the shore, and is similar to the Heiau La-la-ola at Hale Haku in Hueln." (Ashdown 1971-:54)	Not investigated during present study
Leleiwi		Leleiwi - "Koolau. A sacred shrine situnte near the shore; visited by Kamehameha III. on his royal progress." (Thrum 1909:39)		Leleiwi at Koolau, destroyed or not found (Walker 1931:167).			Not investigated during present study
Paliuli *heiau* (Ke'anae)		Paliuli - listed; "No particulars learned of these Keanae temples." (Thrum 1909:39)		Paliuli; Heiau sites destroyed or not found (Walker 1931:167)			Not investigated during present study

Archaeological Sites	State Site # & Form Information	Thrum (1909)	Stokes (1916)	Walker (1931)	Soehren (1963)	Ashdown (1971)	Cultural Surveys Hawaii (1994)
Rock terraces on State land (Wailuanui)	State site 50-50-07-2942 "at 104 m. from Makehau street, rock terraces were observed 2.0 m. south from the centerline. At 108 m., the route crosses a 6.0 m. long terrace wall; at 114 m., a second terrace is crossed. These features re part of a terrace complex which continued down the hill to the stream. ... In general, they are in poor condition and have been disturbed by erosion or other factors (Field Inspection of Revised Road Easement Route for Mike Adams, Wailua, Koolau, Maui, Jan. 13, 1993).						
wall for an old roadbed (Wailuanui)	State site 50-50-07-2943 The proposed road will pass over ... pushed berm and stay to the south side of the old retaining wall. Intact portions of the retaining wall are within 3.5 to 2.5 m. from the marked centerline of the route (Field Inspection of Revised Road Easement Route for Mike Adams, Wailua, Koolau, Maui, Jan. 13, 1993).						

C. TABLE OF KE'ANAE-WAILUANUI HISTORIC SITES

C. Table of Historic Sites Located at Ke'anae-Wailuanui

Historic Sites	State Site Number and Decription
Puohokamoa Bridge	State site 50-50-07-1509 In Honomanū, Puohokamoa Bridge is a reinforced concrete structure of flat slab design with a single tapered pier in the stream bed, located slightly toward the south end of the bridge. The bridge is approximately 45 feet long and 20 feet wide. Cast into the railing on the east side is "A.D. 1912," the date it was built." (Hawaii Register of Historic Places 1974)
Lin Hing Society Building	State site 50-50-07-1510 "The Lin Hing Society Building in Ke'anae was built in 1908 and served the religious, social, and educational needs of the Chinese in the area; last used about 1950 and abandoned; the surviving materials from the building are stored at the Kwock Hing Society, Keokea, Kula." (Hawaii Register of Historic Places 1974)
Lanakila Ihiihi o Iehova Ona Kau/ Lanakila Ihiihi o Iehova Ona Kauwa (JH)	State site 50-50-07-1511 Name of Congregational church on Ke'anae Peninsula, Meaning: sacredness of Jehovah, Son of God" (DLNR, *Fruitful Fields* 1993) or God's Sacred Wishes for the Outcasts (JH & AKD); built in 1856, restored by members of Ke'anae's Pahukoa family (On the Hana Coast 1983:95); begun in 1857, completed in 1863, restored and rededicated in 1969 (DLNR 1993).
St. Gabriel Shrine	State site 50-50-07-1512 Catholic chapel in Wailua, "The building is particularly unusual because of its miniature size (20 by 40 feet) and its high proportioned triple slope gambrel roof, surrounded by a small square steeple ... On Christmas Day, 1860, the first Mass was celebrated in the church." (Hawaii Register of Historic Places form 1974)
Wailua Stone Church Ruins	State site 50-50-07-1513 "The stone ruins at Wailua, Maui, stand in a level, overgrown field about 160 feet back from the village road. They consist of rough fieldstone walls with cement mortar, approximately eleven feet high and 27 to 30 inches thick, enclosing a rectangle 25 by 60 feet. There is one door opening on the northwest end and one on each long side. Window openings are located two on each long side and one on the southeast end. There is no indication left of a floor or roof. The form of these ruins is very similar to many known early mission stone churches and it is assumed that this was also a church, either fallen in over the years, or never completed" (Hawaii Register of Historic Places 1973). Cultural Surveys Hawaii: Wailua Stone Church remains presently covered with hao and a palm is growing in the middle of the building, walls are still standing. Report is that church was commenced in 1860, at the same time the Catholic church was begun, and like the latter, coral was needed to make lime. A storm supposedly littered the shore with coral and was used for both churches. Another storm shortly thereafter washed all the coral away and there was not enough left to complete this church and the work was abandoned (Per. Comm. G. Kanoa 1994).
Wailua Mormon Church	State site 50-50-07-1514 "The church was built during 1934 and dedicated in 1935. It served the small Mormon community in the area. The building was abandoned for many years and recently has been used mainly as a residence ... The Mormon Church is a one-story wooden structure with an intersecting gable roof. The squat L-plan is raised approximately two feet above the grade. There is a gabled entrance way with double entrance doors. This projecting unit has shingle covering like the remainder of the structure ... The church is located on the upper or mountain side of Hana Highway, Route 36, between Keanae School and Wailua Homesteads Road." (Hawaii Register of Historic Places 1974)

Historic Sites	State Site Number and Decription
Ramos House	State site 50-50-07-1515 The oldest house in Wailuanui (State site 50-50-07-1515), lived in by Florentine Ramos and his wife since 1927. Appears to have been built around 1900-1910. (Hawaii Register of Historic Places 1974)
Waikani Bridge	State site 50-50-07-1516 Bridge near Wailua (State site 50-50-07-1516) built in 1926 with a main arch of 36 feet; one of the larger bridges along the Hana Highway (Hawaii Register of Historic Places, 1974).
Ke'anae School	State site 50-50-07-1630 Built in 1912, an example of a surviving plantation-style rural school of wood construction (Hawaii Register of Historic Places, 1992).
Ke'anae Landing	State site 50-50-07-2957, recorded by SHPD in 1992; "Landing Sites of Maui" by T. Donham for 5th Annual Symposium on Maritime Archaeology and History of Hawaii and the Pacific, Honolulu, n.d. (State Historic Preservation Division) Concrete piers and other structural remnants of the former Ke'anae Landing (Cultural Surveys Hawaii 1994)
Ke'anae Quarry	State site 50-50-07-3943 Cultural Surveys Hawaii identified a stone quarry located on cliff below the Ke'anae YMCA, winch and stone crusher on site; the rock quarried here was used for building the Hana road. There is a stone platform here, perhaps a burial platform for one of the quarry workers who reportedly died in an explosion.

D. A COMPILATION OF PLACE NAMES IN KE'ANAE AND WAILUANUI

D. A Compilation of Place Names in Ke'anae and Wailuanui, Ko'olau District
by Victoria S. Creed, Ph.D.

A special concern of this cultural landscape study has been the collection and cataloging of place names in Ke'anae and Wailuanui. These names have been recorded in 19th century Land Commission Award (LCA) documents and Boundary Commission records, on historic maps, and in various writings on the area (including archaeological reports and personal documents).

Presented below is a compilation of place names in Ke'anae and Wailuanui collected during the course of the present study. The compilation also includes information generously provided by local residents during the study. Each entry includes a short description, locational information (when available), and source. There are also many stories about the place names which appear in the body of this report and have not been repeated here.

The map which follows the place name compilation uses U.S.G.S. topographic maps - Ke'anae and Nāhiku quads - as a base. The names presented on the map include those shown on historic maps which are located as exactly as possible. Names mentioned in written documents are located as accurately as possible.

This compilation is only a first effort to register the heritage of Ke'anae and Wailuanui preserved in the region's names. It is hoped that others with knowledge about the place names in this area will contribute to this list, adding further details, correcting any errors, or deleting items which do not belong.

Named Places[1] in Ke'anae and Wailuanui, Ko'olau District

R.M. = Registered Map
Informant Sources:
JH = James Hueu, Ke'anae kupuna; AKD = Apollonia K. Day, Ke'anae kupuna; HN = Helen Nakanelua, Wailuanui kupuna; EW = Elaine Wender; For other sources see Reference Section

Āhole
—Promontory near Pauwalu Point, *āhole* is a fish (*kuhlia sandvicensis*) (U.S.G.S. map Ke'anae quad) Sea arch beneath promontory; scenes from the movies "Teenage Mutent Ninja Turtles" and "Papillon were filmed here."

'Aihonu
—place in Pauwalu along Waiokamilo stream, means: eating of turtle (Soehren 1963:192); shown on Handy and Handy map (1972:499); (See following map).

Ainakiki
—boundary marker along Pahoa on a ridge separating Wailua and Ke'anae (Boundary Commission, 1895, Maui, vol. 2, p. 49) (Not shown on any known maps).

Akeke/Kaakeke/Paakeke
—spring, in the forest above Moana, above Kupa'u along Waiokamilo Stream, also called Banana Springs (HN & A. Carmichael in McGregor interview 1994); (Map on pages following Place Names dictionary).

Alaloa ("Long Road") See Pi'ilani Trail
—paved trail that ran around both east and west ends of Maui. "Between Wailua and Ke'anae the old trail and present road cross and recross each other" (Handy and Handy 1972:490). Same as Pi'ilani Trail.

Ālia See also Keālia
—'ili or place name in LCAs for Wailua meaning: Salt pond or salt encrustation (Pukui, Elbert and Mookini 1986); LCA 4865

Alenuihāhā Channel
-Channel between Maui and Hawaii (A-P); Lit. great billows smashing (Pukui, Mookini, Elbert 1986); "great waves pursuing."

Aluea Rocks
—Rock islet (0.14 acres, 40 feet elevation) Ke'anae quad (Pukui, Mookini and Elbert 1986); off coast at Wailua (U.S.G.S. map, Ke'anae Quad); means "sagging" (Soehren 1963:194).

Analoa
—'ili or place name in LCAs for Ke'anae; meaning: long cave (Pukui and Elbert 1986); (See LCA 2442 on 1904 map of Ke'anae Flat, Makai).

'Auwai Ho'omanumanui? Honomanu?
—Ditch, Name means "Patient ditch." (JH).

Baldwin Camp
—site shown in *'ili* of Pahoa in upper Ke'anae (R.M. 2235 Ke'anae Flat Mauka Map); Ko'olau Ditch Trail camp for irrigation company workers (McGregor Interview, 1994).

[1] The Hawaiians use the words "wahi pana" for places of distinction.

Banana Springs/see also Akeke
—spring along Waiokamilo (Kamilo) stream.

Hahāha Bay
—Bay to the east of Pauwalu Pt. (U.S.G.S. map Ke'anae quad); noted as a place for shell fish, means pant, breathe hard (Soehren 1963:192).

Ha'ikū (Uka)
—*ahupua'a*, boundary lines meets with Wailua across Ko'olau Gap (Boundary Commission, 1895. Maui, vol. 2, p. 49-50) (U.S.G.S. map

Haipua'ena
—stream in Ke'anae quad (Pukui, Elbert and Mookini 1986); swimming place (P. Sinenci in McGregor interview 1994) (U.S.G.S. map between Puohokamoa and Kolea Streams, Honomanū)

Hakakea See Haleakeā
—'ili or place name in LCAs for Ke'anae, means house of light (Soehren 1963:192) (See 1904 map of Ke'anae Flat Makai; LCA 4856).

Haleakalā
—'ili or place name in LCAs for Ke'anae; Lit. House of the sun (Pukui, Elbert and Mookini 1986) (R.M. 2238 1904 map of Ke'anae Flat Makai, LCA 4856).

Haleakea see also Haleakala
—'ili or place name in LCAs for Ke'anae meaning: broad or spacious house (Pukui and Elbert 1986) (See 1904 map of Ke'anae Flat Makai, LCA 4856).

Hamau
—stream, shown on Handy and Handy map (1972:499) flowing behind Lakini and flowing into Waiokamilo Stream in Wailuanui; also shown on map of Grant 4866 of Kupa'u, no date, no. map no.)

Hanawī
—stream, Ke'anae quad, "seeking fresh water shellfish," stream in Ko'olau (A-P); "supported small terraces on diminutive flats near the sea" (Handy 1985:110); in Nāhiku (U.S.G.S. map).

Hau'oli Wahine/Hauolowahine
—Gulch, stream and water falls shown in upper Ke'anae Valley (HTS Plat 1607-A); Hau'oli Wahine? feminine happiness (Soehren 1963:192) (U.S.G.S. map); R.M. 2235 Ke'anae Flat Mauka).

Honomanū
—Land division and bay, Ke'anae quad (Pukui, Mookini and Elbert 1986); Land division to the west of Ke'anae (U.S.G.S. map).

Ho'okuli
—land area shown on Ke'anae Flat Mauka map (R.M. 2235); means "disobedient" (Soehren 1963:192).

Ho'olio
—hill used as marker in Wailua *ahupua'a* boundary (Boundary Commission 1895, Maui, Vol. 2:53-54) (Not seen on any of present maps used).

Huo see Kuoo
—'ili or place name in LCAs for Ke'anae Name of an unidentified star (Pukui and Elbert 1986) (See LCA 4847 on 1904 map of Ke'anae Flat Makai).

Ka'alani see Kualani
—trig. station, southeastern side of Wailuanui (R.M. 2234).

Kaaunaku
—'ili or place name in LCAs for Ke'anae (LCA 4848G; not shown on any of presently used maps).

Ka'awale/Kuawale
—falls and place or ridge above Kupa'u, means "separate" (Soehren 1963:194);

water fall is boundary along Gov't land for Wailuanui-Wailuaiki *ahupua'a* (Boundary Commission, 1895, Maui, Vol. 2:57-58); Handy and Handy 1972:499).

Kaelua
—islet, Ke'anae quad (Pukui, Elbert and Mookini 1986); in Nāhiku (U.S.G.S. map).

Kahukahu
—trig. station at Ke'anae Park on northeast side of peninsula (R.M. 2238 Ke'anae Flat Makai map); means "dedicate with prayer," probably an older name than Kawee for the same place (Soehren 1963:192).

Kahekili's Leap, See also Pali Kahekili
—Leaping place above Waiolohi Pond in Ke'anae where Kahekili took his last leap (JH) Kahekili ruled Maui for 27 years beginning in 1766 (Pukui, Elbert and Mookini 1986); Ke'anae Peninsula Overlook.

Kake'e/Kaahaakee
—'ili or place name in LCAs for Wailua where *olonā* grows (LCAs); means "abrupt turn" (Soehren 1963:194); LCA 5049:2 (R.M. 1760); (See following map).

Kakū see Makaku
—area name in Keononalu in Wailua where *olonā* grows (LCAs).

Kala'alaea (also Kealaalaea)
—'ili or place name in LCAs for Wailua means "remove red ochre" (Soehren 1963:194) (LCA 4853G, shown near Catholic Church on R.M. 1760).

Kalālo'i
—'ili or place name in LCAs for Waianu; means "the day to cultivate taro" (Soehren 1963:194); LCA 3472B R.M. 2972 Waianu Valley).

Kaleiomauli/Laemomaui
—Stream in far upper Ke'anae Valley (HTS Plat 1607-A); trig. station (R.M. 2235 Ke'anae Flat Mauka).

Kalia'e
—'ili or place name in LCAs for Wailua, "wait awhile," Land section in Ko'olau (A-P) toward Hana side beyond Wailua (HTS Plat 1607-A) (U.S.G.S. map).

Kalihi
—'ili or place name in LCAs for Ke'anae meaning: the edge (Pukui, Elbert and Mookini 1986) (LCAs 2442 & 4665 on R.M. 2238 Ke'anae Flat Makai).

Kali'i
—land area *makai* of Pauwalu *'ili* in Wailuanui (R.M. 1760); Handy and Handy (1972:499) show this area planted in *uala* (sweet potatoes); (See following map).

Kalimapuhi/Kalunapuhi
—'ili or place name in LCAs for Wailua; Kalunapuhi means "the high place for burning (Soehren 1963:194); LCA 4773B:1 on R.M. 2234 Wailua).

Kaluanui
—stream (below 'Ohi'a Spring name changes from Waianu to Kaluanui — JH in McGregor interview 1994) and *heiau* State site 50-50-07-95 (BM A5-9); "No particulars learned of these Keanae temples" (Thrum 1909:39); "Kaluanui, a small heiau, 41 x 42 ft., on land of same name, at Wailua nui below a *koa ia* known as Ohia, one-third of a mile from sea; on side of taro patch; of two sections ... Said to have been for sacrifice, and that the drums are heard" (Stokes in Thrum 1918:125); (Walker 1931:170); (See following map).

Kamilo
—*heiau*, State site #93 (BM A5-8),

"Location: At Kawaloa on the north side of the stream in a dense grove of hau and puhala: Description: A small enclosure 22 x 25 feet built of rough basalt and some pebbles. Walls 3 feet high and 3 feet thick" Walker 1931:168); —Kamilo Stream (Boundary Commission, 1895, Maui, Vol. 2:57-58) see Waiokamilo Stream).

Kamaino
—trig. station; short ridge in Ke'anae Valley; means "bad child" (Soehren 1963:192); shown in upper Ke'anae valley overlooking Pi'ina'au Stream (Handy and Handy 1972:499) (R.M. 2235, Ke'anae Flat Mauka)

Kamakaihe/Kamakaaihe
—'ili or place name in LCAs for Ke'anae (not seen on any maps presently used).

KānekauoLono
—*heiau* at Ke'anae on lands of that name at the shore (Ashdown 1971:54) (Not seen on any maps presently used).

Kānemakua
—'ili or place name in LCAs for Ke'anae; name of a Maui chief (AKD); (R.M. 2238 Ke'anae Flat Makai); area known for growing *olonā* in LCAs; Kānemākuʻe? means dark brown Kāne (god) (Soehren 1963:192).

Kano/Kanou
—stream and falls shown in upper Ke'anae Valley (HTS Plat 1607-A); (R.M. 2235); means hard, stiff (Soehren 1963:192); falls is boundary marker for land of Wailuanui and Wailuaiki (U.S.G.S. map).

Kaoiki
—place name shown on Handy and Handy map (1972:499) in upper Pauwalu valley; beneath Kuawale Ridge; (See following map). dictionary).

Kapa'akea (See also Pa'akea)
—stream, land division, Ke'anae quad; also called Pa'akea. Lit., the coral or limestone surface (Pukui, Elbert and Mookini 1986) (U.S.G.S. map between Waiohue and Kapaula Streams).

Kapae
—'ili or place name in LCAs for Ke'anae; Lit. the landing (Pukui, Elbert and Mookini 1986) (R.M. 2238 Ke'anae Flat Makai); area known for growing *olonā* in LCAs.

Kapahukū/Ka Pahu Kū
—place in Ke'anae Valley (Soehren 1963:192); "Ka Pahu Ku", a place marking the boundary between Ke'anae and Wailua *ahupua'a* (Boundary Commission, 1895. Maui, vol. 2, p. 49); (not seen on maps presently used).

Kapa'ula
—trig. station between Waiohue and Paakea Streams (U.S.G.S. map); "red enclosure," Land section in Ko'olau (A-P); Kapa'ula Gulch, see also Pa'ula near Kapili'ula along the ocean (McGregor Interviews 1994)

Kapiha Point
—Sacred area for fishing folk (P. Sinenci, McGregor Interview 1994) (not seen on maps presently used).

Kaulanamoa
—land area shown for Ke'anae Flat Mauka (R.M. 2235), located across stream from ili of Pi'ina'au and *mauka* of Pahoa; means "chicken roost" (Soehren 1963:192).

Kaulani
—land area shown for far *mauka* land in Ke'anae Flat Mauka (R.M. 2235); means "for support of the chief" (Soehren 1963:192).

Kaumakani/Maumakani
—hill forming boundary of Wailua *ahupua'a* (Boundary Commission, 1895, Maui, vol. 2, p. 54-54) (Not seen on maps presently used).

Kauwalu
—islet off Pauwalu Pt. (U.S.G.S. map Ke'anae quad); means "eight landed" (Soehren 1963:192).

Kawaaune hill
—place name in LCAs for Ke'anae, place claimed for growing olonā, meaning: to pry up the canoe? (Pukui and Elbert 1986) (not seen on any maps presently used).

Kawaikuu?/Kawaikau Flume
—flume used in 1904 from Palauhulu Stream to Ke'anae peninsula (R.M. 2238 Ke'anae Flat Makai).

Kawalimukala
—*heiau* at Pauwalu; "Heiau sites destroyed or not found" (Walker 1931:167); State site 50-50-07-90.

Kawe'e Point
—Area of park on Ke'anae peninsula, also trig. station of Kahukahu (U.S.G.S. map, Ke'anae quad); earlier maps show place as Kahukahu.

Keaku
—falls on Palauhulu stream (Soehren 1963:192); located on Handy and Handy map (1972:499); boundary for Ke'anae and Wailua (Boundary Commission 1895:49-50); at 400' elevation (U.S.G.S. map).

Keala'alaea
—'ili or place name in LCAs for Wailua (LCA 10828B:3, R.M. 1760).

Keālia See also Kaliea
—'ili or place name in LCAs for Wailua; Lit. the salt encrustation (Pukui, Elbert and Mookini 1986).

Kealokekua
—'ili or place name in LCAs at Kaluawaa; LCA 4848H:1 on western *mauka* side of Ke'anae Peninsula (1904 map of Ke'anae Flat Makai).

Ke'anae
—ahupua'a in Ko'olau District of Maui in LCAs; Here, the god Kāne, accompanied by Kanaloa, thrust his *kauila* staff into solid rock, and water gushed forth; *ke'anae* Lit. the mullet (Pukui, Elbert and Mookini 1986); Ashdown heard that it meant "the Inheritance from Heaven," because Kāne, the creator, visits this particular area, thrusts his staff into solid rock and draws forth water; —A small *lo'i* near the western side of the land formerly belonging to the chief of Ke'anae and has the name Ke-anae (the big mullet); it is said that the entire locality took its name from this small sacred *lo'i*" (Handy 1985:110); (Inez Ashdown Ke Alaloa o Maui, 1971:54); Others, like Harry Kuuilii MItchell believed the name derived from *nae* "out of breath" from the crosspiece *ke'a* needed to carry the dirt down to the peninsula (EW); *ahupua'a* area of 11,148 acres (Boundary Commission 1895:50) (U.S.G.S. map).

Ke'anae Arboretum
—Arboretum started by Henry C. Inciong, Forest ranger in 1942 (JH); around the bend from YMCA on Hana Highway 6 acres; taro patches were renovated in 1946 by prisoners from the Ke'anae prison camp. In 1971 ... district forester, Wesley H.C. Wong Jr., began to develop the arboretum" 60 varieties of taro listed (*Star Bulletin:* 11/29/84:A17); The arboretum taro complex has been assigned State site 50-50-07-3932.

Ke'anae Landing
—Landing on the west side of the Ke'anae Peninsula. Used by the inter-island steamer to bring supplies and mail once a month. No longer used after the road went through to Hana in 1927 (JH) (U.S.G.S. map).

Ke'anae Peninsula
—"It is on the broad flat peninsula of lava that extends for nearly a mile into the sea from the western line of the valley, that Ke'anae's famed taro patches are spread out in striking evidence of old Hawaii's ingenuity ... Anciently, according to Henry Ikoa, the peninsula was barren lava. But a chief, whose name is not remembered, was constantly at war with the people of Wailua and determined that he must have more good land under cultivation, more food, and more people. So he set all his people to work (they were then living within the valley and going down to the peninsula only for fishing), carrying soil in baskets from the valley down to the lava point. The soil and the banks enclosing the patches were thus, in the course of many years, all transplanted and packed into place; area shown in "kalo loi" shown on Handy and Handy map (1972:499) (U.S.G.S. map). The Ke'anae Peninsula taro complex has been assigned State site 50-50-07-3933.

Ke'anae Prison Camp
—Prison camp used by workers building the Road to Ke'anae and beyond. It's use began in 1925 (JH) and was in use until about 1939 when it was given over to the Civilian Conservation Corps (CCC) for corps workers to forest the mountains of Maui. The arboretum history indicates that it was used again by prisoners as late as 1946, when the prisoners worked the taro patches at the arboretum. The prison camp was closed in the 1950s (*Star Bulletin:* 11/29/84:A17); The Gymnasium on the site was first built in 1925 (JH).

Ke'anae Quarry
—quarry on hill beneath YMCA; in use when road was being built in 1920s; blue rock quarry with crusher. Isaac Kanoa II said there is a story that a quarry worker died during blasting and rock platform could be possible grave for this worker; crusher machine and winch handle still there; crusher is marked "Indiana road Machine Co. Ft. Wayne Ind. #9C13" (Hammatt notes 1994); This has been assigned State site 50-50-07-3943.

Ke'anae Uka
—Land section, Ke'anae, Maui. Lit., upland Ke'anae (Pukui, Elbert and Mookini 1986); Trig. station (R.M. 2235); "in the extensive confines of Keanae Valley, now a water reserve with no inhabitants, the old Hawaiians planted a great deal of dry-or forest-land taro ... It would seem that the greater part of the valley was, until recent times, boggy forest" (Handy 1985:110); (U.S.G.S. map).

Keawaluka
—ridge above Hana road in Ke'anae; shown on Handy and Handy map (1972:499); (See following map).

Ke'elaimaka
—land area shown in upper Ke'anae between Kuo and Pi'ina'au (R.M. 2235, Ke'anae Flat Mauka); Keālaimaka? means "fascinates the eyes" (Soehren 1963:192).

Kekaele
—'ili or place name in LCA 4848F for Ke'anae; (See following map).

Kekapa
—'ili of Ke'anae, meaning: the kapa (or tapa) (R.M. 2238 Ke'anae Flat Makai).

Kekuapo'owai
—falls along "Puuhaoa" marking the Wailua/Ke'anae boundary at S 58° 8' E (Boundary Commission 1895, Maui, Vol. 2:53-54) (not seen on any maps presently used).

Keononalu/Keonenalu?
—'ili or place name in LCAs 4779 & 4587 for Wailua; area where taro and *olonā* grow (LCAs); means the sixth wave? (Soehren 1963:194); (See following map).

Kepo'ookamoku/Ke Po'o a ka Moku
—place in Ke'anae Valley, means "the head of the district" (Soehren 1963:192); "Ka Poo o ka Moku" marks boundary line between Ke'anae and Wailua *ahupua'a* boundaries (Boundary Commission, 1895, Maui, vol. 2, p. 49) (not seen on maps presently used).

Kiapu/Kiapo'o
—'ili or place name in LCAs for Ke'anae Ki'apu, Lit. ti-leaf drinking cup (Pukui, Elbert and Mookini 1986) (See LCA 2442 on Ke'anae Flat Makai).

Kikahō
—small ridge in Kupa'u; means abrupt, rude (Soehren 1963:194); located on Handy and Handy map (1972:499) as a bluff at source of Hamau Stream in Wailua; (See following map).

Kikau
—hill forming boundary between Ha'ikū and Wailua at the "south corner of the land of Honomanu" (Boundary Commission, 1895. Maui, vol. 2, p. 49-50); (See following map).

Kikokiko
—place in Ke'anae Valley, means "hatch" (Soehren 1963:192); waterfall (E. Akina, McGregor Interview, 1994); on Waiokamilo Stream, water diversion from Ko'olau Ditch (EW); (See following map).

Kilo
—area near the base of Waianu Valley; stream name below Ohia changed from Waianu Stream first to Kaluanui and then at the ocean is called Kilo (JH in McGregor interview 1994); The prehistoric habitation here has been assigned State site 50-50-07-3940; (See following map).

Kilo'ia
—Kilo is a place name in lower Waianu Valley, fish sighting areas (JH).

Kīpapa
—'ili or place name in LCAs for Ke'anae, Lit. placed prone (Pukui, Elbert and Mookini 1986) (See LCA 4665:1 as Kekapa on Ke'anae Flat Makai).

Koali
—Land forming boundary beyond Wailua (Boundary Commission, 1895, Maui, vol. 2: 53-54) (not seen on any maps presently used).

Koleamoku
—'ili or place name in LCAs for Ke'anae; (R.M. 2238 Ke'anae Flat Makai); name of a deity (Soehren 1963:192).

Ko'oiki
—site shown on Ke'anae Flat Mauka map at *mauka* end of the *'ili* of Pahoa Gr. 3223 (R.M. 2235); means "small prop or support" (Soehren 1963:192).

Ko'olau Ditch
—Ditch system in the uplands of Ke'anae (HTS Plat 1607-A) (U.S.G.S. map).

Kōpili'ula
—stream, gulch and falls, at boundary towards Nahiku, on stream of same name, stream east of East Wailuaiki

Stream; The stream here never runs dry (JH); Kopiliula -means "red together" (JH); also a tunnel and horseback trail. There is a cave which was cut in the hill so people waiting for car to come from Hana could get out of rain (JH). "If you go Hana, telephone to the one who get car - go Kopili'ulu, wait for you; Go with horse along ditch trail to Kopili'ula, leave horse, go on car" (E. Akina, McGregor Interview, 1994); U.S.G.S. map.

Kualani
—Trig. station above Pu'u Ililua (R.M. 2235); *heiau*, means: sour, as unclean food container (Soehren 1963:194); "Kualani on top of ridge on west side of Waiokane Falls" (Walker 1931:167); shown on Handy and Handy map (1972:499); (See following map).

Kuaimoa
—'ili or place name in LCAs for Ke'anae, meaning "chicken ridge?" area known for growing *olonā* in LCAs; not seen on any presently used maps.

Kuapohaku
—'ili or place name in LCAs for Ke'anae, meaning "stone ridge?" Not located on any maps presently used.

Kuawale
—bluff or hill shown in upper Wailuanui (Handy and Handy 1972:499); (See following map).

Kukuiohoko
—'ili or place name in LCAs for Ke'anae; area known for growing *olonā* in LCAs; houselot for Ehu (LCA 4665G); (See map of Ke'anae Flat Makai).

Kukuiolono/same as Kukuiolono?
—*'ili* of Ke'anae (R.M. 2238; map of Ke'anae Flat Makai, just *mauka* of parsonage).

Kukuiolono
—trig. station at the point Ke'anae peninsula (R.M. 2238 map of Ke'anae Flat Makai); *heiau*, means "light of Lono (deity) (Soehren 1963:192); "heiau site destroyed or not found (Walker 1931:167); State site 50-50-07-82.

KukuioPuni/Kukui'aupuni
—"*heiau* at Ke'anae with its entry way at Pu'uWalu adjoining Waikeanui" (Ashdown 1971:54); near Ke'anae School under dense growth of trees (CSH 1994); State site 50-50-07-96.

Kukuipuka
—stream leading down to Ke'anae peninsula; shown on Handy and Handy map (1972:499); shown on U.S.G.S. maps as Kuo Stream.

Kūō (See also Kuoo)
—'ili or place name in LCAs for Ke'anae (R.M. 2238 map of Ke'anae Flat Makai and also on R.M. 2235 Ke'anae Flat Mauka in upland); stream leading into Pi'ina'au Stream (HTS Plat 1067-A).

Kūōlī'olio
—'ili or place name in LCAs for Ke'anae (R.M. 2238 map of Ke'anae Flat Makai); means "loud cries of birds" *heiau*, means "light of Lono (deity) (Soehren 1963:192).

Kū'oko'a
—'ili or place name in LCAs for Wailua; LCA 5051 to Manu or Kamanu; (See following map).

Kuoo/See Kūō
—'ili or place name in LCAs for Ke'anae.

Kupa'u
—'ili in Wailuanui, meaning: stand exhausted (after working hard)(JH) (HTS Plat 1607-A); *heiau* "Kupau above the road in Keanae valley toward the ditch trail 84 feet of terrace wall is all that

remains (Walker 1931:167) State site 50-50-07-91; a *wahine heiau* (P. Sinenci in McGregor interview 1994); the large abandoned taro complex in this area has been assigned State site 50-50-07-3937 (R.M. 2235 map of Ke'anae Flat Mauka).

Laenomaui/see also Kaleiomaui
—Trig. station shown in uplands of Ke'anae Flat Mauka (R.M. 2235); means "brow of Maui (Soehren 1963:192).

Lākini
—variously an *'ili or mo'o* name in LCAs for Pauwalu *ahupua'a* in Wailua area (R.M. 1760 map of Kupa'u and Wailuanui) (HTS Plat 1607-A); meaning "many days" or "many generations" (HN). This taro complex has been assigned State site 50-50-07-3936.

Lālāola
—'ili or place name in LCAs for Ke'anae Meaning: living branch (Pukui and Elbert 1986) (R.M. 2238 map of Ke'anae Flat Makai): *heiau* on point of Ke'anae peninsula, destroyed (Walker 1981:94); State site 50-50-07-83.

Lanakila Ihiihi o Iehova Ona Kau
—Name of Congregational church (State Site #50-50-07-1511) on Ke'anae Peninsula, Meaning: sacredness of Jehovah, Son of God" (DLNR, *Fruitful Fields* 1993) or God's Sacred Wishes for the Outcasts (JH & AKD); built in 1856, restored by members of Ke'anae's Pahukoa family (On the Hana Coast 1983:95); begun in 1857, completed in 1863, restored and rededicated in 1969 (DLNR 1993).

Lin Hing Society
—The Lin Hing Society Building (State site 50-50-07-1510) in Ke'anae was built in 1908 and served the religious, social, and educational needs of the Chinese in the area; last used about 1950 and abandoned; the surviving materials from the building are stored at the Kwock Hing Society, Keokea, Kula (Hawaii Register of Historic Places 1974) (See map of archaeological sites in this report).

Lolokeahi see Ololokeahi
—'ili or place name in LCAs for Ke'anae.

Lonowai
—'ili or place name in LCAs for Ke'anae; Meaning: Water of Lono (Pukui and Elbert 1986); area known for growing *olonā* in LCAs (LCA 4848G; also claims land in Pōhakuokāne, which is both on the peninsula and in the uplands) name not found on the maps presently used.

Makahuna
—site shown on Ke'anae Flat Mauka (R.M. 2235); means "hidden eyes" (Soehren 1963:192); also shown on Handy and Handy map (1972:499); (See following map).

Makaīwa/Maka'iwa
—'ili or place name in LCAs for Ke'anae; Lit. mother-of-pearl eyes (as in an image) (Pukui, Elbert and Mookini 1986) Name of Lono's gods (Andrews 1985); "beautiful eye," Land section in Ko'olau (A-P); (R.M. 2238); —fishing grounds (P. Sinenci, McGregor interview 1994); R.M. 2238 Map of Ke'anae Flat Makai).

Makakū/Makahū
—'ili or place name in LCAs for Wailua; means "landmark" (Soehren 1963:194); LCA 4729 R.M. 1760); (See following map).

Makoloaka
—islet, Ke'anae, Maui (Pukui, Elbert and Mookini 1986); means "creeping shadows" (Soehren 1963:194); U.S.G.S map.

Manahoa Rock
—Rock islet, Ke'anae, Maui (Pukui,

Elbert and Mookini 1986) (U.S.G.S. map Ke'anae quad). (See also Ule o Nānāhoa)

Manonui
—a land name in LCAs for Ke'anae, described as land *mauka*; meaning: big shark? (Pukui and Elbert 1986); not found on maps presently used.

Manupaki'i
—place name for area where YMCA is situated, meaning: flat where (*'iwi'i*) birds used to land (JH); (See following map).

Mā'ulu
—'ili or place name in LCAs for Wailua; means "stiff from exercise" (Soehren 1963:194); R.M. 1760 Ili o Kupau and Wailuanui; LCA 4562:2; (See following map).

Menehune Trail
—Trail along Ditch in Wailuanui above Young Estate said to have been used by the *menehune* (Kanoa family, 1994)

Moana
—area above Kupa'u as you go up to the forest (McGregor interview, 1994); not located on any maps presently used.

Moku Hala
-Islet to the northeast of Pauwalu Pt.; (U.S.G.S. map, Ke'anae quad); meaning: "hala or pandanus island" (Soehren 1963:192).

Moku Hōlua
—Islet Ke'anae, Maui, Lit. sled island (Pukui, Elbert and Mookini 1986)(U.S.G.S. map, Ke'anae quad).

Moku-huki
—Islet Ke'anae, Maui, Lit. Pulling island (Pukui, Elbert and Mookini 1986); U.S.G.S. map.

Moku Mana
—islet, Lit. divided island or divided district (AKD) (Pukui, Elbert and Mookini 1986); bird sanctuary, island off Pauwalu Pt.; (U.S.G.S. map Ke'anae quad).

Nua'ailua/Nauailua/Nuailua
—Name of gulch, stream, and bay Hamakua side of Ke'anae, claimed in LCA for Ke'anae, "large abundance" (Hawaii Heritage Center 1990:79); "now uninhabited, was formerly the site of a settled community which raised wet taro in terraces (Handy 1985:109) (U.S.G.S. map Ke'anae quad).

Nunumea
—Boundary marker above Pahoa for Ke'anae and Wailua *ahupua'a*, on a ridge (Boundary Commission, 1895, Maui, Vol. 2: 49-50;57), not located on any maps presently used.

O'ao
—place in Kupa'u, means "glimmer of light" (Soehren 1963:194); shown on Handy and Handy map as Oao (1972:499); (See following map).

'Ōhi'a
—'ili area of Waianu in LCAs, — spring, Lit. ohi'a tree (Pukui, Elbert and Mookini 1986); Ohi'a gulch is the location of two famous springs called WaiaKane and WaiaKanaloa (Ashdown 1971:54); U.S.G.S. map; —*heiau* (State site 50-50-07-94); "Location: At Ohia in the valley three quarters of a mile from the sea. Description: Stones removed to build pig pen, and outlines thus lost. Probably an agricultural heiau built by a chief Kaimuki" (Walker 1931:169); Wailuanui region.

Ololokeahe
—'ili or place name in LCAs for Ke'anae (R.M. 2238 map of Ke'anae Flat Makai).

Pa'akea (See also Kapa'akea)
—land division, Ke'anae quad; also called Kapa'akea. Lit., the coral or limestone surface (Pukui, Elbert and Mookini 1986); U.S.G.S. map.

Pa'akamaka
—'ili or place name in LCAs for Wailua; area known for growing *olonā* in LCAs; means "close the eye" (Soehren 1963:194); not located on maps presently used.

Paehala
—'ili or place name in LCAs for Ke'anae (R.M. 2238 map of Ke'anae Flat Makai), *'ili* name for Wailua where *olonā* was grown (LCA 4587 see R.M. 1760 map of Kupa'u and Wailuanui); means "row of pandanus trees" (Soehren 1963:192).

Paepaemoana Pt./Pa'epa'emoana
—Point or cape just south of Pauwalu Pt. (U.S.G.S. map Ke'anae quad); means "deep-sea canoe landing? (Soehren 1963:192); (McGregor interview 1994).

Pāhoa/Pahoa/Puuhaoa
—'ili or ahupua'a, place name in LCAs just east of Ke'anae, meaning: I touch my partner (JH); area known for growing *olonā*; (R.M. 1760 map of Kupau and Wailuanui); (R.M. 2235 map of Ke'anae Flat Mauka); means "short dagger, tabu sign (Soehren 1963:192); boundaries of Wailua and Ke'anae *ahupua'a*; goes along the Government land of Pahoa; Ke'anae boundary named Pahoa, Wailua called Puuaoa (same place?) (Boundary Commission, 1895, Maui vol. 2: 49-50; 53-54).

Pakanaloa
—*heiau* where Kahuna Kahekili was *kahu* of that place. He was of the Kane-Ku order of priesthood...He was a descendant of the earliest "goda" (Ashdown 1971:45); "A kahuna named Kahekili who at one time kept the heiau of Pakana-loa, erected back of Keanae on Maui at a place where violent thunderstorms occur, came to be regarded as possessed by the spirit of Kane-hekili. He was feared as a sorcerer, but any plot against his life seemed invariably to be checked by a violent thunderstorm. When he died, his brother-in-law sought his body inside the heiau and carried away the head to Lanai and worshiped it as a god. Parts of the body were distributed, and men became known as worshipers of 'eyes of Kahekili' or 'mouth of Kahekili' (underlining added)" (Beckwith 1936:48-49); State site 50-50-07-84; Possibly located in *'ili* of Analoa (?) shown on R.M. 2238 map of Ke'anae Flat Makai.

Pakui
—Trig. Station near shore beneath Catholic church in Wailuanui; Also two land areas shown near the shore between the trig. station and Wailua Homestead Road (R.M. 1760 map of Kupa'u and Wailuanui).

Palaha
—place name where the "Pōhaku 'oki 'āina" is found on brink of Haleakalā Crater, (Boundary Commission, 1895, Maui, vol. 2: 49-50); not located on maps presently used.

Palauhulu
—stream in Ke'anae, "Leaf-sheltered" (Hawaii Heritage Center 1990:83); (R.M. 2238); Pālauhulu, means "chief takes all" (Soehren 1963:192); U.S.G.S. map.

Pali Kahekili
—Leaping place above Waiolohi Pond in Ke'anae where local tradition has it the king injured his genitals so that he could no longer father children (Speakman, Jr. 1984); (See following map).

Paliuli
—*heiau* "No particulars learned of these Keanae temples" (Thrum 1909:39); "Heiau sites destroyed or not found" (Walker 1931:167); not located on maps presently used.

Palolena
—'ili or place name in LCAs in Wailua; area known for growing *olonā* in LCAs; area beneath Waikani falls; (See following map).

Palolua
—'ili or place name in LCAs in Ke'anae, identified as *mauka*; not located on maps presently used.

Pana'ewa
—'ili or place name in LCAs for Ke'anae (R.M. 2238 map of Ke'anae Flat Makai).

Papīhā
—promontory, east beyond Wailuaniki Bay, earlier maps show Poahonu, means "choked with debris" (Soehren 1963:194); U.S.G.S. map.

Pa'ula
—area by ocean near Kopili'ula (McGregor interview, 1994); two valleys before Nahiku with many old terraces (Hammatt notes 1994).

Paulae
—'ili or place name in LCAs for Wailua, one LCA lists the name as Paula, which means both "gun powder" and "a full grown tree when timber becomes red" (Andrews 1985); (same as Pa'ula?); (See following map).

Pauna
—Trig. station, and land areas in Wailuanui (R.M. 1760 map of Kupa'u and Wailuanui).

Paumoni/Paunoni
—'ili or place name in LCAs for Ke'anae. From description in LCA 4853K it appears to be near present Ke'anae beach park.

Pauwalu
—ahupua'a or 'ili place name in LCAs for Wailuanui, west of Kupa'u (R.M. 1760 map of Kupa'u and Wailuanui); trig. station, Point (R.M. 2235); "this point is one of several spots in East Maui where ghosts described as marching warriors are said to appear" (*On the Hana Coast* 1983:89); name means "eight no more" or where eight persons were eaten by sharks (JH, AKD); Handy and Handy (1972:499) show in mid Pauwalu valley lower limit between *kalo maloo* [dryland] and upper valley *kalo* [wetland taro]. Figure * is sea arch beneath Pauwalu Point and Figure * is on top of Pauwalu Point looking southeast to Hana; U.S.G.S. map.

Pi'ikalawa
—'ili or place name in LCAs for Wailua; fishpond mentioned in LCA 10828B; (See following map).

Pi'ilani Trail
—old trail, became the Old Government Road (AKD), Pi'ilani was famous Maui chief; this trail passes across Pauwalu Point; night marchers walk on this trail (AKD); same as Alaloa (Trail); "from Wailuanui ... it goes all the way to Kalia'e" (C. Day in McGregor Interview 1994).

Pi'inā'au
—stream, *'ili* or place name in LCAs for Ke'anae, Pinaoa Lit. "Kind-hearted" (Hawaii Heritage Center 1990:81) "guts come out (JH); stream (R.M. 2238); means "swim upstream" (Soehren 1963:194); U.S.G.S. map.

Pilanolipi
—'ili or place name in LCAs for Ke'anae; pasture land *mauka*; not located on maps presently used.

Poahonu
—promontory, see Papīha (Soehren 1963:194).

Pōhakukāne
—'ili or place name in LCAs for Ke'anae, meaning: Kane's stone (Pukui and Elbert 1986) (R.M. 2238 map of Ke'anae Flat Makai and R.M. 2235 map of Ke'anae Flat Mauka); means "male stone" (Soehren 1963:194).

Pōhaku 'oki 'āina
—"large rock on the brink of Haleakala crater ... where all the large lands of East Maui meet" (Boundary Commission, 1895, Maui, vol. 2:49-50); not located on maps presently used.

Pōhakuokāne
—stream leading into Pi'ina'au Stream (HTS Plat 1067-A); means stone of Kāne (deity) (Soehren 1963:194); R.M. 2235 Map of Ke'anae Flat Mauka.

Pōhakuoluakai
—ridge, shown above Kukuipuka Stream in Ke'anae valley (Handy and Handy 1972:499); (See following map).

PōhakuuleoKahekili
— "There is a large black stone below Pali Kahekili at Keanae and its name ... "The stone of Kahekili's penis" (Speakman, Jr. 1984); See Pali Kahekili.

Pohaluakai
—Trig. station between Pohakuokane and Kuo in uplands of Ke'anae (R.M. 2235 map of Ke'anae Flat Mauka).

Poi factories
—one of the old poi factories in on the Mary Lum Hoy property in Wailuanui (JH). Another poi factory (Ngs) was across from Ke'anae school, dates from about 1936 (JH) and lasted the longest (HN); The Alama Poi shop by the old Ching store at the YMCA intersection was the oldest in the area (HN); Eddie Wendt had a poi factory for four years in the 70s (HN) and there was a poi factory in Kupa'u. Ben Tau'a poi shop in Ke'anae, past the landing on the makai side of the road.

Puco
—hilltop on west rim of Ke'anae Valley, means "owl" (Soehren 1963:194); not located on maps presently used.

Pukalawa see Piikalawa
—'ili or place name in LCAs for Wailua.

Puohakumoa/Puohokamoa
—where bridge is at Wahinepee (P. Sinenci in McGregor interview 1994); meaning: frightened or excited chicken (JH); Bridge is State site 50-50-07-1509; U.S.G.S. map.

Pu'u Alaea
—a hill in Wailua, boundary is north of this hill (Boundary Commission, 1895, Maui, vol. 2:49-50); not located on maps presently used.

Pu'u Ililua
—hill, trig. station, Puuililua is directly across from and above Wailua Homestead Road (R.M. 1760); means "two sided hill?" (Soehren 1963:194); Handy and Handy suggest the name written as Puuili lua (1972:499); U.S.G.S. map.

Pu'u Kaunohua
—Trig. Station on hill above Waialohi Pond; R.M. 2235 Ke'anae Flat Mauka.

Pu'u Maiaoiao
—peak near end of ridge in Wailua

(Soehren 1963:194); shown on Handy and Handy map (1972:499) just south of Pu'uililua.

Pu'u Olu
—fishpond at southeastern edge of Pauwalu Point (R.M. 1760); means "restful place" (Soehren 1963:194); shown on Handy and Handy map (1972:499); State site 50-50-07-538; B.M. A4-9; U.S.G.S. map.

Ramos House
—the oldest house in Wailuanui (State site 50-50-07-1515), lived in by Florentine Ramos and his wife since 1927. Appears to have been built around 1900-1910 (Hawaii Register of Historic Places 1974); See map of archaeological and historic sites in this report.

Rice factories
—there were two rice factories on the Ke'anae Peninsula (JH), one on the present Kepler property across from the Ke'anae Landing; the other not located.

St. Augustine Shrine
—Catholic shrine in Wailuanui; see archaeological and historic map in this report.

St. Gabriel's Catholic Church
—Catholic church in Wailua, one of the first stops for Roman Catholic priests in the islands (*On the Hana Coast*); R.M. 1760 map of Kupa'u and Wailuanui.

St. Gabriel Shrine/Shrine in Memory of Our Lady of Fatima
—Catholic chapel in Wailua, (State site 50-50-07-1512) "The building is particularly unusual becaue of its miniature size (20 by 40 feet) and its high proportioned triple slope gambrel roof, surmounded by a small square steeple ... On Christmas Day, 1860, the first Mass was celebrated in the church" (Hawaii Register of Historic Places form 1974) see map of archaeological and historic sites in this report.

Ulenānāhoa
—"Statue of Liberty" rock near Moku Mana, fertility rock (AKD); same as Manahoa Rock? U.S.G.S. map.

Uluhane
—Trig. station and land area far *mauka* in Ke'anae Flat Mauka (R.M. 2235).

Wahinepee
—gathering spot mentioned by P. Sinenci (McGregor interview 1994); also listed on 1922 Ke'anae voter register as location of residence; located several streams west of Honomanū; U.S.G.S. map.

Waiaka
—pond, meaning: shadow water (JH) or reflection water (Pukui, Elbert and Mookini 1986); not located on maps presently used.

Waihāowa
—creek and gulch on *'auwai* built by J.A. Chamberlain to get water down to Ke'anae peninsula (JH in McGregor interview 1994); not located on maps presently used.

Waihiumalo
—falls marking the Wailua *ahupua'a* boundary (Boundary Commission; Maui, vol.2:53-54); not located on maps presently used.

Waiakamoi, See also Waikamoi
—watershed, Ke'anae quad; Lit., the water [acquired] by the threadfish (Pukui, Elbert and Mookini 1986); stream west of Honomanū; U.S.G.S. map.

Waiakuna/Wai o Kuna
-Falls, place name along upper Palauhulu Stream; shown on Handy and Handy map (1972:499); U.S.G.S. map.

Waianu
—ahupua'a in LCAs for area between Ke'anae and Wailuanui; stream; Lit. cold water (Pukui, Elbert and Mookini 1986); a place where Mr. Pogue planted experimental rubber trees (Ashdown 1971:54); area known for growing *olonā* in LCAs; the old Waianu taro complex has been assigned State site 50-50-07-3938; (See following map).

Waiaolohe/Waiolohi
—'ili or place name in LCAs for Ke'anae meaning: shining water? (Pukui and Elbert 1986); meaning: hearing water (echoes) (JH) *mauiwai* name & trig. station on cliffs above Waiaolohi Pond (R.M. 2238 map of Ke'anae Flat Makai).

Wai'apuka
—'ili or place name in LCAs for Ke'anae upland; Lit. water coming out (Pukui, Elbert and Mookini 1986); area known for growing *olonā* in LCAs; not located on maps presently used.

Wai'eli
—'ili or place name in LCAs for Wailua Lit. dug water (Pukui, Elbert and Mookini 1986); (See following map).

Wai'eliiki
—'ili or place name in LCAs for Wailua meaning: little dug water (Pukui and Elbert 1986); (See following map).

Wai'elinui
—'ili or place name in LCA 5068 for Wailua; meaning: big dug water (Pukui and Elbert 1986); (See following map).

Waihau owā
—place where 2 streams meet just Hamakua side of Ke'anae (JH), meaning: roaring ice water (Pukui and Elbert 1986).

Waikamilo/Waiokamilo
—stream in Wailuanui (U.S.G.S. map Ke'anae quad) (HTS Plat 1607-A); means "water of the milo tree" (Soehren 1963:194).

Waikamoi
—land division, stream, and ridge trail, Ke'anae quad; Lit. water [of] the *moi* taro (Pukui, Elbert and Mookini 1986); west of Honomanū; U.S.G.S. map.

Waikani see also Wai o Kane
—waterfall in Wailuanui, meaning "roaring water" (JH); *'ili* area where *olonā* grown at time of LCAs below Waikani Falls.

Waikani Bridge
-Bridge near Wailua (State site 50-50-07-1516) built in 1926 with a main arch of 36 feet; one of the larger bridges along the Hana Highway (Hawaii Register of Historic Places, 1974).

Wailolena
—Trig station near Palauhulu Stream on Ke'anae Flats (R.M. 2235); shown on Handy and Handy map (1972:499) in upper Pauwalu valley.

Wailua
—*ahupua'a* and *'ili* of Wailua, East Maui, Ko'olau District; Kalani'opu'u is said to have boarded Captain Cooks' flagship Resolution off Wailua (Speakman, Jr. 1984); means "two waters" (Soehren 1963:194); "Wailua-nui has even more extensive terracing than Keanae, sloping seaward from the base of the cliff around which the road winds. About half the terraces are still cultivated by Hawaiians. On the whole, Wailua is today richer agriculturally than Keanae" (Handy 1985:110); map showing "terraced Kalo loi" (Handy and Handy 1972:499); area of 380 acres, of which 130 acres are below the waterfall (Boundary Commission, 1895, Maui, Vol. 2:53-54); The east side of Wailua has been assigned State site 50-50-07-3935; U.S.G.S. map.

Wailua Stone Church Ruins
— "The stone ruins at Wailua, Maui, stand in a level, overgrown field about 160 feet back from the village road. They consist of rough fieldstone walls with cement mortar, approximately eleven feet high and 27 to 30 inches thick, enclosing a rectangle 25 by 60 feet. There is one door opening on the northwest end and one on each long side. Window openings are located two on each long side and one on the southeast end. There is no indication left of a floor or roof.
The form of these ruins is very similar to many known early mission stone churches and it is assumed that this was also a church, either fallen in over the years, or never completed" (Hawaii Register of Historic Places 1973); see map of archaeological and historic sites in this report.

Wailua Mormon Church
— "The church was built during 1934 and dedicated in 1935. It served the small Mormon community in the area. The building was abandoned for many years and recently has been used mainly as a residence ... The Mormon Church is a one-story wooden structure with an intersecting gable roof ... The church is located on the upper or mountain side of Hana Highway, Route 36, between Ke'anae School and Wailua Homesteads Road (Hawaii Regiester of Historic Places 1974); see map of archaeological and historic sites in this report.

Wailuaiki
—stream, *'ili* or place name in LCAs for Wailua, land division Nāhiku quad, Maui. Lit. small Wai-lua (Pukui, Elbert and Mookini 1986); "Wailua-iki, Waiohue, and Hanawi Streams supported small terraces on diminutive flats near the sea (Handy 1985:110); Boundary Commission puts Wailua Nui and Wailua Iki together as one unit containing 3034 acres (Boundary Commission, 1894, Maui, Vol. 2:58); U.S.G.S. map.

Wailuanui
—'ili or place name in LCAs for Wailua, land division, Nāhiku quad Maui, where Kapo saved Pele from Kamapua'a, Stones represent a vagina, See Kohe-leplepe. Lit. big Wai-lua (Pukui, Elbert and Mookini 1986); stream (U.S.G.S. map Ke'anae quad); Boundary Commission puts Wailua Nui and Wailua Iki together as one unit containing 3034 acres (Boundary Commission, 1894, Maui, Vol. 2:58); The Wailuanui area has been assigned State site 50-50-07-3935.

Waioea/Waloea
—'ili or place name in LCAs for upland Ke'anae; not located on maps presently used.

Waiohue
—Stream in Wailua which supported small terraces (Handy 1985:110); also known to fishermen (P. Sinenci in McGregor interview 1994); *lo'i* terraces still extent (Hammatt 1994 notes); valley two streams east of Kaliae; U.S.G.S. map.

WaioKāne Falls/Waikani
—water falls in Wailuanui, meaning: water of Kane (JH); (HTS Plat 1607-A); U.S.G.S. map.

Waiokilo Falls/Waikolo
—falls at base of Waiokamilo stream in Wailuanui (R.M. 1760); means "landmark water" (Soehren 1963:194); U.S.G.S. map.

Waiokukui
—falls on Waiokamilo stream, means "water of the candlenut tree" (Soehren 1963:194); shown on Handy and Handy map (1972:499) in far uplands; (See following map).

WaioKuna
—falls on Palauhulu stream, means "water of Kuna (a fresh water eel) (Soehren 1963:194); Boundary line of

Ke'anae and Wailua *ahupua'a* (Boundary Commission, 1895, Maui, vol. 2: 49-50); U.S.G.S. map.

Waiolohi, see Waiaolohi/Waiaolohe
—'ili or place name in LCAs for Ke'anae meaning: shining water? (Pukui and Elbert 1986), hearing water (echoes) (JH); R.M. 2238 map of Ke'anae Flat Makai.

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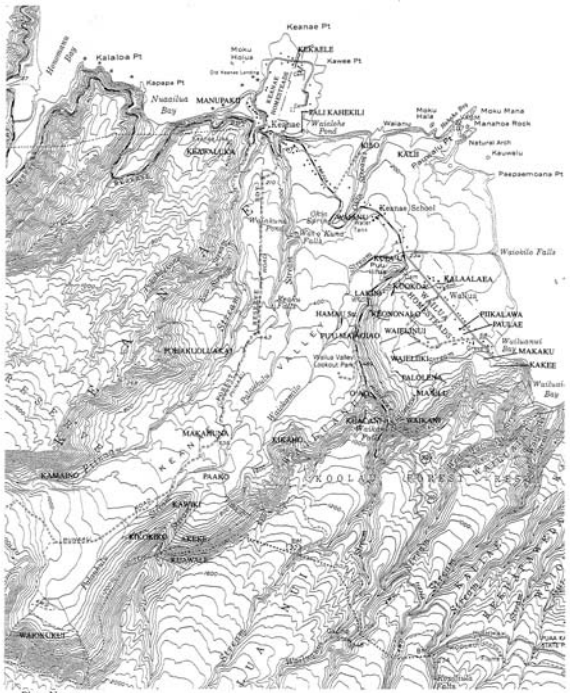


Place Names
KEʻANAE - WAILUANUI CULTURAL LANDSCAPE

E. KEʻANAE AND WAILUANUI BRIDGES
(from *Historic Bridge Inventory and Evaluation: Islands of Maui and Molokai* [Hawaii Heritage Center 1990])

HISTORIC BRIDGE INVENTORY AND EVALUATION

ISLANDS OF MAUI AND MOLOKAI

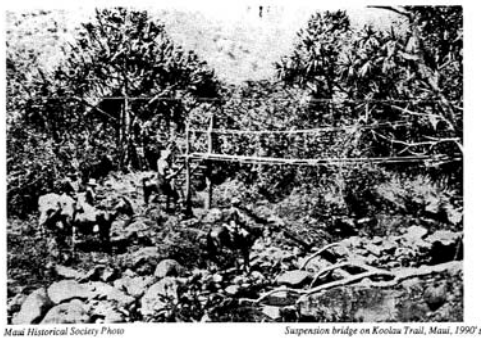
by
Hawaii Heritage Center

Prepared for the
State of Hawaii
Department of Transportation Highways Division
In Cooperation with the
U.S. Department of Transportation
Federal Highway Administration

September 1990

Chapter

Road and Bridge Building on Maui and Molokai



Maui Historical Society Photo *Suspension bridge on Koolau Trail, Maui, 1990's.*

Before 1900, most travel in Hawaii was by sea. The Hawaiian Kingdom lacked an extensive system of interior roads, making land travel in all the islands difficult.[1] Hawaiian chiefs before Cook had attempted to build rudimentary roads, however, and the remains of one built of ʻala stones can still be seen between Kawaihapapa and Honomaele near the Hana Highway in East Maui.[2]

By the mid-nineteenth century, the increasing use of horses and wagons necessitated a better system of interior roads. The Kingdom in 1846 established an Interior Department to oversee internal improvements. Over the next twenty years a 40-mile carriage road on Maui between Ulupalakua in the Makawao District and Wailuku was built.[3]

The Kingdom made use of the abundant timber and stone as construction materials for 19th century bridges. Some wagon roads were built on Oahu, Hawaii and Maui, but for the most part the government lacked the engineering skills and funds for extensive highway systems. The Kingdom's road building, according to one historian, consisted of little more than clearing a right of way, doing a little rough grading and putting up wooden bridges where they could not be dispensed with.[4] As a result, timber bridges were routinely washed away during heavy rains, a problem which in East Maui made it difficult to travel between Hana and the rest of the island. Most of the kingdom's scarce funds were absorbed by repairs to bridges and maintenance of existing roads.[5]

In 1887 King David Kalakaua transferred much of his kingdom's control over internal improvements to local road boards financed by a road tax. These boards were semi-autonomous and charged with the construction of public highways in their taxation districts. Road boards on Maui and Molokai represented each of the islands' districts.

Upon annexation in 1900, the Interior Department was replaced by the Office of the Superintendent of Public Works (SPW), which had responsibility for expending territorial funds on road and bridge work. Five years later, the Territorial Legislature established the county governments on the separate islands, granting them taxing and spending powers in their jurisdictions. Hence, the County of Maui was composed of the islands of Maui, Lanai and Molokai, and county road-building was to be planned and financed by an elected Board of Supervisors.

Road Building After 1900

The forty-year period of bridge-building covered by this study witnessed rapid economic expansion and population growth on all of the major islands. From 1898 to 1940, commercial sugar planters in Hawaii increased their acreage under cane cultivation by 88 percent, from 125,000 to 235,110 acres.[6]

During the same period, Maui County's population more than doubled, from 27,920 to 55,980.[7] Most of this growth took place around the large sugar and pineapple plantations in central and upcountry Maui. The Wailuku District, which includes prime sugar lands as well as Maui's principal shipping port, nearly tripled its population from 7,953 in 1900 to 21,051 in 1940.[8] At the same time, the population of neighboring Makawao District doubled from 7,236 to 14,915.[9] Only the Hana District, traditionally isolated from the central area by lack of good roads, witnessed a decline in population during this period.

The county's growing population meant increased demand for housing, schools, utilities and physical infrastructure. In the same year Henry Baldwin completed Hawaii's highest railroad bridge, a steel trestle over the Maliko Gulch near Haiku in Makawao District, for the Kahului Railroad. Horses and carriages gave way to automobiles, trucks and buses, which meant a need for wider, more durable roads. With more acreage being brought under cultivation, better roads were needed to service the trucks hauling crops from the fields to the mills or canneries.

Road and Bridge Financing

Before 1905 nearly all funds for bridge construction came from the Territorial government through the Superintendent of Public Works (SPW). For example, the 1903 SPW report showed an appropriation of $75,800 for Maui's roads and bridges, broken down by district as follows:

Hana	$11,000
Makawao	30,000
Wailuku	17,200
Lahaina	14,500
Molokai	2,800
TOTAL	$75,800[10]

After the counties were granted independent taxing powers in 1905, Maui County still relied on legislative appropriations to supplement county funds for internal improvements. The history of road-building on Maui, especially the development of the Hana Highway, was closely tied to Territorial and Federal government largesse to the county.

Consequently, throughout much of the 1900-1940 period the county's road- and bridge-building seriously lagged behind the island's economic development and infrastructural needs (refer to Figure 1 and Table 1). As late as 1928, County road-building funds were so scarce that in the Haiku area the gravel roads were maintained by the Haiku Fruit and Packing Company.[11] The belt road from Peahi to Kailua on the windward north coast was likewise maintained by the East Maui Irrigation Company.[12] Increased automobile traffic and damage from heavy rains had increased the maintenance cost of these roads, and by the late 1920's private planters demanded that the County administration shoulder the burden of road upkeep.

The Hana Highway

The most critical infrastructural issue facing the newly-created Board of Supervisors was the development of a belt road from central Maui to Hana along the north coast. Before 1930, the journey to Hana was made partly over unpaved wagon roads and horse trails, often rendered impassable by damage from frequent rains. An alternative route through the island's south side took the traveler through the drier ranch country ending up at Kipahulu. Since both land routes were arduous and slow, the most common means of travel to Hana was by steamer ship.

As early as 1900 the *Maui News* editorialized in favor of a good wagon road connecting Hana and central Maui. Five years later a rudimentary road in the Nahiku and Keanae areas was completed. Because of the extreme difficulty of the terrain, however, its cost was prohibitive and the roads were inadequate for frequent automobile traffic. The 1905 SPW report stated that "very rough country is encountered in these districts. On account of the great expenses of road construction, the road has been made as narrow as possible in order to construct, with the money available, the maximum length of road."[13]

East Maui's potential tourism value gave the county a strong incentive to promote the idea of a belt highway to Hana. Between 1905 and 1908, concrete bridges were built in the ditch country near Nahiku to support a proposed 60-mile paved road between Hana and Kailua. No bridges were built on Maui in 1909, but five were built in 1910 on the Piilani Highway south of Hana along the southern route.

Bridge building on Maui surged in 1911, when the Territorial Legislature established a Loan Fund Commission to oversee a special fund for belt roads. Out of the $1,270,000 appropriated by the Commission in 1911, Maui received $370,000. This made possible the building of 21 Maui bridges: four on the Hana Belt Road, four on the Piilani Highway south of Hana, six in the upcountry district, six in Central Maui and one in West Maui.

The Maui Board of Supervisors created the Office of the County Engineer in 1915, naming Hugh Howell to the post. Howell would later be involved in Maui road building as a private contractor.

Work on the northern Hana Belt Road proceeded from different areas and at different times, depending on the extent of funding. A narrow road and bridges from Kailua in Makawao to Nuaailua Bay near Keanae was built by 1912 with territorial funds. From Hana, contractors Wilson and McCandless had completed a road to the Nahiku-Keanae section by 1915. This road, however, did not link up with the Kailua extension, but instead dead-ended in the Koolau Forest Reserve. The lack of a continuous paved road prompted one Maui legislator to complain that "Maui is the only island on which you cannot traverse by road around it."[14]

After 1914 Territorial governor Lucius E. Pinkham disapproved of further loan fund monies for the Keanae-Hana Belt Road. The Territory made no effort until 1920 to sell bonds to finance Belt Road construction on Maui, and relatively few bridges were built between 1915 and 1926. No bridges were built in 1918, 1919 and 1923.

Hana was by 1922 the site of the large Kaelekuu sugar plantation and mill. The plantation's manager, Mr. Joseph Herschorr, favored the proposed Hana Belt Road as "a wonderful tourist asset."[15] He even offered to buy $300,000 worth of bonds floated by the Territorial government to finance road construction.

Most of Maui's business interests also favored the construction of a road to Hana but disagreed about the route and means of financing. County Engineer A.P. Low estimated in 1923 that the Hana Belt Road through the ditch country would cost about $692,000.[16] Citing the highway's high cost, Maui businessman A.F. Tavares instead urged funding for a less expensive Kipahulu-Kaupo belt road around Maui's south side.[17] But Maui businessmen objected to all financing proposals which included either county bonds or a special road tax.

(Some indication of the bridge-building can be seen by comparing 1936 costs with those of the present day. Construction of the large Waiale Drive Bridge, a 79-foot concrete bridge with steel girders in Wailuku, cost $23,700 in 1936. In comparison, repairs alone to the Anahulu bridge in Haleiwa, built in 1921, will cost the City & County of Honolulu an estimated $735,000 in 1989.[18])

Despite its then-prohibitive cost, the county eventually decided to complete the paved road through the ditch country. Some territorial funds were provided in 1922 and 1923, and the County set to work completing the extension between Kailua and Keanae. To lower costs, the county administration regularly used convict labor shipped in from other islands and established work camps for convict and free roads gangs at either end of the extension. Materials and heavy equipment were driven in from Kahului or shipped to Hana and transported to Keanae.

Federal Financing

Completion of the Hana Belt Road was finally made possible by the federal government, which in 1925 appropriated to Hawaii Federal Aid funds for primary roads. These funds had been allotted to mainland states since 1917. The Territory's newly-created Highways Department then began a systematic replacement of narrow and hazardous bridges, constructing twelve new bridges on Maui in 1926. By 1927 the Maui News remarked that "very few wooden structures are left on Maui ... concrete bridges have been put in all over the County."[19]

Work on Maui bridges continued throughout the 1930s with monies from several sources—the Emergency Relief Funds, Hawaii Special Funds and the Public Highway Funds. By the mid-1930s the Federal Government financed roughly 75% of Maui County's road building. The Federal Act of 1931 had provided the County with $765,177.15 road aid funds that year. Washington's yearly contributions for Maui roads topped the one million dollar mark by 1935, amounting to $1,161,225 in 1936.[20] Sixteen bridges were constructed on Maui from 1936 to 1940, including the Nailoa Overpass (Control No. 9) and the Waiale Drive(Control No. 10) Bridges in Wailuku.

Throughout this period of extensive road-building, the County Engineer played a key role in overseeing bridge construction. Hugh Howell, senior engineer under the Loan Fund Commission, authorized building of the 1911-1912 bridges and later constructed some Belt Road bridges as a private contractor.

A.P. Low, County Engineer from 1916 to 1928, appears to have been influential in developing the Hana Belt Road and bridges during the 1920s. A.H. Wong, his assistant and eventual successor, also oversaw the completion of the Belt Road and construction of many federally-funded bridges during the 1930s. Wong was succeeded by Herman Bigelow, former Superintendent of Public Works, during the later part of the 1930s.

The longest serving Chairman of the Maui Board of Supervisors was Samuel E. Kalama of Makawao. Under his chairmanship from 1913 to 1933, a total of 54 bridges in the study were built, many of them in the Upcountry region he represented. The rapid development of Upcountry Maui can be ascribed partly to his influence. The Kailua Gulch Bridge (Control No. 45), built in 1929, was subsequently named the Sam Kalama Bridge in his honor.

While Maui still has no paved road encircling the entire island (the Piilani Highway south of Kipahulu to Kihei is still unpaved), overland access to East Maui from the rest of the island was finally assured with the completion of the belt road and bridges in the 1920s and 1930s.

Bridge Materials and Design

(Refer to Table 2)

The oldest bridge in this study, the Mokuhehua Stream Bridge (Control No. 78) on the Hana Highway, is a concrete slab structure built in 1908. The 48-foot bridge is typical of early-twentieth century concrete structures.

However, the Mokuhehua Stream Bridge is by no means the first bridge built on Maui, however. Many of the bridges in the study were originally timber and steel bridges which between 1900 and 1940 were partially replaced as the County extended paved roads over previous horse trails.

Concrete, previously used for the arch ring of masonry bridges, became widespread after the Superintendent of Public Works made construction of strong, low-maintenance bridges its stated policy shortly after annexation.[21] According to the 1905 report of the Assistant SPW, the foundations of all bridges and culverts, were to be "constructed that they are good for all time." The report went on to state that

> "Wherever practicable, bridges have ... been built of concrete, and where the span was too great so as to make the cost excessive, timber bridges (treated with creosote) have been designed preferably to the steel structures which we have found ... to be the most expensive to maintain and keep in repair."[22]

In particular, concrete dock girders and concrete slabs dominated Maui's modern bridge designs. As their strength and economy became apparent, concrete dock girders replaced concrete arches and open-spandrel arches for short spans.[23] Early 20th century bridges built with county funding often consisted of simple concrete decks built over the original 19th century stone abutments.

Later bridges built with Federal funds were not only larger but also more elaborate. Federal bridges were apt to contain arched pier columns, haunched girders and railing brackets. A striking example of this is the Naalae Gulch Bridge (Control No. 46) in the Makawao District. This 1933 bridge is not

only one of the longer bridges on Maui, but also distinguished by two twin-arch substructure columns.

The various types of bridges in the study are shown in Table 2.

Bridge Distribution

(Refer to Table 3)

Sam Kalama's Makawao District is the site of 18 bridges or 17.5% of the bridges in this study. The Wailuku District has 9 bridges or 8.7%. Lahaina has 11 bridges or 10.7%.

The majority of Maui's bridges (61 bridges or 59.2% in the study) is located in East Maui, reflecting the government's strenuous efforts to forge a road through the wilderness of the ditch country. Most of this construction occurred between 1910 and 1940. By the end of this period the highway was substantially complete. A journalist driving through the ditch country at the time called the Hana Belt Road a "paved trail following the line of the ditch through the wild jungle."[9] Today the 60-mile road to Hana from Wailuku, State Highway 360, offers residents and tourists alike one of the most spectacularly scenic automobile routes in the state of Hawaii.

Footnotes

[1]Ralph S. Kuykendall, The Hawaiian Kingdom, Vol. II, 1854-1874, (Honolulu: The University of Hawaii Press, 1953), p.23.

[2]Dipesh Sterling, *Sizes of Maui County*, 14 unpublished volumes, (Bishop Museum, Department of Archaeology).

[3]Kuykendall, p. 25.

[4]Kuykendall, p. 26.

[5]Kuykendall, p. 26.

[6]Robert C. Schmitt, Historical Statistics of Hawaii, Honolulu: University Press of Hawaii, 1977, pp.359-360.

[7]Schmitt, pp. 13-14.

[8]Schmitt, pp. 13-14.

[9]Schmitt, pp. 13-14.

[10]Hawaii, Report to the Governor, Territory of Hawaii by the Superintendent of Public Works for the Year Ending June 30, 1905.

[11]*Fine Pioneers Demand Better Roads Makawao*, Maui News, May 30, 1928, p. 1:3.

[12]*County Committee Endorses Division Makawao District*, Maui News, January 14, 1928, p. 1:6.

[13]Hawaii, Report to the Governor, Territory of Hawaii by the Superintendent of Public Works for the Year Ending June 30, 1905.

[14]*Roads First Need View of Fassoth*, Maui News, February 11, 1921, p. 1:5.

[15]*Belt Road Bonds Can Be Taken Up*, Maui News, May 5, 1922. p. 1:5.

[16]*Estimate Made of Belt Road Cost By Way of Kailua*, Maui News, January 13, 1923, p. 1:1.

[17]*Supervisors And Committee Agree As to Belt Road*, Maui News, February 8, 1923, p. 1:1.

[18]*Anahulu Bridge to Get Repairs*, Honolulu Advertiser, July 21, 1989, p. A14.

[19]*Roads and Bridges of County Weather Heavy Rain Storms*, Maui News, April 6, 1927, p. 1:6.

[20]Patricia M. Alvarez, *Historic Bridge Inventory and Evaluation, Island of Hawaii*, unpublished manuscript prepared for the Dept. of Transportation Highways Division, State of Hawaii, July, 1987, p. 34-35.

[21] Alvarez, p. 74.

[22]Hawaii, Report to the Governor, Territory of Hawaii by the Superintendent of Public Works for the Year Ending June 30, 1905.

[23] Alvarez, p. 73.

[24]*Driver Takes You 'Round The Isle' – Maui This Time*, Honolulu Advertiser, April 27, 1940, p. 3:3.

Bridge No. 29
Name of Bridge PIINAAU STRM
Structure type: CONCRETE/TEE BEAM
Structure No. 009003600501662

Factors Comprising the Evaluation Criteria for Historic Significance of Maui and Molokai Bridges

	Points	Comments
ENVIRONMENTAL (65%) or 26 pts max		
1. INTEGRITY		
A. Location and setting	0-3	3
B. Workmanship	0-3	1
C. Design	0-3	1
D. Feeling and association	0-3	2
E. Material	0-3	1
	15 pts max	8
2. AESTHETICS		
A. Poor	0	0
B. Average	1-2	0
C. Excellent	3	0
	3 pts max	0
3. HISTORY		
A. Poor	0	0
B. Average	4-7	0
C. Excellent	8	0
	8 pts max	0
		8 Sub Total
DOCUMENTATION (17.5%) or 7 pts max		
1. BUILDER/DESIGNER		
A. Unknown	0	0
B. Known	1	0
C. Known, Prolific	2	0
D. Known, Noted	3	0
	3 pts max	0
2. CONSTRUCTION DATES (original)		
A. 1936 - 1940	1	0
B. 1926 - 1935	2	0
C. 1911 - 1925	3	3
D. Pre 1910	4	0
	4 pts max	3
		3 Sub Total
TECHNOLOGY (17.5%) or 7 pts max		
1. TECHNICAL		
A. Spans (no.) more than 1	1	0
B. Span lengths (varying)	1	0
C. Height (over 25')	1	0
D. Special features	1	0
	4 pts max	0
2. GEOMETRIC CONFIGURATION		
A. Unique	3	0
B. Unusual	2	0
C. Typical	0	0
	3 pts max	0
		0 Sub Total
		11 Grand Total

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Control No. 29

PIINAAU STREAM BRIDGE

Maui County
Hana District
State Highway 360
Located 0.04 miles east of Keanae Homestead Road
Structure File No. 009003600501662
Crosses Piinaau Stream

The Piinaau Stream Bridge is located along Hana Highway over Piinaau Stream near the entrance to Keanae Peninsula. Built in 1916, the bridge's main structure type is concrete tee beam. It has one span and is 28 feet long.

The correct name of the stream and bridge is "Pi-na-au," which means "kind-hearted."

Bridge No. 30
Name of Bridge PALAUHULU STRM
Structure type: CONCRETE/TEE BEAM
Structure No. 009003600501679

Factors Comprising the Evaluation Criteria for Historic Significance of Maui and Molokai Bridges

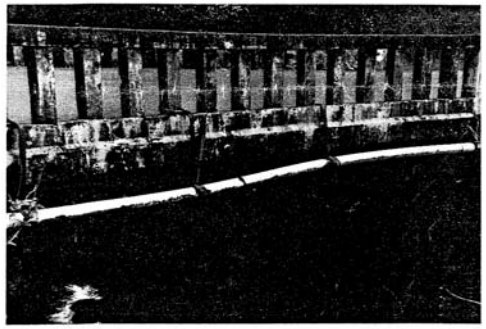
	Points	Comments
ENVIRONMENTAL (65%) or 26 pts max		
1. INTEGRITY		
A. Location and setting	0-3	3
B. Workmanship	0-3	1
C. Design	0-3	1
D. Feeling and association	0-3	2
E. Material	0-3	1
	15 pts max	8
2. AESTHETICS		
A. Poor	0	0
B. Average	1-2	0
C. Excellent	3	0
	3 pts max	0
3. HISTORY		
A. Poor	0	0
B. Average	4-7	0
C. Excellent	8	0
	8 pts max	0
		8 Sub Total
DOCUMENTATION (17.5%) or 7 pts max		
1. BUILDER/DESIGNER		
A. Unknown	0	0
B. Known	1	0
C. Known, Prolific	2	0
D. Known, Noted	3	0
	3 pts max	0
2. CONSTRUCTION DATES (original)		
A. 1936 - 1940	1	0
B. 1926 - 1935	2	0
C. 1911 - 1925	3	3
D. Pre 1910	4	0
	4 pts max	3
		3 Sub Total
TECHNOLOGY (17.5%) or 7 pts max		
1. TECHNICAL		
A. Spans (no.) more than 1	1	0
B. Span lengths (varying)	1	0
C. Height (over 25')	1	0
D. Special features	1	0
	4 pts max	0
2. GEOMETRIC CONFIGURATION		
A. Unique	3	0
B. Unusual	2	0
C. Typical	0	0
	3 pts max	0
		0 Sub Total
		11 Grand Total

HHC/DOT CC N 17986
11/20/86

Control No. 30

PALAUHULU STREAM BRIDGE

Maui County
Hana District
State Highway 360
Located 0.21 miles east of Keanae Homestead Road
Structure File No. 009003600501679
Crosses Palauhulu Stream



The Palauhulu Stream Bridge is located along Hana Highway over Palauhulu Stream near the entrance to Keanae Peninsula. Built in 1916, the bridge's main structure type is concrete tee beam. It has one span and is 31 feet long.

Until a road was constructed through this area in 1916, Keanae valley was accessible only from the sea. Its inhabitants were Hawaiians who followed the traditional Hawaiian customs and activities. Until recently, taro farming and fishing were Keanae's primary industries.

The meaning of "Pa-lauhulu" is "leaf sheltered."

Bridge No. 31
Name of Bridge WAIOKAMILO STRM
Structure type: CONCRETE/TEE BEAM
Structure No. 009003600501811

Factors Comprising the Evaluation Criteria for Historic Significance of Maui and Molokai Bridges

	Points	Comments
ENVIRONMENTAL (65%) or 26 pts max		
1. INTEGRITY		
A. Location and setting	0-3	2
B. Workmanship	0-3	1
C. Design	0-3	1
D. Feeling and association	0-3	1
E. Material	0-3	1
	15 pts max	6
2. AESTHETICS		
A. Poor	0	0
B. Average	1-2	2
C. Excellent	3	0
	3 pts max	2
3. HISTORY		
A. Poor	0	0
B. Average	4-7	0
C. Excellent	8	0
	8 pts max	0
		8 Sub Total
DOCUMENTATION (17.5%) or 7 pts max		
1. BUILDER/DESIGNER		
A. Unknown	0	0
B. Known	1	1
C. Known, Prolific	2	0
D. Known, Noted	3	0
	3 pts max	1
2. CONSTRUCTION DATES (original)		
A. 1936 - 1940	1	0
B. 1926 - 1935	2	0
C. 1911 - 1925	3	3
D. Pre 1910	4	0
	4 pts max	3
		3 Sub Total
TECHNOLOGY (17.5%) or 7 pts max		
1. TECHNICAL		
A. Spans (no.) more than 1	1	0
B. Span lengths (varying)	1	0
C. Height (over 25')	1	0
D. Special features	1	0
	4 pts max	0
2. GEOMETRIC CONFIGURATION		
A. Unique	3	0
B. Unusual	2	0
C. Typical	0	0
	3 pts max	0
		0 Sub Total
		12 Grand Total

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Control No. 31

WAIOKAMILO STREAM BRIDGE

Maui County
Hana District
State Highway 360
Located 0.02 miles west of Wailua Homestead Road
Structure File No. 009003600501811
Crosses Waiokamilo Stream

The Waiokamilo Stream Bridge is located along Hana Highway over Waiokamilo Stream near St. Gabriel's Church and the town of Wailua. Built in 1921, the bridge is 24 feet long. Its main structure type is concrete tee beam, one span.

The bridge was designed by D.K. Kapohakimoheu.

The meaning of "Wai-o-ka-milo" is "whirling waters."

F. VEGETATION

Name of Bridge WAIKANI STRM
Structure type: CONC CON/ARCH-DECK
Structure No. 009003600501942

Factors Comprising the Evaluation Criteria for Historic Significance of Maui and Molokai Bridges

	Points	Comments
ENVIRONMENTAL (65%) or 26 pts max		
1. INTEGRITY		
A. Location and setting	0-3	3
B. Workmanship	0-3	2
C. Design	0-3	3
D. Feeling and association	0-3	3
E. Material	0-3	2
	15 pts max	13
2. AESTHETICS		
A. Poor	0	0
B. Average	2	0
C. Excellent	3	3
	3 pts max	3
3. HISTORY		
A. Poor	0	0
B. Average	4	4
C. Excellent	8	0
	8 pts max	4
		20 Sub Total
DOCUMENTATION (17.5%) or 7 pts max		
1. BUILDER/DESIGNER		
A. Unknown	0	0
B. Known	1	1
C. Known, Prolific	2	0
D. Known, Noted	3	0
	3 pts max	1
2. CONSTRUCTION DATES (original)		
A. 1936 - 1940	1	0
B. 1926 - 1935	2	2
C. 1911 - 1925	3	0
D. Pre 1910	4	0
	4 pts max	2
		3 Sub Total
TECHNOLOGY (17.5%) or 7 pts max		
1. TECHNICAL		
A. Spans (no.) more than 1	1	0
B. Span lengths (varying)	1	0
C. Height (over 25')	1	0
D. Special features	1	0
	4 pts max	0
2. GEOMETRIC CONFIGURATION		
A. Unique	3	3
B. Unusual	2	0
C. Typical	0	0
	3 pts max	3
		3 Sub Total
		26 Grand Total

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11/20/86

Control No. 54

WAIKANI STREAM BRIDGE

Maui County
Hana District
State Highway 360
Located 0.33 miles east of Wailua Valley Road
Structure File No. 009003600501942
Crosses Waikani Stream

The Waikani Stream Bridge is located along Hana Highway over the Waikani Stream where the road enters the Koolau Forest Reserve. Here, the Hana Highway turns inland and proceeds through dense tropical growth until the Hana Airport.

One of the most impressive bridges on Maui. The superstructure is typical open railing, concrete design of that era. The substructure is unique and impressive – prominent concrete arch. The substructure is visible from the road and the bridge itself is located at the head of a dramatic valley.

The bridge serves as a highway and waterway and no pedestrian traffic is allowed. The bridge has one spectacular span with a maximum span length of 83 feet. The structure length is 108 feet. The bridge roadway from curb to curb is 17 feet. The surface of the roadway is approximately 50 feet above the stream bed which curves and thunders down to Wailua Valley, and eventually into the Pacific Ocean.

The material used in the substructure and superstructure is reinforced concrete and the wearing-surface is asphalt. The design load is unknown.

Built in 1926, the Waikani Bridge is unique on Maui for its structure type of continuous concrete arch-deck. Seen from the side, the substructure is an excellent example of the arch-deck design. The bridge is one of the most aesthetically appealing on Maui.

The dramatic use of the single 83 feet long arch gives the Waikani Bridge a spectacular appearance and compliments the dramatic, rugged ravines and mountains of scenic Hana Highway. The name "Waikani" is aptly named for it means "sounding" (kani) "water" (wai). Especially during the heavy rainy seasons, when the water thundered from the top of the falls down the mountain side to the stream bed, the local Hawaiians liked the special sound of the falling water, and therefore, named the falls and waterway, Waikani.

The Waikani Bridge was built by the Moses Akiona Construction Company of Honolulu. Mr. Akiona was born in Kailua, in the Keanae district, then moved to Honolulu to seek his fortune in construction. It was prophetic that he would return to build the Waikani Bridge.

Lyman H. Bigelow was the Superintendent of Public Works for the Territory of Hawaii at the time of construction of this bridge and A.P. Low was the Maui County Engineer.

KEANAE ARBORETUM
5/26/89 Alphabetical by Common Name Page 1

Common Name	Scientific Name	Origen	Area
	Chukrasia tabularis	India	4
	Gyrocarpus jaquinii	Kenya	8
	Ptychosperma robustum	-unknown-	5
	Terminalia ivorensis	Africa	4
African tulip	Spathodea campanulata	Africa	2
African tulip	Spathodea campanulata	Tropical Africa	2
Alexandra palm	Archontophoenix alexandrae	Australia	5
Angels trumpet	Datura candida	Tropical America	9&10
Arabian coffee	Coffea arabica	Tropical Africa	6&7
Bagras	Eucalyptus deglupta	Indonesia	5
Banana shrub	Michelia figo	China	9&10
Barrigon	Pseudobombax septenatum	Tropical America	3
Betelnut palm	Areca cathecu	Malaya	1
Betelnut palm	Areca cathecu	Malaya	5
Black sapote	Diospyros ebenaster	Caribbean	3&7
Blue latan palm	Latania loddigesii	Mauritius	1
Blue latan palm	Latania loddigesii	Mauritius	5
Blue marble tree	Elaeocarpus grandis	Australia	2
Blue marble tree	Elaeocarpus grandis	Australia	6&7
Bottle palm	Mascarena lagenicaulis	Mauritius	1
Bottle palm	Mascarena lagenicaulis	Mauritius	5
Bottlebrush	Callistemon citrinus	Australia	6&7
Breadfruit	Artocarpus altilis	Indonesia	6&7
Brownea	Brownea grandiceps	South America	6&7
Brownea	Brownea grandiceps	Tropical America	2
Buttercup tree	Cochlospermum vitifolium	Tropical America	6&7
Calabash tree	Crescentia cujete	Tropical America	5
Cashew nut	Anacardia occidentale	Caribbean	2
Chinese fan palm	Livistonia chinensis	China	3
Chinese fan palm	Livistonia chinensis	China	5
Chinese rice flower	Aglaia odorata	China	9&10
Chinese taro	Alocasia cucullata	India	1
Common Mango	Mangifera indica	India	1
Common bamboo	Bambusa vulgaris	Java	2
Cook pine	Araucaria columnaris	New Caledonia	2
Coral tree	Erythrina variegata	Indonesia	6&7
Coyure palm	Aiphanes caryotaefolia	Columbia	5
Crepe myrtle	Lagerstroemia speciosa	Indonesia	2
Cycad	Cycas revoluta	Japan	1
Dwarf date palm	Phoenix roebelinii	Tropical Asia	1
Edible pandanus	Pandanus sp.	Micronesia	2
Eggfruit	Pouteria campechiana	Tropical America	6&7
False wiliwili	Adenanthera pavonina	Tropical Asia	8
Fish tail palm	Caryota urens	Tropical Asia	1
Fishtail fern	Nephrolepis biserrata	Indonesia	2
Fishtail palm	Caryotia mitis	Southeast Asia	5
Flame of the forest	Butea monosperma	India	6&7
Flame tree	Brachychiton acerifolium	Australia	2
Flame tree	Cordia alliodora	Australia	2
Formosan sweetgum	Liquidambar formosana	Taiwan	6&7
Fragrant dracaena	Pleomele fragrans	Tropical Africa	9&10

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KEANAE ARBORETUM
5/26/89 Alphabetical by Common Name Page 2

Common Name	Scientific Name	Origen	Area
Golden fruited palm	Chrysalidocarpus lutescens	Madagascar	1
Golden fruited palm	Chrysalidocarpus lutescens	Madagascar	5
Gourka	Garcinia dulcis	Southeast Asia	4
Grapefruit	Citrus paradisi	Cultigen	2
Guava	Psidium guajava	Tropical America	1
Guiana chestnut	Pachira aquatica	Tropical America	5
Hala	Pandanus odoratissimus	Pacific Islands	9&10
Heliconia	Heliconia rostrata	Peru	9&10
Impatiens	Impatiens sultani	East Africa	1
Indian bulang	Gmelina arborea	India	6&7
Ivorynut palm	Metroxylon amicarum	Micronesia	1
Jabon	Citrus maxima	Southeast Asia	6&7
Jaboticaba	Eugenia cauliflora	Brazil	2
Jakfruit	Artocarpus heterophylla	Southeast Asia	6&7
Jucaro	Bucida buceras	Central America	4
Kamani	Calophyllum inophyllum	Western Pacific	4
Khirni	Manilkara hexandra	Southeast Asia	6&7
Kokio	Hibiscus saintjohnianus	Kauai	9&10
Kokio keokeo	Hibiscus immaculatus	Molokai	9&10
Kokio ula ula	Hibiscus clayi	Kauai	9&10
Lemongum	Eucalyptus citriodora	Australia	5
Liberian coffee	Coffea liberica	Tropical Africa	6&7
Lime	Citrus aurantifolia	Southeast Asia	2
Lipstick plant	Bixa orellana	Tropical America	6&7
Longan	Euphoria longan	China	4
Loulu palm	Pritchardia brevicalyx	Molokai	1
Loulu palm	Pritchardia forbesiana	Maui	1
Loulu palm	Pritchardia gaudichaudii	Molokai	1
Loulu palm	Pritchardia munroii	Maui	1
Mabolo	Diospyros discolor	Philippines	6&7
Macarthur palm	Ptychosperma macarthurii	Indonesia	1
Male bamboo	Dendrocalamus strictus	Southeast Asia	2
Mammee apple	Mammea americana	Tropical America	6&7
Mango	Mangifera indica	India	2
Mangosteen	Garcinia mangostana	Malaya	4
Manila palm	Veitchia merrillii	Philippines	1
Marang	Artocarpus odoratissimus	Indonesia	4
Mokinerie	Molineria recurvata	Indonesia	1
Monstera	Monstera deliciosa	Central America	5
Moreton Bay chestnut	Castanospermum australe	Australia	2
Moreton Bay chestnut	Castanospermum australe	Australia	8
Narra	Pterocarpus echinatus	Philippines	2
Niusawa palm	Veitchia joannis	Fiji	5
Noni	Morinda citrifolia	Indonesia-Polynesia	9&10
Oil palm	Elaeis guineensis	Africa	5
Oil palm	Elaeis guineensis	Tropical Africa	1
Orange bauhinia	Bauhinia galpinii	Africa	6&7
Panama hat palm	Carludovica palmata	Peru	1
Pandanus	Pandanus sp. (cultivar)	Pacific Islands	9&10
Parana pine	Araucaria angustifolia	Paraguay	2
Parlor palm	Chamaedorea tepejilote	Mexico	1
Payang	Pangium edule	Malaya	4

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Maui DOFAW ID:2435006 NOV 25'94 9:53 No.002 P.04
KEANAE ARBORETUM
5/26/83 Alphabetical by Common Name Page 3

Common Name	Scientific Name	Origen	Area
Peach palm	Guilelma gasipaes	Peru	5
Pinange palm	Pinanga kuhlii	Indonesia	1
Pinanga palm	Pinanga kuhlii	Indonesia	5
Pink poui	Tabebuia rosea	Caribbean	6&7
Pink tecoma	Tecoma pentaphylla	Tropical America	6&7
Pluwerta	Pluwerta rubra	Tropical America	9&10
Pomelo	Citrus paradisi	Cultigen	8
Pua alo alo	Hibiscus kokio	Maui	9&10
Puakenikeni	Fragraea berteriana	South Pacific	8&7
Purple bauhinia	Bauhinia purpurea	India	8&7
Queen Emma spiderlily	Crinum augustum	Mauritius	9&10
Queen palm	Arecastrum romanzoffianum	Brazil	1
Queen palm	Arecastrum romanzoffianum	Brazil	5
Queensland maple	Flindersia brayleyana	Australia	8
Rainbow shower	Cassia fistula x javanica	Cultigen	8
Rattan palm	Rhapis excelsa	China	1
Rattan palm	Rhapis excelsa	China	5
Red ginger	Alpinia purpurata	Polynesia	9&10
Red lehua haole	Calliandra haeguilarere	Bolivia	8
Red pandanus	Pandanus japonesis	Micronesia	2
Rosegum	Eucalyptus grandis	Australia	5
Royal palm	Roystonea regia	Cuba	1
Royal palm	Roystonea regia	Cuba	5
Sadang	Livistonia rotundifolia	Indonesia	1
Sausage tree	Kigelia pinnata	Africa	2
Seville orange	Citrus aurantium	Southeast Asia	5
Shoebutton ardisia	Ardisia humilis	Southeast Asia	2
Sisoo	Dahlbergia sissoo	India	4
Soapberry	Sapindus saponaria	Tropical America	2
Solitaire palm	Ptychosperma elegans	Australia	5
Sugar apple	Annona squamosa	Caribbean	6&7
Surinam cherry	Eugenia uniflora	Brazil	2
Sweet Orange	Citrus sinensis	Southeast Asia	2
Sword fern	Nephrolepis aultiflora	Indonesia	2
Syagrus palm	Syagrus coronata	Brazil	5
Sydney bluegum	Eucalyptus saligna	Australia	1
Synechanthus palm	Synechanthus mexicanus	Mexico	5
Teak	Tectona grandis	Southeast Asia	4
Three angled palm	Neodypsis decaryi	Madagascar	5
Torch ginger	Phaeomeria speciosa	Mauritius	9&10
Turpentine tree	Syncarpia globulifera	Australia	1
Wallichia palm	Wallichia disticha	India	5
White bauhinia	Bauhinia variegata	Southeast Asia	6&7
White champak	Michelia alba	Java	9&10
White lehua haole	Calliandra haeguilarere	Bolivia	8
White sapote	Casimiroa edulis	Mexico	2
Wi tree	Spondias dulcis	Tahiti	6&7
Yellow ginger	Hedychium flavescens v.furc	India	2
Yesterday-today-tomor	Brunfelsia americana	Caribbean	9&10
Ylang Ylang	Artabotrys uncinatus	India	9&10

Total Plant Count: 153

Prepared by Jozef Smit, Pacific Basin Arboretum, 245-8377

APPENDIX Source: La'au Hawaii
Isabella A. Abbott
1992

Flowering Plant and Fern Names

List of Hawaiian names, common names (English common names are given preference), and scientific names of flowering plants and ferns mentioned in this book. Species without Hawaiian names are listed at the end of the Appendix and are alphabetized according to their common names. Scientific names for flowering plants follow W. L. Wagner et al., 1990. Scientific names for ferns are from W. H. Wagner, Jr. *Lima*, or edible seaweeds, are listed in chapter 6.

Hawaiian Name	Common Name	Scientific Name
'a'ali'i	——	*Dodonaea viscosa*
'ahakea	——	*Bobea elatior*
'ahu'awa	(a sedge)	*Mariscus javanicus*
'aiea (hālena)	——	*Nothocestrum* species
'aka'akai	great bullrush (a sedge)	*Schoenoplectus lacustris* subsp. *validus*
'akala	Hawaiian raspberry	*Rubus hawaiiensis* and *Rubus macraei*
'akia	——	*Wikstroemia* species
'ala'alawainui	——	*Peperomia* species
'alahe'e	——	*Canthium odoratum*
alani	——	*Pelea (Melicope)* species
'ali'ipoe	shot	*Canna indica*
'ama'u	(a tree fern)	*Sadleria* species
'ape	elephant's ear	*Alocasia macrorrhiza*
'auhuhu	——	*Tephrosia purpurea*
'awa	kava	*Piper methysticum*
'awapuhi	shampoo ginger	*Zingiber zerumbet*
'awiki'awiki	——	*Canavalia galeata*
'ekaha	bird's nest fern	*Asplenium nidus*
ha'a (hame)	——	*Antidesma platyphyllum*
hala	——	*Pandanus tectorius*

La'au Hawai'i - TRADITIONAL HAWAIIAN USES OF PLANTS

Hawaiian Name	Common Name	Scientific Name
halapepe	——	*Pleomele* spp.
hame (ha'ā)	——	*Antidesma platyphyllum*
hāpu'u	(a tree fern)	*Cibotium* species
hau	——	*Hibiscus tiliaceus*
hoi	bitter yam	*Dioscorea bulbifera*
hōlei	——	*Ochrosia* species
'ie'ie	——	*Freycinetia arborea*
'iliahi	sandalwood	*Santalum* species
'ilie'e	——	*Plumbago zeylanica*
'ilima	——	*Sida fallax*
ipu (kilu), hue	gourd	*Lagenaria siceraria*
kalo	taro	*Colocasia esculenta*
kamani	Alexandrian laurel	*Calophyllum inophyllum*
kauila	——	*Alphitonia ponderosa*
kāwa'u	Hawaiian holly	*Ilex anomala*
ki (ti)	ti leaf plant	*Cordyline fruticosa*
kō	sugarcane	*Saccharum officinarum*
koa	——	*Acacia koa* subsp. *koa*
koai'a (koai'e)	——	*Acacia koa* subsp. *koaia*
koali 'awa	bitter morning glory	*Ipomoea indica*
koali 'ai (kūpala)	wild morning glory	*Ipomoea cairica*
kohekohe	(a sedge)	*Elaeocharis* species
ko'oko'olau	——	*Bidens* species
kou	——	*Cordia subcordata*
kūkaenēnē	——	*Coprosma ernodeoides*
kūkaepua'a	itchy crabgrass	*Digitaria setigera*
kukui	candlenut tree	*Aleurites moluccana*
kūpala (koali 'ai)	wild morning glory	*Ipomoea cairica*
kūpaoa	——	*Dubautia* subgenus *Railliardia*
la'amia	calabash tree	*Crescentia cujete*
lama	——	*Diospyros sandwicensis* and *Diospyros hillebrandii*

Hawaiian Name	Common Name	Scientific Name
laua'e	(a fern)	*Phymatodes scolopendrium**
loulu	native fan palm	*Pritchardia* species
ma'aloa	——	*Neraudia* species
maile	——	*Alyxia oliviformis*
mai'a	banana	*Musa acuminata* hybrids
makaloa	(a sedge)	*Cyperus laevigatus*
māmaki	——	*Pipturus* species
māmane	——	*Sophora chrysophylla*
ma'o	Hawaiian cotton	*Gossypium tomentosum*
mau'u lā'ili	(a native iris)	*Sisyrinchium acre*
milo	portia tree	*Thespesia populnea*
mokihana	——	*Pelea anisata*
naio	false sandalwood	*Myoporum sandwicense*
nānū (nā'ū)	Hawaiian gardenia	*Gardenia* species
nā'ū(nānū)	Hawaiian gardenia	*Gardenia* species
nioi	chili pepper	*Capsicum frutescens*
niu	coconut	*Cocos nucifera*
noni	Indian mulberry	*Morinda citrifolia*
'ohai	——	*Sesbania tomentosa*
'ohe	Hawaiian bamboo	*Schizostachyum glaucifolium*
'ohelo	——	*Vaccinium* species
'ōhi'a 'ai	mountain apple	*Syzygium malaccense*
'ōhi'a hā	——	*Syzygium sandwicensis*
'ōhi'a lehua	——	*Metrosideros polymorpha*
'ōlapa	——	*Cheirodendron* spp.
'ōlena	turmeric	*Curcuma longa*
olonā	——	*Touchardia latifolia*
olopua (pua)	——	*Nestegis sandwicensis*
ōpuhe	——	*Urera* species
pala	(a fern)	*Marattia douglasii*

*According to one of the foremost students of Hawaiian ferns, W. H. Wagner, Jr., *Phymatodes scolopendrium* is a recent introduction. See chapter 7, note 33.

La'au Hawai'i - TRADITIONAL HAWAIIAN USES OF PLANTS

Hawaiian Name	Common Name	Scientific Name
pala'ā	lace fern	*Odontosoria chinensis*
palapalai (palai)	(a fern)	*Microlepia strigosa*
pāpala kēpau	——	*Pisonia* species
pia	Polynesian arrowroot	*Tacca leontopetaloides*
pi'a	yam	*Dioscorea pentaphylla*
pili	tanglehead (grass)	*Heteropogon contortus*
po'a'aha (wauke)	paper mulberry	*Broussonetia papyrifera*
pōhuehue	beach morning glory	*Ipomoea pes-caprae*
polapola	(erect banana)	*Musa troglodytarum*
pōpolo	glossy nightshade	*Solanum americanum*
pua (olopua)	——	*Nestegis sandwicensis*
pūkiawe	——	*Styphelia tameiameiae*
ti (ki)	ti leaf plant	*Cordyline fruticosa*
'uala	sweet potato	*Ipomoea batatas*
'uhaloa	——	*Waltheria indica*
'uhi	yam	*Dioscorea alata*
uhiuhi	——	*Caesalpinia kavaiensis*
'uki	——	*Machaerina angustifolia*
'uki'uki	——	*Dianella sandwicensis*
'ūlei	——	*Osteomeles anthyllidifolia*
'ulu	breadfruit	*Artocarpus altilis*
wauke (po'a'aha)	paper mulberry	*Broussonetia papyrifera*
wiliwili	——	*Erythrina sandwicensis*
——	betel nut	*Areca catechu*
——	betel pepper	*Piper betle*
——	cabbage tree	*Cordyline australis*
——	kudzu	*Pueraria lobata*
——	pink velvet banana	*Musa velutina*
——	pulach	*Cyrtosperma chamissonis*
——	sago palm	*Metroxylon* species
——	swamp cabbage	*Ipomoea aquatica*
——	Tahitian chestnut	*Inocarpus fagifer*

G. BUILDINGS

Keanae-Waluanui
Property Records

TMKM	Area Code			Area	Materials	Age
2110020090000	A	sf	1) 2)	1628 576	Wood Resid - 1, 7 Conc - 2, 3, 4	1) 1934 2) 1939 3) 1935 4) 1981 7) 1981
2110020100000	A	sf				
2110030010000	A	sf				
2110030010000	A	sf				
2110030030000	A	sf	2)	1536-B 754-P	Wood	1975
2110030030000	F	sf	1)	603-B	Wood	1917
2110030050000	A	sf	1)	524-B 162-P	Wood	1931
2110030050000		sf				1931
2110030070000		sf	1)	363-B	Wood	1940
2110030070000						
2110030120000		sf	1)	810-B 318-P	Wood	1990
2110030300000		sf	1)	1596-B 96-B	Wood Wood	1939
2110030310000		sf	1) 2)	144-B 660-B 260-G 120-P	Wood Wood	1987 1967
2110030410000		sf	1)	1150-B 801-P	Wood	1980
2110030530000	A	sf		947-B 144-P	Wood	1939
2110030570000	F	sf		648-B	Wood	1946

B- Building
P- Porch
C- Car/Storage

TMKM	Area Code			Area	Materials	Age
2110030580000	F	sf	1)	852-B 579-G 576-P	Wood	1986
2110030590000	A	sf	1)	1153-B	230-O O-Masonry	1970
2110030610000	A	sf	1)	1132-B	Wood	1935
2110030680000	F	sf	1)	1130-B 400-C 360-P	Wood	1942
2110030700000	F	sf	1)	1216-B 240-P	Wood	1973
2110030700000	F	sf				
2110030890000		sf	1)	880-B	Wood	1963
2110030900000						
2110030910000	F Church	sf	1)	2368-B		1860
2110040010000	F	sf	1)	754-B	Wood	1907
2110040020000	A	sf	1)	648-B	Wood	1939
2110040040000	A 2) Hall 3) Church 4) Church 5) Dwelling	sf	2) 3) 4) 5)	2456-B 1810-B 840-B 828-B	2) Wood 3) Wood/Conc 4) Wood 5) Wood	2) 3) 1937 4) 1860 5)
2110040350000	A	sf	2) 1)	424-B 2408-B	24-0 Wood Wood	1920 1975
2110040390000	A	sf	1)	948-B	Wood	1953
2110050030000	A	sf	1)	816-B	Wood	1910
2110050040000	F	sf	1)	400-B	Wood	1940

B- Building
P- Porch
C- Car/Storage

TMKM	Area Code			Area	Materials	Age
2110050050000	A	sf	1)	452-B	Wood	1919
2110050060000	A	sf	1)	664-B 264-G 191-P	Wood	1962
2110050070000	F	sf	1)	1004-B 336-G 20-P	Wood	1964
2110050090000	S	sf	1) 2) 3)	312-B 96-P 908-B 266-G 20-P 400-B, 600-C, 200-P	Wood Wood Masonry	1910 1965 1981
2110050100000	A	sf	1)	400-B 144-P	Wood	1971
2110050110000	F	sf	1)	1344-B 288-C	Wood	1937
2110050150000	F	sf	1)	999-B 96-P	Wood	1934
2110050160000	A	sf	1)	748-B 480-G	Wood	1970
2110050260000	A	sf	1)	948-B	Wood	1920
2110050350000	F	sf	1)	416-B	Wood	1915
2110050400000	A	sf				
2110050430000	F	sf	1)	940-B	Wood	1929
2110050470000	A	sf	1)	768-B 76-P	Wood	1988
2110050500000	A	sf	1)	768-B 76-P	Wood	1939
2110050560000	F	sf	1)	1284-B 24-P	Wood	1935
2110050580000	A	sf	1)	952-B 60-P	Wood	1949
2110060020000	A	sf	1)	1156-B 650-P	Wood	1972
2110060030000	F	sf	1)	960-B 400-C 261-P	Wood	1967

B- Building
P- Porch
C- Car/Storage

TMKM	Area Code			Area	Materials	Age
2110060050000	A	sf	1)	784-B	Wood	1940
2110060070000	F	sf	1) 2)	540-B 698-B	Wood Wood	1920 1920
2110060080000	F	sf	1) 2)	1086-B 1056-B 560-G 60-P	Wood Masonry	1930 1975
2110060090000	A	sf	1) 2)	800-B 1056-B 560-G 460-P	Wood Masonry	1949 1978
2110060110000	F	sf	1)	1088-B 674-P	Wood	1919
2110060710000	F	sf	1)	184-B	Wood	1940
2110070050000	F	sf	1) 2)	1300-B 152-P 500-B	Wood Wood	1980 1980
2110070200000	A	sf	1)	1120-B 800-G	Wood	1981
2110080070000	A	sf				
2110080100000	A	sf	1)	1232-B	Masonry	1974
2110080180000	F	sf	1)	678-B	Wood	1936
2110080200000	A -School					1912
2110080210000	A	sf	1)	1946-B 270-G 168-P	Wood	1940

B- Building
P- Porch
C- Car/Storage

H. KE'ANAE AND WAILUANUI CEMETERIES
(from *Maui County Cemetery Directory*
[Maui Historical Society 1990])

ISLAND OF MAUI

CEMETERY (MAP & HISTORY) DIRECTORY

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OF HAWAIIAN LANGUAGE, ART AND CULTURE

MAUI LAND AND PINEAPPLE CO.

- 1990 -

NO.	NAME	BIRTH DATE	DEATH DATE	RELATIONSHIP	PHOTO	MADE OF	TYPE	OTHER INSCRIPTION INFO
1	AHOKU, NANCY	01-28-1880	04-21-1923			CONCRETE	UPRIGHT	
2	AKIU, GEORGE EWALIKO REV.	06-20-1893	08-06-1944	HUSBAND		MARBLE/GRANITE	UPRIGHT	
3	AKOI, W.A.	03-06-1922	05-15-1922			CONCRETE	TOMB	(SAME MARKER AS: W.A. AKOI)
4	AKOI, W.A.	04-04-1926	12-25-1928			CONCRETE	TOMB	(SAME MARKER AS: H.A. AKOI
5	HOOKANO, S.K.	09-04-1844	03-27-1906			CONCRETE	UPRIGHT	
6	KAIWI, MAILE ANN L.	00-00-1937	00-00-1981	MOTHER		MARBLE/GRANITE	UPRIGHT	
7	KANAKA, JOHN PALAILE	00-00-1876	00-00-1949	FATHER		MARBLE/GRANITE	UPRIGHT	
8	KANOA, ESTHER K.	11-14-1895	10-22-1968	MOTHER		MARBLE/GRANITE	UPRIGHT	
9	KANOA, MARTIN A.	07-12-1886	12-27-1952	FATHER		MARBLE/GRANITE	UPRIGHT	
10	KEAUPUNI, ALICE	00-00-0000	00-00-1941			MARBLE/GRANITE	RAISED	
11	KEAUPUNI, SOLOMON	00-00-0000	00-00-1957			MARBLE/GRANITE	RAISED	
12	MAHOLE, ANNIE HALEMANO	03-30-1887	01-12-1934			MARBLE/GRANITE	UPRIGHT	
13	NUUWANU, MELEANA	00-00-0000	07-10-1927			MARBLE/GRANITE	UPRIGHT	
14	PAHUKOA	MARY ANN	00-00-1897	MOTHER		MARBLE/GRANITE	UPRIGHT	
15	PAHUKOA, CAROLINE KELALAINA	08-18-1926	09-18-1926			MARBLE/GRANITE	UPRIGHT	(SAME MARKER AS: CLARENCE AIMA)
16	PAHUKOA, CLARENCE AIMA	12-13-1935	12-20-1935			MARBLE/GRANITE	UPRIGHT	(SAME MARKER AS: CAROLINE KELALAINA)
17	PAHUKOA, HARRY SR.	06-03-1897	06-24-1958	HUSBAND		MARBLE/GRANITE	UPRIGHT	
18	PLUNKETT, R. JR.	00-00-0000	02-22-1928			CONCRETE	RAISED	

SITE DATA FORM: HALEMANO FAMILY CEMETERY

ALSO KNOWN AS: _____

LOCATION: Taro patch near end of main road into Ke'anae. AREA: Ke'anae

APPROX. SIZE: .42 Acres STATUS: ___Active X Closed

RECORDED TOMBSTONES: 2 # UNMARKED GRAVES: 2

CONDITION OF SITE:
___Abandoned/Overgrown/No maintenance
X Some individual graves maintained
___Regular maintenance of entire site
___Poor X Fair ___Good ___Excellent

MAINTAINED BY: ___Owner ___Cemetery Assoc. X Individual Families ___Unknown

OWNER: Ernest Wilhelm Jr.

CONTACT PERSON: Mrs. Nancey Ihu — Descendant
Name — Title

244-0112 — 137 Waiale Road, Wailuku — 96793
Phone — Address — Zip

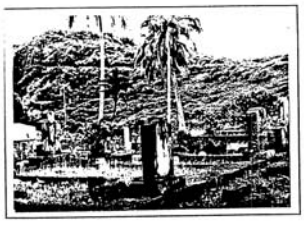
CONTACT PERSON: James Haeu — Descendant
Name — Title

248-8355 — Ke'anae YMCA —
Phone — Address — Zip

NOTES: Halemano graves at this site are great-grandparents of Nancy Ihu and James Haeu.

O.	NAME	BIRTH DATE	DEATH DATE	RELATIONSHIP	PHOTO	MADE OF	TYPE	OTHER INSCRIPTION INFO
19	POMAIKAI, MISS DORCES M.	11-10-1880	06-24-1907			CONCRETE	TOMB	
20	ROSSI, MARGARET MALEKA	02-12-1921	12-14-1985			METAL	TEMPORARY	AGE 64
21	WAINER, LIZZIE K.	00-00-0000	00-00-0000			CONCRETE	TOMB	UA HALA KUU LEI, JAN. 14, 1875, JUNE 3, 1900, MARCH 19, 1906. (NOTE: NOT SURE WHICH ARE CORRECT BIRTH AND DEATH DATES)

.	NAME	BIRTH DATE	DEATH DATE	RELATIONSHIP	PHOTO	MADE OF	TYPE	OTHER INSCRIPTION INFO
1	HALEMANO, DAVID	01-25-1880	09-21-1883			CONCRETE	TOMB	(SAME MARKER AS: JOS. HALEMANO)
2	HALEMANO, JOS. A.	07-04-1878	06-12-1904			CONCRETE	TOMB	(SAME MARKER AS: DAVID HALEMANO)



SITE DATA FORM: ST. GABRIEL CATHOLIC CEMETERY

ALSO KNOWN AS: OUR LADY OF FATIMA CHURCH CEMETERY

LOCATION: Waiiua Road AREA: Waiiua

APPROX. SIZE: .25 Acres STATUS: X Active ___Closed

RECORDED TOMBSTONES: 36 # UNMARKED GRAVES: _____

CONDITION OF SITE:
___Abandoned/Overgrown/No maintenance
___Some individual graves maintained
X Regular maintenance of entire site
___Poor ___Fair X Good ___Excellent

MAINTAINED BY: X Owner ___Cemetery Assoc. ___Individual Families ___Unknown

OWNER: Catholic Diocese of Hawai'i

CONTACT PERSON: Nona Kawai, Diocese Office — _____
Name — Title

533-1791 — _____ —
Phone — Address — Zip

CONTACT PERSON: _____ — _____
Name — Title

_____ — _____ —
Phone — Address — Zip

NOTES: Church and cemetery established circa 1850's.

SITE DATA FORM: KE'AHAE CONGREGATIONAL CHURCH CEMETERY

ALSO KNOWN AS: KE'AHAE PROTESTANT CHURCH CEMETERY

LOCATION: Ke'anae Village AREA: Ke'anae Peninsula

APPROX. SIZE: .12 Acres STATUS: X Active ___Closed

RECORDED TOMBSTONES: 21 # UNMARKED GRAVES: 23

CONDITION OF SITE:
___Abandoned/Overgrown/No maintenance
___Some individual graves maintained
X Regular maintenance of entire site
___Poor ___Fair X Good ___Excellent

MAINTAINED BY: X Owner ___Cemetery Assoc. ___Individual Families ___Unknown

OWNER: United Church of Christ (Parent Church)

CONTACT PERSON: Pearl Pahukoa — Minister
Name — Title

248-8013 — Ke'anae Congregational Church —
Phone — Address — Zip

CONTACT PERSON: PR Box 58, Ha'iku, HI 96708 — _____
Name — Title

_____ — _____ —
Phone — Address — Zip

NOTES: Maintained by church caretaker.

SITE DATA FORM: WAILUA COUNTY CEMETERY

ALSO KNOWN AS:

LOCATION: Wailua Road AREA: Wailua

APPROX. SIZE: 1.0 Acres STATUS: ___Active X Closed

RECORDED TOMBSTONES: 3 # UNMARKED GRAVES:

CONDITION OF SITE: ___Abandoned/Overgrown/No maintenance
___Some individual graves maintained
Irregular X Regular maintenance of entire site
X Poor ___Fair ___Good ___Excellent

MAINTAINED BY: X Owner ___ Cemetery Assoc. ___ Individual Families ___ Unknown

OWNER: County of Maui

CONTACT PERSON: George Kaya, Chief of Field Operations & Maintenance
Name Title

243-7869 1827 Kaohu St., Wailuku, HI 96793
Phone Address Zip

CONTACT PERSON: Geraldine Carroll Informant
Name Title

Phone Address Zip

NOTES:

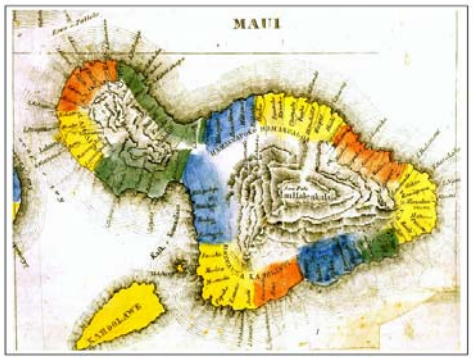
NO.	NAME	BIRTH DATE	DEATH DATE	RELATIONSHIP	PHOTO	MADE OF	TYPE	OTHER INSCRIPTION INFO
1	MATS, BONNIE JEAN K.	07-20-1949	01-22-1954			MARBLE/GRANITE	UPRIGHT	
2	QUNOBL, MAY	00-00-0000	05-30-1944			CONCRETE	UPRIGHT	
3	SOON, LOOK	00-00-0000	03-30-1921			CONCRETE	UPRIGHT	46 YRS. OLD

NO.	NAME	BIRTH DATE	DEATH DATE	RELATIONSHIP	PHOTO	MADE OF	TYPE	OTHER INSCRIPTION INFO
	CHONG, JOSEPH AH TIN	10-16-1898	04-20-1956	FATHER		MARBLE/GRANITE	CROSS/UPRIGHT	
	AKIONA, NATHICE NUULEI S.	00-00-0000	00-00-0000			CONCRETE	UPRIGHT	
	AKIONA, KELEKA	10-29-1869	11-05-1937	MOTHER		MARBLE/GRANITE	UPRIGHT	
	AKIONA, JAMES A.	04-24-1901	08-30-1934			MARBLE/GRANITE	UPRIGHT	
	AKIONA, SAMSON	05-16-1929	09-04-1938			MARBLE/GRANITE	UPRIGHT	
	AKIONA, SARAH	07-06-1896	02-11-1937	MOTHER		MARBLE/GRANITE	UPRIGHT	
	AKIONA, SARAH	07-06-1896	02-11-1937	MOTHER		MARBLE/GRANITE	UPRIGHT	
	AKIU, ABEL WONG SIU	06-06-1906	06-25-1953	FATHER		MARBLE/GRANITE	UPRIGHT	
	AKIU, LOUISE K.	11-07-1908	01-19-1976	MOTHER		MARBLE/GRANITE	RAISED	
	AKIU, MARY	01-00-1887	77-77-7777			CONCRETE	UPRIGHT	
	AKUNA, BENJAMIN A.	02-06-1886	12-04-1947			MARBLE/GRANITE	UPRIGHT	
	ANN, MISS ANNA	05-17-1917	03-16-1918			CONCRETE	CROSS/UPRIGHT	
	ANTHONY, ROUGE	10-10-1922	02-05-1970			MARBLE/GRANITE	UPRIGHT	
	CHONG, JOSEPH AH TIN	10-16-1898	04-20-1956	FATHER		MARBLE/GRANITE	CROSS/UPRIGHT	

NO.	NAME	BIRTH DATE	DEATH DATE	RELATIONSHIP	PHOTO	MADE OF	TYPE	OTHER INSCRIPTION INFO
	AKANA, MOSES LOE	11-26-1900	02-03-1961			MARBLE/GRANITE	CROSS/UPRIGHT	
	AKINA, ANDREW F.	02-09-1936	05-21-1953	SON		MARBLE/GRANITE	UPRIGHT	
	AKINA, NAPAKA WONG TOUNG HIN	00-00-1878	00-00-1905			MARBLE/GRANITE	UPRIGHT	(SAME MARKER AS: ROSEMARY YOUNG AND RAIMOND AKINA)
	AKINA, RAYMOND	00-00-1939	00-00-1939			MARBLE/GRANITE	UPRIGHT	(SAME MARKER AS: ROSEMARY YOUNG AND MAKAHIA AKINA)
	AKIONA, BARTHICE NUULEI S.	00-00-0000	00-00-0000			CONCRETE	UPRIGHT	
	AKIONA, KELEKA	10-29-1869	11-05-1937	MOTHER		MARBLE/GRANITE	UPRIGHT	
	AKIONA, JAMES A.	04-24-1901	08-30-1934			MARBLE/GRANITE	UPRIGHT	
	AKIONA, SAMSON	05-16-1929	09-04-1938			MARBLE/GRANITE	UPRIGHT	
	AKIONA, SARAH	07-06-1896	02-11-1937	MOTHER		MARBLE/GRANITE	UPRIGHT	
	AKIONA, SARAH	07-06-1896	02-11-1937	MOTHER		MARBLE/GRANITE	UPRIGHT	
	AKIU, ABEL WONG SIU	06-06-1906	06-25-1953	FATHER		MARBLE/GRANITE	UPRIGHT	
	AKIU, LOUISE K.	11-07-1908	01-19-1976	MOTHER		MARBLE/GRANITE	RAISED	
	AKIU, MARY	01-00-1887	77-77-7777			CONCRETE	UPRIGHT	
	AKUNA, BENJAMIN A.	02-06-1886	12-04-1947			MARBLE/GRANITE	UPRIGHT	
	ANN, MISS ANNA	05-17-1917	03-16-1918			CONCRETE	CROSS/UPRIGHT	
	ANTHONY, ROUGE	10-10-1922	02-05-1970			MARBLE/GRANITE	UPRIGHT	
	CHONG, JOSEPH AH TIN	10-16-1898	04-20-1956	FATHER		MARBLE/GRANITE	CROSS/UPRIGHT	
	CHONG, LOOK	00-00-0000	03-30-1921			CONCRETE	UPRIGHT	46 YRS. OLD
	CUNOBL, MAY	00-00-0000	05-30-1944			CONCRETE	UPRIGHT	
1	MATS, BONNIE JEAN K.	07-20-1949	01-22-1954			MARBLE/GRANITE	UPRIGHT	

NO.	NAME	BIRTH DATE	DEATH DATE	RELATIONSHIP	PHOTO	MADE OF	TYPE	OTHER INSCRIPTION INFO
34	YOUNG, ROSEMARY	00-00-1922	00-00-1922			MARBLE/GRANITE	UPRIGHT	(SAME MARKER AS: RAYMOND AKINA AND MAKAHIA AKINA)
35	YOUNG, VICTORIA	11-25-1893	01-15-1952	MOTHER		MARBLE/GRANITE	UPRIGHT	
36	YOUNG-SOO, HANA NAHAL	00-00-0000	10-14-1947	MOTHER		MARBLE/GRANITE	UPRIGHT	

VOLUME I
WAI O KE OLA:
HE WAHI MO'OLELO NO MAUI HIKINA
A Collection of Native Traditions and Historical Accounts of the Lands of Hāmākua Poko, Hāmākua Loa and Ko'olau, Maui Hikina (East Maui), Island of Maui



Island of Maui (Showing Major Districts and Selected Ahupua'a); Portion of Map by Samuel P. Kalama (1858) (Geography and Map Division, Library of Congress; in Moffat and Fitzpatrick 1995:24-25)

Kumu Pono Associates

Historical & Archival Documentary Research · Oral History Studies · Integrated Cultural Resources Management Planning · Preservation & Interpretive Program Development

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VOLUME I

WAI O KE OLA:
HE WAHI MO'OLELO NO MAUI HIKINA
A Collection of Native Traditions and Historical Accounts of the Lands of Hāmākua Poko, Hāmākua Loa and Ko'olau, Maui Hikina (East Maui), Island of Maui

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Historical & Archival Documentary Research · Oral History Studies · Integrated Cultural Resources Management Planning · Preservation & Interpretive Program Development

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Preparation of this study was made possible because many people agreed to come together and share in the process of contributing to its completion.

To all of you who shared your mana'o and aloha —

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Also, to all of you who shared your thoughts, expertise and recommendations to ensure that the record could be presented with as much clarity as possible — Vicki Creed, Moses Haia; Garret Hew; Alan Murakami; Kenneth Nomura; Patricia Tummons; staff and collection managers of the Hawai'i State Survey and Land Divisions, the Hawai'i State Archives, and Mission Houses Museum —

We say — ***Mahalo nui nō, a ke aloha o ke Akua pū me 'oukou a pau!***

We also wish to note here, that while a sincere effort was made, it was impossible to record everything that could be said about the land and traditions of the lands and families of Hāmākua Poko, Hāmākua Loa and Ko'olau. We have made every effort to present readers with a detailed overview of the rich and varied history of the region, and to accurately relay the recollections, thoughts, and recommendations of the people who contributed to this study.

māua nō me ke aloha kau palena 'ole — Kepā a me Onaona Maly

O ka mea maika'i mālama, o ka mea maika'i 'ole, kāpae 'ia
(Keep the good, set the bad aside)

EXECUTIVE SUMMARY

At the request of Garret Hew, Manager of East Maui Irrigation Company, Ltd. (EMI), *Kumu Pono Associates* conducted a two-phased study of cultural-historical resources in the lands of Hāmākua Poko, Hāmākua Loa, and Ko'olau, in the region of *Maui Hikina* (East Maui), Island of Maui (an area that includes some 73 individual *ahupua'a* or native land divisions). The study included—conducting detailed research of historical records in public and private collections (*Volume I*); and conducting oral history interviews with individuals known to be familiar with the cultural and natural landscape, and history of land use in the *Maui Hikina* study area (*Volume II*). This study was conducted in conjunction with the Water License Application of the East Maui Irrigation Company, Ltd., to the Board of Land and Natural Resources of the State of Hawai'i.

The specific scope of the study sought to investigate and describe the wide range of issues related to Native Hawaiian and historic practices associated with *nā mea wai* (water and its usage). In order to understand the cultural-historical context of water resources including — those uses which have been handed down from antiquity, and those which were both protected and permitted in 1876 by King David Kalākaua, and subsequently licensed by the Republic, Territory and State of Hawai'i — this study also looks at the larger cultural-historical landscape of *Maui Hikina*. The historical accounts and oral history interviews cited in the following volumes provide interested readers with foundational information for addressing cultural-historical values attributed to the land, water, sustainable resources, and traditional and customary practices.

The study draws on many primary (first hand) literature sources written by — native Hawaiian writers (some not previously available in English); foreign visitors and residents; and quotes lengthy narratives in order to bring a wide range of important documentation into one collection. Also, in the process of conducting the oral history interviews, elder *kama'āina* residents of the Hāmākua-Ko'olau region (with generations of residency upon ancestral lands of the study area), were sought out. The *kama'āina* interviewees shared a wide range of information pertaining to traditional and customary practices, as handed down from their elders; traditions of *wahi pana* (storied landscapes); practices associated with land and water use, and fisheries (including collection practices); historical descriptions of development and management of the East Maui Irrigation System, and water flow; past and on-going resource stewardship practices; and the relationship between regional communities and the East Maui Irrigation Company, Ltd.

The interview records demonstrate remarkable continuity between descriptions of landscape, practices, sites and features, and those recorded in historical literature. Nearly all of the interviewees expressed the belief that in a traditional context, Hawaiian traditions, practices and beliefs, are directly tied to the health and well-being of the land or *'āina*, and that *wai* (water) is that which sustains life upon the land. In regards to the specific issues of water rights and stream flow, the primary discussions and sentiments shared by all of the interview participants (on some level) was the thought that *wai* (water) is integral to all aspects of Hawaiian culture and life. Most of the interviewees expressed the belief that a balance needs to be reached by which — the health of the streams can be improved; the water needs of the *kama'āina* (native) families for cultivation of *kalo* (taro) and other crops, and water for domestic purposes can be sustained; and other reasonable uses can be met. It was also the observation of the interviewees, that in their life time, the landscape—noticeably the watershed forests, and thus the volume of water flow from mountain to sea—has undergone drastic changes. The forests have receded, the make up of the forest plant community has changed, and the waters no longer flow from mountain to sea in the streams, as they did when the elder interviewees were young.

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INTRODUCTION

Background

At the request of Garret Hew, Manager of East Maui Irrigation Company, Ltd. (EMI), *Kumu Pono Associates* conducted a two-phased study of cultural-historical resources in the lands of Hāmākua Poko, Hāmākua Loa, and Ko'olau, in the region of *Maui Hikina* (East Maui), Island of Maui. The study included—conducting detailed research of historical records in public and private collections (*Volume I*); and conducting oral history interviews with individuals known to be familiar with the cultural and natural landscape, and history of land use in the *Maui Hikina* study area (*Volume II*). This study was conducted in conjunction with the Water License Application of the East Maui Irrigation Company, Ltd., to the Board of Land and Natural Resources of the State of Hawai'i.

The study area includes some 73 *ahupua'a* (native land divisions, generally extending from fisheries to the mountain region) which make up the *moku o loko* (districts) of Hāmākua Poko, Hāmākua Loa, and Ko'olau, Maui (*Figure 1*). Situated on the eastern slopes of Haleakalā, the lands are a part of the region generally known as *Maui Hikina* (East Maui). These lands comprise a large portion of the rich water producing forest of the East Maui Watershed, which collects rains from the *ko'olau* or windward weather systems that prevail upon the Hawaiian Islands.

From ancient times, the abundant rains, supported the development of rich forests which are now threatened by invasive species (including both plants and animals). The rains and forests have in turn led to the formation of hundreds of streams (*kahawai*) and thousands of small feeder tributaries (e.g., *waikahe* and *kahawai li'ili'i*), that have molded the landscape of *Maui Hikina* into one with many large valleys (*awāwa*) and smaller gulches (*kahawai*). These watered valleys and gulches, and their associated flat lands (*kula*), have been home to and have sustained Native Hawaiian families for centuries.

The specific scope of this study sought to investigate and describe the wide range of issues related to Native Hawaiian and historic practices associated with *nā mea wai* (water and its usage). In order to understand the cultural-historical context of water resources — including uses which have been handed down from antiquity, and those which were both protected and permitted in 1876 by King David Kalākaua, and subsequently licensed by the Republic, Territory and State of Hawai'i — this study also looks at the larger cultural-historical landscape of *Maui Hikina*.

The above said, the authors point out that this study does not repeat all that has been previously written about the Hāmākua-Ko'olau Region. The study does draw on many primary (first hand) accounts from — native Hawaiian writers (some not previously available in English); foreign visitors and residents; and quotes detailed accounts in order to bring a wide range of important narratives into one collection. Thereby interested parties gain access to information that is at times difficult to locate. We note, that rather than "rewriting" accounts of substance which have been authoritatively written, we have chosen to include pertinent quotes (some lengthy), and in short introductions, identify selected topics of interest which will be found within the selected quotations. In this way, readers here, receive the information as the original authors or translators intended it to be.

It is the goal of this study to provide East Maui Irrigation Company, Ltd., land and resource management agencies, residents and interested parties with a wide range of important historical documentation pertaining to some of the significant traditions, and cultural and natural features (e.g. residency, land use, storied places, access and water flow) of the landscape in the Hāmākua-Ko'olau region of *Maui Hikina*.

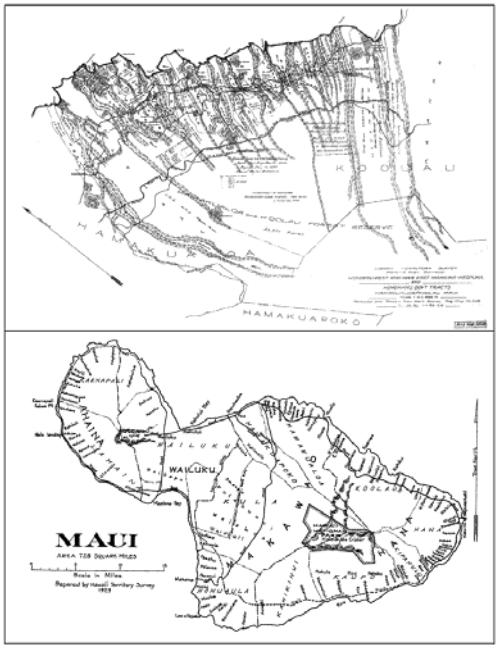

Figure 1. Study Area– Island of Maui (1929)
Hāmākua Loa-Ko'olau Ditch System (HTS Plat 1011, 1915)

Study Guidelines

The research and interviews conducted for this study were performed in a manner consistent with Federal and State laws and guidelines for such studies. Among the referenced laws and guidelines were the National Historic Preservation Act (NHPA) of 1966, as amended in 1992 (36 CFR Part 800); the Advisory Council on Historic Preservation's "*Guidelines for Consideration of Traditional Cultural Values in Historic Preservation Review*" (ACHP 1985); National Register Bulletin 38, "*Guidelines for Evaluating and Documenting Traditional Cultural Properties*" (Parker and King 1990); the Hawai'i State Historic Preservation Statute (Chapter 6E), which affords protection to historic sites, including traditional cultural properties of ongoing cultural significance; the criteria, standards, and guidelines currently utilized by the Department of Land and Natural Resources-State Historic Preservation Division (DLNR-SHPD) for the evaluation and documentation of cultural sites (cf. Title 13, Sub-Title 13:274-4,5,6; 275:6 – Draft of December 1996); and guidelines for cultural impact assessment studies, adopted by the Office of Environmental Quality Control (November 1997).

A primary objective of the present study was to research and report on documentation that would help readers better understand native Hawaiian customs and practices associated with *'āina* (land) and *wai* (water) resources, and to provide readers with access to a collection of historical records documenting residency, land and water use, and events in the history of lands in the Hāmākua-Ko'olau region of Maui. In preparing the archival-historical documentary report for this study, the author reviewed both published and manuscript references in English and Hawaiian—referencing documentation for lands of the immediate study area as well as those for neighboring lands. In an effort to further our understanding of the cultural-historic resources, the author conducted research in several areas which have not received much exposure in past studies. Thus, this study along with other previously conducted studies, provides readers with a well-rounded picture of residency, land and water use, and events in the history of the *Maui Hikina* study area.

Archival and Historical Research

In the period between April 9th to November 5th, 2001, the authors conducted an extensive review of archival-historical literature in Hawaiian and English texts. The references that were reviewed included, but were not limited to — land use records, including an extensive review of Hawaiian Land Commission Award (LCA) records from the *Māhele 'Āina* (Land Division) of 1848; Boundary Commission Testimonies and Survey records of the Kingdom and Territory of Hawai'i; and historical texts authored or compiled by—D. Malo (1951); J.P. I'i (1959); S. M. Kamakau (1961, 1964, 1976, and 1991); the 1779 Journals of Captain James Cook (Beaglehole 1967); J.S. Green (letters of 1840s); C. Wilkes (1845, reprinted 1970); F. L. Clarke (1878); A. Fornander (1916-1919 and 1996); G. Bowser (1880); T. Thrum (1909 & 1938); W.F. Martin and C.H. Pierce (1913); Beckwith (1970); Handy and Handy with Pukui (1972); Sterling (1998) and W. M. Walker (ms. 1931); E. Sterling (1998); McGreggor et al. (1995); and numerous other authors (cited in text). Importantly, this study also includes several native accounts from Hawaiian language newspapers (compiled and translated from Hawaiian to English, by the author), which have not been previously available in English. This information is generally cited within categories by chronological order of the date of publication.

The archival-historical resources were located in the collections of the Hawai'i State Archives, Land Management Division, Survey Division, and Bureau of Conveyances; Hawaiian Mission Children's Society; University of Hawai'i-Hilo Mo'okini Library; private family collections; and in the collection of *Kumu Pono Associates*. Additionally, a week was spent reviewing historical land records in the collections of East Maui Irrigation Company and Alexander & Baldwin. The collections include important records pertaining to land tenure and development of the East Maui Ditch

System. Because the material is housed in private collections, with limited access, the records were primarily used as reference points and guides to documentation that could be found in public collections. Thus, only limited private collection documentation (only that for which permission for use was granted) is cited in this study.

In addition to the historical literature, a detailed review of historical maps and field survey books was conducted. Historical maps copied; and maps referenced during interviews (map packets were also provided to interviewees), that help identify sites mentioned in historical narratives include—

- Portion of Makawao (Hamakuapoko), Maui; Register Map No. 186 (Metcalf, 1848);
- Makawao (Hamakuapoko), Maui; Register Map No. 603 (Alexander, Lydgate, Lyons & Brown, 1872);
- Koolau (District Sheet—Keaa to Makaiwa), Maui; Register Map No. 2052 (Alexander, 1877)
- Plan of the Huelo Sugar Plantation (Honopou to Huelo), Hamakualoa Maui; Register Map No. 862 (J. Gay, 1881);
- The Paia Plantation, Hamakuapoko Maui; Register Map No. 1187 (J.M. Alexander, ca. 1885);
- Map of Spreckles Plantation, Wailuku & Waikapu, Maui; Register Map No. 1786 (tracing by C.J. Lyons, 1893);
- Plan Showing Ili of Kupau and the Makai Portion of Wailuanui, Rice and Kula Lands (Pahoa to Wailua Nui), Koolau Maui; Register Map No. 1760 (Kanakanui, 1896);
- Map of the Nahiku Coffee Lands (Pa'akea to West Honmā'ele), Koolau, Maui; Register Map No. 2649 (H. Howell, 1897);
- Map of Homesteads at Nahiku, Maui; Register Map No. 2429 (Public Lands Map No. 20-a) (Howell 1899);
- Ke'anae, Koolau Maui; Register Map No. 2238 (Howell and Kanakanui, 1903);
- Wailuanui, Koolau Maui; Register Map No. 2234 (Howell and Kanakanui, 1903);
- Waianu Valley, Koolau Maui; Register Map No. 2433 (S.M. Kanakanui, 1908);
- Honomanu Homesteads, Koolau Maui; Register Map No. 2467 (Heilbron, 1909);
- Portion of Hamakualoa and Koolau Districts (Peahi to Honomanu), Maui; Register Map No. 2482 (compiled from Reg. Maps 956 & 578; J. Iao, 1915);
- Honopou-West Makaiwa, East Makaiwa-Keopuka, and Honomanu Govt Tracts; Hamakualoa and Koolau, Maui; HTS Plat 1011 (tracing by J. Iao, 1915);
- Koolau Forest Reserve – Honomaele to Makawao, Maui; Register Map 2891 (R. Lane, 1932 & 1934).
- Koolau Forest Reserve, Hana and Makawao (County) Districts, Maui. HTS Plat 1067-A (R. Lane, 1932 & 1934);
- State of Hawaii…Water License, Makawao and Hana District, Maui. HTS Plat 1067-B (S. Hasegawa, January 20, 1987);
- State of Hawaii…Nahiku, Keanae, Honomanu, and Huelo Water Leases, Makawao and Hana District, Maui. HTS Plat 1067-C (tracing by W. Aona, 1988).

Oral History Interviews: Approach to Conducting the Study

The oral history interviews conducted as a part of this study were performed in a manner consistent with Federal and State laws and guidelines for such research. While preparing to initiate the oral history interview program, Maly developed a general questionnaire outline to help give direction to the process of conducting the oral history interviews. Prospective interviewees were identified through three primary sources, those known to Maly (through family and previous work); individuals suggested by Garret Hew and Jackie Honoka'upu of East Maui Irrigation Company; and in consultation with Moses Haia and Alan Murakami, legal counsel of the Native Hawaiian Legal Corporation (representing several Native Hawaiian families of *Maui Hikina* and the Native Hawaiian organization, *Nā Moku Aupuni o Ko'olau Hui*).

In between April 11th to November 8th 2001, Maly conducted twelve (12) oral history interviews, including site visits and follow up discussions with seventeen (17) participants. The interviews were recorded with a Sony-Mini Disc (digital recorder, MZ-R70). The interviewees range in age from 90 years old to their late 30s. Additionally, a Board of Land and Natural Resources Hearing, held on May 25, 2001, was attended and portions of the hearing, recorded. A verbatim transcript of statements and testimonies from selected participants in the hearing was prepared by *Kumu Pono Associates*. The transcript, cited in this study, focuses on: (1) Statements by members and representatives of the Board of Land and Natural Resources, and Alexander & Baldwin/East Maui Irrigation Company, regarding ditch history, the Water License Application, and the review agency process; and (2) testimonies from the public—with particular emphasis on Native Hawaiian tenants of the affected lands—and others who did not support the application, or who raised questions and concerns regarding the nature and extent of the Water License. A number of issues pertaining to cultural-historical resources, raised during the hearing, were also covered during the formal oral history program, a number of which are elaborated upon in the present Volume.

Perhaps foremost of the discussions and sentiments shared (on some level) by all of the interview participants was the thought that *wai* (water) is integral to all aspects of Hawaiian culture and life. *Kupuna* Joe Rosa of Honopou expressed it in this way, "*Wai o ke ola! Wai, waiwai nui! Wai, nā mea a pau, ka wai, waiwai no kēlā!*" (Water is life! Water is of great value! Water, the water is that which is of value for all things!) (oral history interview of November 8, 2001). Thus, in discussing water and life upon the land, one will naturally find that like water which flows from the mountains to the sea, so run the beliefs, traditions, customs and practices of the Hawaiian people upon the land. It will be seen that the historical records and oral history interviews cited in this study, connect the life and well being of the people (individuals and corporate), and the land to the flow of water.

KO KA 'ĀINA, KA WAI, KE KAI, ME KA LEWA
(THE ISLAND LANDSCAPE–A CULTURAL CONTEXT)

This section of the study provides readers with a general overview of the Hawaiian landscape—including origin of the islands, settlement and population expansion—and Hawaiian traditions, customs and practices of resource management that are the basis of the sustainable relationship shared between the native Hawaiians, the *'āina* (land), *wai* (water), *kai* (ocean), their *'ohana* (family), and *akua* (gods). As noted in the preceding introduction, water matters (*nā mea wai*) and the related customs and practices of land use are the primary focus of this study. Thus, several important historical narratives which describe those resources in a cultural–spiritual context are cited in this section of the study, and set a foundation for narratives cited in subsequent sections.

Natural and Cultural Resources in Hawaiian Culture

In Hawaiian culture, natural and cultural resources are one and the same. Native traditions describe the formation (literally the birth) of the Hawaiian Islands and the presence of life on and around them, in the context of genealogical accounts. All forms of the natural environment—from the heavens and mountain peaks, to the watered valleys, *kula* (flat sloping lands) and lava plains, and to the shore line and ocean depths were believed to be embodiments of Hawaiian gods and deities. One Hawaiian genealogical account, records that Wākea (the expanse of the sky–father) and Papa-hānau-moku (Papa—Earth-mother who gave birth to the islands)—also called Haumea-nui-hānau-wā-wā (Great Haumea—Woman-earth born time and time again)—and various gods and creative forces of nature, gave birth to the islands. Maui, the second largest of the islands, was the second-born of these island children. As the Hawaiian genealogical account continues, we find that these same god-beings or creative forces of nature (parents of the islands), were also the parents of Hā-loa-naka-lau-kapulili (long stalk quaking and trembling leaf). This Hāloa was born as a "shapeless mass" and buried outside the door of his parents house (cf. Pukui and Elbert, 1981:382), and from his grave grew the *kalo* (taro). And when the next child was born to these god-parents, he too was called Hāloa (the long stalk or breath of life), and he is credited as being the progenitor of the Hawaiian race (cf. David Malo 1951:3, 242-243; Beckwith 1970; Pukui and Korn 1973). It was in this context of kinship, that the ancient Hawaiians addressed their environment and it is the basis of the Hawaiian system of land use.

An Overview of Hawaiian Settlement

Archaeologists and historians describe the inhabiting of these islands in the context of settlement which resulted from voyages taken in canoes, across the open ocean. Archaeologists have proposed that early Polynesian settlement voyages between Kahiki (the ancestral homelands of the Hawaiian gods and people) and Hawai'i were underway by ca. 400 A.D., with long distance voyages occurring fairly regularly through at least the thirteenth century (cf. Cordy 2000). It has been generally reported that the sources of the early Hawaiian population—the Hawaiian "Kahiki"—were the Marquesas and Society Islands (Emory in Tatar 1982:16-18).

For generations following initial settlement, communities were clustered along the watered, windward (*ko'olau*) shores of the Hawaiian Islands. Along the *ko'olau* slopes, streams flowed and rainfall was abundant, and agricultural production became established. The *ko'olau* region also offered sheltered bays from which deep sea fisheries could be easily accessed, and near shore fisheries, enriched by nutrients carried in the fresh water, could be maintained in fishponds and coastal fisheries. It was around these bays that clusters of houses where families lived, could be found, and in these early times, the residents generally engaged in subsistence practices in the forms of agriculture and fishing (Handy and Handy 1972:287).

Handy, Handy & Pukui (1972) report that there were five major population centers on the Island of Maui, noting the importance of the Ko'olau region in this discussion. These centers, while not exclusive, were—the Kahakuloa region; the deep watered valleys of *Nā Wai 'Ehā* (Waihe'e, Wai'ehu, Wailuku and Waikapū); the 'Olowalu to Honokōhau region of Lāhainā; The Kula-'Ulupalakua region; and:

> On the northeast flank of the great volcanic dome of Haleakala…the two adjacent areas of Ke'anae and Wailua-nui comprise the fourth of the main Maui centers and the chief center on this rugged eastern coast. It supported intensive and extensive wet-taro cultivation. Further eastward and southward along this windward coast line is the district of Hana, the fifth great center… [Handy, Handy and Pukui 1972:272].

Based upon early historical observations (ca. A.D. 1778-1850), settlement in the watered valley environments of Hāmākua-Ko'olau, consisted of permanent residences which centered near the shore and spread along the valley floors. Residences also extended inland along near-shore *kula* (flat lands or plateaus), and in fewer instances into the upper valleys. Temporary houses from which mountain resources (such as *olonā*, *koa*, and birds) were collected, extended into the upper valley areas, among fields on stream flats and on adjacent slopes. Two primary forms of agricultural sites occur in these watered valley contexts, they are the *lo'i kalo* (irrigated and drainage taro farming field systems) on the valley floors and slopes; and the *kula* and *kīhāpai* dry land farming plots where crops such as *'uala* (sweet potatoes), *kō* (sugar canes), *kalo* (taro), *mai'a* (bananas and plantains), and *wauke* (paper mulberry) were cultivated (see *Māhele* records in this study; and Cordy 1978).

Hawaiian Land Use and Resource Management Practices

Over the generations, the ancient Hawaiians developed a sophisticated system of land- and resource –management practices. By ca. 1500, in the time Kāka'e and Kaka'ālaneo, the island (*moku-puni*) of Maui was divided into some eleven or twelve major districts or *moku-o-loko*, and smaller subdivisions, which were handed down through time (cf. Malo, 1951:16; Fornander, 1919 Vol. VI-2:313; Beckwith, 1970:383; and King 1942). These (*moku-o-loko* or *moku*) included Hāmākua Poko, Hāmākua Loa, Ko'olau, Hāna, Kīpahulu, Kaupō, Kahikinui, Honua'ula, Kula, Lāhainā, Kā'anapali, and Nāpoko or Wailuku. As was the practice, some of these large districts were subdivided into smaller '*okana* or *kālana* (regions of land smaller than the *moku-o-loko*) yet comprising a number of smaller units of land. An example of this is Nāhiku, in the district of Ko'olau; and perhaps Makawao, between Hāmākua Poko and Kula, which apparently was an independent division (cf. Lyons 1875 and Coulter 1935).

The large districts (*moku-o-loko*) and sub-regions ('*okana* and *kālana*) were further divided into manageable units of land, and were tended to by the *maka'āinana* (people of the land). Of all the land divisions, perhaps the most significant management unit was the *ahupua'a*. *Ahupua'a* are subdivisions of land that were usually marked by an altar with an image or representation of a pig placed upon it (thus the name *ahu-pua'a* or pig altar). In their configuration, the *ahupua'a* may generally be compared to wedge-shaped pieces of land that radiate out from the center of the island, extending to the ocean fisheries fronting the land unit. Their boundaries are defined by topographic or geological features such as *pu'u* (hills), ridges, gullies, valleys, craters, or areas of a particular vegetation growth (cf. Malo 1951:16-18; Lyons, 1875; and Boundary Commission testimonies in this study).

The *ahupua'a* were also divided into smaller manageable parcels of land (such as the *'ili, kō'ele, māla, kīhāpai, mo'o* and *paukū* etc.), generally running in a *mauka-makai* orientation, and often marked by stone wall alignments. In these smaller land parcels, the native tenants tended fields and cultivated crops necessary to sustain their families, and the chiefly communities they were associated

with. As long as sufficient tribute was offered and *kapu* (restrictions) were observed, the common people, who lived in a given *ahupua'a* had access to most of the resources from mountain slopes to the ocean. These access rights were almost uniformly tied to residency on a particular land, and earned as a result of taking responsibility for stewardship of the natural environment, and supplying the needs of ones' *ali'i* (see Malo 1951:63-67 and Kamakau 1961:372-377).

Entire *ahupua'a*, or portions of the land were generally under the jurisdiction of appointed *konohiki* or lesser chief-landlords, who answered to an *ali'i-'ai-ahupua'a* (chief who controlled the *ahupua'a* resources). The *ali'i-'ai-ahupua'a* in turn answered to an *ali'i 'ai moku* (chief who claimed the abundance of the entire district). Thus, *ahupua'a* resources supported not only the *maka'āinana* and *'ohana* who lived on the land, but also contributed to the support of the royal community of regional and/or island kingdoms. This form of district subdividing was integral to Hawaiian life and was the product of strictly adhered to resources management planning. In this system, the land provided fruits and vegetables, and some meat in the diet, and the ocean provided a wealth of protein resources. Also, in communities with long-term royal residents, divisions of labor (with specialists in various occupations on land and in procurement of marine resources) came to be strictly adhered to (Malo 1951:63-67). It is in the cultural setting described above, that we find some seventy-two (72) *ahupua'a* that make up the three *moku* of Hāmākua Poko, Hāmākua Loa, and Ko'olau.

Overview of Agriculture and Water Use in Hāmākua-Ko'olau (ca. 1930s-1950s)

Handy, Handy and Pukui (1972), also provide us with first hand accounts of native customs, practices, and traditions associated with lands of the Hāmākua-Ko'olau region as they learned them from native residents during field visits in the 1930s-1950s. Their description of the lands follows:

HAMAKUA

> Hamakua Poko (Short Hamakua) and Hamakua Loa (Long Hamakua) are two coastal regions where gently sloping *kula* lands intersected by small gulches come down to the sea along the northern coast line of East Maui. Maliko Stream, flowing in a gulch that widens and has a flat bottom to seaward, in pre-sugar-plantation days had a considerable number of *lo'i*. East of Maliko the number of named *ahupua'a* is evidence of habitation along this coast. Kuiaha Gulch, beyond Maliko, has a good stream and there were probably a few *lo'i*. Two *kama'aina* at Ke'anae said that there were small *lo'i* developments watered by Ho'olawa, Waipi'o, Hanehoi, Hoalua, Kailua, and Na'ili'ilihaele Streams, all of which flow in deep gulches. Stream taxo was probably planted along the watercourses well up into the higher *kula* land and forest taro throughout the lower forest zone. The number of very narrow *ahupua'a* thus utilized along the whole of the Hamakua coast indicates that there must have been a very considerable population. This would be despite the fact that it is an area of only moderate precipitation because of being too low to draw rain out of trade winds flowing down the coast from the rugged and wet northeast Ko'olau area that lies beyond. It was probably a favorable region for breadfruit, banana, sugar cane, arrowroot; and for yams and *'awa* in the interior. The slopes between gulches were covered with good soil, excellent for sweet-potato planting. The low coast is indented by a number of small bays offering good opportunity for fishing. The *Alalaa*, or "Long-road," that went around Maui passed through Hamakua close to the shore, crossing streams where the gulches opened to the sea.

THE KO'OLAU

> The northeast coast of East Maui has precipitous shores eroded by the waves which the tradewinds sweep against its cliffs, islets, and inlets. Here the flank of Haleakala is steep, and as the trade winds blow up across their forested slopes they are cooled and release their moisture, making this the wettest coastal region in all the islands.

> O'opuola Gulch marked the boundary between Hamakua and Ko'olau. Its stream watered small *lo'i* areas, as did likewise Waikamoi, Puohokamoa, and Haipuena Streams.
>
> Then, southeastward along the coast comes Honomanu, a large stream with a broad deep valley at its seaward end and a good beach for fishing canoes and gear, facing its broad bay. Anciently Honomanu supported a large population. Old terraces run back into the valley as far as the level land goes, [page 498] a little less than a mile. Above the valley, on elevated flatlands, there used to be some terraces and houses. These upland slopes were doubtless planted with all the plants that flourish where there is much rain, but they were too wet for sweet potatoes.
>
> Just beyond Honomanu is Nu'uailua [Nu'a'ailua], flat bottomed like Honomanu but smaller. Terraces cover the flatlands and much taro was formerly raised, watered by an ample stream; but the valley has long been uninhabited. There are broad slopes above this valley which were presumably inhabited and cultivated. Upland taro should have flourished there.
>
> Because of the unique character, topographical and demographic, of Ke'anae and Wailuanui, the two communities next to be described, they have been designated as our Type Area for windward East Maui… [page 499]
>
> …Ke'anae lies just beyond Honomanu Valley. This is a unique wet-taro growing *ahupua'a*… It was here that the early inhabitants settled, planting upland rain-watered taro far up into the forested area. In the lower part of the valley, which is covered mostly by grass now, an area of irrigated taro was developed on the east side. A much larger area in the remainder of the valley could have been so developed. However, we could find no evidence of terracing there. This probably was due to the fact that the energies of the people were diverted to create the *lo'i* complex which now covers the peninsula.
>
> It is on the broad flat peninsula of lava extending for about half a mile into the sea from the western line of the valley that Ke'anae's famed taro patches are spread out-striking evidence of old Hawaii's ingenuity. Polaukulu [Palauhulu] Stream, which breaks through the gap at the northwestern corner of the valley, gives an abundant supply of water to the many wet patches (about half those once cultivated) which are still used for raising wet taro. A flume (*ha wai*) carried the water across the narrow channel below the *pali*. When well tended, the taro growing there was as healthy as any we have seen, indicating that there is ample water. But we are told that there has been taro disease in some of the patches and that some of the lower terraces were abandoned because the earth bottoms, which rest on rough lava, break through in spots and allow the water to drain out. Above the peninsula, but below the highway, there are a few cultivated patches watered by the small stream midway between Ke'anae and Wailua.
>
> The story of the founding of the Ke'anae *lo'i* area is highly interesting. Anciently, according to Henry Ikoa, the peninsula was barren lava. But a chief, whose name is not remembered, was constantly at war with the people of neighboring Wailua and was determined that he must have more good land under cultivation, more food, and more people. So he set all his people to work (they were then living within the valley and going down to the peninsula only for fishing) , carrying soil in baskets from the valley down to the lava point. The soil and the banks enclosing the patches

were thus, in the course of many years, all transported and packed into place. Thus did the watered flats of Ke'anae originate. A small *lo'i* near the western side of the land formerly belonged to the chief of Ke'anae and has the name Ke-'anae [page 500] (the Big Mullet); it is said that the entire locality took its name from this small sacred *lo'i*. Here, as at Kahakuloa, the taro that grew in the sacred patch of the *ali'i* was reputed to be of great size.

Beyond Ke'anae is a sizable bay formed by erosion where three streams flow into the ocean. Facing the bay on its west side is a pocket of land which slopes gently seaward from the base of a cliff which corresponds to that separating Ke'anae Valley from the peninsula… About half the gently sloping land seaward of the cliff was terraced with *lo'i* which were watered by Wailuanui (Big Wailua) Stream, the larger of the three that flow into the bay. The land beyond the terraced area, on the Ke'anae side toward the sea, is too high for irrigation; here sweet potatoes were planted. And on high ground there was a war temple. A road runs down to the bay between the terraced area and the higher ground, and along this road are the houses of the people, and the Roman Catholic church.

Wailua has been notable for its continued occupancy and cultivation by Hawaiian families. This has been due, we were told, to the influence of the Catholic mission. Land titles here are very complicated, too much so to be defined correctly by an outsider .

There are several small streams between Ke'anae and Wailuanui. They flow in deep small gorges, and the terrain is very rough, but there were a few small *lo'i* developments. There are said to have been two springs of fresh water, which were opened by Kane and Kanaloa in their travels on Maui. From these springs, in a valley named 'Ohi'a, comes the water that irrigates the *lo'i* in Wailua, so says the legend *(Ka Nupepa Ku'oko'a,* October 4, 1923). The Wailuanui Stream gushes down in a beautiful cascade in its gorge just before flowing into the *lo'i* area. This cascade is called Wai-o-Kane (Water of Kane).

Beyond Wailuanui there are a succession of small deep gulches, each one having a few *lo'i*: East Wailuaiki and West Wailuaiki (Little Wailua) , Kapili'ula [Kopili'ula], Waiohue, Pa'akea, Kapa'ula, Hanawi. Then comes Nahiku, a settlement spread over gently rising ground above the shore, with a number of groups of *lo'i* watered from Makapipi Stream. Some wet taro was still grown there when we visited it in 1934.

Throughout wet Ko'olau, the wild taro growing along the streams and in the pockets high on the canyon like walls of the gulches bespeaks former planting of stream taro along the watercourses, on the side of the gulches, and in the forest above. The same is true of the wild taros seen here and there in the present forest above the road and in protected spots on what was formerly low forest land, now used as pasture.

Eastward from Nahiku there are no large streams or gulches in Ko'olau. The shore is low and the terrain gently sloping and jungle like. From Ulaino to Hana extends a *hala* forest growing upon recent lava flows which cover [page 501] the coast from Ulaino to Hana Bay. At Ulaino and Honomā'ele there are a number of places where dry taro was still planted by Hawaiians in 1934 together with other small subsistence plantings. Formerly there was scattered planting all along the coast and forest plantations inland, between Ulaino and Nahiku, which are connected by the old *Alaloa* trail crossing the low- lands near the coast line.

In 1954 there were about ten houses still occupied in lower Nahiku, and a small school in use. There were some Hawaiians and some Japanese. Apparently ranching was the only activity; we saw no taro or sweet-potato patches, but there were some bananas. A number of houses had been abandoned and were falling into decay; others had more recently been vacated. [Handy et al. 1972:502]

Oral history interviews with *kūpuna* Helen Nākānelua, James K. Hū'eu, Mina Atai, Joe Rosa, Stephen Cabral, Beatrice Kekahuna, and Marjorie Wallett demonstrate continuity in practice, customs and traditions as described by Handy et al., above (see *Volume II*).

Kekāhi Mau Mea Mēheuheu Mai nā Mākua Mai

In the nineteenth century several native and foreign writers recorded first-hand accounts of various aspects of Hawaiian life and their relationship with the *'āina* (land), *wai* (water), *kai* (ocean), and *'ohana* (family). There are many *mēheuheu* (customs and practices) handed down from elders of preceding generations (*mēheuheu mai nā mākua mai o nā hānauna mua*), that are shared similarly on all islands, and which demonstrate a deep "cultural attachment"[*] to the Hawaiian landscape. Native Hawaiian historian, Samuel M. Kamakau (also a member of the Land Commission and District Judge on Maui), penned several important narratives which share with readers glimpses into the significance of, and attitudes towards *'āina*, *wai*, *kai*, and *'ohana*, in the Hawaiian mind and *mēheuheu*.

In his "*Mo'olelo o na Kamehameha*" (History of the Kamehamehas), Kamakau (1867; Ruling Chiefs, 1961) titled one section of his account "*O na Hana ike a me ke Akamai mamua o ka Hiki ana mai o na Misionari*" (The Skilled Works and Wisdom—of the Hawaiians—prior to the arrival of the Missionaries). In those narratives Kamakau observed that the Hawaiians were adept at many crafts, they were industrious, skilled agriculturalists, and fishermen. He also noted that on Maui, the men and women both worked the land (unlike divisions of labor that were established on some of the other islands in the group). The narratives also describe some of the hardships forced upon the people under the old system, but he notes that his people are worse off today (ca. 1867-1869), under the foreign innovations than they were in earlier times :

> The Hawaiians were in old days a strong and hard-working people skilled in crafts and possessed of much learning. In hospitality and kindness they excelled other peoples of the Pacific. Cultivation of the land was their main industry. With their hands alone, assisted by tools made of hard wood from the mountains and by stone adzes, they tilled large fields and raised taro, sweet potatoes, yams, bananas, sugar cane, and *'awa*; and bartered *(ku'ai 'ia)* their product or used it at home. Always the first food of the harvest was offered to the gods. Parents before they died instructed their children, the sons to plant and fish, the daughters to make and dye *tapa* and weave mats. The land was fertile, and the principal crop on Kauai, Oahu, and Molokai was wet-land taro cultivated in ponds, artificially constructed patches, along the banks of water courses, or anywhere where the ground was soft and moist.

[*] "Cultural Attachment" embodies the tangible and intangible values of a culture—how a people identify with, and personify the environment around them. It is the intimate relationship (developed over generations of experiences) that people of a particular culture feel for the sites, features, phenomena, and natural resources that surround them—their sense of place. This attachment is deeply rooted in the beliefs, practices, cultural evolution, and identity of a people.

The significance of cultural attachment in a given culture is often overlooked by others whose beliefs and values evolved under a different set of circumstances (cf. James Kent, "Cultural Attachment: Assessment of Impacts to Living Culture." September 1995).

On Maui and Hawaii where there was less wet land, dry-land taro was cultivated. On Lanai and Niihau sweet potatoes were the principal crop. On Kauai, Oahu, and Molokai also are to be seen most of the fishponds built to preserve the fish supply; very few occur on the other islands.

The Hawaiians built houses of various kinds… [page 237] …The house of a chief was made lofty with a high-peaked roof, and carefully thatched, first with some coarse material laid flat underneath and then with a covering of fine *pili* grass neatly tied and fastened to give a smooth appearance inside the house. Houses thatched with pandanus, *ti*, or banana leaves were finished with equal care. Heaps of mats completed the furnishing within. The houses of the commoners were of *pili* thatch, sometimes with cane leaves or *'uki* grass underneath, or of pandanus or cane leaves folded over, and were often built only just a little higher than the head. Many varieties of grasses were used to put a handsome finish to the house…

All the work outside the house was performed by the men, such as [page 238] tilling the ground, fishing, cooking in the *imu*, and furnishing whatever the women needed in the house. This was the common rule on Kauai, Oahu, and Molokai, but on Maui and Hawaii the women worked outside as hard as the men, often cooking, tilling the ground, and performing the duties in the house as well. At the time when Kamehameha took over the rule from Hawaii to Oahu it was not uncommon to see the women of Hawaii packing food on their backs, cooking it in the *imu*, and cultivating the land or even going fishing with the men. On Maui the men showed their wives where their patches were and while they went to do other work the women brought the food and firewood from the uplands and cared for the *imu*. This was why the chiefs of Hawaii imposed taxes on men and women alike and got the name of being oppressive to the people, while the chiefs of Oahu and Kauai demanded taxes of the men alone.

Fishing was one of the chief occupations in old days. The fishhooks were made of turtle shell, dog, fish or human bones, prongs of hard wood, and other materials… The Hawaiians, both men and women, were expert in the art of preparing *olona* fiber from the bark of *maoli, ma'alua, hopue, mamaki,* and *papakukui.* It required intelligence to do this work properly… [page 239]

…[I]n old days people who lived in out-of- the-way places were heavily burdened by labor performed for chiefs, landlords, and land agents. But although the work was hard, that today is even more so when families are broken up and one must even leave his bones among strangers. In the old days, the people did not work steadily at hard labor but at several years' interval, because it was easier then to get food from the fishponds, coconut groves, and taro patches. Hogs grew so fat that the eyelids drooped, bananas dropped off at a touch, sugarcane grew so tall that it leaned over, sweet potatoes crowded each hill, dogs fattened, fish cooked with hot stones in the early morning filled the food gourd, and a man could eat until he set the dish aside. This was the generous way of living under a chief who made a good lord; the people were fed and every wish of the chief was gratified. Labor done in the patch of the chief was a rental paid for the use of the land and everyone was benefited thereby. Today the working man labors like a cart-hauling ox that gets a kick in the buttocks. He shivers in the cold and the dew-laden wind, or broils in the sun with no rest from his toil. Whether he lives or dies it is all alike. He gets a bit of money for his toil; in the house where he labors there are no blood kin, no parents, no relatives-in-law, just a little corner for himself. In these days of education and Christianity there is no

regard for the old teaching of the ancestors. In those days the boys were taught to cultivate the ground and fish for a living, the girls to beat out tapa and print patterns upon it, and to work well and pray to the god, and they were taught that it was wrong to be indolent and take to robbing others. These teachings were held in esteem in old Hawaii, and the land was rich and its products varied… [Kamakau 1961:372]

In another section of his history, Kamakau revisits the attachment-connection shared by the people for the land of their ancestors. He describes this in the context of the land as the burial place of one's family, and the sanctity of such a relationship:

> …In the old days the inheritance of the family burial place, the caves and secret burial places of our ancestors was handed down from these to their descendants without the intrusion of a single stranger unless by consent of the descendant, so that wherever a death occurred the body was conveyed to its inheritance. These immovable barriers belonged to burial rights for all time. The rule of kings and chiefs and their land agents might change, but the burial rights of families survived on their lands. Here is one proof of the people's right to the land.
>
> With this right of the common people to the land is connected an inherent love of the land of one's birth inherited from one's ancestors, so that men do not wander from place to place but remain on the land of their ancestors. The Kona man does not wander to 'Ewa or Ko'olau, nor does the 'Ewa man change to Waialua. Whether rich or impoverished and barren, his love is unchanged; he cannot treat the land with contempt. However good the land on which he later lives he will wish to return to the land of his birth. The land so worthless in the eyes of a stranger is good to him. But today the habit of going away for an education or sailing abroad has undermined this old feeling for the land… (Kamakau 1961:376)

An Overview of Native Traditions and Customs of Water Management and Cultivation of the Land

The significance of water in all aspects of Hawaiian life is a consistent theme in native traditions, practices, land use, and historical accounts. The continuation of the significance and value of water in the lives of native Hawaiians today, is eloquently expressed in the oral history interviews conducted as a part of this study. In the 1970s, the author (Kepā Maly), regularly visited the *kupuna* (grand-aunt) of co-author, Onaona Pomroy-Maly. This *kupuna*, Mary Kawena Puku'i, dedicated her life to the collection and recordation of native Hawaiian lore and practices. During the visits, *tūtū* Kawena shared recollections and explanations of various aspects of Hawaiian lore with Maly. And among the traditions shared by *tūtū* Kawena was a discussion about the intimate relationship of Hawaiians with the environment around them—specifically the relationship between *wai*, *kalo*, and *'ohana*. The following notes (a paraphrased summary of what she shared) were recorded on April 11, 1975, at *tūtū* Kawena's home in Mānoa, O'ahu—

> *'Ohana* is family, relative, kin; this word comes from the Hawaiian word *'ohā*, which describes the offspring of the *kalo*. The *'ohā* grow and are nurtured by the *makua*. The *makua* is the head of the stalk (*kalo*). The *kupuna*, the grandparents and ancestors, are those who stand at the spring, literally the source of water, and are above. The *keiki* (offspring), and the *mo'opuna* (grandchildren) are connected back to the spring or source of the family…
>
> The Hawaiian word for water is *wai*. The Hawaiian word for wealth is *waiwai*; *wai* doubled, or said twice. When you have *wai* you have life, the ability to sustain

yourself upon the land. And the water was believed to be from *Kāne i ka wai ola*, Kāne the giver of the water of life.

The Hawaiian word for a spring of water is *puna-wai*. *Punawai* or *pu'una-wai* describes a place where water bubbles up from the ground (rising like a hill or a mound), it is the source of water. The Hawaiian word *kupuna*, may be translated as — *ku* (standing at) *puna* (the source of water); *ku-puna* are those who stand at the source of water. Now this has deeper meaning than standing at the water source. When duplicated, the Hawaiian word *wai*, is *waiwai*, and it means wealth. Thus the one who stands at the *puna*, stands at the source of wealth. In this case, the wealth isn't in material things, it is that our elders are those who stand at the source of knowledge. They stand at the well-spring gained by the years of their life, and from that which has been handed down to them from their own *kupuna*, and they in turn, pass their *waiwai* on to their *'ohā*, *keiki*, *mo'opuna*, *mo'opuna kuakāhi*, *kualua*, and on down the generations, from *piko* (umbilical cord) to *piko*… (pers. comm. M.K. Pukui).

As recorded in the oral history interviews, and expressed by many people who have spoken about the waters of *Maui Hikina*, we see that the relationship between water, land, and people remains integral to the well-being of the Hawaiian families of the land, and indeed, is important to all the people of Hawai'i.

The following narratives, penned between the 1860s to 1930s provide readers with detailed descriptions of: (1) Hawaiian customs and practices associated with water and land use; and (2) matters pertaining to *pono wai* (water rights). These accounts were collected and penned by historians and legal experts (Hawaiian and non-Hawaiian alike). While there is little specific reference made to lands of the Hāmākua-Ko'olau region, the descriptions are consistent with the nature of subsistence agriculture documented in the historical land records for the immediate study area, and importantly, demonstrate time-depth in the recollections shares by many of the participants in the oral history interviews conducted as a part of the present study. Underling of selected texts is used here to draw reader's attention to various passages.

In writing about "*mahi'ai 'ana*" (cultivation of the land) in Hawai'i, both dry land and wet land systems, S.M. Kamakau (1976) described various methods of cultivation, environmental (or elevational) zones. He also observed that ceremony was a part of the field preparation, planting, and harvesting process. The following narratives are excerpted from Kamakau's writings in the late 1860s and early 1870s:

> MY PEOPLE HAVE BEEN cultivators from very ancient times; it was by agriculture that they made a living for themselves, for their families, and for those dependent on them. For some it was a favorite occupation.
>
> *Ka po'e kahiko* were not well supplied with proper tools; they had no iron digging implements, no cattle, no horses. Their tools were their hands and their backs—these were their cattle, horses, and carts. Their hands were their lifting implements and their shoulders their carts for hauling rocks, great logs, and all heavy things. If they wanted canoes, or posts for their houses or fences, thatching sticks, or any other kind of wood they might want for themselves or for others, their hands had to serve as axes, *ko'i lipi,* adzes, *ko'i holu, koi kahela, ko'i ho'oma, ko'i wili,* and planes, *ko'i pahi;* their hands had to break the wood and carry it to the lowlands. Because of this lack of proper tools, they used adzes of stone, shell (*pupu mahaloa*) and *walahe'e* wood—and also their teeth. Fire was a man's plow and his clearing implement. With

his hands he softened the earth, weeded, raked, and spaded, with only the help of a wooden digging stick.

The Cultivation of Sweet Potatoes

The methods of planting sweet potatoes were not the same in all places, because the places were different. The place might be on the lower mountain slope, *'apa'a;* in open country, *kula;* in the forest, *kuahiwi;* or on bottom lands, *palawai;* it might be pitted, or stony, or uneven.

There were two main kinds of sweet potato cultivation in ancient times, one called the *malo 'eka* ("dirty *malo*"), and the other, *ha'aheo* ("aristocratic"). The *ha'aheo* method was used on the bottom lands. These [1976:23] *palawai* lands were not planted during the wet weather, but in dry weather during the season of *Kau* [the dry season], when leaves were turning yellow.

This is the way the planting was done on *palawai* lands. About a hundred or more acres intended for planting were set on fire, and after a week had gone by, the land was softened by digging, and all stubbles of grass and brush were removed. Thus it lay for a month, until the moisture in the ground rose to about half an inch from the surface. Then sweet potato slips, *lau,* were gathered. If they were gotten from a distance, the slips were broken off and allowed to wilt in the sun. Then the leaves were plucked off, leaving about four with the leaf bud. The slips were made up into bundles, from about eighty to a hundred in a bundle, and bound with cords. These were wrapped in ti or other leaves to keep them moist, and left for a week or two before planting… The planting of the slips began with the first row, which was laid out very straight with fish line or rope. The mounds for the potatoes were to be spaced three or four meters apart. It was not well to have them too close together, lest the growing vines become entangled with each other… The men stood along the width of the field with their backs to it and began digging… Women followed with the slips, dropping two into each planting hole and other women placed them side by side, and packed the earth down around them with their feet… The sweet potato slips were then left alone until they had sprouted rootlets, then they were cultivated. After that, the vines were allowed to [page 1976:24] grow and spread out from the planting holes, and the mounds were kept softened until the vines had lengthened out to about three or four meters and were becoming entangled. The runners were wound up high on the mounds to prevent them from becoming entangled with each other and to check excessive growth. Then tubers appeared; huge ones that filled each mound, and so big that in order to cook them thoroughly they had to be cut in pieces.

There was one great fault with such lands [and that was flooding]. In a sunny winter season *(ho'oilo lola)* without heavy rains, the plants flourished and all was well. But when dark rain clouds lowered and the wind blew hard enough to lay the sugar cane prostrate, then racks, *haka,* were made ready to save the potatoes, ten or more racks for each man's crop. Plenty of wood was required for the rack frames and rails. The land was so flooded that a canoe could sail on it. The sweet potatoes were trampled out with the feet and lifted up onto the racks. Everybody helped himself to them without being rebuked; this was "lost" food anyway *(he 'ai poho 'ia).* The people who planted on the hillsides *('apa'a)* escaped loss, for the water did not reach there. *Wauke* was also destroyed by the water, but the sugar cane and bananas were unharmed, except when uprooted and carried away by the flood… [1976:25]

The Cultivation of Taro

Taro is a plant food that was raised on "wet" or "dry" lands—*'aina wai* or *'aina mala'a*. On lands where rain fell abundantly, dry taro, *kalo mala'o*, was planted from before the door of the house to where the *kukaepua'a* grass and the *'ama'u* ferns grew, clear to the edges of the forest and right up to the *kuahivi*. Where rain fell less abundantly, dry taro was found under ti [1976:31] plants, *'ama'u* ferns, and in wooded places. There were two ways of dry plantings, one on fields, *mala,* and patches, *kihapai,* that had been burned over, or cleared of *'ama'u* ferns… The *huli* were just dropped into the planting holes and when the *kihapai* was all planted, the cuttings were left until rootlets spread and the plants began to grow. Then the planting holes were pressed closed and mulched with grass. When the planter saw a fine growth of taro from one end of the field to the other, with four or five leaves to a plant, he set the whole field on fire, regardless of the green taro leaves. When all was burned over, the taro grew up again out of the soil so luxuriantly that a man could be hidden among the leaves-providing the soil were mulched again… [1976:32]

There were many kinds of wet taro plantings, two important ones being planting on mountain slopes, *'apa'a,* and planting in marshlands, *poho*… Cultivation of wet taro in boggy places was marshland cultivating, *mahi'ai kalo poho,* it was miry work. A man sank into mud up to the thighs, the loins, the chest, while the water rose as high as the chin. This was called *kuawehi,* "black back," planting because the back of the planter was burned black by the sun… The *kama'aina,* however, built up his mound neatly and trimly, whether he shaped it round or square or in whatever shape he chose.

The making of a *lo'i* [irrigated terrace or pond field] required much work. If the planter were a chief, the work was easy, for he had from a hundred to a thousand workers to do his work for him. The chiefs' *lo'i* were therefore large. This was also true of a prominent person or one with a large family (*'ohana*) and many kinfolk (*mukamaka*); he too had a large *lo'i*. Those who had no help had a small *lo'i*, although an industrious man who worked day and night might have a large one.

This is how such a new taro patch, a *hakupa'a,* was made. For a few days water was flowed over the land selected for the *lo'i,* perhaps a *kula* land, or [1976:33] some other place suitable for such a purpose. A few days later, when the soil was thoroughly soaked, "food" and "fish" were brought to the scene of labor; if pigs were brought they were baked there. When the men had gathered—perhaps to the number of several hundred—most of them were lined up at the lower bank of the patch. If the bank were forty *anana* [fathoms] in length, they were perhaps in two or three rows. Along the two shorter sides there might also be two or three rows.

Then the embankments, the *kuauna,* were raised by heaping up dirt from below. Two or three meters away from each bank they dug down for three or four feet and, leaving the dirt of the bank to make a solid foundation, they heaped up the dirt to raise the embankment, and leveled the dirt on the bank. They stamped the sides facing the *lo'i* with their feet to straighten them, then beat in sugar cane tops until they disappeared, then beat in coconut stems, *ha niu.* To make firm the foundation underneath, they pounded in large flat rocks, covering them with damp soil and pounding that in. When the sides of the three *kuauna* were even and the foundation smooth, they covered them with fine soil, trash, and grass to prevent them from cracking in the sun.

After that the *lo'i* itself was dug out. This digging took from a month to some years to complete. Then it was treaded. On the day of treading the *lo'i* was filled with water, and the owner of the patch made ready plenty of "food" (*poi*), pork, and "fish." It was a great day for the men, women, and children, and no chief or chiefess held himself too *tabu* to tread in the patch. Every man, woman, and child bedecked himself with greenery, and worked with all his might-trampling here and there, stirring the mud with his feet, dancing, rejoicing, shouting, panting, and making sport. This treading was done so that the water would not sink into the soil, and to allow the taro to grow. The taro was not planted until the next day, when the mud had settled to the bottom.

Select taro cuttings *(huli wae)* were planted. Among the varieties preferred by *ka po'e kahiko* were, the *haokea,* because it produced many suckers; the *ipuolono,* the *ipulonokea,* also called *piko;* the *pi'iali'i,* also called *makohi,* the *nohu;* the *'ili'a,* the *lehuakuikuwao,* the *ka-i;* the *'elepaio;* and many others. *Ka po'e kahiko* were familiar with the nature of their *huli,* and in cutting them, noted those that were weakening in vigor, and marked their bases with a cross, leaving the select tops unmarked. The planters knew that the marked *huli* were not to be planted in the row lest the taro decay; their strength was spent and they were worn out. But the select tops were strong, and the plants would last a long time.

After the *lo'i* had been planted with taro, the embankments were planted with bananas, sugar cane, and ti. Fishes such as *awa, puu 'ama'ama, 'o'opu,* and *aholehole* were liberated in the reddish-brown water of the *lo'i.* When the *huli* had grown three or four leaves—the *laupa'i* and the *lau'awa* leaves—the planter of the new patch gave thanks to the god. He plucked a number of these *lau'awa* leaves, made two or more bundles of them, went back home, lighted a fire, cooked them until they were well done, prepared [1976:34] his "food" (*poi*), and gave thanks to the god, addressing him thus:

E kulia e ikumaumaua e ke akua,	Pause and receive thanks, O god,
E Kane, e Kaneikawaiola;	O Kane, O Kane-of-life-giving-water;
Eia ka lu'au, ka lau'awa mua o ka 'ai a kakou;	Here is *lu'au,* the first leaves of our taro;
E ho'i e 'ai ke akua;	Turn back, and eat, O god;
E 'ai ho'i ko'u 'ohana,	May my family also eat,
E 'ai ka pua'a,	The pigs eat,
E 'ai ka 'ilio.	The dogs eat.
E ola ho'i a'u i ko pulapula,	Grant success to me, your offspring,
I mahi'ai, i lawai'a, i kukulu hale,	In farming, in fishing, in house building,
A kaniko'o, haumaka'iole, a palalauhala,	Until I am bent with age, bleary eyed as a rat, dried as a *hala* leaf,
A kau i ka puaaneane;	And reach advanced old age;
O kau ola ka ho'i ia.	This is the life that is yours to grant.
'Amama, ua noa; lele wale aku la ho'i.	*'Amama,* the *kapu* is freed; the prayer has gone on its way.

After his praying and appealing to the god, the planter ate the *lau'awa* with his *poi* until satisfied, and gave some to the pigs, This was to signify that he had plenty of "food" (taro); there was enough for the mighty planter and for his pigs too.

When the taro was growing vigorously the weeds were pulled out and the *huli* pressed firmly into the earth from one side of the patch to the other. In the morning after this was done the planter went to the first bank of the new patch and uttered this prayer and appeal to the god:

E ke akua, E Kukulia, E Kukeolowalu,	O god, O Ku-[of]-the-striver, O Ku-of-joint-effort,
He olowalu ka ulu o kaua kalo, e Kukeolowalu;	Make our taro grow profilically, O Ku-of-joint-effort;
He mai'a ka ha o ka kaua kalo e Ku,	Make our taro have stalks like banana, O Ku,
He 'ape ka ha o ka kaua kalo e Ku,	Make our taro have stems like the *'ape,* O Ku,
Lau mai'a ka lau o ka kaua kalo e	Make our taro have leaves like Ku, the banana, O Ku,
Nalowale kanaka ilalo o ka kaua kalo la e Ku	That a man may be hidden; amongst our taro, O Ku;
E Kukeolowalu, ku'u akua a hiki i ke o'o ana o kalo la, e Ku;	O Ku-of-joint-effort, my god until the taro reaches maturity, O Ku;
Amama ua noa lele wale ho'i.	*'Amama,* the *kapu* is over; the prayer has gone on its way.

After that it was tabu for anyone to go into the *lo'i* or to cultivate it until the taro matured. The plants on the banks were, however, constantly cared for. It was a matter of pride to the planter to have flourishing plants on the *kuauna,* and a man skillful in this work was a "chief" *(he ali'i he kanaka maiau* [1976:35] *ma keia hana);* [he had an abundance of food, and was therefore as independent as a chief]… [1976:36]

Kamakau's general descriptions of the planting process, the mannerisms, and pride in doing the work are today, still expressed by the Hawaiian practitioners interviewed as a part of this study.

Knowledge of one's landscape, when you depend on all aspects of it, is integral to life. In his writings, Kamakau also provided readers with a discussion of the environmental regions of the *kahawai* water systems —

The Waters

Water flowing from the mountainside is called a *kahena wai* or a *kahawai,* a watercourse or stream. The spot from which water begins to flow is the *po'owai*, it is the source of the water. The bank on either side is called *kapana wai* or *ka'e no ka wai* or *ikana wai,* and the water amid-stream is called the *holomoku* or *ihiakala.* Water that rushes along is called a *kololio* or *kahawai,* where it flows in a slow deep current it is a *muliwai.* A section of rushing water is also called a *kololio* as well as *ko'ie'ie.* Where the water is turbulent it is called *pu'owai,* and where it eddies, it is called *wiliwai.* Where the water of a slow moving stream, a *muliwai,* meets the sea is called a *nuku muliwai,* and [1976:10] the mouth of a shallow rushing stream, a *kahawai,* is called a *nuku kahawai.* Water flowing over a cliff is called a *wailele,* waterfall. If the water divides in falling (*kahe makawalu*), it is called a *waihi,* cascade; if the water sprays (*kulu makali'i*) in falling over a cliff it is called *huna wailele* or *wai puhia* or *wai ehu.*

The area near the sea, *makai* of a village or a group of houses, is called *kalawa kahaone,* curve of beach, or *kahaone manawanawa,* beach with *manawanawa* plants, or *kahaone pohuehue,* beach with *pohuehue* plants, or *kahaone mahikihiki,* beach with *mahikihiki* grass. The part of the beach where *'ohiki* crabs live is the *one wai,* wet sand. These terms apply only to low stretches of sandy beaches; the terms for rocky shorelines are different… [1976:11]

Wai o ke Ola (Waters of Life)

In addition to the narratives by S.M. Kamakau, above, we find further discussions on the sacred nature and importance of water in the Hawaiian belief system. Nathaniel Emerson, son of a missionary stationed at Waiahu (Water-of-Lua), O'ahu, took a great interest in the traditions, practices (including *mele* and *hula*), and beliefs of the Hawaiian people. He spent much of his life collecting, translating, and writing on Hawaiian lore. Among his accounts is a discussion of water, which was also known as "*Wai o Kāne*" (Waters of Kāne). In the following *mele* (chant) collected by Emerson on Kaua'i (prior to 1906), is an expression of the great love and esteem of the Hawaiian people for *wai* (water). Importantly, the *mele* also includes a reference to a spring of water made by Kāne and Kanaloa at Ke'anae[1].

XLI.—THE WATER OF KANE

If one were asked what, to the English-speaking mind, constitutes the most representative romantico-mystical aspiration that has been embodied in song and story, doubtless he would be compelled to answer the legend and myth of the Holy Grail. To the Hawaiian mind the aspiration and conception that most nearly approximates to this is that embodied in the words placed at the head of this chapter, The Water of Kane…

This *mele* comes from Kauai, the island which more than any other of the Hawaiian group retains a tight hold on the mystical and imaginative features that mark the mythology of Polynesia; the island also which less than any other of the group was dazzled by the glamour of royalty and enslaved by the theory of the divine birth of kings.

He Mele no Kane	***The Water of Kane***
He ù-i, he ninau:	A query, a question,
E ù-i aku ana au ia oe,	I put to you:
Aia ihea ka wai a Kane?	Where is the water of Kane?
Aia i ka hikina a ka La	At the Eastern Gate
Puka i Hae-hae; [a-1]	Where the Sun comes in at Haehae;
Aia i-laila ka Wai a Kane.	There is the water of Kane.
E ù-i aku ana au ia oe,	A question I ask of you:
Aia i-hea ka Wai a Kane?	Where is the water of Kane?
Aia i Kau-lana-ka-la,[b-1]	Out there with the floating Sun,
I ka pae opua i ke kai,'[c-1]	Where cloud-forms rest on Ocean's breast,
Ea mai ana ma Nihoa,[d-1]	Uplifting their forms at Nihoa,
Ma ka mole mal o Lehua;	This side the bune of Lehua;
Aia i-laila ka Wai a Kane.	There is the water of Kane.

[1] In an oral history interview with *kupuna* James Keolaokalani Hū'eu (November 6, 2001), we learn the name of this spring, and details of how the spring of 'Ōhi'a, at Waianu, Ke'anae, was made.

E ù-i aku ana au ia oe,	One question I put to you:
Aia i-hea ka Wai a Kane?	Where is the water of Kane?
Aia i ke kua-hiwi, i ke kua-lono,	Yonder on mountain peak, on the ridges steep,
I ke awāwa, i ke kaha-wai;	In the valleys deep, where the rivers sweep;
Aia i-laila ka Wai a Kane.	There is the water of Kane.
E ù-i aku ana au ia oe,	This question I ask of you:
Aia i-hea ka Wai a Kane?	Where, pray, is the water of Kane?
Aia i-kai, i ka moana,	Yonder, at sea, on the ocean,
I ke Kua-lau, i ke anuenue,	In the driving rain, in the heavenly bow,
I ka punohu,[a-2] *i ka ua-koko,*[b-2]	In the piled-up mist-wraith, In the blood-red rainfall,
I ka alewa-lewa;	In the ghost-pale cloud-form;
Aia i-laila ka Wai a Kane.	There is the water of Kane.
E ù-i aku ana au ia oe,	One question I put to you:
Aia i-hea ka Wai a Kane?	Where, where is the water of Kane?
Aia i-luna ka Wai a Kane,	Up on high is the water of Kane,
I ke ouli, i ke ao eleele,	In the heavenly blue, in the black piled cloud,
I ke ao pano-pano,	In the black-black cloud,
I ke ao popolo-hua mea a Kane la, e!	In the black-mottled sacred cloud of the gods;
Aia i-laila ka Wai a Kane.	There is the water of Kane.
E ù-i aku ana au ia oe,	One question I ask of you:
Aia i-hea ka Wai a Kane?	Where flows the water of Kane?
Aia i-lalo, i ka honua, I ka Wai hu,	Deep in the ground, in the gushing spring,
I ka wai kau a Kane me Kanaloa—[c-2]	In the ducts of Kane and [Kana] Loa,
He wai puna, he wai ina,	A well-spring of water, to quaff,
He wai e mana, he wai e ola.	A water of magic power—The water of life!
E ola no, e-a!	Life! O give us this life!

[Emerson, 1965:257-259]

Footnotes

[a-1] *Hae-hae.* Heaven's eastern gate; the portal in the solid walls that supported the heavenly dome, through which the sun entered in the morning.

[b-1] *Kau-lana-ka-la.* When the setting sun, perhaps by an optical illusion drawn out into a boat-like form, appeared to be floating on the surface of the ocean, the Hawaiians named the phenomenon *Kau-lana-ka-la*—the floating of the sun. Their fondness for personification showed itself in the final conversion of this phrase into something like a proper name, which they applied to the locality of the phenomenon.

[c-1] *Pae opua i ke kai.* Another instance of name-giving, applied to the bright clouds that seem to rest on the horizon, especially to the west.

[d-1] *Nihoa* (Bird Island). This small rock to the northwest of Kauai, though far below the horizon, is here spoken of as if it were in sight.

[a-2] *Punohu.* A red luminous cloud, or a halo, regarded as an omen portending some sacred and important event.

[b-2] *Ua-koko.* Literally bloody rain, a term applied to a rainbow when lying near the ground, or to a freshet-stream swollen with the red muddy water from the wash of the hillsides. These were important omens, claimed as marking the birth of *tabu* chiefs.

[c-2] *Wai kau a Kane me Kanaloa.* Once when Kane and Kanaloa were journeying together Kanaloa complained of thirst. Kane thrust his staff into the *pali* near at hand, and out flowed a stream of pure water that has continued to the present day. The place is at Keanae, Maui

In a series of articles published in 1865 in the native language newspaper, *Ku Okoa,* J. Waiamau, penned an account about the gods Kāne and Kāneloa, and their association with springs that were formed around the islands. The third article in the series was titled "*Ka Hoomana Kahiko, Ka Mookelo no Kaneloa, kona mana a me kana mau hana.*" (Ancient Religion. The Traditions of Kaneloa, his power, and the things done by him.), and in it, is mentioned a spring in the Hāmākua region of Maui, that was made by, and which bears the name of Kāneloa (unfortunately, the specific location is not given). Summarized, Waiamau wrote:

> Kane and Kanelоa had come from Kahiki, and traveled around the island of Hawaii. At various locations they desired to drink *awa,* and when no fresh water was available, Kanelоa struck his spear into the ground and fresh water poured out. At each of the places where this occurred, there is a spring that bears the name Kaneloa. Once they had completed their circuit around the island of Hawaii, Kane and Kanelоa then traveled to Maui. On their journey around Maui, they arrived at Hamakua, and desired to drink *awa,* but there was no fresh water. They caused the water to flow, and they then were able to drink the *awa.* Because they came, and needed water, the water flows, and the spring is called Kaneloa to this day… [J. Waiamau in *Nupepa Ku Okoa* – January 19, 1865:2; Maly translator]

Handy, Handy and Pukui (1972), also write extensively on the correlation between water (*wai*), life (*ola*), land (*'āina*), and wealth (*waiwai*). In summarizing their research in paper collections and through field interviews in the 1920s-1930s, Handy, Handy and Pukui (1972) observed that:

> …The life of taro was dependent upon water. In his role as life-giver, Kane the procreator was addressed as Kane-of-the-water-of-life (Kane-ka-wai-ola). Water (*wai*) was so associated with the idea of bounty that the word for wealth was *waiwai.* And water rights were the basic form of law, the Hawaiian word for which was *kana-wai,* meaning "relative to water…" [1972:19]
>
> …Fresh water as a life-giver was not to the Hawaiians merely a physical element; it had a spiritual connotation. In prayers of thanks and invocations used in offering fruits of the land, and in prayers chanted when planting, and in prayers for rain, the "Water of Life of Kane" is referred to over and over again… [1972:64]

Handy et al., also observed that Kāne-i-ka-wai-ola —

> "Kane-of-the-living-waters," with whom taro, sugar cane, and bamboo were identified, and Lono the rain god who took the form of sweet potato, gourds, and swine, were invoked together in most prayers for abundance, sometimes with Ku in his role as forest god, and Kanaloa, one of whose forms was the banana tree. [1972:311]

NATIVE TRADITIONS AND HISTORICAL ACCOUNTS OF THE HĀMĀKUA-KO'OLAU REGION OF MAUI HIKINA

Overview

This part of the study presents readers with a collection of *mo'olelo* — native traditions and historical accounts — (some translated from the original Hawaiian text for the first time, by the author) which span many centuries. Many of the *mo'olelo* which reference the Hāmākua-Ko'olau region, also describe the neighboring lands of Maui which share some of the traditions in common. Some of the narratives make specific references to cultural sites (such as villages, *heiau*, family sites, trails, and other features) and events spanning several centuries (into the historic period) of the Hāmākua-Ko'olau region; while other accounts are part of larger traditions which are associated with regional localities and events of "national" significance.

The native traditions cited in this section of the study describe some of the customs and practices of the native people who resided on these lands. Through the narratives, readers will learn of those who worked the land, water, and marine resources; those people who walked the trails, and who were sustained by the wealth—and who lived within the limitations—of the natural landscape. Most of the cited traditions are presented in association with place names, cultural sites, features of the landscape, and events in the history of these lands. Such traditions are an expression of the cultural-historical importance of the Hāmākua-Ko'olau region to it's native families.

The authors of the narratives cited herein, include native Hawaiian residents and visitors to the region, and foreign visitors—explorers, missionaries, and travelers—who recorded their observations and often included important descriptions of features that make up the cultural landscape. The narratives below are presented in several categories, generally chronological in sequence, by date of the period being described by the historians and authors.

Nā Mo'olelo Hawai'i (Native Traditions and Historical Accounts)

Several prominent native historians have been widely published, and provide readers with important details of history on Maui and in the Hāmākua-Ko'olau region. Among the Hawaiian authors are David Malo (born at Keauhou, Kona in ca. 1793), who was associated with chiefs of the Kamehameha household, and a resident land owner on Maui; John Papa I'i (born in 1800 at Waipi'o, O'ahu), descended from families of Kona, and raised as a member of the Kamehameha household; and Samuel Mānaiakalani Kamakau (born in 1815 at Waialua, O'ahu), who was educated at Lahainaluna (and a Maui resident), and who rose to prominence as an educator; politician; and most importantly, a chronicler of Hawaiian history. Selected traditions and historical accounts recorded by Malo (1951), I'i (1959), and Kamakau (1961), as well as the writings of lesser known native historians, are cited below. Underlining is used in the quoted material to draw the reader's attention to specific place names, site references, and individuals mentioned.

He Mo'olelo no Kamapua'a

"*He Moolelo no Kamapuaa*" (A tradition of Kamapua'a), predates the twelfth century, and was submitted to the native language newspaper, *Ka Hae Hawaii*, in 1861 by G.W. Kahiolo (who wrote from Kalihi, O'ahu). Kamapua'a is a Hawaiian demigod, who could assume a wide range of nature body-forms as well as a human form. Kamapua'a is associated with agriculture, rain, and ceremonies of the god Lono. The issue published on August 7, 1861 (*Helu* 7), includes the first written account of Kamapua'a's visit to Wailua-iki, Maui, and his relationship with the goddess-in human form, Kapo-ma'ilele (a sister of the goddess Pele). Localized variations of this account were repeated, and embellished in the writings of native story tellers in the late 1800s and early 1900s, and are still told

by elders of the Ko'olau region today (see narratives below by Moses Manu; and oral history interviews with *kupuna* James K. Hū'eu in *Volume II*).

The following narratives (translated by Maly) are excerpted from Kahiolo's original Hawaiian texts published in "*Ka Hae Hawaii*":

> …Kamapua'a's advances towards Pele, having been thwarted, he departed from Kilauea, following Kapo-ma'ilele (Pele's sister who had taken her genitals off and thrown them across the land to distract Kamapua'a — thus the name, Kapo-of-the-flying-genitals). It was in this way that Kapo-ma'ilele saved Pele from Kamapua'a's advances.
>
> Traveling across the island of Hawai'i, and eating *mai'a* (bananas), Kamapua'a met with Kapo-ma'ilele at Kahuā in Kohala. Kapo-ma'ilele then flew across the sea, and returned to her home on Maui, at Wailua-iki. From the heights of Kapaliiuka, Kamapua'a looked across the ocean, and decided to follow her. He crossed the channel and landed at Hāmoa, Hāna... He then traveled to Kawaikau which is near the boundary between Ko'olau and Hāna. From there, he traveled to Kaliae, and then arrived at Wailua-iki, where he found the house of Kapo-ma'ilele. Looking shoreward, he saw Puoenui, the husband of Kapo, fishing. He then chanted:
>
> | | |
> |---|---|
> | *Kanikani hia Hikapoloa—e,* | Hīkapōloa cries out loudly. |
> | *Ka la o Wailua-iki.* | The day is at Wailua-iki. |
> | *Ka lai malino a Kapo i noho ai,* | Kapo dwells in the calm, |
> | *A ka wahine a Pueonui,* | The woman of Pueonui, |
> | *I noho nanea i ka lai a ke Koolau, aloha.* | Dwelling with pleasure, in the peace of Ko'olau—*aloha.* |
>
> Kamapua'a then went to the *kapa* making house (*hale akuku*), and asked Kapo-ma'ilele if they too might sleep together. She agreed, and they did. Now a man saw this and went to tell Puoenui that his wife was sleeping with another man. Puoenui returned to the house in anger, and he struck Kamapua'a on the back with a paddle. Kapo got angry, and he struck Kamapua'a again. Kapo told him "stop, don't do that, for he is not a man, but is Kamapua'a." Hearing this, he was afraid, for he had heard the he was a god and man of power.
>
> Kamapua'a then went to Hāmākua-loa, Hāmākua-poko, and on to Wailuku…

Kānehekili – A Tradition of the Pāpa'a'ea-Ke'anae Region

Samuel Kamakau also recorded early god-associated accounts that mention lands of the Hāmākua-Ko'olau region, specifically naming Pāpa'a'ea, 'O'opuola, and Ke'anae. While discussing the thunder and lightning manifestation of the god Kāne (whose attributes also include *ka wai ola*—the waters of life—*kalo*, and sunlight), Kamakau (1968) made reference to an ancient defied, resident–priest of Pāpa'a'ea, who also made a *heiau*, that "stood above Ke'anae." By association with chiefly genealogies, the time period described, predates the 1500s. Kamakau also reports that throughout history chiefs of the Hekili line were dedicated at Pāpa'a'ea:

> Kanehekili, Kanewawahilani, Kaho'ali'i, Kauilanuimakehaikalani, and the many other gods who belong to the upper and lower strata of the firmament (*ka lewalani, ka lewamuru),* are called "gods of the heavens," *na akua o ka lani.* Kanenuiakea's place was elsewhere. The first *kahu* who observed the kapus of these gods was

named Hekili (Thunder). He lived at Papa'aea in Hamakualoa, Maui. The land of Papa'aea where this man was born is a place where thunder claps very loudly, with double claps, and there come flashes of lightning that smash to pieces the forest of 'O'opuloa.

Everyone knew Hekili as a man who had *mana*, so that everything he said was fulfilled. He had but to speak to the thunder and lightning, and they avenged him instantly upon his enemies; those persons who cursed him and abused him were all killed suddenly by thunder and lightning. His enemies therefore plotted in their hearts to kill him and whispered about it in secret. While they whispered, thunder struck. His enemies ceased to plot and to think evil thoughts.

People feared Hekili as a man of great *mana*, and they all called him Kanehekili. They believed him to be a man with the *mana* of a god, and they relied on him as a man of *mana* and as a *kahu* for the "gods of the heavens." His *heiau* for the gods of the heavens stood above Ke'anae in the Ko'olau district. There Hekili died, beneath the *kuapulo* offering stand. When the brother-in-law of this man of the thunder spirit *(kanaka akua hekili)* entered the *heiau* and found him dead, he cut off his head and took it to Lanai, and thus it came into the possession of Lanai. The men of Hamakualoa missed him, and searched, and found his body in the *heiau* [Pakanaloa[3]] above Ke'anae. When they found that this *kahu* of great *mana* was dead, they took the body and divided it into small pieces and distributed the pieces to various places around Maui. Then they became their *kuleana* to worship thunder. Those persons who had the head worshiped through the head and eyes of Kanehekili. They were called "the eyeball of the god" (*ka 'onohi o ke akua*), and "the mouth of the god" (*ka waha o ke akua*). [They were the seers and prophets of the god in thunder.]… [1968:69]

…From the very beginning Kanehekili appeared with one side a deep black. This is the reason why Kahekili, the ruler of Maui, was tattooed a solid black (*kakau pa'ele*) from head to foot on the right side. His whole company of warrior chiefs (*po'e pu'ali ali'i*) and household companions (*na 'aialo*), were tattooed in the same way as Kahekili. He himself had an ancestor who had been born from thunder (*mailoko mai o ka hekili*). This was Kahekilinui'ahumanu, the son of Kaka'alaneo and Kapohauola. As a child Kahekilinui'ahumanu was taken to the thunder (*lawe 'ia na ka hekili*) and so became (*ho'olilo*) a child of the thunder. The royal child was consecrated to the thunder at Papa'aea in Hamakualoa, a land of thunder. His mother was of the thunder (*he makuahine hekili*), and so the descendants of thunder have come down to this day.

Among the offspring of the descendants of thunder, if a child is born from his mother's womb daubed with black (*pala hiwa 'ele'ele*) on one side, it is a sign that he has been chosen by the god Kanehekili, who has placed the mark on the child he desires to be his. The mark appears to this day, but only among the god's own descendants. Ulumahelhei Houpilikane was an offspring of thunder. His face was marked with deep black, visible to all; and everybody said he was a child of thunder. His mother, Keli'iokahekili, came from thunder… [1968:70]

[3] Beckwith (1970:48), cites an account naming the *heiau* "Pakana-loa." Which was "erected back of Keanae on Maui at a place where violent thunderstorms occur…"

No nā Wahi Ilina

Another one of the significant observations shared by Kamakau (1968), is one that discusses the mountain lands above the Ke'anae – Ko'olau region. In this account, he describes burial places, and observes that such places are important to the Hawaiians from Hawai'i to Kaua'i:

> The disposal pit of Ka'a'awa is a deep disposal pit inside the crater of Haleakala. It is on top of a lava mound in a pit *(lua)* on the north side, close to Wai'ale'ale [a swamp just outside the crater wall] and the rock that divides the lands [Pohaku Palaha, or Pohaku'oki'aina] on the eastern edge of the Ke'anae gap that opens at Ko'olau. It is a chasm, a *nupa*, or perhaps a deep pit, a *lua meki*, opened up from the foundations of the island by the forces of heaping lava, and may be several miles deep, with fresh or sea water at the bottom. Because of the insipid taste *('ono 'ole)* of the waters, some people have supposed that the waters of Waiu and Waipu at Kaupo have their source at this pit of Ka'a'awa, or from some [page 39] disposal pits *mauka* of Pu'umane'one'o. This pit of Ka'a'awa was like Waiuli; it was the disposal pit for the people of Makawao, Kula, and Kaupo. These pits could be visited in broad daylight because no evilly disposed people could get at the bones and take them away to work mischief. This is the character of *nupa* and *lua meki*—they are pits that mischievous people cannot get at.
>
> Burial caves, disposal pits, and caverns (*ana huna, lua huna, nupa)* were important from Hawaii to Kauai… [1968:40]

Maui Hikina–Traditions of the Pi'ilani Line

Writing under the title *"Ka Moolelo o Kamehameha I*" (The History of Kamehameha I), and later under the title *"Ka Mo'olelo o na Kamehameha*" (The History of the Kamehamehas), Kamakau referenced several traditional accounts and historical events of the Hāmākua-Ko'olau region. Among the traditions recorded by Kamakau is an account of the chief Kiha-a-Pi'ilani (ca. 1600), son of the famed chief Pi'ilani, and chiefess Lā'ie-lohelohe-i-ka-wai. After the death of his parents, Kiha-a-Pi'ilani, lived under his elder brother Lono-a-Pi'ilani. Lono-a-Pi'ilani, began mistreating Kiha-a-Pi'ilani, and in order to protect himself, Kiha-a-Pi'ilani and his wife, Kumaka, fled to Moloka'i, and Lāna'i, and eventually returned to Maui in secret. Kamakau explains, that for a time, the couple lived in the uplands of Honua'ula, Kula, and Makawao. It was during that time, that mention is made of Hāmākua Poko, and we learn that *'uala* (sweet potatoes) were planted in the region. Kamakau also relates that Kiha-a-Pi'ilani traveled to Pāpa'a'ea, Ke'anae, and Hāna, and he set in motion his plan to take the kingdom of Maui:

> Lono-a-Pi'i-lani took care of Kiha-a-Pi'i-lani, and the latter cared for the people by giving them food. Lono-a-Pi'i-lani became angry, for he felt Kiha-a-Pi'i-lani was doing it to seize the kingdom for himself… Lono-a-Pi'i-lani sought to kill Kiha, so he [and his wife] fled in secret to Molokai… [and] Lanai. From Lanai he sailed and landed at Kapoli in Ma'alaea and from thence [p. 22] to the upland of Honua'ula… They lived on the charity of others at the boundary of Honua'ula and Kula, at a place named Ke'eke'e. They lived with farmers in the remote country… They lived in poverty, but knew of the blessings to come… [They then] went away in secret and lived close to the boundary of Kula and Makawao.
>
> Kiha-a-Pi'i-lani was befriended by a woman of the place, named La'ie, and they were made welcome by her. There they lived. Many people came there to play games and to go swimming in a pool, Waimalino. Kula and a part of Makawao were waterless lands, and so this pool became a place where all enjoyed themselves and

danced hulas. Although La'ie extended her hospitality to Kiha-a-Pi'i-lani, he kept his identity a secret, lest be be killed. Kiha-a-Pi'i-lani slept so much in the house that his hosts began to complain, and his wife told him about it.

There was a famine in Kula and Makawao, and the people subsisted on *laulele, pualele, popolo*, and other weeds. One night Kiha-a-Pi'i-lani went to clear a patch of ferns to plant sweet potatoes, and on that same night he made a large one that would naturally require the labor of eighty men to clear. When morning [page 23] came, the huge patch was noticed, an immense one indeed. The people said skeptically of this great undertaking, "Where will he find enough sweet-potato slips to cover the patch?" Next day Kiha-a-Pi'i-lani went to Hamakuapoko and Hali'imaile to ask for potato slips. The natives gave him whole patches of them wherever he went. "Take a big load of the slips and the potatoes too if you want them" [they said]. He went to clean a number of morning-glory vines and returned. The owners who gave him the contents of their patches had gone home. He pulled up the vines and whatever potatoes adhered to them, and allowed them to wilt in the sun. After they had wilted he laid out the morning-glory vines to bind them, laid the sweet-potato vines on them, and tied them. He went on doing this until he had enough loads for ten men to carry. Then he made a carrier (*'awe'awe*) of morning-glory vines, placed the bundles of slips in it, and lifted it with great strength onto his back. The sunshine beat down on his back, the *'uki'ukiu* breeze blew in front of him, the *'Ulalena* rain added its share, and intense heat reflected from the *'ulei* vines.

One old man remarked to another, "There must be a chief near by for this is the first time that a rainbow is spread before the trees." As they were speaking a man came from below with a huge load on his back, and they called to him to come into the house. He shifted his load, saw the old men, Kau-lani and his companion, let down his burden, and entered. Each of them gave him a bundle of *popolo* greens and sweet potato which he ate until he was satisfied. They asked, "Where are you going?" He answered, "I am returning to the boundary of Kula and Makawao." "Are you a native of the place?" they inquired. "Yes," he replied. They said, "There is not a native from Kula to Hamakua with whom we are not acquainted. You are a stranger." "Yes, I am a stranger." They said, "The god has revealed your identity. You are a chief, Kiha-a-Pi'i-lani." He answered, "I am he. Conceal your knowledge of me and tell no one." They said, "The secrets of the god we cannot tell to others, because you have been mistreated. The man that can help you lives below Hamakuapoko, at Pa'ūa. His name is 'A-puni." When they had finished talking, Kiha-a-Pi'i-lani returned to his dwelling place with his huge bundle of sweet-potato slips. One bundle of slips was sufficient to cover every mound of the whole field. No sooner were they planted than a shower fell, and the chief who made efforts at farming was pleased.

His effort was vain when he was refused help by 'A-puni. 'A-puni directed him to Kukui-ho'oleilei in Papa'a'ea who in turn directed him to Ka-luko in the upland of Ke'anae. He was again directed to Lanaihu in Wakiu, and he was directed by Weua-Lanaihu to go down to Kawaipapa [page 24] to consult Ka-hu'akole at Waipuna'alae. Kiha-a-Pi'i-lani became a ward of Ka-hu'akole, a person of prominence. It was said that he was an able person in directing the affairs of the land, and [it was] believed that Kiha-a-Pi'i-lani would be avenged on his brother, Lono-a-Pi'i-lani… [Kamakau 1961:25]

Kamakau's narratives record events that led up to Kiha-a-Pi'ilani becoming the King of Maui, through the help of his brother-in-law, 'Umi-a-Līloa, King of Hawai'i. At one point a great fleet of war canoes from Hawai'i were landed on the shores of Wailua-iki and Wailua-nui. The warriors then traveled over land and entered into battle at 'Ula'ino and continued on to Hāna. The warriors of Kiha-a-Pi'ilani and 'Umi-a-Līloa were victorious, and Kiha-a-Pi'ilani was established as king of Maui (Kamakau 1961:29-32).

In addition to the above cited narratives, noted native historian, Moses Manu (whose family had been among the native residents of the 'Ōhi'a vicinity, Ko'olau District), and contributor to the abbreviated account published by Abraham Fornander (1918 & 1996), added important references to places and lands of the Hāmākua-Ko'olau region. In his account, titled "*Ka Moolelo o Kihapiilani*" (published in the native language newspaper *Ku Oko'a*; January 12th to August 23d 1884), Manu described disposition of lands in the region and told readers about the good work undertaken by Kihapi'ilani, including construction of the paved (*kipapa*) trail from "Oopuloa" (a type-setting transposition of 'O'opuola) at Ko'olau, to Kawaipapa, Hāna (this trail was completed around the island of Maui). The following narratives (translated by Maly), are a synopsis of the Manu's narratives:

> …Upon securing his rule over Maui, Kihapi'ilani determined that he was going to build a *heiau*, a house for the gods. His chiefs, priests and people all concurred, and the stones were gathered from Kaiakahauli, on the northeast of Honokalani and the point of Nanu'alele, and taken to Honua'ula, above the hill of Ka'uiki, where the great *heiau* was built… *'Ōhi'a* logs for the images of the *heiau* was gathered from the forest of Kealakona in the uplands of Honomā'ele. At the time that the logs were gathered and borne to Honua'ula, the *alanui* (trails) were treacherous, and the *hala* groves were thick. The logs were often caught in the rocks and forest growth, and impossible to move. The priest called Kihapi'ilani, and asked him to go to the head of a log, and in doing so, his *mana*, enabled the logs to be moved through the tangle of the woods. The place where the path was made while gathering the *'ōhi'a* logs may still be seen along the *alanui kahiko* (ancient trail)… When the work on the *heiau* was completed, and the dedication made, Kihapi'ilani remembered the kindness of Kōleamoku (his second wife, who he had married while living at Hāna). To her, he gave the lands of Hāmoa, Haneo'o, and Wailua at Hāna; Waiohue and Waianu at Ko'olau; and Pāpa'a'ea and Honopou at Hāmākua Loa…
>
> Kihapi'ilani then called upon the chiefs and commoners alike, having them gather the *'alā makahiu* (dense basalt stones) to build an *alanui* (trail). The trail began at the stream of Kawaipapa and Pihehe, and entered the *hala* forest of Kahalawaka. From that place, it went to the forest of 'Akiala'a at Honomā'ele. It was laid out and paved with *'alā* stones. Also at Kīpahulu paving was begun, and laid out from 'Alae-iki to Kuikui'ula. In some of these lands, the *kipapa* has been destroyed in the road work of T.K. Clarke, with the stones cast aside or buried at this time. The trail was also set out at Kaupō, from the stream (gulch) of Manawainui to Kumunui. That was the extent of the work of the king and the people. He then began the paving in the forest of 'O'opuloa [i.e., 'O'opuola], at Ko'olau, extending from Kawahinepe'e to Kaloa, then on to Pāpa'a'ea, and on to Ka'ohekanu at Hāmākua Loa. This was a place made famous in olden times because of the *pōwā* (robbers). There was much treachery upon this road, and it was difficult traveling for the visitors. But, when Kihapi'ilani caused the paving (*kipapa'ia*), it became a good *alanui* (trail) to travel by.

Now, in recent years, some of the stones have been displaced by the people who are making the roads (*alanui*) of these times. There is once again, much trouble for those who travel the roads. It has been damaged by the animals (*holoholona*), and has many potholes. There is much trouble for the visitors and the mail carriers who travel between Hāna and Ha'ikū.

Now when the King (Kihapi'ilani) completed his work in this area, he moved and lived at Kahului, where he began the collection of stones for the *kuapā* (fishpond walls) of Manoni and Kanahā. He is the one who caused the water in those two ponds to be separated, and given two names. The *kuapā* is still there to this day, but a large portion of it has been lost, covered under the sands flying in the winds. When this work was completed, Kihapi'ilani then departed for Waiehu and 'Ā'āpueo… [Manu in *Nupepa Ku Okoa*, August 23, 1884:4]

Fornander (1996) also reported that Kihapi'ilani:

> …kept peace and order in the country, encouraged agriculture, and improved and caused to be paved the difficult and often dangerous roads over the Palis of Kaupo, Hana, and Koolau—a stupendous work for those times, the remains of which may still be seen in many places, and are pointed out as the "Kipapa of Kihapiilani." His reign was eminently peaceful and prosperous, and his name has been reverently and affectionately handed down to posterity… [Fornander 1996:206] .

Kahekili*[3] *and Kalani'ōpu'u–Shaping Island Kingdoms

Few references to sites or events in the Hāmākua-Ko'olau region are found again, until ca. 1776 when Kalani'ōpu'u (king of Hawai'i) invaded Maui, and met the warriors of Kahekili in battle on the plain of Kama'oma'o. In this battle, the fierce warriors of Maui were likened to various elements of the forests of Hāmākua:

> …Like the fiery petals of the *lehua* blossoms of Pi'iholo were the soldiers of Kahekili, red among the leaves of the *koa* trees of Lilikoʻi or as one glimpses them through the *kukui* trees of Ha'iku… [Kamakau 1961:87]

Once again, in ca. 1778, Kalani'ōpu'u invaded the kingdom of Kahekili, attacking Kaupō, Kaho'olawe, and Lāhainā; and it was in these battles, that the young Kamehameha, exhibited his prowess on the battle field as well. Maui's forces eventually drove Kalani'ōpu'u's army from Maui, and they took Lāna'i by force. The people and resources of Lāna'i were abused and overtaxed, and a famine came upon the island. Kalani'ōpu'u then determined to sail to Ko'olau, Maui, and Kamakau described the events in the following narratives:

> Ka-lani-'opu'u decided to go on to Koʻolau, Maui, where food was abundant. He went to Ka'anapali and fed his soldiers upon the taro of Honokahua… At Hamakualoa Ka-lani-'opu'u landed and engaged in battle, but Ka-hekili hastened to the aid of his men, and they put up such a fierce fight that Ka-lani-'opu'u fled to his canoes. Landing at Koʻolau he slew the common people and maltreated the captives by urinating into their eyes. Descendants of people so treated are alive today. From Hana, Mahi-hele-lima, commander of the fortress Ka'uiki, joined forces with Ka-lani-'opu'u, and for six months the fighting continued. During this campaign, carried

[3] In 1863, native author, J.W. Kaiole, wrote "The last King of Maui was Kahekili. It is said that he was born at Hāli'imaile, Makawao. His father was Kalaniku'ihonoikamoku, and his mother was Keku'iapoiwa (the first)" (Kaiole in *Nupepa Ku Okoa*, June 20, 1863:4; Maly, translator).

on for half a year, from 1778 to 1779, with fighting at Kaupo, Lahaina, Lanai, Hamakualoa, and Ko'olau, Kamehameha, as well as his master in warfare, Ke-ku-hau-pi'o, distinguished himself for skill and bravery in war… [Kamakau 1961:91]

Kamakau also recorded that it was while the battles were occurring on Maui, and Kalani'ōpu'u was at Wailua, Ko'olau, that Captain James Cook and his ships sailed along the coast of Maui Hikina. In Kamakau's version of the arrival, readers learn that Cook anchored near Ha'aluea Rock (pointed out in oral history interviews conducted as a part of the present study as an area fronting the canoe landing of Wailuanui):

> While Ka-lani-'opu'u was in Wailua in Koʻolau, Maui, on the evening of November 19, 1778, Captain Cook's ship was sighted northeast of Mokuho'oniki with the prow turned a little to the southeast. It was seen at Kahakuloa, and the news spread over the island, then at Hamakua, and at evening it was seen in Ko'olau. The night passed, and the next day the ship was anchored at Hā'aluea just below Wailua. When they saw that its appearance exactly fitted the description given by Moho, there was no end of excitement among the people over the strange object. "The tower of Lono! Lono the god of our fathers!" they exclaimed, redoubling their cries at the thought that this was their god Lono who had gone to Kahiki. The men went out in such numbers to visit the ship that it was impossible for all to get on board.
>
> When the canoes returned to shore, Kala'i-mamahu' persuaded Kamehameha and one other to remain on board, and that night the ship sailed away taking Kamehameha and his companions and by morning it had disappeared. Ka-lani-'opu'u thought that Kamehameha must have gone away to Kahiki. He was displeased and ordered Ke-pa'a-lani to bring them all back. Ke-pa'a-lani took six paddlers and a large single canoe supplied with food and water. Puhie declared that within two days and two nights they would sight the ship. Maui disappeared, and Mauna Kea rose before them out of the waves. Kamehameha, looking out, saw a white object on the wave and said to Kala'i-mamahu', "Is that a canoe or only a wave ?" "Where?" "Yonder." As they watched it became clearly a canoe, and Kamehameha guessed that it was Ke-pa'a-lani come to seek them. But Captain Cook had no intention of carrying them away; he only wanted them to guide him to a good harbor on Hawaii. Captain Cook may have sailed by a map made by the Spaniards, for how else could he have found the proper harbors at Waimea, Mahukona, and Kealakekua? As for Ke-pa'a-lani he was relieved, for he had already sailed two [page 97] days and nights without sighting the ship. Kamehameha pointed out the canoe to Captain Cook and then pointed toward Maui. Cook would not consent; he pointed to the ship and then to Hawaii. Again Kamehameha pointed to Maui, and the ship turned about and reached Wailua in a single night… [Kamakau 1961:98]

Mele (Chant) of Keaulumoku

One of the most significant texts penned by Kamakau, in which lands and resources of the Hāmākua-Ko'olau region of Maui are described, dates from ca. 1780. It is in the form of a *mele* (chant) composed by the seer, Ke-a-ulu-moku. The *mele* includes a number of place names, descriptions of rains, winds, sites and resources of note at various localities:

> …Ke-a-ulu-moku was another celebrated man of Ka-lani-'opu'u's day. His father was the great chief Ka-ua-kahi-akua-mii, son of Lono-maka'i-honua and Kaha-po'ohiwi, but his mother belonged to Naohaku in Kohala. He was celebrated as a composer of war chants, chants of praise, love chants, prophetic chants, and genealogical chants. When he went back to Hawaii with Ka-lani-'opu'u he was

homesick for the two Hamakua districts of Maui where he had lived with Kamehameha-nui and Ka-hekili. His love for the place found expression in the following lines :

Alo—ha, alo—ha—	Affectionate longing, affectionate longing,
Aloha wale o'u maku—a Ia—e o'u	Affection for my (foster) parents, *makua*, my parents,
Aloha wale o'u makua	Affection for my parents [page 112]
Mai na 'aina Hamakua,	Who belong to Hamakua.
He mau 'aina Hamakua elua,	The two districts of Hamakua,
No'u mua kaikua'ana i noho ai.	Where my elder brothers live.
H e ala pali na'u he mau ali'i ia,	My hillside trails are theirs to rule,
O *ka hanai ana komo ke aloha,*	They nurtured me until I loved them;
Lele hewa au i he mau kaikua'ana—e	I find myself with other elder brothers
'A'ole—he mau mea 'e wale no o lawa.	Who are not the same to me.
H e ua i pono—e—pono ia ua.	Let the rain fall, for rain is good.
A he ua i halaka', he mahala,	It patters down, it pelts down,
Pehi hewa i ka nahele	It crushes the forest growth,
Kua'oa kanikani i ka pua lehua.	It sprinkles musically on the *lehua*.
Ua ua lehua, he lehua hala,	The *lehua* trees blossom, the yellow *lehua*,
Ua i ka lehua o Kailua.	When the rain comes to the *lehua* of Kailua.
Lehua maka konunu i ka wai,	The *lehua* petals are heavy with raindrops,
Konunu konunu oha'ha'.	Heavy, heavy and full-blown.
Halana makapehu wale no kie ia,	They know not the pangs of thirst
Pehu, ua mae ka maka mua o ka hinalo ho'i.	That wilt the first-blown pandanus bloom.
Ho'i ka ua ma Haneho'i,	The rain returns by way of Haneho'i,
Ma ka lae o Pu'umaile i Hoalua,	Along the brow of Pu'umaile to Hoalua,
Ma kahalua o Pu'ukaua'e,	Over the ridge of Pu'ukaua'e,
Ma ke alo pali o Huelo.	Before the face of the cliff of Huelo.
Ua poha' Kaumealani,	There it pours down on Kaumealani,
U a ko ia e ka pua nui	The rain that brings out the full-blown flowers
Hukia aku la lilo i kai	And draws them close down to the shore.
Lilo aku la ua i ka moana,	The rain goes out to sea,
He maka o Hawini ia ua,	It falls on Hawini like teardrops,
He ua 'alo ma ka lae,	It passes along over the capes,
Nihi pali nihi lae,	It creeps by the cliffs and capes, [page 113]
Nihi i ka lae o Mokupapa.	Creeps by the cape of Mokupapa.
Hele wale ka ua a kipa wale,	The rain comes uninvited,
Ka ua pe'e hala huna kai o—	The rain that hides in the *hala* groves below,
O–huna huna lauki.	Whose fine drops water the ti plants.
Huna ke kupa i ka hala mua a kau.	The native-born hides away the first *hala* fruit of summer,
U-u-e ua wahia e ka ua o ka ho'oilo.	And weeps over the stormy rains of winter.
E ke kuawa kahi o ke kau	Oh! for the light summer showers
Nana i ho'oko'o nei ka pua!	That brought forth the blossoms!
Aui ka pua noho laolao i ke ka,	The blossoms droop with stem half-broken,

[4] Chiefess Kamāmalu, a granddaughter of Kamehameha I and Kaheiheimālie, held many lands on Maui as a birthright inheritance. Among these lands was Ha'ikū, which her father (and trustee), Mathew Kekūanā'oa sold to Richard Armstrong in 1849 (see Deed Book 1; Bureau of Conveyances). Kamāmalu died in 1866.

Aui e noho e na pua polo pe'a;	The blossoms hang wilted and uncared-for;
Pala ka'ao, ka'ao ka pola,	The fruit clusters, ripened above,
Loli helele'i ahu ilalo;	Mildew and fall in heaps to the ground;
Loli ka'ao ka hala me ka hinalo.	Both fruit and flower's are mildewed.
O *ka hala* o *ka 'ohi'a lana i ka wai*	The *hala* fruit and the mountain apples drop into the stream
I ka'i ke kahawai o *Kakipi,*	And are washed down in the stream of Kakipi,
Ilina iluna o *ka mau'u kuku',*	Washed up on thorny weeds,
I ka pua po'o o ka mau'u pu'uko'a	Up on the flowers of coarse grasses
I kahi a maua e hele ai,	Where we two have wandered,
Me ku'u wahine i ka ua hala o Kulo—li,	My wife and I, to the rain-wet *hala* grove of Kuloli,
A 'oia loli ke ala iho ma ka lau,	Fragrant among the leaves,
Lauhala—e a ke 'o'i'o 'ina 'oe i Ko'olahale..	The *hala* leaves over the resting place of Ko'olahale,
'Ike aku i ka mahina hiki'alo'alo	Where we watched for the belated moon
One ka a ki'i i ke kaha o Malama.	To rise over the cinder cone of Malama. [page 114]
Malamalama ke one kea ke hele ia,	The white sands are plainly to be seen if we wish to go there,
Kipa ke alanui mauka o Waiakuna,	Over the upland trail of Waiakuna
He kuna—e.	Winding like the fresh-water eel.
Me he kuna kuhe la ke oho o ke kukui,	The *kukui* leaves look dark like the *kukui*, gobey [*kuna* the eel] fish,
I ka ho'olu'u lupekolo ia e ke hau	When overshadowed by the twining *hau* trees
A lipo a'ele'ele i ka waokoa.	Deep in the dusky *koa* forest.
He'ele'ele ko ke kukui noho malu,	Dark are the leaves of the *kukui* in the shade,
He lena ho'i ka lau o kekahi kukui	The leaves are pale yellowish green
O *ke kukui aku i waho i ka la,*	In the full light of the sun,
I ka ua ia e ka ua 'ulalena.	Watered by the rainbow-tinted rain… [Kamakau 1961:page 115]

Kamehameha I on Maui (ca. 1790)

Following the death of Kahekili, his son Kalanikūpule, ruled Maui and the larger kingdom of Kahekili. In ca. 1790, Kamehameha I returned to Maui set on taking the island into his own kingdom. Kamakau (1961) described events of a battle which took place in Hāmākua Loa:

> Hearing of Kamehameha's approach Ka-lani-ku-pule sent an army to Hamakualoa under the warrior Kapa-kahili. The battle met at a small hill called "Bosun-bird Hill" (Pu'ukoa'e) situated on the *makai* side of Pu'umaile at Hanawana in Hoalua, and Kapa-kahili was defeated. In the evening Kamehameha beached at Halehaku, went ashore, and built temporary shelters just were he stepped foot. The feather god Ku-ka'ili-moku encouraged him to fight, for its feathers bristled and stood upright in the direction of Hina-wai-koli'i; Kamehameha therefore lost his fear of a fight with slingshot. The next morning he saw through the *koa* and *hala* trees the red gleam of feather capes. It is said the he narrowly escaped defeat by Kapa-kahili's company. But reinforcement came up, Kamehameha put the enemy to flight, and pursued them along the main road or they would have rejoined their fellow-warriors at Kokomo.

At the ascent of 'Opaepilau, Kapa-kahili was exhausted and was overtaken. "Slain by Pipili," Kamehameha boasted over him… (Kamakau 1961:148)

The battle then moved to Wailuku and 'Īao, where the battles were called Ka'uawa'upali and Kepaniwai, and Kamehameha was victorious (ibid.:148-149)

The original Hawaiian text to the above account, published in *Ka Nupepa Ku Okoa* (April 13, 1867) is important to cite here, as another place name is referenced, that does not appear in the English translation. The narrative reads:

> "*He wahi puu kaua ma Hamakualoa, o Puukoae ka inoa, aia ma kai ae o Puumaile i Hanawana i Hoalua, a ua kaua ia kela puu kaua a ua pau i ke auhee. A i ke ahiahi ua pae o Kamehameha ma i Halehaku a pii akula o Kamehameha ma a hiki i Kapuaiokamehameha; a hana iho i mau papai auolo no lakou…*" [*Ka Nupepa Ku Okoa*; April 13, 1867]

This may be literally translated as:

> There is a hill of battle at Hamakualoa, its name is Puukoae, it is there on the seaward side of Puumaile at Hanawana, at Hoalua, The battle took place at that hill, and it was a route. In the evening, Kamehameha and his people landed at Halehaku, Kamehameha and party climbed up and reached Kapuaiokamehameha; and built there, a number of temporary houses for them… [Maly, translator]

J.M. Alexander's Map of Halehaku (Register Map No. 491; October 1873) names a hill "Kapuai" near the Halehaku-Pe'ahi boundary (*mauka* of Keio Hill). Register Map No. 2482 (March 1909) identifies the same hill as "Kapuai o Kamehameha," placing it at the 1,149 foot elevation.

"Na Hunahuna no ka Moolelo Hawaii"

Native historian and steward to the descendants of the Kamehameha line, John Papa I'i, penned important accounts of Hawaiian history in a series of articles published between 1868 to 1870. His work, titled "*Na Hunahuna no ka Moolelo Hawaii*" (Fragments of Hawaiian History; Ii 1959), includes one reference to lands of the Hāmākua-Ko'olau region of Maui. In 1853, I'i and his ward, Chiefess Victoria Kamāmalu[4] sailed to Hawai'i from O'ahu, and returned via Maui. I'i described the beauty of the Hāna–Ko'olau–Hāmākua region, but also reported that by that time, the smallpox epidemic had reached the island. Among the important references made by I'i to places, is that there was at Makapu'u (Ko'olau), a swimming pool famous in legend. While at the location, the party also made *lei* (garlands) of *palapalai* and ginger with which to adorn themselves:

> They left the *Kalaikini* behind, and reached the port of Kapueokahi, Maui, near noon. They looked up at the stronghold of Kauiki, where Kaahumanu was born. It was evening when the smaller ship arrived. As soon as it reached port some of the passengers made haste to go ashore, but their rowboats had not reached the shore when orders came to stay aboard because smallpox had been brought there. As the *Kalaikini* lacked water and food, five bundles of hard poi, ten dried *awa* fish, and one barrel of water were sent out to the ship.

Ii's ship remained at Kapueokahi until after Sunday, and the passengers associated with the people there. On Monday they left and paused at Ulupo, belonging to John Young II, to bathe in the water at Makapuu, a pool famous in legend. Then they returned with head leis of *palapalai* fern and ginger. In the house where they were received their emptiness became well filled. Then they bade their friends farewell and boarded a boat to return to the ship.

The sails of the lovely one turned hither. Those aboard glanced at the cliffs of Koolau and Hamakua, reaching Halehaku at night, where they paused until day break. Then they moved along, looking at Halehaku and Haiku, seeing the growing *koa* and *kukui* trees of Lilikoi and other sights until they reached Kahului. They went ashore there and went to Kaoo's houses at Wailuku and spent two nights there. When they left for Kahului on ox carts, Kamamalu and the others sang. Children, men and women accompanied them until they boarded the boats… [Ii, 1959:172]

He Mo'olelo Ka'ao Hawai'i no Lauka'ie'ie

"He Moolelo Kaao Hawaii no Laukaieie…" (A Hawaiian Tradition of Laukaieie) was published in the native language newspaper, *Nupepa Ka Oiaio*, between January 5th 1894 to September 13th 1895. The *mo'olelo* was submitted to the paper by Moses Manu (the native historian mentioned earlier, with family ties to 'Ōhi'a, Ko'olau). The story is a rich and complex account with island-wide references to—places; descriptions of place name origins; history and *mele*; interspersed with accounts from other traditions and references to nineteenth century events.

The following narratives (translated by Maly), have been excerpted from the *mo'olelo*, and include an overview of the tradition and those narratives which recount the travels of Makanikeoe (one of the main figures in the *mo'olelo*. During his travels, Makanikeoe sought out caves, and tunnels that served as underground trails, and through the description of his travels, we learn about some of the important places and resources of the lands in the Ko'olau-Hāmākua region—

> Kaholokuaīwa [w] and Koa'ekea [k] lived at Ulu, in Waipi'o Valley on the island of Hawai'i. They were descended from the chiefly and godly lines of Kahiki and Hawai'i. Their first child was Lauka'ie'ie. But because she was born in an *'e'epa* (mysterious) form, looking more like a plant than a child, she was wrapped in *lipoa* seaweed and set in the stream. Without her parents knowledge, Lauka'ie'ie was retrieved by a mountain goddess and nurtured. Later, two other children, boys, were born to Kaholokuaīwa and Koa'ekea. One was named Hi'ilawe, and the other was Makanikeoe (who was also a wind deity).
>
> Koa'ekea's sister was Pōkāhi, and her husband was Kaukini. Though they had been married for a long time, they were childless, and because of their prayers and offerings, the forest goddess, Hinaulu'ōhi'a, approached Pōkāhi while she was gathering seaweed, and told her that she would have a girl child to raise as her own. The condition was, that no one, not even her brother and sister-in-law were to know about this child. Because Pōkāhi and Kaukini lived on the mountain ridges between Waipi'o and Waimanu, it was easy for her to keep the secret. It was in this way, that Lauka'ie'ie came to be raised by her own aunt and uncle. As a youth, Lauka'ie'ie's companions were the spirits of the plants and animals of the forest. When she matured, she was very beautiful, and thoughts of finding an acceptable mate for her began to grow. One night, when Lauka'ie'ie was sleeping, she dreamed of flying past the valley lands of Hawai'i, and across, Maui,

Moloka'i, O'ahu, Kaua'i, Ni'ihau, Ka'ula, and on to Lehua[5], where she saw a handsome young chief, named Kawelonaakalālehua. It was this chief that was destined to become her husband… [January 5-19, 1894]

[February 23, 1894]
…Makanikeoe and his companions landed at Keawaiki (Lāhainā), and after surfing, they desired to adorn themselves with garlands of *lehua*, which they wore upon their heads and necks. The red of *lehua* blossoms was so bright that the ocean's surface reflected their color and looked like a *kapa pa'i'ula* (a highly prized, red-dyed kapa), or like the *lehua* blossoms that glow in the *'ulalena* rains of Pi'iholo…

Portions of the *mo'olelo* also refer to shark gods (*akua manō*) of the various Hawaiian islands. In this account, readers learn that Puakawiliwili is one of the *akua* of Maui. Puakawiliwili, had been called to a gathering by Kamohouli'i, king of the sharks. In preparation for the gathering, Puakawiliwili traveled to the Ko'olau region where he collected some choice items to present to Kamohouli'i:

[March 2, 1894]
…Puakawiliwili is of Maui. He gathered two fish each of the *awa* and *'anae* from Wailuaiki, Ko'olau, Maui. These fish were gotten from atop a flat area on the *pali* in a fish pond that was made by Kāne. The pond was reached by dropping a rope along the *pali*, and is situated at the land where Kapo dwelled. The path is a difficult one, there on the cliff, and it is one of the places that visitors travel to see to this day.

Puakawiliwili also gathered some of the *lī'au* of the god at Nāhiku-a-ke-akua which is the long name of the land of Nāhiku at Ko'olau, Maui. He then continued his journey quickly, going to Māliko, at Hāmākua where are found the famous *kukui* groves of Liliko'i…

Later in the account, Makanikeoe returned to Maui, and traveled round the island. On his journey, he visited various places at Kahikinui, Kaupō, Kīpahulu, Hāna, Ko'olau and Hāmākua. Having traveled through Hāna, Makanikeoe:

[November 16, 1894]
…looked to the uplands he saw many places where *kalo* was growing. The interesting thing about the *kalo* at this place was that it appeared to be flying along the edges of the cliffs at Hanawī. Desiring to understand how the *kalo* could grow along the cliffs in this manner, Makanikeoe climbed up to one of the places where these *kalo 'e'epa* (mysterious formed taro) was growing. It was a large place where the water flowed, and in the distance, he saw a man carrying a single large *kalo*.

Makanikeoe then heard a voice calling out, and saw one of the small *kalo* plants growing along the side of the cliff talking, just as if it were a man. It called out to the large *kalo*:

Make no 'oe e kalo nui – Ola no au o kalo iki." (Say there large taro, you are to die –and I, the little taro, will live.)

[5] The lengthy narratives include site descriptions and traditional accounts for various locations on each of the named islands.

Makanikeoe chuckled to himself, hearing the words of the little *kalo*, and he understood the surprising nature of the *kalo* at this place. These places where the *kalo* grows on the cliffs may still be seen to this day.

After seeing this *kalo* that speaks like a man, Makanikeoe then went to the top of the mountain ridge, where he could see the cliff of Lelekea (Kīpahulu) below. He then went down to Kahaleikalalea, where he turned his gaze to the calm sea, and the pond of Waihī, Kīpahulu…

Having visited Kīpahulu, Makanikeoe returned to the uplands, and:

[November 23, 1894] …From the mountain heights he looked to Ko'olau and saw the famous pond of Waiʻale. This is a place which many visitors travel to see to this day… [December 21, 1894] …On his journey, Makanikeoe passed through the forest of Ahikala [Ahiakala is identified as an *'ili* at Kea'ā in Māhele records]. In the olden days this was a place of trouble for travelers who were often attacked by robbers (*pōwā*). There is a large red stone here, that stands on the *mauka* side of the path, it's name is Ahikala pōhaku. In olden days the people greatly feared passing by this place, but it was nothing for our fierce warrior of Waipi'o (Makanikeoe).

Now, while traveling through the forest of this region, Makanikeoe arrived at Makapu'u, where he saw a boy and a girl bathing in a pond with other youth of the area. Now perhaps my readers, you may be wondering about the names of these two children, well, I will tell you. They were Mokulehua and his sister, Wai'aka [Wai'a'aka]. These two children were cherished by their parents and family, and were compared to the crimson *lehua* blossoms of the forest (the places which bear their names were named for them). Makanikeoe continued walking towards the youths, passing through a grove of *hala* trees, and he came to an *'ōhi'a 'ai* tree where he met Mokulehua and Wai'aka. Turning to him, the two youth greeted Makanikeoe… Makanikeoe then continued along the path and arrived at the top of the *pali* at 'Ula'ino. From there, he continued along the *pali* to the stream of Lele'ikeoho (Helele'ikeoho) which in olden days, was the boundary between the districts of Hāna and Ko'olau. He then passed by Waione and the two Kea'ā. He then arrived at the wondrous stream of 'Ōpiko'ula. It was at this stream in olden days, that two ignorant men were killed (because they did not take heed when crossing the stream).

Makanikeoe then continued on to Nāhiku, stopping a place where he could look to the uplands and out to the sea. The path then took him along the *pali* of Ko'olau to Waiohue, the place for which the *haku mele* (song writers) have said, "*The brow of Waiohue faces the storm.*" He then passed the point of Kamokupeu which is a *hula'ana* [a trail that crosses the water between to points of land — *ala hula'ana*].

Makanikeoe then reached the heights overlooking Kekuapa'awela and went on to the *pali* of 'Ohea where he turned to look upon the *hula'ana* of Ka'iliūlala. There, he saw the *noio* birds circling above the cliff. Going to look more closely he saw that there was a cavern in the cliff where the birds landed. He also saw a long round stone which was wrapped in white *kapa*, a *pā'ū Puakai*, thus he understood that this stone was a *kū'ula i'a* (fisherman's deity or shrine).

Makanikeoe then turned and looked to sea and saw a large red colored form moving just below the surface of the water, outside of the point of Mokumana at Pauwalu.

There were many birds flying above the ocean surface, and when he looked more closely he saw that the large red form was a large *kala* fish. He then understood that the stone that was set there at the point [of Ohea] on the cliff was for this famous fish of the Ko'olau *pali*. Today, there are no people left who go out to surround the *kama'āina* fish of that land.

Makanikeoe then turned and followed the path along the famous cliffs of Ko'olau and arrived at Kaliae, renowned for the winds that rise up on the Ko'olau cliffs. He then traveled to the valley of Wailuaiki, where Kapo lived, and for whom the lines of the *mele* were composed…:

[December 28, 1894]:

O 'oe ia e Wailuaiki	It is you, Wailuaiki
E ka lau'i pali a Uli	The ti plants which grow upon the cliff of Uli
Ua hele 'ia e Li'awahine	Li'awahine has departed
E ka wahine kuhea pali	O woman who calls from the high cliffs
Kui pua lei o Ho'akalei e	Stringing the garland of Ho'akalei
E lei – ho'i au a.	Might I too be adorned with a garland.

This is the place where Kamapua'a committed his transgression upon Kapo and left a scar atop the *pali* of Puhiai. Also, from this *pali* the traveler can see the women going to the shore below Kapaiikaunoa [?]. From there, Makanikeoe went down to the shore and saw the great *he'e* (octopus), of which there was no equal. This *he'e kūpua* (supernatural octopus) is the one that was in a great battle with other *kūpua* (supernatural beings). The name of this *he'e* was Hā'aluea, and his stone body may be seen in the ocean, off the landing of Wailuanui. His stone body has eight branches or divisions that look like the tentacles of a *he'e*.

After seeing this *he'e kūpua*, Makanikeoe passed along the shore to the point fronting Mokumana. He then arrived at the *muliwai* (estuary) of Wai'ōlohe at Ke'anae. It is at this place that the *wai kau o Kauwahikaua* (the flume of Kauwahikaua) was made, thus turning Ke'anae into a land of *lo'i* to this day.

Makanikeoe then found a large cave on the side of the cliff by the *muliwai*, that opened in the water. It was not a deep cave, but it came out in the *muliwai* at Wai'ōlohe and in the channel of Kukuipuka, from where Makanikeoe found a cave (tunnel) that ran to the uplands of Kūō. It was at this place that Puanui was thrown by Kamapua'a from Wailuaiki, with the thrust of his snout. It is almost eight miles in distance. And this place in the uplands of Ke'anae is called Kūō (to cry out) because of the wailing of Puanui.

From this place, Makanikeoe turned and went to a pond *mauka* of Puhipinao where Hi'u, the profit shark (*manō kālua*) of Ko'olau was born. From the cave that Makanikeoe first saw at Wai'ōlohe, there is a *pali* that rises above the *muliwai*, that is Pu'ukanohua the place where Kahekili and his steward would leap. This place was made famous in the lines of this *mele* — "*I mahu'i aku au e 'ike lihi. I ka wai kau mai o Ke'anae.*" (I have caught a glimpse of the water perched above Ke'anae.)

Passing this land Makanikeoe then went to the front of the cliffs of Nu'a'ailua and Honomanu. These are the youthful cliffs (*pali keikikāne*) of Ko'olau. He then went on to Kaloa [in vicinity of Pu'ukālai'ipu], where the *alanui aupuni* passes the place

called Kawahinepe'e. There, he saw a small dark hole, covered by forest growth. Makanikeoe wanted to enter into, and travel through this cave, so he took a body form as small as the *nāhiki* (crab) or the *'ōpae* (shrimp), and he entered the cave, and found the water that flows to the stream named Waikamō'i. The water also flows to the stream of 'O'opuola, which is the boundary between Ko'olau and Hāmākualoa.

It was in this cave that Makanikeoe saw a great *kūpua* (supernatural being) with the body form of an *'o'opu*, sleeping. This is an astounding place to see, but in the old days the travelers through here were set upon by robbers, so they traveled in fear. It was in this forest that the chief Kihapi'ilani caused the commoners to pave a path with stones so that people could travel safely around Maui. It was at this place that Makanikeoe saw the *'o'opu kūpua* of these streams, Ka'o'opili, who is in the forest of 'O'opuola. It was for this place that the lines for the *mele* were composed:

'Akāhi au a ike i ka nani o Ko'olau	I have finally seen the beauty of Ko'olau
Ke loku maila kaua ia o 'O'opuola	The rains that pour down at 'O'opuola
Ola no Maka'iwa i ke 'ehu a ke kai.	Maka'iwa has its life in the mist of the sea.

Makanikeoe, then went down to the shore of Maka'iwa. Today, this is one of the good places for boats to wait out the storms, it is a sheltered place. Looking about, Makanikeoe saw a cave opening in the *pali*, on the Ko'olau side of Maka'iwa. When he looked in, he saw that there was a stone there which was carefully set in place with two stalks of ti plants growing next to it. This is *keiki kāla'i o Makaiwa.*

After seeing this place along the edge of the *pali*, Makanikeoe then turned to follow the path along the sea, fronting the famous points of Hāmākualoa for which the lines of the song were composed:

Ua pau ka heluna no Hāwini	Hāwini has been counted
Helu 'ekāhi o ka pukauwahi…	Number one of the chimneys…

Makanikeoe then reached the point of Hāwini and turned his gaze upon the seaward cliffs. He traveled on to the cove where the boats now land at Hōlawa, and from there he looked upon the splashing of the waves on the shore. Passing that place he arrived at Halehaku, where there is a deep cave from the land to the sea:

Aia ka palena a i Halehaku	It is there at the boundary of Halehaku
Ilaila ku nei o Mākālei	That Mākālei stands
Lā'au kaulana a Makanikeoe.	The famous tree of Makanikeoe

From there Makanikeoe turned and looked at a stone islet standing in the sea that is struck by the waves on all sides. This stone islet was covered with birds, the *kōlea*, *'ūlili*, and *'akekeke*. He also saw two *kama'āina* men who were trying to catch the birds with nets like fishermen. Because this was the custom of catching birds in his native land of Waipi'o, Hawai'i, he called out to the men offering to teach them how to fish for birds in this manner. The two *kama'āina* were astonished at the skills of this visitor who caught the birds with nets. Makanikeoe then looked about this little stone islet and dove into the ocean where he found and entered a cave. He followed the cave upland, for it was dry and there was no water. He came out at the *pali* by Hōlauolopolo along the stream of Kākipi. Another branch of the cave came out above Ho'ikaōpūai'uwala, at Makawao.

From this place he then traveled to the cool pond of Kālena and then he went to the top of the hill, Pi'iholo, from where he could look out upon the beauty of the land. While he was atop Pi'iholo the *'ākiokio* mist rains and the *'ulalena* surrounded him, and the *lihau* dropped from the leaves of the *koa* of Kokomo and the famous *kukui* grove of Liliko'i. There, while upon the hill he saw two young women whose features were like that of Hinaulu'ōhi'a [a goddess of the forests and water at Waipi'o, Hawai'i] sitting along the side of the stream of 'Alelele. In his mysterious manner, Makanikeoe appeared before these two young women. Startled, they dove into the stream of 'Alelele and entered a cave, and in a short time these mysterious women arose below Wai'alalā. There, the women took their mysterious body forms and Makanikeoe called out to them. He learned that their names were Lauhuki and Kili'oe, and that they were the *mo'o* guardians of the cool waters of Kālena and all of the ponds at Makawao. For them the lines of the *mele* were composed:

Ka helena a wahine i ka pali	The women travel along the cliffs
I ka luna o Pi'iholo i 'Alelele	At the heights of Pi'iholo and 'Alelele
O Lauhuki ma lāua o Kilioe.	They are Lauhuki and Kili'oe

After exchanging their greetings, Makanikeoe passed through the cave by which the women traveled to Wai'alalā. He then continued underground till he reached the sea fronting Māliko. He arose at the eastern point of Māliko, which is the boundary between Hāmākualoa and Hāmākuapoko. From here, the path of our traveler passed before Kū'au and Pā'ia and he then arrived at Kapuka'ulua, the boundary between Hāmākuapoko and Waiuku. There, Makanikeoe saw a deep pit in the sea which he entered and followed to the ponds of Kanahā and Mauoni, those famous ponds that are near Kahului. The ponds were made by the commoners in the time of the chief Kihapi'ilani…

He Mo'olelo Ka'ao no ka Pūhi o Laumeki

"*He Moolelo Kaao Hawaii no ka Puhi o Laumeki, ka Mea i Like me ka Ilio Puaapualenalena…*" (The Hawaiian translation of Pūhi Laumeki…) was published in the native language newspaper, *Nupepa Ka Oiaio*, between November 8th 1895 to February 14th 1896. Like the *mo'olelo* of Lauka'ie'ie, this story was submitted to the paper by Moses Manu. The *mo'olelo* primarily focuses on sites and features associated with the lands of 'Ewa, O'ahu—recounting events associated with the birth and deification of an eel (*pūhi*) guardian of fisheries, and his siblings, among whom was Mokumeha. It is in the narratives pertaining to Mokumeha, that we find descriptions of sites and features in the lands of the Hāmākua-Ko'olau region. The excerpts below (translated by Maly), introduce the account, and are a summary of selected references to the Hāmākua-Ko'olau study area:

[November 8-December 6, 1895]
It is perhaps not unusual for the Hawaiian people to see this type of long fish, an eel, about all the shores and points, and in the rough seas, and shallow reefs and coral beds of the sea. There is not only one type of eel that is written about, but numerous ones that were named, describing their character and the type of skin which they had. In the ancient times of our ancestors, some of the people of old, worshipped eels as Gods, and restrictions were placed upon certain types of eels. There are many traditions pertaining to eels. It is for this fish that the famous saying "An eel of the sea caverns, whose chin sags." [Describing one who is prosperous; see Pukui 1983, No. 1545.]

…Kaihuku'una and Ka'ōhai were the parents of Laumeki. It is said in this account of Laumeki, that his true form was that of an eel. A while after the birth of Laumeki,

another child was born to Ka'ōhai, a son. He was named Mokumeha…and there at Honouliuli, 'Ewa, places are named for all of these people. The natives of that land are familiar with these places…

When Mokumeha grew up, he was noted for his handsome features, and skills in all manner of fishing. His eel-formed brother accompanied him, and drew the fish to his nets.

Having had a dream of a young chiefess, Mokumeha set out to find her and secure her as his wife. The journey took him from O'ahu, to Moloka'i and on to Wānanalua, Hāna, where the young chiefess lived:

[January 24, 1896]
Mokumeha and his companions departed from Honouliuli and traveled to Moloka'i where they stayed for a while. They then departed in their canoes, and passed through the channel of Mokuho'oniki. They sailed beyond Maui, to where they could see Kahakuloa and as far as Pu'ukoa'e which seemed to flutter upon the winds… They then turned around and landed at Honolua, and as is the custom of the Hawaiian people, they were greeted by the voices of the natives, calling them to rest and enjoy some food…

Departing from Honolua they then traveled around Maui, passing Kahului, and arrived at Keon'ākeāe and Kapukaulua where they were greeted by the youth, Kaihuwa'a, his sister, and elders. They were natives of the place, residing in the district of Hāmākuapoko. After spending a few nights there Mokumeha and his companions departed from Hāmākuapoko and traveled along the trail through Hāmākualoa to Pāpa'a'ea where they rested for the night. At daylight, they traveled through the forest of 'O'opuola and arrived at Kaloa. From there they went to the *pali* of Honomanu—*Honomanu, ka pali keiki kāne*—at Ko'olau, Maui. The cliffs are described in the song:

He malihini au na ke kai i lawe mai	I am a visitor, born upon the ocean,
'Ike iā Honomanu he 'āina pali.	Seen is Honomanu, a land of cliffs.

They then descended the *pali* to the place where the people lived and found the young woman Kahāli'i famed for surfing the waves of Pinana'i [roaring surf]. This was a *hula'ana*, the swimming trail of that time. Mokumeha and companions relaxed and were entertained by the natives of that place. They then departed and climbed up the cliffs and arrived at Nu'a'ailua. This is the place where 'Umiamaka filled the shell of a lobster with sand and then went to meet with a woman and her daughter who were gathering *lauhala* on the upland side of the trail. When the woman saw 'Umiamaka holding the lobster in his hands, she asked him to give her the lobster. She offered her daughter in return, and 'Umiamaka agreed. The exchange was made and 'Umiamaka and the young woman departed. Shortly thereafter, they heard the voice of the woman calling out, "Where are you? This is a mistake, for the fish (lobster) of 'Umiamaka is filled with white sand. (*Ua hewa ka i'a a 'Umiamaka he 'ō kea o loko.*)" 'Umiamaka replied, "You are the one who is mistaken, we two are justified. (*Hewa no 'oe, pono no māua.*)"

Now 'Umiamaka was a real man of Ke'anae, not a *kūpua*, and there are still some of his descendants living to this day. He was a crafty man skilled in deceit, as told in

this story. But now, forgive me my readers, but these are some of the tales that have been handed down from old.

Passing the cliffs of Nu'a'ailua, Mokumeha and his companions arrived at Ke'anae, where is the water channel of Kauwahikaua (*Ke'anae i Kawaikau a Kauwahikaua*). Kauwahikaua is the one who made the famous *'auwai* along the *pali* of Ko'olau. Mokumeha and companions were welcomed by the natives of that land, and they stayed there for two days. On the third day they departed for Wailuanui and Wailuaiki, where Kapo dwelled at Ka'ea'ea. She is the one who tricked the pig grandson (*mo'opuna Pua'a*) of Kamauinuaniho of Oahu.

Passing this place along the famous cliffs of Ko'olau, they came to Kaliae and ascended to Kopili'ula and arrived above Kapehu. They then went down to Waiohue, traveling along the trail that runs along the ocean's edge. Thus, they arrived at *Ke hula'ana o Kamokupeu* (The swimming path of Kamokupeu). At this place a traveler must cling like a lizard to the *pali*, but that is the trail that must be taken to travel through this land. One must grasp at the aerial roots of the *hala* trees to pass this way, and it is done with great fear. This is also the boundary between the cliffs of Ko'olau and the land of the *hula'ana* trails. They then arrived at Nāhiku-a-ke-akua and stopped at a place where they saw several large men who were prepared to play in the sport of diving at the leaping place of Kapalalau (*kawa o Kapalalau*).

The first two men leapt without looking, and were killed. The last man observed this and called out "why didn't you see that there was no water?" They had fallen onto the stones below, and were broken into pieces and died. This place is there along the trail that passes on to 'Ōpiko'ula.

Passing this place, Mokumeha and companions went to Kauluena and the two Kea'ā, and they then arrived at Lele'ikeoho, the boundary between Ko'olau and Hāna. They then passed into 'Ula'ino where they were greeted by the natives of that place… A disagreement arose between the people of Ko'olau and Hāna, and the boundary between the districts was relocated…

Traditions of Fisheries and Sharks of Ko'olau

In between ca. 1900 to 1935, several traditions regarding fisheries, sharks, and the occurrence of place names were recorded. The writers included Moke Manu, whose family had resided at 'Ōhi'a, Ko'olau (a property now held by the family of James K. Hū'eu), and ethnographers, Mary Kawena Puku'i and Martha Beckwith (who was raised in the Hāmākua Poko District). The latter two writers recorded traditions from native residents, at various localities around the islands.

Writing about native fishing customs, Moke Manu (Manu in Kawaharada 1992), recounted a tradition of Kū'ula (a fisherman's deity), his wife Hina (also a goddess of fishermen and agriculturalists), and their son 'Ai'ai. As a result of the powers and knowledge of the ocean and fisheries possessed by Kū'ula and his family, people learned many techniques of fishing. Among the narratives recorded by Moke Manu, are descriptions of fisheries in the Ko'olau region which 'Ai'ai established for the benefit of the people, and a tale of a supernatural *he'e* (octopus) that lived in the sea fronting Wailuanui (see also accounts cited above), which was turned into a stone islet. Manu wrote:

> 'Ai'ai…went over to Waiohue (a bay west of Honomā'ele), Ko'olau, where he placed a stone on a sharp rocky island called Paka, on which a few *pū hala* (pandanus trees) grow. At a certain time of the year, the *kala* come in from the

ocean, attracted to this place by the power of this stone. They continue on westward to Mokumana, a cape between Ke'anae and Wailua-nui. They come in gradually for two days, and on the third day, at the *puli* of Ohea, they are taken with nets.

In olden times while the fishermen were hauling in their nets full of *kala* into the canoes, the *akule* and *'ō'io* also came in great numbers, making it impossible to catch all the fish in one day; and so many fish were gathered in the nets, it took the fishermen a day and a night before they could care for their catch, which was more than they could use, so the leftovers were fed to the pigs and dogs. The *kula* of Ohea is noted for its fatness and fine flavor. Few people are living there now, and the people who knew about this fishing are dead; but the stone 'Ai'ai placed on that little island at Waiohue is still there.

'Ai'ai stayed there a few days and then returned to Hāna and lived at his birthplace quite a long time…he taught his art of fishing in all its forms; and when he was satisfied the people were proficient, he prepared to visit other places to teach his art. But before leaving Hāna, 'Ai'ai told the friend he had appointed as head fisherman of Hāna to go and kill the big *he'e kupua* (supernatural octopus) in the deep sea right off of Wailuanui, Ko'olau (west of Waiohue); and his friend consented.

When the canoes were prepared and drawn to the beach and the people were ready to go, 'Ai'ai gave his friend the *hōkeo* (gourd for fishing gear) in which the *leho* (cowry shell lure for catching octopus) his father had given him was kept. This shell is called *Leho'ula* ("Red cowry"), and Leho'ula in Hāna was named after it. The people went in the canoes till they reached the *pali* near Kopiliula, where they rested. 'Ai'ai was not with them, but supervised their work from the *pali* of Puhiai. While resting, they prepared the *leho* for lowering, and when it was ready, 'Ai'ai's friend called on Kū'ula and Hina for the assistance of their *mana kupua*. Then he removed the covering of the gourd and took out the *leho*, which had rich beautiful colors like the rainbow; he attached it to a line and lowered it into the sea, where it sent out rays of fiery light.

The *he'e* was so attracted by the radiance that it came out of its hole and with its great arms, which were as long and thick as full grown coconut trees, pushed up to the surface of the water and stood there like a coconut grove. The men were frightened, for the *he'e* entered among the canoes, intending to destroy the canoes and the men and capture the *leho*; but it failed because 'Ai'ai's friend, at the proper moment, shoved a stone he had brought into the head of the *he'e*; and the weight of the stone drew the *he'e* down to the bottom of the sea and kept it there; being powerless to remove the stone, the *he'e* died.

The men seized and cut off one of the arms; it was so big it loaded down all the canoes and they returned to Hana with just that one arm. The rest of the *he'e* turned to stone and is pointed out today, just outside of Wailuanui, where a stone formation resembles the body of a *he'e* with one arm missing. When 'Ai'ai saw from the *puli*, that his friend had succeeded in killing the *he'e*, he returned to Hana; the canoes arrived shortly after him and the arm of the *he'e* was divided among the people according to his directions… [Manu in Kawaharada 1992:18-20]

Puku'i and Beckwith (Beckwith 1970) recorded traditions of two sharks—one good, the other not—that lived at Ke'anae and Pauwalu. In their narratives, we also learn how the places Luahi'u (Ke'anae) and Pauwalu came to be named. Pukui wrote:

> Pau-walu (Eight dead) lives at Wailua, Maui. He warns men as they go to the sea that eight will be dead before they return and a shark always kills eight of them as predicted. He is therefore suspected as a shark-man. Akeake the strong is born beside the stream Hau-ola and while yet a little boy starts about Maui fighting champions. After overcoming Lohelohe, he, with his companion Pakolea, spends the night at a friend's house named Ohia and learns about Pauwalu. The shark-man scoffs at so little an antagonist, but Akeake easily binds him, exposes the shark's mouth on his back, and casts him into the fire. [Beckwith 1970:141]

And Beckwith wrote that Mrs. Hardy of Ke'anae told her:

> A man and his wife live near the sea at Keanae; his sister and her husband live in the woodland at Kau-palahalaha. Every day the man goes out fishing, bidding his wife give fish to his sister when she comes from her upland garden with vegetable food for the family. The man's wife is stingy and gives her sister-in-law only the tail end of a fish. This the woman in disgust drops into a calabash. One night both husband and wife have a dream and, rising, they find a live shark in the calabash. For many years they keep it in a pool [which may be seen today at this place] and make food offerings to it. Once, during high water, it is washed down to the sea. It now lives in the hole called Lua-hi'u (Hole of the tail) which may be seen near Mrs. Hardy's house and which extends underground half a mile and comes out near the Keanae wharf. [Beckwith 1970:134]

Both of these traditions are still told in various forms by *kupuna* James K. Hū'eu, and were recorded in oral history interviews conducted as a part of the present study. Notably, the account of Luahi'u, is described in some detail, with specific descriptions of the relationship between residents of the uplands near Kaho'okuli, and the near shore, at Ke'anae Peninsula (see *Volume II*).

Maui Hikina–Described by Visitors of the Historical Period (ca. 1779-1929)

In addition to the traditional accounts and historical observations penned by native Hawaiians and others interested in Hawaiian lore, visitors to the islands, also recorded their observations of *Maui Hikina*—the first written account, being penned in 1779. The following accounts cover the period from 1779 to 1929. The writers describe various aspects of the the land, sites, industry, and communities, and also describe the transitions in residency, land use, and the regional communities of the Hāmākua-Ko'olau region[6].

The Journals of Captain James Cook (1779)

The journals of Captain James Cook and crew (Beaglehole 1967) include further documentation regarding this period of history. Cook and crew first saw the Hawaiian Islands of O'ahu and Kaua'i on January 18, 1778. Cook then reports that on November 26th, 1778, he and his crew saw the island of Maui (Mowee) for the first time. While sailing on the eastern side of Maui, they were visited by residents of the Wailuku-Hāmākua-Ko'olau region, prior to their sailing to the island of Hawai'i. Though only a limited time was spent at Maui, Cook penned a few observations of the region. In parts, Kamakau's narratives (cited earlier) coincide with those of Cook:

> Finding we could not weather the island I bore up and ranged along the coast to the westward. It was not long before we saw people on several parts of the coast, some houses and plantations, and the Country seemed to be both well wooded and Watered, the latter was seen falling into the Sea at several places… [page 474] …At first but a few people vested us, but towards noon we had the company of a good many who brought with them breadfruit, Potatoes, Tarra or eddy roots [taro], a few plantains and small pigs, all of which they exchanged for Nails and iron tools; indeed we had nothing else to give them… [page 475]
>
> Monday 30th. In the afternoon of the 30th being off the NE end of the island, several canoes came off to the Ships, most of them belonged to a Chief named Terryaboo [Kalaniopuu] who came in one; he made me a present of two or three small pigs and we got by barter from the other people a little fruit. After a stay of about two hours they all left us except six or eight who chused to remain, a double sailing canoe came soon after to attend upon them which we towed astern all night. In the evening we discovered another island to the windward [Hawaii] …our Indian friends not chusing to accompany us, imbarked in their canoe and left us [page 476].
>
> MOWEE… A low Istmus separated it into two circular high peninsulas, the Easternmost being as large again as the Westernmost one. Its figure is not much unlike Otaheite, nor do they differ greatly in size. The length of Mowee (being East & West) is 15 leagues, the greatest breadth of the East Peninsula (NE & SW) 8 ½ leagues, & which is calld Wha'madooa [Hamakua or Hamakualoa]. Its NE side being the first land we saw on coming down to these Islands… [Beaglehole 1967:609]

Unfortunately the description of this region of Maui ends with the above narrative, and Cook himself never again returned to Maui.

[6] In addition to the selected citations in this section of the study, interested readers will also find a rich collection of historical narratives in missionary journals and communications. Selections from field station reports may be found in "The Friend;" a newspaper published between 1843 to 1954; and detailed letters, reports, and journals pertaining to mission station activities and parishioners, are found in the collection of the Hawaiian Mission Children's Society Library. At the time of this writing, Ms. Laurel Murphy is conducting research, and preparing for publication, a book on the Baldwin family (and missionary history) on Maui.

Commander Charles Wilkes:
The United States Exploring Expedition of 1840-1841

In 1840 and 1841, Commander Charles Wilkes of the United States Exploring Expedition, toured the Hawaiian Islands (Wilkes 1845, Vol. IV: reprint 1970). In April 1841, Wilkes and party toured the island of Maui, and Wilkes' narratives provide readers several descriptions of the lands and activities in the Wailuku and Kula District, including portions of the Hāmākua-Ko'olau region. Among the topics discussed by Wilkes were — cultivation of the land, including the development of foreign crops; the barren nature of the isthmus plain, noting its lack of water; the perseverance of the native community in construction of the protestant church of Hāmākua Loa; the McLane-Miner sugar plantation at Hāmākua Poko; and the presence of wild cattle, dogs and goats in the summit region of Haleakalā.

> The district of Wailuku is composed of valley and upland. The soil in the former is extremely rich and well watered; the upland, also, produces good crops when sufficient moisture can be had. Potatoes, corn, sugar-cane, and sweet potatoes, are the chief products of the windward side of the island.
>
> In some places there are extensive woods, the trees in which are of [page 250] large size; but the timber is of little value, being either soft and spongy, or hard and difficult to work. Of the former kinds the natives make their canoes. The District of Kula, on east Maui, although extremely rough and rocky, has a loamy, rich, and productive soil: it produces the finest Irish potatoes, turnips, corn, melons, and wheat. The latter, of an excellent quality, is found growing wild. It was introduced about twenty years before our visit, planted, and not the least attention paid to it; instead, however, of "running out," it has increased…
>
> The isthmus is too dry to be fit for cultivation; it is in extent about twenty by fifteen miles. During nine months of the year it is a fine grazing country, and feeds large herd of cattle, that are mostly owned by foreigners… Both at Wailuku and at Hamakualoa, the natives have shown much perseverance and enterprise in erecting stone churches. These are built by native workmen, and their dimensions are one hundred feet in length, by fifty feet in width. For construction of that at Hamakualoa, they were obliged to bring stones, lime, and sand, on their backs, to the place of building. The lime and sand were brought from a distance of two or three miles, and the timber was dragged from four to six miles. In putting on the roof, it fell in twice, after nearly all the timbers were up, and broke them to pieces; but they persevered until they had completed the edifice, which will contain [page 251] about one thousand people. The whole amount of money laid out was sixteen dollars!…
>
> The north coast of East Maui is a succession of deep ravines, which gradually diminish in breadth as they ascend, and are finally lost on the flanks of the mountains; travelling along the coast, in consequence becomes almost impossible. Cascades are seen falling in these ravines several hundred feet in height, having little volume of water, however.
>
> The face of Mauna Haleakala is somewhat like that of Mauna Kea; it is destitute of trees to the height of about two thousand feet; then succeeds a belt of forest, to the height of six thousand feet, and again, the summit, which is cleft by a deep gorge, is bare… [page 252] …[O]ur gentlemen were very kindly received by the king and missionaries. They forthwith made preparations for a tour to East Maui. The Rev. Mr. Andrews, his son, and four students of the seminary, joined the party, together with six Kanakas to carry their food. The Kanakas were engaged at twenty-five cents

> a day, and twenty-five cents more was allowed for their food. The party first passed to Wailuku, where it was further increased by the accession of Mr. Baily.
>
> In the evening they reached the sugar plantation of Messrs. Lane and Miner, which they found one thousand six hundred and ninety- two feet above the level of the sea. These are two very respectable white men, who have married native wives. They are natives or Boston, and have brought their Yankee enterprise with them. Here all the party were kindly received. The plantation of these gentlemen is of some extent, and although the cane grows more slowly here, it makes better sugar than that on the low grounds, which is said to be owing to the former not blossoming. The houses are partly of native construction, and seem well adapted for their uses. The sugar-mill is one of the largest on the island.
>
> Crops of Irish potatoes are very productive here; and corn is abundant a thousand feet higher up the mountain.
>
> The next day, the party set out at an early hour, in hopes of reaching the summit, but it began to rain violently, in consequence of which they took shelter in a large cave, at an altitude of eight thousand and ninety feet. Here many interesting plants were found, among which were two species of *Pelargonium*, one with dark crimson, the other with lilac flowers; the *Argyroziphium* began to disappear as they ascended, and its place was taken up by the silky species, which is only found at high altitudes. From the cave to the summit they found shrubby plants, consisting of *Epacris*, *Vaccinium*, *Edwardsia*, *Compositae*, and various *rubiaceous* plants… [Wilkes 1970:253]

Having reached the summit of Haleakalā, Wilkes reported that "Near the summit, bullock-tracks were observed, and likewise those of wild dogs, but no other animals were seen except for a few goats" (Wilkes 1970:254).

Makawao and Hāmākua Poko Described in 1846

The Polynesian, a newspaper publication of the Hawaiian Government, regularly ran articles contributed by both residents and visitors, that offered readers glimpses into the activities and developments in island communities, and sites to be seen when visiting various localities. J. Jarves, the paper's editor was also a prolific writer and contributed many descriptive articles to the paper. Among the writings was a series of articles describing a trip from Lāhainā to Haleakalā via the *kula* lands of Kahului and Hāmākua Poko, and on up the slopes through Hāli'imaile and Makawao. Jarves reported on industry and sites of the region through which he traveled. Also among his observations were the significant changes on the Wailuku (Kama'oma'o) Plains, and in the uplands of the Makawao region as a result of wild cattle, and the difficulty in getting water on the Hāli'imaile-Makawao lands:

> ***The Polynesian***
> ***Saturday, July 25, 1846***
> ***Editorial Correspondence, Mauna Haleakala, East Maui.***
>
> [Having landed at Kahului, the party then traveled to Hāmākua Poko] …The bay here is subject to violent gusts of wind, which make it dangerous boating. On reaching shore we found a very good house, built by the missionaries for a night's accommodation when travelling to Lahaina, and awaiting here a calm opportunity to canoe it round the mountain. We dined here, rested two hours, and started on a very good carriage road, which follows the margin of the bay for some distance. On reaching the eastern bend, the dust, wind and heat were each intense. The first,

composed of the light sand of the seashore, which is here invading the country to the very foot of the mountain, destroying in its course every green thing, rose in clouds to darken the sun. Our road lay for many weary miles through it. The country about the bay is barren enough to starve grasshoppers, and if it is a specimen of the "unclaimed and unoccupied" lands of the kingdom, I should say, thanks to the Company that would take it *off* or pay for it as it is. We passed a number of hamlets, and noticed plenty of healthful and well clad children. Indeed, the whole population of Maui so far as I have thus seen, appear well off as regard's clothing and if the children to be seen on this route are a fair criterion for the island generally, population is far from running out. On some of the sand hills we noticed human skulls, which had bleached there for centuries, for aught we could tell. At 8 o'clock P.M., we arrived at the landing place of our boat [in the area below Pā'ia], which had crossed the bay in advance with the luggage. I would give the name but do not know it, and can only describe it as the terminus of the road leading from Mr. Torbert's plantation [the Brewer Plantation at Kawa'apae – Hāli'imaile], and the grand potato embarking place for the fertile region above…

…In the morning, Mr. Torbert, the enterprising proprietor of the sugar plantation above and owner of the ship-yard where we were encamped, rode down from his place to assist us in moving up… The plantation is about three miles from the shore and 2000 feet up. It has a commanding view of the ocean and neighbouring islands. Sugar is at present the chief product, and that which we saw was of exceeding good quality and selling readily at 8 cents per lb…The buildings here are all of thatch and on a cheap scale. Mr. Torbert is turning his attention to the cultivation of both temperate and tropical fruits and vegetables, for both of which his land is suited. If successful, he will make a valuable estate. The soil is a rich loam on a bed of cinders. —The greatest drawback is the want of water for domestic purposes. It brought from a distance of several miles up the mountain, from pools which are little better than collections of stagnant rain, covered with slime and impregnated with decayed vegetable matter. Those that I saw, though exceedingly valued by the inhabitants as being their only fountains, were quite disgusting in their appearance. The water however, was cold and tolerably sweet, and quite like nectar compared with the brackish puddles on the sea-side.

…The population of this land is now only 80. Mr. White, who has lived on Maui 46 years, says he recollects when it numbered 2000 laboring men.

…I had here the first glimpse at the extensive Irish potatoe region. It ranges along the mountain between 2000 and 5000 feet elevation, for the distance of 12 miles. The forest is but partially cleared, and the seed put into the rich virgin soil. The crop now in the ground is immense. The fields being all in blossom have a fine appearance, spreading as they do, over the broad surface of the mountain.—

THE POLYNESIAN
Editorial Correspondence.
August 1, 1846 [continued from July 25, 1846]

…Makawao is more than sufficiently watered by rain, but the soil is too porous to allow of streams. Bathing spots, such as they are as to extent, are to be found among the rocky beds of some of the ravines. The drinking water is most lusciously cool and limpid…. The roads are excellent in several directions both for carriages and horses for many miles. There may be good fishing at the beach and gunning among the hills for aught I know… At present, beside the patches of the natives who

cultivate this region tolerably extensively, Mr. McLane's is the only plantation. It occupies a most delightful situation. His house – and a real Yankeefied look it has, with its red sides and porticoed front, stands in the midst of a *koa* grove [*mokai* and west of Pi'iholo]… well kept fields of cane extend in front of the house over 100 acres; fences enclose it in part and separate it from verdant pasture ground; corn and pumpkins have their allotted space; clumps of trees here and there resemble orchards…

…McLane's sugar mill is about a half-mile below his house. The sugar of this region ripens the same as at Mr. Torbert's place and is of excellent quality. The produce to the acre is about one ton. At present the mill is worked by animal power, but Mr. McLane proposes erecting a wind-mill as more economical…

THE POLYNESIAN
Editorial Correspondence
August 15, 1846 [continued from August 1, 1846]

…Makawao is as yet the only district that rejoices in an Hawaiian pastor, The Rev. J.S. Green, whose hospitality I cannot say too much, has become naturalized and now derives his support from the people of his parish. This is very extensive and numbers several thousand inhabitants. He has already given an account of his ways, means and success, in a previous Polynesian…

…On the 14th I rode to Wailuku. The road for the first six or seven miles passes gently down to the beach through a pleasant and fertile country. The remainder of the way is not particularly agreeable, particularly if the sun is disposed to make reflections upon one in the passage over the sand hills which skirt the plain. The Wailuku plain which is some six or seven miles across by rather more in width, was once waving with tall grass, and when Mr. White first came to the island, trees six inches in diameter grew in it. Not a bush is now to be seen. The goats and cattle have exterminated the grass and dug up the soil of the plain, which dried by the sun, is now moving in drifts to the leeward into the ocean, leaving a bare and sun-parched surface. The windward beach which was once covered with a profuse vine that kept the sand in its place, is now travelling in huge wave-like heaps to the other side. The sand may be said to make a beach clear across the isthmus…

Hāmākua Poko-Hāmākua Loa: Plantations and Ranching Interests (1880)
George Bowser, editor of "*The Hawaiian Kingdom Statistical and Commercial Directory and Tourists Guide*" (1880) wrote about various statistics and places of interest around the Hawaiian Islands. In the following excerpts from "*An Account of the Sugar Plantations and the Principal Stock Ranches on the Hawaiian Islands,*" Bowser (1880) provided readers with an overview of the major plantations of the Hāmākua Poko, Hāmākua Loa region; as well as descriptions of the Spreckel's Plantation on the Wailuku-Waikapū lands, as they connected in area and by water to operations of the aforementioned lands. In the approximately 35 years since Jarves' descriptions of the land (cited above), readers find that the plantation and ranching interests have matured, and the ditch systems from the Ko'olau-Hāmākua watershed has been tapped to draw water to the more arid lands.

The Huelo Sugar Mill And Plantation, Huelo, 25 miles from Wailuku; post office address, Haiku, Makawao Road. T Akanaliili, Proprietor and Manager; Agents, C. Brewer & Co., Honolulu. Owns 1,500 acres. Under cultivation, 500; available for sugar planting, 1,200. Estimated yield for season of 1880, 900 tons. Men employed, 120; oxen, 200 yoke. Capacity of mill, 10 tons. This plantation is comparatively in its infancy, having only been in operation somewhere about 15 to 18 months, and in

that time Mr. Akanaliili has effected a most wonderful change in the appearance of the land. Where it was formerly overgrown with scrub and native trees it is now blossoming; not with the rose, but with the most magnificent fields of sugar-cane, which on some parts of the estate are actually growing on the verge of high, precipitous rocks, overhanging the sea, in some places, perpendicularly, at a height from the sea of – I am safe to say – 1,200 to 1,500 feet. The plantation is situated in one of the most beautiful parts of the Island of Maui, and the scenery is magnificent and grand in the extreme… [page 428]

I have measured cane on this estate (and it is not an isolated case,) which measured 10 inches in girth or circumference, and from 8 to 10 feet long, which is estimated to return 5 tons of sugar to the acre. Mr. Akanaliili has erected a flume, which runs through a considerable portion of his plantation, to carry the cane to the mill, and which works admirably. The mill in connection with the plantation has only recently been erected, and its capacity is 10 tons per day; it has all the modern improvements. The landing and anchorage attached to this plantation is all that can be wished for. The steamer *Mokolii* calls here once a week on her up and down trip from Honolulu, via the Island of Molokai. Fare, cabin, $6; deck $2. There is a splendid opening for an enterprising man to open a hotel for the use of tourists. Mr. Akanaliili, I am very sure, would render any assistance to the right man.
The Piholo [Pi'iholo] Sugar Plantation, Makawao, East Maui, 16 miles from Wailuku; post office address, Makawao, Makawao Road. Akanaliili & Co. Proprietors (T. Akanaliili & W.P.A. Brewer). Own 1,250 acres and rent 10,500. Under cultivation, 500. Estimated yield for 1880, 500 tons. Employ 60 men, 220 yoke oxen, 20 horses, 15 mules. Managers, Akanaliili & Brewer. Agents in Honolulu, C. Brewer & Co. The district of Makawao is well adapted to the culture of the sugar-cane, as it is favored by a most beautiful and magnificent soil. The scenery around this district is grand in the extreme, and the roads, for the most part, as far as Huelo, are in good order and makes riding very enjoyable. The various trees appertaining to the Islands grow here in great luxuriance.

The Haiku Sugar Mill and Plantation Haiku, No. 1 [Incorporated], Haiku, 15 miles from Wailuku; post office address, Haiku, Kahului Road; manager, S.T. Alexander; agents in Honolulu, Castle & Cooke. Own 4,000 acres; 500 acres under cultivation; 2,000 acres available for sugar, and 2,000 pasture and wood-lands. Estimated yield for season of 1880, 1,100 tons. Men employed, 175; oxen, 125 yoke. Capacity of mill…This plantation is situated in a beautiful part of the Island, and furnishes large returns to the properties, which must yearly increase to a large extent under the skillful management of the manager… [page 429] The manager's house and grounds are an object worthy of a visit from anyone who delights in horticultural and landscape gardening, and which goes to prove an undoubted fact, that the Islands are capable of growing to perfection a large variety of fruits, flowers, etc., in their greatest profusion.

East Maui Sugar Plantation Company, Makawao, 13 miles from Wailuku; post office address, Makawao, Main Road. W.F. Allen, T. Akanaliili and Edward Hoffman, proprietors. Own 2,000 acres; 350 under cultivation. Estimated yield for 1880, 500 tons. Capacity of mill, about 8 tons. Employ 80 men and 120 yoke oxen. This is another valuable piece of property, and the author has no hesitation in saying here, and this will apply to all the Islands, that in five years from now there will be ten times the amount of land under cultivation in sugar cane; that will bring to the owners very large returns by careful and systematic management.

The Haiku Sugar Mill and Plantation, Haiku, No. 2, [Incorporated], Makawao, twelve miles from Wailuku; post office address, Haiku, Kahului Road. Manager, C.H. Alexander; Agents in Honolulu, Castle & Cooke. Own 3,200 acres; 700 acres under cultivation; available for sugar planting, 3,000 acres; estimated yield for season of 1880, 1,500 tons of sugar. Men employed, 190; oxen, 125 yoke; capacity of mill… At this plantation there is every facility for the successful cultivation of a large area of land, and there is a splendid harbor and landing at no great distance from the mill, where vessels of the tonnage of 150 tons can lay at anchor with perfect safety.

The Grove Ranch Plantation, Makawao, eleven miles from Wailuku; post office address, Makawao, Kahului Road. W.F. Sharratt, S.B. Dole, A.S. Hartwell, J.K. Smith, and A.H. Smith, Proprietors; Manager, W.O. Smith; Agents in Honolulu, H. Hackfeld & Co. Owns 3,870 acres; 350 acres under cultivation; available for sugar planting, 3,870 acres; estimated yield for season of 1880, 800 tons sugar. Men employed, 110; oxen 110 [page 430] yoke. This is a very valuable plantation, and, as will be observed above, is all capable of being cultivated in sugar, and the able manager, W.O. Smith, Esq., will furnish large returns to the proprietors by his skillful and assiduous labors in the furtherance of that object…

The Lilikoe [Liliko'i] Sugar Plantation, Haiku Maui. Mr. Bowser, the publisher of this work, waited upon Mr. Bailey at the above plantation, who excused himself, stating that he had company at the house, and could not possibly furnish the particulars asked for, viz: the particulars as appended to all the other plantations. Mr. Bailey desired Mr. Bowser to write down the questions to be answered, which was done. Mr. Bailey faithfully promised to forward the same in a post or two, which has never come to hand. This was in February. Since then Mr. Bowser has forwarded to Mr. Bailey a most respectful requisition to the above effect, but no reply has come to hand. Consequently the names of all the employees of the Lilikoe Plantation will not appear in the Directory. Messrs. Hackfeld & Co., of Honolulu, are the agents, who will, I have no doubt, furnish any particulars about the above plantation. In the next issue full particulars will appear.

Claus Spreckels & Co.'s Sugar Mill and Plantation, Wailuku and Waikapu Common, seven miles from Wailuku; Kahului Road; post office address, Kahului. Owns 30,000 acres; 3,000 acres under cultivation; 25,000 acres available for sugar planting; the balance in pasture, etc. sole right of 32 streams for irrigating purposes; said right obtained direct from the Crown; estimated yield for season of 1880, 3,000 tons of sugar. The cane will average six tons to the acre. Number of men employed, 350; horses and mules employed, 70 head. [page 431]

The ploughing on the whole is done by steam ploughs, and the cane is transported by the aid of portable railways to the mill. The capacity of the mill will be about twenty tons per diem; the mill will have five crushers in two sets, one of three, and one of two. The mill buildings are now in course of construction, and it is expected that grinding may be commenced about November next. Mr. Spreckels has his own landing and storehouse at Kahului, and the sugar is brought down to the landing by Captain Hobron's Wailuku and Hamakua Railway. Messrs. J. Horner & Co. plant 600 acres, all under cultivation, on shares with this company. Mr. Spreckels calculates to import, inside of four years, 40,000 tons of sugar per annum from his Hawaiian estates. [page 432]

Maui–Communities and Scenery (Wailuku to Ko'olau ca. 1880)
Under the heading, "*An Itinerary of the Hawaiian Islands*…" (Chapter III Maui), Bowser (1880) described the native- and plantation-communities, and various attractions to be seen while traveling from Wailuku to the Hāmākua-Ko'olau region; and he provided readers with a detailed overview of the development of the East Maui Irrigation System. Bowser's description of the ditch and land development is highly accurate (being based on discussions with the builders); communications between applicants, developers, and Kingdom officials, cited later in this study, fill out the historical record:

…From Wailuku to Kahului I found the already familiar road in first rate order, either for horses or wheeled vehicles. The trade-wind, however, although it be the perennial benefactor of the island, is not at times a good traveling companion. This morning I found it in boisterous spirits. For the first seven miles of my journey my road was over a perfectly level country, on which there was not a tree to be seen. It is not for lack of good soil, I am sure, that neither trees nor cultivation are to be found over a great portion of the level land around Wailuku. Attempts will no doubt in time be made to irrigate this fine tract, either by extending the system of water-races, which have lately been constructed by the enterprising owners of sugar plantations, or by the and [sic] of artesian wells, and then thousands of acres here will be available for sugar planting and other agriculture.

I had not proceeded far on my way before I found myself in the neighborhood of the sugar plantation of Mr. Claus Spreckels, to whose enterprise and example this part of Maui owes much of its wealth. His enterprise, by demonstrating the feasibility, and above all, the profitable character of works by which the superfluous waters [page 505] of one district are made to fertilize districts otherwise unproductive because less bountifully supplied with water by Nature, has been one of the most important which the chronicler of the industrial development of the Islands has to record.

[Development of Spreckel's Ditch and Plantation]
Mr. Spreckels, who is a well-known San Francisco merchant, having on a previous visit examined the undeveloped land and water resources of Maui, engaged Mr. H. Schussler in the Spring of 1878, Chief Engineer of the Spring Valley Water Works of San Francisco, to accompany him, and thoroughly survey the land and investigate the scheme he had in contemplation for bringing water from the streams on the northerly coast of East Maui to the large fertile tract of bottom land known as the Wailuku and Waikapu Commons, and located on the neck of land connecting East and West Maui. Mr. Schussler finished the survey of a water race and pipe line, and made a general topographical survey of the land to be brought under cultivation. The work occupied him ten days, and upon his reporting the results to Mr. Spreckels, an application was made to the Government for a franchise for the proposed irrigation scheme. This was granted for the term of thirty years, with the privilege of thirty years extension. These preliminaries being arranged, Mr. Spreckels acquired, by a long lease, a tract of 15,000 acres of Crown lands, and, by purchase, an interest in a large adjoining tract, both areas being part of the bottom lands already spoken of. Returning to San Francisco, Mr. Spreckels contracted for a large amount of the best American plate iron with the house of Holbrook, Merrill & Stetson, Mr. Schussler's survey of the line of the race having shown that no less than thirty gulches required to be crossed by piping – gulches which varied in width from 150 to 2,000 feet, some of them having a depth of from 300 to 400 feet. Mr. Spreckels also contracted with the Risdon Iron Works in San Francisco for the manufacture of the iron he had

ordered in to 21,000 feet of piping of 35, 37, 39 and 41 inches diameter, with the necessary mouth-pieces, blow-offs, elbows, air valves and manholes, in accordance with the specifications prepared by Mr. Schussler. For economy in shipment, these pipes were telescoped into one another – one of each diameter in a lot – and wedged solid with wooden dunnage, and were then shipped direct to Kahului. From Kahului they were reshipped by small coasting schooners to Maliko Landing, near the line of the contemplated water race. Meanwhile Mr. Schussler proceeded to Maui with a large force of mechanics – white and Chinese laborers – numbering, at first, 250, and subsequently increased to 350. He also took with him sixty mules. The construction of the ditch was commenced [page 506] in October, 1878; camps were located in suitable places, and a depot established, at which the pipes were boiled in an asphaltum bath. The pipes were distributed as required to the different gulches they were to span by a force of about 120 bullocks driven by natives. Where these pipes cross the gulches substantial bridges to carry them have been constructed, and where the water has to be carried down to the level of these bridges, pipes sunk in ditches five feet deep and five feet wide make the necessary connections with the race at either end. The pipes are in sixteen-feet lengths, and are connected with each other by heavy iron bands and lead joints, a system which had already proved so successful on the former pipe lines constructed under Mr. Schussler's direction in California and Nevada.

According to the lay of the ground, the ditch was cut of varying dimensions, so as to keep the carrying capacity about equal, as the grade varied. Where the fall is four feet in the mile the ditch is thirteen feet wide at the top and nine feet at the bottom, with a depth of three feet and four inches. The run is all cut in the solid ground from gulch to gulch. The various streams being thus crossed at right angles, are connected with the main fall by side ditches. To give an idea of the great additional labor and expense involved in thus securing the inflow of the various streams crossed, I may mention that one of them necessitated the construction of four miles of difficult ditching, with three tunnels and 950 feet of heavy piping, involving an outlay for this side work alone of $25,000. As the work was being completed, working in an easterly direction, the force employed upon it was gradually diminished, until now it is reduced to about eighty men, who are expected to complete the work and bring in all the streams included in the franchise granted to Mr. Spreckels before the end of the current year, 1880. The length of the race, as constructed up to the present time, is forty miles, including the side ditches, and its delivering capacity is about 60,000,000 of gallons daily.

The main work was so far advanced within ten months after the first stroke of the pick upon it, say, by August, 1879, that water was then let into the commons, and ploughing commenced. In order to gain an accurate knowledge of the lay of the land to be irrigated, Mr. Spreckels had a thorough topographical survey made of it, with the aid of which, he has been able to devise a complete system of irrigation. He has also commenced the construction of a large distributing reservoir at the lower end of the race, which will, when complete, contain about 40,000,000 cubic feet of water. In the plan of irrigation adopted, each acre has a separate number, and is surrounded [page 507] by a path ten feet wide. Every twenty-five to thirty acres are again surrounded by roads forty to fifty feet wide. By this method, the furrows in each acre can be filled with water in about twenty minutes, so that in ten hours work one man can irrigate from twenty-five to thirty acres per day, whilst under the systems hitherto in vogue, one or two acres were considered a day's work. The furrows in which the cane is planted are two feet wide at the bottom by a foot at the top, about

eight inches high, and six to seven feet apart from centre to centre. Planting was commenced about the middle of December, 1879, and discontinued in January following, by which time a little over 500 acres had been planted. At this time (July, 1880), the cane is growing finely, promising an enormous crop, which will be ready for the mill at the beginning of 1881. The mill is situated in a central part of the estate, and in a position which will allow the greater part of the cane to be brought to it on a downward grade, over portable and stationary railroad tracks. The mill, which is to be one of the most complete ever imported into the islands, is in course of construction at the Risdon Iron Works, San Francisco.

Mr. Spreckels is now engaged in planting another cane-field of 1,600 acres, which work will be finished by the end of this year. This cane will come in for the season of 1882. He has also contracted with several parties from California to raise cane on shares with him on portions of the property. One of these is to work 500 acres and the other 600. By these arrangements, he will, when the season of 1882 comes round, have between ten and twelve thousand tons of sugar coming forward. Mr. Spreckels has the intention of planting from 1,500 to 2,000 acres of new land each year, rattooning or volunteering the older crops for several years, until they require replanting. He also contemplates erecting additional mills in the near future, as the necessities of the plantation demand. The whole work undertaken by Mr. Spreckels is one of the most gigantic enterprises of its kind, and reflects great credit on the master mind that conceived it, and on the engineering skill with which it has been conducted. May it have that complete and lucrative success which it deserves!

At nine miles from Wailuku I came to the dairy ranch of Mr. W.H. Rogers. The country here is rich pasture, and, at the same time, suitable for agriculture. The numerous hedge rows, formed of a species of cactus, which was growing from five to nine or ten feet high, had a curious appearance. These cacti serve the cattle in dry weather as a substitute both for their ordinary fodder and for water. Both horses and cattle thrive upon them, and so do the pigs, for whom the lobes or leaves are boiled, along with skim-milk and the usual pigwash. [page 508]

[Makawao Described]

Twelve miles from Wailuku, the road enters on the district of Makawao, which is rather an extensive one. The country all around is beautiful – the sea on the left, about nine miles off the great mass of Haleakala. Looking round, there are to be seen within a radius of ten miles some of the most beautiful homesteads that it has been my lot to meet with anywhere. At nearly all the homesteads on these slopes you will see groves of the eucalyptus, the gum tree of Australia. These have been planted to shelter the houses and gardens and home paddocks from the trade winds, which, as I experienced that morning, occasionally blow here too strongly to be pleasant. The eucalyptus has been introduced here, as into so many other countries, partly for its own sake, but chiefly on account of its rapid growth, which, where shelter has to be provided, renders it one of the most desirable of trees. Everywhere in this district the pasture seemed to me to be the very rich; horses and cattle were in excellent condition, and everything betokened the capacity of the country to carry a considerable population. Settlers with a little capital and with thrift and industry would make this "wilderness blossom like the rose." The climate is good – not too hot, but yet always genial. Those plagues of hot countries, mosquitoes, are not found in the district, and no more tempting place could be found for the Englishman or the American to settle in.

[Makawao Village Described]

At Makawao Mr. Miller has a very fine place, and the finest piece of pasture I have seen in the Islands is just at the back of his house. The house is surrounded by eucalyptus trees, and commands a splendid view of the sea, which is about nine miles away to the north. A ladies' boarding-school has been established in the district. It is called the East Maui Female Boarding Seminary, and is conducted by Miss. H.E. Carpenter. The establishment is capable of accommodating fifty boarders. There is no day school in connection with it. There are also two Government schools for the natives and two churches. The township is a more considerable one than I had expected to find here. Several stores, some kept by Chinese as butcher-shops, and a couple of coffee-saloons and the post office make up a tidy little township. There is a junction of roads here; one way leads to Huelo and Haiku, and the other kept on more directly to the eastern plantations. This, no doubt, is partly the cause of the size of the place and the business done in it. Travelers can obtain fair accommodation in the township, either at Mr. Miller's, where I stayed, and which is a capital house, and kept by a first-rate host, or at several other places. [page 509]

[Haleakalā and Environs Described]

The crater of Haleakala has not the cup-like shape proper to a volcano, and on account of which the name crater has been adopted. It is very irregular in outline, and at two places there are gaps, as if the crater rim had yielded to pressure, or been disrupted by an earthquake… There is a great rift on the northern side, which shows no sign of any eruption of lava having accompanied the breach of the crater wall, and which ends in a deep ravine cut into the mountain side. A similar breach appears at the southeastern side…

[Road from Makawao to Ha'ikū]

Leaving Makawao I took the more northerly road, and a pleasant ride, between six and seven miles, brought me to Haiku. The roads, ever since I started from Wailuku, I found good and easy travel- [page 510] ing for anyone, whether he drives, rides or goes on foot. Of course the road to the top of Haleakala is an exception; but throughout the cultivated country and on beyond Haiku as far as Huelo, the roads are first-class. The ride to Haiku was a pleasant one, the day being fine and the scenery still more so. When you get to Haiku Plantation No. 1 there is a most magnificent view of the mountains and of the sea. Fields of sugar cane and beautiful pastures greet the eye on every side. From this plantation to the Haiku Plantation No. 2 the road is in some places very precipitous, the traveler having to pass through a steep defile. At Haiku there are various stores, three of which are kept by Chinese. There is also here a telegraph office in connection with the line I have already spoken of. The residence on Plantation No. 1 is a capital house, with beautiful grounds, well made out. The main carriage entrance to the house is through an avenue of guava trees. Here Mr. Alexander, the manager of the plantation, lives…

[Road from Ha'ikū to Huelo]

From Haiku to Huelo the distance is about three and a half miles. The road continues good, but there are five or six deep gulches to cross on the way, involving the exercise of patience. The land along the route is owned by the Crown or by members of the Royal Family, and is of various qualities, suitable for growing almost anything. In some parts it is heavily timbered with *ohia*, *koa*, *kukui*, *puhala* and other native woods. These woods are all useful for various purposes. There are two kinds

of *ohia*. One of them bears a fruit known here as the mountain apple; the wood of the other is much in request for wheelwrights' purposes. In such spots as this, which are so often to be met with on the Hawaiian Islands, the tourist will always find plenty to amuse and interest him. The gulches are full of ferns and other interesting vegetation. Along the road the native houses are scattered, but they are not so numerous as they formerly were, and are continually growing fewer. I ought not to omit to mention that it is from this neighborhood that the water for Mr. Spreckels' plantation is procured by means of the water race already spoken of.

[Huelo Plantation]

At Huelo is the plantation and residence of Mr. T. G. Akanaliili. This gentleman and his wife gave me a most hospitable reception. This plantation is situated in a fine part of the country; the land is all virgin soil, and, when I was there, there were some 500 acres already planted with sugar cane, which struck me as being the finest sample I had yet seen, and I measured some of it, which has ten inches in girth and [page 511] from eight to ten feet long, a style of cane which will, I feel sure, turn out five tons to the acre. Mr. Akanaliili has erected a flume which is nearly two miles long, the purpose of which, besides the conveyance of water to points where it may be needed, is to float the sugar cane down, from the fields in which it is grown, to the mill, an arrangement which will save a great deal of money in the matter of carriage, besides being more expeditious. Another advantage this plantation has is derived from nature and not from the skill and ingenuity of man. There is no irregular ground upon it, so that it can be worked at a much less expense than those of many of his neighbors. Mr. Akanaliili has erected a very fine sugar mill on the premises which is capable of turning out ten tons per day…

There is a first-rate landing at Huelo, with eight fathoms of water at the landing, and a small steamer from Honolulu called the "*Mokolii*" calls here every week. The fare is only six dollars (two on the deck), and visitors, besides enjoying the natural beauties of the place, would have no lack of amusement, there being plenty of shooting in the mountains for gentlemen, ferns in the gulches for ladies, and fishing in the sea for both.

Mr. Akanaliili is not, as his name might lead my readers to suppose, a native of the Hawaiian Islands. He is a Chinaman. Akanaliili simply means, Little Akana, the latter being his name, and the adjunct an addition by the natives, which he has adopted. He was a mere boy when he came to these islands, twenty-seven years ago. A self- made man, he is now the proprietor of the plantation on which he resides, which is 1,500 acres in extent, of half the Piholo plantation, nearer Makawao, and of one-third the East Maui plantation. He also owns a large ranch on the other side of the Island, where he has, at the present time, 1,500 Angora goats. Here is an example of what may be done by industry and pluck and thrift. Here, too, is a contrast to the ways of that native race, whose decline everyone bewails and no one seems to know how to prevent, and which, to my mind, would be quickly checked by good, honest work, instead of the lazy lives they mostly live.

Before parting from the description of this part of the country, I ought to mention that some of the sugar cane on the Huelo plantation is grown within a few yards of the edge of the ocean cliffs, which are [page 512] here very precipitous, in some places almost perpendicular for ten or twelve hundred feet, right down to the sea. This shows that even in the most unpromising places every inch of land in this part

of Maui is capable of cultivation, and only requires the capital and the will to make productive.

[Roads of the Huelo-Ko'olau Region]

After leaving Mr. Akanaliili's plantation, the road for the first mile and a half is through a woodland country, all virgin soil. The tourist from this point will have a bad and precipitous road to travel, which can only be safely got over by the help of mules. Horses are scarcely of any use, for the way is all down one steep face of a gulch and up another, and when you are crossing the intervening country, from one gulch to another, it is worse than going either up or down. The road is nothing but deep ruts, worn by constant travel on the same track and full of mud and water, so that you never know the moment when the animal you ride, be he horse or mule, will stumble into some hole, and fall and break his leg. To make up for all this, however, you have some of the most magnificent scenery that it has been my lot to travel through anywhere… All manner of evergreen trees indigenous to the Islands, contrasts of a delightful kind between the foliage of one tree and another, especially between the *Kukui*, or candlenut tree, and that which bears the mountain apple, cascades in the far distance, and ever and anon a sudden vision of the beautiful blue sea, with its great waves dashing against the steep cliffs…

There is, for the most part, a lack of song-birds in the Hawaiian forest or open country; but whilst traveling this wild but charming region, I have listened to the song of a bird which resembles in its note the European lark.

[Honomanu and Ko'olau]

At a place called Honomanu, I stopped the night at the house of a Hawaiian native. Here we were served for supper some *poi*, baked fish and baked taro, with some of the clearest and nicest water I ever [page 513] tasted. The beach is within a stone's throw of where we slept, and we were lulled to sleep by the surge upon the shore. The valley where this is, is only about a furlong wide and four or five miles long. In it a few native cultivate small patches of taro. It is distant about twenty miles from Hana, the easternmost part of the Island. The mountains each side of this place are very high, 800 feet or more, and on either side the bridle path winds very considerably. It took us just twenty minutes to go down one side and about half an hour to ascend the other. In each of the gulches in this country you have a good-sized torrent to cross. Tourists, at any rate, at this time of the year, should not attempt the journey without a good guide and an equipment of light rubber clothing. As far as I can learn, May, June and July are the best months in which to make the tour of the Islands.

[Ke'anae Village & Garrett's Sugar Plantation]

My next halting place was the little hamlet of Keanae. There are here only a few *Kanaka* huts and some patches of taro cultivation, but it is just the spot for the growth of sugar cane, and has the benefit of a very good landing, at which the steamer "*Mokolii*" calls about once a month. Mr. J.C. Garrett has a sugar plantation here, which was a delight to the eyes as a contrast to the forest scenery I had been passing through. There are something like 2,000 acres here, all virgin land, capable of being turned to account for the cultivation of the sugar cane… Wailua is the name of the next place I arrived at, about two miles further on. Near the road from Keanae to here there are several beautiful waterfalls. These, in the summer time, are beautified by perpetual rainbows…

[Wailua and Nāhiku Described]

The Wailua valley is about two miles square. There are here a church and a school house and a number of native houses, some which are built of wood. Some of these natives, are, I heard, well to do in the world. Certainly they live in a delightful spot. There in the valley two very romantic waterfalls, each with a fall of about 500 feet. Some of those already spoken of in this neighborhood have [page 514] a clear fall of seven hundred feet… My next halting place was Nahiku, about half-way between Honomanu and Hana. This place is in a very delightful little valley surrounded on every side by precipitous mountains, and rejoicing in the richest possible soil. It only wants thirty of forty industrious families settled in each of these lovely valleys to make the country a very different aspect… There are here several varieties of shell-fish that are eatable, and in the mountain streams there is a kind of shrimp which is very plentiful. These turn red like the lobster when cooked, and are very fair eating… [page 515]

The native huts are generally constructed of a framework of bamboo, with something more substantial for uprights with rafters of bamboo for the roof. Over these a covering is laid of the native grass called *pili*, which will last for twenty years, and will withstand the heaviest rains. Some huts, however are covered with *lauhala*, which is the leaf of the *puhala* tree. The natives sometimes cook inside their huts. The sleeping place is on a raised platform about a foot and a half from the floor, and is covered with two or three layers of matting, also made of *lauhala*… [page 516]

…Leaving Nahiku, I found the rest of the road to Hana good for the most part, even at this time of the year. The scenery continued to be enchanting, the route passing through dense masses of tropical trees, ferns, etc. The guava trees, breadfruit, bananas and mountain apples are very plentiful, and can be had for the picking. It is ten miles from Nahiku to Hana, and all the way there is a breadth of about eight miles between the sea and the mountains, which is capable of growing *awa*, taro, potatoes, sugar cane, etc., the whole being up to the present time, virgin soil… There is an excellent landing at Nahiku, with every facility for shipping away the products of industry when industry shall appear upon the scene… [page 518]

[Gulches and Streams from Ha'ikū to Nāhiku named]

…[B]efore I close my account of the eastern trip, it may be of interest to the future tourist who may be induced to follow on my track, to enumerate in their order the many gulches into which the road plunges between the Makawao district and Hana. The following list, in which the names of these ravines are given in strict order, will enable the traveler to ascertain the locality at which he may at any time have arrived, merely by keeping count of his frequent descents. Starting, then, from Haiku, the order is as follows: 1, Kakipi; 2, Honopou; 3, Holawa; 4, Waipio; 5, Huelo (village here); 6, Hoalua; 7, Kailua; 8, Nailiilihaele; 9, Kahauola; 10, Oopuola; 11, Makanale; 12, Kaaiea; 13, Kalaauokiopihi; 14, Pohakuhonu; 15, Kolia [Kolea] (village here); 16, Waikamoi (Large village here); 17, Wahinepee (large village here); 18, Puohokamoa (large village here); 19, Haipuaena; 20, Honomanu (village here); 21, Nuaailua; 22, Keanae (small village here); 23, Ohia; 24, Kaamilo; 25, Wailuanui; 26, Wailuaiki; 27, Kopiliula; 28, Waiohue; 29, Kapaula; 30, Hanawi; 31, Nahiku (village here); 32, Palipilo (river here); 33, Hana… [page 522]

Ranching Interests Developed on the Hāmākua Lands (ca. 1830-1930)

One of the most significant impacts on land use and land tenure in the nineteenth century, was the emergence and formalization of ranching operations. The Hawaiian ecosystem evolved without large hoofed animals—indeed, prior to Polynesian contact, only two mammals recorded as having been on land in the islands, the *'ōpe'ape'a* and the *'ilio holo i ka uaua* (the Hawaiian bat and monk seal) (Carlquist 1980). In the period that the Hawaiian ancestors were colonizing these islands, they brought with them things which were of value to them, among which was the Polynesian pig (*pua'a*) and dog (*'ilio*), both of which were important as food items and in ceremonial practices. These *holoholona* (animals) were generally smaller than their European or continental counterparts, and were kept near places of residence. To facilitate their management in populated areas, the Hawaiians developed *pā* (walled enclosures) of varying forms that were at times, connected to the *pā hale* (house lots) of the Hawaiian *kauhale* (homesteads). Ethnographers Handy, Handy and Pukui (1972) wrote about the care of pigs:

> Generally they were allowed to run about the *kauhale* (homestead) and gardens while they were young pigs, but when they were sizable and ready for fattening they were penned inside enclosures of heaped-up stones. [Handy, Handy and Pukui 1972:253]

In 1778, European boars, goats, rams, and ewes were introduced by Captain Cook (Beaglehole 1967:276, 578-579). Later, in 1793, cattle were brought to Hawai'i by Captain Vancouver. Given as gifts to the king, a ten-year *kapu* was placed upon the cattle to protect them and allow them to reproduce (Kamakau 1961:164). Between 1793 and c. 1811, new stock was added, and the numbers of cattle had increased dramatically. The cattle and other introduced stock rapidly became a problem to the native population and forests, and by the 1840s, had intruded upon the lands of the Hāmākua-Makawao-Honua'ula region, causing the abandonment of some districts (cf. Kamehameha III, February 14, 1846; and J.S. Green, October 3, 1846 in this study). The sizable populations of cattle, led the King, *Konohiki*, and foreign residents to develop business interests focused on ranching operations.

Ranching interests were developed in the Huelo-Ha'ikū vicinity of Hāmākua Loa and across the district of Hāmākua Poko, extending up the mountain slopes and out into the Kula and Wailuku Districts (cf. Wilkes 1970 in this study). One of the earliest communications regarding formalized ranching activities on lands in the Makawao-Hāmākua Poko vicinity, is dated September 10, 1838, and is in the form of a lease from Governor Hoapiliāne to Wm. McLane and Edwin Miner. The lease (cited in this study – section titled "*Moku o Makawao (District or Section of Makawao)*") granted them a 50 year lease of the land, with the right to water, and trail access to the shore, in order for them to export their cattle.

Kingdom laws and large business interests brought the population of cattle under some control, and from ca. 1875, large independent ranches were able to supply more than an adequate amount of beef for the island market (Maxwell 1900). During the last quarter of the nineteenth century, as plantation interests on Maui expanded, primarily a result of the development of reliable water sources for irrigation, the grazing range in the Hāmākua region *kula* lands decreased and the cattle were forced into the higher elevations. Maxwell (1900) observed:

> ...the meat-eating population has increased, while the areas devoted to grazing and the numbers of cattle have gradually diminished... Formerly [cattle]... had wider ranges to rove over and feed upon; they were possessors of the land, and their value consisted chiefly in the labor and hides that they yielded. At that time the plantations, which were of smaller areas than now, were almost wholly worked by bullock labor... In the course of time, and that very recent, the sugar industry has

undergone great expansion. The lands, some of which formerly were among the best for meat-making uses, have been absorbed by the plantations, and the cattle have been gradually forced within narrower limits at higher altitudes [Maxwell in Thrum 1900:75-76].

While some native tenants kept livestock (primarily for subsistence purposes), *ali'i* and non-Hawaiian awardees and grantees of large tracts of land developed the formal ranching interests in the Hāmākua lands (cf. Wilkes 1970 in this study). Among the early ranch developers in the area were members of the Alexander, Baldwin, Andrews, Green, Wood, and Hobron families; who also generally represented the plantation interests who had need of livestock for plantation work.

In 1903, Thrum wrote about the "Development of Hawaii" (Thrum 1903). In his discussion on ranching, he observed that "cattle raising is confined chiefly to the mountainous districts, where natural pasturage is abundant" (Thrum 1903:52). Of interest, he also reported that the "horn fly" had become such a pest to the cattle, that "the keeping of herds" on the lowlands, was "considered practically impossible" (Thrum 1903:52).

In 1929, the University of Hawaii published a "Survey of Livestock in Hawaii" by L.A. Henke. Henke provided readers with background information pertaining to the history of livestock and the operation of ranches in the islands. The excerpts below, come from Henke's 1929 research publication, reporting on the "leading beef ranches of the Territory." Among these ranches were Grove Ranch and the Hawaiian Commercial and Sugar Company Ranch and Dairy:

Maui Agricultural Company's Grove Ranch

Grove Ranch, the livestock division of Maui Agricultural Company, is located at Makawao, Maui, and comprises a total of about 12,000 acres of grazing lands ranging from sea level to about 2,500 feet elevation. The ranch acreage has been decreasing year after year as more and more of the lands are being utilized for pineapple growing for the joint account of the Maui Agricultural Company and the California Packing Corporation.

Grove Ranch at present has 1,676 grade polled Angus cattle, 72 Holstein cows, 80 light horses, eight Percherons, 189 hogs and five sheep. This has not always been a polled Angus ranch. Shorthorn bulls were introduced by Lorrin Andrews in the nineties and crossed with native cattle and later Hereford bulls were introduced and crossed with the Shorthorn grades. When D. T. Fleming became manager of the ranch early in 1900 all Hereford cattle were disposed of and the beef herd today consists essentially of polled Angus cattle.

Cattle are marketed when 2 ½ to 4 years of age and average 475 to 525 pounds dressed weight. About 600 are marketed annually, all slaughtered locally on Maui.

Lorrin Andrews, while manager, introduced *Pilipiliula* (*Chrysopogon aciculatus*), Bermuda grass (*Cynodon dactylon*), Hilo grass (*Paspalum conjugatum*), *Kakaipuaa* (*Syntherisma sanguinalis*), and a blueweed called *Oi-puu-plu* by the Hawaiians.

Mr. Fleming early in 1900 introduced several more of the Paspalums and Rhodes grass (*Chloris gayana*).

In recent years during the managership of W. A. Clark, pigeon peas were planted in the Haiku section, of which there now are 300 acres. The area has been decreased because each year more land is given over to the planting of pineapples.

Haiku Ranch was consolidated with Grove Ranch in 1904. Various men have been identified with the ranch in the past thirty years. Among the men who have served as managers are Lorrin Andrews, Frank Tilton, H. A. Baldwin, Will E. Beckwith, John Ritchie, Fred Baldwin, D. T. Fleming and George Steele. Others who conducted the affairs of the ranch for a time are Messrs. Kaumoana, Luna and Kalaina.

At present H. A. Baldwin is manager of Maui Agricultural Company, Ltd., and W. A. Clark has been manager of Grove Ranch since 1912.

Hawaiian Commercial and Sugar Company
Ranch and Dairy

The ranch lands of the Hawaiian Commercial and Sugar Company consist of about 6,000 acres of fee simple lands running from the sea to an elevation of about 250 feet. The rainfall in this section is light,–24 inches and less per year,–and the area is largely covered with algaroba trees (*Prosopis juliflora*) which, while they largely prevent grasses from getting started, provide an excellent feed in themselves. The bean season lasts from the middle of June to the middle of December and cattle make good growth during this time but often little more than maintain themselves during the season when the beans are not maturing.

This plantation has long carried cattle but only as a minor division of the major enterprise, which is the production of sugar. In 1907 about 1,200 head of cattle of mixed breeding, with Holstein blood predominating, were found, sixty of these being used as dairy animals, the balance being in the beef herd, but as production of any cows in the dairy dropped to a low level they were sent out to the general ranch and other more promising milkers were brought in. In this way some 300 different cows might pass through the dairy in one year, only about sixty of them being there at any one time, a plan still in vogue to a lesser degree in some places.

Twenty grade Shorthorn cows were introduced in 1912.

The first purebred Holstein cows, five head, were purchased from Puuwaawaa Ranch in 1916, and eight Holstein bulls were imported from the States in the same year. Six additional purebred cows were purchased in Vancouver in 1919 and fifteen more through Giltner Bros. of Kentucky in 1922, the above animals being the foundation cows of the present dairy herd. An excellent bull, "Excelsior Job," was purchased in New York State in 1923. Some fifty of a total of 130 milking cows are purebred at the present time. Practically all of the milk is consumed by the Hawaiian Commercial and Sugar Company employees.

Since 1920 the dairy has been kept distinct from the ranch, the total cattle in both divisions numbering about 900 head. The beef herd consists essentially of Holstein cattle and Holstein sires are used. According to Ben Williams, who has been manager of the ranch department since 1907, they experienced trouble from sore eyes with both Herefords and Shorthorns.

Cattle are slaughtered at 2 ¼ to 3 ½ years of age, when they dress out at 275-525 pounds. About 150 are slaughtered annually, all being consumed locally, and besides about 200 head are purchased to supply the needs of this community.

Cattle are bred so that most of the calves will be dropped from May to August. Bulls are left on the range only sixty days, when new bulls are substituted, for they find that their stall-fed bulls from the dairy are pretty thin after two months on the range.

Inferior milk cows from the dairy are added to the beef herd from time to time, but none of the range animals are brought in the dairy now as was formerly done.

Pasture lands are added to the cane fields from time to time and as a result the number of cattle in the ranch department is decreasing.

The dairy animals are fed in the barns and paddocks and alfalfa (*Medicago sativa*), elephant (*Pennisetum purpureum*) and merker grass (*Pennisetum merkeri*) and cane tops (*Saccharum officinarium*) are largely relied on for roughage.

Hawaiian Commercial and Sugar Company has a large number of work animals, including about 600 draft and light breeding mares, 100 progeny of these, 140 draft horses, 225 saddle animals, 200 mules and 60 pack animals.

They also have about 60 Duroc-Jersey hogs, eighteen of which are breeding animals. [Henke 1929:54-56]

A CHRONOLOGICAL HISTORY OF THE LAND AND PEOPLE IN THE HĀMĀKUA-KO'OLAU REGION

There are several important primary (first-hand account) sources of historical documents that provide readers with detailed descriptions of residency, land and water use, travel, business, and transitions in land tenure in the Hāmākua-Ko'olau region. These historical resources include—communications between residents and government officials, and inter-agency communications; the papers and maps of Alexander and Baldwin, and East Maui Irrigation Company; articles and letters published in newspapers of the Hawaiian Islands (both Hawaiian and English language papers); and journals and letters of foreign residents and visitors. The two most significant collections, reviewed as a part of the present study were records from government collections, and those of the private collections of Alexander and Baldwin-East Maui Irrigation Company. These two collections may be briefly summarized as:

(1) The government collections—portions of which are found at the Hawai'i State Archives, Survey and Land Division, and Bureau of Conveyances. Though spread between several repositories, records spanning from ca. 1840 to the present-day were found which describe various facets of the history of the Hāmākua-Ko'olau region. By the middle 1840s several divisions of government in the Hawaiian Kingdom had been established, and charged with the responsibility of ensuring that the people could contribute to, and benefit from public resources and programs. The programs included (but were not limited to) the land and resource branches of the Interior Department (which bore responsibility for such functions as the Land Commission and *Māhele 'Āina*; land grant, survey, and homestead programs; road improvements; and public works), the Bureau of Conveyances; and the Department of Public Instruction.

(2) The private collection of Alexander and Baldwin-East Maui Irrigation Company, which includes field survey notes and maps; records on development of the East Maui Ditch System and plantation lands; a significant collection of land title records and genealogies (tracking disposition of land); crop and flow volume records; and photographs. Access to the collection was granted *Kumu Pono Associates* during the course of preparing the present study, but because access is limited, Maly reviewed documents, took notes, and used reference dates and names to identify information that could be found in public collections.

This section of the study is separated into several sub-sections, which direct readers attention to particular aspects of the history of lands, families, and resources of Hāmākua Poko, Hāmākua Loa, and Ko'olau. The records (by category) are generally presented in chronological order, spanning the period ca. 1840 to 1950 [7]. The sub-sections include:

[7] The part of this study which chronicles development of the East Maui Ditch System, under authority and license of King David Kalākaua, in 1876—and subsequently licensed by the Republic, Territory and State of Hawai'i—is presented under a separate heading. "*E 'Olū'olū 'Ana ka Wai i nā 'Auwai—Development and Operation of the East Maui Ditch System.*" While the primary records pertaining to ditch development and water licenses are located in government collections, they are treated here as a separate section of the study, in order to provide readers with easier access to the primary records pertaining to the history water use and ditch development. It should be noted that the historical narratives and government records which precede the section on ditch history—as well as the oral history interviews which follow in *Volume II*—all have direct bearing on the discussions of traditional and customary practices and water rights, and ditch history.

A. *Kānāwai (Pertaining to Water and Water Laws)* (pages 62-79)
B. *Kuleana 'Āina (Land Tenure)* (pages 80-304)
C. *Historical Communications Documenting Land Use, Applications for Land and Residency (ca. 1847-1920)* (pages 305-398)
D. *Nā Alahele me nā Alanui Aupuni (Routes of Access–Trails and Government Roads)–ca. 1847-1925* (pages 399-422)
E. *Forests and Watershed Conservation (ca. 1840-1924)* (pages 423-443)

Many of the communications cited in the following section, were originally recorded in the Hawaiian language. Some records were previously translated, others were not—the latter were translated by Maly. In some cases it was found that significant discrepancies between the original Hawaiian texts and existing English translations exist, and Maly revised existing translations based on the original Hawaiian text. Such communications are so noted[8].

A. Kānāwai (Pertaining to Water and Water Laws)

Of direct interest to the discussion of water, are several laws (*kānāwai*) and descriptions of *nā pono wai* (water rights) which were handed down from antiquity, and as they came to be interpreted through the period of development of the historic Hawaiian economy. In addition to the discussions cited earlier in this study, pertaining to traditional customs and practices associated with water use, we find a number of important papers which address water. Among the laws, articles, and reports cited herein is — the Law of 1840, pertaining to the "division of Water for irrigation;" a detailed article written by Water Commissioner Emma Nakuina, in 1894; a "Brief History of Hawaiian Water Rights" written by Judge Antonio Perry in 1912; and a paper titled "The Hawaiian System of Water Rights" prepared by Wells Hutchins (1946) of the Division of Irrigation Soil Conservation Service, United States Department of Agriculture.

The papers are cited here, as they provide readers with an important understanding of *nā mea wai* (water matters). Oral history interviews conducted as a part of the present study demonstrate that the basic knowledge of water rights and responsibilities (as those described in the following papers) are still practiced by some native residents of lands in the Hāmākua-Ko'olau region, as well.

The Polynesian (October 2, 1841)
Laws of the Hawaiian Islands - November 2, 1840.
15. Of the division of Water for irrigation.

…In all places which are watered by irrigation, those farms which have not formerly received a division of water, shall when this new regulation respecting lands is circulated, be supplied in accordance with this law, the design of which is to correct in full all those abuses which men have introduced. All those farms which were formerly denied a division of the water, shall receive their equal proportion. Those bounties which God has provided for the several places should be equally distributed, in order that there may be an equal distribution of happiness among all those who labor in those places. The allowance of water shall be in proportion to the amount of taxes paid by the several lands. For it is not the design of this law to withhold unjustly from one, in order to unjustly enrich another according to the old system which has been in vogue down to the present time. That the land agents and that lazy class of persons who live about us should be enriched to the impoverishment of the lower classes who with patience toil under their burdens and

[8] Italics and underlining emphasis, and the use of square brackets to enclose text are used below by the authors of this study. (Also Note: the abbreviation HSA = Hawaii State Archives.)

in the heat of the sun is not in accordance with the designs of this laws. This law condemns the old system of the king, chiefs, land agents and tax officers. That merciless treatment of the common people must end. If the Governor thinks it proper to adopt a protective policy, let him protect all alike, and there shall be an equal division of protected articles, in order that every man may obtain the object of his desire according to the amount of his labor. Such is considered to be the proper course by this law, regulating the property of the kingdom; not in accordance with the former customs of the country which was for the chiefs and land agents to monopolize to themselves every source of profit. Not so with this law… [Government Newspaper, The Polynesia; October 2, 1841:66]

In the matter of water, the *Kuleana Act* (August 6, 1850) which remains the foundation of law pertaining to native tenant rights, reads:

An Act confirming certain resolutions of the King and Privy Council passed on the 21st day of December 1849, granting to the common people allodial titles for their own lands and house lots, and certain other privileges…

…Section 7. When the Landlords have taken allodial titles to their lands the people on each of their lands shall not be deprived of the right to take firewood, *aho* cord, thatch, or ti leaf from the land on which they live, for their own private use, should they need them, but they shall not have a right to take such articles to sell for profit. They shall also inform the Landlord or his agent, and proceed with his consent. The people shall also have a right to drinking water, and running water, and the right of way. The springs of water, and running water, and roads shall be free to all should they need them, on all lands granted in fee simple. Provided, that this shall not be applicable to wells and water courses which individuals have made for their own use… [copied from original hand written "Enabling Act"[9] – HSA, DLNR 2-4]

1894
Ancient Hawaiian Water Rights
And Some Of The Customs Pertaining To Them
(Written for the Hawaiian Annual by Mrs. Emma Metcalf Nakuina,
Commissioner of Private Ways and Water Rights, District of Kona, Oahu)

All *auwais* (water courses), had a proper name, and was generally called after either the land, or the chief of the land that had furnished the most men, or had mainly been instrumental in the inception, planning and carrying out of the required work. All *auwais* tapping the main stream were done under the authority of a *Konohiki*[1] of an *Ahupuaa, Ili* or *Ku*.[2] In some instances the *konohikis* of two or three independent lands—i.e. lands not paying tribute to each other—united in the work of *auwai* making, in which case the *konohiki* controlling the most men was always the recognized head of the work.

Auwais, were generally dug from *makai*—seaward or below—upwards. The *konohiki* who had the supervision of the work having previously marked out where it would probably enter the stream, the diggers worked up to that point. The different *ahupuaa's, ili's or ku's* taking part in the work, furnished men according to the

[9] See also *Kanawai Hoopai Karaima no ko Hawaii Pae Aina* (Penal Code) 1850.
[1] Landlord or sometimes a steward representing him; term also applied to the duties that would be required of the landlord by the King.
[2] Terms generally used for land divisions according to size or area, although not invariably so.

number of cultivators on each land. There was no limit though to the number of laborers any land might furnish, and it often happened that a small *ku* or *ili* was sometimes represented in the *auwai* making by more men than a much larger land or *ahupuaa*, and would thus become entitled to as much or more water, at the distribution of the water privileges, than were assigned larger tracts.

The dams were always a low loose wall of stones with a few clods here and there, high enough only to raise water sufficiently to flow into the *auwai*, which should enter it at almost a level. No *auwai* was permitted to take more water than continued to flow in the stream below the dam. It was generally less, for there were those living *makai* or below the same stream, and drawing water from it, whose rights had to be regarded.

Any dam made regardless of this well recognized rule, were levelled to the bed-rock by the water right holders below, and at any rebuilding, delegates from each dam below were required to be present to see that a due proportion of water was left in the stream.

The general distribution of the quantity of water each independent land was entitled to was in proportion to the quota of hands furnished by each land, but subject to regulations as to distance from source of supply. This quantity was regulated by the time each had in the water rotation or division, when such land would take all or almost all the water of the *auwai* for the period of time allotted to it. This time varied in the cases of *mooaina*, *ku*, *ili* or *ahupuaa* from a few hours, half a day, a day, night, or both, to two or three days. The divisions of the day were regulated by the sun, the night by the stars.

The *konohiki* of each independent land subdivided his water time among the holders of *mooainas* (now *kuleanas*) on his *ahupuaa*, *ili* or *ku*.

The *konohiki* of the land controlling the most water rights in a given *auwai* was invariably its *luna*. He controlled and gave the proportion of water to each *mooaina* or single holding of the common people cultivating on that land.

The quantity of water awarded to each *mooaina* was according to the amount of work expended on the *auwai* and *mano* (dam) by the occupant of that *mooaina*, or by his family, as has been already stated.

Thus, a strong middle-aged man having three or four grown up sons living on the land, and sharing in whatever *konohiki* work was undertaken, would naturally be entitled to more water than the one who had only his own personal labor to depend on in any work which was for the common good. The enterprise and industry of an individual holder, while having an effect on the quantity of water he was entitled to, was subject to certain rights to be claimed. For instance, a strong able-bodied man who had not only worked himself at the opening of the *auwai* but had also induced others to help as his quota to the *konohiki* work, but had neglected to claim or utilize the amount of water he was entitled to, using only enough to irrigate the *koele*[3], or *konohiki* patch in his holding and one or [t]wo others for his own use, would, after a while be restricted to the right… [page 80] …only of such quantity of water as would irrigate those *lois* which it had become customary for him to cultivate.

[3] The landlord's share, or patch cultivated for his share.

In ancient times the holders of a water right were required whenever it became their turn in the water rotation or division to go up with the *luna wai* (superintendent) to the waterhead or dam to see that it was in proper condition; follow down the *auwai* from there, removing all obstructions which may have fallen in or had been carried down by the water during the night from the *kahawai* or mountain stream; shut off all branch *auwais* or runlets from the main *auwai*, except those conducting water to *lois* entitled to water at the same time, the *luna wai*—who should be with him during all this time—making the necessary division by means of a clod, stone or both; the water holder continuing to follow the water until it entered his *lois* and the *koele* in his charge.

An *ili* or *ku* may have one or two days and nights to itself, which time is subdivided among it's own *mooainas*, and is the time, or portion, in the water rotation that was held by the different *kuleanas* at the time of the Land Commission. Instances occurred where *kuleana* owners, by some means, obtained more water than was their due under the *konohiki*, but to hold good, it must have been for some service or recognized benefit to all the shareholders.

The *konohiki* rights in the division of water pertaining respectively to *ahupuaa*, *ili* or *ku* remain the same, whether the land was obtained directly from the chiefs, or from the Government as Grants. The old *konohiki* water right went with the land unless the owner had previously formally relinquished, transferred, divided, or neglected it for a period of over twenty years.

Bordering on the upper portions of most *auwais* are small *lois* limited in size and number, generally on a hillside, or on the borders of a gulch. These *lois* are generally awarded *kulu* or drops; that is, they are entitled to continual driblets of water, and no one having a water share may turn the water entirely away from them unless, in times of scarcity, it should be seen that these *lois* or *loi* were full to overflowing.

Lois entitled to *kulu* water have no time set apart in the regular rotation. Holders of *kulu lois* were subject to all the *auwai* duties It was a strictly enforced custom, that should any water right holder neglect to go, or furnish a substitute at the periodical *auwai* cleanings, repairs of dam, etc., water would be withheld from the land of the absentee until such time as he should see fit to resume work for the benefit of what might be termed the shareholders of that *auwai*. Independence in the matter of performing, or neglecting the water duties was very rarely indulged in by the ancient Hawaiians, as the consequences were apt to be disagreeable. for, by the time he was ready to resume them, it would perhaps happen that the landlord's attention had been directed to the neglected condition of his *mooaina*, or the *Koele* under his charge, and some fine morning he might receive a peremptory order to vacate the holding and thus be deprived of both land and home, and become a *kuewa*, (an outcast) a condition very much dreaded by the Hawaiian agriculturist, who generally inherited his holding from ancestors who had lived on the land in successive generations, paying tribute of service and produce to successive *konohikis*.

It sometimes occurred that a land originally entitled only to a small portion of water, but afterwards held or presided over by an industrious, energetic man, whose popularity attracted many to live under him, would be accorded an increased supply in consequence of his promptly furnishing as many or more hands than some land entitled to more water than his. After this had continued some time, the water-*luna* would recognize the justice of an increased supply for his land, and would either

take a portion of water from any land failing in its due quota of hands, or as was more frequently done, simply adding a day, night, or both to the rotation; letting his land have the added time.

Any one in the olden times caught breaking a dam built in accordance with the Hawaiian's idea of justice and equity, would be slain by the share holders of that dam, and his body put in the breach he had made, as a temporary stopgap, thus serving as a warning to others who might be inclined to act similarly. Such a deed with this provocation was never openly resented, unless the one killed was a person of considerable consequence, in which case his death might precipitate a small local war.

Tradition has it though, that, in the days of the Great Kamehameha, if any chief of any district during times of peace presumed to trample on the customs honored by usage pertaining to agriculture, fishing, or any form of labor conducing to the benefit of the people, the great chief or *makua*, as he was fond of being styled, would promptly order the enforcement of the customary penalty, even on one of his immediate retainers.

Another custom well recognized and universally acquiesced in was, during the scarcity of water in dry seasons, the right of the *luna wai* to take water from parties having an absolute right on a given day, after their patches or *lois* were full but before their time had expired; and turn it on to any *loi* that was suffering whose turn in the rotation had not arrived. This right of the water-*luna* was being insisted on and exercised in some districts as late as ten years ago, and may be yet in some of the outer districts.

Water rights were primarily for *lois*, that is, for *kalo* culture. [P]otato patches, bananas or sugar cane had no recognized claim on a water right in the rotation. The cultivation of these, regarded as dry land crops, were invariably during the rainy season except in the *Koolau* or wet districts. Sugar cane and bananas were almost always planted on *loi* banks (*kuauna's*) so as to ensure a sufficiency of moisture from the seepage or ooze between them.

In good seasons when there was plenty of water in summer, surplus water was sometimes led on to *kula* land and a second crop of potatoes planted, but this was never done if any *loi* or *lois* should be needing the water.

There were some curious beliefs, superstitions and rites, connected with *mano* making and water supply. When the digging of an *auwai* was completed to the satisfaction of the *luna* in charge of the work, a day would be set for the building of the dam. This was an occasion for rejoicing and feasting, and was never hurriedly done. The water *kahuna* or priest had to be first consulted in regard to a favorable day, which being settled, the *konohiki* was required to furnish a hog large enough to supply a good meal to all the workers of the *auwai*, red fish (*ahuluhulu*), *amaama* and *aholehole*, as well as *awa* root for the use of the priest at the opening ceremonies, (corresponding to the box containing papers, pictures and relics in the modern laying of a corner stone, or the bottle of champagne in the christening of a vessel); *kukui*-nut and *poi* galore. On the appointed day all the workers decked with *leis* (wreaths) of swamp fern, *kowali* (*convolvulus*), or yellow and green banana leaves split through the midrib, proceeded to the end of the *auwai* nearest the spot chosen for the dam, each one bearing a stick of firewood for the *imu* or oven in

which the hog and other articles of food was to be baked. The *imu* was made in the *auwai* near the point where the water was to enter it; the hog, *luau*, potatoes and *kalo*, or taro were placed in it, and while these were cooking, the *awa* root was chewed or pounded and strained, and the fish *lawalued* (Wrapped in ti leaves and roasted over coals.)

When everything was cooked and in readiness, the water *kahuna* took the head of the hog, the fishes, and the bowl of *awa* juice, and going to the place where the dam was to be built made an offering of these to the water *Akua* or God. An invocation would be made and a petition that the local water god or goddess would take the dam and *auwai* under his or her special protection, not only sending or causing a good supply of water to fill the stream at all times, so that her votaries might be blessed with good and abundant crops, but also to guard against both drought and floods as being disastrous to the planting interests. At the conclusion of his invocations he would sprinkle a few drops of *awa* juice in the stream; eat the eyes, ears and snout of the hog, the eyes and gills of the fishes in the name of the local deity, and return to the feast which had been spread on the bank of the new-made *auwai*, when every one was free to partake. Everything edible at this feast of consecration had to be consumed either by the people or by their dogs. All the refuse was buried in the *imu*; the dam built in a few minutes, and the water turned in to the new *auwai*; flowing directly over the now submerged *imu*. The younger folks would likely indulge in bathing in the pool formed by the dam, while the older ones with the *konohikis* and invited guests would follow the water through the new-made *auwai*, and singers of both sexes would chant songs composed in honor of him who had planned and carried out the beneficent undertaking that would be the means of a supply of food for many. [E.M. Nakuina, In Hawaiian Annual, 1894:79-84]

June 15, 1912
A Brief History of Hawaiian Water Rights
By Antonio Perry - Associate Justice of the Supreme Court of Hawaii
Read at the Annual Dinner of the Hawaiian Bar Association

A history, however brief, of the water rights of Hawaii is a forcible reminder of the material progress of these Islands. The causes and the results of the development of those rights on the one hand and the growth of agricultural production and the increase of prosperity on the other, bear a close relation to each other. Water like land is one of the elements contributing prominently to the wealth of a country and certainty and security of the titles to each are always sought but not always obtained without a struggle. Due very largely to the generosity and the wisdom of a King, Hawaii has been fortunate in having had individual titles to its land developed, defined and rendered secure at an early day, the transition from the ancient state of affairs when the King was the owner of all of the land in the Kingdom, through a period when titles in individuals were in embryo, undefined and almost indefinable, to the present condition of clear definition and absolute certainty, occupying in the aggregate scarcely more than a decade. So, too, the titles to the water were rendered secure by the same act of King Kamehameha III but the process of ascertaining and defining the precise extent and limits of those rights has not been as brief and decisive as was that relating to the land. In furtherance of the relinquishment by the King of the great bulk of the lands in his Kingdom to his chiefs and to the common people the Land Commission [p.1] was by Act of April 27, 1846, created to receive, hear and pass upon the claims of all those who, under the terms of the royal gift, deemed themselves entitled to portions of the land[.] The commission held its sessions during a comparatively short period of years, while the best evidence on the

subject was abundant and easily available and made its awards of separate parcels, some large and others smaller, to named individuals, the parcels being described either by metes and bounds or by names well known to those who lived in that day and upon whose testimony definite boundaries were subsequently ascertained, whether with or without the aid of judicial tribunals. The act creating the land commission contained a provision that the decision of the board should be "in accordance with the principles established by the Civil Code of this Kingdom in regard to prescription, occupancy, fixtures, *native usages in regard to* landed tenures, *water privileges* and rights of "piscary" and certain other specified rights, but the commission did not deem it to be a part of its duty to hear claims to water or to determine or define the rights of persons or lands to water, and no adjudications were made by it on the subject. As far as that body and that period were concerned, the whole matter was left open for future investigation and determination,—with this qualification only, that as is apparent from a long line of subsequent judicial decisions, the water rights, whatever they were, in existence at the time of the awards of the land commission passed to the awardees as appurtenant to the land.

Knowledge of the causes leading up to and of the circumstances surrounding the great *Mahele* and of the principles upon which the Land Commission acted in the pursuit of its investigations and in the making of its awards is essential to a correct understanding of the origin and development of early Hawaiian water rights, but the limits of this paper do not permit of a review of those causes and principles. Its reading is addressed to those who are familiar with them and only the briefest possible reference will be made to them [p.2].

From very early days, long prior to the *Mahele*, the distribution of water for the purposes of irrigation was the subject of unwritten regulation. The familiar word "*Kanawai*," used for so long a time that the memory of man runneth not to the contrary to denote a law or laws, upon whatever subject [sic], in its origin signified regulations concerning water. The very first laws or rules of any consequence that the ancient Hawaiians ever had are said to have been those relating to water. The water, it is true, like the land was all, originally, the property of the King, to be disposed of as he saw fit, but the ordinary disposition of it was, again as in the case of the land, to permit its use to the chiefs and through them to the common people, the actual occupants and cultivators. The rules were undoubtedly simple at first. The supply of water was usually ample to satisfy the requirements of the land. Cultivation on a large scale for purposes of export was unknown and the needs of the people were few and simple. Taro, of course, was the main vegetable food and with a little sugar-cane, bananas, sweet potatoes and perhaps one or two other articles, composed the list of products for which irrigation was required.

Most important in the system of distribution of water for application to the soil were the main ditches diverting the water from natural streams. Each of these large auwais was authorized and planned by the King or by one or more chiefs or konohikis whose lands were to be watered thereby, the work of excavation being under the direction of the chief providing the largest number of men. The water diverted was subsequently divided among the chiefs in the proportions in which each had contributed men for the accomplishment of the undertaking. The same rule was followed with reference to the parceling out of the water to which each chief was thus entitled among the common people on his lands. To each *hoaaina* a share was allotted in accordance with the labor furnished by the recipient. Some hoaainas contributed merely the labor of their own hands, others that also of their sons or

other relatives. It sometimes [p. 3] happened that a small *ili* was represented in the work of construction by a larger number of laborers than a large *ahupuaa* and was in consequence assigned a larger share of the water than was awarded to the larger tract. It is easily apparent, however, that this system of assignment in accordance with the labor provided in digging the auwais was in its results the equivalent of a system of distribution in accordance with the acreage planted, for each *konohiki* and *hoaaina* would doubtless bestir himself to contribute towards the completion of the enterprise sufficiently to meet the requirements of the land which he desired to till. The old system, particularly in view of the conditions then existing concerning the possession of land, possessed the merit of encouraging industry. One of the causes for dispossession by the King was the failure of the *hoaaina* to render his plot productive. On the other hand if one in the enjoyment of a water right increased his accustomed contribution of labor to the maintenance of the *auwai* his energy was rewarded by the allotment to him of additional water. By way of illustrating the beneficial operation of the system of distribution just described, it may be noted that in some instances chiefs or those under them contributed labor with reference to the needs not only of the lands then held by them but also of lands which they hoped to obtain in the neaear [sic] future. Such was the case with the high chief in planning the *Paki auwai* about to be referred to. And so also these rights or privileges were subject to loss through non-user. A tenant who by his exertions in the digging of the *auwai* had obtained the right to water sufficient to irrigate all of his land and who subsequently, for an undue period of time, allowed a large part of his land to remain uncultivated was deprived of all water save that necessary for the cultivated portion.

It may be added at this point that in some ditches not all of the water was used but after irrigating a few patches the ditch returned the remainder of the water to the stream.

Each large *auwai* was given the name of the chief or of the [p.4] land most prominently connected with the undertaking. In the digging of one of the more recent auwais, the *Paki auwai*, per extending from a point above Laukaha to the vicinity of the present cemetery in Nuuanu Valley and so named because the chief Paki planned it and directed its construction, 700 men were employed, 300 being furnished by Paki, 300 by chief Kehikili [sic] and 150 each by Huakini and Dr. Rooke. The work was completed in three days. It is interesting to note that the old *kamaaina* who in 1886 gave the very clear testimony upon which this statement concerning this particular *auwai* is based, was very modest with reference to his mental attainments. Shortly after taking the stand he explained that in the old days he was pipe-lighter to the high chief Kehikili [sic] and that, quoting his own words, "my profession employed all my time which kept me from mental cultivation."

The construction of a dam and the actual, original diversion of the water were attended with much rejoicing, song and feasting and with solemn religious ceremonies. The day was named with the water kahuna's assistance and the konohiki is furnished *awa* root for the priest and other edibles in abundance for the workers. Prayers were addressed to the local water god, invoking his assistance and protection. After the feast all refuse was buried in the *imu* which had been dug in the bed of the *auwai*, the dam was built in a very short space of time and the water turned into the new *auwai*, passing over the *imu*. The dams were always composed of loose stones and clods of earth and grass and were not made tight but so as to permit of some of the water percolating… Lower holders were likewise entitled to water and their rights were respected.

The burden of maintaining the ditches fell upon those whose lands were watered, failure to contribute their due share of service rendering the delinquent hoaainas subject to temporary [p. 5] suspension or to entire deprivation of their water rights or even to total dispossession of their lands.

By the aid of smaller branch ditches each land received its share of water. The methods of distribution differed at different times and in different places. One method, perhaps the one best known in later years, was that by time only, the watercourse being allotted to certain tracts or lots on certain days of each week or of alternate weeks or at certain hours of the day or night, as the case might be. The Hawaiians' ideas of the time of day and of the duration of time were not exact and under this system the time for each land was regulated in accordance with the position of the sun and that of the stars. In some instances of large, neighboring lands the allotment was of all night to one and of all day to the other for the period of days necessary to water all of the subdivisions of each tract, followed by an exchange of night and day use between the tracts then an exchange again at the end of the period and so on endlessly. Another was for each land beginning with the highest to take, irrespective of time, all the water it needed, and then to permit it to flow on to the next to satisfy its requirements and so on in order until the lowest had received its share and then to repeat the process. It is not entirely clear whether the last method wholly preceded the other, but the probability would seem to be that it did, at least in all cases where the supply was abundant, and that it was gradually supplanted by the more precise distribution by time as a decreasing supply or an increasing demand rendered it necessary or advisable. In still other instances, comparatively rare, however, the patches were given water merely by overflow or percolation from adjoining patches and not directly from any watercourse.

Each chief or *konohiki* or some one designated by him became the superintendent (*luna wai*) of the ditch and its maintenance and of the distribution of its waters and such disputes as arose were ordinarily referred to him for settlement. In dry seasons the right was recognized in the *luna wai* to transfer [p. 6] water from the lands having more than strictly necessary to those in need. This right is said to have been claimed and exercised in some instances as late as the eighties. For unjustifiable interference with a dam it was permissible for any one to kill the offender and to place the body in the breach made by him in the dam, this as a warning to others. If the offender, however, was a man of great prominence in the community, his death might not be permitted to pass unnoticed but might cause considerable local disturbance,—in which latter respect some analogies may be found in more modern history.

A fact made clear by the testimony of many kamaainas in later water controversies is that prior to the *Mahele*, under the ancient Hawaiian systems, more elaborate in some ahupuaas than in others, disputes concerning water were extremely rare. The aim of the konohikis and of all others in authority was to secure equal rights to all and to avoid quarrels. A spirit of mutual dependence and helpfulness prevailed, alike among the high and the low, with respect to the use of the water. This laudable condition was doubtless due to several causes. The rainfall was in many localities more abundant, the supply of water larger and the area under cultivation less extensive than at the present time. The desire for wealth, as the term is used today, did not exist.

If each had a sufficiency for his simple needs, he was content. The land tenures were so precarious as to be conducive to abstention from unjustifiable or otherwise irritating claims by the tillers of the soil. And yet it must be said on this last point that even during the period shortly preceding the *Mahele*, when the landlords were directed by statute not to dispossess the occupants except for just cause, the same friendly relations, free from all contention, usually characterized the exercise of the rights under consideration.

With assured ownership of distinct pieces of land in individuals and particularly with the advent of foreigners accustomed to more definite delimitation of rights of property, possessed of more advanced knowledge in the art of cultivation and imbued [p. 7] with a keener desire for material prosperity, and, as to some localities, with a decreased rainfall, came more frequent and more intense misunderstandings and differences concerning the ownership of water. In 1860, only fourteen years after the creation of the Land Commission, an act was passed (by way of amendment to an act of 1856 relating to commissioners of private ways) providing for the appointment in each election district throughout the Kingdom of three suitable persons to act as commissioners whose duty it was to determine all controversies respecting rights of way and rights of water between private individuals or between private individuals and the government and upon whom it was enjoined to render such decision as might "in each particular case appear" to be "just and equitable between the parties interested," with right of appeal to the circuit and the supreme courts. By subsequent amendments a single commissioner was substituted for each board of three (1888), an appeal was allowed to the supreme court only (1907), and the decision was required to be such as might "in each particular case appear to be in conformity with vested rights and *** just and equitable between the parties," (1886). [*] It was intended by the legislature that the proceedings before these commissioners should be simple, expeditious and inexpensive and with a very few exceptions they were in fact quite informal. The petitions for adjudication would seem in some instances to have been oral only. As late as 1884 the "law's delays" were evidently unknown in those courts. On June 7 of that year the commissioners in deciding a controversy ordered that the defendant "remove the obstructions in the *auwai* and open a free pass- [p. 8] age for the water to plaintiff's land *and that he gave him water tomorrow morning*;" and the order was apparently complied with. The powers and duties of the commissioners were finally, by act of 1907, transferred to the circuit judges. Our courts of equity have been held to have had during the period under discussion concurrent jurisdiction with the commissioners of controversies respecting water and in a few instances the aid of equity was invoked. In the great majority of cases, however, the hearings were before the commissioners.

It was the aim of the commissioners and of the courts to declare and to protect these rights as they existed, under the ancient Hawaiian customs and regulations, at the

[*] At least since 1886 the law has required that all of the testimony adduced in water controversies, as well as all decisions, "shall be recorded in books of record to be kept and preserved" by the commissioners or circuit judges, as the case may be, and has provided that "the said books when filled shall be deposited with the clerks of the respective courts" (meaning the circuit courts and the supreme court). Even prior to 1886 some of the commissioners and probably all of them, recorded the testimony in bound volumes. Inquiry of the clerks of the circuit courts and of the supreme court has, however, disclosed the fact that no such records are on file with any of the courts named, save two volumes, now in the Archives Building in Honolulu, in the custody of the clerk of the supreme court, relating to hearings before the commissioners for the District of Honolulu during the period from 1860 to 1887 inclusive. The writer has been unable, after some further search, to find any of the missing records [footnote to page 8].

date of the awards of the Land Commission. The work has not always been free from difficulty. In a decision rendered in 1862 it was declared: "The commissioners feel the difficulty of fixing with rigid precision any exact time for the beginning or continuing the water right of any particular party—as to natives, whose motions of time are so loose and vague it would seem almost impracticable and all that we can do where serious disputes have arisen is to indicate about the time" and the allotment to one of the pieces was adjudged to be "from early dawn" of the water day for that land "say commence at about 4:30 or 5 a.m. until 8 o'clock a.m." The earlier adjudications by the commissioners were characterized, perhaps, by somewhat greater freedom in the readjustment of the methods of distribution of water to the new conditions, as from inexact methods to those which are more clearly defined and more certain. In the case just referred to the commissioners said: "It has always been our desire in making our decisions to place the foreigners' time for water as much within the time of daylight as possible for obvious reasons," but whether that coarse was followed in that particular instance by reason of consent of all the parties concerned or in recognition of a change of rights secured by adverse user does not appear. Let it be added that the commission referred to was composed of one foreigner and two Hawaiians. [p.9] However that may be, this greater latitude, in so far as there was any, is not apparent in the later decisions. In 1870 the supreme court declared that "the right to use water is an easement in land, to be gained only by grant or prescription" (favors from the *konohiki* or the King could no longer be relied upon) and in 1884 that the commissioners "cannot, of course, create new privileges nor apportion and distribute water arbitrarily without refeence [sic] to its title."

Rights of water, rightful in their inception under ancient Hawaiian customs and regulations and lawfully passing to their present holders by grant, devise or descent, have in recent years been often referred to with inexactness as prescriptive rights. Prescription has, however, played an important part in the history of some of the rights and the ordinary principles of adverse user have been judicially applied, not only to the acquisition of a larger quantity of water than a given land was originally entitled to or in favor of *kula* land which in olden days had no water right whatever, but also so as to effect a change from a night use to a day use or vice versa and other changes as to the time and method of distribution.

While it has been repeatedly held that purely moot questions concerning the existence or extent of these rights would not be considered by commissioners or courts, much progress has been made in the settlement of real controversies and important principles of wide application have been decided. In addition to the principles of adverse user already mentioned and the determination of the precise rights, with reference to time and to quantity and otherwise, of many kuleanas, ahupuaas and other divisions of land, it has been held, *inter alia*, that mere non-user does not operate as a forfeiture; that water to which a land is entitled may be diverted by the owner of the land to other land, whether from one kuleana to another or from one *ahupuaa* to another and irrespective of whether the land to which the water is transferred was originally entitled to water, provided that the diversion can be accomplished without injuring the rights of others; [p. 10] that an ancient right of lower taro patches to the overflow and seepage from neighboring patches is to be respected and that such right of seepage and overflow may under certain circumstances be acquired by prescription; that under certain other circumstances no prescriptive right can be acquired to the seepage from a stream; that subterranean waters to be the subject of rights must like surface waters in general flow in known and well defined channels; and that the surplus water of an *ahupuaa*, using the term

as including water, whether storm water or not, that [sic] is not covered by prescriptive or riparian rights, is the property of the *konohiki*, to do with as he pleases, and is not appurtenant to any particular portion of the *ahupuaa*.

But the work of authoritative definition is not yet complete. For example, in a pending case the Territory presented the contention, for the first time in the history of local water litigation, that by virtue of the provision of a statute passed in 1850 that "the springs of water, running water, and roads shall be free to all, on all lands granted in fee simple," the Territory is now the owner of all of the surplus water of the *ahupuaa* of Kaneohe on this Island and presumably of all other ahupuaas. A circuit judge of the first circuit, sitting as commissioner, a few days ago filed an opinion overruling the contention and an appeal has not been perfected by the Territory; but the point may be presented under the appeal of one of the other parties to the cause. The subject of riparian rights has been touched upon in former decisions of commissioners and of the supreme court but the law on the subject as on that of subterranean waters is, perhaps, capable of further development.

Water rights are destined to play an important part in the future of Hawaii as they have in its past. The growth of urban communities and the agricultural development of the territory render inevitable the conservation and use in an increasing degree of the available waters, with probable consolidation of some rights and new distributions of others. The subject will lose none of its interest with the passage of time [p.11]. [Perry in Thrum's Hawaiian Annual, 1913]

The Hawaiian System of Water Rights (Hutchins, 1946)

Excess Waters from Irrigation of Upper Lands

Only a portion of the water that is applied in the irrigation of land is "consumed" in transpiration through the plants and evaporation from the soil surface. Some of the water diverted for irrigation is a necessary vehicle for conveying to the place of use the portion to be consumed there. Part of this excess water drains from the irrigated land over the surface, in channels or in diffused flows, and part of it sinks into the ground. The portion that disappears from the surface becomes part of the local ground-water supply and takes on the characteristics of such ground water; and depending upon the local physical situation, some of this water unless removed by artificial drainage may reappear in the form of seepage springs, and a substantial portion may augment the flow of a surface stream.

The excess water from irrigation diversions on the mainland is often referred to as "waste." This term is not always the most appropriate, even on the mainland. Still less is this so if applied to the ancient Hawaiian methods of irrigating *kalo* or taro, where the excess water was immediately used upon lower lands to which it flowed directly from the upper patches, or was promptly drained into a lower *auwai* or back into the stream from which diverted, in any case being made available to the next lower users under an orderly system of diversions and uses. However, recognizing the fact that even under the best methods of irrigation some so-called "waste" is inevitable, for the purpose of considering rights of use "waste water" may be taken to be principally water that has escaped from conduits or structures in course of distribution or from irrigated lands after application to the soil, and "return flow from irrigation" as that portion of water diverted for purposes of irrigation which eventually finds its way back to the stream from which diverted, or to some other stream, or which would do so if not intercepted by some natural or physical obstacle. The water that is used in Hawaii in irrigating successive terraces of land is therefore

excluded from the definitions of waste water and return flow, so long as it remains on the group of patches of land which the combined flow is intended to irrigate.

Excess from Irrigation of Upper Terraces

In tracing the development of irrigation in Hawaii, Wadsworth [1933] states that flat culture of taro (*kalo*) was common, and that:

> When this method was used low levees were thrown around conveniently shaped areas of land and water admitted from the neighboring *auwai*. Apparently water was admitted to each basin from the one above it, if not from the *auwai* itself, drainage from the last patch finding its way into the original stream or another ditch. [page 78]

Apparently in some cases the *kalo* patches of different tenants were supplied successively and directly from a single *auwai*; while in other cases water was diverted in the first instance into one high-lying basin, from which the overflow passed to the adjoining lower basin or terrace through openings or low places in the levee, as well as by seepage, and so on down to the terrace at the lowest level, from which the excess water drained back into the natural stream from which the water was originally diverted or into a lower *auwai*. Whether this latter method was common or rare, it seems to be agreed that it existed…

The fact that this was not only [an] ancient but extant practice has been noted in several cases in the Supreme Court of Hawaii. In the earliest reported decision on water rights, Chief Justice Allen, in distinguishing the facts before him, referred to "the case of adjacent proprietors of *kalo* lands, when water is supplied from one *kalo* patch to another." A case decided in 1892 involved a controversy over the interception of water that the holder of lower land had been accustomed to receive "for an indefinite time" from adjoining *kalo* land. The head note [*Ing Choi v. Ung Sing & Co.*, Haw, 498 (1892)] states :

> Evidence of an ancient flow of water from *kalo* land to lower land, and use of the same for cultivating the lower land, tends to prove an easement of the lower land in such flow.

And in the opinion of the court it is stated:

> The evidence is convincing that this acquisition and use of the water from the patches of the land above is an ancient right. This conclusion is supported by the position of the premises, which is such that they naturally must receive the waste water from the adjoining wet lands above, which circumstance alone is often sufficient to account for the growth of a water right under the ancient Hawaiian system of irrigation.

Again in 1898 [*Wailuku Sugar Co. v. Hale*, 11 Haw. 475, 476 (1898)], an opinion written by a different justice states:

> The land of plaintiff adjoins the land of defendant and is at a lower level, and the water was accustomed to flow through defendant's *kalo* patch to the *kalo* land now held by plaintiff. That plaintiff's land was so watered when cultivated in *kalo* by its former owner is testified to and is also evidenced by the fact that if a ditch should be made leading around defendant's land it would deliver the water

> at too low a level to flow on the plaintiff's land. *Kalo* patches watered from the same source are generally constructed in terraces one below the other, so that the water after filling the upper patches can supply those lower. ***

Where the right of a *kuleana* holder to receive the excess water from irrigation of adjacent higher lands has been established as an ancient right, then, the upper owner will be enjoined from diverting the excess water elsewhere so as to prevent it from reaching the lower land in the accustomed manner. [*Ing Choi v. Ung Sing & Co.*, Haw, 498 (1892); *Wailuku Sugar Co. v. Hale*, 11 Haw. 475, 476 (1898)]

However, the burden is upon the lower landowner to establish by a preponderance of the evidence the right that he claims. Where the evidence [p. 79] that the ancient right or a prescriptive right to receive water from a specific source, across certain lands, is conflicting and uncertain, injunction will not issue… [p. 80]

Ancient Appurtenant Rights

Prior to the *Mahele*, the *konohiki* of an *ahupuaa* or *ili kupono* controlled all water privileges as well as land privileges during his tenure and made allotments thereof to his sub-chiefs, and they in turn made allotments to those inferior in rank and so on down to the hoaainas (native tenants) lowest in degree. Any tenant could be dispossessed at the pleasure of his, landlord, for he was simply a tenant at will, and necessarily could be deprived of the use of water as well as of other privileges. However, the rule apparently came to be for the king to dispossess tenants of their lands only for cause, or of the use of water which the lands had customarily received, and this rule eventually applied to the inferior landlords as well. In any event, regardless of the personnel of the cultivators or of the petty landlords, the general custom was to authorize the continued delivery of water to wet *kalo* (taro) lands for the service of which distribution systems had been built, for the continued cultivation of lands having irrigation facilities was in the interest of the immediate landlord and his superiors as well as that of the tenant. Hence, so long as the water supply continued dependable, the lands productive, and tenants available, the continued service of water to the general area and thence to the sub-units of *kalo* patches would be in the ordinary case the natural custom to follow.

It was the practice in some cases to layout the *kalo* patches in terraces, into the highest of which the water was turned from the *auwai* (ditch), the overflow from each terrace flooding the adjoining patch below and so on down successively to those lying at the lowest levels. Hence, under such system of distribution, the tracts of several hoaainas were largely interdependent in their use of the water. In other cases the several patches were supplied directly out of the auwais. In either case, the method of distribution of water was such as to perpetuate the use of water on a given tract.

The use of water as a practical matter, therefore, was originally attached by custom to the tract of land irrigated, although it might be severed from the land by the *konohiki*. That attachment which originated in custom eventually ripened into a legal appurtenance, or easement, or incident to the land. That is to say, the ancient use of water, where continued down to the period of land reform and existing at the time of the confirmation [p. 102] of land titles in tenants, became the basis of a valid water right. Likewise the use of water on a tract at the time title was acquired, even though

not literally an ancient use, became the basis of an equally valid right. These are all included in the term "ancient appurtenant rights."

Lands Having Ancient Rights

The supreme court has held consistently that lands which from time immemorial have enjoyed the use of water are entitled to that use as a matter of right. Apparently this has never been a moot question. On the contrary, it is a fundamental principle of Hawaiian water law.

These ancient rights apply in many cases to "kuleanas" — or homesteads of the common people—a term that now is used to designate the small tracts of cultivated lands awarded to native tenants[17]. However, the right of any portion of an *ahupuaa* that, by ancient use, was irrigated land, would be on an equality with that of irrigated *kuleana* land. Furthermore…the ancient rights of kuleanas in government ahupuaas are similar to those in privately-owned ahupuaas. Although in the case of a privately-owned *ahupuaa* the water right of the *kuleana* holder might be subsequently enlarged by adverse use, the ancient right itself would be of the same character as that in a government *ahupuaa*, the enlargement being the subject of a prescriptive right against the owner of the *ahupuaa*.

The rights of *kuleana* holders to the use of water are paramount to the right of the *konohiki* to make further disposal of water privileges. He can dispose of surplus waters only. A subsequent lease is necessarily subject to the requirements of the kuleanas, and tenants at sufferance under the *konohiki* have no separate rights as against the *kuleana* holders but must look to the *konohiki* for their supply of water out of whatever surplus may exist.

Kula Land

Ancient *kula* or dry land had no water right; hence water cannot be claimed for present rice irrigation on ancient *kula* land, solely by reason of extending the irrigated area to include ancient *kula* land as well as ancient [page 103] taro land[18]. But, in the case just cited, ancient taro land that had been left dry as the result of the diminution in population of the Islands which once subsisted on taro, and which land thereafter had been used as pasture and to a great extent had lost its characteristics as taro land, was not classed with ancient *kula* land. Such land, now cultivated in rice, had claimed all the water to which it was once entitled for the irrigation of taro; and where the evidence as to whether the irrigated land had been extended to include ancient *kula* land was conflicting and uncertain, the court refused to modify or set

[17] The use of the term in a customary reservation in conveyances of land in Hawaii was involved in *Territory of Hawaii v. Lāhaokaloni*, 14 Haw. 88, 95 (1902). The court stated that the words "*koe nae ke kuleana o na kanaka*," as so used in conveyances, as well as the English equivalent "reserving however the people's *kuleana* therein," have a well understood meaning; that they "mean the reservations of the house lots and taro patches or gardens of natives lying within the boundaries of the tract granted." In this case, the term had been used in a royal patent and award. The specific holding of the court was that the term did not apply to public rights in land below high and low-water marks, where used in a royal patent issued in 1866 to land on the seashore, the boundary of which in the patent ran to the sea and thence along the sea at low-water mark…

It would appear, then, that the reservation of the people's *kuleana* within the boundaries of a conveyed tract meant a reservation of their rights as against the owner of the tract so conveyed, and that it included the rights in gross accorded by the statute of 1850 (Laws Haw. 1850, pp. 202, 203, s. 7 (Rev. Laws Haw. 1925, Vol. II, pp. 2141, 2142); Rev. Laws Haw. 1945, sec. 12901).

[20] *See Loo Chit Sam v. Wong Kim*, 5 Haw. 200, 201 (1884).

aside the decision of the commissioners adjudicating the water rights of the ancient taro land.

Water to the use of which one is entitled in connection with certain land cannot be transferred to *kula* land if others having water rights in the same source of supply are manifestly injured by the change. But if no injury is done to others, one may transfer to *kula* land the same quantity of water to which he is entitled by reason of immemorial usage on *kalo* land.

Water Titles

That titles to these ancient water rights, like titles to the lands themselves, belonged equitably to the occupants of the irrigated lands appears to have been a matter of tacit recognition prior to and during the period of land reform. Procedure was established, as a result of that reform, for the vesting in private individuals of legal titles to the lands; but no separate procedure was set up for the perfecting of water titles until the legislature in 1860 provided for the hearing and determination, by commissioners, of controversies respecting rights in water. The land commission determined the claimant's title to land, but in few if any cases does it appear that the commission specifically determined water rights. Water privileges were apparently assumed by the commission and by all interested parties to be appurtenances; and the supreme court decisions have treated these water rights as easements appurtenant which passed without express mention upon the acquisition of legal titles to the lands, as they were undoubtedly intended to pass. Such rights passed by implication in public grants as well as in awards of the land commission.

Water titles have been adjudicated to individuals as the result of determinations by the commissioners of water rights (or circuit judges sitting as commissioners) and by the courts. Titles to the use of water appurtenant by ancient custom were adjudicated to the owners of the land, unless of course the rights had been divested by grant or conveyed by lease or lost by adverse use. In any event, the awards and [p. 105] records of the land commission in connection with claims of title to tracts of land have been important in determining the question of water titles incident to those tracts. As stated in a decision of the supreme court:[26]

> Whenever it has appeared that a *kuleana* or perhaps other piece of land was, immediately prior to the grant of an award by the land commission, enjoying the use of water for the cultivation of taro or for garden purposes or for domestic purposes, that land has been held to have had appurtenant to it the right to use the quantity of water which it had been customarily using at the time named. In some instances a mere reference to the land in the award or in the records of the land commission as "taro land" ("*aina kalo*" or "*loi kalo*") or as "cultivated land" ("*aina mahi*") has sufficed to lead to and to support an adjudication that that land was entitled to use water for agricultural purposes. Sometimes the testimony of witnesses who appeared before the land commission in the hearings leading up to the award, that the land was taro land or cultivated land, or other statements substantially to that effect, have sufficed to support a similar adjudication. * * *

[26] *Territory of Hawaii v. Gay*, 31 Haw. 376, 383 (1930).

The description of a *kuleana* in an award as *kalo* or *loi* land, then, would be evidence that the land was entitled by ancient custom to water for irrigation, "and the lack of such description would probably be evidence to the contrary, though not conclusive."[27]

The land commission's awards and records, while important in the cases in which they have been introduced in evidence, have not been by any means the sole basis of determination. In the first place, they were not always introduced in evidence.[28] Again, as stated, the land commission was concerned only incidentally with water privileges, and direct grants as well as awards carried appurtenances. Conveyances of crown land by warranty deed have been held to pass the ancient rights shown to be appurtenant to the land. *Kamaaina* or "old-timer" testimony has usually been accorded great weight in the adjudications; but important as this testimony is in determining questions of this character, it has necessarily been conflicting and uncertain in some cases, as, for example, where changes in the use of land made the identification of the boundaries of ancient taro land most difficult. The position of the premises, where lower land must naturally receive the overflow from irrigation of adjoining higher land and where it is shown that the occupants of the lower land have actually been making use of the overflow in the cultivation of taro, has supported adjudications of ancient rights in such lower tracts. [p. 105]

Quantity of Water

The quantity of water to which the ancient right attaches is that quantity that was customarily used, and necessary for the use that was being enjoyed, at and immediately prior to the time the legal right accrued-that is, the time when the land in connection with which the use was being made first became the subject of private ownership. Predicating the right upon the quantity used at the time of the awards or grants is more clearly emphasized in the recent supreme court decisions than in the earlier ones. The reported decisions in early cases seem to have been based more generally upon long-continued use, or use from time immemorial—uses that necessarily antedated the land commission awards. It was necessary in the Carter case to be more specific than this, inasmuch as the quantity of water claimed because of use on a sugar plantation, which had ceased to exist a few years before the date of the grant, was greater than the court believed was being used for irrigation purposes at the time of the grant. The right to the use of this larger quantity, "which was at one time used in what seems to have been no more than an experiment in the attempt to grow cane on a commercial scale", did not pass with the grant; all that passed was the right of use "of such quantity as was being used at and immediately before the date of the grant."

Although the general principle as to quantity of water has been long established, and has been made to relate more specifically to the time of the award or grant, comparatively few cases in the supreme court have involved adjudications of water in terms of measured units of flow or quantity of water. Precise methods of measurement were not available in the early days. Adjudications, therefore,

[27] *Carter v. Territory of Hawaii*, 24 Haw. 47, 58-59 (1917)

[28] In *Wailuku Sugar Co. v. Widemann*, 6 Haw. 185, 186 (1876), it was contended that the land commission award had described the land in controversy as *kula* land, but the award was not in evidence; and the testimony showed that the land had been anciently watered but not during a period of more than 20 years prior to its purchase by plaintiff. Other questions were involved, and on the whole it was held that sufficient testimony was not available to determine the rights of either party.

generally were based upon divisions of the entire flow of the stream into stated fractions, such as one-half or one-third to each contestant; or upon the entire flow of the stream at the customary point of diversion and with the customary means of diversion; or upon the usual overflow from a certain structure or from certain lands; or upon rotation of the entire flow or of a stated fraction of the flow among various lands for a given number of days or hours of the day at a time. Established rotation systems may not be altered to the injury of the holders of rights based upon them, nor may methods of diversion be altered if the effect of the alteration is to deprive others of their customary use of water. Increased demands upon available water supplies, and claims of rights by adverse use, have made the need for precise determinations more imperative. A quantitative determination may be made where there is a reasonably definite basis for an adjudication, even though the evidence is not wholly satisfactory, but not where it is impossible for the claimant to make a showing with any reasonable degree of certainty. However, if the fact of customary use is shown by satisfactory evidence, the right is not denied merely because the quantity was not measured and [p. 107] cannot be proven…

Kalo or taro culture was common at the time of the land reform; apparently the principal use of water for agriculture at that time was on *kalo* lands. Hence the quantity of water required for *kalo* has been the basis of probably most of the ancient rights for agricultural purposes. This runs throughout the decisions. The quantity of water used on land on which *kalo* was being cultivated at the time of the inception of the right, whatever that quantity was in a given case, is the current measure of the ancient appurtenant right of that land, regardless of the present use of the water for other crops, such as rice or sugar cane, and regardless of whether this ancient right is being exercised in the cultivation of the land in connection with which it was originally acquired or has been transferred to new land.[35] The ancient right of taro lands to the use of storm or freshet waters for the purpose of flushing out the patches was recognized in one of the decisions.[36] (Hutchins, 1946:107)

Hutchins (1946) also observed that while the primary discussions address "ancient appurtenant rights…adjudicated…for irrigation purposes," domestic usages are also granted:

> …The ancient appurtenant right includes also the right to water for household and other domestic purpose. This was probably implicit in the early cases, and has been recognized explicitly in several decisions…[38] (Hutchins, 1946:107)

In the course of collecting the oral history interviews or "*kama'āina* testimony" for the present study, the issues of water flow, and continued rights to water for agricultural and domestic use on *Kuleana* and Grant lands (as raised by Hutchins' paper above), were raised. The waters and lands are important to the well-being of families in the Hāmākua-Ko'olau region (see *Volume II*).

[35] See Davis v. Afong, 5 Haw. 216, 224 (1884); Lonoaea v. Wailuku Sugar Co., 9 Haw. 651, 665 (1895); Wong Leong v. Irwin, 10 Haw. 265, 267-269 (1896); Palolo Land & Improvement Co. v. Wong Quai, 15 Haw. 554, 560-563 (1904).

[36] Hawaiian Commercial & Sugar Co. v. Wailuku Sugar Co., 15 Haw. 675, 690-691 (1904).

[38] Kaalaea Mill Co. v. Steward, 4 Haw. 415 (1881); Lonoaea v. Wailuku Sugar Co., 9 Haw. 651, 664 (1895)

B. Kuleana ʻĀina (Land Tenure)

In pre-western contact Hawai'i, all land and natural resources were held in trust by the high chiefs (*ali'i 'ai ahupua'a* or *ali'i 'ai moku*). The use of lands and resources were given to the *hoa'āina* at the prerogative of the *ali'i* and their representatives or land agents (*konohiki*), who were generally lesser chiefs as well. By 1845, the Hawaiian system of land tenure was being radically altered, and the foundation for implementing the *Māhele 'Āina* of 1848, was set in place. This change in land tenure was promoted by the missionaries and the growing Western population and business interests in the island kingdom. Generally these individuals were hesitant to enter into business deals on lease-hold land.

On December 10th, 1845, the king, Kauikeaouli, Kamehameha III signed into law, a joint resolution establishing and outlining the responsibilities of the Board of Commissioners to Quiet Land Titles. The actions called for, and laws to be implemented were as follows:

ARTICLE IV. –OF THE BOARD OF COMMISSIONERS TO QUIET LAND TITLES.

SECTION I. His Majesty shall appoint through the minister of the interior, and upon consultation with the privy council, five commissioners, one of whom shall be the attorney general of this kingdom, to be a board for the investigation and final ascertainment or rejection of all claims of private individuals, whether natives or foreigners, to any landed property acquired anterior to the passage of this act; the awards of which board, unless appealed from as hereinafter allowed, shall be binding upon the minister of the interior and upon the applicant.

SECTION II. Said commissioners shall, before acting, take and subscribe an oath to be administered to them by the minister of the interior in the following form:

> We and each of us do solemnly swear that we will carefully and impartially investigate all claims to land submitted by private parties against the government of the Hawaiian Islands; and that we will equitably adjudge upon the title, tenure, duration and quantity thereof, according to the terms of article fourth of the seventh chapter of the first part of an act entitled "An act to organize the executive departments of the Hawaiian Island," passed at Honolulu, —— day of ——, 18—.
>
> Subscribed and sworn to, this —— day of ——, 18—.
>
> Before me, ———
>
> Minister of the Interior.

Which oath, having been sworn to, shall remain on file in the interior department.

SECTION III. It shall be the duty of said board of commissioners to select one of their number as president…

SECTION IV. The president of said board shall, at least once in each month, from the date of their first convention, report their proceedings to the minister of the interior—the number of claims then pending before them—the number to that date confirmed or rejected, and the reasons for confirmation and rejection of any particular claim to land, with all the evidences adduced to and reduced before them.

SECTION V. It shall be the special duty of board to advertise in the Polynesian newspaper, during the continuance of their sessions the following public notice, viz.:

> TO ALL CLAIMANTS OF LAND IN THE HAWAIIAN ISLANDS.—The undersigned have been appointed by His Majesty the king, a board of commissioners to investigate and confirm or reject all claims to land arising previously to the —— day of ——, 18— [Dec. 10, 1845]. Patents in fee simple, or leases for terms of years, will be issued to those entitled to the same, upon the report of which we are authorized make, by testimony to be presented to us.
>
> The board holds its stated meetings weekly at ——, in Honolulu, island of Oahu, to hear the parties or their counsel, in defense of their claims; and is prepared, every day to receive in writing, the claims and evidences of title which parties may have to offer, at the ——, in Honolulu between the hours of 9 o'clock A.M. and 3 o'clock P.M.
>
> All persons are required to file with the board specifications of their claims to land, and to adduce the evidence upon which they claim title to any land in the Hawaiian Islands, before the expiration of two years from this date, or in default of doing so, they will after that time be forever barred of all right to recover same, in the courts of justice.

SECTION VI. The said board shall be in existence for the quieting of land titles during the two years from the first publication of the notice above required, and shall have the power to subpoena and compel the attendance of witnesses by discretionary fine; in like manner, when in session for the hearing of arguments, to punish for contempt; and they shall have the power to administer oaths to witnesses, and to perpetuate testimony in any case depending before them, which, when so perpetuated, shall be valid evidence in any court of justice created by the act to organize the judiciary.

SECTION VII. *The decisions of said board shall be in accordance with the principles established by the civil code of this kingdom in regard to prescription, occupancy, fixtures, native usages in regard to landed tenures, water privileges and rights of piscary*, the rights of women, the rights of absentees, tenancy and subtencancy, —primogeniture and rights of adoption; which decisions being of a majority in number of said board, shall be only subject to appeal to the supreme court, and when such appeal shall not have been taken, they shall be final.

SECTION VIII. All claims to land, as against the Hawaiian government, which are not presented to said board within the time, at the place and in the manner prescribed in the notice required to be given in the fifth section of this article, shall be deemed to be invalid, and shall be forever barred in law, unless the claimant be absent from this kingdom, and have no representative therein.

Section IX. The minister of the interior shall issue patents or leases to the claimants of lands pursuant to the terms in which the said board shall have confirmed their respective claims, upon being paid the fees of patenting or of leasing (as the case may be) prescribed in the third part of this act, unless the party entitled to a lease shall prefer to compound with the said minister in the succeeding section allowed.

SECTION X. The minister of the interior shall have power in concurrence with the privy council, and under the sanction of His Majesty, to issue to any lessee or tenant for life of lands so confirmed, being an Hawaiian subject, a patent in fee simple for the same, upon payment of a commutation to be agreed upon by his Majesty in privy council.

SECTION XI. The patents and lease issued in accordance with the award of said commissioners, shall be recorded at the expense of the patentee or lessee, as prescribed in the third part of this act, in a book to be kept for that purpose by the minister of the interior.

SECTION XII. The said board shall not have power to entertain any claims to lands set up by any private person or persons until the claimant shall have deposited with the minister of finance a bond conditioned to defray the costs and expenses incident to the proposed investigation, according to the rates of charge prescribed in the third part of this act; which costs and expenses, shall, after award rendered, be taxed by the president of said board, and a certificate thereof shall be given to the claimant who shall exhibit the same to the minister of finance, whose certificate of full payment, together with the award of the commissioners, shall authorize the delivery of the awarded patent or lease to such confirmed claimant, by the minister of the interior, and not without.

SECTION XIII. The titles of all lands claimed of the Hawaiian government anterior to the passage of this act, upon being confirmed as aforesaid, in whole or in part by the board of commissioners, shall be deemed to be forever settled, as awarded by said board, unless appeal be taken to the supreme court, as already prescribed. And all claims rejected by said board, unless appeal be taken as aforesaid, shall be deemed to be forever barred and foreclosed, from the expiration of the time allowed for such appeal. [In the Polynesian; January 3, 1846:140]

As the *Māhele* evolved, it defined the land interests of Kauikeaouli (King Kamehameha III), some 252 high-ranking *Ali'i* and *Konohiki*, and the Government. As a result of the *Māhele*, all land in the Kingdom of Hawai'i came to be placed in one of three categories: (1) Crown Lands (for the occupant of the throne); (2) Government Lands; and (3) *Konohiki* Lands (cf. Indices of Awards 1929). The "Enabling" or "*Kuleana Act*" of the *Māhele* (December 21, 1849) further defined the frame work by which *hoa'āina* (native tenants) could apply for, and be granted fee-simple interest in "*Kuleana*" lands (cf. Kamakau in *Ke Au Okoa* July 8 & 15, 1869; 1961:403-405). The *Kuleana Act* also reconfirmed the rights of *hoa'āina* to access, subsistence and collection of resources necessary to their life upon the land in their given *ahupua'a*. The *Kuleana Act*, which remains the foundation of law pertaining to native tenant rights, sets forth the following:

August 6, 1850
An Act confirming certain resolutions of the King and Privy Council passed on the 21st day of December 1849, granting to the common people allodial titles for their own lands and house lots, and certain other privileges.

Be it enacted by the Nobles and Representatives of the People of the Hawaiian Islands in Legislative Council assembled;

That the following sections which were passed by the King in Privy Council on the 21st day of December A.D. 1849 when the Legislature was not in session, be, and are hereby confirmed, and that certain other provisions be inserted, as follows:

Section 1. Resolved, That fee simple titles, free of commutation, be and are hereby granted to all native tenants, who occupy and improve any portion of any Government land, for the land they so occupy and improve, and whose claims to said lands shall be recognized as genuine by the Land Commission; Provided, however, that the Resolution shall not extend to Konohikis or other persons having the care of Government lands or to the house lots and other lands, in which the Government have an interest, in the Districts of Honolulu, Lahaina and Hilo.

Section 2. By and with the consent of the King and Chiefs in Privy Council assembled, it is hereby resolved, that fee simple titles free of commutation, be and are hereby granted to all native tenants who occupy and improve any lands other than those mentioned in the preceding Resolution, held by the King or any chief or Konohiki for the land they so occupy and improve. Provided however, this Resolution shall not extend to house lots or other lands situated in the Districts of Honolulu, Lahaina and Hilo.

Section 3. Resolved that the Board of Commissioners to quiet Land titles be, and is hereby empowered to award fee simple titles in accordance with the foregoing Resolutions; to define and separate the portions belonging to different individuals; and to provide for an equitable exchange of such different portions where it can be done, so that each man's land may be by itself.

Section 4. Resolved that a certain portion of the Government lands in each Island shall be set apart, and placed in the hands of special agents to be disposed of in lots of from one to fifty acres in fee simple to such natives as may not be otherwise furnished with sufficient lands at a minimum price of fifty cents per acre.

Section 5. In granting to the People, their House lots in fee simple, such as are separate and distinct from their cultivated lands, the amount of land in each of said House lots shall not exceed one quarter of an acre.

Section 6. In granting to the people their cultivated grounds, or *Kalo* lands, they shall only be entitled to what they have really cultivated, and which lie in the form of cultivated lands; and not such as the people may have cultivated in different spots, with the seeming intention of enlarging their lots; nor shall they be entitled to the waste lands.

Section 7. When the Landlords have taken allodial titles to their lands the people on each of their lands shall not be deprived of the right to take firewood, *aho* cord, thatch, or ti leaf from the land on which they live, for their own private use, should they need them, but they shall not have a right to take such articles to sell for profit. They shall also inform the Landlord or his agent, and proceed with his consent. The people shall also have a right to drinking water, and running water, and the right of way. The springs of water, and running water, and roads shall be free to all should they need them, on all lands granted in fee simple. Provided, that this shall not be applicable to wells and water courses which individuals have made for their own use.

Done and passed at the Council House, Honolulu this 6th day of August 1850. [copied from original hand written "Enabling Act"[10] – HSA, DLNR 2-4]

The most important source of documentation that describes native Hawaiian residency and land use practices — identifying specific residents, types of land use, crops cultivated, and features on the landscape — is found in the records of the *Māhele 'Āina* (Land Division). The "Land Division" gave the *hoa'āina* an opportunity to acquire fee-simple property interest (*kuleana*) on land which they lived and actively cultivated, but the process required them to provide personal testimonies regarding their residency and land use practices. As a result, records of the *Māhele 'Āina* present readers with first-hand accounts from native tenants generally spanning the period from ca. 1819 to 1855.

The lands awarded to the *hoa'āina* became known as "*Kuleana* Lands." All of the claims and awards (the Land Commission Awards or LCA) were numbered, and the LCA numbers remain in use today to identify the original owners of lands in Hawai'i.

[10] See also *Kanawai Hoopai Kanuma no ko Hawaii Pae Aina* (Penal Code) 1850.

The work of the Land Commission was brought to a close on March 31, 1855. The program, directed by principles adopted on August 20, 1846, met with mixed results. In its' statement to the King, the Commissioners to Quiet Land Titles (George M. Robertson, March 31, 1855) summarized events that had transpired during the life of the Commission:

…The first award made by the Commission was that of John Voss on the 31st March 1847.

The time originally granted to the Board for the hearing and settlement of all the land claims in the kingdom was two years, ending the fourteenth day of February, 1848.

Before the expiration of that term it became evident that a longer time would be required to perform a work… Accordingly, the Legislature on the 26th day of August 1847, passed an Act to extend the duration of the Board to the 14th of February, 1849, adding one year to the term first prescribed, not however, for the purpose of admitting fresh claims, but for the purposes of hearing, adjudicating and surveying those claims that should be presented by the 14th February, 1848. It became apparent to the Legislature of 1848 that the labors of the Land Commission had never been fully understood, nor the magnitude of the work assigned to them properly appreciated, and that it was necessary again to extend the duration of the Board. An act was accordingly passed, wisely extending the powers of the Commissioners "for such a period of time from the 14th day of February 1849, as shall be necessary for the full and faithful examination, settlement and award upon all such claims as may have been presented to said Board." …[T]he Board appointed a number of Sub-Commissioners in various parts of the kingdom, chiefly gentlemen connected with the American Mission, who from their intelligence, knowledge of the Hawaiian language, and well-known desire to forward any work which they believed to be for the good of the people, were better calculated than any other class of men on the islands to be useful auxiliaries to the Board at Honolulu…

…During the ten months that elapsed between the constitution of the Board and the end of the year 1846, only 371 claims were received at the office; during the year 1847 only 2,460, while 8,478 came in after the first day of January 1848. To these are to be added 2,100 claims, bearing supplementary numbers, chiefly consisting of claims which had been forwarded to the Board, but lost or destroyed on the way. In the year 1851, 105 new claims were admitted, for Kuleanas in the Fort Lands of Honolulu, by order of the Legislature. The total number of claims therefore, amounts to 13,514, of which 209 belonged to foreigners and their descendants. The original papers, as they were received at the office, were numbered and copied into the Registers of the Commission, which highly necessary part of the work entailed no small amount of labor…

…The whole number of Awards perfected by the Board up to its dissolution is 9,337, leaving an apparent balance of claims not awarded of say 4,200. Of these, at least 1,500 may be ranked as duplicates, and of the remaining 2,700 perhaps 1,500 have been rejected as bad, while of the balance some have not been prosecuted by the parties interested; many have been relinquished and given up to the Konohikis, even after surveys were procured by the Board, and hundreds of claimants have died, leaving no legal representatives. It is probable also that on account of the dilatoriness of some claimants in prosecuting their rights before the Commission, there are even now, after the great length of time which has been afforded, some perfectly good

claims on the Registers of the Board, the owners of which have never taken the trouble to prove them. If there are any such, they deserve no commiseration, for every pains has been taken by the Commissioners and their agents, by means of oft repeated public notices and renewed visits to the different districts of the Islands, to afford all and every of the claimants an opportunity of securing their rights… [Minister of Interior Report, 1856:10-17]

It is reported that the total amount of land—around the Hawaiian Islands—awarded to *hoa'āina* equaled approximately 28,658 acres (cf. Kame'eleihiwa 1992:295).

Claims and Awards of the Māhele 'Āina (1848-1855)
For Lands of Hāmākua Poko, Hāmākua Loa and Ko'olau

As a result of a detailed review of the Hawaiian language records of the *Māhele*, important documentation regarding residency and land use practices in the lands extending from the Wailuku-Hāmākua Poko District Boundary to the Ko'olau-Hāna District Boundary— including seven (7) *ahupua'a* and various *'ili* in Hāmākua Poko; twenty-eight (28) *ahupua'a* and numerous *'ili* in Hāmākua Loa; and thirty-nine (39) *ahupua'a* and many *'ili* in Ko'olau—was located. The Indices of Awards (1929), which is the standard reference used to identify *Ali'i-Konohiki* and *hoa'āina* (native tenant) awardees of *kuleana* (private property rights) in the *Māhele*, reports that 276 claims were awarded in the lands of the Hāmākua-Ko'olau region.

A detailed review of the original Hawaiian claims recorded in the Register and Testimony Books of the Land Commission, provided documentation that at least 453 claims—representing at least 470 individuals—were recorded for the lands from Hāmākua Poko to Ko'olau. Of this total, 51 applications were made for land in Hāmākua Poko; 255 applications were made for land in Hāmākua Loa; and 147 applications were made for land in Ko'olau. Thus, at least 180 more claims were registered than were awarded. The author notes here, that while a detailed review of the *Māhele* records was conducted as a part of the present study, it is possible that additional records of claims may be located in future searches of the *Māhele* – Land Commission records[11].

Like the records of the *kuleana* that were awarded, the additional claims, provide important documentation pertaining to a wide range of land use activities, spanning elevational zones extending from the near-shore fisheries to the forest lands. The records tie specific families to *ahupua'a* and sites (i.e. features of the cultural-historical landscape and the nature of land use), and provide us with background information on how the claimants came to be in possession of the properties. Many of the claimants reported that their property rights of residency and land use dated back to 1819 and earlier (handed down from their parents and grandparents). Other claimants also stated that their rights were granted by pre-*Māhele Konohiki*, generally dating from the 1830s to the 1840s.

Upon realizing that many more claims for *kuleana* were made than were awarded, one naturally might wonder "why?" Aside from the fact that the concept of private land ownership was completely foreign to the native Hawaiian mind, other factors also contributed to the short-comings of the *Māhele*. Regardless, the records show that many native tenants did step forward in the process of application for private land rights. Several problems in perfecting claims stand out in the record. Among these problems was the occurrence of — (1) epidemics; (2) fear; (3) loss of applications; and (4) rejection of claims:

[11] Have have listed only those claims for which a land area was specifically identified. It has been found that a number of claims (as transcribed into the Register and Testimony Volumes), were separated from their original transmittal packets (during the proceedings of the Land Commission), without recording who the transmitting sub-agent was, and the lands he was responsible for.

(1) Historical documentation from all of the Hawaiian Islands reports that many native residents (including applicants) died in between the time they registered their claims, and were to have provided testimony verifying the claims.

(2) Some of the *Ali'i-Konohiki* awardees also made it a practice of instructing *hoa'āina* not to present testimony for *kuleana* (cf. Kamakau 1961:403; and J.S. Green, October 3, 1846 in this study).

(3) In the Hāmākua Poko-Ko'olau study area many applicants provided testimony that their registration of claims were written out and submitted via authorized agents. The records apparently did not arrive at the office of the Land Commission (see testimonies in this study).

(4) As described above in G.M. Robertson's report to the King (March 31, 1855), the Commissioners to Quiet Land Titles rejected many claims for various reasons. As described in the records for the Hāmākua Poko-Ko'olau region, at least 180 applications were rejected. Interestingly, it will be seen in the records of the Royal Patent Grants, that some *hoa'āina* did acquire fee-simple interest in land (likely some of the land they had originally claimed), as a part of the Grant program.

Tables 1-a and 1-b (pages 92-292 in this study) provide readers with the primary documentation cited in each individual application for land found in records of the *Māhele* [12]. Documenting the *Māhele* in 1848-1855 was a monumental task for the Land Commission and its agents. While the generations that follow the years of the *Māhele* are fortunate to have the records, it will be seen that there were many problems in recordation. These problems present us with some questions that will never be answered, and require us to make educated assumptions (based on standard practices of residency and land use, and requirements of the *Māhele* application process at the time), to better understand what the records tell us.

Several important points should be considered when reviewing the translations of verbatim records of the *Māhele* cited herein. These points include, but are not limited to the following observations:

(1) Transcription Errors:
Among the records of the Hawaii State Archives (HSA) is a collection of original handwritten notes from applicants for *kuleana* and field agents of the Land Commission. This collection is found in Series 294 of the HSA, and is the source information for the Register and Testimony volumes that make up the Māhele Books. Our review of selected records in Series 294 has revealed that Land Commission transcribers sometimes transposed applicant and land names, and *Helu* (the Land Commission Award or LCA Numbers) when first transcribing the records. Also, the spelling of names (people and places) is inconsistent. At times, errors are further compounded between Register, Testimony, Mahele Award Books, and Royal Patent Books.

Subsequently, the 1929 Indices of Awards adds further errors to the collection (transposing the spelling of names and *Helu*).

[12] In October 2000, *Kumu Pono Associates* made arrangements with the Hawaii State Archives, and contracted with Advanced Micro-Image, to digitize the entire collection of original records of the Register, Testimony, Mahele Award Books, and Royal Patents (work being done in development of the KPA collection). All of the documentation cited herein for the Hāmākua Poko-Ko'olau study area was viewed (and in most cases translated by Maly) from the digitized collection. A paper copy of the records is cited as *Appendix A*, and accompanies selected copies of the study. All original source documentation is cited with each record, thus providing parties the information necessary to locate records of interest.

In the 1960s-1970s, the HSA archivists also undertook the significant task of translating all Hawaiian documents of the Register and Testimony books, in order to help make the records more accessible. The archivists used the original handwritten volumes of the Register and Testimony as their source of information, but unfortunately another layer of errors was added to the record—most of which are simple typographical errors. Because the translated texts are those which receive the most use in present-day land history research, a number of errors which are not a part of the original records are repeated as fact. These errors include discrepancies in the types of land use reported, and transposing of people and land names, and *Helu*.

(2) Documentation is Vague or not Given (discussion on selected terms used in narratives):

(a) There are many claims in the Register and Testimony that provide no verbal description of cultivation or residence. Based on the requirement of the Law (the *Kuleana Act*; Dec. 21, 1849), this should not be interpreted as the absence of such features or land use, but instead, a weakness in the original process of recordation. The *Kuleana Act* (cited above) specifically limited native tenant claims to *'āpana* (parcels or lots) of land which they actively cultivated, and on which they resided.

(b) Of particular interest to the study of land use and water flow, are descriptions of *kahawai* (streams), *'auwai* (irrigation channels) and *lo'i kalo* (irrigated taro pond fields). In a number of claims a specific number of *lo'i kalo* and *'auwai* is given. In other claims, the Hawaiian word "*mau*" (many or some) is used to describe more than one *lo'i* or *kula* (planting field). In some narratives, *mau* is qualified by also giving the exact number of features being described, but not always. Where *mau* is used in text without a qualifying number, we have indicated "2 +" for the number of features listed. Thus, the total number of *lo'i* and dry land planting features used at that time of the *Māhele* was likely much greater than the numbers reported herein, indicate.

Lo'i, Kula, and Pō'alima
Generally, the Hawaiian word "*lo'i*" means that the parcel is an irrigated pond field. At the time of the *Māhele*, the Hawaiian word "*kula*" (open plan or flat land) described a dry land parcel that was cultivated (unless otherwise qualified — e.g., *"kula holoholona*," a pasture). While conducting the present investigation into records of the *Māhele*, it was found that when *kula* is used in association with *kalo* (e.g., "*kula kalo*" or "*kalo kula*"), the applicant is describing either a dry land cultivating field, or when near a stream flatland on which *lo'i* could be made and flooded, a wet land use was described. Because records are incomplete, the total number of dry-land and wet-land field features cannot be accurately given, and it is likely that there is a greater number of both types of agricultural fields, than the numbers presently indicate.

Also, in some cases, where Hawaiian and English texts for a claim were recorded (usually because the original claim was thought to have been, or was misplaced), the descriptions for the same *Helu* differed. One narrative will give "*Aina Loi*" (pond field land), and the corresponding narrative might state "*kalo* land" (with no indication of wet or dry-land use)[13]. (For example, see *Helu* 5514 of Anakalea – Native Testimony 5:460, and Native/Foreign Testimony 8:83.)

Another important term in Hawaiian land use is *pō'alima* (literally: fifth night, historically, Friday). In ancient Hawai'i, certain parcels of land were worked solely for the *ali'i*; such parcels are also known as "*kō'ele*." By the time of the *Māhele*, changes in land tenure and taxation laws, led to the establishment of the *pō'alima* parcel of land — literally called Friday Parcel because the pieces of land so designated, were worked by the commoners on Fridays to supply food resources to their *ali'i* (no one else was allowed to take the crops cultivated on the *pō'alima* for their personal use). In the districts of Hāmākua Poko, Hāmākua Loa and Ko'olau, a total of 129 *pō'alima* were discussed by the native tenants. Thus, the total number of cultivated lots (both wet land and dry land) is greater than the total given in the claims for *kuleana*.

(3) Access:

There are few specific references to the native trails or historic "roadways" (e.g. *mauka-makai* trails, the larger *alaloa* and *Alanui Aupuni*) in the documentation provided in the Register and Testimony for claims. While there is only limited reference to trails, this is explained by the fact that trails were integral to residency and subsistence patterns, and the cultural landscape. The rights of native tenants to access, both within their *ahupua'a* and to the larger public byways, were prescribed in both traditional and historic laws. In the case of the *mauka-makai* trails, the record of land use also tells us that such trails existed in each *ahupua'a*. This is substantiated by the descriptions of various *kuleana* parcels (claimed by individual tenants) that cross several land use and elevational zones (for example near the shore, on the *kula*, and in the forest). Oral history interviews conducted as a part of the present study also speak of the presence of *mauka-makai* trails in each *ahupua'a*.

Summary of Land Use Described by Applicants for Kuleana in Hāmākua Poko, Hāmākua Loa and Ko'olau

As a result of the above observations, while conducting the present study, all of the original Hawaiian language claims submitted to the Land Commission, were reviewed. *Tables 1-a and 1-b* (pages 92-292) are a compilation of all the *Māhele* claims that have been located for lands of Hāmākua Poko, Hāmākua Loa and Ko'olau[14]. The author prepared the translations herein, and focused on several classes of documentation cited in the claims, including —

(1) The locations of the parcels;

(2) Types of usage, such as crops cultivated (wet land and dry land) and areas of residency;

(3) Occurrence of *lo'i, 'auwai, kahawai*, and *kula* lands;

(4) How the land was obtained, and length of residency;

(5) Place names of the *'ili* and other small land division units within the larger *ahupua'a*; and

(6) References to additional sites or features within or adjoining the *kuleana* (for example — trails, walls, and platforms etc.).

[13] Citing legal renderings, W.A. Hutchins (1946; in this study) discusses irrigated and dry land fields, and provides readers with a historical overview of the water rights (*pono wai*), and their disposition in *Māhele* and Grant lands.

[14] All primary Hawaiian documentation in Native Register and Native Testimony for lands of Hāmākua Poko, Hāmākua Loa and Ko'olau is shown in *Tables 1-a & 1-b*.

In *Tables 1-a and 1-b*, a long dash (—) indicates that no specific reference to cultivation, a residence or some other feature was made in the original written description. Where no description of cultivation is given in the records, at least one (1) cultivated field and one (1) house for each for the *kuleana* can be reasonably assumed. For example, only 53 of 453 claims provided specific reference to a house being a part of a *kuleana* claim. It is reasonable to assume that as many as 400 additional houses—likely more, based on the traditional practice of families having separate residences at various elevational zones in some of the *kuleana*—would have occurred at the time of the *Māhele*. Also, 34 of the claims cited in the Testimony volumes, provided no specific documentation describing the nature and extent of crop cultivation. Many other claimants reported that some sort of cultivation was occurring, but gave no specific description of the type (e.g., wet land, dry land, or types of crops). Thus, in addition to the more than 1,032 cultivated fields (both wet- and dry-land) for which specific documentation was given, there are, at a minimum, another 133 *pō'alima* parcels, and 34 individual gardens of varying sizes that could be safely added to the total number of cultivated fields in the three districts of the study area.

While much information appears to be missing from the historic record, a variety of subsistence and residency land use practices were described in the claims by *hoa'āina* of Hāmākua Poko, Hāmākua Loa and Ko'olau, spanning the period from ca. 1819 to 1855. *Table 2* provides readers with a summary of selected activities and features described in the Register and Testimony volumes for each district (inconsistencies in recordation, as described above will be observed).

Table 2. Summary of Selected Land Use Activities Described in Māhele Records

Register		*Testimony*	
Hāmākua Poko		***Hāmākua Poko***	
Hale	1	*Hale*	1
Lo'i	3	*Lo'i*	0
'Auwai	0	*'Auwai*	0
Kīhāpai etc. (Dry Land Gardens)	96	*Kīhāpai* etc. (Dry Land Gardens)	78
'Ualu	9	*'Ualu*	0
Olonā	0	*Olonā*	0
Pō'alima	1	*Pō'alima*	2
'Ōpae	0	*'Ōpae*	0
'O'opu	0	*'O'opu*	0
Kai & Loko (Fisheries)	0	*Kai & Loko* (Fisheries)	0
Hāmākua Loa		***Hāmākua Loa***	
Hale	32	*Hale*	5
Lo'i	919	*Lo'i*	21
'Auwai	1	*'Auwai*	3
Kīhāpai etc. (Dry Land Gardens)	415	*Kīhāpai* etc. (Dry Land Gardens)	534
'Ualu	214	*'Ualu*	12
Olonā	12	*Olonā*	5
Pō'alima	0	*Pō'alima*	124
'Ōpae	5	*'Ōpae*	0
'O'opu	4	*'O'opu*	0
Kai & Loko (Fisheries)	6	*Kai & Loko* (Fisheries)	0

Table 2. Summary of Selected Land Use Activities Described in Māhele Records

Register		*Testimony*	
Ko'olau		***Ko'olau***	
Hale	20	*Hale*	33
Lo'i *approximately 142 lo'i at Ke'anae & approximately 408 lo'i at Wailua*	625	*Lo'i* *approximately 62 lo'i at Ke'anae & approximately 96 lo'i at Wailua*	232
'Auwai	1	*'Auwai*	48
Kīhāpai etc. (Dry Land Gardens)	94	*Kīhāpai* etc. (Dry Land Gardens)	145
'Ualu	7	*'Ualu*	0
Olonā	9	*Olonā*	27
Pō'alima	0	*Pō'alima*	3
'Ōpae	1	*'Ōpae*	0
'O'opu	0	*'O'opu*	0
Kai & Loko (Fisheries)	3	*Kai & Loko* (Fisheries)	3

Glossary of Hawaiian Words and Abbreviation Terms Cited in Māhele Claims:

In the translated texts that follow, the original Hawaiian is maintained when referencing land terms, directional coordinates, sites, features, and plants. The glossary below, provides readers with translations of various words and terms used in the *Māhele* claims:

Ahupuaa – an important sub-division of land (extending from fishery to an area on the mountains), generally containing varied environmental zones and resources necessary to sustain a community. Such zones and resources were managed in smaller land parcels which were delineated within given *ahupuaa*.
Ala Aupuni — Government Road.
Alanui – trail or thoroughfare.
Apana – parcels or lots within given *kuleana* (i.e. *Apana 1, Apana 2…*).
Auwai – an irrigation channel; ditch system.
FR – Foreign Register
Hale – house.
Hau – a native woody hibiscus; used for outriggers, floaters, and cordage etc.
Ie & ieie – the endemic climbing screwpine of the forest lands, used to make baskets and traps.
Ili – land sections of varying sizes and configurations, part of the land management system within the larger *ahupua'a*.
Kahawai – a stream, creek or gulch (wet or dry).
Kalawa – scattered planting areas.
Kalo or *ai* – the taro.
Kihapai – a small land parcel, usually a dry land garden; though sometimes seen in association with *loi*, indicating a pond-field garden (e.g., *kihapai kalo* and *kihapai uala* — dry land taro and sweet potato fields). In the larger regional field system, the planting areas are often marked by walls, clearings, stone mounds, and planting pits etc.)
Ko – sugar cane.
Koa (*Koá*) – the native *acacia* of the forest; used for canoe making.
Koele – a land division worked for the chief (called *poalima* in historic times).
Konohiki – land overseer, chief or owner of the larger land division.
Kukui – candlenut trees.
Kula – generally an open dry land cultivating field; also describes a plain land region (in the later 1800s, also used to describe pasture land).

Glossary (continued)

Lai – the ti plant; used for a wide range of purposes.
Loi Kalo — taro pond fields.
Loko – a pond (fish pond).
Loko ia – a fish pond.
MA – Mahele Award Book.
Mahi – to cultivate or cultivated.
Mahiai, Mala and *Mahina* – cultivated fields and gardens in the dry land area.
Maia – bananas.
Makai – to the shore; shoreward.
Mala – a dry land cultivating field (e.g., *mala kalo* - taro field).
Mauka – to the uplands; inland.
Moo aina – a cultivated strip of land, often marked with stone alignments, running *mauka-makai*.
Muliwai – an estuarine pond system; generally where fish are cultivated.
N/A – Claim Not Awarded.
Niu – coconut trees.
NR – Native Register.
NT – Native Testimony.
Ohia – generally describing the mountain apple tree.
Olona – an endemic forest plant; used to make cordage.
Oopu – native stream fish (gobidae); eaten.
Opae – native stream shrimp; eaten.
Opu – a planting clump or patch (e.g., *opu olona*, a clump of *olona*).
Pa – a lot or enclosed parcel; for example "*pa hale*" (a house lot); "*pa puua*" (a pig pen); and "*pa holoholona*" (a corral) etc.
Paahao Loi – a taro pond field worked by prisoners.
Pahale – a house lot (also *hale, kahuahale, kauhale,* and *kulana kauhale*).
Pa kanu – cultivated lots.
Pa Mahiai – cultivated lot.
Pa pipi – cattle pasture.
Pauku – a segment of land; a dry land cultivating parcel.
Pue – mound plantings.
Punawai – a freshwater spring or pond.
RP – Royal Patent.
Uala – sweet potatoes.
Ulu – breadfruit trees.
Wai Opae – a pond or stream area where *opae* are gathered.
Wauke – the paper mulberry; used to make *kapa*.
Wiliwili – the *Erythrina* tree; used for canoe and net floaters.

Readers should also note that in the Testimony for claims (*Table 1-b*), directional references (e.g. *Mauka*, Hana, *Makai*, Hamakua…) indicate the boundary reference, qualified by what lies on the boundary of a given parcel. Also, every reference — to a *kahawai* (stream or creek, sometimes a watered gulch), *'auwai* (irrigation channel), and *lo'i* (irrigated pond field); as well as references to types of crops cultivated and resources collected — found in the testimonies is cited. Other reference points (such as lands and individuals bounding the parcels) are sometimes cited as well.

Claimant & Helu	*Ahupua'a*	*Register Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*

Table 1-a – Claims Registered for Hāmākua Poko, Hāmākua Loa and Ko'olau
Claims Registered for Hāmākua Poko

M. Kekauonohi ***Helu 11216***	Haliimaile	4:360-363	*Ahupuaa* of Haliimaile, Hamakuapoko, Maui. (*Alii* Awardee). (page 361)	—	—	—	—	—	See Testimony
W. P. Lelehoku ***Helu 9971***	Hamakuapoko	4:503-505	Western ½, *Ahupuaa* of Hamakuapoko, Maui … (*Alii* Awardee) (page 503)	—	—	—	—	—	See Testimony
Kekapa Wiili & Naai ***Helu 5443*** (see also *Helu* 5443 B)	Hamakuapoko	5:59 & 60	Wiili – I have claims at Ohia, Kuapaia, and Ekahunui. They are an old right from my parents. Naai – My claim is at Poala, gotten from my parents. Kekapa – My claims are at Onohai and Kui o Pai. Gotten from my parents. January 26, 1848	—	—	—	—	—	See Testimony
I. Nalaipuleho ***Helu 3331***	Paniau	6:60	My property right was gotten from Kekauluohi, and when she died, from Kanaina, it extends from the mountain to the sea. It is at Paniau, Hamakuapoko. January 8, 1848	—	—	—	—	—	See Testimony
Kekahuna Kamahine Kuana Nawai Paulua & Kanakanui ***Helu 4142***	Haliimaile, Paniau	6:151-152	Kekahuna folks have a claim for land at Haliimaile and Hamakuapoko. The *Ahupuaa* is Paniau, the *ili* are: Kahakaibu, which belongs to Kamahine. Also, at Pana, Kuana has a *kuleana*. At Pana 2nd, Nawai has a *kuleana*. At Kahanui, Paudua has a *kuleana*. At Kuapaia, Kanakanui has a *kuleana*. The right of residency is from our *kupuna*, in the time of Kahekili, and it has come to us, the descendants.	—	—	—	—	—	See Testimony

Claimant & Helu	*Ahupua'a*	*Register Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kiha ***Helu 5325***	Paia, Hamakuapoko & Haiku, Hamakualoa Hamakuapoko	6:268-269	My land claim at Hamakuapoko is a paicel on the *kula*. The name of the *kula* is Mokaoi. It is an open place where people do not live. There are two men who cultivate it. I also have some lots at Paia that I cultivate (*pa mahiai*), there are ten and forty cultivated lots, and one *pa pipi* (cow pasture). Also three *punawai nui* (large ponds or springs), and two lands that I inherited from my father-in-law. Here also is a claim that I have for three *loi kalo* at Haiku, Hamakualoa, gotten from Kahalekohu. It was I who made the walls of the *loi*. I would also like to perhaps have a another land at Hamakuapoko. The reason for this is that in 1841, Feb. 7, Kekauluohi instructed me to care for the land of Hamakuapoko, Kuakini also instructed me to care for Hamakuapoko.	—	3	—	51	*Kula* *Pa mahiai* Pasture *Punawai* *Loi Kalo*	See Testimony
Kalaeloa ***Helu 5326***	Paia	6:269	My claim is for property which my *kupuna* had, then my father, and which I now have. I also have twelve *pu hala* (pandanus trees), four *ohia* (mountain apple trees), and also several *wiliwili* trees. January 25, 1848	—	—	—	—	*Hala* *Ohia* *Wiliwili*	See Testimony

Claimant & Helu	Ahupua'a	Register Book & Page	Summary of Claim Documentation	Hale	Lo'i Kalo	Auwai	Kihapai Kula Mahiai Mahina Mala Moo Opu Pa	Crops, Activities and Resources Identified	Disposition N/A=Not Awarded Mahele Award Book & Royal Patent
Kekahuna ***Helu 5421***	Haliimaile, Paia & Hamakuapoko (& Haiku)	6:288-289	My *kuleana* is at Haliimaile and Hamakuapoko. At Haliimaile it is in Mahana, Kawaapae, and Kukuiohana. The *kuleana* at Hamakuapoko are Kamole, Kauhikoa, Apee, Kaluanui, Puuiki, these are for the school house, how about Kekahuna, does he not have any rights? Here is what Kekahuna has cultivated, an *uala* field (*mahina*) at Kahalamanu, and another garden at Kuapaia, a mound (of *uala*). At Ekahanui is a garden, with a *poalima* in it, and at Kahakahee there is a garden. At Haiku, Kekahuna also has a garden, and at the *Pali* of Kapuna… (also cites a *kuleana* in Wailuku).	—	—	—	6	School House Lot *Uala* *Poalima* (1)	See Testimony
Wahai ***Helu 5484***	Haliimaile	6:303	23, January 1848 My *kuleana* is a *Kihapai* (garden) at Kaeke in Haliimaile *Ahupuaa*. In the garden is a planted area and a *wiliwili* tree. I have had it for nine years. Gotten from Kalua, the *Konohiki*.	—	—	—	1	*Wiliwili* trees	N/A
Kulahola ***Helu 5492***	Kaopa & Haiku (Hamakualoa)	6:303-304	My *kuleana* is at Opelepela in Kaopa, the *Ahupuaa*. I have two *Kihapai* (dry land gardens) there. There is also one *Kihapai* at Haiku. Kamakini is the *Konohiki* at Kaopa and Kopa is the *Konohiki* at Haiku. I have had the *Kihapai* at Kaopa for 30 years, and had the *Kihapai* at Haiku for 3 years.	—	—	—	3	*Kihapai*	See Testimony
Palalu ***Helu 5500 B***	Haliimaile	6:307	My *kuleana* area at Kakaiwao, Kukuihookiikii, Paneaneonea, and Kaliukea.	—	—	—	—	—	See Testimony

Claimant & Helu	Ahupua'a	Register Book & Page	Summary of Claim Documentation	Hale	Lo'i Kalo	Auwai	Kihapai Kula Mahiai Mahina Mala Moo Opu Pa	Crops, Activities and Resources Identified	Disposition N/A=Not Awarded Mahele Award Book & Royal Patent
Kanakanui ***Helu 5500*** (see also 4142)	Paniau	6:308	My claim is two parcels, one at Kuapaia and the other at Makaleha.	—	—	—	—	—	See Testimony
Naluahi ***Helu 5501 B***	Kaliukea (Kaopa)	6:308	My claim is at Kaliukea second. It is an old place, gotten from Kapeke of Kaliukea.	—	—	—	—	—	See Testimony
Kaumana ***Helu 5501***	Paniau	6:308	My land claims are at Aula, in the *Ahupuaa* of Paniau; I have three *kihapai* (cultivated gardens) there, one of *uala*, one of *wauke*, and one with *ulu* trees and *ko*. Haleipuleo is the *Konohiki*, I have had it for one year. January 23, 1848	—	—	—	3	*Uala* *Wauke* *Ulu* *Ko*	See Testimony
Kaina ***Helu 5502***	Haliimaile	6:308	I have a *kihapai* at Pualaea, in Haliimaile, it only has *wauke* growing in it. I have had it for nine years, and Kalua is the *konohiki*. January 23, 1848	—	—	—	1	*Wauke*	See Testimony
Kiha ***Helu 5503***	Honohina	6:309	My *kihapai* is at Moomuku in Honohina. My one *kihapai* is planted with *uala*, *maia*, *ulu*, and some *ko*. Kekipi is the *Konohiki*. It was gotten by me five years ago.	—	—	—	1	*Uala* *Maia* *Ulu* *Ko*	See Testimony
Kahalela ***Helu 5504*** (see also *Helu* 3504 & 3304 E)	Haliimaile & Haiku	6:309	I have a *kihapai* at Kukuioleu, Haliimaile. My *kihapai* has *uala*, *maia*, *wauke*, and *ohia*. I've held it for nine years, Kalua is the *Konohiki*. At Haiku, I have a *kihapai* with three *mala kalo* (dry land taro patches). I've had it for 2 years, Kopa is the *Konohiki*.	—	—	—	5	*Uala* *Maia* *Wauke* *Ohia* *Kalo*	See Testimony
Kaiwiheleole ***Helu 6387***	Kamole (Paia)	6:361	My property is at Kamole. It is an inheritance from my parents.	—	—	—	—	—	N/A
Apiki ***Helu 6510***	Hamakuapoko	6:397	I have a claim at Kikalapuakea. It was gotten by me long before the work on the Fort at Lahaina.	—	—	—	—	—	See Testimony

Claimant & Helu	Ahupua'a	Register Book & Page	Summary of Claim Documentation	Hale	Lo'i Kalo	Auwai	Kihapai Kula Mahiai Mahina Mala Moo Opu Pa	Crops, Activities and Resources Identified	Disposition N/A=Not Awarded Mahele Award Book & Royal Patent
Huna ***Helu 6536***	Paia	6:398	My property claim is at Waioku, it is a small *kihapai*, and a open field (*kula*).	—	—	—	2	—	See Testimony
Palalu ***Helu 6603***	Haliimaile & Paniau	6:404	I have a *kula hanai holoholona* (pasture on which livestock is tended), it is a place where no one lives. On the field, I have two stone walled paddocks, the name of these places are Wilikilau, and Puuhinale is the second.	—	—	—	2	Pastures	See Testimony
Kanehailua ***Helu 7970***	Paia	6:448	I herein describe my claims at Hamakua poko to you. I have six *pa mahiai* (cultivated lots), some behind and some in front of the Fort. These cultivated parcels are at Paia. There is also a valley where *kukui* trees were planted by the grandfather of my wife. There are four *kukui* trees, five rows of *hala* trees, and six rows of *wiliwili* trees. All of these things which I have told you, were done by our grandparents, and by our parents.	—	—	—	6	*Pa Mahiai* *Kukui* *Hala* *Wiliwili*	See Testimony
Haulepu ***Helu 8055***	(Hamakualoa, Kahulu) & Kaopa	6:453	My claim is for two native *uala* patches (*moo uala maoli*) at Hamakualoa. At Kahulu, there are two foreign potato patches. At Kaopa, there is one foreign potato patch. At Mokulaau there is an *uala* patch. At Kualapa, there is a *kalo* patch. At Kaopa, there is one *uala* patch for the winter time.	—	—	—	6	*Uala* *Uala Haole* *Kalo*	N/A

Claimant & Helu	Ahupua'a	Register Book & Page	Summary of Claim Documentation	Hale	Lo'i Kalo	Auwai	Kihapai Kula Mahiai Mahina Mala Moo Opu Pa	Crops, Activities and Resources Identified	Disposition N/A=Not Awarded Mahele Award Book & Royal Patent
Kekipi ***Helu 8314***	Waiaka at Wailuku Honohina & Hulaia, Hamakua-poko)	NR 6:460	February 10, 1849 My claim is for land and *loi*. It is an *ili* in Wailuku, Waiaka is its name. My right came from Kailihiwa. I have 50 *loi*, and have had them since Feb. 23, 1840. (Note: NR Vol. 5 contains portion of NT Vol. 9:582-697. NT 9:597 – *Helu* 8314 contains description of 5 parcels in Hamakuapoko.)	—	—	—	—	(see Native Testimony)	See Testimony
Kamakaala ***Helu 8468***	Paia & Paniau	6:466	My claim is at Hamakuapoko, two *Ahupuaa*, Paiakohola is one, the other is Paiakupono. There are six *pa kanu* (cultivated lots) and one *pahale*. I have lived at Paia since before the death of Kamehameha I. I also have a *pa mahiai* (cultivated lot) at Paniau. Feb. 5, 1848	1	—	—	7	*Pahale* *Pa kanu* *Pa mahiai*	See Testimony
Paele ***Helu 10783***	Haliimaile	6:534	My property is at Kukuiohana. The *Konohiki* and tenants have all departed, I am the only one who remains on the land. There are four *ohia* trees, many *hala* trees and many *kukui* trees. At Koheheleia there are two *moo aina uala* (dry land fields of sweet potatoes), that I have there, and three *wiliwili* trees.	—	—	—	2	*Moo aina* *Ohia* *Hala* *Uala* *Kukui* *Wiliwili*	See Testimony

Claimant & Helu	Ahupua'a	Register Book & Page	Summary of Claim Documentation	Hale	Lo'i Kalo	Auwai	Kihapai Kula Mahiai Mahina Mala Moo Opu Pa	Crops, Activities and Resources Identified	Disposition N/A=Not Awarded Mahele Award Book & Royal Patent

Claims Registered for Hāmākua Loa

Claimant & Helu	Ahupua'a	Register Book & Page	Summary of Claim Documentation	Hale	Lo'i Kalo	Auwai	Kihapai Kula Mahiai Mahina Mala Moo Opu Pa	Crops, Activities and Resources Identified	Disposition N/A=Not Awarded Mahele Award Book & Royal Patent
E. Miner (Mahina) ***Helu 202***	Haiku	FR 1:135	The undersigned doth hereby lay his claims before you for a land, a *ili* in Haiku state of Hamakualoa, by the name of Kapalalea (Kapalaalaea), given to me by the *Konohiki* of the said land Haiku, Dec. 5, 1825. Secured to me by Hoapiliwahine in 1832. Of the said land I still hold possession.	—	—	—	—	—	See Testimony
Caswell, J. F. ***Helu 311***	Ulumalu	2:76 FR 1:181-182	"Look in the Foreign Book." In pursuance of an order issued in the Polynesian to all claimants of land to present their Claims for investigation, I beg leave to lay before you my claim to a Land situate in Hamakua, East Maui, known by the name of Ulumalo (Ulumalu), given me by H. Majesty Kamehameha III in December 1837 and I have held uninterrupted possession of it up to this date….	—	—	—	—	—	See Testimony
Nahinu ***Helu 791 & 3905*** (see also *Helu* 6510 VV)	Pauwela & Haiku	2:433-434	My property is at Pauwela, the name of the *ili* is Waikina. I have held it from the times of Aiawale, Lalahili, David Malo, and now Daniel Ii. I also have a claim at Haiku, in the *ili* named Nukupano, to it, also belongs the sea. It is an old holding, from the time of my grandparents, and then my father, and now me.	—	—	—	—	—	See Testimony

Claimant & Helu	Ahupua'a	Register Book & Page	Summary of Claim Documentation	Hale	Lo'i Kalo	Auwai	Kihapai Kula Mahiai Mahina Mala Moo Opu Pa	Crops, Activities and Resources Identified	Disposition N/A=Not Awarded Mahele Award Book & Royal Patent
Nakaleo (Kaleo) ***Helu 792***	Pauela (Pauwela)	2:434	My claim is in Pauela, Paukee is the name of my *ili*. There is also an *ili* called Laie, it is where I live. These are my claims. The *Konohiki* has taken Paukee from me, and I made a complaint to Kamakau, but he has done nothing. I got this property right from David Malo, and held it through Daniel Ii.	—	—	—	—	—	N/A
Kahue ***Helu 1402*** (see also *Helu* 6510 OO)	Peahi	3:99	My claim is for two *ili aina*, one is named Poponi, and the other named Pohakuhaku. One parcel is a *kula* (land), the other is an upland *olona* patch. They are at Peahi, Hamakualoa, above Halauololo, adjoining Halehaku…	—	—	—	2	*Olona*	See Testimony (6510 OO)
Wm. Harbottle ***Helu 2937***	Opana & Waipio	3:701	…Here are the lands taken by the King, Opana, Waipio and Kumuniu, on Maui. These lands were given to John Harbottle (father of William Harbottle) by Kamehameha I…	—	—	—	—	—	See Testimony
Keoni Ana ***Helu 8515***	Halehaku	3:708	*Ahupuaa* of Halehaku, Hamakua, Maui. (*Alii* Awardee)	—	—	—	—	—	See Testimony
Ouli ***Helu 4697***	Hanawana & Puumaile	4:322-323	I tell you of my claim, it is in the *ili* of Kaluaopii, in Hanawana first. I got it in the year 1841 from Umiumi, the *kahuna* of A. Paki, from his land there. Here also is a parcel in Kahauiki, an *ili* in Hanawa[na]; there are several *loi* and a dry land field. Here is another claim of mine, two *loi* in the *ili* of Keauhou, Hanawana 2.	—	5 +	—	6 +	*Loi* *Kalo* *Wauke* *Opae* *Olona*	N/A

Claimant & Helu	*Ahupua'a*	*Register Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Ouli ***Helu 4697*** (cont'd.)	Hanawana & Puumaile	4:322-323	In this claim of mine, there are also places where dry land *kalo* and *wauke* are planted; a *wai opae* (shrimp pond), and several *mala olona*. These are all my claims in Puumaile; gotten in the time of Huaheo, wife of Kaiko. given to me by Puu, from the time when Kaiko was living there, to the present.						
Nawaiki ***Helu 4794*** (see *Helu* 5361)	Makaiwa, Papuaea, Hanawana & Haiku (Waiakoa)	4:327	My claim is in the *Ahupuaa* of Makaiwa, gotten from Kaiko in the Year[18]20; held to this time, and now under Kekauonohi. Here is a claim of mine, an *ili* in the *Ahupuaa* of Papuaea, gotten from Kapaleaumoku in 1836. My right in this land is to this time, under Kekauonohi. I have a claim for a *kihapai* at Hanawana. There is also a claim for a *kihapai wauke* at Haiku. Kaonohimaka gave this to me in 1844, and to this time. There is also a field of *uala kahiki* at Kula, Waiakoa…	—	—	—	2	*Wauke*	See Testimony
Kealoha ***Helu 4796***	Waipio, Honopou, Honokala & Holawa	4:328	I have claim for property which I got from my parents, it was theirs from the time of Kamehameha I. I have a *kihapai* at Waipio, and a place at Ukake in Honopou. I also have some *kihapai* at Honokala. There are also *kihapai* at Holawa. Jan. 17, 1848	—	—	—	4 +	—	See Testimony

Claimant & Helu	*Ahupua'a*	*Register Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Halau ***Helu 4806***	Papuaea	4:329	My land is in the *ili* of Kualele at Papuaea nui. I got it in 1835 from hi-a.	—	—	—	—	—	N/A
Kahaule ***Helu 4919***	Kapuaea (Papuaea)	4:335	My claim is at Kapuaea, in the *ili* named Kanalimahoea. I got it from my *kupuna*, who got it at the time of the Peleleu [ca. 1795]. This is where I live to this time. There is another *kuleana*, with much water and 15 *loi*. It is at Kualele, in Kapuaea. Gotten from Kekauaaleleiki in 1846.	(1)	15	—	—	*Loi (Kalo)*	See Testimony
Kekahuna ***Helu 4965***	Papuaea	4:338	Aweuweu is the name of my property, it is an *ili* in Papuaea. I got it from my father in 1835. I also have a *kuleana* in Puua, an *ili* in Papuaea, gotten from my mother in 1835. Another *kuleana* is in the *ili* of Pahala, in Papuaea, it is my own, gotten from Iwa in 1835. January 14, 1848.	—	—	—	—	—	See Testimony
W.P. Leleiohoku ***Helu 9971***	Napuumaile Hanawana Kuiaha	4:502-506	…Napuumaile, District of Hanakualoa; Hanawana; Kuiaha; (page 503)… (*Alii* Awardee)	—	—	—	—	—	See Testimony
Namauu ***Helu 10474***	Uhumalu	4:558-559	*Ahupuaa* of Kaupakuhua and Uhumalu, Hamakualoa, Maui. (page 559) (*Alii* Awardee)	—	—	—	—	—	See Testimony
Kahanauwaha ***Helu 5130*** (see also *Helu* 6510 F)	Honokala Waipio	5:9	My claim is for three *ili aina*, their names are Mauli, Kaubiula, and Puu o Kaupu. There are places here and there, that are cultivated, one with 4 *loi*, another with 10 *loi*, at Waipio. There is also a *mala ie*. This is my right from the year 1841…	—	14	—	1	*Loi (Kalo)* *Ie*	See Testimony

Claimant & Helu	*Ahupua'a*	*Register Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kauwai ***Helu 5160***	Honopou	5:12	At Honopou, Lanikahuli, the *ili aina* of Kuuwewa. It is the claim of Kauwewa and her husband Hai. His wife is a relative, they are both blind. Kawai will see to it.	—	—	—	—	—	N/A
Kaumiu ***Helu 5161***	Hanawana	5:12-13	My claim is for the *ili* of Kukule, gotten from my parents in the time of the *ai kapu*…It is at Hanawana. There is also a claim at the shore, it is an *ili* of Hanawana, gotten in the time of Kamakini… There is also a claim for the *ili* of Kawaihae at Hanawana Second. There are 9 *loi* in Hanawana first. There are three *loi* at Alae. There are also several *loi* at Kaula.	—	15 +	—	—	*Loi (Kalo)*	N/A
Naone ***Helu 5208***	Waipio, Puohua, Honokala	5:18	(At) Waiohiwi, two *loi*. (At) Lanikahuli, two *loi*; 4 all together. At Waipio we purchased Kamoaulauhulu a *hoe* patch at Kaluaalaea. For ten [dollars ?] 12 cents. (At) Puohua there are five *loi*, so all together there are 9 *loi* claims of mine. At Hamakua. In Honokala lalo, there is an *ili* claim for Naone. Securing several *loi* at Keauwaula, and *mo o uala*, as a property for Naone, a relative.	—	12 +	—	1	*Loi (Kalo)* *Hau* *Uala*	N/A
Holoka ***Helu 5379***	Pauwela	5:49	My *kuleana* are at Waiokana and Ulukoa, in Pauwela..	—	—	—	—	—	See Testimony

Claimant & Helu	*Ahupua'a*	*Register Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Hoomaikai, Halelo & Kealawela (Kealiwaia) ***Helu 5393*** (see also *Helu* 5393 B)	Halehaku & Kuiaha	5:50-51	1. At Halehaku, I have several claims for *kuleana* land. An *ili* of *loi* at Pohakoele; an *ili* on the *kula* of Pualaea; a *kahawai Opae* (stream with shrimp); and 2 *wai Olona* (watered *Olona* patches) at Keaholiki, Waihua. By Hoomaikai, Halehaku. 2. My claim is in the *ili* of Kupoumoa (Kuiaha). (by) Halelo at Kuiaha. 3. Kuiaha. My *kuleana* claim is in the *ili* of Opihi, there is 1 *loi* at Poeleele, and one *moo uala* at Okanahua. By Kealawela at Kuiaha.	—	1	—	3 +	*Loi (Kalo)* *Opae* *Olona* *Uala*	See Testimony
Kapua ***Helu 5419***	Haiku	5:55	My claim is 12 *uala* patches, 7 *loi kalo*, and 1 *wauke* patch. My claim is at Maliko, my residence is there also.	1	7	—	13	*Uala* *Loi Kalo* *Wauke*	N/A
Kaauai (Kauahi) ***Helu 5423***	Halehaku	5:55	Kauahi has a *kuleana* at Halehaku. There are three *Olona* patches; there is also a section at Peahi; and a *pa hale* set aside for Kauahi.	1	—	—	3	*Olona* *Pa hale*	See Testimony
Kauailikea ***Helu 5426***	Pauwela	5:55	My *kuleana* is at Papaholahola, Pauwela. There are several *loi* and trees also.	—	3 +	—	—	*Loi (Kalo)* & various trees	See Testimony
Manoa ***Helu 5464*** (see also *Helu* 6510 D)	Holawa	5:62-63	My *kuleana* is in Kauhamano, an *ili* in Holawa, gotten from my parents in the time of Kamehameha first. I also have another claim, one *loi*, in the *ili* of Opae, at Holawa. I also have an *ie* patch in Kahikiloa.	—	1	—	1	*Loi (Kalo)* *Ie*	See Testimony
Hiilawe ***Helu 5516***	Holawa	5:63	My *kuleana* is at Puukaaha, an *ili* in Holawa. I have cultivated it at various locations.	—	—	—	—	*Mahi*	See Testimony

Claimant & Helu	*Ahupua'a*	*Register Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Moua (Mua) ***Helu 5516 B***	Holawa	5:63	My *kuleana* is in Kuahanahana at Holawa. I have cultivated it at various locations.	—	—	—	—	*Mahi*	See Testimony
Kaio ***Helu 5516 C***	Holawa	5:63	My *kuleana* is at Halenoni, an *ili* in Holawa, Hamakua. I have cultivated it at various locations.	—	—	—	—	*Mahi*	See Testimony
Oopu ***Helu 5516 D***	Holawa	5:63-64	My *kuleana* is at Kauhamano, an *ili* in Holawa. I have cultivated it at various locations.	—	—	—	—	*Mahi*	See Testimony
Poohina ***Helu 5516 E***	Holawa	5:64	My *kuleana* is at Kaumoohua, an *ili* in Honopou. I have cultivated it at various locations.	—	—	—	—	*Mahi*	See Testimony
Kaliki ***Helu 5516 F***	Honopou	5:64	My *kuleana* is at Kuamoohua, an *ili* in Honopou. I have cultivated it at various locations.	—	—	—	—	*Mahi*	N/A
Koleamoku Kaili Kanihoe Kaihe Kauhi ***Helu 6234***	Opana & Haiku	5:262-263	January 26, 1848 1. My *kuleana* land consists of 2 *loi kalo*, 2 cultivated *uala* fields. They are at Haiku, of Kaonohimaka, by Kaili. (see *Helu* 3905 B & 6510 K.) 2. My *kuleana* is 9 *loi kalo*, and a separate *ili*, by the name of Puaihao. by Kanihoe. (see *Helu* 3304 D) 3. My *kuleana* is 18 *loi kalo*, 1 *mala kalo*, 1 *mala wauke*, and 1 *kalena hale* (house), the name (of the place) is Wailea. by Kaihe. (see *Helu* 6510 M) 4. My claim is a different *ili*, and another *ili* with 32 *loi kalo*, at various locations. by Kauhi. (see *Helu* 6510 XX)	1	68	—	11	*Loi Kalo* *Uala* *Kalana hale* *Wauke*	See Testimony

Claimant & Helu	*Ahupua'a*	*Register Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Koleamoku Kaili Kanihoe Kaihe Kauhi (cont'd.) ***Helu 6234***	Opana & Haiku	5:262-263	5. My claim is also 2 *uala* gardens and 1 *wauke* garden. by Kaili (1). (see *Helu* 3905 B & 6510 K). Here is my *kuleana* claim. There are different *ili*, 1 *ili* with *uala* at Luahinepii. 1 *mala kalo* at Malua. 2 gardens, 7 *loi kalo*. My *kuleana* are in Opana. By Koleamoku.						
Kanui ***Helu 6249***	Hanawana	5:271	Hanawana *Ahupuaa*, Hamakua, Maui is for Kanui.	—	—	—	—	—	See Testimony
Esera Kauwahi (plus 6 others) ***Helu 7140***	Uaoa	5:286	My land claim is at Hamakualoa, Maui, Uaoa is the name of the *Ahupuaa*; it was gotten from the King in 1831. There are six people below me in this *Ahupuaa*.	—	—	—	—	—	(see *Helu* 8624)
Kawaha ***Helu 6454*** (see also *Helu* 6510 I)	Halehaku	5:373	This is a claim for my cultivated lands and place of residence. Punkii is a dry land parcel. Kalaimahina is where my *loi* are. At Waiki there are also two *loi*, and at Kahaikki, I have four *loi*; and a dry land piece. Kulihai is a dry land parcel, and it is covered with woods.	1	6 +	—	3	*Loi (Kalo)*	See Testimony

Claimant & Helu	*Ahupua'a*	*Register Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kipu Ku Kamakaeu ***Helu 7768***	Haiku	5:454	I have 7 *loi kalo* at Haiku, a/so a *hale* (house), and 3 *wala* patches at Haiku of Kaonohimaka… By Kipu. My claim is for 2 *loi kalo* at Haiku of Kahaleohu. I also have an *ili* in which *wala* are cultivated, 9 patches at one place, 2 patches at another, and 9 patches at another place. It is here in Haiku of Kaonohimaka… By Ku. (see *Helu* 6510 L) We tell you our claim. I have six *loi kalo* in Haiku of Kahaleohu; there are also six *walo* patches in Haiku of Kiliona Kaonohimaka… By Kamakaeu. (see *Helu* 6510 O)	1	15	—	2 9	*Loi Kalo* *Uala*	See Testimony
Kalua ***Helu 6487*** (see also *Helu* 3542)	Honopou	5:437	[Claims *ainc* on Oahu, Hawaii, and Maui.] …. 1 cultivated *kula* at Hamakualoa, Maui…	—	—	—	1	—	See Testimony
Nalopi ***Helu 3336***	Koiaha, Pauwela & Haiku	6:62	January 30, 1848 My *kuleana* is at Hamakua, Kuiaha, the section of land is Kupouamoa. *Kula* lands at Ulupepe, Pohoalauhala, Kunapopo. The *kulana hale* (house) claim is at Haiku. At Pauwela there is an *wala* patch. These are my *kuleana* lands, *loi, kula*, two *hala* trees, and two houses. 1 at Pauwela and 1 at Kuiaha.	2	1	—	2 +	*Loi (Kalo)* *Kalana hale* *Uala* *Hala*	See Testimony

Claimant & Helu	*Ahupua'a*	*Register Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
N. Paele ***Helu 3829***	Pauwela & Kuiaha	6:125	January 12, 1848 I have a claim at Pauwela, three *ili*, gotten from Kalola and Kamehameha I., and through Kamehameha II and Kamehameha III. From my *hapuna*, parents, and to me. Daniel Ii is the overseer of the *poalima* (lot). There is also a *kuleana* at Kuiaha, seven *loi*…	—	7	—	—	*Loi (Kalo)* *Poalima* (1)	See Testimony
Nalopi ***Helu 3904***	Kuiaha & Haiku	6:134	My *kuleana* is in the *ili* of Kapuaomanoa (Kupoaamoa), and the *ili* of Kalaupuli, Gotten from Kuka, to Nailiili, to my parents, and to me. I have a *kuleana* in the *ili* of Akauhewa, gotten from Kaonohimaka. At Haiku, Hamakualoa.	—	—	—	—	—	N/A
Laikona ***Helu 3904 B***	Haiku	6:134	I have a *kuleana* in the *ili* of Kahaleula, gotten from Keaka, then Nailiili, and to me. At Haiku, Hamakua, Maui…	—	—	—	—	—	N/A

Claimant & Helu	*Ahupua'a*	*Register Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Nahinu ***Helu 3905*** (see also *Helu* 6510 VV)	Haiku, Pauwela & Kaupakalua	6:134	I hereby tell you of my land claims. Nukupono is a *kuleana* (right), one section is a *kai* (fishery), gotten from my parents in 1832, upon the passing of Kauhumanu. At Haiku. My claim is also at Waikiina, Pauwela is the *Ahupuaa*, held for 17 years. Sections of the land are in *kalo*, and others are open *kula*.. Also, the claim is for Halilipali, at Pauwela, where we reside. Held since Armstrong has been at Hamakua. Here also is my claim at Puuolono, in Kaupakulua, held since 1847. Also at Kaupakuhua *Ahupuaa*, is a *kuleana* gotten from Kekio. I've been there two years…	1	—	—	1 +	*Kala* Fishing Rights *Kalo*	See Testimony
Kaili ***Helu 3905 B***	Pauwela	6:135	The claim is at Halilipali. A section is *kula*, and another section is a *loko* (pond).	—	—	—	1	*Loko*	See Testimony
Keliia ***Helu 3905 C***	Kuiaha	6:135	Olowaui is a *kula* parcel for *kalo*.	—	—	—	1	*Kalo*	See Testimony
Kaliiaa ***Helu 3905 D***	Pauwela	6:135	Here are the claims of Keliiaa, Noni a *kai* (fishery), a *kula* land and a *kalo* land. The right was given by Aiawale, and held to the present. At Pauwela.	—	—	—	1	Fishery *Kalo*	See Testimony
Koki ***Helu 3905 E***	Haiku	6:136	The claim is named Hookano, at Haiku the name is Pohakuloa. It is *kula* land and *kalo* land, gotten from his parents.	—	—	—	1	*Kalo*	N/A

Claimant & Helu	*Ahupua'a*	*Register Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Konohia ***Helu 3905 F***	Kaupakulua	6:136	The claim at Paehala is a *kai* (fishery). Another claim is for *kalo* land. It is an old right, from the time of Kauaeleiki. It is at Kaupakuhua.	—	—	—	—	Fishery *Kalo*	See Testimony
Keonekapu (Keonepaihu) ***Helu 3905 G***	Peahi (Paeaki)	6:136	Peahi is the *Ahupuaa*, Waiau is the *kuleana* land. There is land of *kalo, kula, Olona*, and *Ei* [*ie*], and a *Kahawai* (stream).	—	—	—	4 +	*Kalo* *Olona* *(Ie)* *Kahawai*	See Testimony
Kuewa ***Helu 3905 H*** (see also *Helu* 6510 T)	Peahi (Paeaki)	6:136	The *kuleana* is in Hukioho. There is a *kai* (fishery), also sections of *kula* and *kalo* land. It is at Paeaki (Peahi).	—	—	—	3 +	Fishery *Kalo*	See Testimony
Kuhaohao ***Helu 3905 I***	Halehaku	6:136	The *kuleana* is in Halehaku, the name is Kahapapa. There is *kalo* and *kula* (land), some *Olona* and *ie*, and a *Kahawai* (stream valley).	—	—	—	4	*Kalo* *Olona* *Ie* *Kahawai*	See Testimony
Piopio ***Helu 3905 K***	Halehaku	6:137	My *kuleana* is at Halehaku, it's name is Keamuhole. There is *kalo* and *kula* (land), also an area of *Olona* and *ie*, and a *Kahawai*.	—	—	—	4	*Kalo* *Olona* *Ie* *Kahawai*	See Testimony

Claimant & Helu	*Ahupua'a*	*Register Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Halcole ***Helu 3969***	Haiku & Kuiaha	6:140-141	January 11, 1848 My claim at Haiku is for five *kihapai uala*, gotten from Kaonohimaka. Also at Haiku, of Kahaleohu, there are *kihapai uala*, and *loi kalo*. 2 *kihapai uala* are before Kalanikahua. At Kaluakini there are 20 *loi kalo*. There is also another *ili* named Puleha. There are also *kihapai uala* gardens and 2 *loi kalo* at Kuiaha. I also have a *pa puaa* (pig enclosure), and a *kalana hale* (house), Kalanikahua is it's name. The *pa puaa* is within the lot. There is a *punawai* (spring) within the enclosure, and my horse is kept there.	1	22	—	8	*Uala* *Loi Kalo* *Pa puaa* *Punawai* *Kalana hale*	See Testimony
Hao ***Helu 3970*** (see also *Helu* 5490)	Kuiaha	6:141	My property claim is at Kuiaha, named Kahaakaholua. It was from my grandparents, and parents to me. I also have 4 *loi kalo* at Waiokama, and a place on the stream where *kalo* is planted in mounds (*kipi Kahawai*), 5 *olelo*, and 6 cultivated *loi* below there. There are also 14 pieces planted in *uala*.	—	10	—	14 +	*Loi Kalo* *Uala* *Kipi Kahawai* *Kahawai*	See Testimony
Kapohaku ***Helu 4120***	Maliko, Haiku	6:146	January 12, 1848 My *kuleana* is at Haiku, gotten from Kaonohimaka. There are 8 *kihapai uala*, 2 *kihapai waake*, and 6 *loi kalo* at Haiku of Kahaleohu..	—	6	—	10	*Uala* *Waake* *Loi Kalo*	See Testimony

Claimant & Helu	*Ahupua'a*	*Register Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kaai & Kealoha ***Helu 4121*** (see also *Helu* 4121 B)	Haiku	6:146	…Our *kuleana* is in Pahala 2, and Waiki. Gotten from our *hapuna*, and parents who are now dead. (Kaai and Kealoha – siblings)	—	—	—	—	—	See Testimony
Kaianui ***Helu 4128***	Haiku	6:147	January 11, 1848 My *kuleana* is a *kalo* land, an *ili* in Haiku. Its' name is Maunaoni. There is also a *kihapai uala*.	—	—	—	1	*Kalo* *Uala*	See Testimony
Kahoohanohano ***Helu 4131***	Kuiaha	6:147	Jan. 11, 1848 Keonekapu is the *Konohiki*, Kuiaha is the *Ahupuaa*, Kanoiloa is the name of the *ili*, my *kuleana* is there. There is also a *kuleana*, which I have cultivated under Kahaleula, there are several *loi kalo*..	—	3 +	—	—	*Loi Kalo*	See Testimony
Kaai ***Helu 4133***	Kuiaha	6:148	January 11, 1848 My *kuleana* is in the *ili* of Kahelu, in the *Ahupuaa* of Kuiaha. There are also some properties that I have at other locations. At Poeleele, there are 15 *loi*, at Kahaloa there is 1 *loi*. There are several *pua uala* (sweet potato mounds) at Ano. At Kiloiakua there are 4 *mou uala*, and 1 cliff side patch at Pohakaiole.	—	16	—	7 +	*Loi Kalo* *Uala*	See Testimony

Claimant & Helu	*Ahupua'a*	*Register Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Hanauapuaa ***Helu 4134***	Kuiaha	6:149	My *kuleana* lands are under the property of Kapihe, three parcels at Ululoloa, in the *Ahupuaa* of Kuiaha. At Nukuwai First, I have 29 *loi*. At Nukuwai second, I have 7 *loi*, and at Nukuwai Third I have 11 *loi*. At Ohia, there are 11 *loi*. At Kalanapoi there are 14 *loi*. At Poeleele there are 18 *loi*. I also have *wala* growing on the slope (*he wahi pali wala*), and a *awawa* (gulch) with *wauke*, and the *ala* (trail) to there. At Kaheho there are 4 *loi*, and *wauke* on the slope, and *niu* (coconut trees). These are my *kuleana*, held from Kamehameha I to Kamehameha III, where my *kupuna* and parents, and I have lived.	—	94	—	—	*Loi Kalo* *Uala* *Wauke* *Niu* *Ala* (trail)	See Testimony
Kahale ***Helu 4136***	Kuiaha	6:149	January 11, 1848 Kuiaha is the *Ahupuaa*, Keonekapu is the *Konohiki*. At Kaheho there are 5 *loi kalo*. At Poeleele there are 5 *loi kalo*. At Ululoa there are 7 *loi*. There is also a *kula wala* field with 8 gardens. I also have a *kauhale* (house) claim.	1	17	—	8	*Loi Kalo* *Uala* *Kauhale*	See Testimony

Claimant & Helu	*Ahupua'a*	*Register Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kapela ***Helu 4137***	Kaupakuhua	6:150	January 11, 1848 The *Ahupuaa* is Kaupakuhua, Kanehoalani is the *Konohiki*. My *kuleana* is named Kaluaaluaca. There are also several cultivated *loi* below Wailapa, 5 *loi* and 5 *uala* gardens.	—	5	—	5	*Loi Kalo* *Uala*	See Testimony
Kekahuna ***Helu 4138***	Kuiaha	6:150-151	The *Ahupuaa* is Kuiaha, the *ili* is Kapili, that is my claim. My land extends to the forest. I also have a *kuleana* at Poeleele, 8 *loi*, 5 *loi* at Pohakaiole, and 2 *loi*. I also have some *kalo* planted with *uala*, at Kikoiakua are 2 *uala* patches, at Pohakaiole is 1 *uala* patch.	—	13	—	3 +	*Loi Kalo* *Uala*	See Testimony
Mahiai ***Helu 4516***	Kuiaha	6:176	I have several claims for *loi*. In the *ili* of Kaohe, there are 23 *loi*, gotten from Kupa and Aimoo, at Kuiaha second. There are also claims of mine in Kawailoa and Kalapaulia, in Kuiaha II.	—	23 +	—	—	*Loi (Kalo)*	See Testimony
Kapihe ***Helu 4517***	Kuiaha	6:177	My claim is in the *ili* of Ululoloa, gotten from Keaka, Moa, Kahi, and Hapai.	—	—	—	—	—	See Testimony
Kekamaka ***Helu 4518***	Kuiaha	6:177	My claim is in the *ili* of Kahaleula, gotten from Keaka, to Naiiili, to Laikona, and to me, Kekamaka. At Kuiaha.	—	—	—	—	—	See Testimony
Kaiewe & Kamakau II ***Helu 4964 B***	Hanehoi	6:182	My *kuleana* is at Wailuahia in Hanehoi, gotten from Keawemahi, the *Konohiki*. January 13, 1848	—	—	—	—	—	See Testimony

Claimant & Helu	*Ahupua'a*	*Register Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Keonea ***Helu 4964***	Paohua	6:182	My *kuleana* is in Kauhi at Paolua, Hamakualoa.	—	—	—	—	—	N/A
Namokuelua ***Helu 4564***	Haiku	6:183	My *kuleana* is at Haiku, in Pahaa 1. Gotten from Kahaleohu, to his grandson Nahaolelua, and from my father.	—	—	—	—	—	See Testimony
Kealoha ***Helu 4564 B***	Haiku	6:183	My *kuleana* is a *kalanahale* (house) at Haiku, Nuuomalena is the *kula*. My right is from 1842. (see also L.C.A. 4121)	1	—	—	1	*Kalenahale*	N/A
Waiomao ***Helu not given***	Haiku	6:184	My *kuleana* is in Haiku, at Maialoa, that is the *ili*. Gotten from Kaaimalani to Hoaai, and then Kaonohimaka.	—	—	—	—	—	N/A
Daniela Ii ***Helu 4579*** (see also *Helu* 520)	Huelo Pauwela & Haiku (Kalanikahua)	6:185	January 18, 1848 My *kuleana* are at Hamakua, their names are Huelo and Pauwela. Haloa and Kalalii are the *kuleana* at Huelo. The *ili* at Pauwela are Kapuna, Hoopauwahie, and Waikina. I also have a *kalanakauhale* (house) at Kalanikahua.	1	—	—	—	*Kalenakauhale*	See Testimony

Claimant & Helu	*Ahupua'a*	*Register Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kapahu ***Helu 4960***	Holawa	6:189-190	My *kuleana* came to me from my parents. They had it in the time of Kamehameha I, Mahiahume was the overseer. Kamehameha I died, then Mahiahume died, and Lohelohe was the overseer under Kamehameha II. Then Kahui was the overseer, and Kamehameha III was the King. Kamokuiki was the overseer, when she died., Kapaukea became the overseer. I reside in the *hale* at this time...	1	—	—	—	*Hale*	See Testimony
Kalulo ***Helu 4673 B***	Uaoa	6:192	My claim is the *ili* of Akahoopua, in Uaoa, Hamakualoa.	—	—	—	—	—	See Testimony
Poohina ***Helu 4673*** (see also *Helu* 6510 WW)	Halehaku & Peahi	6:192	My claim is for 2 *kihapai* ie at Peahi, and at Halehaku, a patch of *Opu olona*, and a *Kahawai* (stream). At Pealii, there is some *Olona*.	—	—	—	3 +	*Ie* *Olona* *Kahawai*	N/A
Kuha ***Helu 4753 B***	Opana Halehaku	6:197	January 14, 1848 My claim is for 2 *Opu olona*, a *kihapai* (dry land garden), three *Ie kalo* (dry land taro fields), and a separate *ili*. These *kuleana* extend from Opana to Halehaku.	—	—	—	5	*Olona* *Kalo*	See Testimony
Maiola ***Helu 4753***	Halehaku	6:197	My *kuleana* has 3 *Opu olona*, 4 *kihapai ie*, 1 *pahale* (house), and 3 *loi kalo*.	1	3	—	7	*Olona, Ie* *Pahale* *Loi Kalo*	See Testimony

Claimant & Helu	*Ahupua'a*	*Register Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kaonohimaka ***Helu 4921***	Haiku	6:219-220	My *kuleana* is at Haiku, and there are several *ili* within it. Here are their names, Puhikoko, Mailehahei, and Kuiliili. These are *kula* lands with *uala* planted down to the shore. There are two *ili kor kalo*, Kekekukiai and Kiilua. These are my claims at Haiku. I also have a *kulanakauhale* (house) at Pauwela, Noni is it's name.	1	—	—	5 +	*Kalo* *Uala* *Kulanakauhale*	See Testimony
Kukiiahu ***Helu 4959***	Haiku	6:225	18, January 1848 Palaa is the name of my *kuleana*, it is in the land section of Pahaa, an *ili* of Haiku. It is a dry land *kula*, in the distant uplands, given to my parents by Kupihea. I also have a *kuleana* with two sections of *wauke*, along the stream of Nao. I inherited it from my parents.	—	—	—	3	*Wauke*	See Testimony
Kuapuu ***Helu 5016***	Kuiaha	6:227-228	14, Jan. 1848 My *kuleana* is in Kuiaha, at Pohakaiole. Hoikapaa is above, Malauea is below, and my right came from them. There are several *loi kalo*, and dry land fields of *uala* in my *kuleana*. There are also 9 *loi kalo* below there, from Kekoa, and a slope with *wauke*; and a dry land *uala* field as well, gotten from Kekoa.	—	12 +	—	5 +	*Loi Kalo* *Uala* *Wauke*	See Testimony

Claimant & Helu	*Ahupua'a*	*Register Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kaniau ***Helu 5086*** (see also *Helu* 5555)	Haiku & Pauwela	6:236-237	[A claim for various lands on Maui and Molokai] ... At Hamakualoa, Haiku, at Ipuwailua, there are 4 *loi*; and at Pauwela, there is one section of land...	—	4	—	—	*Loi (Kalo)*	See Testimony
Kaualeleiki ***Helu 5118***	Papaaea Haiku Hanawana	6:239	17, January 1848 My claim is in Papaaea three, gotten from Kaiko in 1820. I also have a *Kahawai wauke* (stream valley with *wauke* planted) at Haiku of Kaonohimaka, given me by Pahua in 1845. I have 5 *loi kalo* at Hanawana, given by Inoimo. I also have a *mala ie* (*ie* patch) and a *kulanakauhale* (house) at Hanawana.	1	5	—	2	*Loi Kalo* *Wauke* *Ie* *Kulanakauhale*	See Testimony
Kauhiheewaa ***Helu 5119*** (see also *Helu* 5392 D)	Pauwela, Hanawana	6:240	My claim is for 9 *loi kalo*, in Pauwela. I also have a *kuleana* at Kanemoaala, and *ili* in Pauwela. Daniela is the witness.	—	9	—	—	*Loi Kalo*	See Testimony

Claimant & Helu	*Ahupua'a*	*Register Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kanehoalani ***Helu 5123***	Kaupakulua Kuiaha	6:240	January 18, 1848 My *kuleana* are in the *Ahupuaa* of Kaupakulua, Maumau is my *kuleana*, gotten from Kamehameha I, when my *kupuna* lived on it. There are *kuleana* at Ulukaa and Pohakii and in the forest at Kapuku, Kauoha and Poaiwi. These are my own *kuleana*. There are also some below, that I cultivate from Makale, there is one *loi*, and at Kuiaha, there are 10 *loi kalo*. At Kaupakulua first, Pohoiki is the name of my *Kuleana*. There is a dry land *uala* patch, a *Pali* with *wauke*, *maia* are also planted, and all the things needed for my living and for my wife, children, and loved ones. Here also is something that I forgot, an *uala* field at Kapahi, gotten from Kamealoha.	—	11	—	3 +	*Loi Kalo Uala Wauke Maia*	See Testimony
Kamohai ***Helu 5162***	Hoolawa	6:243-244	Komoiki sold Honokala to Hoapili, and Holawa went to Kamokuiki. Kamokuiki told me to return to and live at Holawa, she gave me an *ili* at Holawa. There are many *loi*, a large area of *kula*, and a *Kahawai* (stream). The witnesses are Kapahu, Aukukui and Kealoha. [Also describes old *kuleana* rights at Hana…]	—	4 +	—	1	*Loi (Kalo) Kahawai*	See Testimony

Claimant & Helu	*Ahupua'a*	*Register Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kanui ***Helu 5250***	Hanawana 2	6:252	My *kuleana* is the *ili* of Kawaihae at Hanawana second, Hamakua. Also at Keauhou second, I have *Olona* patches and many things that I care for.	—	—	—	2 +	*Olona*	See Testimony
Uheke ***Helu 5250 B***	Honokala	6:252	Paamau in Honokala, that is my land of Keawaula.	—	—	—	—	—	See Testimony
Pihao ***Helu 5250 F***	Honokala	6:252	My land is Malena at Honokala.	—	—	—	—	—	N/A
Iseraela ***Helu 5250 C***	Honokala	6:253	It is Kahei at Honokala, there are six *loi*, it is an *ili*.	—	6	—	—	*Loi (Kalo)*	See Testimony
Pilipili ***Helu 5344***	Pauwela	6:274	My *kuleana*, gotten in 1841, is at Waikina, Pauwela, Hamakualoa. Here is another claim, at Puukoa in Pauwela. 23, Jan. 1848	—	—	—	—	—	See Testimony
Nawaiki ***Helu 5361*** (see also *Helu* 4794)	Makaiwa & Papaaea	6:276	My *kuleana* are two *Ahupuaa*, Makaiwa is one, and Papaaea iki is the other. My right is from Kaiko, and when he died, it went to Kaukuna, and when he died, it went to Kekauonohi, and I am below her. I also have a *pahale* (house) lot at Hanawana. There are also several dry land gardens at Hanawana, one *loi*, one dry gulch and dry land *kalo*, in it. There is also a dry land section with *hala* trees. At Hanawana second, there is one *loi kalo*, and one *uala* patch. There is also several wet areas with *Olona* growing at Papaaea.	1	2	—	7 +	*Pahale Loi Kalo Hala Uala Olona*	See Testimony

Claimant & Helu	*Ahupua'a*	*Register Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Huluhulu ***Helu 5392***	Waipio	6:281	My *kuleana* is at Kapalaoa second, Waipio.	—	—	—	—	—	See Testimony
Kawahine ***Helu 5392 B***	Hanehoi	6:281	My *kuleana* is at Kaiwa, Hanehoi.	—	—	—	—	—	See Testimony
Makapowahine ***Helu 5392 C***	Puolua	6:281	My land is at Popolonui, at Puolua.	—	—	—	—	—	N/A
Kauhihoewaa ***Helu 5392 D*** (see also *Helu* 5119)	Hanawana	6:281	My *kuleana* is several *loi kalo*, an *uala* field, and a *pa* (house lot) at Hanawana.	1	3 +	—	1	*Loi Kalo Uala Pa*	See Testimony
Moenalauhulu ***Helu 5392 E***	Waipio	6:282	My *kuleana* is at Alele, in Waipio.	—	—	—	—	—	See Testimony
Unu ***Helu 5392 F***	Huelo	6:282	My *kuleana* is at Kahuku, in Huelo.	—	—	—	—	—	N/A
Kanakaokai ***Helu 5392 G***	Huelo & Puolua	6:282	My *kuleana* is for the things which I have done with my hands, many *loi* at Huelo and Puolua.	—	3 +	—	—	*Loi (Kalo)*	See Testimony
Nika ***Helu 5392 H***	Waipionui	6:282	My *kuleana* is at Pahoa, in Waipionui.	—	—	—	—	—	See Testimony
Kauhi ***Helu 5392 I***	Honokala	6:282	My land is at Kaluanui in Honokala, Hamakualoa. There are several places cultivated.	—	—	—	—	*Mau wahi mahi ai*	See Testimony
Makahikipuni ***Helu 5392 K***	Honopou	6:282	My land is at Kapapaanae in Honopou. It is my own *ili*, given by the *Konohiki*, there are many *loi* there.	—	3 +	—	—	*Loi (Kalo)*	See Testimony
Kanoa ***Helu 5420 B*** (see also *Helu* 3304 C)	Haiku	6:288	Haiku. 24, Jan. 1848 My *ili* is Auwaiokane, gotten from my parents who had it from Kalohi. It is our claim, for myself and my older brother.	—	—	—	—	*Auwaiokane*	See Testimony
Kulaamea ***Helu 5420***	Haiku	6:288	I have a *kuleana* at Haiku first, Kahalaupuikii is my *ili*, gotten from Kaonohimaka.	—	—	—	—	—	See Testimony

Claimant & Helu	*Ahupua'a*	*Register Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kekahuna ***Helu 5421***	Haiku with Haliimaile & Hamakuapoko	6:288-289	[see also entry for Hamakuapoko] …At Haiku, Kekahuna also has a *mahina* [*uala* garden], at the *Pali* of Kapuna, a place that he has walled in with his own hands.	—	—	—	1	*Uala*	See Testimony
Naeole ***Helu 5439***	Haiku	6:293	My *kuleana* is for 5 *uala* patches and 6 *kalo* patches. My *hale* (house) claim is in Maliko.	1	—	—	11	*Kalo Uala Hale*	See Testimony
Palea ***Helu 5451***	Honopou	6:294	At Honopou, the land of Kealiiahonui, I have two claims at Lukue and Kahauiki. At Lukue there are 25 *loi kalo* and 4 slopes with *uala* plantings, up to my *hale*. At Kahauiki there are five *loi kalo*, 3 mounds (*kalawa*), and 4 *uala* patches. It is in the woods and *ie*. (MA 7:453)	1	30	—	12	*Hale Loi Kalo Uala Ie*	See Testimony
Pia ***Helu 5452*** (see also *Helu* 10650)	Honopou	6:294	My *kuleana* is at Honpou, the land of Kealiiahonui. At Mauluku there are six *loi*, one *kalawa*, and one cliff with *wauke*. At Manohale there are 13 *loi kalo*, five *uala* fields, three *kalo* mounds (*kalawa*), and a *kulanahale* (house).	1	19	—	10	*Loi Kalo Wauke Uala Kulanahale*	See Testimony
Paele ***Helu 5453*** (see also *Helu* 5453 D)	Haiku	6:295	January 20, 1848 My *kuleana* is 12 *kuleana mahi uala* (sweet potato gardens), 6 *kalo* gardens, and 1 *wauke* field. My *kauhale* (house) is at Kahei, in Haiku.	1	—	—	19	*Uala Kalo Wauke Kauhale*	See Testimony
Auaea ***Helu 5453 B***	Haiku	6:295	January 20, 1848 My *kuleana* is two *kihapai uala*, 12 *kihapai kalo*, 2 *kihapai wauke*, and my *kulanakauhale* (house).	1	—	—	16	*Uala Kalo Wauke Kulanakauhale*	N/A

Claimant & Helu	*Ahupua'a*	*Register Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kalino ***Helu 5453 C***	Haiku	6:295	January 20, 1848 My *kuleana* is 15 *kihapai uala*, a *kihapai mahi wauke*, and my *kauhale* (house) at Maliko, in Haiku.	1	—	—	16	*Uala Wauke Kauhale*	See Testimony
Moi ***Helu 5459***	Hanehoi & Waipio	6:297	My *kuleana* is the *ili* of *Ohia* at Hanehoi, Hamakualoa, and also many places with *loi* at Waipio.	—	3 +	—	—	*Loi (Kalo)*	See Testimony
Kaleo ***Helu 792***	Hanehoi	6:297	My *kuleana* is at Mohala, in Hanehoi, Hamakualoa. Gotten from the *konohiki*.	—	—	—	—	—	N/A
Papaiakea ***Helu 5459 B***	Puolua	6:298	My *kuleana* is at Kuaikawakawa in Puolua. There are many *loi* at various locations.	—	3 +	—	—	*Loi (Kalo)*	See Testimony
Paukei ***Helu 5459 C***	Huelo	6:298	My *kuleana* is at Pohakoele in Huelo. There are many *loi* at various places which are mine.	—	3 +	—	—	*Loi (Kalo)*	See Testimony
Kaalae ***Helu 5459 D***	Papaaea	6:298	My *kuleana* is the *ili* of Waikawiwi, in Papaaea. I have cultivated various locations.	—	—	—	—	*Mahi ma kahi e*	See Testimony
Kuluwaimakalani ***Helu 5459 E***	Huelo	6:298	My *kuleana* is at Kamakauke in Huelo. There are many *loi* at various locations.	—	3 +	—	—	*Loi (Kalo)*	See Testimony
Kaahaiea ***Helu 5459 F***	Huelo	6:298	My claim is at Palau in Huelo. There are many *loi* in various places.	—	3 +	—	—	*Loi (Kalo)*	See Testimony
Mahoe ***Helu 5459 G***	Huelo	6:298	My *kuleana* is at Kahaloa in Huelo.	—	—	—	—	—	See Testimony
Kaaeae ***Helu 5459 H***	Hanehoi	6:298	My *kuleana* is at Opuoloolo in Hanehoi.	—	—	—	—	—	See Testimony
Poohina ***Helu 5459 I***	Honokala	6:298	My *kuleana* is at Ha in Honokala.	—	—	—	—	—	See Testimony
Kamanu ***Helu 5459 K***	Waipio	6:299	My *kuleana* is at Pohakuloa in Waipio.	—	—	—	—	—	See Testimony

Claimant & Helu	*Ahupua'a*	*Register Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kahi ***Helu 5459 L***	Puolua	6:299	My *kuleana* is at Puulahokole in Puolua.	—	—	—	—	—	N/A
Paleku ***Helu 5459 M***	Hanehoi	6:299	My *kuleana* is at Kaiwa in Hanehoi.	—	—	—	—	—	N/A
Olomele ***Helu 5459 N***	Hanehoi	6:299	My *kuleana* is at Pohakoele in Hanehoi.	—	—	—	—	—	See Testimony
Hewahewa ***Helu 5459 O***	Honopou	6:299	My *kuleana* is at Papuaa in Honopou.	—	—	—	—	—	See Testimony
Puuheana ***Helu 5459 P***	Honopou	6:299	My *kuleana* is at Pohaku in Honopou.	—	—	—	—	—	N/A
Kaluhiauhee ***Helu 5459 Q***	Huelo	6:299	My *kuleana* is at Kawahaokapuaa in Huelo.	—	—	—	—	—	See Testimony
Pahia ***Helu 5459 R***	Huelo	6:299	My *kuleana* is at Pulehu in Hamakualoa.	—	—	—	—	—	See Testimony
Naoo ***Helu 5459 S***	Huelo	6:299	My *kuleana* is at Kalalii in Huelo.	—	—	—	—	—	See Testimony
Lalahili ***Helu 5459 T***	Puolua	6:299	My *kuleana* is at Kawapapulua in Hamakualoa.	—	—	—	—	—	See Testimony
Kepio ***Helu 5459 U***	Waipio	6:300	My *kuleana* is at Makaku in Waipio.	—	—	—	—	—	See Testimony
Kaliki ***Helu 5459 (V)*** (& 5516 F)	Honopou	6:300	My *kuleana* is at Kumoohua in Honopou.	—	—	—	—	—	See Testimony
Paaluhi ***Helu 5459 W***	Halehaku	6:300	My *kuleana* is at Pohakuloa in Halehaku.	—	—	—	—	—	See Testimony
Imihia ***Helu 5459 X***	Honopou	6:300	My *kuleana* is at Puniawa, Kaulukanu in Honopou.	—	—	—	—	—	See Testimony
Keahi ***Helu 5459 Y***	Puolua	6:300	My *kuleana* is a *wai Olona* (a wet area of *Olona* growth) in Holawa.	—	—	—	1	*Olona*	See Testimony

Claimant & Helu	*Ahupua'a*	*Register Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Hao ***Helu 5490***	Kuiaha & Pauwela	6:303	My *kuleana* is an *ili* at Kuiaha, Kaluakoholua is its name. There are many *loi* at Kuiaha second, eight at Kuiaha, and a place with *uala* mounds. At Pauwela there are several *loi*, and at Kuiaha, several *uala* mounds, gotten from my parents.	—	12 +	—	4 +	*Loi (Kalo)* *Uala*	See Testimony
Hookaea ***Helu 5491***	Kuiaha	6:303	My *kuleana* is at Kuiaha, it is an *ili* in Kuiaha, named Kapili. At Kaheho I have four *loi*, I also have several places along the cliff for potatoes, and potato mounds. At Kaopili, Kapuaa, Papalo, and Kuiaha, there are *uala* mounds, gotten from my parents.	—	4	—	6 +	*Loi (Kalo)* *Uala*	See Testimony
Kulahola ***Helu 5492***	Kaopa & Haiku	6:303-304	My *kuleana* is at Opelepela in Kaopa, the *Ahupuaa*. I have two *Kihapai* there. There is also one *Kihapai* at Haiku… Kopa is the *Konohiki* at Haiku… I have had the *Kihapai* at Haiku for 3 years.	—	—	—	1	—	See Testimony
Kekaa (Kekoa) ***Helu 5493***	Halehaku	6:304	My *kuleana* is at Halehaku, from Nahaolelua. There is also an *ili* gotten from Kapoe, in this claim. There are also five *loi* gotten from Kulani. Also, above this *ili* claim, there are many trees, *kukui*, *ohia*, *Kaa*, and *Puhala*. There is also my *kauhale* (house), and some *kula* lands, and 3 *pauku kahawai* (stream side parcels).	1	5	—	3 +	*Loi (Kalo)* *Kukui* *Ohia* *Kaa (Koa)* *Hala* *Kahawai* *Kauhale*	See Testimony

Claimant & Helu	*Ahupua'a*	*Register Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kuahuikala ***Helu 5494*** (see also *Helu* 4594 B)	Uaoa	6:305	My *kuleana* is at Uaoa, land of Kauahi. There are two *wauke* patches, and three *ulu* trees there.	—	—	—	2	*Wauke* *Ulu*	See Testimony
Naala ***Helu 5494 B*** (see also *Helu* 6510 YY)	Keaaula	6:305	My *kuleana* is Keaula, Maliko is the name of the *ili*. There are 15 *loi kalo*, several *ulu* trees, and one *niu* (coconut tree).	—	15	—	—	*Loi Kalo* *Ulu* *Niu*	See Testimony
Momona ***Helu 5494 C***	Keaaula	6:305	At Keaula I, the *ili* is named Kipapa. There are 5 *loi*, and a section of *kula*. That is my claim.	—	5	—	1	*Loi (Kalo)*	See Testimony
Napoka ***Helu 5494 D***	Keaaula	6:305	At Keaaula I in the *ili* of Kapu, there are 10 *loi*, several *ulu* trees, several slopes planted with *uala*, also a *kula*. That is my claim at Keaaula.	—	10	—	4 +	*Loi (Kalo)* *Ulu* *Uala*	See Testimony
Kepaa ***Helu 5495***	Honopou Holawa Honokala	6:305-306	25, January 1848 My place is in the *Ahupuaa* of Honopou, at Kunananiho. There are 14 *loi*, two dry land planting areas and a cliff-side, *uala* patch. I have 13 more *loi* fallow, and 1 *kalawa*. Above the *ili* of Kunananiho, from Keauhou to Waihiloa, there are six *koa* trees. At Holawa there are 4 *Wai Opae* (shrimp ponds), and at Halehaku, is a seventh *koa* tree. (MA 8:320)	—	27	—	4	*Loi (Kalo)* *Uala* *Koa* *Wai Opae*	See Testimony

Claimant & Helu	*Ahupua'a*	*Register Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kauahilahaole ***Helu 5497***	Peahi & Keaalii	6:306	20, Jan. 1848 My *kuleana* lands are at Peahi, land of Kinimaka, 1 *ili*. My *kupuna* and parents have died, and I am the one who remains. On this *ili* there are many trees, *kukui*, *kaa*, *ohia*, *puhala*, and also a section of *kula* with *wauke*, *maia*, *lai*. There is also an area with *Oopu* and *Opae*. At Kealii, in the *ili* of Piianaia, there are three *loi*.	—	3	—	1	*Kukui* *Kaa (Koa)* *Ohia* *Hala* *Wauke* *Maia* *Lai* *Oopu & Opae* *Loi (Kalo)*	See Testimony
Kaumakaowakea ***Helu 5498***	Uaoa	6:306	My *kuleana* is at Uaoa, land of Kapu, there are three *ili*, Maialoa and Makeia. There are 20 *loi kalo*. Also the *ili* of Ohialoloa second, in this *ili* there are 8 *loi kalo*. And in the *ili* Auliilii there are 38 *loi kalo*. Also in this *ili* there are many slopes near the *Pali* which have *uala*, and some *ulu* trees.	—	66	—	4 +	*Loi Kalo* *Uala* *Ulu*	See Testimony
Kahuhu ***Helu 5498 B***	Uaoa	6:307	At Uaoa, the land of Kapu, is where my *ili* of Kahauiki is. There are 7 *loi*, several *ulu* trees, and some dry land *uala* patches.	—	7	—	3 +	*Loi Kalo* *Ulu* *Uala*	See Testimony
I. Kauhi ***Helu 5499***	Halehaku	6:307	21, Jan. 1848 My *kuleana* is at Halehaku, in the *ili* named Kahai. In this *ili* there are 3 sections (*moo aina*), one with 20 *loi*, one with 8, and another with eight *wauke* patches. There are also two dry land garden, and 5 *loi kalo* in my claim at Halehaku, land of Nahaolelua.	—	31	—	10	*Loi Kalo* *Wauke*	See Testimony

Claimant & Helu	*Ahupua'a*	*Register Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kahalela ***Helu 5504*** (see also *Helu* 3504 & 3304 E)	Haliimaile & Haiku	6:309	…At Haiku, I have a dry land garden with three *kalo* patches. I've had it for 2 years, Kopa is the *Konohiki*.	—	—	—	3	*Kalo*	See Testimony
Kaaukai ***Helu 5506***	Halehaku	6:310	My *kuleana* is in the *ili* of Ululoloa, and I have cultivated it at various locations. I also have an upland section above there.	—	—	—	3 +	—	See Testimony
Kawaahulihia ***Helu 5507 B*** (see also *Helu* 6510 Y)	Uaoa	6:310	My *kuleana* is at Uaoa in the land of Kapu, within it are 30 *loi kalo*, 4 *ulu* trees, and also some *kukui* and *ohia* trees.	—	30	—	—	*Loi Kalo* *Ulu* *Kukui* *Ohia*	See Testimony
Kanui ***Helu 5507***	Uaoa	6:310	My *kuleana* is at Uaoa second, it is mostly open lands, with only a small area suitable for cultivation. I have three *pauku maloo* (dry land parcels). That is my claim at Uaoa of Kauahi.	—	—	—	3	—	See Testimony
Kapaahili ***Helu 5508***	Halehaku	6:310-311	My *kuleana* is at Halehaku. I have cultivated it at various locations.	—	—	—	—	*Mahi*	See Testimony
Kekahuna ***Helu 5510***	Honpou & Halehaku	6:311	24, January 1848 My *kuleana* is a place where I have cultivated here and there. I also have several *koa* trees at Halehaku and some at Honopou.	—	—	—	—	*Mahi* *Koa*	N/A
Kamaka I ***Helu 5511***	Kealii	6:311-312	My *kuleana* is at Keaalii II, land of Piianaia, at Kaluaaoa. There are 8 dry *loi*, three *uala* patches on the slopes, a *kula* parcel, and one *kauhale* (house).	1	8	—	4	*Loi (Kalo)* *Uala* *Kauhale*	See Testimony

Claimant & Helu	*Ahupua'a*	*Register Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kamaka II ***Helu 5511 B***	Kealii	6:312	Kamaka's second claim is below Paimahinahina, at Kakamako second. I do not know the value of that claim, there is a cliff section where *wauke* grows, and two hollows for *uala*. That is all that is good in that place.	—	—	—	3	*Wauke* *Uala*	N/A
Kulani ***Helu 5512***	Halehaku	6:312	My *kuleana* is from the old people and now to me. In the *ili* of Papane, I have several land sections, one with five *loi*, others with four, four, five, three, and three *loi*, (24) all together. There are also many *kukui*, *koa*, and *ohia* trees. Also a stream with *Oopu* and *Opae* at Kawailoa. There is a *wauke* patch, and place where I cultivate *uala* at Kawailoa.	—	24	—	2	*Loi (Kalo)* *Kukui* *Koa* *Ohia* *Kahawai* *Oopu & Opae* *Wauke* *Uala*	See Testimony
Pohailele ***Helu 5514***	Peahi Halehaku & Opana	6:313	My *kuleana* is at Peahi, land of Kinimaka. There are two *ili*. My *kupuna* and parents are dead, and it is I who am here. Within these *ili* are many *kukui*, *koa*, *ohia*, and *puhala* trees, and a dry land field (*kula*). At Halehaku, there is a *moku ie* (section of *ieie*), and below, there is *kalo*, gotten from Keawe. At Opana there are two *moku ie*, and a *kalo* patch below there. It is Opana, the land of Aikake.	—	—	—	4 +	*Kalo* *Kukui* *Koa* *Ohia* *Hala* *Ie*	See Testimony

Claimant & Helu	*Ahupua'a*	*Register Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Pekupeku ***Helu 5515***	Peahi & Halehaku	6:314	My *kuleana* is not an *ili*, just some cultivated parcels. There are three *loi* gotten from Nika, also a house from Kekahuna. There are some *koa*, *kukui*, and *puhala* trees, and a *kula* section, with the *kulanakauhale* (house). My *kuleana* is in Peahi, land of Kinimaka. At Halehaku there is a section of land, and a section with *ie* growing in the forest. At this *ie* place, there are two *koa* for canoes (*waa*). These are my *kuleana* from Nahaolelua.	1	3	—	2 +	*Loi (Kalo)* *Koa* *Kukui* *Hala* *Ie* *Kulanakauhale* *Koa Waa*	See Testimony
Haolelua ***Helu 5517***	Honopou & Halehaku	6:314-315	Within my *kuleana* are 10 *loi kalo*, 4 *uala* patches, and a stream with *Oopu* and *Opae*. That is my claim at Honpou, the land of Kalua. At Halehaku, my *ili* is Papalua, there are 30 *loi kalo*, and an *uala* field.	—	40	—	5	*Loi Kalo* *Uala* *Kahawai* *Oopu & Opae*	N/A
Mahu ***Helu 5518***	Keaalii & Peahi	6:315	My *kuleana* was given to me by Kamaka. There is one *ili* at Keaalii, the land of Piianaia, the name of the *ili* is Kihapuna. There are 3 *uala* patches near the *Pali*, 15 dry *loi*, and a dry land field. At Peahi, there is an *ili* with 9 *loi*, 1 dry land garden with *wauke*, 1 *uala* patch near the cliff, and several *koa*, and *kukui* trees.	—	24	—	6	*Loi (Kalo)* *Uala* *Wauke* *Koa* *Kukui*	N/A

Claimant & Helu	*Ahupua'a*	*Register Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Napohaku ***Helu 5519 B***	Halehaku	6:315-316	My *kuleana* is in the *ili* of Kapalaalaea, and there are three sections of land. One with 6 *loi kalo*, another with 8 *loi*, and two *uala* plantings near the cliff. At Kaholo, there are two *uala* plantings at the *Pali*, and six *loi kalo*. At Kahai, there is one section of *wauke*, and one section of *ie*. The woods are above, and the *kalo* is below. That is my claim at Halehaku, land of Nahuolehua.	—	20	—	6	*Loi Kalo* *Uala* *Wauke* *Ie*	See Testimony
Mana ***Helu 5519*** (see also *Helu* 5519 C)	Halehaku	6:316	One of my *kuleana* is in the *ili* of Papalua, and there are five sections. There are 20 *loi kalo*, and many *ulu* trees, and *uala* patches. At Puniawa, there are two patches of *kalo*. At Pilali, there are 3 *uala* patches. At Kawailua, there is a *wauke* patch. It is at Halehaku, land of Nahuolehua	—	20	—	6 +	*Loi Kalo* *Uala* *Wauke*	See Testimony
Kalawaia ***Helu 5520 B***	Kaupakulua	6:316	My *kuleana* is an *ili* at Kaupakulua. My *ili* is Puakiki, gotten from Kauleleiki i.	—	—	—	—	—	See Testimony
Nakaikuaana ***Helu 5521***	Honopou	6:317	My *kuleana* is in the *ili* of Kapahi. I have cultivated it at various locations. I also have some *koa pahi* (fallen *koa* trees) at Holawa, and in Honopou nui, some land.	—	—	—	—	*Mahi* *Koa*	See Testimony
Kanewaa ***Helu 5521 B***	Honopou	6:317	My *kuleana* is in the *ili* of Halaula. I have cultivated that land at various locations.	—	—	—	—	*Mahi*	See Testimony
Kaopu ***Helu 5522 B***	Honopou	6:317	My *kuleana* is in the *ili* of Kapapamuku.	—	—	—	—	—	See Testimony

Claimant & Helu	*Ahupua'a*	*Register Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Owili ***Helu 5522***	Hoalua	6:317	My *kuleana* is in Hoalua and at Kumumaile in Hamakualoa. Given to me by Kealiihaonui in 1845.	—	—	—	—	—	See Testimony
Kokoki ***Helu 5525***	Uaoa	6:318	My *kuleana* is in Uaoa, at Ohulehailua. There are 8 *loi kalo*, 6 patches of *uala* on the cliff, and one patch of *wauke*, that is my claim at Uaoa, land of Kapu.	—	8	—	7	*Loi Kalo* *Uala* *Wauke*	See Testimony
M. Kamiau ***Helu 5555*** (see also *Helu* 5086)	Haiku	6:318-319	Here is this claim of mine, at these places. I have four *loi* at Opuaihaa, at Haiku.	—	4	—	—	*Loi (Kalo)*	See Testimony
Kapahau ***Helu 6405***	Kuiaha	6:366	February 2, 1848. Poeleele is my *kuleana* in the *Ahupuaa* of Honokowai, and at Kuiaha. Keonepahu is the *Konohiki*. It is from my *kupuna* and parents, to me. (See also, FT 15:9 1 in regards to reference of Honokowai.)	—	—	—	—	—	See Testimony
Kilauea ***Helu 6411***	Keaaula	6:369	My *kuleana* is a *Kihapai* in Kipapa, at Keaaula. Within it are some *loi* and *uala* patches. Keonepahu is the *Konohiki*. At Hamakualoa.	—	3 +	—	2 +	*Loi Kalo* *Uala*	See Testimony
Kaha ***Helu 6455***	Pauwela	6:383	My *kuleana* is at Pauwela, there are two *ili*, Kaohe is one, the other is Wailuna. There are my *ili* from Kalola, at the time that Kamehameha I dwelt here. It is from my *kupuna*. There are *poli paoo* (cliff side sweet potato planting areas) at Lale, and at Lile there are some mound planting areas (*puepue*).	—	—	—	4 +	*Uala*	See Testimony

Claimant & Helu	*Ahupua'a*	*Register Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kapua ***Helu 6466***	Haiku	6:386	My *kuleana* is below Wainae.	—	—	—	—	—	See Testimony
Kuana ***Helu 6482***	Kuiaha	6:390-391	My *kuleana* is a garden at Kahaiku in Kuiaha. There are many *loi*, and *uala*, *maia*, and *wauke* planted. Keonepahu is the *Konohiki*, but the right is from when my *kupuna* lived there. There is a garden at Kaohe in Kuiaha, there is a *lolo* (pond) and *uala* patches there. At Opihi, in Kuiaha there are *uala* patches. At Hauola in Kuia there are *kalo* patches. There is one *pahale* (house) at Pamoa (from the time of the *kupuna*).	1	6 +	—	7 +	*Loi Kalo* *Uala* *Wauke* *Maia* *Lolo* *Pahale*	See Testimony
N. Paele ***Helu 6613*** (see also *Helu* 5453 D & 3829)	Haiku	6:406	I have additional *kuleana*, not recorded in the earlier document. There are some *akaka* patches, and our *kahuahale* (houses) as well. On the east is Kalanikahua; on the south are Nahinu's houses; and a *poolima* parcel.	2	—	—	3	*Akiakia* (bulrushes) *Kahuahale*	See Testimony
Heikapua ***Helu 6713***	Kuiaha	6:411	My *kuleana*, received from the King, is ½ of Kuiaha at Hamakualoa. (*Alii* Awardee)	—	—	—	—	—	*Buke Mahele* 1848:71-72

Claimant & Helu	*Ahupua'a*	*Register Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kaluahinenui ***Helu 7972***	Keaalii iki & Uaoa	6:449	My *kuleana* is in Kealii iki, the *ili* called Maialoa. At Uaoa, there is the *ili* called Mauiaoa, with four *loi*. And in the *ili* called Kahauone, there is one *loi*. Also an *ili* called Pakipauka in Kealii iki. There is a gulch with *ulu* trees in the *ili* called Auliilii, and one *uala* patch… (also claims an Irish potato patch at Homauala).	—	5	—	1	*Loi (Kalo)* *Uala* *Ulu*	See Testimony
Haulepu ***Helu 8055*** & (Kaopa)	Hamakualoa, Kahului	6:453	My claim is for two native *uala* patches (*mea wala maoli*) at Hamakualoa. At Kahului, there are two *uala haole* (foreign potato) patches. At Kaopa, there is one foreign potato patch. At Mokulaau there is an *uala* patch. At Kualapa, there is a *kalo* patch. At Kaopa, there is one *uala* patch for the winter time.	—	—	—	6	*Uala* *Uala Haole* *Kalo*	N/A
I. Haupu ***Helu 8070***	Haiku	6:454	Jan. 24, 1848 My *kuleana* is at Haiku, the *ili* is Puelua. I have a total of 11 *loi*; 3 large *loi*, and 8 small *loi*. I got my land from Ese Opunui in 1845. Also, the *loi* are not all together in one place, there is *kala* land between them in areas. There is also a *pa holoholona* (animal paddock), extending from one gulch to another gulch. I also have a *lulanakauhale* (house) outside of the *pa holoholona*. The land is not flat.	1	11	—	1	*Loi (Kalo)* *Pa Holoholona* *Kulanakauhale*	N/A

Claimant & Helu	*Ahupua'a*	*Register Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Keoho ***Helu 8584*** (see also *Helu* 6510 B)	Honopou Holawa & Waipio	6:469-470	12, Feb. 1848 My *kuleana* is for two *kula* parcels where *uala* are planted, one is in the *ulu* trees, and the other is in the *obia* trees. There is also a stream branch (*mana Kahawai*), land for my brother, with four *loi* for me. There are two springs (*mapuna*) on the land of my in-laws, and five *loi* for me. In another land, there is one *loi*. There are two *koa* trees, at Honopou and Holawa. Also a grass land (*mola mauu*) at Waipio.	—	10	—	3	*Uala* *Ulu* *Obia* *Loi (Kalo)* *Kahawai* *Mapuna* *Koa* *Mola Mauu*	See Testimony
Kauwahi ***Helu 8624***	Uaoa	6:472	½ Uaoa *Ahupuaa*, Hamakualoa. One half of Uaoa *Ahupuaa*, Hamakualoa, Maui to be quit claimed.	—	—	—	—	—	*Buke Mahele* 1848:142-143
Kopa ***Helu 8889***	Haiku	6:492	My *kuleana* is at Papahawahawaha, on the East of Palahapohaku of Makawao. Kaliuliamai is on the West. Kaliuliamai is also to the uplands, and Haiku is *makai*. That is my claim. This one is a *Konohiki*, and to my thinking, a hard worker. Where are you Kuauwai, thank of his claim. By Gelina (Green).	—	—	—	—	—	See Testimony

Claimant & Helu	*Ahupua'a*	*Register Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Pia ***Helu 10650*** (see also *Helu* 5452)	Honopou	6:529	My *kuleana* is an entire *ili*. On the north is a *Pali*, on the east is the *ili* of Kahauiki, on the south is *ili* land of Luai Kahuli, and on the west is the *ili* of Uhikee. It was gotten from our parents, who have passed away, gotten in the time of Kamehameha I. In 1832, we inherited the land. I also have some *loi* in another place, in the *ili* of Uiukee. There are 10 *loi*, and *uala* growing near the *Pali*. Near the stream there are places where I have planted *kalo* and *wauke*. These *loi* were gotten from Hewahewa. I have a stream with *Oopu*. My section of the stream with *Oopu* (*Kahawai Oopu*) is named Makaku. Gotten from Nohoua in 1822. Also some *loi* at various locations. In 1831, Nohoua also gave me another *Kahawai Oopu*, Pohaku is the upper boundary, and Pao is the lower boundary of my *Kahawai Oopu*. Also above these areas is a claim in the forest of Papakeaa and Kikalakoele and Paki. Kikalakoele and Paki were gotten from Kikau. Papakeaa was gotten from Kalikolani in 1839.	—	10 +	—	2 +	*Loi Kalo* *Uala* *Wauke* *Kahawai Oopu* Forest plantings (*Kuleana ma ka nahelehele*)	See Testimony
Piianaia ***Helu 10789***	Kealii	6:550	The *Ahupuaa* of Keaalii, Hamakualoa, Maui is for me. (A *Konohiki* claimant)	—	—	—	—	—	See Testimony

Claimant & Helu	*Ahupua'a*	*Register Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Claims Registered for Ko'olau District									
Tito Kealina ***Helu 2441***	Keanae	3:501	I have a *lauleana* in the *ili* called Lalaola, gotten from Kauaioku. It is 19 *loi*, a dry land *kula*, and upland woods and *Olona*. Sept. 4, 1847	—	19	—	2	*Loi (Kalo)* *Olona*	See Testimony
Kaea ***Helu 2442***	Keanae	3:501	June 22., 1847 My *lauleana* in the *ili* of Analoa is 6 *loi*., there is also a claim for a wooded *kula*., gotten from Kanehaku II. I have a *lauleana* in the *ili* of Kiapu, a *lula* with *hala* growing on it, at a place near the shore. Gotten from Hoaai.	—	6	—	2	*Loi (Kalo)* *Hala*	See Testimony
Kanehaku ***Helu 2443***	Keanae	3:501	My *lauleana* is in the *ili* of Pololua, there are 2 *loi*, 1 *loko* (pond), a *lula* pare1, and wooded section in the uplands. Gotten from Hoaai. Kamakau Kanehaku. I have a *lauleana* in the *ili* of Kanemakue, it is *Olona* in the uplands and a wooded area. Kanehaku. Dec. 30, 1847.	—	2	—	3	*Loi (Kalo)* *Olona* *Loko*	See Testimony
Kanehoa, J.Y. ***Helu 8518 B***	Ulaino	3:708	*Ahupuaa* of Ulaino, Koolau, Maui. (*Alii* Awardee)	—	—	—	—	—	See Testimony

Claimant & Helu	*Ahupua'a*	*Register Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Bokii ***Helu 4639***	Waiha	4:318	My land is at Waiha. Keabi gave me this section of land in the *ili* Paukamaka. There are 17 *loi* there and a section of *kula* (land) that I think should be for me. In the *ili* of Paulae, there are also some *loi*, one *loi* was given to me by Puo; there in the *ili* of Waieli, there are also two *loi* which are mine, given to me by Puo. There in the *ili* of Mauu, I also have a claim, it is the place where my house stands. My *hale* (house) was given to me by Kanibo.	1	20 +	—	1	*Loi (Kalo)* *Hale*	N/A
Pahukaa ***Helu 4642***	Waiha	4:319	My section of land is at Waiha., in the *ili* of Waikani. Kanibo gave me this section of land. There are eleven *loi* and a *lalo* within it, that I think should be for me. In the ili of Waieli, there are also ten *loi* which are mine. Kiowai gave them to me.	—	21	—	1	*Loi (Kalo)*	See Testimony
Punhonua ***Helu 4647***	Waiha	4:319	My land is at Waiha. Manu, the first *Konohiki* of this land gave me this section of land in the *ili* of Waikani. In the *ili* of Paulae, there are 3 *loi*. I want to secure this land for myself.	—	3	—	—	*Loi (Kalo)*	N/A
Maewaewa (1) ***Helu 4706*** (see also *Helu* 4848 F)	Keanae	4:324	I received the *ili ainа* of Kukuiolono from my *kupuna*. Kauhikaua was their landlord. They are all dead, and I have received it. There are 12 *loi*, and a *lula*, where *uala* are planted; also an upland place. That is it. I am Maewaewa, the *konohiki*.	—	12	—	1	*Loi (Kalo)* *Uala*	See Testimony

Claimant & Helu	*Ahupua'a*	*Register Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
D. Malaihi ***Helu 4752*** (see also *Helu* 492.5 F)	Kapehu	4:326	My claims for cultivated land are at Kapehu. Kapehu is an *Ahupuaa*, there are no *ili* within it. My two cultivated parcels are named Kamukualii. Cultivated field 1 is *mauka*., it is 40 long by 30 wide; cultivated field 2 is *makai*, it is 30 long by 18 wide. I have resided there for a long time…	—	—	—	2	*Mahi*	See Testimony
Naka ***Helu 4778***	Waiha	4:327	My land is at Waiiua. Kanibo gave me this land, it is Palolena, an *ili*., not an *Ahupuaa*.	—	—	—	—	—	N/A
Naholo ***Helu 4788*** (see also *Helu* 6768 C)	Honolulu	4:327	My land claim is in the ili of Oihiihinui. It is an old *ili* (held) from Kamehameha I.	—	—	—	—	—	See Testimony
Nalau ***Helu 4797*** (see also *Helu* 4832 & 4925 C)	Kapaula & Kapaakea	4:328-329	Dec. 30 1847. My *kuleana* is for cultivated land in the *Ahupuaa* of Kapaula, gotten from Kaakai and Kalahihi folks. I also have cultivated land in the *Ahupuaa* of Kapaakea. There is also a place with one *loi*., gotten from Kalino.	—	1	—	2	*Loi (Kalo)*	See Testimony
Kalawaia ***Helu 4830*** (See also *Helu* 4832 & 4925 D)	Waiohue & Kapaakea	4:330	My *kuleana* is a cultivated area at Waiohue and Kapaakea. At Waiohue there are four cultivated places, and a fifth place that was taken from me, a *loi io* (taro pond-fish pond) that I dug. At Kapaakea there are 2 *loi*, gotten from Malaea and Wahahua.	—	3	—	4	*Loi (Kalo)* *Loi io* (pond in which taro and fish are grown)	See Testimony

Claimant & Helu	*Ahupua'a*	*Register Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Wahahua ***Helu 4831*** (see also *Helu* 4925 E)	Kapaakea, Puakea & Kapehu	4:330	I have a cultivated *lauleana* at Kapaakea, land of Kalani [S. Grant], and at Puakea, and at Kapehu of Huaa. At Kapaakea there are 4 small *loi*., and some larger ones at other places. They were given to me by Malaea. At Puakea is where my *hale* (house) is, the land was given to me by Kalawaia. At Kapehu is a place that I cultivate, given to me by Haua.	1	4 +	—	3 +	*Loi (Kalo)* *Hale*	See Testimony
Kamahine Kaahiki Kaumaka Kalawaia Makuakane & Nalau ***Helu 4832***	Waiohue, Kapaakea	4:330-331	We have submitted our claim for the *kuleana* that we cultivate. We also wish to make a claim for the *opu Olona* that we cultivate in the distant uplands. There are several of us who make this request, our names are Kamahine, Kaahiki, Kaumaka, Kalawaia, Makuakane and Nalau (Note: Kamahine, see *Helu* 4925 H; Kaahiki, see *Helu* 4925; Kaumaka, see *Helu* 4925 K & 5155; Kalawaia, see *Helu* 4925 D; Makuakane, see *Helu* 4754; Nalau, see *Helu* 4797 & 4925 C)	—	—	—	—	*Opu Olona*	See Testimony (various *Helu*)
Nuchiiki ***Helu 4857*** (see also *Helu* 4665 H)	Keanae	4:331	My *lauleana* is in the *ili* of Waiaolohe, it was given to me by Kapoe. There are 10 *loi*, a *muliwai* (estuarine - fishery), dry land *uala* fields, an upland *kalo* field, a *kula*, and two *Opu Olona*.	—	10	—	5 +	*Loi Kalo* *Muliwai* (estuarine fishpond) *Uala* *Olona*	See Testimony

Claimant & Helu	*Ahupua'a*	*Register Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kauimui ***Helu 4858***	Keanae	4:331	I have a claim for 3 *loi*; in the land of Kaea, there are 2 *loi*; in the land of Kawaopea there is 1 *loi*. Kauimui gave me one *loi* and Kaea gave me 2 *loi*. Here I am, the one who has these *loi*. Kealina supports me in this claim.	—	3	—	—	*Loi (Kalo)*	N/A
Kiko (wahine) ***Helu 4859***	Keanae	4:332	My *kuleana* is several *opu Olona* (*Olona* patches). Some *opu Olona* are at Pahoa, gotten from Punahua. Popoki also gave some *opu Olona* at Keanae.	—	—	—	4 +	*Olona*	N/A
Kaopa ***Helu 4860*** (see also *Helu* 4853 L)	Keanae	4:332	My *ili* is named Kokeamoku, there are 11 *loi*. There is also a dry land *kalo* patches in the uplands, and two *loi* in Kanes' (*kuleana*). Hoaai gave it to me.	—	13	—	2 +	*Loi* *Kalo*	See Testimony
Kane ***Helu 4861*** (see also *Helu* 4848 B)	Keanae	4:332	I have an *ili*, it's name is Waioea, and there are 11 *loi*. There is also an upland parcel there. Kekapoi gave them to me. There is also land below, Kuhelemanu., in the land of Manumikawaha., I have three *loi* there. I also have a *kalawalua hale* (house) that is in my claim.	1	14	—	1	*Loi (Kalo)* *Kalawakauhale*	See Testimony
Naole ***Helu 4863***	Keanae	4:332	I have an *ili*, Kapae is it's name. There are 16 *loi*, and an *Olona* patch in the uplands. Kekapoi gave it to me. Kamakahiki adjoins this *lauleana*.	—	16	—	1	*Loi (Kalo)* *Olona*	N/A
Paele ***Helu 4862***	Keanae	4:332	I have 3 *loi*. Kanaloa gave them to me. There is also a section that is now fallow, that is a part of my claim.	—	3	—	1	*Loi (Kalo)*	N/A

Claimant & Helu	*Ahupua'a*	*Register Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kuceau ***Helu 4064 B***	Keanae	4:333	I have a claim. There are two *loi* in the land of Malhoe; at Kealakekua, there is 1 *loi*; at Kaaumaiaanaha there are two *loi*. Kailio gave me my right, and Kiko. These are the people who speak for me.	—	5	—	—	*Loi (Kalo)*	N/A
Kaumaka ***Helu 5155*** (see also *Helu* 4832 & 4925 K)	Kapaula Kapaakea	5:11	I have cultivated fields at Kapaula. Kapaula is an *Ahupuaa* and there are no *ili* within it. I have a thought to claim 6 parcels; these cultivated fields were gotten from Kaubi. There are 5 cultivated fields at Kapaula, and 1 field is at Kapaakea, in the land of Kalani. These 6 fields described above, were once untended and overgrown… I have tended these 6 fields for almost 6 years…	—	—	—	6	*Mahi*	See Testimony
Nahuina ***Helu 7262*** (see also *Helu* 10512)	Keaa	5:311	I hereby explain to you about my lands which remain to me from the King. Kauaka, an *ili* at Waipio, Ewa Oahu. 1 *Ahupuaa* of Keaa, Koolau Maui.	—	—	—	—	—	See Testimony
Kauanoa ***Helu 3041***	Honolulu & Makapipi	6:32	I have 7 *loi* at Honolulu, Koolau. Nailima is the one who gave them to me. Kane, the *Konohiki* gave it to him. My place where I live is at Makapipi, it is enclosed with a rock wall, I got it from Kuna. Dec. 29, 1847.	1	7	—	—	*Loi (Kalo)*	See Testimony

Claimant & Helu	Ahupua'a	Register Book & Page	Summary of Claim Documentation	Hale	Lo'i Kalo	Auwai	Kihapai Kula Mahiai Mahina Mala Moo Opu Pa	Crops, Activities and Resources Identified	Disposition N/A=Not Awarded Mahele Award Book & Royal Patent
Zakalia Kekio **Helu 3187**	Honomanu	6:40	My claim is for an overgrown land at Honomanu, it was leased to the school teacher for 25 *pahao* (labor days); .62 ½ $ for the labor. This is a new land, only recently worked. The water now flows and the *ai* (taro) is mature.	—	—	(1)	—	*Loi (Kalo)* *(Auwai)*	See Testimony
Kaihaa **Helu 3472**	Pauwalu & Wailua	6:88	Kaihaa is at Pauwalu and Wailua. At Pauwalu, there are 16 *loi*, at Wailua, there are 5 *loi*. At Pauwalu second, there are 20 *loi*. Also some *kula* land. Dec. 27, 1847	—	41	—	1	*Loi (Kalo)*	See Testimony
Kiowai **Helu 3499**	Wailua	6:94-95	I am a man of Koolau, at Wailua, my *kuleana* are *loi* and *kula*. At Wailua there is 1 *loi*; at Keononalu there is 1 *loi*; at Paehala there is a *kula* parcel; the *hale* (house) stands at Paehala; there is also a *hala* grove at Paehala. At Waieli in Wailua, there are 7 *loi*, and at Paakamaka, Wailua, there are 5 *loi*. At Palolena there are 27 *loi*. At Kealaalaea there is a *kula* parcel. 27, Dec. 1847	1	41	—	2	*Loi (Kalo)* *Hale* *Hala*	See Testimony
Davida Malo **Helu 3702** (see also *Helu* 5410)	Makapipi 1 & 2 & Honolulu iki	6:116-117	These are my lands from the *Alii*…. There are three *Ahupuaa* at Koolau Maui, gotten in 1843, from Kekauluohi…. 2 Makapipi and Honoluluiki at Koolau…	—	—	—	—	—	See Testimony
Wahinemaikai **Helu 4561** (see also *Helu* 6049)	Wailua	6:181	My land is at Wailua. Kaniho, the *Konohiki* gave it to me, it is the *ili* of Waieli. I got it before the Church (Kaluakini) was made. January 11, 1848	—	—	—	—	—	See Testimony

Claimant & Helu	Ahupua'a	Register Book & Page	Summary of Claim Documentation	Hale	Lo'i Kalo	Auwai	Kihapai Kula Mahiai Mahina Mala Moo Opu Pa	Crops, Activities and Resources Identified	Disposition N/A=Not Awarded Mahele Award Book & Royal Patent
Wailaahia **Helu 4562**	Wailua	6:182-183	Jan. 8, 1848 My *kuleana* is at Wailua. Kaniho and Wahinemaikai gave me four *loi*, in the *ili* of Kaaku. Here in the *ili* of Maulu, I also have property on the land above the *Pali*. It lies from the *honua* (flat land) to the distant upland forest. From Kaumiumi to the cliff. At this place, is where my *hale* stands and where I plant some things. Kapoko, the *Konohiki*, gave it to me before the Ainoa [ca. 1819]. In the *ili* of Palolena, I have five *loi*. In the *ili* of Panua there are also *loi*.	1	9 +	—	2	*Hale* *Loi (Kalo)*	See Testimony
Hoonoho **Helu 4587**	Wailua	6:186	My *kuleana* is at Wailua, gotten from Kaniho, the *Konohiki*, a section of land in the *ili* of Keononalu. There are 12 *loi* in this *ili* and a *kula* parcel. The *makai* side is bounded by Waiapea, and *mauka*, by the land of Moo. I have been on this land for 10 years.	—	12	—	1	*Loi (Kalo)*	See Testimony
Moo **Helu 4725**	Wailua	6:193	My *kuleana* is at Wailua, in the *ili* of Paakamaka. It was given to me by Kaniho. There are 9 *loi* and a *kula* parcel.	—	9	—	1	*Loi (Kalo)*	See Testimony
Makaole **Helu 4726**	Wailua	6:193	My *kuleana* is at Wailua, there are two (parcels) in this *ili* of Paulae. Given to me by Mokuliae, the *Konohiki*. There are 9 *loi* and a *kula* parcel. And the other one is 14 *loi* and a *kula* parcel.	—	23	—	2	*Loi (Kalo)*	See Testimony

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Moo II **Helu 4729**	Wailua	6:194	My land is at Wailua, gotten from Naiwi. There are 3 *loi* in the *ili* of Makaku. In the *ili* of Paulae there are 2 *loi* that are mine, gotten from Kaniho. In the *ili* of Palolena there are 2 *loi*, gotten from Kamai. In the *ili* of Maulu, is where my *hale* stands, and one *loi* a little distance from there. Jan. 13, 1848	1	8	—	—	*Hale* *Loi (Kalo)*	See Testimony
I. Makuakane **Helu 4754** (see also *Helu* 4832)	Kapaula & Kapaakea	6:198	My *kuleana* are in the *Ahupuaa* of Kapaula and elsewhere. There are 6 places that I have cultivated. I have had them since before the Ainoa [prior to 1819]. At Kapaakea, is the sixth place that I cultivated. Kalani took it, and I wish it returned. There are 3 small *loi* there.	—	3	—	6	*Loi (Kalo)*	See Testimony
Naiwi **Helu 4772**	Wailua	6:198-199	My land, given to me by Kaniho, the *Konohiki*, is in the *ili* of Makaku. I have lived there for many years, I also have five *loi* at Waieli, gotten from Kiowai. At Keononalu, there is one *loi*, gotten from Wahapuu. In the *ili* of Kalimapuhi, I have one *loi*. In the *ili* of Waikani, I have one *loi*, gotten from Kaniho. In the *ili* of Maulu, I have three *loi*, also from Kaniho. In the *ili* of Kaahu, there is one *loi*, from Kalano.	1	12	—	—	*Loi (Kalo)*	See Testimony

Claimant & Helu	Ahupua'a	Register Book & Page	Summary of Claim Documentation	Hale	Lo'i Kalo	Auwai	Kihapai Kula Mahiai Mahina Mala Moo Opu Pa	Crops, Activities and Resources Identified	Disposition N/A=Not Awarded Mahele Award Book & Royal Patent
Nakihei **Helu 4773** (see also *Helu* 4773 B)	Wailua	6:199	Kaumauma, the *Konohiki* gave me 9 *loi* in the *ili* of Kalimapuhi. One *loi* in the *ili* of Paakamaka was from Wahine. I have resided upon these places for many years.	1	10	—	—	*Loi (Kalo)*	See Testimony
Nalimanui **Helu 4774**	Wailua	6:199	My land is at Wailua, gotten from Kaniho, in the *ili* of Kealia.	—	—	—	—	—	See Testimony
Namakaimau **Helu 4787**	Wailua	6:199-200	I have a *pahale* lot at Wailua, gotten from my parents.	1	—	—	—	*Pahale*	N/A
Malailua **Helu 4847** (see also *Helu* 6723)	Keanae	6:207-208	My land is at Keanae, Koolau. Kuo is the name of my land, there are 8 *loi* there. It is next to Kamamaimoku on one side, and Kaumikanaha on the other side. Kalimanui gave it to me. In the *ili* of Kalihi, there are two *loi*; and in Ololokeahi, there is 1 *loi*.	—	11	—	—	*Loi (Kalo)*	See Testimony
Kuluhiwa **Helu 4848**	Keanae	6:208	My land is at Keanae, the *ili* is named Ololokeahi. I have 9 *loi* there, given to me by my parents. I also have an upland *kula* parcel in this *ili*.	—	9	—	1	*Loi (Kalo)*	See Testimony
Lahilau (Kalohelau) **Helu 4849** (see also *Helu* 4849 B)	Nahiku (Makapipi)	6:208	My land is in Nahiku, the name of the *ili* is Kahoomanamana. This land is from my parents. There are two small *loi* there, and it is near the land of Kaumoki. My parents made them, and I got them.	—	2	—	—	*Loi (Kalo)*	See Testimony
Kaai **Helu 4850**	Honoluluiki	6:208-209	My land is at Honoluluiki, there are 8 *loi*, Kalei gave it to me. Hiiki is the name of the *ili*.	—	8	—	—	*Loi (Kalo)*	See Testimony

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Aoao **Helu 4851**	Honolulunui	6:209	At Honolulunui, the *ili* is named Kahooana, it adjoins Honoluluiki, there is a *kahawai* (stream) between the two. I wish to secure this land for myself and my heirs.	—	—	—	—	*Kahawai*	See Testimony
Uwaua **Helu 4852**	Honolulu	6:209	My land is at Honolulunui, it is named Kawiwi, it extends from the shore to the mountain, and it adjoins the land of Olopana. It was given to me by Kaheana wahine in the time of Kahekili.	—	—	—	—	—	See Testimony
Kawaloa **Helu 4853**	Waiahole	6:209	My land is at Kaululua, Koolau; Waiahole is the name of my land. It is next to the land of Kaululena on one side. Kahakawai gave it to me.	—	—	—	—	—	See Testimony
Mamaikawaha **Helu 4854**	Keanae	6:210	My land is at Keanae, it is a *kihapai* and 4 *loi*, the land adjoins Malailua's place on one side, and the land of Kealina and Kiko on the other side. It was given to me by Kaiawalu. At another place, there are two *loi*, near the *Luakini* (Church). Kaneheloha gave it to me.	—	6	—	1	*Loi (Kalo)*	See Testimony
Kaihu **Helu 4856**	Keanae & Waianu	6:210-211	My *kuleana* was given to me by Kekapoi, and under Nakaiewalu and Hoaai it was not contested. Haleakea is the name of my *ili*, there are 4 *loi* and an open field, also a piece of land in the uplands. I have two *loi* elsewhere and an *Olona* patch at Waianu, that was given to me by Kawahine.	—	6	—	2	*Loi (Kalo)* *Olona*	See Testimony

Claimant & Helu	Ahupua'a	Register Book & Page	Summary of Claim Documentation	Hale	Lo'i Kalo	Auwai	Kihapai Kula Mahiai Mahina Mala Moo Opu Pa	Crops, Activities and Resources Identified	Disposition N/A=Not Awarded Mahele Award Book & Royal Patent
Kapali **Helu 4865**	Wailua	6:211	My place is at Wailua, it is one-third of the *ili* named Kealia. It begins a little above the *alanui* (trail) that crosses the uplands, adjoining the land of Kaholowaa. It was given to me by Kaniho. Dec. 31, 1847	—	—	—	—	*Alanui*	See Testimony
Kaholowaa **Helu 4866**	Wailua	6:211	My land is at Wailua, adjoining the land of Kai. It was given to me by Kaniho, the *Konohiki*.	—	—	—	—	—	See Testimony
Wahapuu **Helu 4867**	Wailua	6:211-212	My land is the *ili* named Keononalu, at Wailua. It is on the *mauka* side of the near-shore *alanui*. It extends from there to the uplands at a dry land parcel. Kaniho gave it to me, and I have had it for many years.	—	—	—	1	*Alanui*	See Testimony
Kahaku **Helu 4867 B** (see also *Helu* 4853 B)	Keaa	6:212	My land is at Keaa, Koolau. Ahikala is the name of the *ili*, and my land is in there. It is along the *alanui* that goes to the uplands, up to the *amaumau*. Naeku gave it to me.	—	—	—	—	*Alanui*	See Testimony
Makua **Helu 4868**	Makapipi	6:212	My land is at Makapipi, Koolau. Kailoi is the name of the *ili*, and I have a section there. Gotten by my parents in the time of Kamehameha I.	—	—	—	—	—	See Testimony
Kaumoki **Helu 4869**	Makapipi	6:212	My land is at Makapipi, Koolau. My land is the *ili* named Kaohi, I am the only one on this land. Kaeha, the *Konohiki* gave it to me.	—	—	—	—	—	See Testimony

Claimant & Helu	*Ahupua'a*	*Register Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Keliiokekanaka ***Helu 4870***	Makapipi	6:213	My land is at Makapipi, Koolau, in the *ili* named Waawaa. Kaeha gave it to me. 2. Wailupo is the name of another *ili* which I received from my parents. These lands are in Makapipi	—	—	—	—	—	See Testimony
Kalohie ***Helu 4871***	Honolulu	6:213	My land is at Honolulu, Koolau. Olopana is the name of the *ili*. It adjoins the land of Uwaua, and extends from the shore to the mountain. Gotten by my *kupuna* in the time of Kamehameha I.	—	—	—	—	—	See Testimony
Kukalau (Kukalaau) ***Helu 4872***	Honolulu Nui	6:213	My land is at Honolulu Nui, Koolau. Kaahipoko is the name of my *ili*, from near the shore to the *a'maumau*. I adjoins the land of the name, Alapuna. Hilihewa gave it to me.	—	—	—	—	—	See Testimony
Kalei ***Helu 4873***	Makapipi	6:213-214	My land is at Makapipi, Kuemanu is the name of the *ili*. I am the only one on this *ili*. It extends from the *alanui* to the mountain. Kaeha gave it to me.	—	—	—	—	*Alanui*	See Testimony
Kealiiholiai ***Helu 4873 B***	Kukui	6:214	My land is at Kukui, Koolau. Kamakehau is the *ili*. I and Kaumoki are the only two here. Holoua gave it to me.	—	—	—	—	—	N/A
Makea ***Helu 4874*** (see also *Helu* 4853 H)	Keanae	6:214	My land is at Keanae, Koolau. It is an entire *ili*, named Paehala, and adjoins the land of Ehu. Kapoi gave me this land.	—	—	—	—	—	See Testimony

Claimant & Helu	*Ahupua'a*	*Register Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kaahiki ***Helu 4925*** (see also *Helu* 4832)	Kapaula	6:220-221	Dec. 29, 1847. My cultivated lands are at Kapaula. Mokuhalii gave me the first cultivated parcel. Held since the death of Keopuolani [1823]. The second cultivated parcel was given to me by Makaikiiani. I've planted it for 5 years. The 4th cultivated parcel, I got from Hauheo, more than 10 years ago. The 5th cultivated parcel, gotten from the same person, I've planted for 10 years. The sixth cultivated parcel, gotten from the same person. It is also where my *hale* stands. I've lived there for 15 years. The seventh cultivated parcel, was gotten from Kahahihi, I've planted for 12 years.	1	—	—	7	*Wahi mahi Hale*	See Testimony
Kekahuna ***Helu 5030***	Waihua	6:229	My section of land is at Waihua, gotten 10 years ago from Kamiho, the *konohiki*. There are 10 *loi* and a parcel of *kula*. Below it is the land of Kaohilae, and *maaka* is the land of another.	—	10	—	1	*Loi (Kalo)*	See Testimony
Kanukuaili ***Helu 5039 B*** (see also *Helu* 4925 B)	Waiohue	6:232	12, Jan. 1848 My *kuleana* is in the *Ahupuaa* of Waiohue. Kole gave it to me, then he was removed, and Mahuka gave it to me. I have resided here for many years.	—	—	—	—	—	See Testimony

Claimant & Helu	*Ahupua'a*	*Register Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
P. Kauakai ***Helu 5039***	Kapaula	6:232	My *kuleana* is in the *Ahupuaa* of Kapaula. Pahu gave it to me, and when he was removed, Kamakiini gave it to me. I have resided on it for many years.	—	—	—	—	—	N/A
Kaiwa ***Helu 5049***	Waihua	6:232	My *kuleana* is in Paakamaka, at Wailua, Koolau. Given to me by the *konohiki*.	—	—	—	—	—	See Testimony
Kamanu ***Helu 5051***	Waihua & Puuwalu	6:233	My land is at Wailua. Waihapuu gave it to me, a parcel in the *ili* of Keononalu. There are 26 *loi* and a section of *kula* in this parcel. There are also three *loi* in the *ili* of Waieli, gotten from Wahinemaikai. Also in Waieli are three other *loi*, gotten from Kahahei. In the *Ahupuaa* of Puuwalu, there is one *loi*, gotten from Kasaikalihi. At Paakamaka, there is one *loi*, gotten from Kaiwa. The place where my *hale* is situated is another claim, and the things which I inherited.	1	34	—	1	*Loi (Kalo) Hale*	See Testimony
Kuiki ***Helu 5052***	Waihua	6:233	My land is at Waihua, gotten from Keahi, the *konohiki*. There are two parcels of land in the *ili* of Palolena. In one there are 14 *loi*, in the other, there are 15 *loi* and a *kula* parcel. In these parcels, is also my *hale* claim, along with those things which are mine.	1	29	—	1	*Loi (Kalo) Hale*	See Testimony

Claimant & Helu	*Ahupua'a*	*Register Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kaiwikaola ***Helu 5054***	Wailua	6:234	My land is at Wailua, given by Hapapako to my parents, the *ili* of Waieli. They have died and I am their heir.	—	—	—	—	—	See Testimony
Kamai ***Helu 5055***	Wailua	6:234	My land is at Wailua, gotten from Kamiho, the *konohiki*. In the *ili*, there is a parcel of land, it is in the *ili* of Palolena. There are 11 *loi*. In the *ili* of Waikani there is another parcel of land with 11 *loi*. In the *ili* of Paakamaka, there are two *loi*, gotten from Wakimi. In Kalimapihi, there are 4 *loi*, and in Palolena 2, there are two more *loi*, and a *kula* parcel. I have resided on these lands for many years. There is also my *hale* claim, in the *ili* of Kaahu.	1	30	—	2	*Loi (Kalo) Hale*	See Testimony
Kumulani ***Helu 5056***	Wailua	6:234-235	My land is at Wailua, in the *ili* of Keononalu. There are 21 *loi* and a *kula* parcel. ... I got it from Wahapuu, the *konohiki*, and have resided there for many years.	1	21	—	1	*Loi (Kalo)*	See Testimony
Kaulia ***Helu 5058***	Wailua	6:235	I have 22 *loi* in the *ili* of Waieli, at Waihua. I got it from Wahinemaikai. There is also a *kula* parcel.	—	22	—	1	*Loi (Kalo)*	See Testimony
Kuikui ***Helu 5059***	Wailua	6:235	My land is at Wailua, gotten from Kamiho, the *konohiki*. The *ili* is Pulawa, and I have lived upon it for many years.	1	—	—	—	—	See Testimony

Claimant & Helu	*Ahupua'a*	*Register Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kewe ***Helu 5061***	Puakea & Paakea	6:235-236	My land is in the *Ahupuaa* of Kekuapaakea, given to me by Ko. I have resided here for many years. Here is another *kuleana* for me and my wife, it is at Puakea, land of Kalani [S. Grant]. Kaumkala gave us a *Kihapai*. *Makai* there is a *hale*, given by the same person. It extends from the *makai* wall of the *Puli* to one stream and to the other stream. It is a small place. We have had it for many years.	2	—	—	2	*Hale*	See Testimony
Davida Malo ***Helu 5410*** (see also *Helu* 3702)	Honoluluiki & Makapipi	6:287-288	...(Then I am there *Ahupuaa*, the (two) Makapipi and Honoluuiki at Koolau, Maui. Gotten from Kekaaonohii.	—	—	—	—	—	See Testimony
Daniela ***Helu 6185***	Waihua	6:350	My *loi* are in the *ili* of Kaakee, in the *Ahupuaa* of Wailua, Koolau. I got this at the time that Manu was the *konohiki* of Waihua. The boundaries are – North by Maulu; East by the shore; South by Waihauki; and a *Puli* on the upland side.	—	3 +	—	—	*Loi (Kalo)*	N/A
Kaaimakahiki ***Helu 6438***	Honomanu	6:377	My *ili* is Punalau, in the *Ahupuaa* of Honomanu. There is a *loi* there. Kekio is the *konohiki*. I have had the land for seven years.	—	1	—	—	*Loi (Kalo)*	See Testimony

Claimant & Helu	*Ahupua'a*	*Register Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Malailua ***Helu 6723*** (see also *Helu* 4847)	Honomanu	6:412	My *kuleana* is a *Kihapai* at Palawai, Honomanu *Ahupuaa*. There are several *loi* there. Kekio is the *konohiki*, and I've held it for 20 years. Also at Honomanu, there is one *loi*, gotten from Kekio six years ago. My *kalanakauhale* (house) is in Niuili (Honomanu), there is also one *loi*. Kekio is the *konohiki*. I've held it for 16 years.	1	5 +	—	—	*Loi (Kalo) Kalanakauhale*	See Testimony
Holoua (Kaholoua) ***Helu 6768***	Kukui (Nahiku)	6:420	My land is an entire *Ahupuaa*, it is named Kukui, at Nahiku. Gotten from Hune.	—	—	—	—	—	See Testimony
Kapahukoa (Kapahukoa) ***Helu 6778*** (see also *Helu* 4642 & 4587 B)	Waihua	6:423	(Note: Kapahukoa's Register and Testimony narratives under this *Helu* describe parcels in Kipahulu. *Mahele* Award Book Notes of Survey identify Wailua at Koolau, Maui.)	—	—	—	—	—	See Testimony
Kahaukomo ***Helu 7784***	Keanae	6:444	My *kuleana* is at Nuuailua, Keanae.	—	—	—	—	—	See Testimony
Kinolau ***Helu 7785***	Honomanu	6:444	My *kuleana* is at Halelau, in Honomanu.	—	—	—	—	—	See Testimony
Makaula ***Helu 7786***	Honomanu	6:445	My *kuleana* is in Pohakuhaele at Honomanu, and my land of Kahuanui.	—	—	—	—	—	See Testimony
Waiwine ***Helu 7787***	Honomanu	6:445	My *kuleana* is at Kanaha in Honomanu.	—	—	—	—	—	See Testimony
Humapala ***Helu 7790***	Honomanu	6:445	Pulola is my *kuleana* at Honomanu.	—	—	—	—	—	N/A

Claimant & Helu	*Ahupua'a*	*Register Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Nawele ***Helu 7791***	Honomanu	6:445	Punau is my *kuleana* at Honomanu	—	—	—	—	—	See Testimony
Halala ***Helu 7792***	Honomanu	6:445	My land is at Punalau, Honomanu.	—	—	—	—	—	N/A
Kamakahiki ***Helu 7793***	Honomanu	6:446	My *kuleana* is at Punalau, Honomanu.	—	—	—	—	—	N/A
Kaokua ***Helu 7793 B***	Honomanu	6:446	My *kuleana* has several *loi* at Niulili, Honomanu.	—	3+	—	—	*Loi (Kalo)*	N/A
Pulaile ***Helu 10828***	Honomanu	6:536	My *kuleana* is at Niulili, an *ili* in Honomanu. I also have five *loi* in the land of Kahaule, and four *loi* in the land of Kekio.	—	9	—	—	*Loi (Kalo)*	See Testimony
Kaumauna ***Helu 11043 B***	Wailua	6:541	My land is at Wailua, gotten from Kaniho, the *konohiki*. It is the *ili* of Kalimapuhi.	—	—	—	—	—	See Testimony
Naiapea ***Helu 4779***	Wailua	6:542	My land is at Wailua, gotten from Kaniho, the *konohiki*. I got this land the 28th day of Dec. (1837), and have begun to work on 8 *loi* and a *kula* parcel. The name of this place is Kaewai, it is not an *ili*, it is a parcel within Keononalu. *Makai* is the land of Kaholowaa, *mauka* is the land of Hoonoho. In the *ili* of Paakamaka, there are 10 *loi*, I got from Nawahine.	—	18	—	1	*Loi (Kalo)*	See Testimony
Kalawaia ***Helu 5060***	Wailua	6:542	My parcel of land is in Wailua, in the *ili* of Waieli. There are 10 *loi* and a *kula* parcel.	—	10	—	1	*Loi (Kalo)*	See Testimony

Claimant & Helu	*Ahupua'a*	*Register Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Keahi ***Helu 5064***	Waihua & Kalii	6:543	My *kuleana* is at Waihua, gotten from Kaniho, the *konohiki*. It is the *ili* of Waikani, and I have lived there a long time. Also at Waihua, Kanaina, the overseer, gave me the *ili* of Paloleua. I had this land for six years. Also, I have an *Ahupuaa* named Kalia (Kalii). The same overseer gave it to me.	1	—	—	—	—	See Testimony
Kauiki ***Helu 5068***	Waihua	6:543	My land is at Waihua, in the *ili* of Waieli. There are 24 *loi* and a *kula* parcel.	—	24	—	1	*Loi (Kalo)*	See Testimony
Kalama	Waihua	6:543	My places are in the *ili* of Kaakee. There are 10 *loi* and a *kula* parcel.	—	10	—	1	*Loi (Kalo)*	See Testimony
Kahakauila ***Helu 5062***	Waihua	6:544	My parcel of land is at Wailua, in the *ili* of Keononalu. There are 20 *loi* and a *kula* parcel behind, that I desire to work. Gotten from Kanihu. I also have a claim for an *Olona* patch in the uplands.	—	20	—	2	*Loi (Kalo)* *Olona*	See Testimony
Kiaha ***Helu 5065***	Waihua	6:544	My land is in Waihua, gotten from Kanihu, the *konohiki*. It is at Maulu, and I've dwelt upon it for many years.	—	—	—	—	—	N/A
Kuohilae ***Helu 5066 B*** (see also *Helu* 5065)	Waihua	6:545	My *kuleana* is in Waihua, gotten from Kanihu. The name of the *ili* is Keononalu.	—	—	—	—	—	See Testimony

Claimant & Helu	*Ahupua'a*	*Register Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kaumiumi ***Helu 5066***	Waihua	6:545	My *kuleana* is at Wailua, gotten from Kanihu. The *ili* is Kaakee. I got the land earlier, before the death of Kamehameha I. Also, in the *ili* of Paloleua, there are two *loi*, and in the *ili* of Kaonoulu, there are two *loi*.	—	4	—	—	*Loi (Kalo)*	See Testimony
Keakuahani ***Helu 6401*** (see also *Helu* 3715 B)	Keopuka	6:546	My *kuleana* is at Keopuka, it is an *ili*. I have cultivated it at various locations. There are several parcels of *wala*, and several *wai Opae* (shrimp ponds); also several *koa* trees and several *wai Olona* (watered *Olona* patches). There are also *kalawa kalo* (scattered taro planting areas) and some *kula* parcels.	—	—	—	10+	*Kalo* *Ualu* *Koa* *Olona* *Wai Opae*	See Testimony
Stephen Grant ***Helu 209***	Paukea & Paukea	FR 1:139-140	In pursuance of your notification in the Polynesian, I beg leave to tender my claim for two lands situated in Koolau, east Maui, named as follows, No. 1 Kepuakea, No. 2 Kepuakea. Said lands were granted to me by Hikiau in the year 1839, and regranted to me by Kekauluohi the late Premier in 1840 and I have built and improved on said lands and hold them in undisturbed possession ever since. Sept. 7, 1846	—	—	—	—	Land built upon and improved	See Testimony

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*

Table 1-b. Testimony for Hāmākua Poko, Hāmākua Loa and Ko'olau Testimony for Hāmākua Poko

Kahalelaau ***Helu 3304 E*** (see also *Helu* 5504 & 3504)	Haliimaile (& Haiku)	5:456-457	Kaina sworn: I have seen his 2 parcels of land. 1 parcel is in Kukuiolelu, an *ili* at Haliimaile; 1 parcel is in the *ili* of Hano, in the *Ahupuaa* of Haiku. Kamakahai gave them to him in 1832. He has been opposed by the foreign sugar growers. [Note: Entries for *Helu* 3304 E, 3504, & 5504, under two names, Kahalelaau and Kahalela; both refere to the same lands – history, witnesses, and dates are the same. The duplication of claims is probably an agent's error.]	—	—	—	—	—	N/A
Naai ***Helu 5443***	Haliimaile	5:458 & FT 8:81	Kaelemakule sworn: I have seen his land, it is in the *ili* of Kaake, in the *Ahupuaa* of Haliimaile. It is an inheritance from his parents, in the time of Kamehameha I. It is a *kula* land.	—	—	—	1	—	N/A
Wili ***Helu 5443*** (& ***5443 B***)	Paia & Paniau	5:459 & FT 8:82	(Original claim in *Helu* 5443) Kiha sworn: I have seen his land, 6 parcels. Three parcels are at Paia, and three parcels are at Paniau, Hamakuapoko. These 6 parcels are all *kalo* lands. The lands at Paniau are from the time of Kamehameha I. The lands at Paia, I gave to him in 1843.	—	—	—	6	*Kula*	MA 3:465 RP 2352 Book 10:389

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kalaeloa ***Helu 5326***	Paia	5:459 & FT 8:82	Kiha sworn: I have seen his land, 1 parcel at Paia, Hamakuapoko, a *kula* land. It is a right from the time of Kamehameha I. *Mauka*, the *ili* of Niniwai; Koolau, a *Puli*. *Makai*, the *ili* of Paelelu; Wailuku, Kukuiohana.	—	—	—	1	—	MA 8:407 RP 2438 Book11:43
Palalu ***Helu 5500 B & 6603***	Paniau & Haliimaile	5:468 & FT 8:91-92	Kiha sworn: I have seen his 4 parcels of land. Parcel 1 is at Kakahu; Parcel 2 is at Kahalamanu; Parcel 3 is at Apua in the *Ahupuaa* of Paniau; Parcel 4 is at Haliimaile. The lands at Paniau are old holdings from the time of Kamehameha I; Parcel 4 was gotten in 1842 from Holokukini. Parcels 1 to 3 are *kula* lands; Parcel 4 is a *Pahoo* (goat enclosure).	—	—	—	3	*Pahoo*	MA 3:721 RP 2213 Book 9:513

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Naluahi ***Helu 5501 B***	Kaopa (& Haiku)	5:468-469 & FT 8:92	Huna sworn: I have seen his 2 parcels of land. Parcel 1 is at Kaliuakea; Parcel 2 is at Puulau, these are *ili* in the *Ahupuaa* of Kaopa, they are *kula* lands. The lands are a right from his parents in the time of Kamehameha I. Kopa sworn: I have seen his 2 parcels of land; Parcel 1 is in the *ili* of Kakaialiiha, in Haiku 2; Parcel 2 is in Kikekukui at Haiku 1. Kauhu gave him Parcel 1 in 1842. Kupalaha gave him Parcel 2 in 1843. These 2 parcels are *kalo* land. Huna sworn: I have seen his 2 parcels of land. Parcel 1 is at Kaliuakea; Parcel 2 is at Puulau, these are *ili* in the *Ahupuaa* of Kaopa, they are *kula* lands. The lands are a right from his parents in the time of Kamehameha I. Kopa sworn: I have seen his 2 parcels of land; Parcel 1 is in the *ili* of Kakaialiiha, in Haiku 2; Parcel 2 is in Kikekukui at Haiku 1. Kauhu gave him Parcel 1 in 1842. Kupalaha gave him Parcel 2 in 1843. These 2 parcels are *kalo* land.	—	—	—	2 2	*Kalo* *Kalo*	MA 8:417

Claimant & Helu	*Ahupua'a*	*Testi-mony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kanakanui ***Helu 5500 (& 5501 C)***	Paniau	5:469 & FT 8:93	Kekahuna sworn: I have seen his 2 parcels of land. The first parcel is at Kuapaia; parcel 2 is at Makaleha. These are *ili* of Paniau, *kula* lands gotten in the time of Kamehameha I.	—	—	—	2	—	N/A
Kekahuna ***Helu 5421, (4942) 4142 & 4945***	Paia & Haiku	5:470 & FT 8:93-94	Kiha sworn: I have seen his 2 parcels of land. The first parcel is in the *ili* of Kamole, at Paia; parcel 2 is in the *ili* of Kapuna at Haiku. I gave him the first parcel in 1842; Kaonohimaka gave him parcel 2 in 1846. Parcel 1 is *kula* land; Parcel 2 is *kalo* land.	— / —	— / —	— / —	1 / 1	*Kula* / *Kalo*	MA 8:733 & 7:174 MA 7:52 RP 2342 Book 10:349
Kiha ***Helu 5325***	Paia & Haliimaile	5:470-471 & FT 8:94	Kamakaala sworn: I have seen his 5 parcels of land. The first parcel is at Kahinahina; Parcel 2 is at Kakalaioa; Parcel 3 is a *Pa Aina* (enclosed lot - corral) in the *Ahupuaa* of Paia; Parcel 4 is at Mokuoi at Paia; Parcel 5 is a *Pa Holoholona* (corral), at Haliimaile. I gave him parcels 1, 2, and 3 in 1841. The other 2 parcels were given to him in 1838 and 1843. They are all *kula* lands.	—	—	—	5	*Pa Aina* *Pa Holoholona*	MA 5:449 RP 2341 Book10:345
Kamakaala ***Helu 8468***	Paia	5:471 & FT 8: 94-95	Kiha sworn: I have seen his 3 parcels of land. Parcel 1 is at Paliku; 2 is at Kaheka; 3 is at Piilani and Waipapa, in the *Ahupuaa* of Paia; Parcel 2 is in Paia 1; and Parcel 3 is also in Paia. These are all *kula* lands. Apahu gave them to him in the time of Kamehameha II…	—	—	—	3	*Kula*	MA 3:468 RP 2349 Book 10:377

Claimant & Helu	*Ahupua'a*	*Testi-mony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Huna ***Helu 6536***	Paia	5:472-473 & FT 8:96	Kiha sworn: I have seen his 1 parcel of *kula* land in the *Ahupuaa* of Paia, in the *ili* of Waioku. Gotten from his parents in the time of Kamehameha.	—	—	—	1	*Kula*	MA 8:392 RP 2212 Book 9:509
Kanehailua ***Helu 7970***	Paia	5:474 & FT 8:97-98	Kamakaala sworn: I have seen his 2 parcels of land. Parcel 1 is in the *ili* of Makahuna, at Paia (bounded *makai* by the *Ala Aupuni*); Parcel 2 is a *kula* land at Paihihi (bounded *makai* by the *Ala Aupuni*). I gave the first parcel to him in the time of Kamehameha II; Parcel 2 was from his grandparents in the time of Kamehameha I.	—	—	—	2	*Ala Aupuni* *Kula*	MA 3:470 RP 5026 Book 20:277
Kulahola ***Helu 5492***	Kaopa (& Haiku)	5:474-475 & FT 8:98	Napua sworn: I have seen his 2 parcels of land. Parcel 1 is at Opelepeleha, Kamana, Haula, Kaapakuole, in the *Ahupuaa* of Kaopa…The first parcel was from his grandparents in the time of Kamehameha I (bounded *makai* by the *Ala Aupuni*)… Parcel 1 is *kula* land…	—	—	—	1	*Kula* *Ala Aupuni*	MA 5:449 RP 2211 ½ Book 9:505

Claimant & Helu	*Ahupua'a*	*Testi-mony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kawaa ***Helu 5438***	Kaopa & Paniau	5:475 & FT 8: 99	Napua sworn: I have seen his 2 parcels of land. Parcel 1 is at Kapoawa, Kaulu & Kaluanui, *ili* in the *Ahupuaa* of Kaopa; Parcel 2 is at Ekahanui in Paniau. These are all *kula* parcels, which I gave to him in 1843. Kaopa gave him Parcel 2 in 1832.	—	—	—	2	*Kula*	N/A
Kiha ***Helu 5503***	Honohina	5:475 & FT 8:99	Kulahola sworn: I have seen his 1 parcel of land at Moomuku and Lonoa in the *Ahupuaa* of Honohina. Kekipi gave it to him in 1832.	—	—	—	—	—	N/A
Kaumana ***Helu 5501***	Paniau	7:9 & FT 8:128	Pookeku sworn: I have seen his land. Parcel 1, is a *kula* land at Pueokaili; Parcel 2, is a *kula* land at Haula; Parcel 3 is at Halekii; these are *ili* of Paniau *Ahupuaa*. Kekahuna gave them to him in 1846. There are *Poalima* lots within the parcels…	—	—	—	3	*Kula* *Poalima* (2)	MA 8:409 RP 5393 21:441
Apiki ***Helu 6510***	Paia	7:9-10 & FT 8:128-129	Paka sworn: I have seen his land, three parcels. Par. 1. *Kula* land at Kahao in Paia *Ahupuaa*. Par. 2. *Kula* land at Kikalapaakea in Paia *Ahupuaa*. Par. 3. *Kula* land at Poala in Paia *Ahupuaa*. It is a right from his parents in the time of Kamehameha I.	—	—	—	3	*Kula*	N/A

Claimant & Helu	*Ahupua'a*	*Testi-mony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kaohimaunu ***Helu 3837 B (& 6510 X)***	Waiopua	7:20 & FT 8:138-139	Makapo sworn: It is true that Kiha wrote his claim, and I have seen his land. *Kula* parcels at Hualau and Ohia, in Waiopua *Ahupuaa*. They are a right from his parents in the time of Kamehameha I.	—	—	—	3	*Kula*	MA 7:196 RP 5173 Book 21:1
Huewai ***Helu 4789 B***	Waiopua	7:20-21 & FT 8:139	Kaohimaunu sworn: It is true that Kiha wrote his claim and I have seen his land. Parcel 1, is *kula* land at Ahupau (bounded *makai* by the *Ala Aupuni*); Parcel 2, is *kula* land at Hualau; these are *ili* of Waiopua *Ahupuaa*. Kuhaulua gave these claims to him in 1819.	—	—	—	2	*Kula* *Ala Aupuni*	N/A
Kao ***Helu 6510 BB***	Honohina	7:21 & FT 8:140	Kuewa sworn: I saw him write his claim and I have seen his land. It is *kula* land in the *ili* of Haleolono, Kapaaiki, Kapaanui, and Kamaihipali; these are *ili* of Honohina *Ahupuaa*. This land came from his parents in the time of Kamehameha I… (bounded *makai* by the *Ala Aupuni*).	—	—	—	3	*Kula* *Ala Aupuni*	MA 7:197 RP 4307 Book 17:611
Poupou ***Helu 6510 CC***	Paia & Paniau	7:21 & FT 8:140	Kaumauma sworn: It is true that Kiha wrote his claim, and I have seen his land. Parcel 1, is a *kula* land in the *ili* of Ohia at Paia *Ahupuaa*; Parcel 2, is a *kula* land in the *ili* of Koaie at Paniau *Ahupuaa*. Gotten from his parents in the time of Kamehameha I.	—	—	—	2	*Kula*	N/A

Claimant & Helu	*Ahupua'a*	*Testi-mony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kaumauma ***Helu 6510 DD***	Paniau & Paia	7:22 & FT 8:140-141	Poupou sworn: It is true that Kiha wrote his claim, and I have seen his land. Parcel 1, is a *kula* land at Kahalamanuiki, in the *Ahupuaa* of Paniau; Parcel 2 is a *kula* land in the *ili* of Kahaupali, at Paia *Ahupuaa*. His land came from his parents in the time of Kamehameha I, in 1819.	—	—	—	2	*Kula*	MA 7:198 RP 2344 MA 10:357
Paahana ***Helu 6510 FF***	Waiopua	7:23 & FT 8:141-142	Kaohimaunu sworn: It is true that Kiha wrote his claim, and I have seen his land, 2 parcels. *Kula* land at Pohaiole, an *ili* of Waiopua *Ahupuaa*. Kekuhaulua gave it to him in the time of Kamehameha II, in 1823.	—	—	—	2	*Kula*	N/A
Kaaikaula ***Helu 6510 GG***	Waiawa	7:23 & FT 8:142	Kao sworn: It is true that Kiha wrote his claim, and I have seen his land. A *kula* parcel in the *ili* of Kaluaoili, Puuokaaha, and Kaluanui in the *Ahupuaa* of Waiawa. His land is from his grandparents in the time of Kamehameha I.	—	—	—	1	*Kula*	MA 7:197 RP 3661 Book 16:81
Poka ***Helu 6510 HH***	Paniau, Paia & Haliimaile	7:23-24 & FT 8:142-143	Poupou sworn: It is true that Kiha wrote his claim, and I have seen his land. Parcel 1, is a *kula* land at Halamanunui; Parcel 2, is a *kula* land at Puhiele (Paia); Parcel 3, is a *kula* land at Poala; these are all *ili* in the *Ahupuaa* of Paniau. Parcel 4, is a *kula* land in the *ili* of Kauhiana, Haliimaile *Ahupuaa*. His land is from his parents in the time of Kamehameha I, in 1819.	—	—	—	4	*Kula*	MA 7:199 RP 2214 Book 9:517

Claimant & Helu	*Ahupua'a*	*Testi-mony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Pau ***Helu 6510 II***	Waiopua	7:24 & FT 8:143	Kaaikaula sworn: It is true that Kiha wrote his claim, and I have seen his land. There are 2 *kula* parcels in the *ili* of Kapalaalaea, Waiopua *Ahupuaa*. Gotten from his parents in the time of Kamehameha I, in 1819.	—	—	—	2	*Kula*	MA 7:200 RP 4306 Book 17:609
Makapo ***Helu 6510 KK***	Waiopua	7:24 & FT 8:143	Kaohimaunu sworn: It is true that Kiha wrote his claim, and I have seen his land. A *kula* parcel in the *ili* of Piliamoo, *Ahupuaa* of Waiopua. Kekuhaulua gave it to him in the time of Kamehameha I, in 1819.	—	—	—	1	*Kula*	MA 7:200 RP 4305 Book 17:607
Kaaikauna ***Helu 6510 LL***	Waiopua	7:24-25 & FT 8:143-144	Kaohimaunu sworn: It is true that Kiha wrote his claim, and I have seen his land. 2 *kula* parcels at Kuaihee and Pohaiole, *ili* of Waiopua *Ahupuaa*. Kekuhaulua gave it to him in the time of Kamehameha I, in 1819.	—	—	—	2	*Kula*	N/A

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
I ***Helu 6510 MM***	Waiopua	7:25 & FT 8:144	Kaohimaunu sworn: It is true that Kiha wrote his claim, and I have seen his land. Parcel 1 is a *kula* land at Kapalaalaea. Parcel 2 is a *kula* land at Aiku; these are *ili* in the *Ahupuaa* of Waiopua. Kekuhauhua gave them to him in 1819.	—	—	—	2	*Kula*	MA 7:201 RP 3358 Book 14:509
Kuke ***Helu 6510 NN***	Waiopua	7:25 & FT 8:144	Kaohimaunu sworn: It is true that Kiha wrote his claim, and I have seen his land. A *kula* parcel in the *ili* of Kuaihee, in the *Ahupuaa* of Waiopua. Kekuhauhua gave it to him in the time of Kamehameha I, in 1819.	—	—	—	1	*Kula*	MA 7:201 RP 7462 Book 27:719
Nika ***Helu 6510 TT***	Waiopua (& Haiku)	7:29 & FT 8:148	I sworn: It is true that Kiha wrote his claim, and I have seen his land… Parcel 2 is in the *ili* of Piliamoo at Waiopua… I gave parcel 2. to him in 1836.	—	—	—	1	*Kula*	MA 7:202 RP 4879 Book 19:633
Kawaha ***Helu 3906 C***	Waiawa	7:34	Kekahuna sworn: It is true that Kiha wrote his claim, and I have seen his land, a *kula* parcel at Moomuku, Kawailepolepo, Kahuala, Waiawa *Ahupuaa* (the *makai* boundary is the sea). Land inherited from his parents in the time of Kamehameha I, and he has resided there peacefully.	—	—	—	1	*Kula*	N/A

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kaina ***Helu 5502***	Haliimaile	7:36	Paele sworn: I have seen his land. Parcel 1. *kula* land at Laakeha and Paalaea; Parcel 2. *kula* land at Kaulemahana, these are *ili* lands in the *Ahupuaa* of Haliimaile. 1. *Mauka*, Makawao: Koolau, Kahuli; *Makai*, Wiliama; Wailuku, Kaloulele. 2. *Mauka*, Mr. Gentna [Green]; Koolau, *Kahawai* of Haiku; *Makai*, *Alanui hele loa*; Wailuku, *Puli* of Haliimaile.	—	—	—	2	*Kula* *Alanui hele loa*	N/A
Paele ***Helu 10783***	Haliimaile	7:36	Kaina sworn: I have seen his land, a *kula* parcel in the *ili* of Kukuiohana, Haliimaile *Ahupuaa*. Wm. Wahinepio gave it to him in 1829.	—	—	—	1	*Kula*	N/A
Kaili ***Helu 3905 B***	Hamakua-poko (& Haiku)	8:77-78	Paele sworn: The Clt's. lands are of 3 pieces. The first piece in the *ili* of Papiha, Hamakuapoko. The second piece in the *ili* of Aiawaiea, the third piece in the *ili* of Haiku, in the *Ahupuaa* of Haiku. All the pieces are *kula* land. He got them from Kaonohimaka in 1836.	—	—	—	3	*Kula*	MA 3:474 RP 2211 Book 9:501
Kawalea ***Helu 5494 F***	Waiawa	8:152	Kekahuna Sw.: I know the land of the Clt. It is one piece of *kula* land in the *Ahupuaa* of Waiawa. The Claimant received it from his parents in the days of Kamehameha I… It is bounded *Mauka* by Kaaikaula's land; Koolau by Kaio's land; *Makai* by sea shore; Waiuku by Kuahiwa's land.	—	—	—	1	*Kula*	N/A

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kekipi ***Helu 8314*** Kekipi & Keala ***Helu 8315***	Hulaia Honohina Hamakua-poko & Wailuku	9:597 & FT 7:401 -402	[Note: The original claim was situated in Waiaka at Wailuku. NR Vol. 5 contains portion of NT Vol. 9 (pp. 582-697. NT 9:597 – *Helu* 8314 describes 5 parcels in Hamakuapoko).] Keahi Sw.: The Clt's. lands are as follows: No.'s 1 & 2… Paumiu & Waiaka, Wailuku. No. 3. is a *Pahale* (house lot) in the *Ahupuaa* of Hulaia, Hamakuapoko. No. 4. is a *kula* land in the *Ahupuaa* of Hulaia… No. 5. is a *kula* land in the *Ahupuaa* of Hulaia… No. 6. is a *kula* land in the *Ahupuaa* of Honohina, Hamakuapoko. No. 7. is a *kula* land in the *Ahupuaa* of Honohina… Lot 1 was from Kaihiwa in 1835; and No. 2 was from his wife in 1830; all the other pieces were from his father in 1829. [See also MA 3:463] This Claim was heard July 5th under No. 8314. Kekipi.	1	—	—	4	*Pahale* *Kula*	MA 7:466 RP 6269 Book 23:705

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Nalaipaleho ***Helu 3331***	Paniau	FT 7:431	L. Kaauwai Sw. The Clt's. land are two Ahupuaas. First the *Ahupuaa* of "Kou" in Waiehu; secondly, the *Ahupuaa* of Paniau in Hamakuapoko.. The Clt. is *Konohiki* of the first., under Lunalilo, the son of Kanaina; and of the second, under Government. He has no rights in these lands if Wm. Lunalilo or the Govt. take away his Konohikiship.	—	—	—	—	—	N/A
Wm. P. Leleiohoku ***Helu 9971***	Hamakua-poko	—	*½ Konohaina o ka Moku o Hamakua Poko*. (Western ½ of the district of Hamakua Poko.) (*Alii* Awardee)	—	—	—	—	—	*Bake Mahele* 1848:23-26 MA 10:614
M. Kekauonohi ***Helu 11216***	Haliimaile	—	(*Alii* Awardee)	—	—	—	—	—	*Bake Mahele* 1848:26-28 MA 9:660 RP 7512 (27) Book 25:235

Testimony for Claims in Hāmākua Loa

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Wm. P. Leleiohoku ***Helu 9971***	Napuumaile Papaaea Hanawana Kuiaha	—	(*Alii* Awardee)	—	—	—	—	—	*Bake Mahele* 1848:23-26 MA 10:612, 614
Keoni Ana ***Helu 8515***	Halehaku	—	(*Alii* Awardee)	—	—	—	—	—	*Bake Mahele* 1848:160-1.61-26 MA 10:336 RP 1666 (3) Book 6:271
Mahina (Edwin Miner) ***Helu 202***	Haiku	2:82	L. Kaauwai sworn: …Kahaleohu told Wahie that it was for Edwin Miner. I did not hear the conversation with Wahie; but at the time when I was collecting lumber for the Church at Wailuku, I did hear Kahaleohu, and I saw the land filled by Mahina with his crops of sugar; afterwards I heard Hoapili wahine state that the land was for him. From that time till now, I have heard of no challenges.	—	—	—	—	Sugar cultivated	MA 1:255 RP 78 Book 1:303
Kanui ***Helu 6249***	Hanawana	3:575 & FT 3:239	This is the propety… Hanawana at Hamakuaiou, Maui…lands for Kanui, the *Konohiki*. His land from the division with the King… This is a claim for an *ili* of land called Makalii (at Kailua, Oahu), and an *Ahupuaa* of land in Hamakuaiou, Maui, called Hanawana.	—	—	—	—	—	N/A

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kanui (cont'd.) ***Helu 6249***	Hanawana	FT 3:239	The Clt. appeared, and substantiated his claim, by showing a certificate by J.P. Judd that these lands had been set apart to him at the division of lands with the King, as will more fully appear by reference to the register in the office of the Minister of the Interior.						
Hikiau ***Helu 4592***	Kaupakulua	5:16	(not recorded in Native Register) This was done in the time of Wm. Richards. The *Ahupuaa* is Kaupakulua, Hamakualoa. Keoni Ana review the *Kuleana* Book in your office. (*Alii* Awardee)	—	—	—	—	—	*Bake Mahele* 1848:101-102
Kalua ***Helu 3542*** (see *Helu* 6487 in NR)	Honopou	5:19-20 & FT 7: 134-135	…3. Kauhapa Sworn. I have seen his *kula* claim in the *Ahupuaa* of Honopou at Hamakualoa. Here are the boundaries. *Mauka*, *Konohiki*; 3 sides Government land, Holawa on the Honomanu side. Kaukapa Sw. I know the land of the Clt. Has a *kula* land in the *Ahupuaa* of "Honopou" Hamakualoa, Maui. It is one piece. The Clt. Re'd. this land fro m Kekauonohi in 1846, and he has held the same with out dispute up to the present day. It is bounded. *Mauka* and *Makai*, and Haiku sides by the land of the Government. On the other side, by the Creek of "Hoolawa…"	—	—	—	1	*Kula* Hoolawa Creek	N/A

Claimant & Helu	*Ahupua'a*	*Testi-mony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Piianaia ***Helu 10789***	Kealii	5:55	Piianaia presented a copy of the *Mahele* certificate for Kealii at Hamakualoa, Maui. Look in the Book in the Office of the Minister of Interior, in Honolulu. (A *Konohiki* claimant)	—	—	—	—	—	(Relinquished)
Kahikona ***Helu 9795 E***	Pauwela	5:72-72 FT 7:191 -192	[Kahiknoa was a Tahitian missionary who came to Hawai'i in 1819; with Taua, he was a teacher to the Hawaiian chiefs.] …Kaauwai Swom: I have seen the land at Pauwela, Hamakualoa Maui, gotten from his wife Lonokahikini, who received it from her father Kekamahu, during the second Kamehameha's reign over the Kingdom… [sections illegible] His residence was not disputed until Daniela Ii became government agent in 1842. There are 8 parcels in the *ili* of Kapuna, Noni and Hoopauwahie; 5 sections of *kula* and 3 sections of *kalo*. 8 all together. The Clt. appeared and made oath that he had sent in a claim for an *Ahupuaa* of land in Kona, Hawaii, called "Onouli" before Feby. 1848, and also for an *ili* of land in "Pauwela, Hamakualoa," Maui…	—	—	—	8	*Kula* *Kalo*	N/A

Claimant & Helu	*Ahupua'a*	*Testi-mony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kauwe Kamakau ***Helu 4964 & 4964 B***	Hanehoi, Puolua & Waipio	5:439-440	His land is in the *ili* of Wailaahili, in the *Ahupuaa* of Hanehoi. It is an old land gotten before 1819. 1. *Mauka*, forest; Hana, the land of Owili; *Makai*, the sea; Wailuku, the land of Mahoe. 2. A *Kihapai* at Puolua. *Mauka*, the land of Kekauaolohia; Hana, a *Pali*; *Makai*, the land of Kaahaiea; Wailuku, a *Pali*. 4. [sic] A *Kihapai* in the *ili* of Kaulu at Puolua. *Mauka*, forest; Hana, the land of Kuluwaimakalani; *Makai*, the land of Kamahine; Wailuku, the land of Lalahili. 5. A *kahuahale*. *Mauka*, an *Alanui Aupuni*; Hana, Kaluhiauhee; *Makai*, Haluhalu [?]; Wailuku, the land of Kapilipolani. 6. A *Kihapai* in the *ili* of Kapalaoa at Waipio 3. *Mauka*, an *Alanui*; Hana, the land of Puolua; *Makai*, the sea; Wailuku, a *Pali* and Waipio of Mahina.	1	—	—	4	Parcels extending from shore to forest *Kahuahale*	MA 5:601 RP 2783 Book 13:25
Paele (heir of Laikona) ***Helu 3829 & 6613*** and ***Helu 3453 & 3904***	Pauwela & Kuiaha	5:440-441 & FT 8:62-63	Kaloma swom: I have seen his lands, several *ili* at Pauwela. There are four parcels. Parcel 1. *Kalo kula* in the *ili* of Puukoa. Parcel 2. *Kalo kula* in the *ili* of Kanaele. Gotten before 1819 in the time of Kamehameha I.						(cont'd.)

Claimant & Helu	*Ahupua'a*	*Testi-mony Book & Page*	*Summary of Claim Documentaion*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Paele (heir of Laikona) (cont'd) ***Helu 3829 & 6613*** and ***Helu 3453 & 3904***	Pauwela & Kuiaha	5:440-441 & FT 8:62-63	1. *Mauka*, mine and Kauhi's land; Koolau, the *Pali* of Pauwela; *Makai*, Pilipili; Wailuku, the *Pali* of Pauwela. 2. *Mauka*, Pilipili; Koolau, Aupuni (Government land); *Makai*, my land; Wailuku, Lii's *Poalima*. 3. *Mauka*, Naeole; Koolau, an *Alanui pii a iho* (a *mauka-makai* trail); *Makai*, Opunui; Wailuku, *Alanui o Kalio* [? - perhaps a horse trail]. 4. *Mauka*, an *Alanui Aupuni*; Koolau and *Makai*, Aupuni; Wailuku, Kaniau. Haleole swom: I have seen his *kalo* land, it is in the *ili* of Kuemakaanu-anu, gotten from Hoapiliwahine in 1841. It is parcel 5. 5. *Mauka*, D. Ii; Koolau, the *Kahawai* of Pauwela; *Makai*, the *Poalima* of Nalima; Wailuku, D. Ii. Pilipili sworn: I have seen his *kula* land at Mooiki, Pauwela. It is his sixth parcel. 6. *Mauka*, the *Papuaa* of Daniela Ii; Koolau, the *Kahawai* of Pauwela; *Makai*, an *Alanui Aupuni*; Wailuku, Mahina. Gotten from Hoapiliwahine in 1841.	—	—	—	9	*Kalo* *Kula* *Alanui pii a iho* *Alanui* *Pa puaa* (pig enclosure) *Kahawai*	MA 5:453 RP 2168 Book 9:333

Claimant & Helu	*Ahupua'a*	*Testi-mony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Paele (heir of Laikona) (cont'd.) ***Helu 3829 & 6613*** and ***Helu 3453 & 3904***	Pauwela & Kuiaha	5:440-441 & FT 8:62-63	Naeole swom: I have seen his land at Halaula and Ulułoloa in the *Ahupuaa* of Kuiaha. Parcel 7. *Kalo* and *kula* land at Halaula. Parcel 8. *Kalo* and *kula* land at Ululoloa. Parcel 9. *Kalo* and *kula* land at Holoka.						
Pilipili ***Helu 5344***	Pauwela	5:441-442 & FT 8:63-64	There are 5 parcels which he received in 1841. Par. 1. *Kalo kula* at Waikina, Pauwela. Par. 2. *Kalo kula* at Waikina, Pauwela. Par. 3. *Kalo kula* at Waikina, Pauwela. Par. 4. A *kula* parcel at Puukoa, Pauwela. Par. 5. *Kalo kula* at Puukoa, Pauwela.	—	—	—	5	*Kula* *Kalo*	MA 7:60
Haleole ***Helu 3969***	Haiku Pauwela & Kuiaha	5:442-443 & FT 8:64-65	His land is 5 parcels, these *ili* are in the *Ahupuaa* of Haiku. He got them from Kahaleohu and Waimaka in 1839. Par. 1. *Kalo kula* at Opuwaihaa (the *Makai* boundary is an *Auwai*). Par. 2. *Kalo kula* at Punalehu. Par. 3. *Kalo kula* at Maunaoui. Par. 4. *Kalo kula* at Maunaoui. Par. 5. *Kalo kula* at Maunaoui (the Wailuku side boundary is a *Kahawai*).	—	—	1	11	*Kalo* *Uala* *Auwai* *Kahawai*	MA 7:55 RP 3240 Book 14:273

Claimant & Helu	*Ahupua'a*	*Testi-mony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Haleole (cont'd.) ***Helu 3969***	Haiku Pauwela & Kuiaha	5:442-443 & FT 8:64-65	Paele swom: I have seen his 2 parcels at Pauwela, and there are 4 *Apana uala* (sweet potato parcels) at Kuiaha, and a *kalo* parcel (the Wailuku side is bounded by the *Kahawai* of Kuiaha).						
Nahinu ***Helu 3905 (& 791)***	Pauwela & Haiku	5:443 & FT 8:65	Paele swom: His land is 3 cultivated *ili* parcels at Pauwela; 1 parcel in Waikina, 1 parcel in Halipali, and 1 parcel in Kawailepolepo… (1. *Makai* boundary is *Alanui* and Pilipili; …3. *Makai* boundary is *Alanui* Aupuni. It was a waste land before he worked there…) Kuhauluа swom: His 2 parcels are at Nukupono an *ili* of Haiku 2. It is an old land from his parents. Parcel 1 is a *kalo* land; Parcel 2 is a *kula* land…	—	—	—	5	*Mahi ia* *Kalo* *Alanui* *Alanui Aupuni*	MA 7:45 RP 2171 Book 9:345
Nalopi ***Helu 3336***	Kuiaha & Pauwela	5:444 & FT 8:65-66	Kapihe swom: His land is 6 parcels; 2 parcels at Kapouamoa and 3 parcels at Ululoloa in the *Ahupuaa* of Kuiaha. His wife gave it to him in 1819, during the time of Kamehameha I. There is also 1 parcel with 2 *loi* at Pauwela. Parcel 2 is bounded by the *Kahawai* of Kuiaha on the Wailuku side. Parcel 3 is bounded by a *Kahawai* on the Wailuku side. Parcel 4 is bounded by the *Kahawai* on the Koolau side. Parcel 5 is in the *ili* of Luaoopu. Parcel 6 is bounded by the *Kahawai* on the Koolau side.	—	2	—	5	*Kula* *Loi (Kalo)* *Kahawai*	MA 8:418 RP 2194 Book 9:433

Claimant & Helu	*Ahupua'a*	*Testi-mony Book & Page*	*Summary of Claim Documentaion*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Holoka ***Helu 5379***	Pauwela	5:444-445 & FT 8:66-67	Paele swom: His land is 4 parcels in the *Ahupuaa* of Pauwela. 1 parcel is at Waiokana; 1 parcel is at Papaholahola; 1 parcel is at Ulukaa; and 1 parcel is at Elialii. He got this from David Malo in 1833. 1. *Kalo* land. 2. *Kalo* land. 3. *Kalo* land. 4. *Kalo* land. 5. A *kula* Parcel.	—	—	—	5	*Kula* *Kalo*	MA 7:50 RP 2180 Book 9:377
Keliiaa ***Helu 3905 D***	Pauwela	5:445 & FT 8:67	Paele swom: His first parcel is *kalo* at Waiokana. Aiawale gave it to him in 1830. The second parcel is *kalo*, gotten from David Malo in 1833. The third parcel is a *kula* parcel at Elialii, gotten from Mamukani in 1842.	—	—	—	3	*Kalo*	MA 7:59 RP 2628 Book 12:109
Kolia ***Helu 3905 C***	Pauwela & Kuiaha	5:445-446 & FT 8:67-68	Paele swom: I have seen his 3 parcels of land, they are *ili* in Pauwela. 2 parcels are in the *ili* of Laie; 1 parcel is in the *ili* of Paukua, given to him by David Malo in 1833. 1. A *loi kalo*. *Mauka*, D. Ii; Koolau, a *Pali*; *Makai*, Kaonohimaka; Wailuku, a *Pali*… Hookaea swom: I have seen his fourth parcel, it is at Waikina at Kuiaha. Kupa gave it to him in 1819.	—	1	—	3	*Loi Kalo*	MA 8:316 RP 2175 Book 9:361 & MA5:525 RP 2771 Book 13:1

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kaili ***Helu 3905 B***	Pauwela, Haiku (Hamakua-poko)	5:446, 455 & FT 8:68 FT 8:77-78	Paele sworn: I have seen his 2 parcels in the *ili* of Haliipuli at Pauwela. The first parcel is a *kalo* land, the second parcel is a *kula* land. Aiawale gave it to his father in the time of Kamehameha I. (see page 77) Paele sworn: The Clt's. lands are of 3 pieces. The first piece in the *ili* of Papiha, Hamakuapoko. The second piece in the *ili* of Aiawalea, the third piece in the *ili* of Kuliu, in the *Ahupuaa* of Haiku. All the pieces are *kula* land. He got them from Kaonohimaka in 1836.	—	—	—	4	*Kalo* *Kula*	MA 3:474 RP 2211 Book 9:501
Hookaea ***Helu 5491***	Kuiaha	5:446 & FT 8:68	Kapua sworn: I have seen his land, 2 parcels in the *ili* of Kaohe at Kuiaha. The first parcel is a *kalo* land, the second parcel is a *kula* land. It is an inheritance from his parents in the time of Kamehameha I.	—	—	—	2	*Kalo* *Kula*	MA 8:333 RP 2195 Book 9:437
Hao ***Helu 3970, 5489 & 5490***	Kuiaha & Pauwela	5:447 & FT 8:68-69	Hookaea sworn: I have seen his land, 2 parcels at Kahakoholua, an *ili* in Kuiaha; 1 *kalo* land, and 1 *kula* land. This is an inheritance from the time of Kamehameha I. There are 3 *Poalima* in his land. Paele sworn: I have seen his 5 parcels, 4 in the *ili* of Kahakula and 1 in the *ili* of Ohia at Kuiaha 2.	—	—	—	7	*Kalo* *Kula* *Poalima* (3) Creek	MA 8:353 RP 2167 Book 9:329

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Hao (cont'd) ***Helu 3970, 5489 & 5490***	Kuiaha & Pauwela	5:447 & FT 8:68-69	...No. 6 is bounded by the Creek of Kuiaha on *the* Waiuku side. ... Parcel 7 is *kalo* land at Waiokama in Pauwela. (Note: 5489 also includes a *kula* parcel in Kanahena, Homaula,: NT Vol. 7:153.).						
Kapua ***Helu 6466***	Haiku	5:447 & FT 8: 69-70	Kaiwa sworn: I have seen his 2 parcels at Pahoa, an *ili* in Haiku. Kahaleohu gave it to him in 1831. Parcel 1 is *kalo* land. Parcel 2 is *kula* land.	—	—	—	2	*Kalo* *Kula*	MA 8:403 RP 4733 Book 19:343
Kapohaku ***Helu 4120***	Haiku	5:448 & FT 8:70	Kaonohimaka sworn: I have seen his 3 parcels of land at Kuliu, an *ili* of Haiku. I gave them to him in 1844. Parcel 1. *Kula* land. ..A *Kahawai* is the boundary on the Koolau side. Parcel 2. *Kalo* land. Parcel 3. *Kula* land.	—	—	—	3	*Kalo* *Kula*	MA 8:432 RP 6625 Book 24:623
Kaniau ***Helu 5555*** (and *Helu* 5086)	Haiku	5:448 & FT 8: 70	Kopa sworn: He does not have a right to this land, there are several *Poalima* for the *Konohiki* here.	—	—	—	—	*Poalima* (3)	N/A
Kaonohimaka, G. ***Helu 4921 & 4991***	Pauwela & Haiku	5:448 & FT 8:70-71	Paele sworn: I have seen his land, a *kalo* parcel in the *ili* of Noni at Pauwela. Kekumoku gave it to him in 1842. Pahua sworn: I have seen his 2 *kalo* parcels at Lilikoi, an *ili* in Haiku. Hoapiikiane gave it to him in 1830.	—	—	—	3	*Kalo*	N/A

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kauaililea ***Helu 5426***	Haiku	5:448-449 & FT 8:71	Holoka sworn: I have seen his land, it is 4 parcels. Par. 1. *Kalo* land in the *ili* of Papahoihoia. Par. 2. *Kalo* and *kula* land at Uhakaa. Par. 3. *Kalo* land at Mookii. Par. 4. *Kula* land at Punkoa. The first and second parcels, I gave him. Parcel 3 was from Naone, and Parcel 4 was from Paele.	—	—	—	4	*Kalo*	N/A
Naeole ***Helu 5439***	Haiku & Kuiaha	5:449 & FT 8:71-72	Kaonohimaka sworn: I have seen his land, 2 parcels in the *ili* of Kuliu, (*kula* land) at Haiku. I gave them to him in 1836. 1. *Mauka*, Lonomakaihonua; Koolau, a *Kahawai*; *Makai*, my land; Wailuku, Paele. 2. *Mauka*, Kapua; Koolau, Limaikaika (Armstrong); *Makai*, Halcole; Wailuku, *Kahawai* of Maliko. Keonepahu sworn: I have seen 1 parcel (with 4 *loi*) in the *ili* of Opihi at Kuiaha. Kuaila gave it to him in 1830. 3. *Mauka*, Kekua; Koolau, a *Pali*; *Makai*, a *Kahawai*; Wailuku, Kekua.	—	4	—	2	*Kalo* *Kahawai* *Loi (Kalo)*	MA 8:405 RP 2187 Book 9:405

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kealoha ***Helu 4121 B***	Haiku	5:450 & FT 8:72	Punilou sworn: I have seen his 2 parcels of land at Waialala (1 *kalo* land and 1 *kula* land); and 1 *kula* parcel Kapalaoa, gotten from Kaonohimaka in 1842. ... No. 3 is bounded *Mauka* by Pauwela; Koolau by Forest; *Makai* by Mahina; Wailuku by the *Kahawai* of Waialala. Kapua sworn: I have seen 1 parcel of land in the *ili* of Pahoa, Haiku 2.	—	—	—	4	*Kalo* *Kula* *Kahawai*	N/A
Kaai ***Helu 4121***	Haiku	5:450 & FT 8:72-73	Kapua sworn: I have seen his land. The first parcel is *kalo* land in the *ili* of Waiki. The second parcel is *kalo* at Pahoa. I gave it to him in 1831.	—	—	—	2	*Kalo*	MA 8:406 RP 4802 Book 19:477
D. Ii ***Helu 4579***	Pauwela & Huelo	5:450-451 & FT 8:73-74	Paele sworn: I have seen his 7 parcels of land . These *ili* are in the District of Hamakua. Paele sworn: I have seen his 7 parcels of land. Those *ili* are in the District of Hamakua. Par. 1 is *kalo* land in the *ili* of Eleile (*Mokai* boundary is the *Koi*). Par. 2 is *kalo* land in the *ili* of Eleile. Par. 3 is a *kula* land in the *ili* of Paukoa. Par. 4 is *kalo* land in the *ili* of Puohala. Par. 5 is *kalo* land in the *ili* of Hoopuawahie.	—	—	—	9	*Kalo* *Kula* *Alanui pii* (Road leading to the mountain)	MA 8:511 RP 4995 Book 20:213

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
D. Ii ***Helu 4579*** (cont'd.)	Pauwela & Huelo	5:450-451 & FT 8:73-74	Par. 6 is *kalo* land at Kanemoaala at Punkoa (*Mauka* boundary is the *Alanui pii*). Par. 7 is *kalo* land at Paukii. Auhea gave these to him in 1842. Mahoe sworn: I have seen two parcels that are his (as well). One parcel is *kalo* land in the *ili* of Kahaloa. Another parcel is *kalo* land at Kalalii, an *ili* in Huelo. These parcels were given to him by Kamehameha II in 1820.	—	—	—	9	*Kalo* *Kula* *Alanui pii* (Road leading to the mountain)	MA 8:511 RP 4995 Book 20:213
Kopa ***Helu 8889***	Haiku	5:452 & FT 8: 74 & 7:32-33	Kaiwa sworn: I have seen his 3 parcels of land. The first parcel is in the *ili* of Papahuwahawa; parcel 2 is a *loi* at Kakaiakiha; parcel 3 is a *loi* in the *ili* of Auhuhu. Gotten from Kaeo in 1844. Nahima sworn: I have seen his land, it is 4 *kula* parcels in the *ili* of Kapela, Haiku *Ahupuaa*. The lands are a right from his grandparents and parents in the time of Kamehameha I. There is one *Poalima* in it. *Mauka*, Piiholo; Koolau, Kawaha; *Makai*, *Poalima* of Kopa; Wailuku, *Kahawai* of Waiakaalae..	—	2	—	1	*Loi (Kalo)* *Poalima (1)*	MA 8:404 RP 2186 Book 9:401

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Namokuelua ***Helu 4564***	Haiku	5:452 & FT 8:74-75	Kaiwa sworn: I have seen his 1 parcel at Pahoa, an *ili* at Haiku. It is an inheritance land from the time of Kamehameha I.	—	—	—	—	—	MA 8:350 RP 3660 Book 16:79 & RP 2185 Book 9:397
Kaiamui ***Helu 4128***	Haiku	5:452 & FT 8:75	Haleole sworn: I have seen his 2 parcels of *kalo* land in the *ili* of Maunaoui. Kahaleohu gave them to him in 1834. there is 1 *Poalima* in the first piece.	—	—	—	2	*Kalo* *Poalima* (1)	MA 7:53 RP 2183 Book 9:389
Kapihe ***Helu 4517***	Kuiaha	5:453 & FT 8:75-76	Kealoha sworn: I have seen his 7 parcels in the *Ahupuaa* of Kuiaha 2. 4 parcels are in the *ili* of Uhaloku; 1 parcel is in the *ili* of Kupouamoa. In the *ili* of Aulilii, there is 1 parcel, and in the *ili* of Halaula, there is 1 parcel. All of these parcels are *kalo* land. These lands are an inheritance from the time of Kamehameha I. ...No. 6 is bounded *Makai* by the *Ala Aupuni*.... No. 7is bounded Koolau by the Kahawai Kuiaha...	—	—	—	7	*Kalo* *Ala Aupuni* *Kahawai*	MA 5:451 RP 2197 Book 9:445

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kekanaka ***Helu 4518***	Kuiaha	5:453-454 & FT 8:76	Kapihe sworn: I have seen his 6 parcels. There are 2 parcels in the *ili* of Kahaloa; in the *ili* of Maialoa, there are 2 parcels; at Auhilili, there is 1 parcel; and in the *Ahupuaa* of Kuiaha, there is 1 parcel in the *ili* of Kamalea. These are lands inherited, from the time of Kamehameha I. There are 3 *kalo* lands and 3 *kula* lands. …No.2 is bounded *makai* by *Ala Aupuni*,… No. 3 is bounded on Koolau by Creek of Kaupakuluaa… No. 4 is bounded on Wailuku by Creek of Kuiaha… No. 6 is bounded *makai* by Creek of Kuiaha,…	—	—	—	6	*Kalo* *Kula* Creek	MA 8:433 RP 2173 Book 9:353
Konohia ***Helu 3905 F***	Kaupakulua	5:454 & FT 8:76-77	Kapihe sworn: I have seen his 3 parcels, *ili* in the *Ahupuaa* of Kaupakuluaa. 1 parcel i s in the *ili* of Wailupu; 1 parcel i s in the *ili* of Pohoiki; and 1 parcel i s in the *ili* of Paehala. Those are old lands held, from the time of Kamehameha I. 1. Kalo land… bounded Koolau by the Kahawai Kau[pakalua]; 2. *Kalo* land; 3. *Kalo* land… bounded *Makai* by the shore…	—	—	—	3	*Kalo* *Kula* *Kahawai*	MA 8:327 RP 2174 Book 9:355
Wahahee ***Helu 3905 B (C)***	Pauwela	5:454 & FT 8:77	D. li sworn: I saw Haleole write out the claim. Paele sworn: I have seen his 2 parcels of land. 1 pacel is at Waikina, and 1 parcel is at Mooiki. They are *kalo* lands. D. li gave them to him in 1842.	—	—	—	2	*Kalo*	MA 5:530 RP 2772 Book 13:3

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kipu ***Helu 7768***	Haiku	5:455 & FT 8:78	Paele sworn: I have seen his 2 parcels of *kalo* land in the *ili* of Kuilu, Haiku *Ahupuaa*. Kauimaluni gave them to him in the time of Kamehameha I.	—	—	—	2	*Kalo*	N/A
Mahiai ***Helu 4516***	Kuiaha	5:455-456 & FT 8:78	Paele sworn: I have seen his 3 parcels of land. 1 parcel is in the *ili* of Kalapauila; 1 parcel in the *ili* of Kaeo, in the *Ahupuaa* of Kuiaha 2 (*Ainai* is *makai* boundary); and 1 parcel i s in the *ili* of Kaohe, in the *Ahupuaa* of Kuiaha 1. These are all *kalo* lands. They were inherited from his parents in the time of Kamehameha I.	—	—	—	3	*Kalo* *Ainnui*	MA 8:409 RP 5454 Book 21:563
Kulaamea ***Helu 5420***	Haiku	5:456 & FT 8:79	Kealoha sworn: I have seen his 3 parcels of land. 2 parcels are at Waialala, and 1 parcel is at Kiilau , in the *Ahupuaa* of Haiku 1. Kaonohimaka gave them to him in 1842. Parcels 1 & 2 are *kula* land; Parcel 3 is *kalo* land.	—	—	—	3	*Kalo* *Kula*	MA 8:413 RP 3941 Book 16:641

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kahulelaau ***Helu 3304 E***	(Haliimaile) & Haiku	5:456-457	Kaina sworn: I have seen his 2 parcels of land. 1 parcel is in Kukuiolau, an *ili* at Haliimaile; 1 parcel is in the *ili* of Hano, in the *Ahupuaa* of Haiku. Kamakahai gave them to him in 1832. He has been opposed by the foreign sugar growers. [Note: Entries for *Helu* 3304 E, 3504, & 5504, under two names, Kahalelaau and Kahalela, claim the same lands – history, witnesses, and dates are the same. The duplication of claims may have been an agent's error.]	—	—	—	—	Land claimed by sugar growers	N/A
Onaha ***Helu 3304 B***	Pauwela & Haiku	5:457 & FT 8:79-80	Ua sworn: Pilipili wrote out his claim. Paele sworn: I have seen his 4 parcels of land. Parcel 1 (a *kalo* land) is at Paukii, an *ili* of Pauwela; Parcel 2 (a *kula* land) is in the *ili* of Waiakaama, at Haiku; Parcel 3 (a *kula* land) is at Koiliu in Apopo; Parcel 4 (a *kula* land) is in the *Ahupuaa* of Haiku.	—	—	—	4	*Kalo* *Kula*	MA 5:507

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Onaha (cont'd.) ***Helu 3304 B***	Pauwela & Haiku	5:457 & FT 8:79-80	Daniela li gave the first parcel to him. Parcels 2 and 3 were given to him by Ku. Parcel 4 was given to him by Moanoa in the time of Kamehameha I.						
Kanoa ***Helu 3304 C (5420 B)***	Haiku	5:457-458 & FT 8:80	Kealoha sworn: It is true, his claim was written out. Kapua sworn: I have seen his 2 parcels of land. Parcel 1 is at Auwaiakane; Parcel 2 is at Auhuhu. These are *ili* of Haiku. They are land inherited from his parents, in the time of Kamehameha I. Parcel 1 is a *kalo* and *kula* land. Parcel 2 is a *kula* land.	—	—	—	2	*Kalo* *Kula* *(Auwaiakane)*	MA 5:523 RP 3041 Book 16:639
Kanihoe (Kanihae) ***Helu 3304 D***	Pauwela	5:458 & FT 8:80-81	Haleole sworn: It is true, I wrote out his claim, and I know his five parcels of land. There are 3 parcels at Pauwahua. At Kalauani, there is 1 parcel; and at Kahuhine, there is 1 parcel. Kahaleohu gave them to him in 1830. Parcels 1, 2, 4, and 5 are *kalo* lands. Parcel 3 is a *Waake* patch.	—	—	—	5	*Kalo* *Kula* *Waake*	MA 5:529 RP 3329 Book 14:451
Kauahilahaole ***Helu 5497***	Peahi	5:460 & FT 8:82-83	Anakalea sworn: I have seen his land, 2 parcels in the *ili* of Koholomukea, in the *Ahupuaa* of Peahi. The lands are from his parents in the time of Kamehameha I. Parcel 1 is *kalo* land; Parcel 2 is a *kula* land.	—	—	—	2	*Kalo* *Kula*	MA 8:350 RP 2627 Book 12:105

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Hookano ***Helu 3905 BB***	Haiku	5:460 & FT 8:83	Nahinu sworn: I have seen his 2 parcels of land in the *ili* of Pohakuloa, at Haiku. These are a right from the time of Kamehameha I. Parcel 1 is a *kalo* land; Parcel 2 is a *lula* land.	—	—	—	2	*Kalo* *Kula*	MA 5:451 RP 2955 Book 13:393
Pohailele ***Helu 5514***	Peahi	5:460 & FT 8:83	Anakalea sworn: I have seen his parcel of land, in the *ili* of Kaukahikuakua at Peahi. It is an *Aina Loi* (taro pond field land), a right from the time of Kamehameha	—	1	—	—	*Loi (Kalo)*	MA 8:344 RP 7310 Book 27:199
Nanukuwaiki (Namakuaiki) ***Helu 5520***	Kaupakuhua	5:461 & FT 8:83-84	Kamaka sworn: I have seen his 4 parcels of land. Parcel 1 is at Paaiki; Parcel 2 is at Wailupu; Parcel 3 is at Kaluaiaea; Parcel 4 is at Kahaku (bounded by Creek of Kaupakuhua on Koolau side). These lands are a right from the time of Kamehameha I. The first 3 parcels are *kalo* lands; the fourth parcel is a *lu'lo* land.	—	—	—	4	*Kalo* *Kula* Creek	N/A
Hoomaikai ***Helu 5393***	Halehaku	5:461 & FT 8:84	Niho sworn: I have seen her parcel of land in the *ili* of Pohakuloa, *Ahupuaa* of Halehaku. It is an old land; he got it from his wife, who got it from her first husband, in the time of Kamehameha II.	—	—	—	—	—	MA 8:318 RP 3158 Book 14:109
Keonepahu (Keonekapu) ***Helu 3905 G***	Peahi	5:461 & FT 8:84	Niho sworn: I have seen his 2 parcels of land in the *ili* of Waiau (Puolokapu), at Peahi. Kekahuna gave them to him in 1846. Parcels 1 and 2 are both *kalo* and *kula* lands.	—	—	—	2	*Kalo* *Kula*	N/A

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Opiopio (Piopio) ***Helu 3905 K***	Halehaku	5:462 & FT 8:85	Keonepahu sworn: I have seen his parcel of land in the *ili* of Keomohale, at Halehaku. It is a *kalo* and *kula* land. It is a right from the time of Kamehameha I. There are also 2 *Poalima* parcels within it.	—	—	—	1	*Kalo* *Kula* *Poalima* (2)	MA 8:326 RP 6230 Book 23:627
Kuhaohao ***Helu 3905 I***	Halehaku	5:462 & FT 8:85	Keonepahu sworn: I have seen his land in the *ili* of Kahoi, at Halehaku. It is an old land, from the time of Kamehameha I. It is a *kalo* and *kula* land.	—	—	—	1	*Kalo* *Kula*	N/A
Hanauapuaa ***Helu 4134***	Kuiaha	5:462-463 & FT 8:85-86	Kapihe sworn: I have seen his 7 parcels of land. There are 3 parcels in the *ili* of Ululoloa; 1 parcel is in the *ili* of Ohia at Kuiaha 2; 2 parcels in the *ili* of Poeleele; 1 parcel at Pohalaoiele and Kahelo, in Kuiaha 1. These lands are an inheritance from his parents in the time of Kamehameha. Parcels 1 to 6 are *kalo* land; parcel 7 is a *kula* land… No. 1 is bounded by Creek of Kuiaha on Koolau…	—	—	—	7	*Kalo* *Kula* Creek	MA 4:244 RP 6077 Book 23:319
Kapahau ***Helu 6405***	Kuiaha	5:463 & FT 8:86	Kapihe sworn: I have seen his 2 parcels of land. 1 parcel is in the *ili* of Poeleele, the other parcel is in the *ili* of Kahaloa, at Kuiaha. Puhihale gave these lands to him in the time of Kamehameha I. Parcel 1 is *kalo* land; Parcel 2 is *kula* land.	—	—	—	2	*Kalo* *Kula*	MA 8:344 RP 2192 Book 9:425

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kekahuna ***Helu 4138***	Kuiaiha	5:463 & FT 8:86-87	Keonepuhu sworn: I have seen his 5 parcels of land. There are parcels at Kapili, Poeleele, Kikoiaiua, and Kuikuiua, in Kuiaiha. It is old land from his grandparents, in the time of Kamehameha I. Parcels 1, 2, 3, and 5 are *kalo* land; Parcel 4 is a *kula* land.	—	—	—	5	*Kalo* *Kula*	MA 8:385 RP 2170 Book 9:341
Kaai (w) ***Helu 4133***	Kuiaiha	5:464 & FT 8: 87	Keaka sworn: I have seen her 4 parcels of land. Parcel 1 is at Kaheho; 2 is at Poeleele; 3 is at Kapili; and 4 is at Aao; they are in the *Ahupuaa* of Kuiaiha. She got them from Puhihale in the time of Kamehameha I. Parcels 1, 2 & 3 are *kalo* land; Parcel 4 is a *kula* land.	—	—	—	4	*Kalo* *Kula*	MA 8:412 RP 2200 Book 9:457
Kahale (w) ***Helu 4136***	Kuiaiha	5:464-465 & FT 8:87-88	Kapihe sworn: I have seen her 7 parcels of land. Parcels 1 and 2 are at Ulukiloa; Parcel 3 is at Kapili; Parcel 4 is at Poeleele; Parcel 5 is at Kawela; Parcel 6 is at Pohakaiole; and Parcel 7 is at Kaheho. These are an inheritance from her grandparents, in the time of Kamehameha I. Parcels 1, 2, 3, 4 & 5 are *kalo* lands; parcels 6 & 7 are *kula* lands.	—	—	—	7	*Kalo* *Kula*	MA 8:419 RP 2198 Book 9:449

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kealawaia (Kealawela) ***Helu 5393 B*** (see also *Helu* 5393)	Kuiaha	5:465 & FT 8:88	Kapihe sworn: I have seen his 3 parcels of land. 2 parcels are at Opihi; 1 parcel is at Kanaloa; they are in the *Ahupuaa* of Kuiaha. He got the lands from Kuaaila in 1845, but they are old lands from the time of Kamehameha I. Parcel 1 is *kalo* land; parcels 2 & 3 are *kula* lands.	—	—	—	3	*Kalo* *Kula*	MA 8:336 RP 2191 Book 9:421
Kuaana ***Helu 6482***	Kuiaha	5:465 & FT 8:88-89	Kamaka sworn: I have seen his 4 parcels of land. Parcel 1 is at Kaihe; 2 parcels are at Kahaloa; and 1 parcel is at Opihi, in Kuiaha 1; Hoikalau gave these lands to him in 1828. Parcels 1 & 2 are *kalo* lands; Parcels 3 & 4 are *kula* lands.	—	—	—	4	*Kalo* *Kula*	MA 8:340 RP 2189 Book 9:413
Kukiiahu ***Helu 4959***	Haiku	5:465-466 & FT 8:89	Nahinu sworn: I have seen his 3 parcels of land. 1 parcel is at Palau; 1 parcel is at Akuabewa; and 1 parcel is at Maunaoui, in the *Ahupuaa* of Haiku. It is an old land from the time of Kamehameha I, and given to him by Kaiunui in 1848. Parcels 1 and 2 are *kula* lands; Parcel 3 is 4 *loi*. …No. 2 is bounded: *Mauka*, *Pali* of Haiku; Koolau, *Pali* of Haiku; *Makai*, by the same; Wailuku, by the Creek of Maliko… (Vol. 8:89)	—	4	—	4	*Loi (Kalo)* *Kula*	N/A

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Ua ***Helu 9795 G*** (& ***4959 B***)	Kuiaha	5:466 & FT 8:89-90	Kapihe sworn: I know, and it is true that the claim was written out. I have seen 3 parcels of land which belong to him. 1 parcel is at Kahaleula; 1 parcel is at Kupoumoa and Manaluhi; and 1 parcel is at Ohia, in the *Ahupuaa* of Kuiaha. It is an old land from his grandparents, in the time of Kamehameha I. The 3 parcels are *kalo* land.	—	—	—	3	*Kalo*	MA 5:509 RP 2169 Book 9:337
Nawaiki ***Helu 5361*** (see also *Helu* 4794)	Papuaea	5:466 & FT 8:90	Kahaule sworn: I have seen his *kalo* land at Papuaea *Ahupuaa*, Kapeleaumoku gave it to him in 1825. *Mauka*, Government Land; Koolau, the *Pali* of Maikaiwa; *Makai*, the *Pali* of Papuaea; Wailuku, the *Kahawai* of Puehu.	—	—	—	1	*Kalo* *Kahawai*	MA 3:611
Kahaule ***Helu 5361 B*** & ***4919***	Papuaea (& Pulehu, Kula)	5:467 & FT 8:90-91	It was sworn and stated that the claim was written out by Kekahuna. Kekahuna sworn: I have seen his 4 parcels of land. 1 parcel is at Papalimahoa, Mukaiwa, Hualele, in Papuaea (bounded *makai* by the shore); Parcel 2 is a *kalo* land at Kahiamoi (bounded *makai* by the shore); Parcel 3 is at Paki, a *kalo* (bounded *makai* and Wailuku by the *Kahawai o Keawakomoo*). These 3 parcels are at Papuaea. This is an old land right from his parents, in the time of Kamehameha I. Parcel 4 is a *Kihapai Uala Kahiki* in the *Ahupuaa* of Pulehu, at Kula.	—	—	—	4	*Kalo* *Kalo* *Kahawai* (*Uala kahiki*)	MA 5:489 RP 83:36 Book 36:45

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kekahuna ***Helu 4965***	Papuaea	5:467 & FT 8:91	Kahaule sworn: It is true that it was written out and I know he is telling the truth. 1 parcel at Aweuweu, Puua and Paehala, several *ili* in the *Ahupuaa* of Papuaea. It is the land right from his grandparents in the time of Kamehameha I. Aweuweu was from Kamehameha I; Puua is from 1832; and Paehala was gotten in 1829. Above is Puu o Kalainapaepae; Koolau is my land; *Makai* is my land and the seashore; Wailuku is Kaalae and my land.	—	—	—	1	—	MA 7:112 RP 7231 Book 26:785

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Hilea ***Helu 5215***	Kuiaha, Kaupakuhua & Haiku	5:469-470 & FT 8:93	Piele sworn: I have seen his 4 parcels of land. Parcel 1 is at Namanu, an *ili* at Kuiaha; Parcel 2 is in the *ili* of Kalapaiha; Parcel 3 is at Kaiwaa, an *ili* at Kaupakuhua; Parcel 4 is in the *ili* of Auhuhu at Haiku. Parcels 1, 2 and 3 were gotten from his parents in the time of Kamehameha I. Parcel 4 was gotten from Kaulunuala in 1837. The 4 parcels are *kalo* lands. There are two *Poalima*.	—	—	—	4	*Kalo* *Poalima* (2)	MA 8:429 RP 2172 Book 9:349
Kekahuna ***Helu 5421, (4942) 4142 & 4945***	(Paia &) Haiku	5:470 & FT 8:93-94	Kiha sworn: …Parcel 2 is *kalo* land in the *ili* of Kapuna at Haiku…Kaonohimaka gave him parcel 2 in 1846… parcel 2 is *kalo* land.	—	—	—	1	*Kalo*	MA 8:733 & 7:174 MA 7:52 RP 2342 Book 10:349
Pia ***Helu 10650*** (see also *Helu* 5452)	Honopou	5:471-472 & FT 8: 94	Kaleo sworn: I have seen his 5 parcels of land. 2 parcels are at Kaule; Parcel 3 is at Uhikua; Parcel 4 is at Paniaiwa; Parcel 5 is at Kawaipapa, in Honopou. Parcel 1 is *kalo* land; parcels 2 to 5 are *kalo* and *uala* lands. There is a *Poalima* in Parcel 2. …No. 3. *Kalo Uala*. Bounded: *Mauka*, my land; Koolau, *Alanui pii* (road leading to the mountains); *Makai*, *Pali* of Honopou; Wailuku, *Kahawai* of Honopou… No. 5. is bounded: *Mauka*, Lupe's land; Koolau, Government Land; *Makai*, by the same; Wailuku, *Kahawai* of Honopou.	—	—	—	5	*Kalo* *Uala* *Poalima* (1) *Alanui pii* *Kahawai*	MA 8:303 RP 3236 Book 14:265

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kuapuu ***Helu 5016***	Kuiaha	5:472 & FT 8:96	Kapihe sworn: I have seen his 3 parcels of land. Parcel 1 is at Pohakaiole; Parcel 2 is at Kaheho (the Wailuku boundary is *Kahawai o Kaiaha*); Parcel 3 is at Aao, in the *Ahupuaa* of Kuiaha 1. These parcels are *kalo* and *kula* lands. Pahihale gave these to him in the time of Kamehameha II.	—	—	—	3	*Kalo* *Kula* *Kahawai*	MA 8:319 RP 2193 Book 9:429
Kahoohanohano ***Helu 4131***	Kuiaha	5:473 & FT 8:96	Kukao sworn: I have seen his parcel of land, there is *kalo* and *kula wala*, in the *ili* of Kawailoa, at Kuiaha 1. Hoikapua gave it to him in 1836.	—	—	—	1	*Kalo* *Kula* *Uala*	MA 8:301 RP 2190 Book 9:417
Kanehoalani ***Helu 5193*** & ***5123***	Kaupakuhua	5:473 & FT 8:97	Kilkii sworn: I have seen his 3 parcels of land. Parcel 1 is at Maumaa; Parcel 2 is at Uhakaa; Parcel 3 is at Poaiwa, in the *Ahupuaa* of Kaupakuhua. It is a land right from his grandparents in the time of Kamehameha I. Parcels 1 and 2 are *kalo* and *wala* lands; Parcel 3 is a *kula* land.	—	—	—	3	*Kalo* *Kula* *Uala*	MA 8:384 RP 2188 Book 9:409
Piko ***Helu 5123 B***	Kaupakuhua	5:473-474 & FT 8:97	Nahinu sworn: I have seen his 3 parcels of land in the *ili* of Wailapa, at Kaupakuhua. It is a land right from his parents in the time of Kamehameha I. Parcels 1 and 2 are *kalo* land; Parcel 3 is *kula* land.	—	—	—	3	*Kalo* *Kula*	MA. 5:512 RP 40:66 Book 17:129

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kulahola ***Helu 5492***	(Kaopa &) Haiku	5:474-475 & FT 8:98	Napua sworn: I have seen his 2 parcels of land. Parcel 1 is at Opelepeleha, Kamana, Haula, Kaupakuole, in the *Ahupuaa* of Kaopa; Parcel 2 is at Kaluanui in Haiku 2. The first parcel was from his grandparents in the time of Kamehameha I; Parcel 2 was given by Waimaka in 1842. Parcel 1 is *kula* land. Parcel 2 is *kalo* land, there are six *loi*.	—	6	—	2	*Loi* *Kalo*	MA 5:449 RP 2211 ½ Book 9:505
Kuha ***Helu 4753*** (& ***4753 B***)	Opana	5:475 & FT 8:98	Hoomaikai sworn: I have seen his parcel of land. It is a *kalo* and *kula* land in the *ili* of Kumukukui, in the *Ahupuaa* of Opana. Ehu gave it to him in 1840. *Mauka*, Mahoe; Koolau, the *Kahawai* of Opana; *Makai*, the *Ahupuaa* of Peahi; Wailuku, Uhumaha *Ahupuaa*.	—	—	—	1	*Kalo* *Kula*	MA 5:442
Kamaka ***Helu 5511***	Keaalii	5:476 & FT 8:98	Kaumaiakawakea sworn: I have seen his land in the *ili* of Kahuaoaa, in Keaalii *Ahupuaa*. Mamala gave it to him in 1834.	—	—	—	1	—	MA 8:300 RP 2912 Book 13:287
Kaumakaiawakea ***Helu 5498***	Uaoa	5:476 & 8:100	Kawaihuha sworn: I have seen his parcel of land at Miailoa, Kahaoi, Kahauiki, in the *Ahupuaa* of Uaoa. Auwae gave it to him in the time of Kamehameha I.	—	—	—	1	—	MA 8:319 RP 5963 Book 23:91

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kanui ***Helu 5507***	Uaoa & Pauwela	5:476 & FT 8:100	Kuahuikala sworn: I have seen his parcel of land in the *ili* of Kahope, at Uaoa *Ahupuaa*. It is a *kalo* land. Nahuaiohu gave it to him in the time of Kamehameha. Puele sworn: I have seen his 1 parcel of land in the *ili* of Kanaele, Pauwela *Ahupuaa*. Daniela Ii gave it to him in 1847; there is 1 *Poalima* in it. It is a *kalo* land.	—	—	—	2	*Kalo* *Kula* *Poalima* (1)	MA 8:302 RP 3343 Book 14:479
Kalulo ***Helu 4673 B***	Uaoa	5:476-477 & FT 8:100	Nohunohu sworn: I have seen his parcel of land at Kaloopua in the *Ahupuaa* of Uaoa. It is *kalo* and *kula* land, which I gave to him in the time of Kamehameha I. There are also 2 *Poalima* within it.	—	—	—	1	*Kalo* *Kula* *Poalima* (2)	MA 8:420 RP 4058 Book 17:113
Kuahuikala ***Helu 4594 B*** (see also *Helu* 5494)	Uaoa	5:477 & FT 8:101	Kanui sworn: I have seen his land at Nonoia in the *Ahupuaa* of Uaoa, it is a *kalo* land. Nohunohu gave it to him during the time of Kamehameha II. There is one *Poalima*.	—	—	—	1	*Kalo* *Poalima* (1)	MA 8:403 RP 8500 Book 37:no # (issued in 1951)

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kalino ***Helu 5453 C***	Haiku	5:477 & FT 8:101	Kane sworn: I have seen his parcel of land in the *ili* of Kahaapuaa at Haiku 1. Kaonohimaka gave it to him in 1836, it is a *kalo* land. There is one *Poalima* in it.	—	—	—	1	*Kalo* *Poalima* (1)	N/A
Puele ***Helu 5453 D***	Haiku	5:477-478 & FT 8:101	Kaili sworn: I have seen his 4 parcels of land. Parcel 1 is at Kuliu; Parcel 2 is at Kuliu; Parcel 3 is at Kuliu; Parcel 4 is at Kuliu, in the *Ahupuaa* of Haiku. These are all *kula* lands given to him by my parents in the time of Kamehameha I.	—	—	—	4	*Kula*	MA 3:445 RP 7205 Book 26:759
Kalawaia ***Helu 5520 B***	Kuiaha & Kaupakuhua	5:478 & FT 8:102	Kealoha sworn: I have seen his 5 parcels of land. Parcel 1 is at Kalauipuki; Parcel 2 is at Kahaleula, in the *Ahupuaa* of Kuiaha; Parcel 3 is at Kapuaiki; Parcel 4 is at Pohoiki; Parcel 5 is at Waikalia, in the *Ahupuaa* of Kaupakuhua. It is a land inherited from his parents in the time of Kamehameha. Parcels 1 to 4 are *kalo* lands (Parcel 2 is bounded by the *Kahawai* of Kuiaha on the Koolau side); there is a *Poalima* in Lot 4. Parcel 5 is a *kula* land, the *Kahawai* of Kaupakuhua bounds it on the Koolau side.	—	—	—	5	*Kalo* *Kula* *Kahawai* *Poalima* (1)	MA 8:339 RP 2199 Book 9:453

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kaualeleiki ***Helu 5118***	Papaaea Hanawana Haiku	5:478-479 & FT 8:102-103	Kauiki sworn: I have seen his 6 parcels of land. Parcel 1 is at Papaaea; Parcels 2 and 3 are at Hanawana; Parcel 4 is at Kahaopii in Hanawana; Parcel 5 is at Auwaiokane in Haiku 2; Parcel 6 is at Kiihau in Haiku. Parcels 1 and 2 were given to him by Kekauonohi in the time of Kamehameha II, in 1823. Parcels 3 and 4 were given to him by Inoino in 1844; Parcel 5 was given by Kanoa in 1846; and Parcel 6 was given by Paiwa in 1845. Parcels 1, 2, 3 & 5 are *kalo* lands; and parcels 4 & 6 are *kula* lands. Parcel 1. Wailuku boundary is *Kahawai* of Puuomaile. Parcel 2. Koolau boundary is *Kahawai* of Naiiliihaele. Parcel 4. Wailuku boundary is *Kahawai* of Hanawana.	—	—	—	6	*Kalo* *Kula* *Kahawai*	MA 8:383 RP 6650 Book 24:673
Kauhihoewaa ***Helu 5119*** (see also *Helu* 5392 D	Hanawana	5:479-480 & FT 8:103	Kauiki sworn: I have seen his 2 parcels of land. Parcel 1 is in the *ili* of Alae at Hanawana 1. Parcel 2 is at Kapahi, in Hanawana 2. Parcel 1 and 2 are *kalo* and *kula* lands. 1. *Mauka*, Kauhua; Koolau & *Makai*, *Pali* of Alae; Wailuku, *Kahawai* of Hanawana. 2. *Mauka*, *Pali* of Hanawana; Koolau, *Kahawai* of Hanawana; *Makai* & Wailuku, *Pali* of Hanawana.	—	—	—	2	*Kalo* *Kula* *Kahawai*	MA 3:451 RP 2166 Book 9:325

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kawaa ***Helu 3714 B*** (& ***5119 B***)	Haiku & Kaupakuhua	5:480 & FT 8:103-104	Kauiki and Kopa sworn: We have seen his 4 parcels of land. Parcel 1 is at Paukii; Parcel 2 is at Kalaimuhua; Parcel 3 is at Waiki, in the *Ahupuaa* of Haiku; Parcel 4 is at Kalaeokini, in the *Ahupuaa* of Kaupakuhua 1. There are 2 *Poalima*. Parcel 1. *Kula* land; *Kahawai* of Haiku is the Koolau boundary. Parcel 2. *Kalo* land. Parcel 3. *Kalo* land. Parcel 4. *Kalo* land.	—	—	—	4	*Kalo* *Kalo* *Kahawai* *Poalima* (2)	MA 3:472 RP 2437 Book 11:39
Kaaluea ***Helu 5459 D*** ***or*** Kaalue ***Helu 5459 D***	Papaaea Hanehoi	7:7 & FT 8:126 or 5:481	Kalama sworn: I have seen his land, a *kalo* and *kula* parcel at Waikawiwi, in Papaaea *Ahupuaa*. Ioane Ii gave it to him in 1841. Kanakaokui sworn: I have seen his parcel of *kalo kula* land in the *ili* of Opuolilo, in the *Ahupuaa* of Hanehoi. Kaiewe gave it to him in 1844… The *Kahawai* of Huelo is on the Wailuku boundary. [Note: Kaalaea(a)'s original NR claim (5459 D) was for Papaaea. The above Testimony (5:481) is exactly the same as that made for Kaaeae (also written Nuaeae) in *Helu* 5459H/5459 (see NT 8:104). The error in recordation began during the Commission's proceedings.]	—	—	—	1	*Kalo* *Kula* See also 54 59 (H); page 236	MA 3:445 RP 7205 Book 26:759

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Keahi ***Helu 5459 Y***	Puohua	5:481 & FT 8:104	Kailiwale sworn: I have seen his parcel of land at Puulahukole, in the *Ahupuaa* of Puohua. It is a *kalo* and *kula* land, gotten from Kaiewe in 1844… The boundary on the Wailuku side is the *Kahawai* of Puohua.	—	—	—	1	*Kalo* *Kula* *Kahawai*	MA 3:449 RP 7054 Book 26:523
Kauahi ***Helu 5423***	Peahi	5:481 & FT 8:104 -105	Poohina sworn: I have seen his 2 parcels of land. Parcel 1 is at Hakiohe; Parcel 2, a *kohanahale* (house) in the *ili* of Pohakuhaku, *Ahupuaa* of Peahi. There is 1 *Poalima* in his land.	1	—	—	2	*Kahua hale* *Poalima* (1)	MA 8:323 RP 4067 Book 17:131
Palea ***Helu 5451***	Honopou	5:481-482 & 8:105	Kaawa sworn: I have seen his 4 parcels of land. Parcel 1 is at Uluku; Parcel 2 is at Kahauiki; Parcel 3 is at Kahaikanuka; Parcel 4 is at Ouku, all of these parcels are in the *Ahupuaa* of Honopou. They are old lands, from the time of Kamehameha I. There is a *Poalima* in Parcel 2. Parcel 1. *Kalo* land; *Kahawai* of Honopou bounds it on the Wailuku side. Parcel 2. *Kalo* land. Parcel 3.*Kalo* land; an *Alanui pii a iho* (*mauka-makai* trail) bounds it on the Koolau side. Parcel 4. *Kula* land; *Kahawai* of Honopou bounds it on the Koolau side.	—	—	—	4	*Kalo* *Kula* *Poalima* (1) *Kahawai* *Ala pii a iho*	N/A

Claimant & Helu	Ahupua'a	Testi-mony Book & Page	Summary of Claim Documentation	Hale	Lo'i Kalo	Auwai	Kihapai Kula Mahiai Mahina Mala Moo Opu Pa	Crops, Activities and Resources Identified	Disposition N/A=Not Awarded Mahele Award Book & Royal Patent
Kauhi **Helu 5392 I**	Honokala & Holawa	5:482 & FT 8:105 -106	Kahanaua sworn: I have seen his 2 parcels of land. Parcel 1 (a *kalo* land) is in the *ili* of Kaluanui, in the *Ahupuaa* of Honokala (inherited from his parents). Parcel 2 is a *kula* land in the *Ahupuaa* of Holawa… There is a *Poalima* in Parcel 1…	—	—	—	2	*Kalo* *Kula* *Poalima* (1)	MA 8:329
Moi **Helu 5459**	Hanehoi, Huelo & Waipio	5:482-483 & FT 8:106 -107	Paukei sworn: I have seen his 3 parcels of land. Parcel 1 is at Kaluaohia in Hanehoi; Parcel 2 is at Kahuku in Huelo; Parcel 3 is at Makaku in Waipio. They are 3 *kalo* lands.	—	—	—	3	*Kalo*	MA 3:451 RP 6894 Book 26:241
Paukei **Helu 5459 C**	Huelo & Hanehoi	5:483 & FT 8:107	Moi sworn: I have seen his 3 parcels of land. Parcel 1, *kalo* land at Pohakoele, in Huelo; Parcel 2, *kalo* land at Opuoloolo, in Hanehoi; Parcel 3, *kalo* land at Punawai, in Huelo… Parcel 1. A *Kahawai* bounds it on the Koolau side… Parcel 2. *Kahawai* of Huelo bounds it on the Wailuku side…	—	—	—	3	*Kalo* *Kula* *Kahawai*	N/A
Papaiakea **Helu 5459 B**	Puolua, Huelo & Waipio	5:483-484 & FT 8:107	Lalahili sworn: I have seen his 3 parcels of land. Parcel 1 is *kalo* land at Kuaikawakawa, in Puolua; Parcel 2 is *kalo* land at Kahaloa, in Huelo; Parcel 3 is *kalo* and *kula* land at Waipio (bounded by *Kahawai* of Puolua on the Koolau side).	—	—	—	3	*Kalo* *Kula* *Kahawai*	MA 3:445 RP 7214 Book 26:773

Claimant & Helu	Ahupua'a	Testi-mony Book & Page	Summary of Claim Documentation	Hale	Lo'i Kalo	Auwai	Kihapai Kula Mahiai Mahina Mala Moo Opu Pa	Crops, Activities and Resources Identified	Disposition N/A=Not Awarded Mahele Award Book & Royal Patent
Olomele **Helu 5459 N**	Hanehoi	5:484 & FT 8:109	Kuluwaimakalani sworn: I have seen his parcel of land, it is a *kalo* and *kula* land in the *ili* of Pohakaiole, in the *Ahupuaa* of Hanehoi. Laikini gave it to him in 1830. There is a *Poalima*.	—	—	—	1	*Kalo* *Kula* *Poalima* (1)	MA 3:447 RP 8113 Book 35:77
Hewahewa **Helu 5459 O**	Honopou	5:484 & FT 8:110	Puuheana sworn: I have seen his 2 parcels of land. Parcel 1 is a *kalo* land in the *ili* of Papuaa, at Honopou. There are 2 people with *Kuleana* in these parcels, Hewahewa and Puuheana. Also in the *ili* of Papohaku at Honopou… Parcel 1and 2 are bounded by *Kahawai* of Honopou on the Wailuku side…	—	—	—	2	*Kalo* *Kahawai*	MA 8:617 RP 3333 Book 14:459
Kaahaiea **Helu 5459 F**	Puolua, Huelo, Holawa & Waipio	5:485 & FT 8:108	Papaiakea sworn: I have seen his 4 parcels of land. Parcel 1 is *kalo* land in the *ili* of Palau, at Huelo; Parcel 2, a *kalo* land is in the *ili* of Ohia at Puolua; Parcel 3, is an *Opu Olona* at Holawa; Parcel 4, is an *Opu Olona* and *kula* land at Waipio. There is a *Poalima* in No. 1… Parcel 1 was given to him by Mahoe in 1819…	—	—	—	4	*Kalo* *Olona* *Poalima* (1)	MA 8:317 RP 5934 Book 23:33
Kuluwaimakalani **Helu 5459 E**	Huelo & Hanehoi	5:485 & FT 8:108	Papaiakea sworn: I have seen his 2 parcels of land. Parcel 1, is *kalo* land at Kaanakauke, in Huelo; Parcel 2, is a *kula* land at Hanehoi. There is a *Poalima* in No. 1.	—	—	—	2	*Kalo* *Kula* *Poalima* (1)	MA 7:52 RP 5162 20:551

Claimant & Helu	Ahupua'a	Testi-mony Book & Page	Summary of Claim Documentaion	Hale	Lo'i Kalo	Auwai	Kihapai Kula Mahiai Mahina Mala Moo Opu Pa	Crops, Activities and Resources Identified	Disposition N/A=Not Awarded Mahele Award Book & Royal Patent
Poohina **Helu 5459 I**	Honokala & Holawa	5:486 & FT 8:108 - 109	Kolea sworn: I have seen his 2 parcels of land. Parcel 1, is *kalo* land in the *ili* of Ohia, at Honokala; Parcel 2, is *kalo* land in the *ili* of Opae at Holawa. There are 2 *Poalima* in No. 1.	—	—	—	2	*Kalo* *Poalima* (2)	MA 8:330 RP 6576 Book 24:252
Kamanu **Helu 5459 K**	Waipio, Holawa & Mokupapa	5:486 & FT 8:109	Papaiakea sworn: I have seen his 4 parcels of land. Parcel 1, is a *kalo* land in the *ili* of Pohakuloa, *Ahupuaa* of Waipio; Parcel 2, is a *kalo* land at Waipio (bounded *Makai* by *Ala Aupuni*); Parcel 3, is a *kalo* land in the *ili* of Kahikiloa, at Holawa; Parcel 4, is a *kula* land at Mokupapa. Parcel 1 was given by Kaulupa in 1830; Parcel 2 was gotten in 1847; Kealoha gave him Parcel 3 in 1819; Holokaiwa gave him Parcel 4 in 1819… There is a *Poalima* in No. 1. No. 2. is bounded *Mauka*, Kawaha's land; Koolau, seashore; *Makai*, by the same; Wailuku, *Kahawai* of Mokupapa.	—	—	—	4	*Kalo* *Kula* *Poalima* (1) *Kahawai*	MA 8:359 RP 3355 Book 14:503 & MA 8:359 RP 5425 Book 21:505
Pahia **Helu 5459 R**	Huelo	5:487 & FT 8:110	Kuluwaimakalani sworn: I have seen his 2 parcels of land. Parcel 1. *Kalo* land in the *ili* of Pulehu, at Huelo. Parcel 2. *Kalo* land in the *ili* of Kahuku, at Huelo. Mahoe gave these lands in 1823… There is a *Poalima* in No. 1.	—	—	—	2	*Kalo* *Poalima* (1)	MA 7:46 RP 4071 Book 17:139

Claimant & Helu	Ahupua'a	Testi-mony Book & Page	Summary of Claim Documentation	Hale	Lo'i Kalo	Auwai	Kihapai Kula Mahiai Mahina Mala Moo Opu Pa	Crops, Activities and Resources Identified	Disposition N/A=Not Awarded Mahele Award Book & Royal Patent
Naoo **Helu 5459 S**	Huelo & Honokala	5:487 & FT 8:110	Kuluwaimakalani sworn: I have seen his 2 parcels of land. There is a *Poalima* in No. 1. Parcel 1. *Kalo* land in the *ili* of Halalii, at Huelo *Ahupuaa*. Parcel 2. An *Opu Olona* at Honokala *Ahupuaa*. Mahoe gave him parcel 1 in 1823; Kawaha gave parcel 2 in the year 1847.	—	—	—	2	*Kalo* *Olona* *Poalima* (1)	MA 7:48 RP 2799 Book 13:59
Lalahili **Helu 5459 T**	Puolua, Holawa & Waipio	5:487-488 & FT 8:110 -111	Papaiakea sworn: I have seen his 3 parcels of land. Parcel 1. *Kalo* land in the *ili* of Kawahapulua, at Puolua. Parcel 2. *Kula* land at Holawa. Parcel 3. A *Pahale* (house) at Waipio. There is a *Poalima* in No. 1.	1	—	—	2	*Kalo* *Kula* *Pahale* *Poalima* (1)	MA 7:48 RP 6937 Book 26:321
Kepio **Helu 5459 U**	Waipio	5:488 & FT 8:111	Papaiakea sworn: I have seen his parcel of land, it is a *kalo* and *kula* parcel in the *ili* of Makaku, Waipio. Kaulupa gave it to him in 1819. There are 3 *Poalima* within it.	—	—	—	1	*Kalo* *Kula* *Poalima* (3)	MA 3:448 RP 6262 Book 23:691
Kaliki **Helu 5459 V**	Honopou	5:488 & FT 8:111	Kolea sworn: I have seen his parcel of land, it is a *kalo* and *kula* land in the *ili* of Kuamoohua, Honopou. It is an old land given to him by Ku in the time of Kamehameha I. There are 2 *Poalima* within it.	—	—	—	1	*Kalo* *Kula* *Poalima* (2)	MA 8:356 RP 7056 Book 26:525

Claimant & Helu	Ahupua'a	Testi-mony Book & Page	Summary of Claim Documentation	Hale	Lo'i Kalo	Auwai	Kihapai Kula Mahiai Mahina Mala Moo Opu Pa	Crops, Activities and Resources Identified	Disposition N/A=Not Awarded Mahele Award Book & Royal Patent
Paaluhi **Helu 5459 W**	Halehaku	5:488-489 & FT 8:111 -112	Kahoakaku sworn: I have seen his 2 parcels of land. Parcel 1 is a *kalo* land at Pohakuloa; Parcel 2 is a *kalo* land at Papalua. These are *ili* of Halehaku, gotten in the time of Kamehameha I. There is one *Poalima* each, in Parcels 1 and 2.	—	—	—	2	*Kalo* *Poalima* (2)	MA 8:402 RP 7068 Book 26:547
Imihia **Helu 5459 X**	Honopou	5:489 & FT 8:104	Nakaikuaana sworn: I have seen his 4 parcels of land. Parcel 1, a *kalo* and *uala* land at Puniawa; Parcel 2, a *kalo* and *uala* land at Kaulukanu; Parcel 3, a *kalo* and *uala* land at Papamuku; Parcel 4, a *kalo* and *uala* land at Halaula (bounded on the *Makai* side by the *Kahawai* of Honopou). These are all *ili* of Honopou… Parcels 3 & 4 were from the time of Kamehameha I in 1819… There are 2 *Poalima* in No. 1; one *Poalima* each in No. 1 and 2… …No. 4. is bounded: *Mauka*, my land; Koolau, *Pali* of Honopou; *Makai*, *Kahawai* of Honopou; Wailuku, *Pali* of Honopou.	—	—	—	4	*Kalo* *Uala* *Poalima* (4) *Kahawai*	MA 8:299 RP 3241 Book 14:275
Kawahine (Makapowahine) **Helu 5392 B**	Puolua & Waipio	5:489-490 & FT 8:112 - 113	Kolea sworn: I have seen his 2 parcels of land. Parcel 1 is a *kalo* land in the *ili* of Popolonui, at Puolua; Parcel 2 is a *kalo* land in the *ili* of Kahiwa, on the *kula* at Waipio.	—	—	—	2	*Kalo* *Kula*	MA 7:51 & MA 8:309 RP 2782 Book 13:23
Kamoenalauhulu **Helu 5392 (E)**	Waipio	5:490 & FT 8:113	Nika sworn: I have seen his parcel of *kalo* land in the *ili* of Alele, at Waipio. There is one *Poalima*.	—	—	—	1	*Kalo* *Poalima* (1)	N/A

Claimant & Helu	Ahupua'a	Testi-mony Book & Page	Summary of Claim Documentaion	Hale	Lo'i Kalo	Auwai	Kihapai Kula Mahiai Mahina Mala Moo Opu Pa	Crops, Activities and Resources Identified	Disposition N/A=Not Awarded Mahele Award Book & Royal Patent
Kawahine **Helu 5392 B**	Hanehoi	5:490 & 8:113	Kolea sworn: I have seen his 3 parcels of land. Parcel 1, *kalo* land at Kaiwa; Parcel 2, *kalo* land at Naukele; Parcel 3, *kalo* land at Olona. These are all *ili* in the *Ahupuaa* of Hanehoi. There is a *Poalima* in Parcel 1, and two *Poalima* in Parcel 2.	—	—	—	3	*Kalo* *Poalima* (3)	MA 7:51 & MA 8:309 RP 2782 Book 13:23
Kanakaokai **Helu 5392 G**	Huelo Puolua Hanehoi & Honokala	5:490-491 & 8:113-114	Moi sworn: I have seen his 5 parcels of land. Parcel 1 is *kalo* land in the *ili* of Pulehu, at Huelo; Parcel 2 is *kalo* land in the *ili* of Keopi, at Puolua; Parcel 3 is *kula* land at Luaohia; Parcel 4 is *Olona* at Hanehoi; Parcel 5 is *Olona* at Honokala… No. 3. is bounded: *Mauka*, Mua's land; Koolau, *Pali* of Hanehoi; on the other two sides, the *Kahawai* of Huelo…	—	—	—	5	*Kalo* *Olona* *Kahawai*	MA 8:308 RP6969 Book 26:379
Nika **Helu 5392 H**	Waipio	5:491 & FT 8:114	Kawaha sworn: I have seen his 4 parcels of land. Parcel 1, *kalo* land in the *ili* of Pahoa; Parcel 2, *kalo* land at Kaluaalaea; Parcel 3, *kalo* land at Pohoiki; Parcel 4, *kalo* land at Wailoa. These are all *ili* in the *Ahupuaa* of Waipio. Kaulupa gave all of these parcels to him in 1828. There is one *Poalima* in each parcel.	—	—	—	4	*Kalo* *Poalima* (4)	MA 7:47 RP 3328 Book 14:449

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Makahikipuni ***Helu 5392 K***	Honopou	5:492 & FT 8:115	Kaumakahano sworn: I have seen his *kalo* land in the *ili* of Kapapaanae, in the *Ahupuaa* of Honopou. Kapeleaumoku gave it to him in 1832. *Mauka*, the *Pali* of Honopou; Koolau, the *Kahawai* of Honopou; *Makai*, Imihia; Wailuku, *Ahupuaa* of Halehaku.	—	—	—	1	*Kalo* *Kahawai*	MA 8:323 RP 5421 Book 21:497
Kamohai ***Helu 5162***	Holawa	5:492 & FT 8:115	Kapahu sworn: I have seen his 6 parcels of land. Parcel 1. *Kalo* land at Hanaipuaa, in Holawa. Parcel 2. *Kalo* land at Kahauiki, in Holawa (*Kahawai* of Holawa bounds the Wailuku side). Parcel 3. *Kalo* land at Halelua, in Holawa. Parcel 4. *Kalo* land at Kahalcona, in Holawa; Parcel 5. *Kalo* land at Waikakulu, in Holawa. Parcel 6. *Kalo* land at Kahikiloa, in Holawa. There in a *Poalima* in Parcel 1; 2 *Poalima* in Parcel 2; and 2 *Poalima* in Parcel 3. . ...No. 2. is bounded: *Mauka*, Keoho's land; Koolau, Kaio's land; *Makai*, Naoopu's land; Wailuku, *Kahawai* of Holawa.	—	—	—	6	*Kalo* *Kula* *Poalima* (5) *Kahawai*	MA 8:307 RP 2779 Book 13:17

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kealoha ***Helu 4796***	Holawa, Honopou, Waipio & Honokala	5:493 & FT 8:116	Keoho sworn: I have seen his 4 parcels of land. Parcel 1. *Kalo* and *lala* land at Waikakulu, in Holawa. Parcel 2. *Kalo* and *lala* land at Puniawa, in Honopou. Parcel 3. *Kalo* and *lala* land at Iwi, in Waipio. Parcel 4. *Kalo* and *lala* land at Panahehi, in Honokala.	—	—	—	4	*Kalo* *Kula*	MA 8:298 RP 3245 Book 14:283
Kapahu ***Helu 4960***	Holawa, Honokala & Honopou	5:493-494 & FT 8:116 -117	Kamohai sworn: I have seen his 5 parcels. Parcel 1. *Kalo* and *lala* land at Kahikiloa, in Holawa. Parcel 2. *Kalo* and *lala* land at Halepohaku, in Holawa (*Kahawai* of Holawa is the Wailuku boundary). Parcel 3. *Kalo* and *lala* land at Kahauiki, in Holawa (*Kahawai* of Holawa is the Wailuku boundary). Parcel 4. *Kalo* and *lala* land at Kaohiuhu, in Honokala. Parcel 5. *Kalo* and *lala* land at Kawaipapa, in Honopou. There are 2 *Poalima* in parcel 1....	—	—	—	5	*Kalo* *Kula* *Poalima* (2)	MA 8:306 RP 2777 Book 13:13

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Hiilawe ***Helu 5516***	Holawa & Honopou	5:494 & FT 8:117	Kamohai sworn: I have seen his 2 parcels of land. Parcel 1, is *kalo* and *lala* land at Kalokoiki, in Holawa. I gave it to him in 1840. Parcel 2, is *kalo* and *kula* land in the *ili* of Kamania, at Honopou. Uhu gave it to him in 1841. There are 2 *Poalima* in parcel 1. 1. *Mauka*, Government Land; Koolau, Kaav; *Makai*, Kekuamana; Wailuku, *Kahawai* of Holawa. 2. *Mauka*, Kanewaa; Koolau, *Pali* of Honopou; *Makai*, Kipawale; Wailuku, *Pali* of Honopou.	—	—	—	2	*Kalo* *Kula* *Poalima* (2)	MA 8:332 RP 3237 Book 14:267
Mua ***Helu 5516 B***	Holawa	5:494 & FT 8:117	Keaikha sworn: I have seen his 2 parcels of land. They are *kalo* parcels in the *ili* of Kuahanahana, at Holawa. Mahiahina gave it to him in 1819.	—	—	—	2	*Kalo*	MA 8:333 RP 2815 Book 13:91
Kaio ***Helu 5516 C***	Holawa	5:495 & FT 8:117 -118	Kamohai sworn: I have seen his parcel of land, it is a *kalo* land at Halenoni, in Holawa. Kipia gave it to him in 1830. *Mauka*, Poohina; Koolau, *Pali* of Holawa; *Makai*, *Kahawai* of Holawa; Wailuku, Hiilawe.	—	—	—	1	*Kalo* *Kahawai*	MA 8:334 RP 7566 Book 28:229

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Naoopu (Oopu) ***Helu 5516 D***	Holawa	5:495 & FT 8:118	Kamohai sworn: I have seen his 4 parcels of land. Parcel 1, *kalo* land at Kauhamano; Parcel 2, *kalo* land, also there; Parcel 3 and Parcel 4, *kula* land at Kawaipapa. These are *ili* of Holawa, gotten in the time of Kamehameha I. 1. *Mauka*, Kipawale; Koolau, myself; *Makai*, Poohina; Wailuku, *Kahawai* of Holawa. 2. *Mauka*, Kipawale; Koolau, *Pali* of Holawa; *Makai*, Keaho; Wailuku, *Pali* of Holawa. 3. *Mauka*, Poohina; Koolau, *Pali* of Holawa; *Makai*, myself. Wailuku, *Kahawai* of Holawa. 4. *Mauka*, Mua; Koolau, *Pali* of Holawa; *Makai*, myself; Wailuku, *Kahawai* of Holawa.	—	—	—	4	*Kalo* *Kula* *Kahawai*	MA 8:335 RP 2780 Book 13:19
Poohina ***Helu 5516 E***	Holawa	5:495-496 & FT 8:118 -119	Kamohai sworn: I have seen his 2 parcels. They are *lala* lands in the *ili* of Kawaipapa, at Holawa. Mahiahina gave it to him in 1819. There are two *Poalima*. 1. *Mauka*, Naoopu; Koolau, *Pali* of Holawa; *Makai*, Hiilawe; Wailuku, *Kahawai* of Holawa. 2. *Mauka*, Poohina; Koolau, *Pali* of Holawa; *Makai*, Naoopu; Wailuku, *Kahawai* of Holawa.	—	—	—	2	*Kula* *Kahawai* *Poalima* (2)	N/A

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kepaa ***Helu 5495*** (also recorded as *Helu* 5595 E)	Honopou	5:496 & FT 8:119	Kaumakahano sworn: I have seen his 2 parcels of land. They are *kalo* and *kula* lands at Hunamanibo, in the *Ahupuaa* of Honopou. Gotten in the time of Kamehameha II. There are 2 *Poalima*. 1. *Mauka*, Kaina; Koolau and *Makai*, *Pali* of Honopou; Wailuku, a *Kahawai*. 2. *Mauka*, Government Land; Koolau, *Kahawai* of Honopou; *Makai* and Wailuku, Government Land.	—	—	—	2	*Kalo* *Kula* *Poalima* (2) *Kahawai*	MA 8:320 RP 3242 Book 14:277
Kulani ***Helu 5512***	Halehaku	5:496 & FT 8:119	Wiwi sworn: I have seen his 2 parcels of land; gotten in 1819. There is a *Poalima* in Parcel 1. Par. 1. *Kalo* and *kula* land at Papane, in Halehaku. Par. 2. *Kalo* and *kula* land at Kawailou, in Halehaku.	—	—	—	2	*Kalo* *Kula* *Poalima* (1)	MA 8:332 RP 5072 Book 20:371
Kanewaa ***Helu 5521 B***	Honopou	5:496 & FT 8:122	Nakaikuana sworn: I have seen his parcel of *kalo* and *kula* land at Halaula, Honopou. Ku gave it to him in the time of Kamehameha II.	—	—	—	1	*Kalo* *Kula*	MA 8:328
Kaaukai ***Helu 5506***	Halehaku	7:1 & FT 8:119 -120	Kauhi sworn: I have seen his land, 2 parcels. Parcel 1 is *kalo* land at Uhaloloa; Parcel 2 is *kalo* and *kula* land at Puniawa; these are *ili* of Halehaku. Kuauamoa gave them to him in the time of Kamehameha I. There is a *Poalima* in the first parcel.	—	—	—	2	*Kalo* *Kula* *Poalima* (1)	MA 8:325 RP 3239 Book 14:271

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Koleamoku ***Helu 6234***	Opana	7:1 & FT 8:120	Kamoana sworn: I have seen his land, 2 parcels. Parcel 1 is a *kula* land at Kahuhinopi; Parcel 2 is a *kula* land at Kapuna; these are *ili* of Opana *Ahupuaa*. Kauka Habatala (Jack Harbottle) gave them to him in the time of Kamehameha I. There is one *Poalima* in each of these parcels.	—	—	—	2	*Kula* *Poalima* (2)	MA 8:327
Napohaku ***Helu 5519 B***	Halehaku	7:1-2 & 8:120	Kaaukai sworn: I have seen his land, 2 parcels. Parcel 1 is *kalo* land at Kaholo; Parcel 2 is *kalo* land at Kapukaulaea; these are *ili* of Halehaku *Ahupuaa*. Kuauamoa gave them to him in the time of Kamehameha I. There is one *Poalima* in Parcel 2.	—	—	—	2	*Kalo* *Poalima* (1)	MA 8:322 RP 7085 Book 26:581
Mana ***Helu 5519 C***	Halehaku	7:2 & 8:120 -121	Wiwi sworn: I have seen his land, 2 parcels. Parcel 1 is *kalo* land at Papalua; Parcel 2 is *kalo* land at Puniawa; these are *ili* of Halehaku *Ahupuaa*. Kauauamoa gave them to him in the time of Kamehameha I. There are three *Poalima* in Parcel 1.	—	—	—	2	*Kalo* *Poalima* (3)	MA 8:331
Maiola ***Helu 4753***	Halehaku	7:2 & FT 8:121	Nahinu sworn: I have seen his land, 3 parcels. Parcel 1 is a *Pahale* at Halauololo; Parcel 2 is *kalo* land also there; Parcel 3 is an *Opu Olona* at Keoholiki; these are *ili* of Halehaku. Kuauamoa gave them to him in 1819.	1	—	—	2	*Pahale* *Kalo* *Olona*	MA 8:330

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Owili ***Helu 5522***	Hoalua & Puumaile	7:3 & FT 8:121	Kamuka sworn: I have seen his land, 2 parcels. Parcel 1 is a *kalo* and *kihapai* in Hoalua *Ahupuaa*. Parcel 2 is a *kalo* and *kihapai* in Puumaile *Ahupuaa*. Kealiiahonui gave them to him in 1843. 1. *Mauka*, Government land; Koolau, the *Pali* of Hanawana; *Makai*, the sea cliff; Wailuku, a *Kahawai*. 2. *Mauka*, Government land; Koolau, *Kahawai* of Puumaile; *Makai* and Wailuku, the *Pali* of Puumaile.	—	—	—	2	*Kalo* *Kihapai* *Kahawai*	MA 3:438 RP 6659 Book 24:691
Nakaikuaana ***Helu 5521***	Honopou	7:3 & FT 8:122	Imihia sworn: I have seen his land, 4 parcels. Parcel 1, *kalo* and *kula* land at Papamuku; Parcel 2, *kalo* and *kula* land at Kapahi; Parcel 3, *kalo* and *kula* land at Kamano; Parcel 4, *kalo* land at Kawaipapa. These are all *ili* of Honopou *Ahupuaa*. Ku gave them to him 1823. *Kahawai* of Holawa, bounds parcel 4 on the Koolau side.	—	—	—	4	*Kalo* *Kula* *Kahawai*	MA 8:375 RP 3233 Book 14:258
Kaopu ***Helu 5522 B***	Honopou	7:3-4 & FT 8:122 -123	Nakaikuaana sworn: I have seen his land, 2 parcels. Parcel 1 is *kalo* and *kula* land at Papamuku; Parcel 2 is *kalo* and *lalo* land at Halaula; these are *ili* of Honopou *Ahupuaa*. Ku gave them to him in 1823. There is one *Poalima* in Parcel 1.	—	—	—	2	*Kalo* *Kula* *Poalima* (1) *Kahawai*	MA 8:377 RP 3234 Book 14:261

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kaopu (cont'd.) ***Helu 5522 B***	Honopou	7:3-4 & FT 8:122 -123	1. *Mauka*, Ulus; Koolau, Government land; *Makai*, myself; Wailuku, a *Kahawai*. 2. *Mauka*, Ulus; Koolau, Government land; *Makai*, myself; Wailuku, Government land.						
Kalubiauhee ***Helu 5459 Q***	Huelo	7:4 & FT 8:123	Papaiakea sworn: I have seen his land, 2 parcels. Parcel 1 is a *kalo* land at Kawaihaokapuaa, in Huelo; Parcel 2 is a *kula kihapai* at Hanehoi. They are an inheritance from his parents, in the time of Kamehameha I. There is one *Poalima* in Parcel 1.	—	—	—	2	*Kalo* *Kula kihapai* *Poalima* (1)	MA 7:51 RP 5946 Book 23:57

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Keoho ***Helu 8584***	Holawa & Waipio	7:4-5 & FT 8:123 -124	Kealoha sworn: I have seen his land, 6 parcels. Par. 1. *Kalo* and *kula* land in the *ili* of Kahauiki, Holawa. Par. 2. *Kalo* and *kula* land in the *ili* of Kahalona, Holawa. Par. 3. *Kalo* and *kula* land in the *ili* of Wailiakuhu, Holawa. Par. 4. *Kalo* land in the *ili* of Iwi, Waipio. Par. 5 *Kalo* and *kula* land in the *ili* of Kahaualaea, Waipio. Par. 6. *Kalo* and *kula* land in the *ili* of Pukuhale, Waipio. Kealoha sworn: I have seen his Parcels 1 and 2 were from his parents, gotten in the time of Kamehameha I; I gave him parcel 3 in 1834; Makae gave him parcel 4 in 1841; Auwae gave him parcels 5 and 6 in 1841.	—	—	—	6	*Kalo* *Kula*	MA 8:305 RP 55:34 Book 21:723

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kanui ***Helu 5250***	Hanawana & Puumaile	7:5 & FT 8:124	Kamuka sworn: I have seen his land, 3 parcels. Parcel 1 is *kalo* land at Kawaihae; Parcel 2 is *kalo* and *kula* land at Keauhou; these are *ili* of Hanawana. Parcel 3 is a *kalo* field at Puumaile. Parcel 1 was received from Niawaloa in the time of Kamehameha II; Parcel 2 was from Kanilo in 1847; Parcel 3 was gotten in the time of Kamehameha I, 1819. There are two *Poalima* in Parcel 1 and one *Poalima* in Parcel 2. 1. *Mauka*, Kalama; Koolau, Kauhua; *Makai*, Kauhihoewaa; Wailuku, a *Kahawai*. 2. *Mauka*, Kauhihoewaa; Koolau, *Kahawai* of Hanawana; *Makai*, Puuhili; Wailuku, *Pali* of Hanawana. 3. Surrounded on all sides by Government land.	—	—	—	3	*Kalo* *Kula* *Poalima* (3) *Kahawai*	MA 3:442 RP 3406 Book 14:609 MA 10:523 RP 6968 B Book 22:427
Uheke ***Helu 5250 (B)***	Honokala	7:5-6 & FT 8:124	Kahanauwaha sworn: I have seen his land, 2 parcels. Parcel 1 is *kalo* land at Puomai; Parcel 2 is *kula* land at Keawaula. These are *ili* of Honokala. I gave them to him in 1839. There is one *Poalima* each in Parcels 1 and 2.	—	—	—	2	*Kalo* *Kula* *Poalima* (2)	MA 8:304 RP 6866 Book 26:207
K. Ienela ***Helu 5250 C***	Honokala	7:6 & FT 8:125	Kahanuwaha sworn: I have seen his land, 2 parcels. Parcel 1 is *kalo* land at Kahahei; Parcel 2 is *kalo* and *kula* land at Keawaula. These are *ili* of Honokala *Ahupuaa*. He got his land from his parents in 1819.	—	—	—	2	*Kalo* *Kula*	N/A

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kilauea ***Helu 6411***	Keaaula	7:6 & FT 8:125	Kawaahulihia sworn: I have seen his land, it is a *kalo* and *kula* parcel at Kipapa, of Keaaula *Ahupuaa*. Kapu gave it to him in 1837.	—	—	—	1	*Kalo* *Kula*	MA 8:326 RP 8502 Book 37: no # (issued in 1951)
Kahuku ***Helu 5498 B***	Uaoa	7:7 & FT 8:125 -126	Kawaahulihia sworn: I have seen his land, a *kalo* and *kula* parcel at Kahauiki, in Uaoa. Auwae gave it to him in 1834. There is one *Poalima*.	—	—	—	1	*Kalo* *Kula* *Poalima* (1)	MA 8:297
Koki ***Helu 5525***	Uaoa	7:7 & FT 8:126	Kawaahulihia sworn: I have seen his land, *kalo* and *kula* parcel in the *ili* of Ohulekailua, at Uaoa. Auwae gave it to him in 1834. *Mauka, Alanui Aupuni*; Koolau, *Pali* of Uaoa; *Makai* and Wailuku, *Pali Kahalai* (sea cliff).	—	—	—	1	*Kalo* *Kula* *Alanui Aupuni*	MA 8:309
Kahuahinenui ***Helu 7972***	Keaaliiiki	7:7 & FT 8:126	Kawaahulihia sworn: I have seen his land, a *kalo* and *kula* parcel at Keaaliiiki *Ahupuaa*, in the *Ili* of Apua. Auwae gave it to him in 1834.	—	—	—	1	*Kalo* *Kula*	MA 8:327

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kaapuahili ***Helu 5508***	Halehaku	7:8 & FT 8:127	Kauhi sworn: I have seen his land, 2 parcels. Parcel 1 is a *kalo* and *kula* land at Puniawa; Parcel 2 is a *kalo* and *kula* land at Kawaiiki. These are *ili* at Halehaku. Kauaumoa gave it to him in the time of Kamehameha I.	—	—	—	2	*Kalo* *Kula*	MA 8:331 RP 3977 Book 16:713
Kaleo ***Helu 5517 B & 5459 Z***	Hanehoi	7:8 & FT 8:127	Kamaka sworn: I have seen his land, a *kalo* and *kula* parcel at Mohala, in the *Ahupuaa* of Hanehoi. Kaiewe gave it to him in 1844. There is one *Poalima*.	—	—	—	1	*Kalo* *Kula* *Poalima* (1)	MA 3:446
I. Kauhi ***Helu 5499***	Halehaku	7:8 & FT 8:127	Keoho sworn: I have seen his land, it is 2 parcels, Parcel 1, is a *kalo* and *kula* land at Kahoi; Parcel 2, is a *kalo* land at Puniawa; these are *ili* of Halehaku *Ahupuaa*. Kauaumoa gave it to him in the time of Kamehameha I. There are 4 *Poalima* at Kahoi.	—	—	—	2	*Kalo* *Kula* *Poalima* (4)	MA 8:328 RP 6719 Book 24:799
Kekoa ***Helu 5493***	Halehaku	7:9 & FT 8:128	Keoho sworn: I have seen his land, it is a *kalo* and *kula* parcel at Kahoi, an *ili* of Halehaku. Kauaumoa gave it to him in the time of Kamehameha I. There is one *Poalima*.	—	—	—	1	*Kalo* *Kula* *Poalima* (1)	N/A
Kaha ***Helu 6455***	Pauwela	7:9 & FT 8:128	Kalii sworn: I have seen his land, 2 parcels. Parcel 1, *kalo* land; Parcel 2, *kula* land, at Kaohu an *ili* of Pauwela. It is old land given by Kalola in the time of Kamehameha I. There is one *Poalima*.	—	—	—	2	*Kalo* *Kula* *Poalima* (1)	MA 8:324 RP 2179 Book 9:373

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Keoho ***Helu 6510 B***	Halehaku	7:10 & FT 8:129	Wiwi sworn: I know, and it is true that Ioane Maria [the Catholic Priest] wrote his claim. I have also seen his land. A *kalo* and *kula* parcel at Awiki; Parcel 2, a *kalo* and *kula* land at Kahoi; these are *ili* of Halehaku *Ahupuaa*. Kuaiamoa gave them to him. There are 2 *Poalima* within it.	—	—	—	2	*Kalo* *Kula* *Poalima* (2)	MA 5:511 RP 3235 Book 14:263
Kalama ***Helu 6510 C***	Hanawana	7:10-11 & FT 8:129 -130	Kamaka sworn: I have seen his land, and it is also true that Kahaule wrote his claim. Parcel 1, is a *kalo* land at Kahauiki; Parcel 2, is a *kalo* land at Kahaopii; Parcel 3, is a *kula* land at Kawailuae. These are all *ili* in the *Ahupuaa* of Hanawana. There are two *Poalima* in Parcel 1.	—	—	—	3	*Kalo* *Kula* *Poalima* (2)	MA 7:114 RP 4111 Book 17:219
Manoa ***Helu 6510 D*** (see also *Helu* 5464)	Holawa & Honopou	7:11-12 & FT 8:130	Kamohai sworn: It is true that Kahaule wrote his claim, and I have seen his land, 5 parcels. Par. 1. *Kalo kula* land at Kauhumano. Par. 2. *Kalo kula* at Halimaumau. Par. 3. *Kalo kula* at Kahikiloa. Par. 4. *Kalo kula* at Waikakuhu. These are all *ili* lands of Holawa *Ahupuaa*. Par. 5. *Kalo* land in the *ili* of Kamaniaat Honopou…The Koolau boundary is the *Kahawai* of Honopou… There are 3 *Poalima* in Parcel 1.	—	—	—	5	*Kalo* *Kula* *Poalima* (3) *Kahawai*	MA 5:527 RP 2781 Book 13:21

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Pupu ***Helu 6510 E***	Halehaku	7:12 & FT 8:130 -131	Kamaikaaloa sworn: I saw Ioane Maria write his claim. I have also seen his land, 5 parcels. Par. 1. *Kalo kula* land at Ululoloa, an *ili* of Halehaku. Par. 2. *Kalo kula* at Papaku, an *ili* of Halehaku (the Koolau boundary is the *Kahawai* of Halehaku). Par. 3. *Kalo kula* at Kaeke, an *ili* of Halehaku (the Koolau boundary is a *Kahawai*). Par. 4. *Kalo kula* at Kaholo, an *ili* of Halehaku (the Wailuku boundary is a *Kahawai*). Par. 5. *Kalo kula* at Puniawa, an *ili* of Halehaku. Kauaamoa gave him these lands in the time of Kamehameha I. There is a *Poalima* in Parcel 1.	—	—	—	5	*Kalo* *Kula* *Poalima* (1) *Kahawai*	N/A

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Hanauwaha ***Helu 6510 F***	Honokala, Waipio & Holawa	7:12 & FT 8:131 -132	Hanauwaha. It was I who wrote the claim. Iseraela sworn: I know his land, 5 parcels. Par. 1. *Kalo lala* at Puuokaupu in Honokala. Par. 2. *Kalo lala* at Maoli in Honokala. Par. 3. *Kalo lala* at Kauhiuhi in Honokala. Par. 4. *Kalo lala* at Pukuhale in Waipio. Par. 5. *Kalo lala* in Waikakuhu in Holawa. The first 4 parcels were given by Kekauwai in 1835. Parcel 5 was from Auwae in 1831. There is one *Poalima* in Parcel 1	—	—	—	5	*Kalo* *Kula* *Poalima* (1)	MA 5:522 RP 6939 Book 26:325
Olopana (w.) ***Helu 6510 G***	Honokala & Waipio	7:13 & 8:132	Hanauwaha sworn: It is true that I wrote her claim, and I know her land, 2 parcels. Parcel 1, is *kalo kula* land in the *ili* of Manema of Honokala; Parcel 2, is *kalo* land in the *ili* of Alele at Waipio.	—	—	—	2	*Kalo* *Kula*	N/A

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Wiwi ***Helu 6510 H***	Halehaku	7:13-14 & FT 8:132 -133	Keoho sworn: It is true that Ioane Maria wrote his claim, and I have seen his lands. There is one *Poalima* in parcel 1. Par. 1. *Kalo kula* land at Awiki, an *ili* of Halehaku *Ahupuaa*. Par. 2. *Kalo kula* at Papaku, an *ili* of Halehaku. Par. 3. *Kalo kula* at Kahaikapuoo, an *ili* of Halehaku. Par. 4. *A Pahale* at Kaapopo an *ili* of Halehaku. Kauaamoa gave it to his parents in the time of Kamehameha I.	1	—	—	4	*Pahale* *Kalo* *Poalima* (1) *Kula*	MA 5:511
Kawaha ***Helu 6510 I*** (see also *Helu* 6454)	Halehaku (Haiku)	7:14 & FT 8:133	Kouiki sworn: It is true that Kauhiloeowa wrote his claim. Kopa sworn: I have seen his land, a *kula* parcel at Kulihai in Halehaku. It is a right from his parents in the time of Kamehameha. *Mauka*, my land; Koolau, Kaihe; *Makai*, Kawaa; Wailuku, the *Kahawai* of Haiku. [Note: English text (Vol. 8:133) places Kulihai in Haiku, rather than Halehaku, as described in the Hawaiian text.]	—	—	—	1	*Kula* *Kahawai*	N/A
Kaili ***Helu 6510 K*** (see also Helu 3905 B)	Haiku	7:14 & FT 8:133	Haleole sworn: It is true that I wrote his claim, and I have seen his land. It is a *kula* parcel at Popoohanalua in the *Ahupuaa* of Paihiihi. Kaaihuwale gave it to him in 1819.	—	—	—	1	*Kula*	N/A

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Ku ***Helu 6510 L*** (see also *Helu* 7768)	Haiku	7:14-15 & FT 8:133 -134	Haleole sworn: It is true I have seen his land. Parcel 1. *Kalo* land at Aiawakea and Waiaama, Haiku *Ahupuaa*. Parcel 2. *Kalo* land at Aiawakea and Waiaama, Haiku *Ahupuaa*. Parcel 3. *Kalo* land at Aiawakea and Waiaama, Haiku *Ahupuaa*. Parcel 4. *Kalo* land at Aiawakea and Kakaiakiha, Haiku *Ahupuaa*. Parcel 5. *Kalo* land at Pue, Haiku *Ahupuaa*. Gotten from his parents in the time of Kamehameha I.	—	—	—	5	*Kalo* *Kalo*	MA 5:504 RP 2181 Book 9:381
Kaihe ***Helu 6510 M*** (see also *Helu* 6234)	Haiku	7:15 & FT 8:134	Haleole sworn: It is true I wrote his claim. Kawai sworn: I have seen his land. Parcel 1. *Kalo* land at Hano; Parcel 2, is *kalo* and *kalo* land at Puehuehu, these are *ili* of Haiku *Ahupuaa*. These 2 parcels were gotten from his parents in the time of Kamehameha I. There is one *Poalima* in Parcel 2.	—	—	—	2	*Kalo* *Kalo* *Poalima* (1)	MA 5:525 RP 2184 Book 9:393
Kawai ***Helu 6510 N***	Haiku	7:15-16 & FT 8:134 -135	Haleole sworn: I wrote his claim. Kaihe sworn: I have seen his land. Parcel 1 is *kalo* land at Hano; Parcel 2, is *kalo* land at Puehuehu. These are *ili* of Haiku *Ahupuaa*. He got it from his parents in the time of Kamehameha I.	—	—	—	2	*Kalo*	MA 5:526 RP 4967 Book 20:157

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kamakaeu ***Helu 6510 O*** (see also *Helu* 7768)	Haiku & Pauwela	7:16 & FT 8:135	Haleole sworn: I have seen his land. It was I who wrote out his claim. Par. 1. *Kalo* land at Maunaoui in Haiku *Ahupuaa*. Par. 2. *Kula* land at Waiaama in Haiku *Ahupuaa*. Par. 3. *Kalo lala* at Hoopauwahie in Pauwela *Ahupuaa*.	—	—	—	3	*Kalo* *Kula*	MA 5:521 RP 5259 Book 21:173
Kanui ***Helu 6510 P (& 3717 B)***	Paohua & Hanehoi	7:16-17 & FT 8:135	It is true that Kaiewe wrote his claim. Kamaka sworn: I have seen his land, 2 parcels. Par. 1. A *kalo kula* at Keopi in Puohua *Ahupuaa*. Par. 2. A *kalo kula* at Opuolo in Hanehoi *Ahupuaa* (the Wailuku boundary is the *Kahawai* of Huelo). Kaiewe gave these parcels to him in 1844. There are 2 *Poalima* in Parcel 1.	—	—	—	2	*Kalo* *Kula* *Poalima* (2) *Kahawai*	MA 3:450 RP 4951 Book 20:125
Kawaha ***Helu 6510 Q***	Honopou & Waipio	7:17 & FT 8:136	It was I who wrote the claim. Iseraela sworn: I have seen his land, 3 parcels. Par. 1. A *kalo kula* at Lanikahuli, Honopou *Ahupuaa*. Par. 2. A *kalo kula* at Waiohiwi, Honopou *Ahupuaa*. Par. 3. A *kalo kula* at Kaluaiaea, Waipio *Ahupuaa*.	—	—	—	3	*Kalo* *Kula*	MA 5:502 RP 3774 Book 16:307

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Naone ***Helu 6510 R***	Honokala	7:17-18 & FT 8:136	Naone sworn: It is true that I wrote this claim. Kawaha sworn: I have seen his land. Parcel 1, is a *kalo kula* at Laipo (the Wailuku boundary is the *Kahawai* of Holuwa); Parcel 2, is a *kalo* and *kula* land at Kauhiulu; these are *ili* of Honokala *Ahupuaa*. Kamokuiki gave them to him in the time of Kamehameha, in 1823.	—	—	—	2	*Kalo* *Kula* *Kahawai*	MA 5:503 RP 2778 Book 13:15
Kuewa ***Helu 6510 T***	Honopou	7:18 & FT 8:137	Kawaha sworn: It is true that I wrote his claim (it was forwarded to Mr. Green to send to Honolulu); and I have seen his land. It is a *kalo* and *kula* parcel at Lanikahuli in Honopou *Ahupuaa*. Kapeleaumoku gave it to him in 1831. *Mauka*, *Pali* of Honopou; Koolau, *Kahawai* of Holawa; *Makai*, Government Land; Wailuku, *Pali* of Honopou.	—	—	—	1	*Kalo* *Kula* *Kahawai*	MA 5:510 RP 3775 Book 16:309
Makue ***Helu 6510 S***	Waipio & Holawa	7:18 & FT 8:136 -137	Keoho sworn: I saw L. Kauuwai write his claim, and I have seen his land, 4 parcels. Par. 1. *Kalo* land at Iwi, an *ili* of Waipio. Par. 2. *Kalo* land at Pauuau, an *ili* of Holawa. Par. 3. *Kalo* land at Haliimaumau, an *ili* of Holawa. Par. 4. A *kalo kalo* at Wailkakulu, an *ili* of Holawa. There is one *Poalima* in Parcel 1.	—	—	—	4	*Kalo* *Kula* *Poalima* (1)	MA 5:506 RP 3238 Book 14:269

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Wahielua ***Helu 6510 U***	Hanawana	7:19 & FT 8:137 -138	Kauhaa sworn: I saw Kahaule write his claim, and I have seen his land. Parcel 1, is a *kalo* and *kula* land at Kapua, Waiahole, Kukuile, several *ili* of Hanawana 1 *Ahupuaa*. Parcel 2, is a *kalo kula* in the *ili* of Kauila, of Hanawana 2. Parcel 1, was given to him by Niaulo a in 1823. Parcel 2, was given to him by Wili in 1823. There is a *Poalima* in Parcel 2. 1. *Mauka*, *Alanui Aupuni*; Koolau, Owili; *Makai*, the sea cliff; Wailuku, *Kahawai* of Hanawana. 2. *Mauka*, Kanui; Koolau, *Kahawai* of Hanawana; *Makai* and Wailuku, *Pali* of Hanawana.	—	—	—	2	*Kalo* *Kula* *Poalima* (1) *Alanui Aupuni* *Kahawai*	MA 5:550 RP 6140 Book 23:447
Kuuiwa ***Helu 6510 V***	Haiku & Honopou	7:19 & FT 8:138	Kao sworn: It is true that Kiha wrote his document and I have seen his land. Parcel 1 is *kalo* land in the *ili* of Kapili, Haiku *Ahupuaa*; Parcel 2 is *kula* land at Kukuihalo. Kaumoohuwa, Halekolane, several *ili* of Honopou *Ahupuaa*. Parcel 1 was from Kaianui in 1842. Parcel 2 was from his parents in the time of Kamehameha I, 1819. There is a *Poalima* in Parcel 2.	—	—	—	2	*Kalo* *Kula* *Poalima* (1)	N/A

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kawaihulihia ***Helu 6510 Y*** (see also *Helu* 5507 B)	Uaoa	7:20 & FT 8:139	Kawaihulihia sworn: Mahu wrote my claim. Naala sworn: I have seen his land. Parcel 1, is a *kalo kula* at Kahaoone; Parcel 2, is a *kula* land at Pohakuloa (the Wailuku side boundary is the *Kahawai* of Uaoa); these are *ili* of Uaoa *Ahupuaa*. Auwae gave them to him in 1834. There are 2 *Poalima* in Parcel 1.	—	—	—	2	*Kalo* *Kula* *Poalima* (2) *Kahawai*	MA 5:510 RP 6849 Book 26: 193
Opunui ***Helu 6510 EE***	Pauwela	7:22 & FT 8:141	Niu sworn: It is true that Kiha wrote his claim, and I have seen his land. Parcel 1, is a *kalo* land at Noni; Parcel 2, is a *kalo* land at Wailkina; Parcel 3, is a *kula* land at Lewaie; Parcel 4, is a *kalo* land at Eliakii; these are all *ili* of Pauwela *Ahupuaa*.	—	—	—	4	*Kalo* *Kula*	MA 5:517
Kahue ***Helu 6510 OO*** (see also *Helu* 1402)	Peahi & Kaupakuhua	7:25-26 & FT 8:144 -145	Kahue sworn: I saw Kanaina write out my claim at Kapalama. Kupa sworn: I have seen his land, 4 parcels. There are 2 *Poalima* in Parcel 1. Parcel 1. *Kalo kalo* at Pohakuhaku, Popoki, Peahi; Parcel 2, *Olona*; Parcel 3, at Pohakuhaku; these are all *ili* of Peahi. Parcel 4, *Olona* at Kaaihoi, in Kaupakuhua. 1. *Mauka*, Kaushi; Koolau, *Pali* of Halehaku; *Makai*, Kaholowale; Wailuku, *Kahawai* of Opana. 2. On all sides surrounded by Government land.	—	—	—	4	*Kalo* *Kula* *Olona* *Poalima* (2) *Kahawai*	N/A

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kahue (cont'd.) ***Helu 6510 OO*** (see also *Helu* 1402)	Peahi & Kaupakuhua	7:25-26 & FT 8: 144 -145	3. *Mauka* and Koolau, Government land; *Mokai*, a *Pali*; Wailuku, *Kahawai* of Opana. 4. *Mauka*, Upui; Koolau, *Pali* of Kaupakuhua; *Makai*, Kahuakobe; Wailuku, *Kahawai* of Kaupakuhua.						
Niu ***Helu 6510 PP***	Pauwela & Haiku	7:26 & FT 8:145 -146	Kaupakua sworn: I know that Kiha wrote his claim, and I have seen his land. Parcel 1 is *kalo* land; Parcel 2 is *kula* land; in the *ili* of Kahaunui, at Pauwela . Parcel 3 is a *kalo* land in the *ili* of Palua, at Haiku. Parcels 1 and 2 were given to him by Davida Malo in 1831. Parcel 3 was given to him by Kakiaihu in 1819. There is one *Poalima* in Parcel 1.	—	—	—	3	*Kalo* *Kula* *Poalima* (1)	MA 5:514 RP 2178 Book 9:369
Kupa ***Helu 6510 QQ***	Halehaku	7:27 & FT 8:146	Kahue sworn: It is true that Ioane Maria wrote his claim, and I have seen his land. Parcel 1. *Kalo* land at Haunakepa, Halehaku. Parcel 2. *Kalo* land at Pohakoele, Halehaku. Parcel 3. *Kalo* land, an *Opu Olona*, at Halehaku. The lands are from his parents in the time of Kamehameha I. These are two *Poalima* in Parcel 1.	—	—	—	3	*Kalo* *Kula* *Olona* *Poalima* (2)	MA 5:518 RP 3157 Book 14:107

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kamaikaoloa ***Helu 6510 RR***	Halehaku & Peahi	7:27-28 & FT 8:146 -147	Kamoku sworn: It is true that Ioane Maria wrote his claim, and I have seen his lands. Par. 1. *Kalo* land at Kapalaalaea and Ululoloa, Halehaku *Ahupuaa*. (There is one *Poalima lo*i in Parcel 1.) Par. 2. *Kalo* land at Kaeke, Halehaku. Par. 3. *Kalo* land at Kaholo, Halehaku. Par. 4. *Kula* land at Puniawa, Halehaku. Par. 5. *Kala* land at Kalena, Peahi *Ahupuaa*…; …2. *Mauka*, Nahalelaau; Koolau, an *Aawai*; *Makai*, Kahouku; Wailuku, a *Kahawai*… 5. *Mauka*, Napohaku; Koolau, Government land; *Makai*, Pupu; Wailuku, the *Kahawai* of Peahi.	—	1+	1	4	*Kalo* *Loi* *Kula* *Aawai* *Kahawai* *Poalima* (1)	MA 5:501 RP 3334 Book 14:461
Hanakahi ***Helu 6510 SS***	Opana & Ulumalu	7:28-29 & FT 8:147 -148	Paahiki sworn: I saw Ioane Maria write his claim, and I have seen his 6 parcels of land. Par. 1. *Kala* land at Manokoho la, Opana *Ahupuaa*. Par. 2. *Kala* land at Hualilili, Opana. Par. 3. *Kala* land at Kumakakui, Opana. Par. 4. *Kala* land at Laulauhala, Ulumalu *Ahupuaa*. Par. 5. *Kalo* land at Kuuwale, Ulumalu.	—	—	—	6	*Kalo* *Kula* *Poalima* (5)	MA 5:516 RP 7331 Book 27:283

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Hanakaoo (cont'd.) ***Helu 6510 SS***	Opana & Ulumalu	7:28-29 & FT 8:147 -148	Par. 6. *Kala* land at Konawaa, Ulumalu… There is one *Poalima* each in the first five parcels.						
Nika ***Helu 6510 TT***	Haiku (& Waiopua)	7:29 & FT 8:148	I sworn: It is true that Kiha wrote his claim, and I have seen his land. Parcel 1 is a *kalo* land in the *ili* of Kakaiakiha, Haiku *Ahupuaa*. Parcel 2 is in the *ili* of Piliamoo at Waiopua. Parcel 1 was given to him in 1847 by Kauhua. I gave parcel 2 to him in 1836.	—	—	—	2	*Kalo*	MA 7:202 RP 4879 Book 19:633
Pahua ***Helu 6510 UU***	Pauwela	7:29 & FT 8:148 -149	Niu sworn: It is true that Kiha wrote his claim, and I have seen his land. Parcel 1 is *kalo* land at Kapuna. Parcel 2 is *kalo* land at Mooiki. Parcel 3 is *kula* land at Kaiiana. These are *ili* of Pauwela *Ahupuaa*, gotten by his parents from Kanaina in 1819.	—	—	—	3	*Kalo* *Kula*	MA 5:514 RP 5502 Book 21:659
Nahinu ***Helu 6510 VV***	Pauwela (& Kula)	7:29-30 & FT 8:149	Kopa sworn: I have seen his land. Parcel 1 is *kula* land in the *ili* of Waikina, at Pauwela. Kalaiopua gave it to him in 1819. Parcel 2 is *kula* land in the *Ahupuaa* of Kula. Kaili gave it to him in 1840.	—	—	—	1	*Kula*	N/A
Poohina ***Helu 6510 WW*** (see also *Helu* 4673)	Halehaku & Peahi	7:30 & FT 8:149 -150	Kauahi sworn: Truly, I have seen his land, 5 parcels. Parcel 1 is a *kalo kula* land at Pohakoele. Parcel 2 is *kalo kula* land at Pohakuhaku. Parcels 3, 4, 5, and 5 are *kala* lands at Pohakoele. These are *ili* of Halehaku and Peahi, two *Ahupuaa*.	—	—	—	5	*Kalo* *Kula*	N/A

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kauhi ***Helu 6510 XX*** (see also *Helu* 6234)	Pauwela & Haiku	7:31 & FT 8:150 -151	Kanihua sworn: It is true, Halcole wrote his claim, and I have seen his 7 parcels of land. Par. 1. *Kalo* land at Puukoa, Pauwela *Ahupuaa*. Par. 2. *Kula* land at Puukoa, Pauwela. Par. 3. *Kalo* land at Puaihaa, Haiku *Ahupuaa*. Par. 4. *Kalo* land at Kakaiakiha, Haiku. Par. 5. *Kalo* land at Kahaunui, Haiku. Par. 7. *Kalo* land at Kahaunui, Haiku. Parcel 1 was from his parents in 1819. Parcels 2, 3, 4, 5, 6, and 7, I gave to him in 1833.	—	—	—	7	*Kalo* *Kula*	MA 5:519 RP 3416 Book 14:625
Naala ***Helu 6510 YY*** (see also *Helu* 5494 B)	Keaaula	7:31-32 & FT 8:151	Kawaihulihia sworn: I have seen his land. It is a *kalo* and *kula* land in the *ili* of Makiki, Keaaula *Ahupuaa*. Auwae gave it to him in 1834. There are three *Poalima*.	—	—	—	1	*Kalo* *Kula* *Poalima* (3)	MA 5:521 RP 8503 Book 37: no # (issued in 1951)

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Momona ***Helu 5494 C***	Keaaula	7:32 & FT 8:151	Kawaihulihia sworn: I have seen his land. It is a *kalo* land in the *ili* of Kipapa at Keaaula. Auwae gave it to him in 1834. There is one *Poalima*.	—	—	—	1	*Kalo* *Poalima* (1)	N/A
Napoka ***Helu 5494 D***	Keaaula	7:32 & FT 8:151 -152	Kawaihulihia sworn: I have seen his land. It is a *kalo lala* in the *ili* of Kapuna at Keaaula. Auwae gave it to him in 1834. There is one *Poalima*.	—	—	—	1	*Kalo* *Kula* *Poalima* (1)	MA 5:512 RP 8501 Book 37:no # (issued in 1951)
Kilua ***Helu 5494 E***	Halehaiku	7:32 & FT 8:152	Maikaaiua sworn: I have seen his land. It is a *kalo lala* parcel in the *ili* of Kaoke at Halehaiku. Kahoaiku gave it to him in 1847. *Mauka*, *Pali* of Halehaiku; Koolau, Kahoakabu; *Makai*, Nahaleliaau; Wailuku, *Kahawai* of Halehaiku.	—	—	—	1	*Kalo* *Kula* *Kahawai*	MA 5:513 RP 5533 Book 21:721
Kukona ***Helu 5494 G***	Haiku	7:33	Nahinu sworn: It is true that his claim was written, and I have seen his land, in 3 parcels. Parcel 1, *kula* land at Kamoeloa and Puhinahina. These are *ili* of Haiku *Ahupuaa*. Parcels 2 and 3 are at Maunaoui in Haiku 2. Parcel 1 is from his parents in the time of Kamehameha I. Parcels 2 and 3 are from Kahaleohu in 1830 and 1839.	—	—	—	3	*Kula*	N/A

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kaui ***Helu 5494 H***	Halehaiku	7:33-34	Mahoe sworn: It is true that Ioane Maria wrote his claim and I have seen his land, in 3 parcels. Parcel 1 is *kalo* land at Kanewai. Parcels 2 and 3 are *kula* land at Pohakoele. These are *ili* of Halehaku *Ahupuaa*. Kahoaku gave him parcel 1 in 1840. Hoomaikai gave him parcels 2 and 3 in 1839.	—	—	—	3	*Kalo* *Kula*	N/A
Pekupeku ***Helu 5515***	Peahi, Halehaiku & Opana	7:34 & FT 8:152 -153	Kawaapolaole sworn: I have seen his land, 4 parcels. Par. 1. *Kalo* land at Kaholo, Peahi *Ahupuaa*. Par. 2. *Kalo* and *kula* at Kaloko, Peahi. Par. 3. *Kalo* land at Kaukini, Halehaiku *Ahupuaa*. Par. 4. *Kalo lala* at Kumukukui, Opana *Ahupuaa*.	—	—	—	4	*Kalo* *Kula*	MA 8:359 RP 2774 Book 13:7
Kuewa ***Helu 3905 H***	Peahi	7:35 & FT 8:153	Keonepahu sworn: I have seen his land, it is 2 parcels. Parcel 1, *kalo* land; Parcel 2, *kula* land; these 2 parcels are in an *ili* (Hukioho) in Peahi *Ahupuaa*. He got them from his parents in 1819. There are 2 *Poalima*.	—	—	—	2	*Kalo* *Kula* *Poalima* (2)	MA 8:326 RP 6230 Book 23:627
Kawaapolaole ***Helu 3906 B***	Halehaiku	7:35 & FT 8:153	Keonepahu sworn: It is true that Maha wrote his claim, and I have seen his land. Parcel 1 is *kalo* land; Parcel 2 is *kula* land at Kaukini. These 2 parcels are *ili* of Halehaiku *Ahupuaa*. Kauamoa gave them to him in 1830. There is one *Poalima*.	—	—	—	2	*Kalo* *Kula* *Poalima* (1)	MA 5:515 RP 3100 Book 13:683

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Mahoe ***Helu 5459 G***	Huelo	7:35-36 & FT 8:154	Kamaka sworn: I have seen his land, 4 parcels. Par. 1. *Kalo* land in the *ili* of Kahaloa, Huelo *Ahupuaa*. Par. 2. *Kalo* land in the *ili* of Ohia, Huelo. Par. 3. *Kula* land in the *ili* of Kapeka, Huelo. Par. 4. A *kula Opu Olona* at Hanehoi. 1. *Mauka*, Papaiakea; Koolau, *Kahawai* of Huelo; *Makai*, Kanakaokai; Wailuku, Mahoe. 2. *Mauka*, Pahia; Koolau, Paukei; *Makai*, Kahaoiua; Wailuku; Kuluwaimakalani. 3. *Mauka*, Government Land; Koolau, *Kahawai* of Huelo; *Makai*, Government Land; Wailuku, Kaiewe. 4. *Mauka*, Koolau and *Makai*, Government Land; Wailuku, Kaiewe. There are 4 *Poalima* in Parcel 1, and 1 *Poalima* in Parcel 2.	—	—	—	4	*Kalo* *Kula* *Kahawai* *Olona* *Poalima* (5)	MA 7:49 RP 4063 Book 17:123
Kapela ***Helu 4137***	Kaupakulua	7:36-37	Kiekie sworn: I have seen his land. Parcel 1 is *kula* land at Kahaualaea; Parcel 2 is *kula* land at Kauoha. These are *ili* in the *Ahupuaa* of Kaupakulua. It is old land, gotten prior to 1819. There is one *Poalima*… … 2. *Mauka*, *Alanui Aupuni*; Koolau, Uhumalu *Ahupuaa*; Wailuku *Pali* of Kaupakulua; *Makai*, *Alanui Aupuni*.	—	—	—	2	*Kula* *Poalima* (1) *Alanui Aupuni*	MA 9:450 RP 3659 Book 16:77

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Naone ***Helu 4284 D***	Pauwela	7:37	Pilipili sworn: It is true that his claim was written. Paele sworn: I have seen his land. Parcel 1 is *kalo* land at Mooiki; Parcel 2 is *kalo* land at Waiokana. These are *ili* of Pauwela *Ahupuaa*. There are 3 *Poalima*. Parcel 1 was given to him by Kekumoiku in 1841. Parcel 2 was given to him by Kila in 1830.	—	—	—	2	*Kalo* *Poalima* (3)	MA 9:466 RP 2776 Book 13:11
Kahalela (Kahaleluau) ***Helu 3504*** (see also *Helu* 5504 & 3304 E)	Haiku & Halimaile	FT 8:79	The Clt's. lands are of two pieces in Haiku [& Halimaile]. No. 1. is a *kula* land in Kukuioleu [Halimaile]. No. 2. is a *kula* land in Hano. The Claimant rec'd. it from Kamakakai in 1831. His title been disputed by Kekauonohi. She has sold this place to Judge Parson's.	—	—	—	2	*Kula* (Disputed)	N/A
Naaeae (Kaaeae) ***Helu 5459 (Helu 5459 H)***	Hanehoi	FT 8:104	Kanakaokai Sw.: The Clt's. lands are four pieces of *kalo* and *kula* land in the *ili* of Opuololo, Hanehoi *Ahupuaa*. The Clt. rc'd. this land from Kaiawe in the year 1844. His title has never been disputed. It is bounded: *Mauka*, Kaiewe's land; Koolau, my land; *Makai*, Kanai's land; Wailuku, Creek of Huelo. (As translated in Native Testimony.)	—	—	—	4	*Kalo* *Kula* *Kahawai*	MA 3:446 RP 2218 Book 9:533

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Huluhulu ***Helu 5392***	Waipio & Huelo	FT 8:106	Moi Sw.: The Clt's. lands consist of three pieces. No. 1. is the *ili* of Kapalaoa, Waipio *Ahupuaa* (gotten in 1842). No. 2. is the *ili* of Pukuhale, Waipio *Ahupuaa* (gotten in the days of Kamehameha I). No. 3. is the *ili* of Kahaloa, Huelo *Ahupuaa* (gotten in the days of Kamehameha I). …No. 3 is bounded: *Mauka*, Papaiakea's land; Koolau, Creek of Huelo; *Makai*, Alukiuki's land; Wailuku, *Pali* of Huelo.	—	—	—	3	Creek	MA 7:58 RP 5535 Book 21:725
Wm. Harbottle ***Helu 2937:7***	Opana	10:2-3	Kanaamu sworn: I have seen his land at Hamakualoa, Maui, it is the *Ahupuaa* named "Opana." The boundaries are. *Mauka* - land of Lot Kamehameha; Wailuku - Kaalaea, Uhumalu, Kaupakulua, & Hailku; *Makai* - the sea; Hana - Keaaula, Uaoa, and Peahi, several *Ahupuaa*. This land was given to his father, John Harbottle, by Kamehameha I, and he resided peacefully there until his death. The land was inherited by his children, and they are here at this time. (See MA 10:312)	—	—	—	—	—	MA 10:312 RP 7031 (8433) Book 25:117

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Wm. Harbottle ***Helu 2937:8***	Waipio	10:3	Kanamu sworn: I have seen his land at Hamakualoa, Maui, it is the *Ahupuaa* named "Waipio." The boundaries are: *Mauka* - land of Lot Kamehameha; Wailuku - Mokupapakua, Mokupapakanaka, and Holawa, several *Ahupuaa*; *Makai* - the sea; Hana - Waipio 2, Puohua, and Huelo. This land was given to his father, John Harbottle, by Kamehameha I, and he resided peacefully there until his death. The land was inherited by his children, and they are here at this time.	—	—	—	—	—	MA 10:143 RP 7761 Book 29:121
John Caswell ***Helu 311***	Ulumalu	FT 3:1, 35-36, & 231	This is a claim to land in Hamakua loa east Maui, called Ulumalu. Charles Cockett sworn: I know Mr. Caswell's land on Maui in the district of Hamakua, called Ulumalu. I do not know the bounds of it. When Caswell received this land I was working for Gov'r. Hoapili. I did a great deal of work for the King at that time… The land referred to by the King as having been given to Freeman Caswell, was Ulumalu; the land now claimed. This was in 1838. Caswell has ever since lived upon it in peace, cultivating it and sawing lumber etc… (p. 1)	—	—	—	—	—	MA 3:177

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
John Caswell (cont'd.) ***Helu 311***	Ulumalu	FT 3:1, 35-36, & 231	George Lawrence sworn for Clt.: I know the land of Caswell in Hamakua, on Maui. It is called Kuhmalo [Ulumalu]. I heard he had this land from Namauu. He took possession of it, to the best of my recollection 8 or 9 years ago; and has lived there ever since. I cannot give the boundaries of this land; it is in part occupied by Natives, but I cannot say how many… (p. 36) Stephen Grant sworn: …The land was always spoken of as Caswell's… He planted sugar cane on the land, and took timber from it…Caswell held this land at the same time as I held mine…Namauu was the Lord of the land, and Caswell did his *poalima* work. We held our lands at the sufferance of the chiefs and when they saw fit to turn us off, they might with impunity… (p. 231)						
N. Namauu ***Helu 10474***	Kaupakuhua & Ulumalu	FT 3:408-411	These belong to N. Namauu: …Kaupakuhua and Ulumalu *Ahupuaa*, Hamakualoa, Maui. (*Alii* Awardee) (pages 410-411)	—	—	—	—	—	*Buke Mahele* 18:48:174-175 MA 9:256 RP 4490 Book 18:469 & MA 3:239 RP 4471 Book 18:393

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Ii, Daniel ***Helu 520***	Huelo (& Lahaina)	FT 15:74	Ua sworn, and being shown the survey made by Mr. Alexander, says he knows the piece of land represented and that it belongs to claimant. It was given to Ii by Hoapili Kane in the year 1835 as an absolute gift. Claimant has held uninterrupted possession of the place up to this time; has a house on it and always cultivated it. (Copy) Resolved, that in view of the statement of His Majesty, that it was his intention originally to have the Division of lands made to secure to Daniela Ii of Maui, "Huelo" in Hamakualoa, and "Nakalepo" in Lahaina, and to the Government, "Kahalu" on Lanai, but that the matter was forgotten at the time, the Minister of the Interior is authorized to correct the decision on record accordingly, By order of Priv'y Council. January 31st 1853… Kaumuuma Sworn: Knows the place claimed by Daniela Ii. It was given him by Hoapili Kane in the year 1835. He has cultivated and held uninterrupted possession of the place up to this time…	—	—	—	—	Land cultivated since 1835	MA 9:319 RP 68:47 Book 22:423

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*

Testimony for Claims in Ko'olau

Wahinemaikai ***Helu 4561 & 6049***	Wailua	5:361 & FT 8: 227-228	In the *ili* of Waiehiki, *Ahupuaa* of Wailua, gotten from Kaniho in 1828. 1. A *Moo. Mauka*, an *Auwai*; Hana, land of Kaulia; *Makai*, land of Limanui; Hamakua, land of Kaiwikaola. 2. One *loi. Mauka*, Hana, and *Makai*, Kaulia; Hamakua, *Konohiki*. 3. A *loi. Mauka* and Hana, *Konohiki*; *Makai*, *poolua*; Hamakua, Kahakauila. There is a new claim at Kahahakee in Wailua. 4. A *Moo. Mauka*, *Pali*; Hana, *Konohiki*; *Makai*, Kaholoua; Hamakua, a *Kahawai*. 5. *Kahua hale* (a house) in the *ili* of Paulae. *Mauka*, the *Alanui Aupuni*; Hana, a *Kahawai*; *Makai*, a *Pali*; Hamakua, the house lot of Kapali.	1	2	1	2	*Moo* *Loi (Kalo)* *Auwai* *Poolua* *Kahawai* *Kahuahale* *Alanui Aupuni*	MA 7:441 RP 3281 Book 14:355
Kaiwa ***Helu 5049***	Wailua	5:362 & FT 8: 228-229	At Paukamaka, a *Moo* in Waihua. 1. *Mauka*, Pale; Hana, an *Auwai*; *Makai*, Muhiai; Hamakua, Kekahuna. 2. *Kahua hale* (house) in the *ili* of Kaukee. *Mauka*, an *Alanui* and Umaikeahani; Hana, *Konohiki*; *Makai*, the *Alanui Aupuni*; Hamakua, a *Kahawai*.	1	—	1	1	*Moo* *Auwai* *Kahuahale* *Alanui Aupuni* *Kahawai*	MA 3:495 RP 3257 Book 14:307

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kuikui ***Helu 5059***	Waihua	5:362 & FT 8: 229	In the *ili* of Piikalawa at Waihua. *Mauka*, a *Pali*; Hana, land of *Konohiki*; *Makai*, the shore; Hamakua, Wahinemaikai.	—	—	—	—	—	MA 3:834 RP 3258 Book 14:309
Kapali ***Helu 4865***	Waihua	5:362-363 & FT 8: 228	In the *ili* of Kealia, *Ahupuaa* of Waihua. 1. A *Moo. Mauka*, Kaniho; Hana, Kuikui; *Makai*, *Paahao Loi*; Hamakua, Church. 2. *Kahuahale* at Paulae. *Mauka*, an *Alanui*; Hana, Wahinemaikai; *Makai*, a *Pali*; Hamakua, Kaoo.	1	1	—	2	*Moo* *Paahao Loi (Kalo)* *Kahuahale* *Alanui*	MA 3:494 RP 6144 Book 23:455
Kaholowaa ***Helu 4866***	Waihua	5:363 & FT 8: 228-229	In the *ili* of Keonoulu, at Wailua. 1. A *Moo. Mauka*, Kuheleaumoku; Hana, *Konohiki*; *Makai* and Hamakua, Kaniho. 2. *Loi* at Waieli. *Mauka*, Kahakauila; Hana, Kaulia; *Makai* and Hamakua, *Konohiki*. 3. A *loi. Mauka*, Kaulia; Hana, *Makai*, and Hamakua, *Konohiki*. 4. 4 *loi* at Paulae. *Mauka*, Pihoenua; Hana, Kaio; *Makai*, an *Alanui* and *kula*; Hamakua, Naiwi. 5. *Pa Hale* (house) at Paukamaka. *Mauka*, Kalia; Hana, Kuikui; *Makai*, Kaniho; Hamakua, Kapali..	1	6	—	1	*Moo* *Loi (Kalo)* *Pa Hale* *Alanui*	MA 3:494
Wahapuu ***Helu 4867***	Waihua	5:363-364 & FT 8: 229	In the *ili* of Keonoulu, at Wailua. *Moo Kalo (taro land). Mauka*, Puuwalu; Hana, *Konohiki* – Kaniho; *Makai*, *Konohiki*; Hamakua, Kumulani.	—	—	—	1	*Moo Kalo*	MA 3:493 RP 2787 Book 13:35

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Moo I ***Helu 4725***	Waihua	5:364 & FT 8: 230	At Paukamaka. *Mauka*, Wahine; Hana, Kaiwa; *Makai*, *Konohiki*; Hamakua. Wahine's *loi* and *Konohiki*.	—	—	—	1	—	MA 3:493 RP 2800 Book 13:61
Moo II ***Helu 4729***	Waihua	5:364 & FT 8: 230	In the *ili* of Makaku, Wailua. 1. 3 *loi* at Makaku. *Mauka*, Hana, and *Makai*, Nawi; Hamakua, *Konohiki*. 2. 2 *loi* at Paulae. *Mauka*, *Loi* of Kepio; Hana a *Kahawai*; *Makai*, Hoa; Hamakua, Keahi. 3. 3 *loi* at Palolena. *Mauka* and Hana, Keahi; *Makai*, Wailuahia; Hamakua, a *Kahawai*. 4. *Kahuahale* in the *ili* of Maulu. *Mauka*, Pokii; Hana, a *Kahawai*; *Makai*, Kaniho; Hamakua, Keahi.	1	8	—	—	*Loi (Kalo)* *Kahuahale* *Kahawai*	MA 3:492 RP 2801 Book 13:63
Nakihei ***Helu 4773 B***	Waihua	5:364-365 & FT 8: 231	At Kalimapuhi, *Ahupuaa* of Waihua. 1. 9 *loi* in Kalimapuhi *Mauka* by a *Pali*; Hana, *Auwai*; *Makai*, Kaumauma's *loi*; Hamakua, by a *Kahawai*. 2. 1 *loi* in Paukamaka.	—	10	1	—	*Loi (Kalo)* *Auwai* *Kahawai*	MA 3:491 RP 3261 Book 14:315
Kamai ***Helu 5055***	Waihua	5:365 & FT 8: 231	At Palolena, a *moo* in Waihua *Ahupuaa*, gotten in the time of Kamehameha I. 1. A *Moo. Mauka*, Kahili; Hana, a *Pali*; *Makai*, Keahi; Hamakua, a *Kahawai*. 2. *Moo* in the *ili* of Waikani. *Mauka*, an *Auwai*; Hana, a *Kahawai*; *Makai* and Hamakua, Kaniho.	—	4	1	2	*Moo* *Loi (Kalo)* *Kahawai* *Auwai* *Kala*	MA 3:490 RP 2943 Book 13:369

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kamai (cont'd.) ***Helu 5055***	Wailua	5:365 & FT 8: 231	3. 2 *loi* at Puakamaka. *Mauka*, Kauaawa; Hana and *Makai*, Wahine; Hamakua, Nalimanui. 4. 2 *loi* at Pulolena. *Mauka*, *Konohiki*; Hana, a *Pali*; *Makai*, *kula* land; Hamakua, *Konohiki*.						
Nalimanui ***Helu 4774***	Wailua	5:365 & FT 8: 231	His land, held since 1847, is a *Moo* in the *ili* of Kealia at Wailua. *Mauka*, the land of Kaiwikaola; Hana, the land of Wahinemaikai; *Makai*, a *Pali*; Hamakua, the land of Wahapuu.	—	—	—	1	*Moo*	MA 3:490 RP 2805 Book 13:71
Wailaahia ***Helu 4562***	Wailua	5:366 & FT 8: 232	Some of the land of Wailaahia is from olden times, and from the new times, in the *ili* of Kaakee. 1. 4 *loi*. *Mauka*, Kaholoua; Hana, *kula* land and *Pali*; *Makai*, *loi* of Daniela; Hamakua, a *Kahawai*. 2. 2 *loi* in the *ili* of Maulu. *Mauka*, a *Pali*; Hana, a *Kahawai*; *Makai*, Naiwi; Hamakua, a *Pali*. 3. 5 *loi* in the *ili* of Pulolena. *Mauka*, the land of Mililkaa; Hana, Kaniho; *Makai*, Kaiwikuamoo; Hamakua, a *Kahawai*. 4. 2 *loi* at Paulae. *Mauka*, *Konohiki*; Hana, Moo; *Makai*, Keahi; Hamakua, Keahi.	—	13	—	—	*Loi (Kalo)* *Kahawai* *Moo*	MA 7:437 RP 2215 Book 9:521

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kaiwikaola ***Helu 5054***	Waiha	5:366 & FT 8: 232	In the *ili* of Waielima, gotten in the time of Kamehameha I, at Wailua. 1. A *moo*. On 3 sides, *Konohiki*; Hamakua, an *Alanui*. 2. A *moo*. *Mauka*, a *Pali*; Hana, Wahinemaikai; *Makai*, *Konohiki*; Hamakua, Puhukaa. 3. *Pa Hale*. *Mauka*, Kaniho; Hana, Kahakauila; *Makai*, Nalimanui; Hamakua, Kahabei.	1	—	—	2	*Moo* *Pahale* *Alanui*	MA 7:440 RP 3278 Book 14:349
Kuiki ***Helu 5052***	Waiha	5:366-567 & FT 8: 233	In the *ili* of Palolena, gotten in 1842, where he resides and cultivates. 1. 2 *moo*. *Mauka* Kaniho; Hana, a *Pali*; *Makai*, Kahili; Hamakua, a *Kahawai*. 2. *Kahuahale*. Surrounded on all sides by the *Konohiki*.	1	—	—	2	*Moo* *Kahuahale* *Kahawai*	MA 3:489 RP 3275 Book 14:343
Kekahuna ***Helu 5030***	Waiha	5:367 & FT 8: 233	In the *ili* of Keonomalu, Waiha, gotten in 1839. 1. A *moo*, *Mauka*, Kukae; Hana, an *Alanui*; *Makai*, Kaholilae, Hamakua, Wahapuu. 2. *Kahuahale* at Puehala. *Mauka*, Kiowai; Hana, Papuaa; *Makai*, Mililkaa; Hamakua, an *Auwai*.	1	—	—	1	*Moo* *Kahuahale* *Auwai* *Alanui*	MA 3:488 RP 2811 Book 13:83
Naiapea ***Helu 4779***	Waiha	5:367 & FT 8: 233	In the *ili* of Keonomalu, given to him in 1848. *Mauka*, Kaniho; Hana, am *Auwai*; *Makai*, Nalimanui; Hamakua, an *Alanui*.	—	1	—	—	*Auwai* *Alanui*	MA 3:488 RP 3279 Book 14:351

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kaohilae ***Helu 5065*** (see *Helu* 5066 B)	Waiha	5:367 & FT 8: 233-234	In the *ili* of Keonomalu, gotten by him in 1839. 1. A *moo*. *Mauka* Kekahuna; Hana, Kahakauila; *Makai*, *Konohiki* and Hoonoho; Hamakua, Kaniho. 2. *Kahuahale* at Piikalawa. *Mauka*, Kaumauma; Hana and *Makai*, Hao; Hamakua, Papuaa.	1	—	—	1	*Moo* *Kahuahale*	MA 3:487 RP 3254 Book 14:301 (*Helu* 5066 B)
Naiwi ***Helu 4772***	Waiha	5:368 & FT 8: 234	In the *ili* of Makaiu, gotten in the time of Kamehameha I. 1. *Mauka*, *Konohiki*; Hana, Kuahine; *Makai*, *Konohiki*; Hamakua, *Moo*. 2. 5 *loi*. In the *ili* of Waieli, resided on since 1842. *Mauka*, a *Pali*; Hana, Kaiwikaola; *Makai*, Pahukaa; Hamakua, Kiowai. 3. A *loi* in the *ili* of Waikani, gotten from Kaniho in 1819. *Mauka*, Kepio, Hana, an *Alanui*; *Makai*, Kaniho; Hamakua, Kuahine. 4. 3 *loi*. In the *ili* of Maulu, gotten from Kaniho in 1842. *Mauka*, Wailuahia; Hana, a *Kahawai*; *Makai*, Pokii; Hamakua, Uma.	—	9	—	1	*Loi (Kalo)* *Moo* *Kahawai* *Alanui*	MA 3:485

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kaumiumi ***Helu 5066***	Wailua	5:368 & FT 8: 234-235	In the land of Kaakee, gotten in the time of Kamehameha I. 1. A *moo* at Kaakee. *Mauka*, Kalana; Hana and *Makai*, a *Pali*; Hamakua, a *Kahawai*. 2. A *loi* at Pulolena. *Mauka*, Keawe; Hana, *Konohiki*; *Makai*, Kamai; Hamakua, a *Kahawai*. 3. 1 *loi*. *Mauka*, Hana, and *Makai*, Ku; Hamakua, Kaniho. 4. 2 *loi* at Keonomalu. *Mauka*, Wahapuu; Hana, Kaniho; *Makai*, Kaohilae; Hamakua, Wahapuu.	—	4	—	1	*Loi (Kalo)* *Moo* *Kahawai*	MA 3:841 RP 2942 Book 13:367
Kumalani ***Helu 5056***	Wailua	5:368-369 & FT 8: 235	In the *ili* of Keonomalu, a *moo* gotten from Wahapuu in 1819. *Mauka*, *Konohiki*; Hana, Kahakauila; *Makai*, *Konohiki*; Hamakua, Kuheleaumoku.	—	—	—	1	*Moo*	MA 3:486 RP 2804 Book 13:69
Kalawaia ***Helu 5060***	Wailua	5:369 & FT 8: 235	In the *ili* of Waieli, gotten in 1832. 1. A *moo*. *Mauka*, Kaula (and a water course); Hana, an *Alanui*; *Makai*, *Konohiki*; Hamakua, Wahinemaikai. 2. *Kahuahale*. *Mauka*, Kaiwikaola; Hana, Kahakauila; *Makai* and Hamakua, Nalimanui.	1	—	1	1	*Moo* *Auwai* *Kahuahale* *Alanui*	MA 3:485 RP 3259 Book 14:311
Kaulia ***Helu 5058***	Wailua	5:369 & FT 8: 235-236	In the *ili* of Waieli, gotten in 1819. 1. A *moo*. *Mauka*, Kukai; Hana and *Makai*, *Konohiki*; Hamakua, an *Alanui*. 2. A *moo*. Also in this *ili*. *Mauka*, an *Auwai*; Hana, Kalawaia; *Makai*, Kukai; Hamakua, Wahinemaikai.	—	—	1	2	*Moo* *Auwai* *Alanui*	MA 3:842 RP 3256 Book 14:305

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Makaole ***Helu 4726***	Waiha Kaeleku (Hana)	5:369 & 411 & FT 8: 236 & 274	In the *ili* of Paulae, gotten in 1819. 1. 2 moo. *Mauka*, Kahuena; Hana, a *Kahawai*; *Makai*, an *Alanui*; Hamakua, Kaholoua. 2. 2 *loi*. *Mauka*, *Konohiki*; Hana, a *Kahawai*; *Makai*, Kahuena; Hamakua, Hoa. In the lands of Kaeleku, Kaonohikau, Pohonui and Pohoiki, gotten prior to 1819. *Mauka*, the mountain; Kipahulu, Honokalani; *Makai*, Kaio; Hamakua, land of the *Konohiki*. There are two *Olona* patches.	—	2	—	2	*Moo* *Loi (Kalo)* *Kahawai* *Alanui* *Olona*	MA 7:442 RP 3265 Book 14:323
Kamana ***Helu 5051***	Waiha	5:370 & FT 8: 236	A *moo* in the *ili* of Keonomalu, since 1823. 1. *Mauka*, Kanibo; Hana, Keahi; *Makai*, *Konohiki*; Hamakua, Wahapuu. 2. *Loi* at Puuwalu, from Kauaikalaihi in 1839. *Mauka*, Kauaikalaihi; Hana, a *Pali*; *Makai*, Kauaikalaihi; Hamakua, Kauaikalaihi. 3. 1 *loi* at Paukamaka. *Mauka*, Kanehoa; Hana, an *Auwai*; *Makai*, Kaiwa; Hamakua, Wahine. 4. *Kahuahale* at Waieli. *Mauka*, a *Pali*; Hana, *Konohiki*; *Makai*, an *Auwai*; Hamakua, *Konohiki*.	1	2	1	1	*Moo* *Loi (Kalo)* *Auwai* *Kahuahale*	MA 3:613 RP 2788 Book 13:37

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kahakauila ***Helu 5062***	Waiha	5:370 & FT 8: 236-237	In the *ili* of Keonomalu, gotten in 1823. 1. A *moo*. *Mauka*, Kaniho; Hana, Kaiwikaola; *Makai*, the shore; Hamakua, *Konohiki*. 2. A *Kihapai olona*, gotten from Kaniho, in the *ili* of Waikani. 3. *Loi*. *Mauka*, *Konohiki*; Hana, a *Pali*; *Makai*, Nalimanui; Hamakua, Kaiwikaola.	—	1	—	3	*Loi (Kalo)* *Olona* *Moo*	MA 3:843 RP 3263 Book 14:319
Kaluahinenui ***Helu 5064 B***	Waiha	5:370-371 & FT 8: 237	Two *Moo aina* in the *ili* of Waikani, given to him in 1819. 1. An *ili*. *Mauka*, a *Pali*; Hana, a *Kahawai*; *Makai*, Kamai; Hamakua, an *Auwai*. 2. 2 *loi* at Palolena. *Mauka*, Hana, and *Makai*, the *Konohiki*. Hamakua, an *Auwai*. 3. 1 *loi*. *Mauka*, Kaniho; Hana, an *Alanui*; *Makai* and Hamakua, Mililkaa.	—	3	2	—	*Loi (Kalo)* *Kahawai* *Auwai* *Moo* *Alanui*	MA 7:436 RP 3252 Book 14:297

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Keahi ***Helu 5064***	Wailua & Kalii	5:371 & FT 8: 237	Land at Palolena, Wailua, gotten in 1842. 1. *Mauka*, Kekanaka; Hana, an *Auwai*; *Makai*, *Moo*; Hamakua, a *Kahawai*. 2. *Ahupuaa* of Kalii, gotten from Kanaina. *Mauka* and Hana, Puowalu; *Makai*, the sea; Hamakua, Waianu. 3. 1 *loi* at Keononalu. *Mauka* Puula; Hana, Kanilee; *Makai* and Hamakua, Kukai. 4. 4 *loi* at Waieli. *Mauka*, Pao's *loi*; Hana, an *Alanui*; *Makai*, Ohule; Hamakua, Umaikealani.	—	5	1	—	*Auwai* *Loi (Kalo)* *Kahawai* *Alanui* *Moo*	MA 3:843 RP 3280 Book 14:353

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kalana (w.) ***Helu 5067***	Waihua	5:571 & FT 8: 237-238	In the *ili* of Kaakee, two *moo* on which she has resided continuously since 1819. 1. *Moo*. *Mauka*, Wahinemaikai; Hana, *Konohiki*; *Makai*, Kaumiumi; Hamakua, a *Kahawai*. 2. *Kahuahale* at Kaakee. *Mauka*, an *Auwai*; Hana, Pohaku; *Makai*, Wahinemaikai; Hamakua, an *Auwai*.	1	—	1	2	*Moo* *Kahuahale* *Auwai* *Kahawai*	MA 7:443 RP 3273 Book 14:339
Kauiki ***Helu 5068***	Waihua	5:371-372 & FT 8: 238	At Waieli nui, gotten from Ku in 1819. 1. A *moo*. *Mauka*, Ohule; Hana, an *Alanui*; *Makai*, Kanilo; (and) Hamakua. 2. 2 *loi* at Keononalu. *Mauka*, a *Poli*; Hana, Kaleooioi's *loi*; *Makai*, Kahakauila's *loi*; Hamakua, Kumulani's *loi*.	—	2	—	1	*Moo* *Loi (Kalo)* *Alanui*	MA 3:832 RP 7025 Book 2:6:469
Kealina ***Helu 2441***	Keanae	5:373-574 & FT 8: 240	At Lalaola, Keanae, resided on since 1819, gotten from Kaualoku. 1. *Mauka*, Konohiki's *loi*; Hana, Ehu; *Makai*, Kaluhiwa; Hamakua, Maewaewa and Mamaikawaha. 2. *Kula* parcel. *Mauka*, mountain; Hana, Polaha; *Makai*, Nuailua; Hamakua, Nuaihia. 3. 1 *loi* in the *ili* of Kuo. *Mauka*, Malaihaa's *loi*; Hana, Mamaikawaha; *Makai*, Piwai's *loi*; Hamakua, an *Auwai*.	2	1	2	4	*Kula* *Loi (Kalo)* *Olona* *Pahale* *Auwai* *Kahawai*	MA 7:444 RP 2946 Book 13:375

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kealina (cont'd.) ***Helu 2441***	Keanae	5:373-574 & FT 8: 240	4. *Olona* garden. *Mauka*, Pahua and Kauakahi; Hana, Uluhani; *Makai*, Forest; Hamakua, Keaka. 5. *Olona* at Kuaimoa. *Mauka* and Hana, Kauakahi; *Makai*, Kaiwilele; Hamakua, a *Poli*. 6. *Pa Hale*. *Mauka*, a *Poli*; Hana, a *Kahawai*; *Makai*, an *Auwai*; Hamakua, a *Kahawai*. 7. *Pa Hale* at Lalaola. *Mauka*, *Konohiki*; Hana, Ehu; *Makai*, Kaea; Hamakua, an *Auwai*.						
Kaea ***Helu 2442***	Keanae	5:374 & FT 8: 240-241	Land given to him by Kanehaku in in 1844, in the *ili* of Analoa. 1. *Mauka*, Kealina; Hana, Ehu; *Makai*, Kaihu; Hamakua, Kuluhiwa. 2. *Ili* of Kiapu. *Mauka*, Kaiea; Hana and *Makai*, *Konohiki*; Hamakua, Kuluhiwa. 3. *Kula* at Analoa. *Mauka*, Umikanaha; Hana, Keohohina's land; *Makai*, Malhoe; Hamakua, a *Kahawai*.	—	—	—	1	*Kula* *Kahawai*	MA 7:443 RP 2017 Book 8:353
Kamakau ***Helu 2443 B***	Keanae	5:374-375 & FT 8: 241	An *ili* of Pololua at Keanae, gotten in 1847. 1. *Mauka*, a *Pali*; Hana, Umikanaha; *Makai*, Kalawaia; Hamakua, shore. 2. A land *mauka* in Pololua. *Mauka*, mountain; Hana, an *Alanui pii* (trail to uplands); *Makai*, Laiholua; Hamakua, Nalima.	—	—	—	—	*Alanui pii*	MA 7:445 RP 3380 Book 14:553

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kanehaku ***Helu 2443***	Keanae	5:375 & FT 8: 241	Land at Kanemakue, Keanae, gotten from Hoaai in 1844. 1. *Mauka*, Nalima; Hana, Kahuena; *Makai* and Hamakua, shore. 2. Pinaau (*Olona* land). *Mauka*, Waiapuka and Opunui; Hana, a *Kahawai*; *Makai*, Mamaikawaha; Hamakua, a *Pali*.	—	—	—	1	*Olona* *Kahawai*	N/A
Kaihu ***Helu 4856***	Keanae	5:375 & FT 8: 241	His land is in the *ili* of Haleakea at Keanae, gotten in 1829. 1. *Mauka*, Kuluhiwa & Kaea; Hana, *Konohiki*; *Makai*, Poola; Hamakua, Maewaewa ea. 2. 2 *loi* at Waiolea, the boundaries are not known; gotten from Kaype in 1819. Also an *Opu Olona* at Waianu, I do not know the boundaries.	—	2	—	1	*Loi (Kalo)* *Olona*	MA 7:444 RP 3357 Book 14:507

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Malaihaa ***Helu 4847***	Keanae	5:375 & FT 8: 242	In the *ili* of Kuo, at Keanae, held since 1819. It is an inheritance, gotten from Kauahikaua. 1. Kuo - *Mauka*, *Konohiki*; Hana, Mamaikawaha; *Makai*, Maewaewa; Hamakua, an *Auwai*. 2. Kuo - *Mauka*, Kelaea; Hana, a *Pali*; *Makai*, Mu; Hamakua, a *Pali*. 3. (A house lot in) The *ili* of Paehala and Kalihi with 1 *loi*. *Mauka*, Naohiki and Makea; Hana, the shore; *Makai*, Kaea; Hamakua, *Konohiki*. 4. At Kalihi. *Mauka*, *Konohiki*; Hana and *Makai*, Paele; Hamakua, Kealina. 5. 1 *loi* at Pohakuakane. *Mauka* Kuluhiwa; Hana, Kaiwilele; *Makai*, Mu; Hamakua, an *Auwai*. 6. 1 *loi* at Ololokuhi. *Mauka*, Kuluhiwa; Hana, Kaea; Hamakua, Maewaewa.	1	3	2	—	House *Loi (Kalo)* *Auwai*	MA 7:445 RP 3266 Book 14:325
Kahaukomo ***Helu 7784***	Keanae	5:376 & FT 8: 242	In the *ili* of Nuaailua at Keanae, gotten in the old days, before Kamehameha I. *Mauka* and Hana, a *Pali*; *Makai*, the sea; Hamakua, a *Kahawai*.	—	—	—	—	*Kahawai* *Kai*	MA 7:442 RP 2908 Book 13:279

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kinolau ***Helu 7785***	Honomanu	5:376 & FT 8: 242-243	In the *ili* of Halelaau, at Honomanu, gotten from C. Kanaina in 1847. 1. *Mauka*, Kahio; Hana, a *Malinai* (estuary – dune banked pool); *Makai* and Hamakua, a *Kahawai*. 2. A coconut grove in the *ili* of Kalalua. *Mauka*, *Konohiki*; Hana, Kapali; *Makai* and Hamakua, *Konohiki*.	—	—	—	1	*Kahawai* Coconut grove	MA 7:448 RP 2945 Book 13:373
Wahine ***Helu 7787***	Honomanu	5:376-377 & FT 8: 243	Kuhao sworn: the land of Wahine is in Kanaha, it is an *ili*, gotten from my father in 1839. 1. *Mauka* and Hana, a *Pali*; *Makai*, the land of Kahaule; Hamakua, a *Kahawai*. 2. 11 *loi* at Punalau, gotten in the year 1829. *Mauka*, Mahoe and Kanahua; Hana, a *Kahawai*; *Makai*, Kupihe; Hamakua, a *Pali*. 3. 5 *loi* at Halelaau, gotten from Kekio in 1839. *Mauka*, Kinolau; Hana, Kekoa; *Makai*, *loi* of Nalau; Hamakua, a *Pali*. 4. 6 *loi*, gotten from Niuli in 1833. *Mauka* Kekahumaiole; Hana, *Konohiki*; *Makai*, Aea; Hamakua, a *Pali*;	—	22	—	—	*Loi (Kalo)* *Kahawai*	MA 7:449 RP 7392 Book 27:487

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Malaiula (Malaihua) ***Helu 6723***	Honomanu	5:377 & FT 8: 243	Lands at Palawai, an *ili* in Honomanu, gotten in 1833, during the time of Hoapili. 1. *Mauka*, Makaula; Hana, *Konohiki*; *Makai*, a *Kahawai*; Hamakua, *Konohiki*. 2. 1 *loi* at Niuli'i. *Mauka*, Aea; Hana, *Konohiki*; *Makai* and Hamakua, Aea. [March 28, 1853, Malaiula gave up his claim, returning the *aina* to D. Ii, *Konohiki* (see DLNR 2-1).]	—	1	—	—	*Loi (Kalo)* *Kahawai*	MA 7:449 RP 5438 Book 21:531
Kekio ***Helu 3187***	Honomanu	5:377 & FT 8: 243-244	At Kahina in Honomanu, gotten from C. Kanaina in 1839. *Mauka*, Hana, and *Makai*, a *Kahawai*. Hamakua, a *Pali*.	—	—	—	—	*Kahawai*	MA3:836 RP 7612 Book 28:381
Palaile ***Helu 10828***	Honomanu	5:377-378 & FT 8: 244	Land at Niuli'i in Honomanu, gotten from Maui in 1832. 1. *Mauka*, Kaaimakahiki; Hana, *Konohiki*; *Makai*, Keaweakanalu; Hamakua, a *Pali*. 2. 5 *loi* at Okahekahe. *Mauka*, Kanaloa; Hana, a *Pali*; *Makai* and Hamakua *Konohiki*. 3. 2 *loi* at Halelaau. *Mauka*, a *Loko* (fishpond); Hana, an *Auwai*; *Makai*, Knokoa; Hamakua, *Konohiki*. 4. 2 *loi*. *Mauka*, Kiihoa; Hana, an *Auwai*; *Makai*, Kauhanui; Hamakua, *Konohiki*. 5. 1 *loi*. *Mauka*, Kinolau; Hana, Wahine; *Makai*, *Konohiki*; Hamakua, a *Pali*.	—	10	2	—	*Loi (Kalo)* *Auwai* *Loko*	MA 3:834 RP 2944 Book 13:371

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kaniho ***Helu 10828 B***	Waihua	5:378 & FT 8: 244-245	The *Moo aina* of Kaniho is in the *Ili* of Palolena, at Waihua, Koolau. It was gotten from Keahi in 1842. 1. A *mo o kalo*, *Mauka*, a *Kahawai*; Hana, a *Pali*; Hana, Luiki; Hamakua, a *Kahawai*. 2. 1 *mo o* at Kalimapuhi, it is an old land. *Mauka*, Nakibei; Hana, an *Alanui*; *Makai*, *Konohiki*; Hamakua, an *Auwai*. 3. 1 *mo o* in the *Ili* of Kealaulaea at Wailua. *Mauka*, an *Alanui*; Hana, the house lot of Kaiwikuamoo; *Makai*, the shore; Hamakua, a *Kahawai*. 4. *Ili aina* of Waihuiiki. *Mauka*, *Kuahiwi* (the mountain); Hana, a *Pali*; *Makai*, the shore; Hamakua, an *Auwai*. 5. A *Loko ia* (Fishpond) at Piikialawa. *Mauka*, the house lot of Kaholoua; Hana, a *Kahawai*; *Makai*, the *Alanui Aupuni*; Hamakua, an *Auwai*. 6. 3 *loi* at Paololena. *Mauka*, Wailauhia; Hana, a *Pali*; *Makai*, Naha; Hamakua, a *Kahawai*.	—	3	2	2	*Moo* *Loi (Kalo)* *Loko ia* *Auwai* *Kahawai* *Alanui*	MA 9:377 RP 2802 Book 13:65

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Mamaikawaha ***Helu 4854***	Keanae	5:378-379 & FT 8: 245	The land is at Kipapa, Keanae. Gotten from Nakahiewahu in 1836. 1. *Mauka*, a *Kahawai*; Hana, Kealima; *Makai*, Naaina; Hamakua, Malaihua. 2. *Ili* of Waieoea at Keanae. *Mauka*, Keakaimalu; Hana, Namakaoma; *Makai*, Maewaewa; Hamakua, Kealiinaea.	—	—	—	—	*Kahawai*	MA 3:477 RP 3270 Book 14:333
Kewe ***Helu 5061***	Kekuapawela & Puakea	5:379-380	His (*aina mahi ia*) cultivated lands are at Napali, in the *Ahupuaa* of Kekuapauwela, at Koolau. 1. *Mauka* and Hana, a *Pali*; *Makai* and Hamakua, a *Kahawai*. 2. *Mauka*, Makalae; Hana, Waiohue; *Makai*, the shore; Hamakua, a *Pali*. 3. *Olonu*. *Mauka*, Makahie; Hana, a *Pali*; *Makai*, Makahie; Hamakua, Kawa. 4. *Olonu*. *Mauka Kuahiwi*; Hana, (land of) Alalea; *Makai*, Koki; Hamakua, forest. 5. A new claim at Puakea, in the land of Palani. *Mauka*, Kaumakala; Hana, the *Alanui*; *Makai*, *Konohiki*; Hamakua, a *Pali*. 6. A *kahuahale*. *Mauka*, a *Pali*; Hana, *Makai*, and Hamakua, a *Kahawai*.	1	—	—	5	*Kahawai* *Olonu* *Alanui* *Kahuahale*	N/A

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Makuakane ***Helu 4754*** (see *Helu* 4832)	Kapaula & Wailaulau	5:381 & FT 8: 246	Land in the *Ahupuaa* of Kapaula. There are five *wahi mahi* (cultivated parcels), which he has worked from the old time, held since 1819. 1. *Mauka*, a *Pali* & *Kahawai*; Hana, a *Kahawai*; *Makai*, the land of Nalau; Hamakua, a *Pali*. 2. *Mauka*, the *Alanui*; Hana, A *Kahawai*; *Makai*, a *Pali Kahawai*; Hamakua, *Konohiki*. 3. *Mauka*, an *Alanui*; Hana, Kaahiki; *Makai*, *Konohiki*; Hamakua, a *Kahawai*. 4. *Ahupuaa* of Wailaulau. *Mauka* and Hana, a *Pali*; *Makai*, a *hau* (clump); Hamakua, a *Kahawai*. 5. *Olonu* land at Wailaulau. *Mauka*, Hana, *Mekei*, and Hamakua, there are no people around.	—	—	—	5	*Olonu* *Kahawai* *Alanui* *Opu hua*	MA 3:850 RP 2790 Book 13:41

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kaahiki ***Helu 4925*** (see *Helu* 4832)	Kapaula	5:381 & FT 8: 246	Kaahiki's land at Kapaula was gotten in 1820. 1. *Mauka*, the land of Nalau; Hana, a *Pali*; *Makai*, Kaaikai; Hamakua, Nalau. 2. *Mauka*, Kaumaka; Hana, the *Alanui*; *Makai*, Kanakaole; Hamakua, a *Kahawai*. 3. *Mauka* and Hana, *Konohiki*; *Makai*, the land of Kau; Hamakua, a *Pali*. 4. *Mauka*, an *Auwai*; Hana, and *Auwai*, and the *Alanui*; *Makai* and Hamakua, a *Kahawai*. 5. 4 *Kihapai Olonu*. *Mauka*, the *Kuahiwi* (no one around).	—	—	1	8	*Kihapai Olonu* *Kahawai* *Alanui* *Auwai*	MA 3:846 RP 2789 Book 13:39
Kaumaka ***Helu 4925 K*** (see *Helu* 4832 & 5155)	Kapaula	5:381-382	Land at Kapaula. It is an old possession, held prior to 1819. 1. *Mauka*, the *Alanui* and land of Kau; Hana, a *Kahawai*; *Makai*, Kaahiki; Hamakua, a *Kahawai*. 2. *Mauka*, *Konohiki*; Hana, a *Kahawai*; *Makai*, the *Alanui*; Hamakua, a *Kahawai*. 3. *Mauka*, an *Auwai*; Hana, an *Alanui pii* (trail to uplands); *Makai*, Kauhiki; Hamakua, a *Kahawai*. 4. *Olonu*, in the distant uplands. Three parcels, the boundaries are not known.	—	—	1	3	*Alanui* *Kahawai* *Auwai* *Alanui pii* *Olonu*	N/A

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kanukualii ***Helu 4925 B*** (see *Helu* 5039 B)	Waiohue	5:382 & FT 8: 247	Land in the *Ahupuaa* of Waiohue, gotten in 1819, and one, earlier than that. 1. *Mauka*, *Konohiki*; Hana, a *Kahawai*; *Makai*, the sea; Hamakua, an *Alanui*. 2. *Mauka*, the forest; Hana, a *Kahawai*; *Makai*, *Konohiki*; Hamakua, a *Kahawai*. 3. 15 parcels of *Olonu*, in the mountain.	—	—	—	15	*Kahawai* *Olonu* *Alanui*	N/A
Nalau ***Helu 4925 C (& 4797)*** (see also *Helu* 4832)	Kapaula Kapehu & Kapaukea	5:382-383 & FT 8: 247	Land at Kapaula, several *Kihapai* gotten in 1832, from Kaupena. 1. *Mauka*, Makuakane; Hana, a *Pali*; *Makai*, the seas; Hamakua, a *Pali*. 2. *Mauka*, an *Auwai*; Hana, Kaumaka; *Mekai*, and *Auwai*; Hamakua, the *Kahawai*. 3. At Kapaukea *Ahupuaa*. *Mauka*, an *Auwai*; Hana, the land of Pumaia; *Mekai* and Hamakua, the *Konohiki*. 4. 7 *Opu Olonu* at Kapaula and Kapehu *Ahupuaa*.	—	—	2	10	*Auwai* *Kahawai* *Opu Olonu*	MA 3:845 RP 3269 Book 14:331
Kalawaia ***Helu 4925 D*** (see *Helu* 4832 & 4830)	Kapaukea & Waiohue	5:383 & FT 8: 247	His land is at Kapaukea and Waiohue. One is an old holding, and the other, Paukea, was gotten from Kalani (S. Grant) in 1840. 1. *Mauka*, Pumaia; Hana, Kaliae; *Makai*, Pumaia; Hamakua, Makapowale. 2. 12 *Opu Olonu* at Waiohue.	—	—	—	12	*Opu Olonu*	N/A

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Wahahua ***Helu 4925 E*** (see *Helu* 4831)	Kapuaikea & Waiohue	5:383 & FT 8: 247-248	His lands are at Kapuaikea and Waiohue, gotten from Kalani (S. Grant) in 1840. Kaukuali'i gave him the *Kihapai* at Waiohue; and in 1832, he got Puakea. *Mauka, Konohiki*; Hana, an *Auwai*; *Makai*, Kaia; Hamakua, a *Pali*. At Waiohue, there are 2 *Opu Olona*.	—	—	1	3	*Kihapai* *Auwai* *Opu Olona*	N/A
Malaihi ***Helu 4925 F*** (see *Helu* 4752)	Kapehu	5:383 & FT 8: 248	His land is at Kapehu, gotten from Kamokuali'i in 1839. 1. *Mauka, Konohiki*; Hana, a *Kahawai*; *Makai*, a *Pali*; Hamakua, a *Kahawai*. 2.*Mauka, Konohiki*; Hana, an *Auwai*; *Makai*, a *Pali*; Hamakua, a *Kahawai*. There is 1 *Opu Olona*, in the distant uplands.	—	—	1	1	*Kahawai* *Auwai* *Opu Olona*	N/A
Kaaukai ***Helu 4925 G***	Kapuula & Kapuaikea	5:383-384 & FT 8: 248	His land was gotten from Kamokuali'i in 1819 in 1840. 1. At Kapuula. *Mauka*, a *Pali*; Hana, a *Kahawai*; *Makai*, the land of Nalau; Hamakua, Makuakane, Nalau and Kauhiki. 2. 1 *loi* at Kapuaikea. *Mauka, Konohiki*; Hana, an *Auwai*; *Mahai* and Hamakua, an *Auwai*.	—	1	2	—	*Kahawai* *Auwai* *Loi (Kalo)*	N/A

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kamahine ***Helu 4925 H*** (see *Helu* 4832)	Wailualau	5:384 & FT 8: 248-249	His land is in the *Ahupuaa* of Wailualau, it was gotten from Kanui in 1832, but was taken away and given to another in 1848, by Kapiko, the *Konohiki*. The land was restored to him until the *Luna Aaluu* (Tax Assessor), Kahale , collected taxes. The tax on this *Ahupuaa* was $3.00, and the *Konohiki* said the land should be given to the person who would pay the tax. Mr. Grant paid the tax, and took possession. 1. *Mauka, Konohiki*; Hana, a *Pali*; *Mahai, Konohiki*; Hamakua, a *Kahawai*. 2. *Mauka, Konohiki*; Hana, a *Pali*; *Mahai* and Hamakua, a *Kahawai*. 3. *Mauka*, a *Kahawai*; Hana, *Konohiki*; *Makai* and Hamakua, a *Kahawai*. 4. *Mauka*, an *Alanui*; Hana, *Konohiki*; *Makai*, *Konohiki*; Hamakua, an *Alanui*. It is contested at this time. I (Maluaikane) confirm that these things are all his old *kuleana*.	—	—	—	—	*Kahawai* *Alanui* (Disputed)	N/A

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Makua ***Helu 4868***	Makapipi	5:388 & FT 8: 253	His land is the *ili* of Kahi at Makapipi, I gave it to him in 1839. 1. *Mauka*, Pahia; Hana, an *Auwai*; *Makai*, Keomowaiki; Hamakua, Liulin. 2. *Olona, Mauka* and Hana, a *Pali*; *Makai*, Puupuu; Hamakua, a *Kahawai*.	—	—	1	1	*Olona* *Auwai* *Kahawai*	N/A
Keomowaiki (Kaumoki) ***Helu 4869***	Makapipi & Honolulu	5:388-384 & FT 8: 253	Kaohe is the name of his land, Kaeha gave it to him in 1839. 1. *Mauka*, Keomowaiki; Hana, an *Auwai*; *Makai*, an *Alanui*; Hamakua, Liuliu. 2. 2 *loi* in the *Ahupuaa* of Honolulu. *Mauka, Konohiki*; Hana, an *Auwai*; *Makai*, house lot of Hilihewa; Hamakua, a *Pali*. 3. *Ili* of Kaukauwai at Makapipi. *Mauka*, Piapia; Hana, a *Pali*; *Makai, Konohiki*; Hamakua, Kalohelau.	—	2	1	—	*Auwai* *Loi (Kalo)* *Alanui*	MA 3:847 RP 2626 Book 12:101

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Keliiokekanaka ***Helu 4869 & 4870***	Makapipi & Honoluliiki	5:389 & FT 8: 253-254	In the *ili* of Wauwaa at Makapipi 1. Gotten in 1839. 1. *Mauka*, Puupuu; Hana, a *Pali*; *Makai*, Kalohelau; Hamakua, Liulin's land; 2. *Ili* of Waikupo at Makapipi 2. *Mauka*, a *Kahawai*; Hana, an *Auwai Kahawai*; *Makai*, Makamakaole; Hamakua, a *Kahawai*. 3. *Ili* of Maikikoia at Makapipi. *Mauka*, Makamakaole; Hana, an *Auwai Kahawai*; *Makai* and Hamakua, a *Kahawai*. 4. *Opu Olona*, all in the *wao* (wilderness) surrounded by the forest growth on the mountain. 5. 4 *loi* at Honoluhiiki. *Mauka, Konohiki*; Hana, Papuaa; *Makai*, Kahua; Hamakua, a *Kahawai*.	—	4	2	1	*Loi (Kalo)* *Opu Olona* *Auwai* *Kahawai*	MA 3:848 RP 2625 Book 12:97
Kalohie ***Helu 4871***	Honolulumui	5:389 & FT 8: 254	His land is in the *ili* of Olopana at Honoluhunui, gotten long before the year 1819. *Mauka*, the forest; Hana, a *Kahawai* and Uaua's land; *Makai*, the sea.	—	—	—	—	*Kahawai*	MA 3:849 RP 2620 Book 12:77
Kukalau ***Helu 4872***	Honolulu	5:389 & FT 8: 254	His land is in the *ili* of Kaubipoko at Honolulu, gotten in 1839. *Mauka*, Kalohie; Hana, the land of Uaua; *Makai*, the sea; Hamakua, Kalohie.	—	—	—	—	—	N/A

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kalei ***Helu 4873***	Makapipi & Honolulu	5:390 & FT 8: 254-255	In the *ili* of Kuemanu at Makapipi, gotten in 1839. 1. *Mauka*, Liuliu; Hana, a *Pali*; *Makai*, Keliiokekanaka; Hamakua, Makua. 2. 5 *loi* at Honolulu iki. *Mauka, Konohiki*; Hana, Kaai; *Makai*, *Konohiki*; Hamakua, a *Pali*.	—	5	—	—	*Loi (Kalo)*	N/A
Aoao (Deceased) ***Helu 4851***	Honolulu	5:390 & FT 8: 254	His land is in Kahoana at Honolulu, gotten before the year of 1819. *Mauka, Konohiki*; Hana, a *Kahawai*; *Makai*, Kukalaau; Hamakua, Kalohie.	—	—	—	—	*Kahawai*	MA 7:186 RP 2807 Book 13:75
Uaua ***Helu 4852***	Honolulu	5:390	Kawiwi is his land at Honolulu, held since 1840. *Mauka*, a *Kahawai*; Hana, Honoluhiiki; *Makai*, Kukalaau; Hamakua, Kalohie.	—	—	—	—	*Kahawai*	MA 3:849 RP 7918 Book 30:609
Kaai ***Helu 4850***	Honolulu iki & Kukui	5:390 & FT 8: 255	He has 5 *loi*, gotten in 1839 from Kaeha. 1. *Mauka*, Naholo; Hana, a *Pali*; *Makai*, Naholo; Hamakua, a *Pali*. 2. A *kalo* land at Kukui. *Mauka*, *Konohiki*; Hana, an *Auwai*; *Makai*, Kalohelau; Hamakua, a ridge.	—	5	1	—	*Loi* *Kalo* *Auwai*	N/A

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kauanoa ***Helu 3041***	Honolulumui & Makapipi	5:391 & FT 8: 255	His land is 7 *loi* at Honoluhunui, gotten from Nailima in 1819. 1. *Mauka*, Hilihewa; Hana, Paikuiku; *Makai*, a *Pali*; Hamakua, my land. 2. A *kahuahele* at Makapipi. *Mauka*, Kaeha; Hana, Papuaa; *Makai*, the sea; Hamakua, an *Alanui*.	1	7	—	—	*Loi (Kalo)* *Kahuahele*	N/A
Kalohelau (Lahilau) ***Helu 4849 B*** (see *Helu* 4849)	Makapipi & Kukui	5:391 & FT 8: 255 & FT 16:101-102	His land is in the *ili* of Kaahumanuana, at Makapipi. He got it in 1839. 1. *Mauka*, Kalei; Hana, Keliiokekanaka; *Makai*, an *Alanui*; Hamakua, Keomowaiki. 2. A *kahuahele*. *Mauka*, an *Alanui*; Hana, a Gulch; *Makai*, Papuaa; Hamakua, a *Kahawai*. 3. *Kalo* land at Kukui *Ahupuaa*. *Mauka*, an *Alanui*; Hana, Kapuaa; *Makai*, an *Alanui*; Hamakua, a *Pali*. 4. 3 *loi*. *Mauka*, Naholo; Hana, Puakea; *Makai*, Kauanoa; Hamakua, a *Kahawai*.	1	3	—	—	*Loi* *Kalo* *Kahuahele* *Alanui* *Kahawai* *Poalima (2)*	MA 8:143 RP 1347 Book 5:269

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kalohelau (Lahilau) (cont'd.) ***Helu 4649 B*** (see *Helu* 4849)	Makapipi & Kukui	5:391 & FT 8: 255 & FT 16:101-102	Two *loi* in Honolulu awarded to Clt. Are said by all the people to be poalimas, while Clt. Was Konohiki's *luna* in Honolulu Koolau he had the use of these *loi* as *Konohiki*, in the same manner as his predecessor had done, and also as his successor had them since, but in my opinion he entered a claim wrongfully for the *loi* and they should be stricken from his award unless the time is past for correcting it. They probably occupy an entire lot in the award of Clt. Running thus,: Beg. At S.W. corner & run S. 86 ¾ ° E. 1.32 Ch. N. 9 °E. 2.42 Ch. N. 79 ½ ° W. 1.09 Ch &c, and make about 3/10 of an acre. Clt. Says his award is in the Land office waiting a Royal Patent, and he will soon go for it.						

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Holoua (Kaholoua) ***Helu 6768***	Kukui, Honolulu & Makapipi	5:391 & FT 8: 256	His land is the *ili* of Hakiole at Kukui, gotten in 1840. 1. *Mauka*, the Mountain; Hana, land of the *Konohiki*, *Makai*, the Sea; Hamakua, Makapipi. 2. 8 *loi* at Honolulu. *Mauka*, Kaikalaau; Hana, a Ridge; *Makai*, Keliiokekanaka; Hamakua, a *Pali*. 3. A *kahuahale* at Makapipi. *Mauka*, an *Alanui*; Hana, Kukui; *Makai*, a *Pali*; Hamakua, a *Pali*.	1	8	—	—	*Loi (Kalo)* *Kahuahale* *Alanui*	N/A
Naholo ***Helu 6768 C*** (see also *Helu* 4788)	Honohuluiki	5:392 & FT 8: 256	His land is at Ihiihimai in Honohuluiki, it is an old land, and given to him by Kaeha in 1839. 1. *Mauka* and Hana, a *Pali*; *Makai*, Mu; Hamakua, a *Kahawai*. 2. A *kahuhale*. *Mauka*, the land of Mu; Hana, a *Kahawai*; *Makai*, the Shore; Hamakua, a *Pali* and Honoluluuui. 3. *Mauka*, Mu; Hana, an *Alanui*; *Makai*, a *Kahawai*; Hamakua, Honoluluuui.	1	—	—	—	*Kahuahale* *Kahawai* *Alanui*	MA 7:195 RP 2809 Book 13:79

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Naeole ***Helu 4665 F***	Keanae	5:401 & FT 8: 265	His land is in the *ili* of Kapae at Keanae, gotten from Kauaioku in 1839. 1. *Mauka*, a *Kahawai*; Hana, Mahoe; *Makai*, Nailima; Hamakua, the Sea. 2. A *kula* (dry land planting area). *Mauka*, Opunui; Hana, Poolai; *Makai*, Kanehaku; Hamakua, a *Pali*. 3. A *Pahale* at Kanemukue. *Mauka*, Nailima; Hana, *Konohiki*; *Makai*, the Sea; Hamakua, the Sea.	1	—	—	1	*Kahawai* *Kula* *Pahale*	MA 3:831 RP 3274 Book 14:341
Ehu ***Helu 4665 G***	Keanae & Pahoa	5:402 & FT 8: 265-266 (& FT 16:114)	His land is at Kalihi in Keanae, gotten from Kanehaku in 1843. 1. *Mauka*, Nuohiki; Hana, Makea; *Makai*, Kaea; Hamakua, Kealina. 2. *Kula*. *Mauka*, Kanehaku; Hana and Makai, Makea; Hamakua, Kanehaku. 3. 2 *loi* in the *aina* of Kealina. *Mauka*, Kealina; Hana, Kalihi; *Makai*, Kealina; Hamakua, Mamaikawaha. 4. *Pahale* at Kukuiohoku. *Mauka*, Kaihu; Hana, the Sea; Hamakua, Kukuiolono; *Makai*, Maewaewa.	1	17	—	2	*Kula* *Loi (Kalo)* *Pahale* *Opu Olona* *Kahawai*	MA 9:361 RP 3341 Book 14:475 & MA 3:830 RP 4062 Book 17:121

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Ehu (cont'd.) ***Helu 4665 G***	Keanae & Pahoa	5:402 & FT 8: 265-266 (& FT 16:114)	5. 9 *loi* in the *Ahupuaa* of Pahoa 1. *Mauka*, Mahoe; on the three remaining sides, surrounded by a *Pali*. 6. *Opu Olona*. *Mauka*, Kimuna's land; Hana, Lukua's land; *Makai*, Kealina's land; Hamakua, Naohiki's land. 7. 6 *loi* in the *Ahupuaa* of Pahoa 2. *Mauka*, *Konohiki*; Hana, Kaleo; *Makai*, a *Pali*; Hamakua, a *Kahawai*.						
Naohiki ***Helu 4665 H*** (& *4857*)	Keanae	5:402 & FT 8:266	His land is in the *ili* of Waiaolohe at Keanae, he has resided there since 1834 . 1. *Mauka* and Hana, a *Pali*; *Makai*, Makea; Hamakua, Kealina. 2. *Aina Olona* at Kuainoa in Keanae. *Mauka*, Punalau; Hana, *Konohiki*; *Makai*, Kuainoa; Hamakua, a *Pali*. 3. *Opu Olona* at Kawaaane. *Mauka*, Poolai; Hana, a *Kahawai*; *Makai*, Opunui; Hamakua, a *Pali*.	—	—	—	2	*Opu Olona* *Kahawai*	MA 9:362 RP 3267 Book 14:327

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kalawaia and Kauakahi ***Helu 4665 I***	Keanae	5:402-403 & FT 8:266-267 (& FT 16:101)	In the land of Kipapa gotten in 1836. 1. *Mauka*, Kanehaku; Hana, Kamoku's land; *Makai*, my land Ouole; Hamakua, the Sea. 2. A *kahuahale* at Kapae. *Mauka* and Hana my land; *Makai*, Nailima; Hamakua, the Sea. 3. *Opu Olona* at Waianu. *Mauka*, Keaupuni; Hana, a *Pali*; *Makai*, a *Kahawai*; Hamakua, *Konohiki*. 4. *Opu Olona* 2. *Mauka*, Piwai; Hana, Kaimoa; *Makai*, a *Kahawai*; Hamakua, Umikanaha. 5. *Opu Olona* 3 at Keana. *Mauka*, a *Pali*; Hana, a *Kahawai*; *Makai*, Naehu; Hamakua, a *Pali*.	1	—	—	3	*Kahuahale* *Opu Olona* *Kahawai*	MA 3:825 RP 3106 Book 14:3

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kanuku ***Helu 4665 K***	Keanae	5:403 & FT 8:267	His land is at Panuewa in Keanae, gotten in 1834. 1. *Mauka*, Umikanaha; Hana, Mu; *Makai*, Kelilaea; Hamakua, a *Kahawai*. 2. 3 *loi* at Makaiwa. *Mauka*, Umikanaha; Hana, Kanehaku; *Makai*, Kailio; Hamakua, a *Pali*. 3. 1 *loi* at Kuo. *Mauka*, *Poalima*; Hana, Mumaikawaha; *Makai*, Kaukalali; Hamakua, *Konohiki*. 4. *Kalo* at Panaewa. *Mauka*, Kamakau; Hana, a *Kahawai*; *Makai*, Kalimaea; Hamakua, Nailima. 5. *Opu Olona* at Kapai. *Mauka*, *Konohiki*; Hana, Kalawaia; *Makai*, Kaiwiele; Hamakua, a *Kahawai*.	—	4		2	*Loi (Kalo)* *Poalima* *Kahawai* *Opu Olona* *Kula*	MA 3:840 RP 3352 Book 14:497

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Hoonoho ***Helu 4587***	Wailua	5:411, 430 & FT 8:274, 288	His land is a *Moo aina* at Keoneonalu *ili*, at Wailua, Koolau. He has resided there since 1819. *Mauka*, Moo; Hana, *kuke*; *Makai*, Naiaipa; Hamakua, Wahapuu. His land is a *Moo* at Keoneonalu, I (Kanihoi) gave it to him in 1839. 1. *Mauka*, the land of Moo; Hana, *Konohiki*; *Makai*, *Konohiki*; Hamakua, Kaohilae. 2. 1 *loi* at Paakamaka. *Mauka*, *Konohiki*; Hana, an *Auwai*; *Makai*, Kuwai; Hamakua, the land of Kaiwa. 3. A *kahuahale* at Paehala. *Mauka*, Kuwai; Hana, Papuaa; *Makai*, Kekahuna; Hamakua, an *Auwai*.	1	1	2	—	*Loi (Kalo)* *Auwai* *Moo* *Kahuahale* *Kalo*	MA 3:845 RP 2806 Book 13:73
Kawaloa (Kaawaloa) ***Helu 4853***	Waiahole	5:428 & FT 8:290	His land is at Waiahole in Koolau. It is a small *Ahupuaa*, gotten from Maluawai prior to 1839. *Mauka*, *Amaumau* (growth of fern); Hana, the land of Kekua; *Makai*, a *Pali*; Hamakua, a *Kahawai*. *Kihapai Olona*, at Kapia; surrounded by the *Konohiki*.	—	—	—	1	*Kahawai* *Kihapai Olona*	MA 8:142 RP 2308 Book 13:77
Kahaka ***Helu 4853 B*** (see also *Helu* 4867 B)	Keaa	5:428-429 & FT 8:290-291	His land is at Ahiakala, an *ili* in Keaa, at Koolau. It is an old land gotten from Ku, before 1829. *Mauka*, *Amaumau*; Hana, a Ridge; *Makai*, the *Alanui Aupuni*; Hamakua, a *Kahawai*.	—	—	—	—	*Alanui Aupuni* *Kahawai*	MA 8:136

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kuwai ***Helu 3499***	Waiha & Pauwalu	5:429 & FT 8: 288-289	His land is a *Kihapai* at Waieli, an *ili* at Waiha. Ku gave it to him in 1843. 1. *Mauka*, the land of Kaiwi; Hana, the land of Pahukaa; *Makai*, *Konohiki*; Hamakua, land of Kahahei. 2. A *Kihapai* at Palolena. *Mauka*, the land of Kanihoi; Hana, the *Auwai*; *Makai*, the land of Wailuahiu; Hamakua, a *Kahawai*. 3. A *Kihapai* at Paakamaka. *Mauka*, the land of the *Konohiki*; Hana, the *Auwai*; *Makai* and Hamakua, the land of Kaiwa. 4. A *Kihapai*. *Mauka*, *Konohiki*; Hana, the land of Kaiwa; *Makai* and Hamakua, the land of Kuikui. 5. A *kihapai* (2 *loi*) at Keoneonalu. *Mauka*, Kaohilae; Hana, land of Hoonoho; *Makai*, Hoonoho; Hamakua, *Konohiki*. 6. *Moo* of Paepaemoana, at Pauwalu. Surrounded on all sides by the *Konohiki*.	—	2	2	4	*Kihapai* *Loi (Kalo)* *Auwai* *Moo*	MA 3:844 RP 3264 Book 14:321

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kaumauma ***Helu 11043 B***	Wailua	5:429-430 & FT 8: 289	His land is at Waieli in Wailua, I (Kamiho) gave it to him in 1819. 1. *Mauka*, an *Auwai*; Hana, the land of Kahahei; *Makai*, the land of Kaiwikaola; Hamakua, my land. 2. A *kihapai* (2 *loi*) at Keoneonalu. *Mauka*, land of *Konohiki*; Hana, an *Auwai*; *Makai*, the land of Waiapea; Hamakua, the *Alanui*. 3. *Mauka*, *Konohiki*'s land; Hana, Kaohilae; *Makai*, land of Waiapea; Hamakua, land of Kaumaumi. 4. A *kahuahale* in the *ili* of Pikalawa. *Mauka*, an *Alanui*; Hana, the land of Kapali; *Makai*, the lot of Kaohilae; Hamakua, Papuaa.	1	2	2	—	*Auwai* *Kihapai Loi (Kalo)* *Kahuahale* *Alanui*	MA 3:614 RP 2786 Book 13:33

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kapahukaa ***Helu 4587 B*** (& ***6778***)	Wailua	5:430-531 & FT 8: 289-290	His land is a *Moo* at Waikani, gotten before 1839. 1. *Mauka*, an *Auwai*; Hana, *Konohiki*; *Makai*, *Konohiki*; Hamakua, Kahauhinenui. 2. A *Kihapai* at Waieli. *Mauka*, the land of Kaholoua; Hana *Makai*, and Hamakua, *Konohiki*. 3. A *Kihapai*. *Mauka*, the land of Kaulia; Hana, the land of Kalawaiia; *Makai*, *Konohiki*; Hamakua, Wahinemaikai. 4. 3 *loi* at Waieli. *Mauka*, the land of Naiwi; Hana, the land of Kaiwikaola; *Makai*, a *kula*; Hamakua, the land of Kuwai. 5. A *Kihapai loi*. *Mauka*, and *Auwai*; Hana, the land of Kaiwikaola; *Makai*, land of Naiwi; Hamakua, the land of Kahahei. 6. A *kahuahale* at Pikalawa. *Mauka*, Kaohilae; Hana, the lot of Kapali; *Makai*, the sea; Hamakua, Papuaa.	1	4	2	2	*Moo* *Loi (Kalo)* *Kihapai* *Kahuahale* *Kalo* *Auwai*	MA 3:615 RP 3262 Book 14:317

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Umaikealani ***Helu 4853 C***	Kaliae, Waihauiki & Waiha	5:431 & FT 8: 291	A *moo* of land is in the *Ahupuaa* of Kaliae. I (Kaniho) gave it to him in 1839. 1. *Mauka* and Hana, a *Pali*; *Makai*, Ohule; Hamakua, a *Kahawai*. 2. A *pa hale* at Wailuaiki. *Mauka*, a *Pali*; Hana, the lot of Ohule; *Makai*, an *Alanui*; Hamakua, Kekua. 3. 2 *loi* at Kaahu, an *ili* in Waiha. *Mauka* and Hana, Kaumiumi; *Makai*, Kaiwa; Hamakua, a *Kahawai*. 4. 1 *loi*. *Mauka*, Wahinemaikai; Hana, *Makai*, and Hamakua, Kaholoua. 5. 2 *loi* at Waielinui. Surrounded on all sides by Kahahei. 6. 4 *loi*. *Mauka*, my land; Hana, an *Alanui*; *Makai*, the land of the *Konohiki*; Hamakua, my land. 7. 1 *loi* at Palolena. *Mauka* and Hana, the land of Ku; *Makai*, the land of Kekanaka; Hamakua, a *Kahawai*.	1	10	—	—	*Pa hale* *Loi (Kalo)* *Kahawai* *Alanui*	MA 3:840 RP 3253 Book 14:299

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Naha ***Helu 4853 D***	Waihua	5:431-432 & FT 8: 291	His land is in the *ili* of Palolena, at Wailua. I (Kaniho) gave it to him in 1846. 1. *Mauka*, my land; Hana, *Konohiki*; *Makai* and Hamakua, a *Kahawai*. 2. A *Kihapai Olona*. *Mauka*, Kealii; Hana, Wahinemaikai; *Makai* and Hamakua, a *Kahawai*. 3. 2 *loi* at Paulae. *Mauka* and Hana, Makaoke; *Makai*, an *Alanui*; Hamakua, Kaholoua.	—	2	—	1	*Loi (Kalo)* *Kihapai Olona* *Kahawai* *Alanui*	MA 3:832 RP3276 Book 14:345
Kahahei ***Helu 4853 E***	Waihua	5:432 & FT 8: 292	His land is at Waieli, gotten from Ku in 1839. 1. *Mauka*, and *Auwai*; Hana, Kiowai; *Makai* and Hamakua, *Konohiki*. 2. A *pa hale*. *Mauka*, *Konohiki*; Hana, Kaiwikaola; *Makai*, and *Auwai*; Hamakua, *Konohiki*. (1/4 Acre) 3. A *Kihapai Olona* at Paakamaka. *Mauka*, Kaahaea; Hana, *Konohiki*; *Makai*, a *Kahawai*; Hamakua, *Konohiki*.	1	—	2	1	*Kihapai Olona* *Pa hale* *Auwai* *Kahawai*	MA 3:844 RP 3277 Book 14:347

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kaahaiea ***Helu 4853 F***	Wailua	5:432 & FT 8: 292	His land is a *Moo* at Palolena, gotten from Keahi in 1840. 1. *Mauka*, Ku; Hana, a *Pali*; *Makai*, the land of Kekanaka; Hamakua, a *Kahawai*. 2. A *Kihapai Olona* at Puakamaka, *Mauka*, Kuwai; Hana, a *Kahawai*; *Makai* and Hamakua, *Konohiki*. 3. A *Kihapai Olona* at Paehala. *Mauka*, Hana, and *Makai*, *Konohiki*; Hamakua, Puula.	—	—	—	2	*Moo* *Kihapai Olona* *Kahawai*	N/A
Kuheleaumoku ***Helu 4853 G***	Wailua & Keanae	5:432-433 & FT 8: 292	His land is at Keonomalu, gotten from Wahapuu in 1819. 1. *Mauka*, a *Pali*; Hana, Kaholowaa; *Makai*, Kekahuna; Hamakua, Kaanaana. 2. A *Kihapai Olona* at Kaakee. *Mauka* and Hana, a *Pali*; *Makai*, a *Kahawai*; Hamakua, a *Pali*. 3. A *Kihapai Olona* at Kapae in Keanae. *Mauka*, Nuehe; Hana, an *Alanui*; *Makai*, Paikaka; Hamakua, a *Pali*. 4. A *kahua hale* at Wailua. *Mauka* and Hana, an *Alanui*; *Makai*, Papuaa; Hamakua, *Konohiki*.	1	—	—	2	*Kihapai Olona* *Kahawai* *Kahua hale* *Alanui*	MA 3:612 RP 3255 Book 14:303

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Makea ***Helu 4853 H*** (see also *Helu* 4874)	Keanae	5:433 & FT 8: 294	His land is at Paehala, an *ili* of Keanae. Gotten from Kekapoi in 1839. 1. *Mauka*, the land of Naohiki; Hana, a *Pali*; *Makai*, the land of Kaea; Hamakua, the land of Ehu. 2. 2 *loi* at Kipapa. *Mauka*, the land of Keakaimalu; Hana, the land of Kamuku; *Makai*, the land of Kaliwaia; Hamakua, a *Papuaa* (pig enclosure).	—	2	—	—	*Loi (Kalo)* *Papuaa*	MA 7:506 RP 3656 Book 16:71
Kalawaia ***Helu 4853 I*** (see also *Helu* 4665 I)	Keanae	5:433-434 & FT 8: 293	His land is Kamakaihe, an *ili* at Keanae. Gotten from Kekapoi in 1839. 1. *Mauka*, the land of Naeole; Hana, Muhoe; *Makai*, Kanehaku; Hamakua, the shore. 2. A parcel of land (*pauku aina*). *Mauka*, my (Kealina) land; Hana, the land of Kamuku; *Makai*, the sea; Hamakua, Kahunkomo. 3. 1 *loi* in the *ili* of Punaewa. *Mauka*, Niau; Hana, an *Auwai*; *Makai*, *Konohiki*; Hamakua, Kalawaia. 4. 1 *loi*. *Mauka*, Kaea; Hana, the *loi* of Kamaliikapu; *Makai*, Keakaimalu; Hamakua, the land of Kamuku.	1	5	3	—	*Loi (Kalo)* *Auwai* *Kahua hale*	N/A

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kalawaia (cont'd.) ***Helu 4853 I*** (see also *Helu* 4665 I)	Keanae	5:433-434 & FT 8: 293	5. 1 *loi* at Makaiwa. *Mauka*, Ihamai; Hana, an *Auwai*; *Makai*, Kalimaeo's land; Hamakua, Kaula's land. 6. 1 *loi* at Pohakuokane. *Mauka*, Poola's land; Hana, Naaina's land; *Makai*, the land of Mu's land; Hamakua, an *Auwai*. 7. 1 *loi* at Kipapa. *Mauka*, Mamakiawaha; Hana, my land; *Makai*, my land; Hamakua, the land of Kaope. 8. A *kahua hale* at Kealakekua. *Mauka*, Muhoe; Hana, a *Pali*; *Makai*, Kaaimoi's land; Hamakua, a *Kahawai*. (1/4 Acre)						
Poolai ***Helu 4853 K***	Keanae & Wailua	5:434 & FT 8: 293-294	His land is in Painoni, an *ili* of Keanae. The *Kihapai* were given prior to 1839. 1. *Mauka*, the land of Kaihu; Hana, the shore; *Makai*, the sea; Hamakua, Maewaewa. 2. A *pauku aina* at Kukuinohoku. *Mauka*, Kealina; Hana, land of Kaleo; *Makai*, land of Makea; Hamakua, a *Kahawai*.	—	2	—	—	*Kihapai* *Loi (Kalo)* *Kahawai* *Moo*	N/A

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Poolai (cont'd.) ***Helu 4853 K***	Keanae & Wailua	434 & FT 8: 293-294	3. 2 *loi* at Waiapuka. All sides surrounded by the land of the *Konohiki*. 4. A *moo aina* at Waieli in Wailua. *Mauka*, a *Pali*; Hana, *Konohiki*; *Makai*, the land of Kaiwikaola; Hamakua, the land of Kahakaula.						
Kaopa ***Helu 4853 L*** (see also *Helu* 4860)	Keanae	5:434 & FT 8: 294 (& FT 16:101)	His land is in the *ili* of Koleamoku, at Keanae. Gotten from Kahewalu in 1839. 1. *Mauka*, Maewaewa; Hana, Kuluhiwa; *Makai*, Maewaewa 1; Hamakua, Maewaewa 2. 2. 2 *loi* at Waiola. *Mauka*, Mumaikawaha; Hana, Maewaewa; *Makai*, Kaihu; Hamakua, Keliiaea. 3. *Pahale* at Makaiwa. *Mauka* and Hana, an *Auwai*; *Makai*, *Konohiki*; Hamakua, Umikanaha. (1/4 Acre)	1	2	1	—	*Loi (Kalo)* *Auwai* *Pa hale*	MA 3:827 RP 3268 Book 14:329

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kuluhiwa ***Helu 4848***	Keanae & Waianu	5:434-435 & FT 8: 294	His land is in the *ili* of Ololoikeahi at Keanae. He got it from Kekapoi in 1824. 1. *Mauka*, my (Kealina) land; Hana, Kaea; *Makai*, Kaihu; Hamakua, the land of Kaopa. 2. A *kule* parcel. *Mauka* of Pilauolipi, the boundaries of this *kula* land are not known; 3. The *ili* of Olvia at Waianu. *Mauka*, Kamakaipooa's land; Hana, a *Pali*; *Makai*, Kamakaipooa; Hamakua, a *Kahawai*.	—	—	—	1	*Kula* *Kahawai*	MA 7:447 RP 3655 Book 16:69
Kane ***Helu 4848 B*** (see also *Helu* 4861)	Keanae	5:435 & FT 8: 294-295	His land is at Waiola, an *ili* in Keanae. Gotten from Kekapoi in 1839. 1. *Mauka*, Kanuku; Hana and *Makai*, the land of Maewaewa; Hamakua, Keliiaea. 2. 2 *loi* at Kipapu. *Mauka*, Mamaikawaha; Hana, Kalawaea; *Makai*, Maewaewa; Hamakua, Poola's land. 3. A *kahua hale* at Kanemakue. *Mauka*, Kanehaku; Hana, Poolai; *Makai* and Hamakua, the shore. (1/4 Acre) 4. A *pauku* (parcel) at Waiola. *Mauka*, Kaiulo; Hana, Kuo; *Makai*, the land of Mu; Hamakua, a *Kahawai*.	1	2	—	—	*Loi (Kalo)* *Kahua hale* *Kahawai*	N/A

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Keliiaea ***Helu 4848 C***	Keanae & Waianu	5:435 & FT 8: 295	His land is in the *ili* of Kuo at Keanae. Gotten from Kekapoi in 1829. 1. *Mauka*, the land of Kanuku; Hana, Kane; *Makai*, Kahuena; Hamakua, Muhoe. 2. A *pauku kula* (dry land parcel). *Mauka*, the land of Kalawaia; Hana, the land of Maewaewa; *Makai*, the land of Poola; Hamakua, a *Pali*. 3. A *Kihapai Olona* at Waianu. *Mauka*, Piwai; Hana, Kainoulehulehu's land; *Makai*, Kaula's land; Hamakua, Umikanaha's land.	—	—	—	2	*Kula* *Kihapai Olona*	MA 3:827 RP 38:12 Book 16:383
Umikanaha ***Helu 4848 D***	Keanae	5:436 & FT 8: 295	His land is in the *ili* of Makaiwa, gotten from Kekapoi in 1829. 1. *Mauka*, Kanehaku; Hana, an *Auwai*; *Makai*, Kanuku; Hamakua, a *Pali*. 2. *Kula* at Manoonui. *Mauka*, the land of Naeole; Hana, the land of Keohina's land; *Makai*, Kaea; Hamakua, a *Kahawai*.	—	—	1	1	*Auwai* *Kula* *Kahawai*	N/A
Maewaewa 2 (II) ***Helu 4848 E***	Keanae	5:436 & FT 8: 295-296 (& FT 16:107)	His land is in Laiuola 2, an *ili* in Keanae. It is an old land gotten in 1819. 1. *Mauka*, Poola's land; Hana, my (Kealina's) land; *Makai*, Kaopa; Hamakua, Mu's land. 2. 1 *loi* at Ololokeahi. *Mauka*, Kuluhiwa; Hana, Kaea; *Makai*, Kaihu; Hamakua, the land of Kaopa.	—	1	—	—	*Loi (Kalo)*	MA3:824 RP 3272 Book 14:337

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Maewaewa 1 (1) ***Helu 4848 F*** (see also *Helu* 4706)	Keanae	5:436 & FT 8: 296	His lands are at Kekaele and Kukuiolono, *ili* in Keanae. Gotten from Kauahikaua in 1819. *Mauka*, the land of Mu and Kuopu; Hana, the land of Kaihu; *Makai*, the sea; Hamakua, the land of Kane and Kahaena.	—	—	—	—	—	MA 9:362 RP 3332 Book 14:457
Mu ***Helu 4848 G***	Keanae	5:436-437 & FT 8: 296	His land is at Pohakuokane, an *ili* of Keanae. Gotten from Kaualoku in 1819. 1. *Mauka*, the land of Poola; Hana, Maewaewa; *Makai*, Maewaewa; Hamakua, Kanuku. 2. A *kula* parcel. *Mauka*, Kamakau; Hana, a *Kahawai*; *Makai*, the land of Niau; Hamakua, a *Pali*. 3. 2 *loi* at Lalaola. *Mauka*, Ehu; Hana, Kuhihiwa; *Makai*, Nauina; Hamakua, Ihu. 4. 1 *loi* at Halealuua. On three sides surrounded by Kaihu; Hamakua, Kaopa.	—	3	—	5	*Kula* *Loi (Kalo)* *Kihapai Olona* *Kahawai*	MA 3:826 RP 3346 Book 14:485

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Mu (cont'd.) ***Helu 4848 G***	Keanae	5:436-437 & FT 8: 296	5. 4 *kihapai Olono* at Waiapuka. *Olono* 1. *Mauka*, Opunui; Hana, a *Kahawai*; *Makai*, Opunui; Hamakua, a *Pali*. 6. *Olono* 2. *Mauka*, Kanekoa; Hana, *Konohiki*; *Makai*, Nachiki; Hamakua, a *Pali*. 7. *Olono* 3. *Mauka*, Ihunui; Hana, a *Kahawai*; *Makai*, Kauaina; Hamakua, Kaukahi. 8. *Olono* 4, Lonowai. *Mauka*, Kaaukai; Hana, a *Kahawai*; *Makai*, Nahale; Hamakua, Kaaukai.	—	3	—	5	*Loi (Kalo)* *Kihapai Olona* *Kahawai*	MA 3:826 RP 3346 Book 14:485
Kaihaa ***Helu 3472***	Pauwalu	5:437 & FT 8: 297	His land is at Lakini, a *Moo* parcel at Pauwalu. Gotten from Kaaua in 1839. 1. This land is surrounded on all sides by the land of the *Konohiki*. 2. A *kalo* land in Pauwalu. *Mauka* and Hana, Wailua; *Makai*, the sea; Hamakua, Puula's land.	—	—	—	1	*Moo na Lalini Kula*	MA 3:846 RP 2803 Book 13:67

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Barenaba ***Helu 3472 B***	Keanae	5:437-438 & FT 8: 297	His land is at Kalaloi, an *ili* in Waianu. Gotten from Lukua in 1839. 1. *Mauka*, *Konohiki*; Hana, a *Kahawai*; *Makai* , *Konohiki*; Hamakua, the land of Ehu. 2. *Ili* of Pahoa at Keanae, gotten in 1829. *Mauka*, Naeole; Hana, a *Kahawai*; *Makai* , a *Kahawai*; Hamakua, the land of Mahoe. 3. 2 *loi* at Koleamoku. *Mauka*, Keaka; Hana, Nauina; *Makai*, the land of Puuohu; Hamakua, Maewaewa 1. 4. 1 *loi* at Kaapohaku. *Mauka*, Piiwai; Hana, Kuopu; *Makai*, Poola; Hamakua, an *Auwai*. 5. 1 *loi* at Kalihi. *Mauka* and Hana, Malaihua; *Makai*, Puapua; Hamakua, Ehu. 6. 1 *loi* at Waiaolohe. *Mauka* and Hana, Naohiki; *Makai*, Makea; Hamakua, Naohiki. 7. A *Kihapai Olono* at Kukuiohaku. *Mauka*, and all sides, the *Konohiki*.	—	5	—	1	*Loi (Kalo)* *Kihapai Olona* *Auwai* *Kahawai*	MA 9:360 RP 2810 Book 13:81

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kailio ***Helu 4848 H***	Keanae	5:438 & FT 8: 294-295 (& FT 16:101)	His land is in Kealakekua at Kahawaa. Gotten in 1839. 1. *Mauka*, the land of Mahoe; Hana, the land of Keliinea; *Makai*, Mahoe; Hamakua, Kalawaia. 2. 5 *loi* at Maikaiwa. *Mauka*, the land of Umikaumaka; Hana, *Konohiki*; *Makai*, the land of Kaopa; Hamakua, a *Pali*. 3. A *pu hala* at Kanemakiae. *Mauka* and Hana, Naeole; *Makai*, Kanemakiae; Hamakua, the shore.	1	5	—	—	*Loi (Kalo)* *Pa hale*	MA 3:829 RP 3271 Book 14:335
Kaaimakahiki ***Helu 6438***	Honomanu	5:438	*Mahaula Hoohikila: Ua ike au. Ua pau kena kaleana i ka wai, ua poino a pilikia maoli, aa hoalele i kona kaleana.* Mahaula sworn: I know that his entire *kuleana* was destroyed by the water and there was great trouble. He has abandoned his *kuleana*.	—	—	—	—	*Kuleana* destroyed by water	N/A
Makaula ***Helu 7786***	Honomanu	5:438-439	His land is the *Moo* of Koaie in Kahaunui, at Honomanu. It is an old place gotten from his father and he has had it since 1819. 1. *Mauka*, the mountain ; on the three remaining sides is the *Pali*. 2. 2 *loi* at Kahaunui. *Mauka*, the land of Makauole; Hana, an *Ahupua'a*; *Makai*, the land of Kamapii; Hamakua, *Konohiki*.	—	5	—	—	*Loi (Kalo)* *Ahupua'a* *Moo*	N/A

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Makaula (cont'd.) ***Helu 7786***	Honomanu	5:438-439	3. 2 *loi*. *Mauka*, Kamapii; Hana and *Makai*, an *Alanui*; Hamakua, the land of Palaie. 4. 1 *loi*. *Mauka*, Papuka; Hana and *Makai*, an *Alanui*; Hamakua, the land of Nawale.						
Nawele ***Helu 7791***	Honomanu	5:439	His land is at Punalau, an *ili* in Honomanu, gotten from Kinolau in 1839. 1. *Mauka*, an *Alanui*; Hana, a *Kahawai*; *Makai*, and Hamakua, an *Alanui*. 2. 1 *loi* at Kaluanui. *Mauka*, Kekahuna; Hana, my (Makaula) land; *Makai*, an *Auwai*; Hamakua, Kanewalawala.	—	1	1	—	*Loi (Kalo)* *Kahawai* *Auwai* *Alanui*	N/A
Luka Keuoho ***Helu 3957 B***	Makaiwa Punaluu Kolea	5:439	His land is at Makaiwa, at Kaloa, Koolau. It is an old land gotten from Kaehelu'oeg before 1819. 1. *Mauka*, forest; Hana, the land of Kekua; *Makai*, a *Pali*; Hamakua, the land of Nawaiki . 2. A *Kihapai* at Punaluu. *Mauka*, Ku; Hana and *Makai*, a *Pali*; Hamakua, a *Kahawai*. 3. *Kihapai* at Kolea. *Mauka*, the land of Pahupu; Hana and *Makai*, a *Pali*; Hamakua, Pahupu's land.	—	—	—	3	*Kihapai* *Kahawai*	MA 3:809 RP 4109 Book 17:215

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pu*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
Kekuahani ***Helu 3715 B & 5250 D*** (see also *Helu* 6401)	Keopuka, Loiloa	7:6 & FT 8: 125	Imihia sworn: I have seen his land, 3 parcels. Parcel 1, a *kalo kula* at Keopuka; Parcel 2, a *kalo kula* at Loiloa; Parcel 3 an *Olona* patch at Loiloa. Ikoa gave it to him in 1839. 1. *Mauka*, *Alanui Aupuni*; Hana, *Pali* of Keopuka; *Makai Pali* of Keopuka; Wailuku, Makaila. The other 2 parcels are surrounded by Government land.	—	—	—	3	*Kalo* *Olona* *Alanui Aupuni*	MA 5:601 RP 7518 Book 28:93
Obule ***Helu 6769 B***	Kaliae & Waihua	FT 8:273	Kaio Sw. Kaliae, an *Ahupuaa*, in Koolau, has been a possession of Ch. since 1819. *Mauka*, by the Mountain; Hana, by Kanehailua's land; *Makai*, by the sea; Hamakua, by a stream. Six *loi* in Waieli, Waihua. *Mauka*, by Kaiwikaoa'la's land; Hana, by Kauiki's land; *Makai*, by Kaohulo's land; Hamakua, by *Konohiki*.	—	6	—	—	*Ahupuaa* *Loi (Kalo)* *Stream*	MA 3:615 RP 3260 Book 14:313

Claimant & Helu	*Ahupua'a*	*Testimony Book & Page*	*Summary of Claim Documentation*	*Hale*	*Lo'i Kalo*	*Auwai*	*Kihapai Kula Mahiai Mahina Mala Moo Opu Pa*	*Crops, Activities and Resources Identified*	*Disposition N/A=Not Awarded Mahele Award Book & Royal Patent*
S. Grant ***Helu 209***	Paukea Puukea	FT 3:37	Alalio sworn for Clr.: I know the lands of Mr. Grant, they are called Paka [Paukea] and Puukea; they are situated in Koolau on the Island of Maui. I cannot give their exact bounds; but I could point them out in part. I know Claimant got these lands of Hikiau, a petty chief, when Hoapili Kane was Governor of this Island; and when Kauikai was Lunaauhau of that district about 1839. They were a mere gift to Mr. Grant accoding to the custom of the country, and there was nothing paid for the lands…	—	—	—	—	—	MA 1:594 RP 1117 Book 3:471
Nahuina ***Helu 7262*** (& ***10512***)	Keaa 2	—	*Ahupuaa* of Keaa 2, Hamakualoa. (*Ali'i* Awardee)	—	—	—	—	—	*Bake Mahele* 1848:142-143 MA 10:263 RP 4488 Book 18:461
Kanehoa, J.Y. ***Helu 8518 B***	Ulaino	—	*Ahupuaa* of Ulaino, Koolau, Maui. (*Ali'i* Awardee)	—	—	—	—	—	*Bake Mahele* 1848:160-161 MA 10:532 RP 2237 (2) Book 9:609

As discussed in earlier sections of this study, in addition to the Register and Testimony Volumes of the *Māhele*, there are a number of letters and communications between the King and native tenants; native tenants and land agents; and government officials that were transmitted as a part of the *Māhele*. The communications cited below, describe some of the difficulties that surrounded the *Māhele 'Āina* (and the concepts of fee-simple title to land, and granting foreigners the right to purchase land); and the—disposition of land, industry of the native tenants, and the nature of land use.

Of particular interest to the disposition of land are a series of articles and letters published in *The Polynesian* that described the events leading up to, and following the "experiment" in granting fee-simple interest in land, first to native tenants and then to foreign residents. In December 1845 and January 1846, King Kamehameha III, Cabinet Members and Ministers, visited Maui, traveling to various districts of the island, among which was Makawao. The visit was in part a response to petitions received from hundreds of native Hawaiian residents on various islands (including Maui), who had expressed opposition to the policies that were evolving in the Kingdom—specifically, those which allowed foreigners to be appointed to important positions in the government and further set up the mechanism by which foreigners could gain fee-simple title to land (cf. *The Friend*; August 1845:118-119).

Kamehameha III; J.Y. Kānehoa, Governor of Maui; A. Pākī; and appointed Ministers met with Hawaiians in large gatherings at various locations. The following excerpts from *The Polynesian*, summarize the thoughts of the King and others in his government on these matters, and make specific reference to the "experiment" of dividing and granting fee-simple interest in property at Makawao. It will be noted in the comments made below, that wild cattle were credited with the abandonment of two districts on the island; though good work in agriculture had been done in other regions of Maui:

The Polynesian
Honolulu, Saturday, Feb. 14, 1846
His Majesty's Late visit to Maui.

…The royal party left this place on the 18th of December and arrived at Lahaina on the 20th…

…On the 12th January, His Majesty addressed several thousand of his subjects, at Wailuku, to the following effect:

"I have addressed you before with my KUHINA, who is gone. I alone am left. I now repeat the same, and urge you to support schools and cultivate the land.

We are seeking the good of the country but the works is not done. We are making laws, but they are not *pohihihi* [bewildering]. If they are so to us they will be so to you. Your hereditary chiefs have been in trouble, and therefore have chosen some to aid them. They are the ministers of white skin, whom you see. This is according to the old system. They know more than we, and I have chosen them for the sake of their knowledge. You have heard of our trouble. I have seen it. Therefore we have chosen these helpers to help you. We have heard of your petitions. Should we consent to them, trouble would immediately follow—instantly—before night. I ask you therefore to put an end to your wish to promote that petition…

…On the 14th, His Majesty addressed a large concourse of people at Makawao with great effect. A large proportion of the assembly were melted into tears. The Premier

followed, urging the people to attend to useful knowledge, agriculture and religion, as the king provided for his own children he provided for theirs. Mr. Judd then spoke of the new arrangement of selling lands in fee simple to the natives in that district, with which they were much gratified. After crossing Mauna Haleakala, sleeping on its summit, and examining the crater, the royal party stopped on the 16th at a romantic place called Mokulau…

…Agriculture on Maui is in a forward state, compared with Oahu. At Honuaula there are 178 acres under cultivation of sugar cane with a good sugar mill managed chiefly by natives. One farm, besides sugar, raises $5000 worth of Irish potatoes annually. There are 12 foreigners here, one of whom John White, arrived in 1799. On some parts of Maui the cattle have done much mischief by trespassing on the plantations, and driving the owners from their little farms. Two districts have in consequence been deserted…

In the *Buke Mahele* (1848), we learn that Kamehameha III relinquished the land of Makawao, placing it in the Government (*Aupuni*) inventory. The *Buke Mahele* also identified Makawao as a separate district (*moku*), apparently not a part of the Hāmākua Poko District. This is recorded in the following entry of the *Buke Mahele* (1848):

			Ko Ke Aupuni			
	Inoa o na Aina		*Ahupuaa*		*Kalana*	*Mokupuni*
…99	*Makawao*	*ka*	*Moku*		*Makawao*	*Maui…*

[*Buke Mahele* 1848:205]

(Literally: For The Government—Makawao the District—Division of Makawao—Island of Maui.)

The review of the volumes of the Register and Testimony of the Land Commission, conducted as a part of the present study, revealed no claims registered by native Hawaiian applicants. Only one specific reference to a land right for a parcel in Makawao was recorded under *Helu* 426, to foreign residents, Wm. A. McLane and Edwin Miner. The actual record (in Native Register Volume 2) was a copy of a deed of lease, granted to McLane and Miner by Maui Governor, Hoapilikane, in 1838. Unfortunately, the land description made no reference to district affiliation (e.g., District of Hāmākua Poko), though it provides us with important information pertaining to land use and resources in the 1830s-1840s.

September 10, 1838
Hoapilikane, Governor of Maui; to Wm. A. McLane and Edwin Miner
Land Assignment – Portion of Makawao (Helu 426):

Here is this document, reporting on the full understanding of Hoapilikane, the Governor of Maui and William A McLane and Edwin Miner for a land at Makawao, Maui; Hoapilikane gave a land at Makawao to William A. McLane and Edwin Miner for the term of fifty years from that day forward. It was for them and their own heirs. Here is the fee for the land from year to year, one hundred dollars.

The land is thus described. On the west of the gulch called Punaokeawe, the cultivated field there, begins the boundary, and runs to the east to a gulch called Alelele, there is a marked corner of the land there. From this corner, run to the uplands along the channel at Manaia. There is a corner. Then from this corner, run to

the gulch on the west of Manawainui. From that corner run to the boundary first mentioned at Punaokeawe.

This land is only for William A. McLane and Edwin Miner, from the water (pond) of Alelele to the place where the stones roll into the gulch of Punaokeawe. The boundaries above and below are marked by stones. These boundaries were marked by William A. McLane, Edwin Miner, and some men with Hoapilikane.

Here also is this. The road for transporting their cattle is set aside, from said land to the landing at shore.

Here also is this. Hoapilikane has restricted (*hookapu*) said land for the term of fifty years, and no man may go to live on said land without the authorization of William A. McLane and Edwin Miner.

Here also is this, about the water. William A. McLane and Edwin Miner may take water for their livestock, and no one can block them from the said water.

Here also is this. When the fifty years are ended and the land is returned to Hoapilikane or his heirs, the houses, walls, everything growing, and all other things can not be taken.

Here also is this. William A. McLane and Edwin Miner swear that they will build schools for all of the people who they employ.

Here also is this. William A. McLane and Edwin Miner agree that the men they hire shall dwell with them. They shall not refuse the working men, the land. They shall pay each year, three dollars for each men, hired. They two agree to fulfill all the words written in this document.

Executed at Wailuku, on this tenth day of September, in the year of the Lord, one-thousand eight hundred and thirty-eight.

By Hoapilikane, Governor of Maui.

I confirm the words above spoke. Kamehameha III

Witnesses (signed)
William Richards Wm. A McLane
Kanakaole Edwin Miner
[Copy in Native Register Volume 2:153-155; 1848; Maly, translator. See Register Map No. 603 for reference points.]

The traditional designation of Makawao (as an independent land divisions or a part of Hāmākua Poko), is a complex one, and is further discussed at the end of this section, under a separate heading, "*Moku o Makawao (District or Section of Makawao)*."

Other communications from the later period of the *Māhele* (ca. 1853-1855), pertaining to lands and residents of the Hāmākua-Ko'olau region include, but are not limited to the following:

March 26, 1853
Honomanu

I, Mahoe, return my *kuleana* (property rights) [15] to the *konohiki*, Daniel Ii. Let my *noho kuleana* (right) of residency end. I will live under the *konohiki*, and I will do all of the work on the *poaha* and *poalima* (Konohiki and King's work days), as was the old way of living. In truth that it is returned, I set my name at the bottom of this document.

I am Mahoe.
Witness, Maleiula.
26, Mar. '53.
I, Malaiula, return my *kuleana* (property right) [*Helu* 6723] to the *konohiki*, Daniel Ii. Let my *noho kuleana* (right) of residency end. I will live under the *konohiki*, and I will do all of the work on the *poaha* and *poalima* (Konohiki and King's work days), as was the old way of living. In truth that it is returned, I set my name at the bottom of this document.

I am Malaiula.
Witness, Mahoe.
26, March 1853.
[HSA, DLNR 2-1; fldr. N.d.; Maly, translator]

Puumalei [Pu'uomaile, Haiku]
August 9, 1853
John T. Gower; to R. Armstrong, Minister Public Instruction:

…In passing around through Hamakua and Koolau I find that many natives who have bought land and others who wish to buy, who have fish nets and *olona*, but cannot in these *pilikia* times get away to dispose of their manufactures in order to raise the cash. Now I would take their nets and *olona* if I knew there was a sale for such things at Honolulu. Could you ascertain through any parties who would be likely to know, whether nets are in demand? And what price a net that contains 2 *lau*, and is 2 fathoms deep, would bring? The usual price I hear for such nets is $20 – Would they bring more or less than that at the present time? I suppose there are some coming into market now, and perhaps there are none wanted on Oahu, there is so much sickness.

If it would not be too much trouble to make these inquiries you would confer a favor by so doing, both upon many of the people, as well as myself, which I shall be happy to reciprocate. I expect to go through Hamakua & Koolau again next month and if I should learn that it would be safe to do so, I shall be glad to take nets and *olona* in payment for land.

[15] During the review of all Register and Testimony Volumes of the Land Commission, no application for a *kuleana* by Mahoe at Honomanu, was located. The Testimony for Wahine – *Helu* 7787, *Apana* 2 – consisting of 11 *lo'i* in the *ili* of Punalau at Honomanu, identifies a parcel belonging to Mahoe as being on the *mauka* boundary of the *lo'i* parcel (7787, Ap. 2). Mahoe's parcel coincides with the *lo'i* land described in the oral history interview of Mrs. Mina Atai (in this study) daughter-in-law Ben Atai (Akoi), former owner of the parcel, and taro farmer (see Register Map No. 2467).

I do not learn that any of the upland is wanted in Kuiaha, for cattle. Kapihe said he wanted some in the ravine and offered $20 per acre, very likely would pay more for it. If you wish to sell the valley I would dispose of it to the best advantage possible, without charge.

We are all well in this region. We have taken "Torberts" girl for a year. Mr. Croswell has just got about through with cutting his wheat. Has done it nearly all with syckles, by native labor. The crop is good this year – well filled… [HSA, Series 261 – Box 14]

1854
E. Bailey, Land Agent; to J.H. Smith, Land Commission:

List of Awards – costs of which were paid to E. Bailey from Dec. 26, 1853 to Mar. 29, 1854 inclusive…

(Helu	Applicant	$	Land	District)
5421 & 4142	Kekahuna	8	—	Hamakuapoko
6536	Huna	5	—	Hamakuapoko
5492	Kulahola	8	—	Hamakuapoko
6510 UU	Pahua	6	—	Hamakualoa
6510 PP	Niu	5	—	Hamakualoa
6510 E	Kilua	4	—	Hamakualoa
6510 R	Naone	6	—	Hamakualoa
6510 O	Kamakaeu	5	—	Hamakualoa
6510 L	Ku	6	—	Hamakualoa
5520 B	Kalawaia	7	—	Hamakualoa
5119	Kauhihoewaa	6	—	Hamakualoa
5250	Kanui	8	—	Hamakualoa
6510 C	Kalama	9	—	Hamakualoa
6510 UU	Pahua	6	—	Hamakualoa
4579	Ii	10	—	Hamakualoa
3905 B	Hookano	6	—	Hamakualoa
3905 C	Kolia	8	—	Hamakualoa
5490 & 3970	Hao	5	—	Hamakualoa
5016	Kuapuaa	5	—	Hamakualoa
5497	Kawauhilahaole	6	—	Hamakualoa
5515	Pekupeku	6	—	Hamakualoa
6455	Kaha	4	Pauwela	Hamakualoa
4121	Kaai	5	Haiku	Hamakualoa
6405	Kapahau	4	Kuiaha	Hamakualoa
4134	Hanauapuaa	4	Kuiaha	Hamakualoa
6482	Kuana	8	Kuiaha	Hamakualoa
4136	Kahale	6	Kuiaha	Hamakualoa
5491	Hookaea	4	Kuiaha	Hamakualoa
3336	Naiopi	7	Kuiaha	Hamakualoa
5516	Naoopu	8	Holawa	Hamakualoa
4517	Kapihe	7	Kuiaha	Hamakualoa
8468	Kamakaala	10	—	Hamakuapoko…
3715 B	Kekuahani	3	Loiloa	Koolau…
4866	Kaholowaa	5	Wailua	Koolau
5052	Kuiki	4	Wailua	Koolau

(Helu	Applicant	$	Land	District)
4865	Kapali	5	Wailua	Koolau
4772	Naiwi	4	Wailua	Koolau
5049	Kaiwa	4	Wailua	Koolau
4773	Nakihei	4	Wailua	Koolau…
7784	Kahaukoko	6	Keanae	Koolau
4561	Wahinemaikai	6	Wailua	Koolau…

[HSA, DLNR 2-1, Maui, fldr. 2]

September 16, 1854

E. Bailey, Land Agent; to G.M. Robertson, Land Commission:

…Herewith I send you the following surveys, which about finish up the work — viz…

(Helu	Applicant	Land	District)
4665 K	Kanuku	Keanae	Koolau
4848 F	Maewaewa I	Keanae	Koolau
	Kaniho	Wailua	Koolau [*Helu* 10828 B]
4853 C	Umaikealani	Wailua	Koolau
5066	Kaumiumi	Wailua	Koolau
5058	Kaulia	Wailua	Koolau
5064	Keahi	Wailua	Koolau
5062	Kahakauila	Wailua	Koolau
4853 E	Kahahei	Wailua	Koolau
3499	Kiowai	Wailua	Koolau
5487	Hoonoho	Wailua	Koolau
4925 C	Nalau	Kapaula	Koolau
4754	Makuakane	Kapaula	Koolau
4925	Kauhiki	Kapaula	Koolau
3472	Kaihaa	Pauwalu	Koolau
4869	Kaomoaiki	Honolulu &c	Koolau
4852	Uaua	Honolulu	Koolau
4872	Kalohie	Honolulu	Koolau
4869 & 4870	Keliiokekanaka	Makapipi	Koolau…
2 *poalima*	Kuikui	Wailua	Koolau [*Helu* 5059]

[HSA, DLNR 2-1, Maui, fldr. 2]

1855

E. Bailey, Land Agent; to J.H. Smith, Land Commission:

Costs rec'd from Mar. 22 to Mar 31, 1855…

(Helu	Applicant	District	$)
7787	Wahine	Koolau	$6.00…
6510 S	Makue	Hamakualoa	$6.00…
6510 B	Keoho	Hamakualoa	$4.00
5459 F	Kauhaiea	Hamakualoa	$6.00…
4137	Kapela	Hamakualoa	$5.00…

…I should sooner have forwarded this list but I have waited for an answer to a letter before I sent it, that I might know whether it was the winding up financially of my account with the Land Commission. But as no letter comes I conclude to send the list as you may want it. I have delivered no awards since the 31st ult. as I knew not whose name to deliver them… [HSA, DLNR 2-1, Maui, Fldr. 2]

Moku o Makawao (District or Section of Makawao)

Disposition and status of the land area (*moku*) of Makawao, is one that provides us with important documentation pertaining to changing practices associated with land tenure in Hawai'i. The land-base status of Makawao also presents us with a number of questions that have been answered in various manners since the 1850s (cf. Coulter, 1935 and King 1942).

While at Makawao, on January 13, 1846, Minister of the Interior, G.P. Judd, in witness of the King, Kamehameha III, and Keoni Ana (John Young), Premier, described the experimental program in land tenure, that the King had agreed to. The program would provide fee-simple interest in land to native tenants, and two lands, Makawao (Maui), and Mānoa (O'ahu), had been selected as those which would be sold in fee-simple to applicants. This program was the forerunner of the *Māhele 'Āina* described above, and Reverend J.S. Green was appointed the land agent to take applications on behalf of the King. The January 13th communication described the program and land of Makawao as:

> Whereas, Makawao has now been acquired by the Government, excepting the previous lease to William McLane—payment for said place is with Kalaipaihala [Keoni Ana]—but the remainder of the land has been granted to me for the Kingdom;
>
> Therefore, I, the one who was appointed to attend to the duties as the Minister, called the Minister of the Interior, I set apart Makawao for a new program, which it is believed will benefit the people. That the land be sold to anyone who may want it, and to grant a document of ownership (*palapala kuleana*) to such as may purchase the land, to him forever, and to his heirs and representatives to the end of time, with similar protection as that of the foreigners.
>
> And I appoint my fellow servant (*hoakauwa*) of the King, Rev. J.S. Green as agent to superintend this work for the Kingdom, he will be the one to assign Land Deeds to the natives (*kanaka maoli*), setting forth of the boundaries, and shall collect the purchase price of the land for the Kingdom.
>
> Here is this, the agent will also set apart a place for the natives to cultivate for him, because he is their teacher. And should said agent think it proper to set apart a place for the natives to cultivate for themselves without their having to pay anything to the Kingdom, it will be alright, so long as there are many people gathered together for the cultivation [16].
>
> Here is this, the natives should help their teacher in all the work on their place, so that at the time the King comes, he will see that all things are in proper order, and if they do, they will not be burdened to go work for the Tax Assessor (*Lunaauhau*) and the Friday tax work (*poalima*). They will only pay the personal tax (*auhau kino*), as required by Law.
>
> But future Laws may pertain to them, as with all the people.
>
> In truth of these words, I sign my name and my seal on this 13th day of January 1846, at Makawao Maui, Hawaiian Islands.
>
> G.P. Judd

[16] A parcel of land was set aside, and is referred to as "The Model Farm" (see Register Map No. 186, Makawao – T. Metcalf, 1848; and Royal Patent Grants issued to grantees as a part of the Makawao Land Program.

We agree to, and approve to these words.

Kamehameha
Keoni Ana
[HSA Interior Department – Land File, January 1846 (translation of Hawaiian revised by Maly)]

Regarding disposition of Makawao as a land division (either an independent land, or a part of the larger Hāmākua Poko District), in 1846, both King Kamehameha III and resident missionary, J.S. Green described Makawao as a "small district" (Kamehameha III, January 3, 1846 (above); and J.S. Green, September 26, 1846 (below). On September 26th and October 3rd, 1846, letters written by J.S. Green (resident missionary and land agent, Hāmākua Poko) were published in the government newspaper, *The Polynesian*. Green provided readers with particulars regarding the "district" and boundaries of Makawao (it will be noted that the land had no ocean frontage) —

> Makawao is a high land district, lying at the base of…[Haleakalā]…the highest mountain on Maui. The district lies between some 1900 and 4000 feet above the level of the sea. It has Kula to the south, Hamakua on the north, and Haliimaile on the west.
>
> The district is a small one… [Green September 26, 1846].

Green also described disposition of the land under the land program, and observed that cattle were having a significant impact on the lands and industry of both native and foreign residents (Green October 3, 1846). Green wrote:

THE POLYNESIAN
September 26, 1846
Editor Polynesian:

…It is generally known at the Islands I believe, that the district of Makawao, on East Maui, is for sale. When the King and Chiefs were here in January last, the Minister of the Interior who accompanied them sought and obtained the lands, with the exception of Mr. McLane's plantation, for the use of the Government. The King and Premier gave a written sanction to the selling of the lands. With the hope of introducing a better state of things among the people, I consented to act as agent for the Government. Having had applications for lands from foreigners residing at Lahaina and other places, I beg leave to say through the columns of your paper, that it is the desire of Government, as I understand it, to sell exclusively to natives of the Islands, till such times, at least, as it shall appear that they are neither able nor willing to purchase. The district is offered for sale as an experiment on the people – as an incitement to awaken industry and thrift – as a test to the question – "Can the common people of Hawaii be induced to abandon their listless, improvident habits, and acquire and maintain habits of enterprise and frugality…

Makawao is a high land district, lying at the base of Haleaalealai [typeset error – i.e., Haleakalāl the highest mountain on Maui. The district lies between some 1900 and 4000 feet above the level of the sea. It has Kula to the south, Hamakua on the north, and Haliimaile on the west.

The district is a small one. Including the plantation of Mr. McLane, who has between three and four hundred acres of saleable land, though were there a crowded population, another thousand might probably be cultivated. Perhaps about one-half

of the lands are arable. Much of the remainder will furnish pasturage for cattle. considerable timber land we have also, some of which is *thickly* timbered. The timbered lands are much broken, so that a small part only of the timber can be easily obtained… Of the productions of this district, it is well known that sugar cane has been hitherto the chief. Of the plantation of Mr. McLane I may hereafter speak more fully. I find that wheat grows well, though the present season has been unfavorable for harvesting on account of frequent rains. Indian corn does well, and most of the vegetable productions of the Islands. Were it not for the plexus worm which is occasionally very destructive, it would be exceedingly easy to obtain the necessaries of life…

Yours, J.S. Green. Makawao, August 31, 1846.

THE POLYNESIAN
October 3, 1846

Editor Polynesian

…During his sojourn among us the last few weeks. Mr. Armstrong, assisted by a graduate from the Seminary, Lahainaluna, has measured most of the arable land in Makawao. He first surveyed the entire portion which we supposed saleable at the present time, and found some 1700 acres, exclusive of Mr. McLane's plantation. He then measured the land which each man had selected for himself. Some 33 farms have thus been surveyed, consisting of from 45 acres to 10 or 12. Nearly every man in the upper part of Makawao has obtained a small piece of land, and as soon as possible I hope to give each a deed of his little homestead. Homestead! What associations cluster around that word; and yet how strangely it reads in reference to Hawaiians! I pray that it may not long seem thus. But more of this anon.

More land I should have sold but for the ravages of the cattle from the plain below. It's now a long time, say two years, since the cattle, chiefly from Wailuhee [typeset error – i.e., Wailuku] and Waikepu [typeset error – i.e., Waikapū], began their depredations. Last autumn and winter they destroyed a considerable quantity of sugar cane for Mr. McLane. The damages he estimated at $1,000 at the lowest calculation, and he would have lost a much larger quantity had he not, for a long time, employed men by day and by night to watch and guard his fields. Since, an arrangement has been made with the owners of the cattle by Dr. Judd. Some change for good has been effected. Still our fears are only partially quelled. Several acres of promising young cane have been destroyed, and some of the natives have lost nearly all they had planted. Some twenty acres of cane, which I aided our people to plant, and which we have devoted to purposes of benevolence, lie exposed. It is easy to see that we all feel an interest in the question. "Will our neighbors of Wailuhee and Waikepu take care of their cattle?" If so, there is much ground to hope that the experiment we are here making will succeed. If the cattle are permitted to run as they now do, I have little hope of success. Is it right that we should thus suffer from the depredations of cattle? Already Hamakuapoko and Haliimaile [Hāli'imaile], two excellent districts of dry land, are nearly destroyed, and the cattle are crossing over into Hamakualoa. Will not all owners of cattle set in accordance with the law of love, and without delay save us from the vexation and loss of their intrusion into our plantations?

A single other impediment to the sale of lands I will mention. An old *konohiki* by the name of Nuwaa has taken it into his head that the King will be a loser by the sale of the lands. He, therefore, refuses himself to purchase, and dog-in-the-manger-like,

he is doing what he can to prevent others from buying. He has been down to Honolulu twice, and on his return has told the people that the King has granted him the land, though he can show no writing. Since I have sold lands to his neighbors he is greatly enraged, calls them thieves, molests them all in his power, and breaks their containers when they go for water to a spring which he claims as being on his lands, though he has refused to purchase.

Some of the reasons why, in my opinion, lands should be sold without delay to the people, I design to give you in good time… J.S. Green. Makawao, Sept. 3, 1846. [See Register Map No. 186 (Metcalf, 1848), which lays out the lots mentioned herein.]

As a part of the Makawao Land Program, J.S. Green was granted an 87.7 acre parcel at Makawao, Royal Patent No. 68, in 1847 (Privy Council Volume 6A:290-291). The land was sold to Green at approximately $1.00 per acre, and described as:

> Commencing at stake at s.w. angle of this land, joining lands owned by Keawe and Kaimu [Grants 321 & 57] and running S. 61° East 16 chains along Kaimu's and Model Farm to stake by road at south corner of this land; thence N. 57º 15' E. 17 ½ chains along Model Farm to stake and stones at slight angle on right side and near Gulch. Thence N. 47º 17 chains 6 7/12 feet across Gulch and along Model Farm to stake at *mauka* East corner of this & south corner of Kaleihopu's land [Grant 65] on right *huai-pali* of Hulahululiili Gulch. Then following along Kaleihopu's land to *Kukui* tree at his West corner near intersection of gulches; thence N. 19º E 5 Chains 19 10/12 feet along up *pali* to stake on left upper edge at South corner of McLane's Plantation; thence N. 65º 30' W. 9 chains 19 10/12 feet along *huai-pali* to stake at North corner of this land and East corner of Kalawe's [Grant 323]; thence S. 52º W. 14 chains 26 4/12 feet across Manawainui Gulch and along Kalawe's to stake, slight angle; thence S. 51º W. 18 ½ chains along Kalawe's and Church land [Grant 67] to stake at Keawe's East boundary. Thence S. 6º E. 10 Chains 4 feet along Keawe's to place of commencement… The above land settled for by Mr. Green's Bill for Surveying Lands… [December 22, 1847; Royal Patent Grant Book 1:138]

On February 28, 1848, Green wrote to G.M. Robertson of the Land Commission, regarding sales of land at Makawao. Green compares the value of land at Makawao to the land of Hāmākua (specifically referencing Grant 59, purchased by Edwin Miner at Ha'ikū), and the difficulties encountered in sustaining one's self on the land at Makawao—the lands was of inferior quality and *pe'elua*, or army worms had infested crops:

> …Yours of the 10th inst. came to hand last week with the Patent for John Smith. This, I take the liberty to return immediately; and I request you to fill *Helu* 75 for Kekahuna, the man to whom I sold the land and for which I have received the pay.
>
> You may recollect that I conversed with you requesting this piece of land in the presence of Mr. McLane and my son. You remarked that it might be made out in Smith's name. I therefore sent his name down, which I now regret having done, as [Ke]Kahuna purchased the land and I regarded him alone responsible for the pay. I now wish to give him a deed as he has complied fully with the terms of sale.
>
> I have sold lands to two foreigners, both colored men, but foreigners. One I think will not hold onto his purchase, I presume, nor will the other at $2 per acre. I shall never ask him such a price as the land is by no means worth it. Mr. Metcalf who

surveyed the land will tell you, I presume, that the land in Makawao is much less valuable than in Hamakua where Mr. Miner purchased. My foreigners at Makawao should pay $2 per acre, while Mr. Miner paid $700 for 675 acres I do not comprehend. I have no hesitation in saying that one acre of land in Hamakua is worth two in Makawao. I could never persuade but one man in Hamakua to purchase an acre here. The fact is the worm destroys so much that is planted here that scarcely a man in the place can raise the money to pay for his land from the products of the soil. If they succeed in paying, it will be by raising potatoes in Kula and hiring out their services…

…Please recollect that I do not say that the land in Hamakua is worth more than $1. per acre. I only say that it is more, much more valuable than Makawao land. The simple fact that they have no *pelua* [*pe'elua*] there is enough for my purpose… [HSA Interior Department - Land Files, February 1848]

William McLane (his wife, Maile Makalena), and Edwin Miner retained their leasehold interest in land at Makawao for a few years, and then gave it up. McLane acquired fee-simple interest in parcels he acquired directly from the Government, or from natives who had been granted Royal Patents (see Mortgage Book 1:386-387 and Liber 4:61). In 1847 and 1849, William McLane acquired two parcels of land (totaling 688.94 acres) at Makawao (Grants 64 and 157). In addition to the ranching interests, McLane developed a sugar plantation (McLane's Plantation) on a portion of his Makawao holdings, parcels of which were later sold to various individuals, and for a while were operated as the Dow and Parks' Plantation (see Register Map No.'s 186 and 603 for locations described in boundary references of Makawao, as well as those which were a part of the McLane holdings).

The land of Makawao as an independent "*moku*," or as an *ahupua'a* of Hāmākua Poko, has a complicated and unclear history. The earliest references as those cited above, seem to tell us that Makawao was independent of Hāmākua Poko. When the *Māhele* was being developed, the Kingdom was also setting into place the first Laws which established uniform direction defining boundaries of districts for taxation, and schools (1846 and 1847). In 1859, the Civil Code modified districts, and it is at this point that we see confusion arise regarding the district-status of Makawao, as the new district boundaries on Maui did not necessarily conform with those of tradition or the *Māhele 'Āina*. The district boundaries for the Island of Maui were defined as:

1. From Kahakuloa to Ukumehame, including Kahoolawe, to be called the Lahaina district;
2. From Waihee to Honuaula inclusive, to be called the Wailuku district;
3. Kahikinui, Kaupo, Kipahulu, Hana and Koolau to be called the Hana district; [and]
4. Hamakualoa, Hamakuapoko, Haliimaile, Makawao and Kula, to be called the Makawao district… [Civil Code of 1859, Section 498]

Writers such as Coulter (1935) and King (1942), included footnotes in No. 4 – Makawao District, observing that "Haliimaile and Makawao are ahupuaas of Hamakuapoko district" without citing a source of information. Why these two *ahupua'a* were singled out, and all other *ahupua'a* on Maui were not, is unclear. Coulter (1935) notes that this division remained generally in tact until 1909, when Act 84 of the Session Laws of 1909 made significant changes to the boundaries. At that time, the districts were reorganized to:

> The island of Maui, Molokai, Lanai and Kahoolawe and counties of Maui and Kalawao shall be divided into six districts as follows:

1. Kahikinui, Kaupo, Kipahulu, Hana and Koolau to be styled the Hana district;
2. Hamakualoa, Hamakuapoko, Kula, and Honuaula, the western boundary being a line starting from the sea at Kapukaulua and running along the bottom of the gulch to the peak of "Puu o Kaiia"; thence to the peak of Kailua Hill; thence to "Puu o Koha" triangulation station; thence to "Puu o Kali" triangulation station; thence down along the boundary of Waiohuli and Keokea to the sea, and the island of Kahoolawe to be styled the Makawao District;
3. All that portion of central Maui lying east of a line along the boundary of Honokohau and Kahakuloa to the peak of Eke Hill; thence along the ridge of the mountains and down the bottom of Manawainui gulch to the sea; and west of the boundary of Makawao district, to be styled the Wailuku district;
4. All that portion of Maui west of Wailuku district and including the island of Lanai, to be styled the Lahaina district… [in Coulter, 1935:219]

Subsequent changes in 1915, further complicated the district divisions (in relation to their traditional designations), and the Makawao District was described as:

> …2. Hamakualoa, Hamakuapoko, Kula and Honuaula, the western boundary being a line starting from the sea at Kapukaulua and running along the bottom of the gulch to the peak of "Puu o Kaiia"; thence in a straight line to the peak of "Puu Koae"; thence in a straight line to "Puu o Koha" triangulation station; thence in a straight line to "Puu o Kali" triangulation station; thence down along the boundary of Waiohuli and Keokea to the sea, and the island of Kahoolawe to be styled the Makawao District. [in Coulter, 1935:221]

Changes again in 1932, further modified the districts (Coulter 1935:222-223), and brought about the basic configuration of district boundaries which we are familiar with in the present-day. None of which appear to reflect the ancient land division (*moku*) of Makawao.

Historic surveys—see Reg. Map. No. 186, Metcalf (1848); Reg. Map No. 182, Makalena (1850); and Reg. Map No. 603, Alexander and Lyons et al., (1872)— place Makawao on the upper slopes of Haleakalā. It cuts off Hāli'imaile on the *makai* side (Makawao has no ocean frontage); and extends *mauka* to the vicinity of Pu'u o Kākaʻe. On the Haʻikū side, Makawao is bounded by Māliko Gulch (Hāmākua Loa), and on the Kula side, it is bounded by Laniwai or Kailua Gulch, and in the *mauka* zone, by the *ahupuaʻa* of Kalialinui (see Reg. Map No. 603).

For reasons that were not described in the narratives viewed by the authors, there were apparently no native tenant claims for *kuleana* in Makawao recorded[17]. The *"Index of all Grants Issued by the Hawaiian Government Previous to March 31, 1886"* (1887) places all of the grants for land at Makawao, in the District of Hāmākua Poko (1887:47-48; see next section). Whether this is solely a reflection of the redistricting that occurred after the *Māhele*, or a traditional designation is unclear.

[17] It has been noted that at least two claims (*Helu* 322 – Kaleipaihala; and *Helu* 2537 to Kaneaukaukahi) belonged in Makawao, but our review of the original Hawaiian narratives, found no reference to Makawao in the claims. The claims under those *Helu* and applicants were not awarded, and no further documentation was located.

C. Historical Communications Documenting Land Use, Residency, and Applications for Land (ca. 1840-1920)

In addition to the records associated with the *Māhele ʻĀina*, there are a wide range of letters, documents, and transmittals pertaining to residency and land use in the Hāmākua-Koʻolau region. This section of the study includes excerpts from government records and public communications found in agency (department) collections and the microfilm copies of historical newspapers (published between ca. 1845 to 1900). The records are associated with the functions of several branches of government including Interior Department and Public Lands (which managed the land grant, leasehold, and homesteading programs); Public Instruction; and Conveyances. They pertain to communications between government divisions and applicants for land (both native tenants and foreign residents); and government land agents. The communications from the newspaper collections were primarily in the form of letters in which the authors informed readers of current events and circumstances in the region—sometimes referencing traditional accounts or cultural sites. Combined, the records include important information pertaining to the identity of residents (some of whom were making requests for assistance in addressing land matters and difficulties encountered by the native tenants in matters of land tenure and water rights); descriptions of lands and resources; and the evolving practices of disposition of "Public" lands in the Hāmākua-Koʻolau region.

The records that follow, are present in several sub-categories, and the following Register Maps (viewed in the collection of the State Survey Division), identify many of the areas (including selected *kuleana*, grant and homestead parcels), and other features, described in the communications—

- Portion of Makawao, Maui; Register Map No. 186 (Metcalf, 1848);
- Makawao (Hamakuapoko), Maui; Register Map No. 603 (Alexander, Lydgate, Lyons & Brown, 1872);
- Koolau (District Sheet—Keaa to Makaiwa), Maui; Register Map No. 2052 (Alexander, 1877)
- Plan of the Huelo Sugar Plantation (Honopou to Huelo), Hamakualoa Maui; Register Map No. 862 (J. Gay, 1881);
- Plan Showing Ii of Kupau and the Makai Portion of Waihuanui, Rice and Kula Lands (Pahoa to Wailua Nui), Koolau Maui; Register Map No. 1760 (Kanakanui, 1896);
- Map of the Nahiku Coffee Lands (Paʻakea to West Honmāʻele), Koolau, Maui; Register Map No. 2649 (H. Howell, 1897);
- Map of Homesteads at Nahiku, Maui; Register Map No. 2429 (Public Lands Map No. 20-a) (Howell 1899);
- Keʻanae, Koolau Maui; Register Map No. 2238 (Howell and Kanakanui, 1903);
- Wailuanui, Koolau Maui; Register Map No. 2234 (Howell and Kanakanui, 1903);
- Waianu Valley, Koolau Maui; Register Map No. 2433 (S.M. Kanakanui, 1908);
- Honomanu Homesteads, Koolau Maui; Register Map No. 2467 (Heilbron, 1909);
- Portion of Hamakualoa and Koolau Districts (Peahi to Honomanu), Maui; Register Map No. 2482 (compiled from Reg. Maps 956 & 578; J. Iao, 1915);
- Koolau Forest Reserve – Honomaele to Makawao, Maui; Register Map 2891 (R. Lane, 1932 & 1934).

Underlining which appears in some texts has been used by the present authors to draw reader's attention to selected points of interest.

Nā ʻĀina o Hāmākua me Koʻolau:
Miscellaneous Records Pertaining to the Hāmākua-Koʻolau Region

October 22, 1847
H.L. Brooks; to Keoni Ana, Minister of the Interior
[applies for lease of 500 acres in Wailua Nui, Pauwalu, and Waianu] :

I desire to lease from the Kingdom a parcel of land at Wailua, Island of Maui, there are, within the parcel three lands, Wailua Nui, Pauwela [sic – Pauwalu] and Waianu, perhaps 500 acres all together, therein. There is a diagram of the land with this document [not located in file], though it is not completely accurate, as it has not been surveyed.

I desire to lease said land for the period of thirty years, and will pay 50 cents an acre, from year to year.

I desire to make a Sugar Mill there, if I get the land.

There are no houses lived in or cultivation on that land… [HSA, DLNR 2-4; Maly, translator]

Kalanikalua (Haiku), East Maui
May 16, 1848 (unsigned letter); to Keoni Ana, Minister of the Interior:
[regarding problems in Government and Konohiki work days—pōʻahā & pōʻalima etc.—and access to resources]

…We, your people living in Alaea here, make known to you the difficulties here in Hamakualoa. Our troubles are these, which have come upon us, that the days set apart for ourselves are turned into working days of the Government only. For the year 47 up to 48 inst., it is only on our days that the Government work is being performed, and not on the King's or Konohiki days.

The nature of the work is this: Posts for houses, and rafters for houses, making pens for stray animals, and such. Here is another trouble to us, parents who have several children, they have all gone back to work, also the old men who are weak, and such. Here is another trouble to us, the taking away of our fish, the *awewe* which we, the people went to fish for in the night, we did our fishing at various places of the sea, four and eight have been collected, some for the government, some for us. We said, is it not the fish which go in the shoals in the day time, and which are seen by everyone, and we go and fish, then, that is to be divided… [HSA, Interior Department – Misc. Box 143; Archivist translation]

September 14 to November 6, 1848
Journal of a tour around the windward islands, Hawaii, Maui, & Molokai in the months of September, October & November 1848:

Object of tour, to inspect the government schools, & in every way in my power promote their prosperity…

Oct. 22. [departing from Lahaina] I set out for the tour of E. Maui on a mule, in the morning early in a hard rain. Reached Honuaula about noon…
Oct. 26. [Departing from Copp's sugar plantation in Hana] I rode to Wailua, walked from there to Keanae; there took a canoe, although the sea was rough, I reached Makaiwa about 3 o' clock.

Oct. 27. Spent the night with Kahaule [*Māhele Helu* 4919 & 5361 B], a fine man & a nice family, & this morning by the dawn of day we set out for Mr. Green's at Makawao, A more splendid country I never saw than that we passed through on our way, & reached Makawao by 9 o' clock A.M… [HSA, Series 261 – Public Instruction, Box 1 (24 page)]

December 30, 1848
J.Y. Kanehoa, Governor of Maui; to Keoni Ana, Minister of Interior:
[regarding impacts of the epidemic on the population and the recent occurrence of heavy rains—taro lands and roadways destroyed]

I wish to let you know that I only just now received your letter of the 29th day of Nov., informing me about your day for fasting being the 6th day of December, and directing me to set a day for fasting here on Maui and the adjoining Islands, as a day of worship to God about this new epidemic… I selected the 14th day of Dec., as Maui's day of fasting, and the adjoining Islands, for a day of worship to God.

There was a very strong winds here on Maui, and freshets the last few days… At Hamakualoa on East Maui, were very heavy freshets, and washed away the taro and bridges. According to the old residents, there has been no freshet as great and bad as this one… [HSA, Interior Department – Misc. Box 143; Archivist translation]

April 8, 1850
D. Baldwin; to Keoni Ana, Minister of the Interior:
[applies to purchase Ahupuaa of Honopou]

…Because it is my intention to dwell a long time in this land, and I want my children to dwell in this land of our King as well, therefore I have looked and thought about purchasing a place at which to live, and perhaps cultivate; and I ask you and the Privy Council if I may purchase from the Kingdom, an *ahupuaa* in Hamakua loa, Maui; Honopou is the name of the *ahupuaa*.

I will give, like those who have given for other lands, fifty cents an acre. I do not know the land, but my children do, and it is they who have told me there are perhaps six hundred or eight hundred acres within the *ahupuaa* — it is not exactly known.
If the sale to me is agreed upon, I will go and look and perhaps survey it… [HSA, DLNR 2-4; Maly, translator]

November 13, 1850
W.P. Alexander; to W.L. Lee (Attorney General and Privy Council Member):
[regarding surveys of lands for Grant applications in Makawao, Hāmākua Poko and Hāmākua Loa]

…I shall report what I have done for the Land Commission before I leave Lahaina. I hope to leave next Monday, & first go & do a little job at Makawao running & making a line between Dr. Wood & Mr. Armstrong, & defining 30 acres of Kaupakulua Hikina for Judge Lee, & 20 acres of said land for myself. I have got a survey made out for Hikiau. He has a noble land, 2226 acres that is measured & how much more that is far inland I cannot tell… [HSA, DLNR 2-1; fldr. 3]

August 20 (ca. 1854)
Kiha; to Keoni Ana, Minister of the Interior:
[Kiha applies to purchase Government land at Hanehoi]

…I desire to purchase in fee simple from the Government some of its lands at Hamakualoa joining Huelo, named Hanehoi. I want the Government's interest in said land and other appurtenances belonging to said land. I do not wish to purchase the rights of the natives, only what belongs to the Government, that is what I want to buy. This is my offer, Five dollars per acre for *kalo* land and one dollar for *kula* land, that is my price for said acres… Because of my great desire to get land for cultivation for me, therefore, I humbly beseech you, with the hope that I may be able to get some place in fee simple so that I and my household can properly live… [HSA, Interior Department – Land Matters; Document No. 142; Archivist translator]

[Note: in the *Mahele*, an applicant by the name of Kiha (Helu 5325), applied for *Kuleana* land at Haiku; the land was not awarded. Kiha was also identified as the individual who had written out a number of the claims for other native tenants (see records in this study).]

March 5, 1855
J.T. Gower, East Maui Land Agent;
to John Young (Keoni Ana), Minister of the Interior:

…I propose to sell to James Reed and Giles B. Norton One Hundred and Fifty Eight acres of land in Holawa & Honokala. Hamakualoa, at $1.25 per acre… [HSA, DLNR 2-4]

September 23, 1856
P. Nahaolelua, Office of the Governor; to His Highness, L. Kamehameha:
[regarding difficulties with cattle and other animals – impacts on cultivated crops – and proposed alignments of fences]

…I have your letter regarding the cattle. Yes, it will be tried so that the mistake will be corrected. Great is the suffering of the animals living at this time. The horses and the cattle are dying. Here is what I desire to inform you, some of the foreigners (*haole*) of Haliimaile and Makawao have requested permission to build a pound for stray animals. These foreigners, the wheat (*Ko-Palaoa*) farmers, are desirous of protecting their plants.

In my own thought I would consent, but I have not the right to permit them or to appoint one of them as Fence Overseer. Therefore, until you direct me, then I will appoint one.

Another thought they have is the fence which they have built, but because it is far sea-ward to Kuiaha, they said that it would be better to build the fence at the boundary of Hamakuapoko and Haliimaile.

It would be well for us to consent to this request to protect the wheat (*Balaoa*)… [HSA, Series 71 Gov. Maui; Translation - Letter Book 1]

September 30, 1856
P. Nahaolelua, Office of the Governor; to His Highness, L. Kamehameha:
[regarding stray animals and fencing]

…I am in receipt of your letter of the 26th and the 27th, and have seen all that has been written therein.

Regarding the request of the foreigners (*haole*) for an Overseer to construct a pound for stray animals for them; they have already constructed a pound, but it is at Pauwela and stands at Hamakualoa. Their great desire is to build at the boundary of Hamakuapoko and Haliimaile, so that it may be close to their gardens (plantation).
I have told them that there is no appropriation for such a position from the Government, but that it would be well if they constructed the pound and then turn it over for stray animals. They have consented, they will do the work.

However, Hamakuapoko is Government land, and there may or may not be a place for the pound to stand. When I receive your letter I shall be able to appoint an Overseer for said pound which has been constructed at Pauwela; but, after that then construct, as mentioned, at the boundary of Hamakuapoko and Haliimaile… [HSA, Series 71 Gov. Maui; Translation - Letter Book 1]

INDENTURE [Hamakuapoko]
July 1, 1857
R. Armstrong, Board of Education; to Prince Lot Kamehameha:
[leasing land of Hāmākua Poko to Lot Kamehameha; boundaries of land described; see Register Map No. 603]

…This indenture of lease between Richard Armstrong of Honolulu, Hawaiian Islands, President of the Board of Education on the one part and Prince Lot Kamehameha of Honolulu island of Oahu, Hawaiian Islands, of the other part, witnesseth, that the said Richard Armstrong has leased and does hereby lease unto the said L. Kamehameha, his executors, administrators and assigns upon the conditions hereinafter expressed that tract of land containing (5628) five thousand six hundred and twenty eight acres situated at Hamakuapoko, Island of Maui known by the following boundaries.

"Beginning at stake near two grass houses on the sea shore at the North West corner of this district adjoining Wailuku [near Kapukaulua] and running south 59°30' east 302 66/100 chains along the district of Kula to stone corner of the North side of Haliimaile; thence N. 43° 25' E. 34 29/100 chains along the boundary of Haliimaile to stone and *wiliwili* tree; thence N. 51° 21/ E. 40° 23' chs. to stone; thence N. 58° 30' E. 15 18/100 chs. always along the boundary of Haliimaile to the bottom of Maliko Gulch; thence along the bottom of said gulch which is the boundary between Hamakualoa and this district N. 26° 13' E. 97 chs.; thence N. 2° W. 27 55/100 chs.; thence N. 36° 45' W. 23 chs.; thence N. 14° E. 98 chs.; thence N. 1° W. 9 47/100 chs. to the N.W. corner of Boundaries, land where the boundary of Hamakualoa and of Hamakuapoko leaves the Gulch; thence N. 66° 30' W. 37 55/100 chs. along the boundary of Hamakualoa; thence N. 40° W. 112 43/100 chs. along the same; thence N. 57° 30' W. 49 16/100 chs. along the same to bottom of a small gulch at seashore; thence along the seashore to point of beginning."

Excepting and reserving that lot on the *mauka* side of this district containing (150) one hundred and fifty acres more or less, sold to R.W. Wood [Grant No. 764] and also excepting and reserving the rights of the native tenants, which tract and all its

present improvements and advantages, the said L. Kamehameha, his executors, administrators and assignees is to possess and enjoy without unlawful molestation for the term of five years from this date, provided he or his said representatives shall, during that period, comply with the following engagements on his part. viz.

The said L. Kamehameha or his said representatives is yearly to pay during the said term to the said Richard Armstrong or to his successors in office at the reserved rents of the said land the sum of (500) five hundred dollars and in addition thereto to pay any taxes now, or to be hereafter imposed by law upon landed property which are applicable to lease estates, and by no means to manufacture or sell any ardent spirits upon said land and at the full expiration of the said term of five years to restore the said land to Richard Armstrong or to his successors in office together with all the buildings enclosures and improvement thereon in which shall be hereafter erected thereon.

And it is thereby covenanted by the said L. Kamehameha that in case default shall be made in the payment of the rent as above reserved, then it shall be lawful for the said Richard Armstrong or his successors in office in present or by attorney, to sue for and levy the same on execution upon any property of said L. Kamehameha or of his representatives, and also that in case of non-payment of rent, whether the same shall have been lines on executions as above mentioned or in case either of the other conditions above set forth shall be violated, then it shall be lawful for the said Richard Armstrong or his successors in office to cause this lease to be annulled and the said Richard Armstrong or his successors in office be reinstated in the previous hereby dismissed.

Provided always that the President of the Board of Education shall have the power and right at any time during the term of this lease to sell and convey the above described premises to any person having first made his best offer to said L. Kamehameha and said offer being rejected and provided further that if the said land is not sold within five years and said Lot Kamehameha continues to occupy it to the termination of this lease, then he shall have the first offer of terms & time for the renewal of his lease.

In witness whereof the respective parties have hereto at this hand and seal this first day of July A. D. 1857…

L. Kamehameha and R. Armstrong
[HSA Series 261, Box 81; Pub. Inst. Land Fldr., 1857]

October 1, 1862
George Wentzel; to L.L. Torbert:
[leasing of portion of Puumalei, East Maui; see Register Map No. 603]

Indenture, Made the first day of October in the year one thousand eight hundred and sixty-two between G. Wentzel of Puumalei East Maui, S.I. of the first part and L.L. Torbert of Brewer Plantations Haliimaile of the second part.

Witnesseth, that the said party of the first part hath letten and by these presents doth grant, demise and let unto the said party of the second part all of the lot of land and water contained within the following bounds, Viz. commencing at the line between said Wentzel and the E. M. Plantations in the valley, via the cart road *mauka* of the wind mill and following said road easterly up the hill and over to the first small

valley. Thence following down said valley to the foot of the bank thence running in straight line to the *makai* side of the last water hole within said Wentzel's line. Then as following the line up the bottom of the valley to place of commencement, for the term of fifty years from the date of this instrument for the sum of forty dollars the receipt of which is hereby acknowledged. It being understood and agreed that said Wentzel shall have access at all times to the water on said lot.

In witness whereof I have here hereinto set my hand and seal, this day and date above written… [HSA, Dole – M-43, Folder 2]

March 30, 1867
Mea Hou o Hamakuapoko, Maui
(News of Hamakuapoko, Maui)

…2. The spring water that the people drink at Waiopua, Hamakuapoko, has been mixed with the water that the animals drink because there has been so much rain. The old people tell us that before, the water of the people and water of the animals was not mixed together, and now, in the year 1867, this is the first time that this has been seen. The people and the animals drank from the same water source for one month, and it has now receded so that the two springs can be seen, one for the people and one for the animals… The people are now considering hosting a feast for the sweetening of their water, from the time when they had to drink water with the animals.

3. The sugarcane leaves are green and fine at Hamakuapoko at this time, before it was short and appeared to grow in mounds.
4. The cattle ranchers have told many stories about their problems with the indigo, but now it is growing, and is good.
5. The foreign sugar growers are fast and diligent, the stripping, cutting and replanting of the cane is done.
6. I admire the adeptness of the Chinese planting sugarcane.
7. The Hawaiians of this place are strong in their planting of their gardens, planting large fields of *uala* (sweet potatoes) and various crops. The people join together (*huliamahi*) and cultivate the land… There is also a man, S. Kaohimaunu is his name, there are ten people in his family. He is a man skilled in fishing, and through his work, he tends to the well-being of his family from season to season with no trouble. And the price of fish is rising here…

F. Iliwai. Hamakuapoko. [*Nupepa Ku Okoa*, March 30, 1867:3; Maly, translator]

August 14, 1867
Jacob Wentzel (by Aug. Schaefer, his Attorney in fact)
Deed (Copy) – Sale of Puumalei

Know all men by these presents, that Jacob Wentzel of Gross Umstadf, Hesse, Germany in consideration of the sum of One Thousand Seven Hundred and Fifty Dollars to me paid by Christopher Farden of Makawao, Island of Maui, the receipt of which is hereby acknowledged. I being the brother, and sole heir of George Wentzel, late of Makawao, Island of Maui, deceased, do hereby give, grant, bargain, sell and convey, unto the said Christopher Farden, his heirs and assigns forever; all that piece and parcel of land, situated in Puumalei or Puuomaile, Haiku, East Maui, consisting of Three Hundred and Thirty Four Acres more or less and being the same as conveyed to George Wentzel on the 2nd day of June, A. D. 1858, by R. C. Wyllie, by deed duly recorded in the Registry Office in Honolulu in Liber 10 on pages 443, 444, 445. [sketch map attached – *Figure 2*]

To have and to hold the same with all the rights, privileges, appurtenances and improvements to the same belonging unto the said Christopher Farden, his heirs and assigns forever.

And I, the said Jacob Wentzel, for myself, my heirs, executors, and administrators, do covenant with the said Christopher Farden, his heirs and assigns, that I have good right to sell and convey the premises aforesaid; that the same are free from all incumbrances and that I will, and my heirs, executors and administrators, shall warrant and defend the same unto the said Christopher Farden, his heirs and assigns against the lawful claims and demand of all persons.

In testimony whereof, I have hereunto set my hand and seal this fourteenth day of August, A. D. Eighteen Hundred and Sixty Seven… [HSA – S.B. Dole Collection, M-43 Folder 4]

November 14, 1868
"Ka naue ana i Wailuku, a Haiku, a Makawao, a Ulupalakua, i kai o Makena, huli hoi i Lahaina." (A journey to Wailuku, Haiku, Makawao, Ulupalakua, and to the shore of Makena, and then returning to Lahaina.):
[Describes sites seen and residents of various locations visited]

On Thursday afternoon, 15 Oct, we left Lahaina and went to Wailuku for the meeting of the Elders on Maui. Upon completion of the meeting, we then went to visit various places… We began our journey across the kula to Haiku. We traveled across the *kula*, on the inland side of the murmuring sands of Kahului (*ke one hone o Kahului*). We saw before us the darkening skies, and soon the rains fell on us. Gathering together, we put on rain jackets and continued our journey. Mr. Kaawa called out. "Fall upon o rains, the rain is needful for our growth." We went on until we reached—

Maliko.
Maliko is a place with a good stream, it is also an anchorage for seafaring boats, and there is a wharf on one side. The cliff is quite steep, but the flat lands below, are beautifully adorned with groves of *kukui*. On one side, there is the ramp on which sugar is taken down from the sugar mill. It is a task of which there is no equal, that which has been done by the boys here. It is described as:

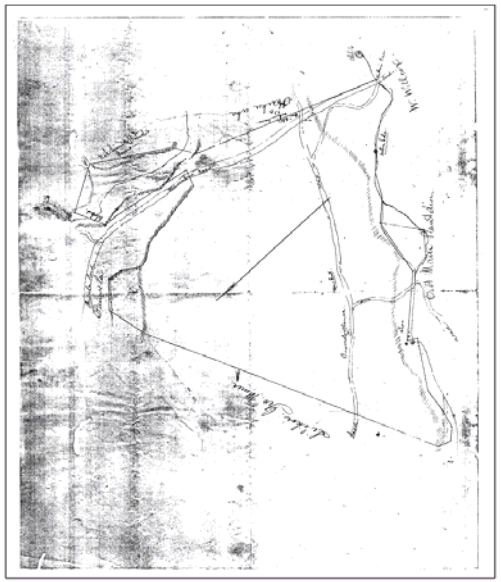

Figure 2. Puuomalei Sketch Map (1867)

"Nome ka la i ka pohu o Maliko.	The sun nibbles away at the calm of Maliko.
Nome na bipi ai weuwea o Kalanikahua.	The cattle munch on the grasses of Kalanikahua.
He kahua holo nome na ke lio o Kaupakulua.	Kaupakulua is the plain upon which the horses nibble.
Lua ole ka ua noho nome iluna o ka laau.	There is nothing like the rains which seem to sit upon and nibble on the forest.
Hoolaau ka manu noho nome i ke kula o Haili.	The birds continuously sit and nibble on the plain of Haili.
Ili iho la ke ao noho nome i ke kuahiwi."	The clouds nudge up against, and settle as if nibbling away at the mountain."

We departed from Maliko, and ascended in the falling rains, and were met by Mr. Castle, the chief mill supervisor at Haiku..and then reached—

Haiku.
We saw the mill, and the people were there beckoning us to come and visit… We toured the mill and when done, we departed. Looking about, we saw the *Ukiukiu* rains proudly moving across the top of Piiholo. We continued up, and it was like the lines of that ancient *mele* (chant) spoken for there—

"Hele i ke alo o Haiku,	Travel in the presence of Haiku,
Eia la—e—	Here it is—
Aniani mai o Awilipu,	Awilipu glistens forth,
Me na malihini e hele nei."	And the visitors approach.

We continued our ascent in the rains, feeling the goose bumps rise, and in the dark of the rain, we reached *kukui* grove of Lilikoi. We then crossed the stream of Waialala, and we arrived at—

Makawao.
We were welcomed at the home of David Crowningburg, Esq….where we were warmed and spent the night… The next morning, we departed, attended by the familiar (native) rain, *Ukiukiu*, and we arrived at—

Maunaolu Home.
That is the girls school, where they ascend the hill of knowledge. We visited with Rev. J.P. Green…and while there we met with Rev. W.B. Paris [of the Kealakekua, Kona Station] and his family who were visiting for a short while. We then departed and went to—

Pulehu.
At the house of Kalama, the sheriff of Makawao. He was on Oahu at the time, but we were greeted by J.W. Kaukaua… [M., Lahaina, Maui – in *Nupepa Ku Okoa*, November 14, 1868:4; Maly, translator]

July 7, 1870
Eugene Bal; to F.W. Hutchinson:
[regarding danger of wild cattle along roadways]

As there are a lot of wild cattle running on my land at Hamakuapoko and have done considerable damage and are dangerous to the public as they attacked me in my

wagon and upset it and killed my dog and chased a great many of the natives and even chased me yesterday. Therefore I wish you or the Government would give me the privilege of catching those cattle which are not branded and they are all over two years old or to shoot them and I will allow you the value of the hides… [HSA, Interior Department – Land Files]

[E. Bal's house was situated *makai* of the *Alanui Aupuni*, near the Hamakuapoko-Haliimaile boundary; see Register Map No. 603, 1872].

April 5, 1876
Elia et al.; to Jacob Markle
Lease of Land at Waianu and Pahoa, Keanae:

This lease agreement was executed on this fifth day of April, A.D. 1876, between Elia (k) Heir of Malailua; and Kekalohe (w), Heir of Kaleo; Nahalea (k) & Lani (w), Heirs of Keohohuna; Ioane (k), Heir of Waiwaiole; Wahine (k), the husband of Kaia (w), Heir of Maewaewa; and Kimokeo (k), Heir of Kiko; and Hakau (k) and Naihe (k), and Hina, Heirs of Kahaukomo; and Kini (k), Heir of Kalino; and Kaakuamoku, Heir of Paula; Uluhani (k), Kailimoku, and Napali (w), Heirs of Paiki; and Nailima, all of Keanae, Island of Maui, Hawaiian Islands, being of the first part; and Jacob Markle of Lahaina, Maui, aforesaid, of the second part.

The people of the first part bear witness by this document, that they lease to Jacob Markle, aforesaid, his heirs and executors, all of that parcel of Land situated at Waianu and Pahoa, Keanae, Maui, aforesaid, (Excepting Two Acres at a place where there are mango growing, and a house stand, on the eastern side of said land, for the people of the first part). The boundaries are thus described:

Begin at the Southern Corner of this, at the corner of the land of Kanihu *ma*, and run: North 32 ¾ ° East 11.35 Chains along the property of Kanihu *ma*… [see Royal Patent Grant No. 1911] …An area of 107 Acres.

To have and to hold this land, along with its benefits, rights and water rights, and other rights by Law, by Jacob Markle, aforementioned, his heirs and executors for the term of Twenty Years, beginning on the day this document is executed to the fulfilling of the time herein described… [HSA – S.B. Dole Collection, M-43 Folder 7 (see also Liber 45:481-482); Maly, translator]

May 23, 1876
C.T. Gulick, Interior Department Clerk; to H. Nalimanui, Agent of Government Lands; from Heleleikeohe Oopuola, Koolau, Maui:

…I am directed by his Excellency the Minister of the Interior to request that you immediately send a statement of all Government Lands lying within the places mentioned above, with their names. Send your statement as soon as you can to the Interior Department… [HSA, Interior Department Letter Book 13:377]

July 31, 1876
C.T. Gulick, Interior Department;
to C.H. Dickey Esqr., Atty. For Hanaloa, Haiku, Maui:
[regarding application of Hanaloa for land at Hāmākua Loa]

…I am directed by His Excellency the Minister of the Interior to acknowledge receipt of yours of the 24th inst. Together with a receipt for $53.50 given by Gov.

Kapena to Hanaloa a/c of purchase of a piece of Govt. Land in Hamakualoa, Maui. And to say in reply to your request for a Royal Patent that, so far as is known at this office, no proper survey has ever been made of the land in question, the first thing required is a survey, approved by Governor Kapena, and compared with the surveys in this office of adjoining lands, to see that it does not interfere with the rights of others. This being done a Patent will issue… [HSA, Interior Department Letter Book 13:377]

November 20, 1876
James Makee; to His Excellency W.L. Moehonua, Minister of the Interior:
[applies for right to draw water from Hāmākua Loa to lands of the Makawao-Waikapū Region (see reply dated May 31, 1877)]

…The undersigned in his own behalf as well as for others with whom he may hereafter associate with, apply to your Excellency for a grant in right to take, draw off, and use water from the streams and sources of water situated in the District of Hamakualoa, Island of Maui and the right to convey said water over the Government Lands for the purpose of irrigation or otherwise, the said lands to be irrigated, and situated in Makawao and Waikapu.

The undersigned also begs to say to your Excellency that he is aware that a grant has already been given to the Haiku Sugar Company and others to take and draw the water from the streams in the said District of Hamakualoa and known as Nailiinaele [Nailiilihaele], Kailua, Hoalua, Huelo, Holawa and Honopou, but the undersigned believes there are other streams in the said District of Hamakualoa that can be utilized although at great expense.

I would therefore ask that your Excellency will be pleased to give this matter your earliest consideration and to place it before the Commission under the Act, "To Develop the Resources of the Kingdom."

I have the honor to be your Excellency's Obt. Servant… [HSA, Interior Department Box 55 – 1866-1887; Water: Maui & Molokai]

February 12, 1877
J. Mott Smith, Minister of Interior;
to W. D. Alexander, Esq. Surveyor General – Maui:
[regarding applications for land in the Hāmākua-Ko'olau Region]

…There are on file in this Dept. several applications for Govt Lands on Maui, concerning which I would like any information which you can gather, in order to determine whether or not, the applications may be granted.

J. Markle applies for a lease of Waianu - Koolau Maui containing some 200 acres of cane land - the tract runs up in the bush – He offers $100 pr year rental.

Dr. F. H. Enders applies to purchase or lease the lands of Puolua No. 1 & 2 in Hamakualoa - Maui offers 50 cents per acre to buy – wants to plant cane.

B. B. Kalilimoku applies to buy land in Keanae Koolau Maui, 3 acres, offers $3 per acre.

Give me some idea of the area of these lands and their nature, and if it is desirable to dispose of them. The 3 acre application you need not trouble yourself very much

about - An early answer will be acceptable… [HSA, Interior Department Letter Book 14:127]

March 18, 1877
J. Mott Smith, Minister of Interior; to F. H. Enders. M. D., Wailuku, Maui:
[Pi'olua already sold to native tenants]

…With reference to your application of Jan 19th for the lands of Puolua 1st & 2nd in Hamakualoa Maui - I have to reply that Surveyor General Alexander, went and examined the said lands, and by his report dated 24th inst. I am informed, that the Government, has no further title there. There are Seven Grants, by Royal Patent, to as many natives and Mr. Alexander thinks these grants cover the whole of Puolua — Without an actual survey, I am not able to say that Mr. Alexander's opinion, is incorrect - at all events, the chances, that any of the land remains in the Govt – is too small – that I cannot without a survey undertake to lease or convey, any rights which may remain to the Government… [HSA, Interior Department Letter Book 14:168]

May 22, 1877
Chas. T. Gulick, Interior Department Clerk; to B. B. Kalilimoku Esqre.:
[regarding Kalilimoku's application for land at Ke'anae]

…I am directed by His Excellency the Minister of the Interior, to acknowledge the receipt of your application of the 8th of February of this year, for a certain tract of land in Keanae, Koolau, Maui.

These lands have not been surveyed, and the Government therefore cannot give prompt approval to your application, until after the survey of the same have been completed. If you wish to have this matter promptly attended to, you had better have said land surveyed at your own expense, and forward the same to this office, so that the notice of sale could be published… [HSA, Interior Department Letter Book 14:232]

May 31, 1877
J. Mott Smith, Minister of Interior; to Capt. Jas. Makee:
[application to draw water from Hāmākua Loa]

…In reference to your application, "for a grant or right, to take, draw off, and use water from the streams, and sources of water, situated in the District of Hamakualoa island of Maui" for the irrigation of lands in Makawao and Waikapu. I have to say that the Govt are ready to convey to you, for the purpose aforesaid — whatever waters in that District may be at its disposal. You are aware, that a Lease to the Haiku Sugar Co and others, of certain of the waters of the District, is in force — the conditions of which, must be observed by the Government — in any negotiation with you — about the water and water-rights in that neighborhood… [HSA, Interior Department Letter Book 14:247]

July 5, 1877
P. Jones, Interior Department Clerk; to Kalilimoku Esqre., Keanae, Koolau, Maui.

…I am directed by His Excellency the Minister of the Interior, to inform you that your land application has been accepted; you must therefore send the purchase price of the land, as stated in your application, the sum of $9.–. Do not forget to send five dollars for the Royal Patent and One Dollar for the stamp; amounting in all to Fifteen Dollars (15.–).

Upon receipt of the money at this office, the Patent will be issued [see Royal Patent Grant No. 3215]… [HSA, Interior Department Letter Book 14:299]

August 7, 1877
P. Jones, Interior Department Clerk;
to W. D. Alexander Esqre., Surveyor General Makawao Maui:
[regarding survey of Kalilimoku's land at Pāhoa, Ke'anae]

…I am directed by His Excy: the Minister of the Interior to request you to be kind enough to give us some information respecting the 3 acres in "Pahoa" Koolau Maui — Kalilimoku has deposited the money for purchase of this lot, but in order to make out a Patent it is necessary that the tract of land should be more or less defined, although in a case like this a survey is not needful. His Excy: would feel obliged to you if you would send this information at your earliest convenience… [HSA, Interior Department Letter Book 14]

August 21, 1877
P. Jones, Interior Department Clerk; to Thos W. Everett Esq., Lahaina, Maui:
[regarding appraisal of Opana]

…I am directed by His Excy: the Minister of the Interior to communicate with you concerning the appraisement of the land of "Opana" Hamakualoa Maui. The Board of Appraisers for the Island of Maui assessed the unimproved value of said land at $1468 – & the party owning the land has appealed to His Excy. against this assessment.

Will you please send any information to this Office, which may tend to show why said land was valued at the above figure which appears rather high… [HSA, Interior Department Letter Book 14]

October 30, 1877
P. Jones, Interior Department Clerk; to S. B. Dole, Esqr.:
[regarding appraisal of Opana]

…I am directed by His Excy the Minister of the Interior to inform you that your appeal from the decision of the Board of Appraisers for the Island of Maui, in the matter of the land "Opana" in Hamakualoa on said Island of Maui, cannot be entertained… [HSA, Interior Department Letter Book 14]

November 29, 1877
Order of Court and Award of Commissioners of the Hui of Hamakuapoko;
to J.M. Alexander

Know all men by these presents that we John D. Havekost, M. Kapihe and S. Kamakahiki each of Makawao Island of Maui, Commissioners appointed by the Honorable A. Fornander, Circuit Judge of said Island of Maui to partition off in severalty to James M. Alexander of Haiku in said Island of Maui, his share in the lands tenements, and [illegible] conveyed by the Haiku Sugar Company of deed of Conveyance dated the fifth day of July AD 1866 and recorded in the register of Deed in Honolulu in book 23 on pages 442 and 443, to Kahalelaau and certain others. Grantees named in said deed, he the said James M. Alexander having succeeded by purchase and sundry deeds of conveyance and assignments to the ownership in fee of certain shares or titles of the said grantees, their heirs or assigns in and to the said granted premises to wit to shares or title amounted in all to Fifteen undivided Twenty Eight parts of the whole of said granted premises – we the said

commissioners did cause such portion to wit Fifteen Twenty Eight parts of the whole of said land to be partitioned off and set apart by metes and bounds to the said James M. Alexander in severalty and further the said Court Justice on our report of such partition being made to him did cause such proceedings to be had before him as were by law required.… …In witness where of we the said John D. Havekost, M. Kapihe and S. Kamakahiki have hereto set our hands on this 29th day of November AD 1877.… …[T]hey further report that they have accordingly set off in severalty to the said James M. Alexander all those certain pieces or parcels of said premises designated on said Map of Survey by the letter "A" and in the notes attached to said survey fully bounded and described and be set apart to the other co-owners of said premises in severalty to them all those certain pieces or parcels of land designated on said Map of Survey by the letter "B" and in the notes of survey thereto attached fully bounded and described. [See *Figure 3*; Survey Map, Liber 56:107; Register Map No. 176. J.F. Brown, Surveyor; 1877.]

The following are the notes of survey of the whole premises and of the several pieces or parcels of the Partition.

Notes of Survey of the whole premises. Beginning at a concrete pillar near the shore at "Kapukaulua" from which point the signal of the Hawaiian Government Survey on Puu Nene bears S 8º 15' W true bearing distant 6037.7 feet the boundary runs S 9º 30' E true 1062 feet to concrete pillar at "Keonekapu." S 40º 7 ½' E true 3013 feet to concrete pillar at "Nukukahawai." S 2.2º 3'-40" E true 934 feet to a rock called "Olopua." S 89º 45' E true 300 feet along Grove Ranch to Iron Pin N 51º 58' E true 4445 feet along Grove Ranch and land belonging to Alexander and Baldwin and Haiku sugar Co. Land to junction of wire fences. N38º 58" W true along wire fence. N 75º 30' W true 150 feet along wire fences. N 85º 25 W true 158 feet to shore. S 60º59' W true 565 feet along shore. S 4º 19' W true 532 feet along shore. S 32º 4' E True 421 feet along shore. S 35º 5' W true 1200 feet along shore. S 57º 21' W true 518 ½ feet along shore. S 70º 00' W true 1510 feet along shore. S 54º 36' W true 1543 feet along shore. S 20º 22' W true 488 feet along shore. S 48º 12' W 824 feet along shore. S 68º 19' W true 405 ½ feet along shore. N 86º 1' W true 928 feet. S 84º 12' W true 2275 feet along shore to point of beginning. Whole Area 872 4/10 acres. Area exclusive of native rights 842 4/10 Acres… [Bureau of Conveyances, Liber 56:103-109; see also Register Map No. 603]

January 22, 1878
P. Jones, Interior Department Clerk;
to W. L. Moehonua, Governor of Maui &c, &c, Lahaina::
[regarding application for purchase of land at Honolulu Nui, Nāhiku]

…I am directed by His Excellency the Minister of the Interior to inform you, that Ioane, a Hawaiian, called at this office with a receipt for the sum of Thirty One 43/100 ($31.43) Dollars, given by L. Aholo, Clerk Governor of Maui pr. D. Mamaki, on the 11th day of Dec. 1877 to Kamili and Twelve others with him.

This being the balance of the purchase price for 36.68 acres of land, at Honolulu Nui, Nahiku, Koolau, Maui. He also brought a survey of said land, as surveyed by Prof. Alexander.

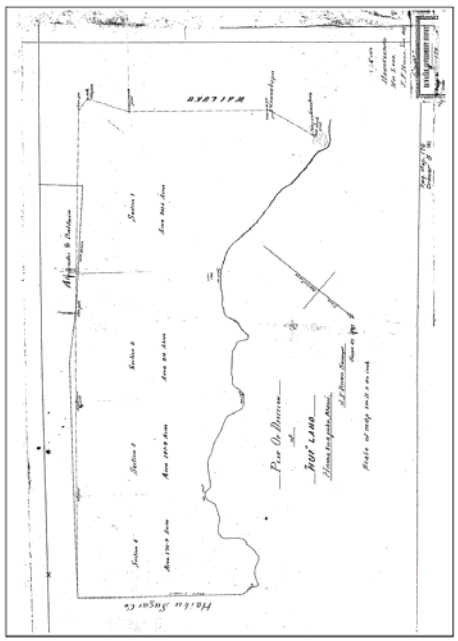

Figure 3. "Hui Land" Hamakuapoko (Register Map No. 176. J.F. Brown, Surveyor; 1877)

I am directed by His Excellency to ask you to be good enough to report to this office all particulars pertaining to this land, and to also report with whom the purchase price of this land was agreed upon with these people, together with all other information which in your judgment, would enlighten all and every subject pertaining to this land… [HSA, Interior Department Letter Book 14]

April 11, 1878
Deed of S. W. Andrews & others; to Akanaliilii:
[regarding sale of parcel – Royal Patent No. 84, Makawao; a parcel from the 1846 land experiment (Mahele)]

Know all men by these presents that S. Samantha W. Andrews for myself and acting under Power of Attorney in fact for Samuel C. Andrews, Lucy C. Andrews, Tammy Andrews and Luella L. Andrews: and Lorren A. Andrews and Florence N. Andrews now and recently of Makawao, Maui Hawaiian Islands for and in consideration of the sum of Four Hundred and Fifty Dollars ($450) to us in hand paid by Akanaliilii of Makawao Maui, the receipt of which is hereby acknowledged do hereby give grant bargain till and by these convey unto the said Akanaliilii his heirs and assigns for each all that certain piece of land situated in Makawao aforeseen (description of parcel of 18 22/100 acres)… The above lot of land is the same granted to Kekoa in Royal Patent No. 84 and dated the 15th of May 1848 and by Kekoa deeded in fee simple to Melville M. Gower on the 24 of February 1855 and by M. M. Gower deeded to John T. Gower on the 13th of November 1857 and by J.T. Gower deeded to J.P. Green on the 1st of April 1868 and by J. P. Green deeded to Saml. Alexander on the 1st of June 1870 and by Saml. Alexander deeded to C.B. Andrews on the 12th day of March 1872. To have and to hold the above conveyed promises with all the privileges and appurtenances thereto belonging with this our covenant of warranty and lawful… [illegible] …into the said Akanaliilii his heirs, executors, administrators and adjoins in fee simple for ever.

In witness whereof we have hereunto set our hands and seals this 11th day of April A. D., 1878.

Samantha W. Andrews
and acting under Power of Attorney in fact for Samuel C., Lucy C., Fanny P. and Luella L. Andrews, Lorrin A. Andrews, Florence N. Andrews… [Bureau of Conveyances, Liber 56;122-123; see Register Map No.'s 186 & 603]

April 23, 1878
C.T. Gulick, Interior Department; to T. Akanaliilii, Makawao, Maui:
[regarding application to purchase land at Pi'olua]

…I am directed by the Minister of the Interior, to acknowledge the receipt of your favors of the 5th and 18th of this month; requesting that the Government sell to you a certain piece of land, called Puolua, in Hamakualoa Maui; in reply would say, that when the Minister gets an opportunity, then careful consideration will be given your application, and whatever is decided upon, you will be duly notified of the same… [HSA, Interior Department Letter Book 15:89]

April 23, 1878
C.T. Gulick, Interior Department; to W.L. Moehonua , Governor of Maui…:
[regarding sale of land in Honolulu Nui to Kamili et al.]

I am directed by His Excellency the Minister of the Interior to say, that your letter by D. Mamaki, dated the 20th of this month, has been received. The notices have this day been sent to the Printing Office… [HSA, Interior Department Letter Book 15:89]

May 6-21, 1878
Interior Department Letter Book – Volume 15

List of Konohiki and Crown Lands on the Island of Maui, bordering on the sea, with the extent of sea-coast belonging to each, as far as known at present.

HAMAKUALOA			
Kaupakulua 1	Award # 10474	Namauu	1620 ft. Sea Coast
Ulumalu	Award # 10474	Namauu	2100 ft. Sea Coast
Opana	Award # 2937	W. Harbottle	2700 ft. Sea Coast
Halehaku	Award # 8515	Keoni Ana	4170 ft. Sea Coast
Huelo	Award # 520	John D. Ii	790 ft. Sea Coast
Hanawana	Award # 5250	Kanui	1300 ft. Sea Coast
Papaaea	Award # 9971	W.P. Leleiohoku	not surveyed
KOOLAU			
Honomanu	Crown		8100 ft. Sea Coast
Keanae	Crown		4900 ft. Sea Coast
Wailua (1 & 2)	Crown		4850 ft. Sea Coast
Paakea & Puakea	Award # 209	S. Grant	900 ft. Sea Coast
Keaa 2	Award # 10512	Nahuina	1200 ft. Sea Coast
Ulaino	Award # 8518B	J.Y. Kanehoa	2000 ft. Sea Coast

[HSA, Interior Department Letter Book 15:123]

August 16, 1878
Jno. S. Smithies, Interior Department; to Mr. Nahiku:
[regarding sale of land in Honolulu Nui to Kamili et al.]

I have found those papers of your land at Honolulu Nui, Koolau, Maui; that is the 36 68/100 acre piece [Royal Patent Grant No. 3190]. Do not therefore search for the copy of the survey of said land; because the plan, receipt and all other papers pertaining to said land are at this Office.

Upon the return of the King from Kauai, the Royal Patent for said land will be issued. Be good enough to state, where to send to… [HSA, Interior Department Letter Book 15:233]

January 11, 1879
"He Ino e ulu nui ana." (A Storm is Growing.):
[Regarding growing plantation interests in the islands—citing development of the Haiku Ditch—and the plans to import laborers. Editor, Jos. Kawainui, describes the problems which he and others have heard regarding the importation of foreign labor, and likens it to a storm brewing on the horizon.]

At this time when new work is developing, and the face of the land is taking on the new appearance of sugar plantations and other undertakings, thus enriching the land and advancing our nation, there is growing need for laborers. The sugar plantations are complaining that they will not have enough labor. There is the new *auwai* (ditch) at Haiku, being dug at this time, but there are not enough workers. Our nation is sending out to the islands of the sea to secure laborers. Even to China… *I manao ai makou, he ino e ulu nui ana*. [J. Kawainui in *Ko Hawaii Pae Aina*; Maly, translator]

February 22, 1879
William Fargo; to William Armitage:
[conveys one-fourth interest in lease of land at Waianu & Pahoa, Keanae]

Know all men by these presents that I William Fargo of Makawao Island of Maui, for and in consideration of the sum Two Hundred and Fifty Dollars to me paid by William H. Armitage of Keanae, Island aforesaid, the receipt whereof is hereby acknowledged, do hereby sell assign and set over unto the said William H. Armitage his heirs executors administrators and assigns one undivided fourth part share or interest of and in all that certain tract of land situated in Keanae Maui and fully described in a certain deed of lease dated the fifth day of April A.D. 1876 recorded in Lib. 45 pages 481, 428 and 483 from Elia and others to J. Markle together with all and singular the improvements and growing crops on the said premises.

To have and to hold the said fourth interest in said premises and improvements until the said William H. Armitage his heirs executors administrators and assigns for all the residue and remainder yet unexpired of the term of twenty years fronted by the aforesaid deed of lease… [HSA – S.B. Dole Collection, M-43 Folder 7]

May 6, 1879
C.T. Gulick, Interior Department Clerk; to [H. Nalimanui]:
[regarding his appointment as land agent of Ko'olau, and instructions for leasing Government lands]

…By direction of His Excellency I beg to inform you that you have been appointed Sub-Agent of Government Lands for the District of Koolau, Maui, lying between Helelekeoho and Oopuola. Full authority is given you to lease the small tracts of land, and all rights the Government may have in the lands, but your leases shall not exceed one year. In all of your transactions report promptly to the Minister of the Interior, and you are under no circumstances to execute a lease with others, as the issuance and execution of leases are done in this office… [HSA, Interior Department Letter Book 13:356]

September 19, 1881
E.W. Kahoapii, H. Kapali and all [native] residents of Wailuanui; to Princess Kamakaeha Liliuokalani, His Majesty's Regent:
[regarding Crown Lands in Wailuanui-Ke'anae vicinity, and of discrepancies in land dealings between agent and Chinese rice farmers]

…The thought has come to me so as to reply to you, Princess, about what we talked about in the night at Keanae, because of crooked doings of the agents who falsely told you, Princess. Kaakuamoku saying to you that it was his own land which he leased to the Chinaman, and not the Crown Land. We, the old residents of Wailuanui stand up and affirm to you, oh Princess, that this land of Kalaiahakea, by name, does not belong to this great crook Kaakuamoku. No, not at all, that is Crown Land from ancient time to the time of your ruling the Kingdom. The above described land has an area of two or three acres, with two other large patches of Kaipalaoa, and it was this agent also who disposed of it to the Chinamen, and by none other. Hookano was another agent here for Wailua, but, he gave absolutely a large patch named Puaiele to the Chinamen to plant rice for themselves. It was these agents who had power which was more than the power of the King and the Commissioners of Crown Lands, and they have repeatedly said haughtily and boasted that the places where the natives were to live was the branches of the trees. And because of this, we, the old residents of the land have combined together and are putting money aside and will come before the Commissioner, Kale Kauka, and His Majesty, when we hear that they have returned from the tour of His Majesty… [HSA, Interior Department Box 55 – Water Maui & Molokai, 1866 – 1887]

June 26, 1893
D.W. Napihaa; to J.A. King, Minister of the Interior:

…I, D.W. Napihaa, of Keanae, Koolau, Island of Maui, make application before your Excellency for the positions below set forth:

1. That it is proper that the Pound mastership of the Government be given to me.
2. That all of the Government lands in the District of Koolau be given to me.

Upon the following grounds: That B.B. Kalilimoku has been appointed Pound Master, and has also been appointed agent of Government lands. And yet, he is completely opposed to this Provisional Government and he is doing his best for the *Aloha Aina*, and is taking petitions of the natives.

And I have taken the oath under this new Government, and am doing all I can for annexation…

I, J.K. Iosepa, certify to everything shown above. [HSA Interior Department – Land Files]

June 21, 1894
D.W. Napihaa; to J.A. King, Minister of the Interior:
[regarding Government lands of Ko'olau and practice of taking logs for canoes]

…You replied to me before that you were considering the matters pertaining to the Government lands here in Koolau, of which I made application to you for two times before, and because I have noticed that the natives are going in great numbers up in the mountains to cut canoes and sell same for their own profit without paying any attention to the rights of the land.

Therefore, I again ask you to please appoint me, the one whose name is below, as agent for Government lands of Koolau, Island of Maui.

Hon. J.K. Iosepa is in Honolulu, and you ask him about this mater... [HSA Interior Department – Land Files]

Palapala Sila Nui (Royal Patent Grants)
Lands of Hāmākuapoko, Hāmākualoa and Ko'olau (1847-1879)

The *Māhele* of 1848 was met with mixed results. Throughout the islands, many of the applications made by native tenants for *kuleana*, had been rejected (see preceding section) by the Land Commission. This problem was recognized while the *Māhele* was being undertaken, and Kamehameha III initiated a program that allowed native and foreign residents to apply for grants of land—in fee-simple interest—which belonged to the Government inventory.

The process of applying for "Grant Lands" was set forth by the "Enabling Act" of August 6, 1850, which set aside portions of government lands for grants—

> **Section 4**. Resolved that a certain portion of the Government lands in each Island shall be set apart, and placed in the hands of special agents to be disposed of in lots of from one to fifty acres in fee simple to such natives as may not be otherwise furnished with sufficient lands at a minimum price of fifty cents per acre. ["Enabling Act" – DLNR 2-4]

The Kingdoms' policy of providing land grants to native tenants was further clarified in a communication from Interior Department Clerk, A. G. Thurston, on behalf of Keoni Ana, Minister of the Interior, to the Government Land Agent of Kona:

> ***February 23, 1852***
> …You will entertain no application for the purchase of any lands, without first receiving some part, say a fourth or fifth of the price; then the terms of sale being agreed upon between yourself and the applicant you will survey the land, and send the survey, with your report upon the same to this office, for the Approval of the Board of Finance, when your sales have been approved you will collect the balance due of the price; upon the receipt of which at this office, the Patent will be forwarded to you.
>
> Natives who have no claims before the Land Commission have no Legal rights in the soil.
>
> They are therefore to be allowed the first chance to purchase their homesteads. Those who neglect or refuse to do this, must remain dependant upon the mercy of whoever purchases the land; as those natives now are who having no kuleanas are living on lands already Patented, or belonging to Konohikis.
>
> Where lands have been granted, but not yet Patented, the natives living on the land are to have the option of buying their homesteads, and then the grant be located, provided this can be done so as not to interfere with them.
>
> No Fish Ponds are to be sold, neither any landing places.

> As a general thing you will charge the natives but 50 cents pr. acre, not exceeding 50 acres to any one individual. Whenever about to survey land adjoining that of private individuals, notice must be given them or their agents to be present and point out their boundaries… [Interior Department Letter Book 3:210-211]

In between 1847 and 1886 a total of 210 applications for 20,449.49 acres, were patented as grants on land that was a part of the Government inventory of lands of the Hāmākua-Ko'olau region. Many of the native grantees had also claimed, and in some cases been awarded *kuleana* in the Hāmākua-Ko'olau region during the *Māhele*. *Table 3* is a list of all grantees (including the Royal Patent Number, location of land and number of acres) for lands granted in the Hāmākua-Ko'olau region up to 1886. The number of Hawaiian and foreign grantees and acres of land granted totals —

> Hāmākua Poko – 53 Hawaiians received 1,317.9 acres; and 12 foreign residents received 2,167.19 acres.
> Hāmākua Loa – 68 Hawaiians received 1,983.12 acres, and two Hawaiian *Ali'i-Konohiki* grantees received 5,629 acres; and 24 foreign residents received 7,436.54 acres.
> Ko'olau – 60+ (in 49 Grants) Hawaiians received 1,852 acres; and one (in 2 Grants) foreign resident received 63.74 acres.

Table 3. Palapala Sila Nui (1847-1886); Hāmākua-Ko'olau Region, East Maui
District of Hāmākua Poko, Maui

Grant No.	*Grantee*	*Location*	*Acreage*	*Book*	*Year*
360	Kekahuna	Hamakuapoko	47.5 A	2	1850
187	Richardson, J.	Hamakuapoko	150.3 A	1	1849
764	Wood, R. W.	Hamakuapoko	150 A	5	1852
327	Aneru	Makawao	24.61 A	2	1850
2639	Conde, D. T.	Makawao	16.77 A	13	1859
68	Green, J. S.	Makawao	87.07 A	1	1847
66 & 833	Green J. S.	Makawao	98.93 A	1 4	1847 1852
2009	Green, Mary	Makawao	24.97 A	11	1856
216	Gower, J. T.	Makawao	404.00 A	3	1850
767	Holliday, R.	Makawao	18.34 A	3	1852
325	Honolulu	Makawao	11.19 A	2	1850
320	Honuaakaha	Makawao	19.22 A	2	1850
87 & 2008	Ii, Daniel	Makawao	39.78 A	1 11	1848 1856
	Ii, Daniel	Makawao	39.78 A	1	1848
598	Ieremia	Makawao	14.77 A	2	1851
2472	Ihu	Makawao	38.60 A	13	1858
499	Kauea	Makawao	8 A	2	1851
57	Kaimu	Makawao	6.48 A	1	1847
86	Kahainapule	Makawao	35.06 A	1	1848
317	Kahainapule	Makawao	21.5	2	1850
315	Kalaau	Makawao	21 A	2	1850
602	Kalawaiahou	Makawao	21.18 A	2	1851
79	Kalawe	Makawao	11.1 A	1	1848
323	Kalawe	Makawao	11.83 A	2	1850

Table 3. (continued)

Grant No.	*Grantee*	*Location*	*Acreage*	*Book*	*Year*
65	Kaleihopu	Makawao	8.62 A	1	1847
90	Kalia	Makawao	13.11 A	1	1848
498	Kalimaimoku	Makawao	23.35 A	2	1851
313	Kalopa	Makawao	10 A	2	1850
249	Kamanaulu	Makawao	50 A	1	1850
314	Kamanohili	Makawao	10.75 A	2	1850
770	Kapai	Makawao	151 A	3	1852
107	Kaukauohi	Makawao	12.9 A	1	1848
2885	Kauwe	Makawao	33 A	14	1862
332	Kauwila	Makawao	16.39 A	2	1850
322	Kaukaikawai	Makawao	43.56 A	2	1850
319	Kealoha	Makawao	12.69 A	2	1850
321	Keawe	Makawao	35.56 A	2	1850
768	Kekahuna	Makawao	56.75 A	3	1852
75	Kekahuna	Makawao	26.14 A	1	1848
318	Kekalo	Makawao	18 A	2	1850
504	Kekino	Makawao	24 A	2	1851
84	Kekoa	Makawao	18.22 A	1	1848
2840	Kekua	Makawao	110.54 A	14	1862
599	Kiaipu	Makawao	11.62 A	2	1851
85	Kilaweau	Makawao	19.79 A	1	1848
316	Kimo	Makawao	20.8 A	2	1850
326	Kuli	Makawao	13 A	2	1850
1817	Kupaiuli	Makawao	10.66	10	1855
597	Lono	Makawao	22.74 A	2	1851
330	Makua	Makawao	19.26 A	2	1850
64	McLane, W.	Makawao	318.94 A	1	1847
157	McLane, W.	Makawao	370 A	1	1849
67	Makawao Prot. Ch.	Makawao	22.17 A	1	1847
3084	Makee, James	Makawao	506 A	14	1871
329	Mooniomio	Makawao	13.4 A	2	1850
324	Naheana	Makawao	12.35 A	2	1850
769	Naheana	Makawao	15.75 A	3	1852
328	Nuole	Makawao	8.90 A	2	1850
600	Nunu	Makawao	24.49 A	2	1854
58	Omaile	Makawao	9.73	1	1847
331	Opu	Makawao	14 A	2	1850
603	Opunui	Makawao	35.59 A	2	1851
56	Paele	Makawao	6 A	1	1847
82	Pololu	Makawao	19.52 A	1	1848
102	Uwe	Makawao	17.74 A	1	1848
601	Uekalohe	Makawao	16.60 A	2	1851

Table 3. (continued) District Hāmākua Loa, Maui

Grant No.	Grantee	Location	Acreage	Book	Year
183	Alexander, W. P.	Haiku	180 A	3	1849
121	Armstrong, R.	Haiku	530 A	1	1849
166	Armstrong, R.	Haiku	558 A	1	1849
176	Armstrong, R.	Haiku	852 A	3	1849
2887	Gower, M. M.	Haiku	2.79 A	14	1862
182	Kekuanaoa for Kamamalu	Haiku	3226 A	3	1849
165	Kekuanaoa for Kamamalu	Haiku	567 A	1	1849
59	Miner, E.	Haiku	674.2 A	1	1847
2701 & 1442	Copp, H. & Crowningburg; Hardy, B. F.	Pauwela	272 A	13 5	1860 1854
3080	Haiku Sugar Co.	Pauwela	62 A	14	1871
184	Hough, James (Cancelled)	Pauwela	272 A	3	1849
594	Ii, Daniel	Pauwela	24.6 A	2	1851
141	Kaniau, M.	Pauwela	70 A	1	1849
140	Kuhio	Pauwela	14.23 A	1	1849
220	Lee, W. L.	Pauwela	612 A	3	1850
226	Lee, W. L.	Pauwela	210 A	1	1850
137	Nahinu	Pauwela	62.8 A	1	1849
144	Paele	Pauwela	46.25 A	1	1849
383	Armstrong, R.	Kuiaha, E	360 A	3	1850
139	Kaea	Kuiaha, E	16.65 A	1	1849
138	Kapihe	Kuiaha, E	39.08 A	1	1849
217	Lee, W. L.	Kuiaha, E	612 A	3	1850
771	Hikiau	Kaupakulua, E	1836 A	3	1852
2974	Allen, E. H.	Kaalaea	78 A	14	1864
3221	Naala (w)	Keaaula	119.5 A	15	1879
160	Bishop, C. R.	Uaoa, 1 & 2	598.3 A	3	1849
2182	Anthon, L. H.	Kealiinui	229 A	12	1856
149	Swinton, H. S.	Peahi	522 A	3	1849
221	Swinton, H. S.	Peahi	Ahupuaa	1	1850
3087	Kamoku	Halehaku	15.84 A	14	1871
972	Fern, James	Honopou	109.25 A	5	1852
1903	Hiilawe	Honopou	1 Loi	10	1855
1916	Imihio	Honopou	5 A	10	1855
2471	Keohokano	Honopou	33.62 A	13	1858
1169	Kaaiwa	Honopou	11.29 A	6	1853
1082	Kaimi	Honopou	8 A	6	1853
1918	Kaimi	Honopou	2 Loi	10	1855
1264	Kahalelaau	Honopou	10.77 A	6	1853
1266	Kaoo	Honopou	8 A	6	1853
3101	Kepani	Honopou	15.82 A	14	1872
538	Koahou	Honopou	117.25 A	3	1851
1267	Nakaikuaana	Honopou	11.75 A	6	1853

Table 3. (continued) District of Hāmākua Loa, Maui

Grant No.	Grantee	Location	Acreage	Book	Year
1077	Nui	Honopou	9.37 A	6	1852
1265	Pailuhi	Honopou	10.80 A	6	1853
1081	Piohia	Honopou	9.62 A	6	1852
1263	Puukoa	Honopou	8.70 A	6	1853
3110	Poiuhane	Honopou	3.37 A	14	1873
1075	Wills, T. A. S.	Honopou	89 A	6	1852
3202	Haleole	Hoolawa	114.8 A	15	1879
1260	Kapahu	Hoolawa	13.22 A	6	1853
1084	Kaupena	Hoolawa	15.12 A	6	1852
1255	Kipawale	Hoolawa	9.40 A	6	1853
1259	Kolea	Hoolawa	4 A	6	1853
2131	Kolea	Hoolawa	29 A	11	1856
1254	Mehe	Hoolawa	6.33 A	6	1853
2125	Naoopu	Hoolawa	13.86 A	12	1856
1083	Nawelu	Hoolawa	14.87 A	6	1852
2041	Reed, J. & Norton, G. B.	Hoolawa	138 A	11	1856
3263	Namale	Hoolawa	48.9 A	16	1880
1076	Wahahee	Hoolawa	13.37 A	6	1852
1143	Kauwaha	Honokala	5 A	6	1853
1142	Keoho & Makue	Honokala	126 A	6	1853
1152	Norton, G. B. & Reed, J.	Honokala & Hoolawa	290 A	6	1853
1262	Kahiwalu	Puolua	86.20 A	6	1853
1900 or 1921	Kawaha	Puolua	2.78 A	10	1855
2630	Keahi	Puolua	2 Loi	13	1859
1686	Oluu	Puolua	1 A	9	1855
1261	Papaiakea	Puolua	0.14 A	6	1853
3214	Papaiakea	Puolua	170 A	15	1879
1901	Paukei	Puolua	0.67 A	10	1855
1087	Hanakahi	Hanehoi	13.37 A	6	1852
1086	Kaekaeka	Hanehoi	9.62 A	6	1852
1256	Kaiewe	Hanehoi	0.39 A	6	1853
2784	Kaiewe	Hanehoi	11.9 A	14	1861
2079	Kaiewe	Hanehoi	94.89 A	11	1856
1085	Kanookolohe	Hanehoi	6.12 A	6	1852
2854	Kanakaokai	Hanehoi	21.3 A	14	1862
2479	Olomele	Hanehoi	0.75 A	13	1858
1080	Puha	Hanehoi	15.12 A	6	1852
1079	Puowaina	Hanehoi	15.25 A	6	1852
1078	Wanaoa	Hanehoi	2.87 A	6	1852
2081	Nakoa & Uilama	Hoalua & Hanawana	48 A	11	1856
1457	Hanauwaha	Hanawana	36.5 A	8	1854
1257	Kekahuna	Hanawana	100.45 A	6	1853

Table 3. (continued) Districts of Hāmākua Loa and Ko'olau, Maui

Grant No.	Grantee	Location	Acreage	Book	Year
2080	Kauhaa	Puuomaile	17.12 A	11	1856
2137	Nahinu	Puuomaile	52 A	11	1856
2136	Needham, W. G.	Puuomaile	98 A	11	1856
384	Alexander, W. P.	Papaaea	360 A	3	1850
1258	Piho	Papaaea, W	15 A	6	1853
1913	Piho	Papaaea, W	10.5 A	10	1855
1677	Kahaule	Makaiwa 2	32 A	9	1855
2561	Kahaule	Makaiwa 2	12 A	13	1859
1915	Mauna	Makaiwa 2	83 A	10	1855

Ko'olau

Grant No.	Grantee	Location	Acreage	Book	Year
2140	Hikiau	Makaiwa	144.5 A	11	1856
1396	Luka & 10 others	Makaiwa	391.63 A	7	1853
1395	Luka & 10 others	Mooloa & Punaluu	8.24 A	7	1854
2916	Kekuahane, et al	Loiloa & Keopuka	79.07 A	14	Not issued
3060	Mahoe & 4 others	Keopuka	28.75 A	14	1868
1911	Malailua& 18 others	Pahoa & Waianu	107 A	10	1855
3215	Kalilimoku, B.	Pahoa	13.7 A	15	1879
3375	Uluhane	Pahoa	31 A	16	1884
1524	Barenaba	Waianu	0.166 A	8	1855
3055	Iokua	Waianu	2.22 A	14	1867
1526	Kaleo	Waianu	0.80 A	8	1855
2665	Kaulahea	Waianu	0.82 A	13	1859
1525	Paiki	Waianu	0.97 A	8	1855
2091	Piwai, Ioane	Waianu & Kalii	58.5 A	11	1856
2092	Puula	Waianu & Kalii	0.8 A	11	1856
2098	Manu, Iokua	Waianu & Kalii	5.7 A	11	1856
1899	Kapali & 10 others	Kalii & Pauwalu	115 A	10	1855
3223	Kaakuamoku, et al	Pauwalu	120 A	15	1879
2549	Puula Kaaihaa et al	Pauwalu	151.65 A	13	1859
3177	Kaaihaa	Wailua-nui	9.2 A	15	1877
1164	Grant, Stephen	Kaliae	63 A	5	1853
2484	Kamaka	Waiohua	1.87 A	13	1858
2797	Kewe	Waiohua	5.63 A	14	1861
2213	Nahula	Waiohua	9.4 A	12	1857
2618	Paele	Waiohua	2.6 A	13	1859
2793	Kukui	Kapehu	9.4 A	14	1861
1300	Grant, Stephen	Kapaula	0.74 A	5	1854
3066	Manu	Kapaula	107 A	14	1867
2654	Hinau	Honolulu-iki	0.84 A	13	1859
1682	Kaahiki, et al	Honolulu-nui	0.50 A	9	1855
1688	Kalama	Honolulu-nui	0.27 A	9	1855
2040	Kalama & Kau	Honolulu-iki	23 A	11	1856

Table 3. (continued) District of Ko'olau, Maui

Grant No.	Grantee	Location	Acreage	Book	Year
2090	Kolohi, Mahiai et al	Honolulu-iki	35.5 A	11	1856
1914	Kolohilau	Honolulu-iki	4.12 A	10	1855
3258	Kamara (w)	Honolulu-iki	1.12 A	16	1880
3181	Kanawe (w)	Honolulu-iki	0.57 A	15	1877
3190 3257	Nahiku	Honolulu-nui	36.68	15	1878
3180	Naholo (w)	Honolulu-iki	0.57 A	15	1877
1658	Wiliama	Honolulu-iki	22 A	9	1855
2857	Holoua	Makapipi	6.64 A	14	1862
1983	Makua & Kaeka	Makapipi	6.10 A	11	1856
2097	Kaakuamoku, et al	Makapipi	0.99 A	11	1856
3178	Kaakuamoku, et al	Makapipi	4.17 A	15	1877
2406	Kaimi, Luisa	Makapipi	0.82 A	12	1857
3176	Paakuku, et al	Makapipi & Opikaula	56.64 A	15	1877
1818	Kalawaia	Makapipi & Opikaula	27 A	10	1855
2629	Kapuu & 4 others	Kuhiwa	57 A	13	1859
3179	Kahalekai (w)	Kauluena	18.8 A	15	1877
1529	Makaliku & Ihu	Waiaholo	100 A	8	1854
2627	Kalua	Puupaipaia	15.54 A	13	1859
2474	Kawahineai	Puumaile	30.5 A	13	1858

Grant Lands – Notes of Survey

While conducting this study, the authors reviewed selected notes of survey for grants—covering various elevational zones, and including both wet land and *kula* land parcels—issued in the districts of Hāmākua Poko, Hāmākua Loa and Ko'olau. Among the notes of survey are found descriptions of land, streams, routes of access, and various natural and manmade features of the landscape. The notes and maps were viewed in the collection of the State Land Division. Thirty grant surveys are cited below (in numerical order). Of that total, 22 include specific references to stream resources (they are bounded by, or have streams running through them); three are *kula* lands (two in Hāmākua Poko and one in Kaliae); and five provide no specific documentation regarding water or *kula* resources.

No. 187 [Figure 4]
John Richardson
Hamakuaboko (Hamakuapoko)

August 18th, 1849

Wm. Lee; to Keoni Ana, Minister of the Interior:

Sir, I beg to make application on behalf of Mr. John Richardson, to the King and Government of the Hawaiian Islands, for the purchase of one hundred and fifty and 3/10 acres of upland, in Hamakua Poko on the Island of Maui, more fully described in the enclosed survey made by L. L. Torbert on the 15th May 1849. I am authorized on behalf of Mr. Richardson to offer fifty cents per acre for this land and trusting that his application may be granted…

Survey for John Richardson; Hamakuaboko East Maui

Commencing at stone on at N. E. Corner of Mr. Crowningburg's land at top of the west bank of big gulch and running South 58º 30' West…; S…W… to stone;

S…W… to large *kukui* tree; N…E… to stone on top edge of big gulch afore said. Thence following along edge of the bank of said gulch. S… E…; S… W…; S… W…; S… E…; S31º 10' west 675 links to first mentioned point. Including an area of 150 3/10 acres.

L.L. Torbert, Surr. May 15th, 1849

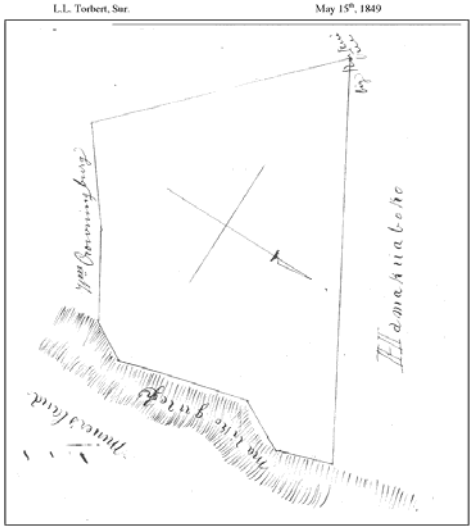

Figure 4. Royal Patent Grant No. 187; John Richardson at Hamakuapoko

Royal Patent Grant 360 [Figure 5]
Kekahuna at Halitimaile, Hamakuapoko

Warranty Deed.

Kekauonohu to Kekahuna.

Situate in Haliimaile:

Beginning at a *Kukui* tree at the N.W. corner of John Richardson's land & running along his line S. 48º…to the seaward side of Wm. Crowningburgs land; thence along Crowningburgs line S…West… 12 chains; thence North… West 38 chains to the *Kukui* tree on the N.W. Corner of this lands; then N… East., 12 chains, along the seaward side to place of beginning. Containing 47 ½ Acres. (Surveyed August 14th, 1849).

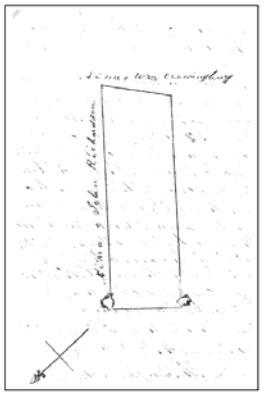

Figure 5. Royal Patent Grant No. 360 Kekahuna at Hamakuapoko

Royal Patent Grant 384
W. P. Alexander,
Application for Papaaea

Honolulu

November 19, 1849

W.P. Alexander;

to John Young, Minister of the Interior:

…I desire to purchase the Government Land called Papaaea, situated in Hamakualoa, on the Island of Maui, for which I am willing to pay the sum of twenty five cents per acre.

This land has not been surveyed as yet, but I should think contains from five to six hundred acres. This land is very wild and covered with large ferns, and very hard of cultivation.

There are a few natives on the land whom I do not wish to disturb, but on the contrary desire that this land may be reserved to them in Fee Simple. I desire to hold the land in Fee simple to me and any Hawaiian heirs; and trusting my application will be granted by the King in Council…

(April 15, 1850)

Notes of a survey of Papaaca Waena situated in Hamakualoa on the Island of Maui.

Beginning at a post on a high bluff called Hualele, on the west bank of the brook Puchu, where it empties into a canoe harbor called Mohowelu, whence a remarkable hole called Kapukaamani, in the ridge that runs down to the sea, bears N 84º ¾ E & running:

N. 84 ¾° W 2.00 chains. Back sight S 80 ° E. Along sea side… [run 7 courses] …S. 33 W. 2.00 chains. Back sight N 34 ¼ E to Pauiki above brook. Hakahi on west bank… Along Nailiilihaele whose stream is the boundary on west side… to a fence made of ferns… …amid *Ohia* forest…to post near cascade Kuimukakanaka… to a post where the underbrush forbids further progress. The stream Nailiilihaele constitutes the western boundary of this survey all the way up to its extreme south.

Beginning again at the post noted on Hualele, at the mouth of the brook Puehu, and running:

S.. W... along west bank of Brook Puehu. S.. W..; S.. W..; S.. W... to Hill Loiiki; S.. W.. Along west bank of brook Pa to hill called Waiopili hence the brook Pa is the eastern boundary; S.. W..; S.. E..; S.. E..; S… E.. to a post in the road to Koolau. Here the underbrush is too dense to progress further south. The bearings of this eastern boundary onwards into the forest is a little East of South.

The area of the above survey is three hundred and sixty acres.

W. P. Alexander, Surveyor
Honolulu
April 15, 1850

(Translation) No. 384
W. P. Alexander Papaaea Waena, Hamakua, Maui

Beginning at a stake at Hualele being the North East corner of this land, and run. West along sea shore to the mouth of Hakahi stream.

Thence running up along the Nailiilihaele stream to the waterfall called Kuimukakanaka. Thence running up along said stream to a suitable place for a stake at the South East of this: on the west edge of *pali* of the gulch, where it is impossible to measure with a chain, thence due East, 25 chains along forest to the South East *Mauka* corner of this land.

Thence leaving, and return to place of commencement at Hualele, and running up along West bank of the stream between this and East Papaaea, to where the road going to Koolau cuts the stream, from there running straight up to the end of the first survey, surrounding this land.

Rights of native tenants reserved.

The survey made by W. P. Alexander not being clear as to some of the boundaries of the land of Papaaea, therefore, it is corrected by S. P. Kalama according to the explanation and plan of the land made by W. P. Alexander, the errors are thus: +++

And it has been so inserted in his Patent in order to straighten it. It being the belief of the person who made the correction, it is better and for the best, so that no difficulties may arise in the future. Let this correction be for W. P. Alexander.

S.P. Kalama
Secretary and Surveyor.

Resolved, that the application for Papaaea made by Wm. P. Alexander on the 19th November 1849. for the purchase of the same in Fee simple, be and is hereby granted upon his paying therefore the sum of 25 cents per acre.

A true copy of a resolution past this 23rd day of November 1849 by His Majesty's Privy Council… Charles F. Hopkins, Secretary. [No survey Map with file; see Register Map No. 2482].

Royal Patent No. 764 [Figure 6]
R. W. Wood
Hamakuapoko, Maui

Notes of a survey of a lot of land in Hamakuapoko, island of Maui. Beginning at the bottom of Maliko gulch at the South East corner of this lot and running South 49 ° West 43.50 Chains along North or *Makai* boundary of lot formerly owned by J. Richardson to head of Ekahauui Gulch; thence seaward along brink of Sd. gulch N… W… to West Corner of this lot and *makai* boundary; thence N… E… to bottom of Maliko gulch forming the *makai* boundary of this lot; thence *mauka* along bottom of Maliko gulch S… E…; and S… W…; and S… E… chains to point of Commencement, and containing an Area of One hundred and fifty Acres.

E. Bailey, Surv.

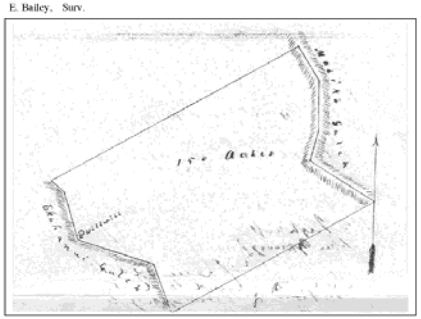

Figure 6. Royal Patent Grant No. 764 – R.W. Wood at Hamakuapoko, Maui

Royal Patent Grant 1081 [Figure 7]
Piohia at Honopou, Hamakualoa, Maui

Apana Aina o Piohia ma Honopou Ahupuaa Hamakualoa, Maui.
E hoomaka ma ke kihi Komohana Akau, Makai o keia ma kahakai a holo aku i ka Hema 6 Kaul. Hema 30° hik. 17 kaul. ma ke Kaepaili alailai huli a holo Ak. 5° Kom. 18 80/100 Kaul. hiki i kahakai. Malailai aku ka holo ana a hiki i kahi i hoomakai. Ma ia Apana aina 9 5/8 Eka.

J.W. Makalena
Anaia 15, Novemaba 1851.

[Translation]
Parcel of land of Piohia at Honopou Ahupuaa, Hamakualoa, Maui.
Begin at the West North corner, below this at the shore and run to the South 6 chains. South 30° East 17 chains along the edge of the cliff, thence turn and run North 5° West 18 80/100 chains, to the shore. Then run to the place of commencement.

9 5/8 acres
within this parcel.
Surveyed by
J.W. Makalena
15, November 1851.
[Maly, translator]

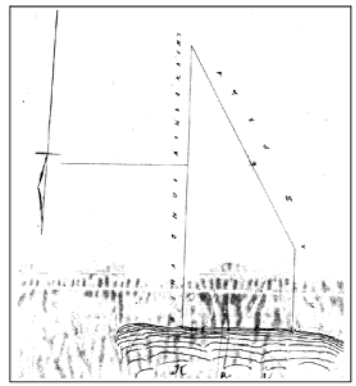

Figure 7. Royal Patent Grant 1081; Piohia at Honopou

Royal Patent Grant No. 1143 [Figure 8]
Kauwaha
Survey of Honokala

Notes of Survey of a lot of land surveyed for Kauwaha, situated in Honokala Hamakualoa, Maui: Beginning at the South East cor. this and running as follows.

Due West 5 chains to *Pali*
Due North 10 chains along side of *Pali*
Due East 5 chains along *Kula*
Due South 10 chains along *Kula* near part running to the seashore, to place of commencement; containing an area of Five Acres —

John T. Gower Surveyor
Wailuku January 17 1853.

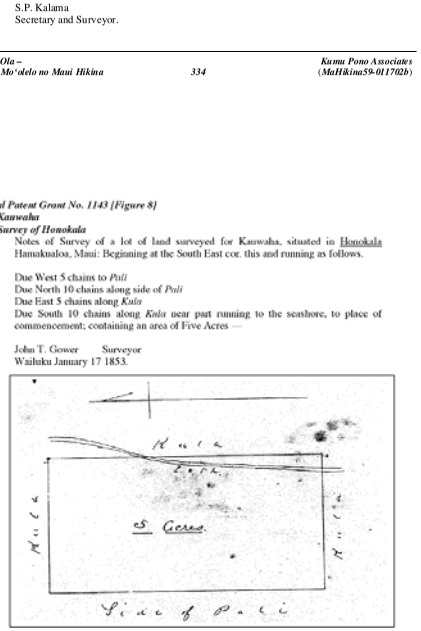

Figure 8. Royal Patent Grant 1143; Kauwaha at Honokala

Royal Patent Grant 1164 [Figure 9]
Stephen Grant at Kaliae, Koolau

Commencing at Makai North East angle and run:
1. S. 18 W. 17.00 links along the Pali Kekuapuawela… [8 courses along *pali* of Kekuapa'awela]; 10. N. 5 E. 500 links along the Pali Waihua… [8 courses along *pali* of Waihua]; 19. to the *Pali* thence along the Sea Coast to the point of commencement.
Area 63 Acres

A.F. Turner
25 May 1852

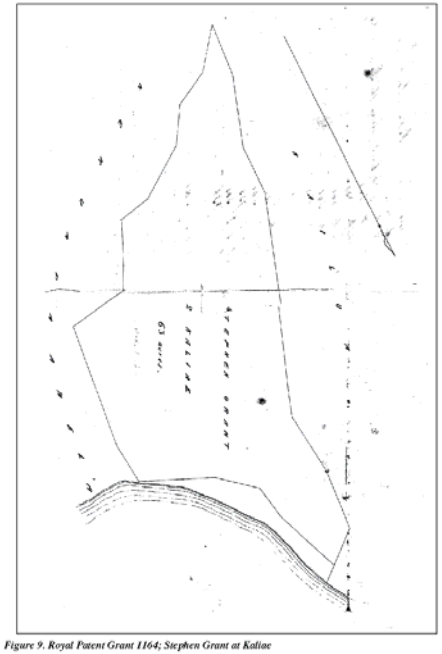

Figure 9. Royal Patent Grant 1164; Stephen Grant at Kaliae

Royal Patent Grant 1257 [Figure 10-a & 10-b]
Kekahuna at Papaaea Komohana, Hamakualoa, Maui.

Notes of Survey of a lot of land Surveyed for Kekahuna, in Papaaea Komohana, Hamakualoa, Maui, Begin at large *Kukui*, bottom of Ravine, near Stream, N. East corner of this, next to Papaaea waena and run:

1. N. 78 W. 4.60 ch. along *Kula*… [run 5 courses] 7. N…W… Down Ravine; N…W… *Kuleana* Kaualeleiki; N…W… *Kuleana* Kaualeleiki; N…W… *Aupuni* land; S…W… Piho's land; 12. S… W… [illegible]; [15 courses along forest] 29. S…E… across Ravine; 30. S…E… Forest; 31. S… E… Forest; S 62 ¾ E. 1.47 ch. Forest to Ravine.

The boundary between Papaaea waena and Papaaea Komohana, thence along bottom of this Ravine to place of beginning containing an area of One Hundred Acres.

John L. Gower Surveyor
Puuomalei January 25 1853

Notes of Survey of Six *Poalima* lois surveyed for Kekahuna in Hanauwana [Hanawana] Hamakualoa, Maui. No. 1 consisting of two lois in the Ili of Kahauiki. Beginning at South East corner of the South *Poalima* 35 links from the East line of Kalama's *Kuleana*, in which these lois are situated and running;

N 5 W. 3.09 chains
S 85 W. 1.00 chains
S 9 ¼ E. 1.84 chains
S. 15 E. 1.25 chains
S 86 E .70 chains to beginning containing an area of 26/100 of an acre.

No. 2. One *loi* in the *Ili* of Kauwela. Beginning at West corner of this from the last station in the survey of the *kuleana* in which this is situated:

S 74 W .10 chains thence
N 82 E .70 chains
S 23 E .29 chains
S 70 W 54 chains
N 40 ¾ W .46 chains to Beginning containing an area 2/100 of an Acre.

No. 3. One *loi* in the *Ili* of Keauhou. Beginning at South cor. of this from the 2nd Station of the *Kuleana* of Kanui in which this is situated:

S 70 ¾ W. 1.79 chains
S 43 E. .74 chains
S 39 W. .36 chains
N 47 W. .84 chains
N 55 E. .41 chains to Beginning containing an area of 3/100 of an Acre.

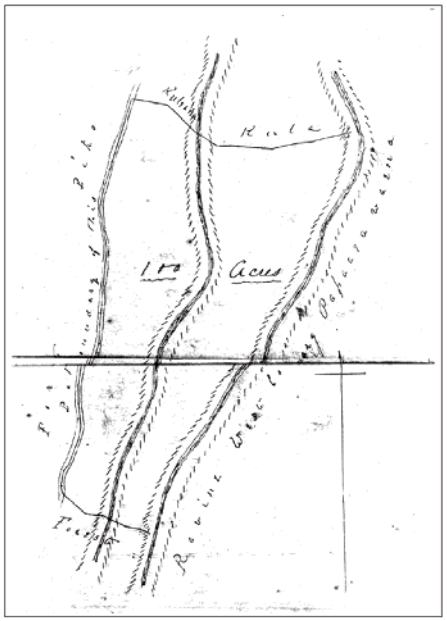

Figure 10-a. Royal Patent Grant 1257; Kekahuna at Papaaea Komohana

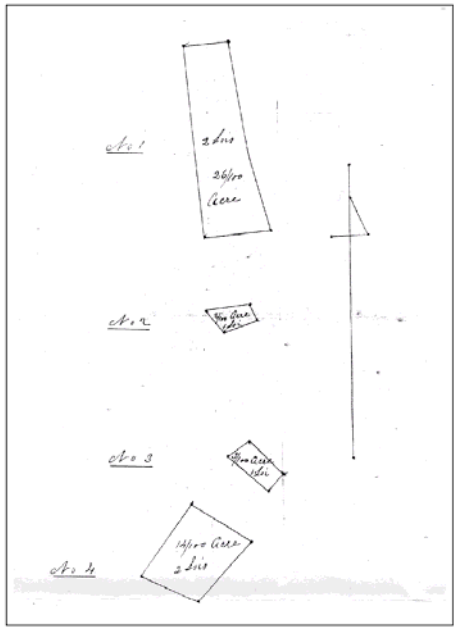

Figure 10-b. Royal Patent Grant 1257; Kekahuna (Six Poalima Lots) at Hanawana

No. 4. Two lots in the *Ili* of Kapahi. Beginning at East corner of this from East corn of the *Kuleana* of Kauhihoewaa in which this is situated:

S 80 W 1.20 chains
S 41 ¼ W 1.29 chains
N 64 W .99 chains
N 35 ½ E 1.41 chains
S 57 E 1.07 chains to Beginning containing an area of 14/100 of an acre

John L. Gower
Surveyor

Royal Patent Grant 1259 [Figure 11]
Kolea at Holawa, Hamakualoa

Notes of survey of a lot surveyed for Kolea in Holawa, Hamakualoa, Maui. Begin at S. E. Corner of this corner of Keoho and Kolea's former purchase, and run:

N. 77 ½ W. 4.09 ch. along Keoho & Makue; Due North... along Kamohai; N..E... along Kamohai; N... E... along Manoa; S... E.. along Komohai; S...E... along Kamohai & Makue; S...W... along Koleas former purchase to Beginning; containing an area of Four Acres.

Puumalei Feb. 11, 1853
John T. Gower

Royal Patent Grant 1263 [Figure 12]
Puukoa
Honopou, Hamakualoa

Notes of Survey of a lot of land in Honopou Hamakualoa Maui Surveyed for Puukoa. Begin at S.W. bon. of this corner of Fern & Mills purchase.:

N. 11 ½ W. 14.91 ch. along top of ridge; S...E... *Kula* down *Pali*; S...E... Through *Hala* Thicket; N...W... Along road to place of beginning, containing an area of Eight and 7/10 Acres.

Puumalei Feb. 11, 1853
John T. Gower.

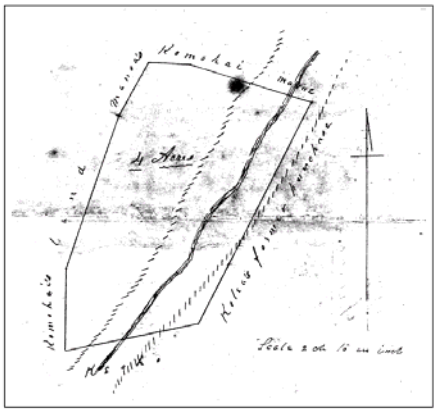

Figure 11. Royal Patent Grant 1259; Kolea at Holawa

Royal Patent Grant 1396 [Figures 13-a & 13-b]
Luka, Makalena, Palena, Ikoa, Makanahelehele, Kaiuli, Kekua, Kaahaaina, Kuonea, Opii, & Kalama
Land in Makaiwa, Mooloa & Punaluu, Koolau Maui

Notes of survey of a lot of land in Makaiwa, Mooloa & Punaluu – Koolau – Maui. Surveyed for Luka, Makalena, Palena, Makanahelehele, Kaiuli, Ikoa, Kaahaaina, Kuonea, Kekua, Opii, & Kalama. Beginning at S.W. corner of the bottom of this Ravine between this and Hamakua:

N. 75 E. 3.52 ch. Up to top of *pali* East side; N...E... along Road – Hikiau; S...E... (same); S...E... across to top of *pali* Mooloa; N...E... along *Aupuni*; N...E... along *Aupuni* through woods; S...E... along *Aupuni* through woods; S...E... along *Aupuni* through woods to road; S...E... along Road to Ohia; S...E... along Road to ravine of Punaluu; N...E... along Road across ravine; S...E... along road to edge of *pali*;

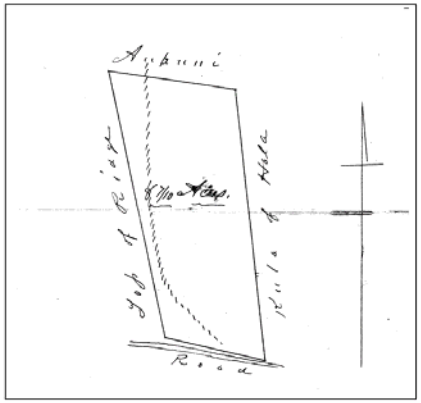

Figure 12. Royal Patent Grant 1263; Puukoa at Honopou

S...E... along Road to stream – Kolea; N...E... along said stream of Kolea; N...E... along *pali* on West side; N...E... down *pali* to Ohia, *makai* point of *kuleana* of Luka; N..E... along west side stream; N...E... (same); N...W... (same); N...E... along West side stream to *Hala* by sea; N...W... up to top *pali* along sea; N...W... along *pali* by sea shore; N...W... along *pali* by sea shore to corner of former Survey; S...W... along their former survey; S...W... along their former survey; S...W... along former purchase… [run 15 courses]; S...W... along Ravine of Makaiwa in Hamakualoa, to place of beginning, containing an area of 277 Acres.

Less the pieces purchased by Luka in the Ahupuaas of Mooloa & Punaluu amounting to 7.63 acres, and his *Kuleana* in said Ahupuaas including an area of 2.24 Acres. leaving an area 267 13/100 acres.

Puumalei Sept. 1st 1853
John S. Gower

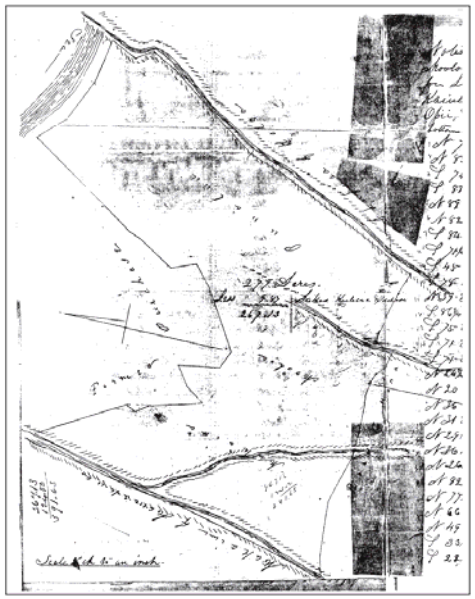

Figure 13-a. Royal Patent Grant 1396; Luka et al, at Makaiwa, Mooloa & Punaluu (267.13 acres)

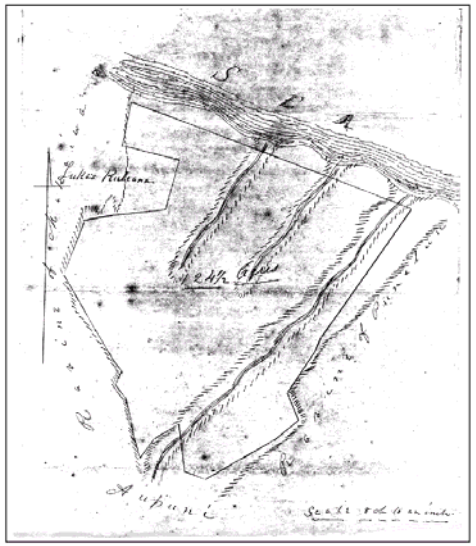

Figure 13-b. Royal Patent Grant 1396; Former Purchases Luka et al, at Makaiwa, Mooloa & Punaluu (124 ½ acres)

Royal Patent Grant 1457 [Figure 14]
Hanauwaha at Hanawana, Hamakualoa, Maui.

Notes of Survey of a lot of land in Hanauana [Hanawana], Hamakualoa, Maui. Surveyed for Hanauwaha, beginning at N.E. corner of this by edge of *Pali* which separates this from Hanauana East:

S. 80 ¼ W. 3.02 ch. along *Aupuni*; N...W... along *Aupuni*; N...W... along *Aupuni* to *pali*; S...W... along *Pali* of Hoalua; S...W... along *Pali* of Hoalua; S...W... along *Pali* of Hoalua to tall straight *Hala*; S..W… along up bottom of valley; S...E... along up small valley to *Koa*; S...E... along up *pali* to top; S...E... along *Aupuni*; S...E... along *Aupuni*; S...E... along *Aupuni*; S..E... along *Aupuni*; S..E... along *Aupuni*; S...E... along *Aupuni* to a place a little *mauka* and beyond *Kukui*; N...E... along the woods; N...E.. along the woods; N..E... along the woods; N...E... along in line of Hanauana…; [run 6 courses] …to place of beginning, containing an area of 36 ½ Acres $56.00.

John T. Gower, Surveyor
Puumalei
August 22, 1853.

Royal Patent Grant 1677 [Figure 15]
Kahaule at Makaiwa, Hamakualoa, Maui.

Apana Aina o ke Aupuni ma Makaiwa Hamakualoa Maui, i Kuaiia ia Kahaule.
E hoomaka ana i ke awa, ma ke kihi Komohana Mauka o keia kokoke i kahi Hale, i ka pau ana o ka Moku Hau ma ka honua Pohaku Hoailonaia A; A holo ka aoao mua Akau.. Hikina... 14 Kaulahao, ma ka hau a i ke kahawai a mawaena o ka Moku Hau ma ka Lapa, a hiki i ke Kahawai e Kaawale ai o Makaiwa me Koolau i ka laau kuikui, Hoailonaia X (oia ka aoao ma uka). Alaila, hoi hou a ma kahi i hoomaka ai, a holo Akau. . . Hik . . 21 Kaulahao hiki i ke Alanui e iho ai ilalo ma Kahi Lapa, Akau. . . Hikina. . . 20 Kaulahau; alaila, hiki i Kahakai; a holo ma kahakai a hiki i ka nuku o kahi Muliwai (Kahawai) a holo ma ke Kahawai, a hiki i kahi i pau ai ka aoao mua ma laau kuikui Hoailona ia X.

Malaila 32 Eka.

J.W. Makalena, Ana Aina
14 Novemaba 1851.

Parcel of Government Land at Makaiwa, Hamakualoa, Maui, purchased by Kahaule.

Beginning at the [canoe] landing, on the Western corner, above this, near a house, at the end of the *Hau* forest on a stone marked A; and running the first side, North 80° 30' East 14 chains to the *hau* on the stream to the middle of the *Hau* forest on the Ridge, to the stream that separates Makaiwa from Koolau at a *Kuikui* tree marked X (it is on the upland side). Then again, going to the place of commencement and run North 18° 30' East 21 chains to the *Alanui* (Trail) that descends the ridge; North 24° East 20 chains, then to the shore. Run along the shore to the opening of a *Muliwai (Kahawai)* (stream estuary), and run along the stream, to the place where the first side ends at the *kuikui* tree marked X. 32 Acres therein.

J.W. Makalena, Surveyor
14 November 1851. [Maly, translator]

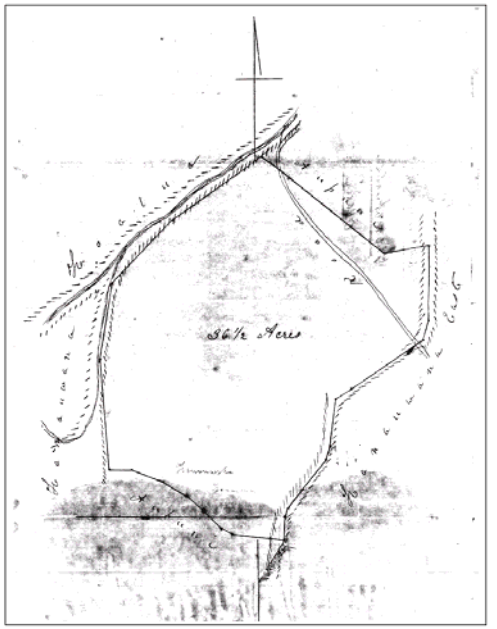

Figure 14. Royal Patent Grant 1457; Hanauwaha at Hanawana

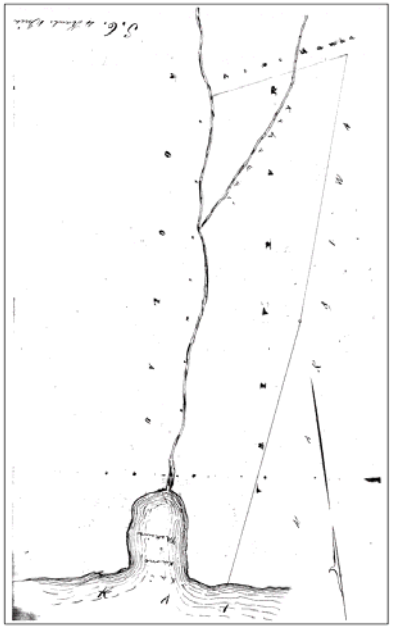

Figure 15. Royal Patent Grant 1677; Kahaule at Makaiwa

Royal Patent Grant
No. 1911 [Figure 16]
Malailua & others
Waianu and Pahoa,
Koolau, Maui.

Notes of Survey of a lot of land in Waianu & Pahoa — Koolau - Maui, surveyed for Malailua & others — beginning at South point of this corner of Kanihu & Co. in Kahi.

N 32 ¾ E 11.35 ch. along Kanihu & Co.
N 51 E. 264 ch. along Kanihu & Co.
N 12 ¾ E. 50.80 ch. along top of Pali Waianu.
S 78 ¾ W 10.94 ch. along seashore.
S 67 ½ W. 2.73 ch. along seashore.
S 74 ¼ W. 8.33 ch. along seashore.
S 87 W. 15.35 ch. along seashore to N. W. Cor.
S 31 ½ E. 13.81 ch. along Keanae Pali
S 13 ½ 44 — along Keanae Pali to place of beginning containing an area of 107 Acres.

John T. Gower Surveyor

Names of those for whom this survey was made:
Malailua, Kaleo, Kekaina, Puula, Kekua, Waiwaiole, Maewaewa, Kiko, Kaai, Hakau, Naihe, Kahaukomo, Kalino, Kaula, Uluhani, Kalilimoku, Kekaimalo, Paiki, Keaka, Nachina.

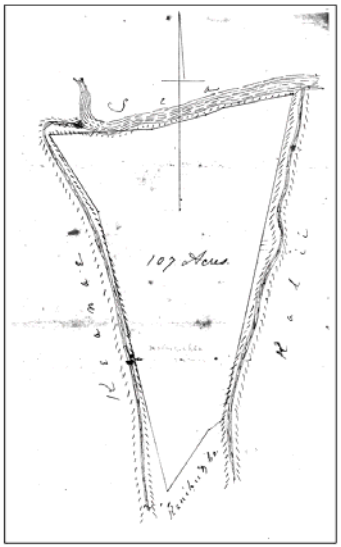

Figure 16. Royal Patent Grant 1911; Malailua et al. Puumalei, Aug 22, 1833 at Waianu & Pahoa

Royal Patent Grant No. 1915 [Figure 17]
Mauna
Makaiwa, Hamakualoa, Maui.

Notes of Survey of a lot of land in Makaiwa, Hamakualoa, Maui — Surveyed for Mauna. — Beginning at N. E. corner of this just below and *makai* of a patch of *Hau* trees in line of Kahaule.

S 54 ½ W 1.54 ch. Along through *Hau* trees; S…W… along through *Hau* trees –*pali* [run 2 courses]; S…W… along between *Hau* bush & *Pali*; S…W… along line of Papaaea; S…W… along line of Papaaea; S… E… along line of Papaaea & Path…; [run 9 courses] S…E… along Main Road… [run 2 courses] S…E… along Main Road to valley; N…E… along Ravine between this and Makaiwa in Koolau to the corner of Kahaule's purchase — thence along the *Mauka* side of his to South West corner his lot — thence along his West side through *Hau* bush along top of *Pali* to place of beginning containing an area of 83 Acres.

John L. Gower Surveyor
Puumalei, Aug 27 1883

Royal Patent Gr. No. 2079 [Figure 18-a & 18-b]
Kaiewe
Puuloa and Waipio, Hamakualoa, Maui.

Notes of Survey of a lot of land in Puuloa & Waipio Hamakualoa Maui Surveyed for "Kaiewe." Beginning at N.W. corner of the *Ahupuaa* of Huelo by the sea… [run 19 courses] …to place of beginning; containing an area of 64 7/10 acres.

J.T. Gower Surveyor

Notes of Survey of Two lots of land in Haneboi, Hamakualoa, Maui, Surveyor for Kaiewe

No. 1. Beginning at West corner of this by brink of *pali* between this and Huelo.
N. 75 E. 3.47 ch. To edge of Hoalua *pali*; N…E… along path through woods… [run 7 courses] … across bend in *pali* to place of beginning containing an area of Twelve and 31/100 Acres.

No. 2. Beginning at South point of this, edge of *pali* between this and Huelo.
N 50 W. 4.24 ch. Along top of *pali* of Huelo…; [run 13 courses] along path & former purchase to place of beginning containing an area of seventeen and 88/100 Acres.

John L. Gower, Surveyor
July 6, 1853

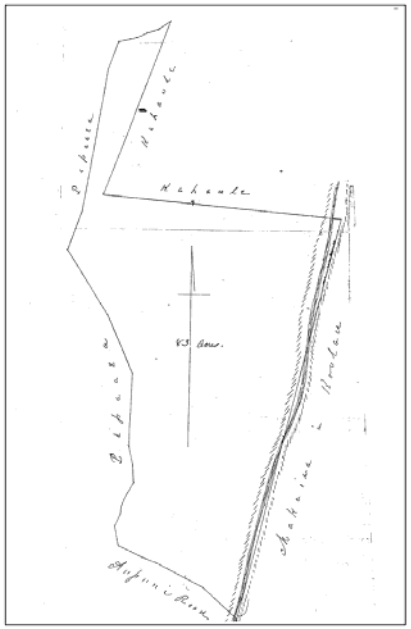

Figure 17. Royal Patent Grant 1915; Mauna at Makaiwa

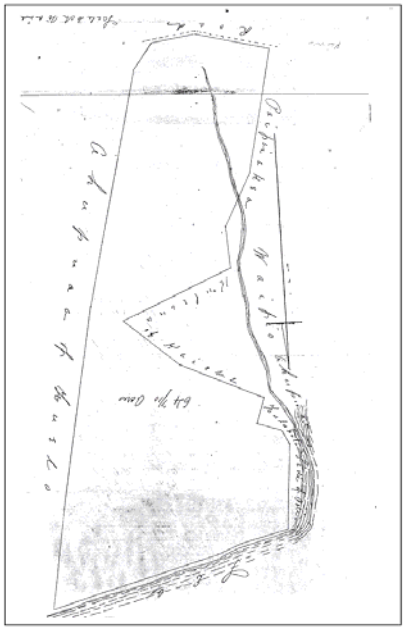

Figure 18-a. Royal Patent Grant 2079; Kaiewe at Puolua & Waipio

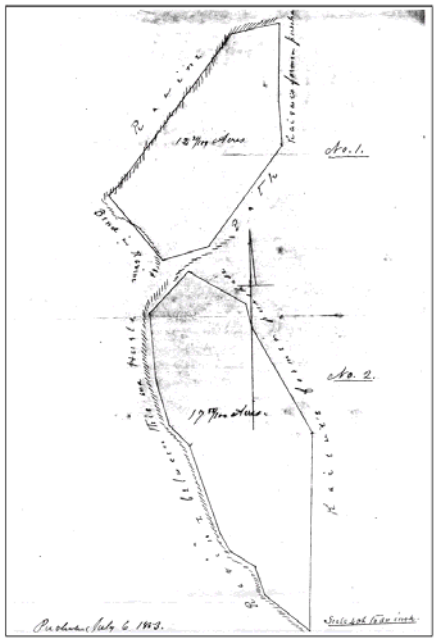

Figure 18-b. Royal Patent Grant 2079; Kaiewe at Hanehoi

Royal Patent Grant No. 2080 [Figure 19]
Kauhaa
Puumaile, Hamakualoa, Maui

Notes of Survey of a lot of land in Puumaile, Hamakualoa Maui, Surveyed for "Kauhaa": Beginning at South point of this by *pali* of Ravine separating this from Papaaea.

N 8 ¾… W 2.01 ch along Needhams; N…E… along Hanauana East; N…E.. along Hanauna East; N…E… along *Kuleana* Wahicloa; N…E… along *Kuleana* Wahicloa to the Sea *pali*, thence along Sea *pali* to Ravine of Papaaea, thence along to top of *pali* to place of beginning containing an area of 17 12/100 Acres.

J. T. Gower, Surveyor

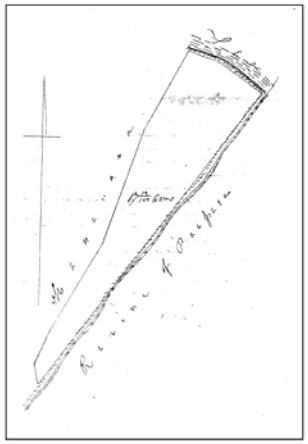

Figure 19. Royal Patent Grant 2080; Kauhaa at Puumaile

Royal Patent Grant No. 2081 [Figure 20]
Nakoa and Uilama
Hanawana and Hoalua Hamakualoa - Maui

Notes of Survey of a lot of land in Hanauana [Hanawana] & Hoalua, Hamakualoa, Maui, Surveyed for Nakoa & Uilama: Beginning at West corner of this, at *kukui* tree between two halas in the Hoalua Valley.

S 67 ½ E 8.48 ch. to top of hill; S…E… *Kuleana* of Kalama; N…E… along top of *pali*; N…E… along side of *pali*; N…E… along *Auponi*; N…W… along sea shore; N…W… along sea shore; N…W… along sea shore to bottom Ravine, thence up the Hoalua Ravine to place of beginning containing an Area of 48 Acres.

J. T. Gower, Surveyor

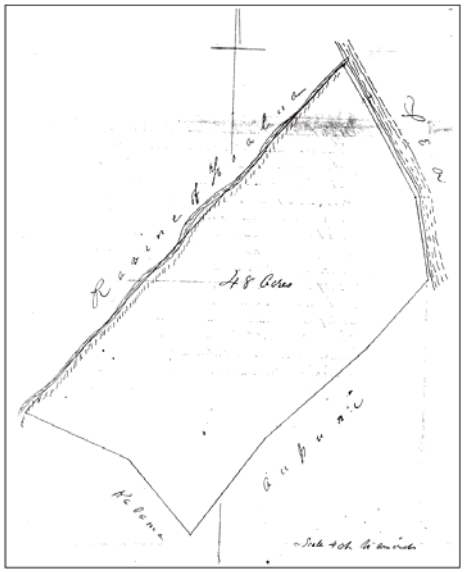

Figure 20. Royal Patent Grant 2081; Nakoa and Uilama at Hanawana & Hoalua

Royal Patent Grant
No. 2137 [Figure 21]
Nahinu
Puumaile, Hamakualoa, Maui

Notes of Survey of a lot of land in Puumaile, Hamakualoa, Maui surveyed for "Nahinu" Beginning at brow of *pali* of ravine that separates this land from Papaaea near North corner this, and at South point of Kauhaa.

N. 8¾ W 2.04 ch. to N point of this; S…W… along Hanauna; S…W… along Hanauana to *Koa*; S…W… along Hanauana to S.W. Corner this; S…E… along Needhams to Papaaea Ravine, thence down the center of said ravine to place of beginning containing an area of 52 acres.

J. T. Gower, Surveyor

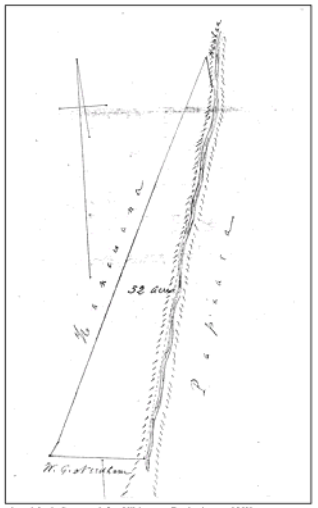

Figure 21. Royal Patent Grant 2137; Nahinu at Puumaile

Royal Patent Grant No. 2140 [Figure 22]
Hikiau
Makaiwa, Hamakua & Makaiwa, Koolau - Maui

Notes of Survey of a lot of land in Makaiwa, Hamakua & Makaiwa, Koolau, Maui, Surveyed for Hikiau — Beginning at N.W. corner of this, by road. where the path which leads mauka enters it:

S. 40¾ E. .50 ch. along road; S…E… along Road [run 4 courses]; S…E… along Road to Mooloa; S…W… along ravine of Mooloa; N…W… *mauka* and through forest; thence along path down to beginning: containing an area of 144 34/100 acres.

J. T. Gower , Surveyor
Puumalei, Aug. 22, 1853

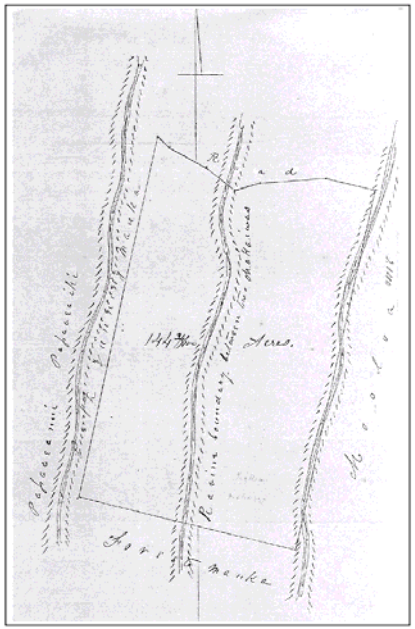

Figure 22. Royal Patent Grant 2140; Hikiau at Makaiwa, Hamakua & Makaiwa, Koolau

Royal Patent Grant No. 2793 [Figure 23]
Kuikui
Kapehu, Koolau, Maui.

Kuikui at Kapehu, in Koolau, Island of Maui.
Parcel 1. Beginning at the South corner of this parcel and running to the North 50.° West 200 links adjoining the Government land… [run 3 courses] to point of commencement. It being 0.1/2 Acre.

Parcel 2. Beginning at the Eastern corner of this parcel, next to the *Kukui* Tree at the edge of the *Pali*, and running:

South 30.° West 162 links, adjoining Kewe… [run 3 courses]; North…West… adjoining the Government land… [run 5 courses]; to the point of commencement. It being 8 ½ Acres.

Parcel 3. A House lot. Beginning at the Southern Corner and running:
North 68.° East 166 links, adjoining the Government land… [run 5 courses]; to point of commencement. It being 0. 4/10 Acre.

Waikapu (loane Richardson)
Sept. 1855.

Royal Patent Grant No. 2797 [Figure 24]
Kewe
Waiohue & Kapehu, Koolau, Maui

Parcel 1. Beginning at the Eastern corner, adjoining Puakea, land of the *Konohiki*, and running thus:

North 43° ½ W 184 links, adjoining the Government Land; South…West…adjoining Kuikui; …[run 2 courses]; South…East… adjoining Government land; North… East… adjoining Puakea… [run two courses]. It being 5 2/10 Acres.

Parcel 2. House lot at Kapehu. Beginning at the Western corner, at a stone in the middle of the stream, and running along the Stream:

North 30° ½ East 290 links, along the Stream; South…East… Along the Shore; South…West… Along the Stream; North…West… Along the Cliff, to the places of commencement. It being 0.43/100 acres.

Waikapu (loane Richardson)
Sept. 1855.

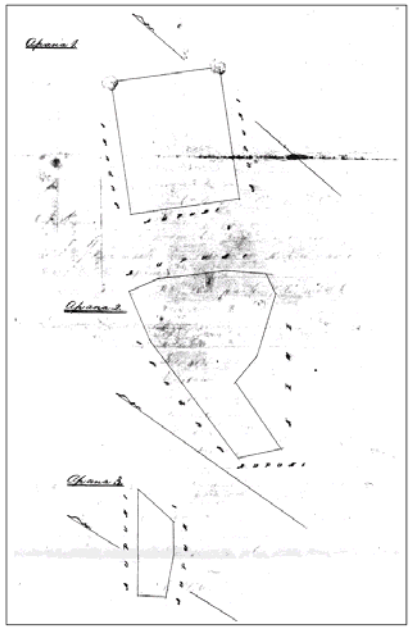

Figure 23. Royal Patent Grant 2793; Kuikui at Kapehu

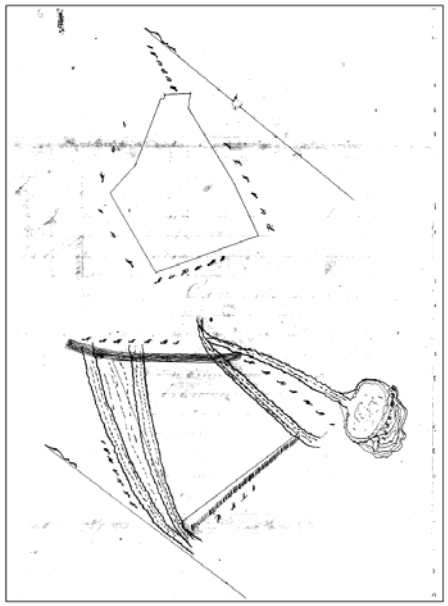

Figure 24. Royal Patent Grant 2797; Kewe at Waiohue and Kapehu

Royal Patent Grant No. 2916 [Figure 25]
Kekuahani, Kekoa, Kauileolani, and Kaulunahele
Loiloa & Keopuka, Koolau, Maui

Notes of Survey of a lot of land in Loiloa & Keopuka, East Koolau — Surveyed for Kekuahani, Kekoa and Kauileolani and Kaulunahele beginning at S. W. corner of this N. E. corner of Mahoe & Co:

N 36 E 7.96 ch along Mahoe & co.
N 10 ½ E 161 1 ch along Mahoe & co.
N 22 E 21.72 ch along Mahoe & co.
S 76 ¾ E 13.10 ch along Sea shore to Ravine of Honomanu
Begin again at same place as above
S 77 E. 1.71 ch along *Aupuni*
S 56 E. 17.10 ch along *Aupuni* to Ravine of Honomanu
thence along said ravine to station above near sea shore containing an area of 79 and 07/100 Acres

John L. Gower, Surveyor
Puumalei, Aug. 22, 1813

Royal Patent Grant 3101 [Figure 26-a & 26-b]
Kepani at Honopou, Hamakualoa, Maui
No ke Aupuni ia Kepani

Apana 1. Honopou Hamakualoa Maui.
Ma ke aoao Komohana o ke kahawai.
E Hoomaka ana ma ke kihi Hema Hikina pili me ko Keohokaua a me Makahikipuni, a e holo ana:
A. 84 ½° Ko. 6.93 Kh. ma ko Keohokaua.
A 2 ½° Ko. 3.40 Kh. ma Halehaku.
A 20° Ko. 7.37 Kh. ma Halehaku.
A. 5° Hi. 3.60 Kh. ma Halehaku.
He. 41° Hi. 7.65 Kh. ma ko Imihia Kuleana.
He. 51 ¾° Hi. 8.85 Kh. ma ko Imihia Kuleana.
He. 12° Hi. 6.40 Kh. ma ko Imihia Kuleana.
He. 37 ¾° Hi. 2.64 Kh. ma ko Makahikipuni a hiki i kahi i hoomaka'i.

Ka ili 6 Eka.

Apana 2. Honopou — (He koena mawaena o na wahi i kuai mua ia, kahi i kuai Kahalelaau o Kepani.)

E hoomaka ana ma ke kihi Hema Komohana o keia e pili ana me ko Kaoo aina kuai; a e holo ana ma ko Kaoo: Akau 83 Hi. 4.36 Kl; Ak 86 ½° Hi 6.76 Kh.; He 85° Hi. 1.40 Kh.; alaila, huli Ak. 71 ½° Hi 71.00 Kh. ma ka pali Kahawai a hiki i ka laepahu i Kahawai; alaila, huli Ak. 73 ½° Ko. 12.00 Kh. ma ka pali Kahawai a me Kahakai; alaila, ma ko Kaimi aina Hema 10° Ko. 3.60 Kh. A 64° Ko. 14. 00 Kh.; alaila, He 19 ½° Ko. 3/56 Kh. ma Kahawai a hiki i ke kihi o Kepaa. alaila ma ko Kepaa He 23 ¾° Hi 3.13 Kh.; He 16° Hi 3.86 Kh. a hiki i kahi i hoomaka'i.

Ka ili 9 82/100 Eka
6/15

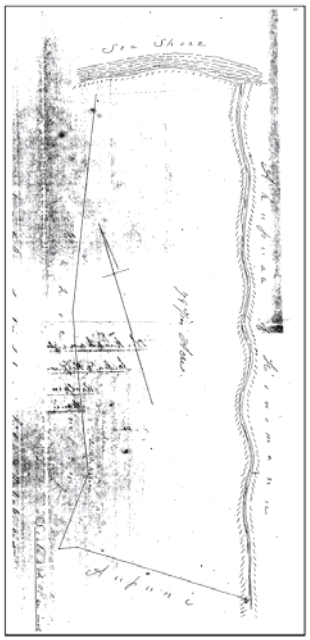

Figure 25. Royal Patent Grant 2916; Kekuahani et al. at Loiloa & Keopuka

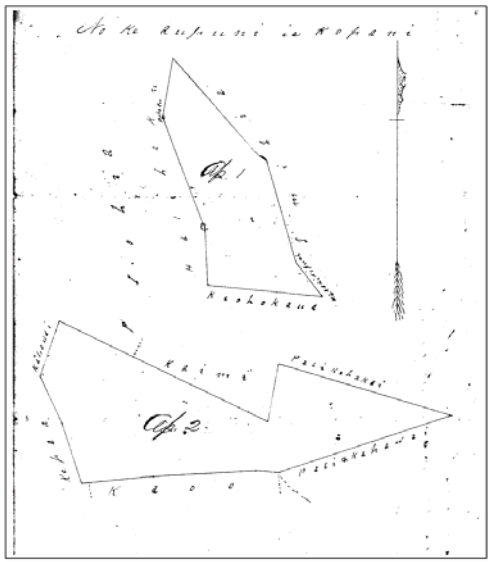

Figure 26-a. Royal Patent Grant 3101; Kepani at Honopou

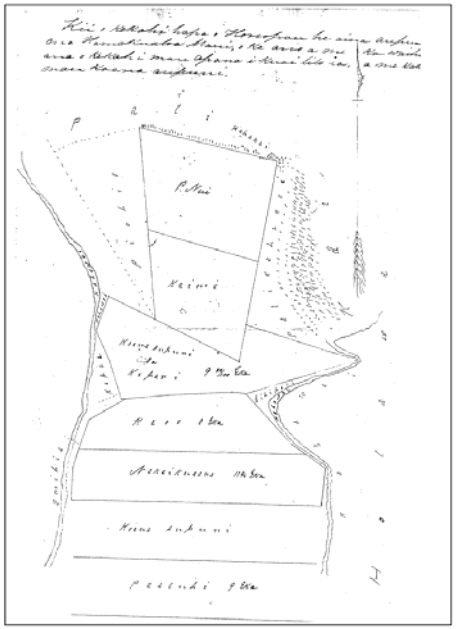

Figure 26-b. Royal Patent Grant 3101; Kepani (and remnant Government Lands) at Honopou

A. Keohokalole
Mea Ana Aina
August 8, 1871.

(Olelo hoakaka)
O na apana elua maluna ae, oia no na wahi o ke ana mua ia ana o Asa Hopu a me J.Richardson; ua koe iki no nae kekahi mau lihi mawaho i ka wa oia ana mua ana, a ma keia ua pau pono loa.

Ua ana ia ka Apana 2 me ka makaala ma ka nana nui ana i na palapala mua i ole ae e huikau a komohewa ia mau wahi o na aina kuai a me ke kuleana a i poho wale no ma keia koena.

A ka Apana 1 hoi, ua pili kekahi aoao o kona mau palena i ko Keohokaua i oleloia ma kona Palapala Sila nui e like me ka mooolelo maluna ae nei oia apana.

A. Keohokalole.

[Translation]

From the Government to Kepani…

Parcel 1. Honopou Hamakualoa Maui.
On the West side of the stream.
Beginning at the South Eastern corner, adjoining the land of Keohokaua and Makahikipuni, and running:
N. 84 ¾ ° W. 6.93 Ch. along Keohokaua's.
N 2 ½ ° W. 3.40 Ch. along Halehaku.
N 20° W. 7.37 Ch. along Halehaku.
N. 5° E. 3.60 Ch. along Halehaku.
S. 41° E. 7.65 Ch. along Imihia's *Kuleana*.
S. 51 ¾° E. 8.85 Ch. along Imihia's *Kuleana*.
S. 12° E. 6.40 Ch. along Imihia's *Kuleana*.
S. 37 ¾° E. 2.64 Ch. along Makahikipuni's to the place of commencement.

Parcel 2. Honopou — (It is a remnant between the first place purchased and the place purchased by Kahalelaau and Kepani.)

Beginning at the South Western corner of this, adjoining the land purchased by Kaoo; and running along Kaoo's: North 83 E. 4.36 Ch; N. 86 ½° E. 6.76 Ch.; S. 85° E. 1.40 Ch.; then turn N. 71 ½° E. 71.00 Ch. Along the stream cliff to the point where the stream exits; then turn N. 73 ½° W. 12.00 Ch. Along the stream cliff and the Shore; then along Kaimi's land, South 10° W. 3.60 Ch. N 64° W. 14. 00 Ch.; then, S. 19 ½ ° W. 3/56 Ch. Along the stream to the corner of Kepau'a; then along Kepau'a S. 23 ¾ ° E. 3.13 Ch.; S. 16° E. 3.86 Ch. To the point of commencement.

A. Keohokalole
Surveyor
August 8, 1871.

(Explanation)

The two parcels above, are those which were first surveyed by Asa Hopu and J. Richardson; and there was a little place left out at the time it was first surveyed, and by this it is accurately completed.

Parcel 2 was carefully surveyed, taking note of the first document, so that there would be no confusion between the (boundaries of the) land purchased and the *kuleana*, and that this remnant would only be wasted.

And Parcel 1, one side of its boundaries are along Keohokaua's as described in his Royal Patent, and is like the description above given.

A. Keohokalole. [Maly, translator]

Kii o Kekahi hapa o Honopou he aina aupuni ma Hamakualoa Maui, o ke ano a me ka waiho ana o kekahi mau apana i kuai lilo ia; a me kahi mau koena aupuni.

(Map of one part of Honopou, a government land at Hamakualoa Maui, the character and extent of certain parcels sold, and those which remain to the government.) [*Figure 26-b*]

Royal Patent Grant No. 3177[18] [Figure 27; from Reg. Map No. 1760]
Kaihaa
Wailuanui (Lakini), Koolau, Maui

Beginning at a marked rock 50 feet south of the Hamau stream and 42 feet *mauka* of the Government road from which the true bearing of the rock off Honokalani pt. is S. 66° 58 E. The boundary:
1. S. 84° 38 W. 371 ft. to *hala* tree on south bank run S. of stream –
Beginning again at the first mentioned point the boundary runs:
2. S. 37.50 W true mag. S. 31 ¼ W. 332 feet up Puu Iilua
3. S. 29 4. true mag. 81 feet up the ridge &c.
4. S. 88.24 W. true mag. 96 feet along ridge to trig. Station Govt. survey.
5. S. 49.40 W. true mag. 325 feet along ridge thence.
6. S. 33.53 W true mag. 1029 feet across a valley to top of hill.
7. S. 23.35 W. true mag. 619 feet along the ridge.
8. S. 12.18 W. true mag. 48 feet up Puu Maikoikoi.
N. 76 W. true 180 feet to the Hamau stream; thence down the S bank of the stream to the *hala* tree first measured to commencement.

Area 11.27 acres.
Deduct 2.7 acres for L.C. Award 3472 inclusive.
9 20/100.

[18] Note: Unlike the other grants cited in this study, the original notes of survey and map for Grant No. 3177 could not be located in the State Land Division Collection (it apparently having been misplaced). The notes of survey (no map attached) were located in the Bureau of Conveyances microfilm collection. Maly discussed this with *Kupuna* Näkänelua (Kaiha'a's great great granddaughter), and her *mo'opuna*, Kyle Näkänelua – who hold family papers pertaining to land and genealogy; Maly provided kupuna Näkänelua with copies of selected Bur. of Conveyances. (see interview transcripts from Helen Näkänelua in *Volume II*)

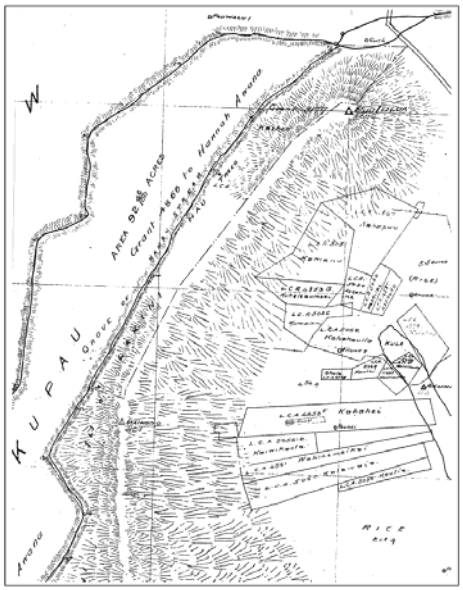

Figure 27. Royal Patent Grant 3177; Kaihaa at Lakini, Wailuanui (from Reg. Map No. 1760)

Royal Patent Grant No. 3202 [Figure 28; note also, Heiau of Halape in survey]
Haleole
Mokupapaakua, Hamakualoa, Maui.

Survey of land bought by Haleole from the Government;
Mokupapaakua Hamakua loa Maui.

Commencing at a stone marked thus → on the North West edge of the gulch between Mokupapaakua and Honokola [Honokala] and near a branch gulch coming in from the South West. From which stone the Government Survey Station of Honokola bears N 88° 1' W true 620 feet and Huelo Station S 65° 37' E true and run:
1. N. 32° 54 ' E. true 532 feet along edge of gulch along Government Land;
2. N…E… true 2099 feet along Keoho & Makue Grant 1142;
3. N…E… true 340.6 feet along Grant 1142;
4. N…W… 194.7 feet along Grant 1142;
5. N…W… 134 feet along Grant 1142;
6. N…E… 236 feet down a red ridge;
7. N…E… 430 feet down ridge to a rock marked thus → on the cliff at the seashore. Thence
8. S…E… 495 feet across gulch along Sea;
9. S…W… 305 feet along sea;
10. S…W… 1182 feet along sea;
11. S…W… 600 feet along sea;
12. S…E… 192 feet along sea;
13. S…E… 1020 feet along sea across of gulch to corner of Waipio (Award 2937 to W. Harbottle);
14. S…W… 686.4 feet along Waipio crossing gulch to a ridge;
15. S…W… 750.4 feet along Waipio up edge of gulch to a point in the center of the Government Road;
16. S…W… 313.5 feet along Waipio;
17. S…W… 694.3 feet along Waipio to a point near a *hala* tree marked thus W. Thence
18. N…W… 1790 feet acr. of head of this piece along Mokupapa Government to the South corner of Reed & Norton (Grant 2041) on the West side of the gulch and near the Government Road. Thence
19. N…E… 248.8 feet along edge of gulch along Grant 2041.
20. N…E… 360.4 feet along edge of gulch along Grant 2041;
21. N…E… 16.83 feet along Grant 2041;
22. N…E… 124.1 feet along Grant 2041 down gulch;
23. N…E… 1492 feet along Grant 2041 down gulch;
24. N…W… 297 feet along Grant 2041 down gulch;
25. N…E… 335.9 feet along Grant 2041 down gulch;
26. N…E… 268.6 feet along Grant 2041 down gulch to a point on the end of a long ridge;
27. N…E… 103 feet Grant 2041 to *Hala* tree marked thus X;
28. N…E… 372.9 feet along Grant 2041;
29. N…W… 152 feet along Grant 2041 up side of the gulch to point on edge of same. Thence–
30. N32° 7' E. 950 feet along Government land across of a branch gulch (coming into the main gulch from the South West) to point of commencement. Area 114 8/10 Acres

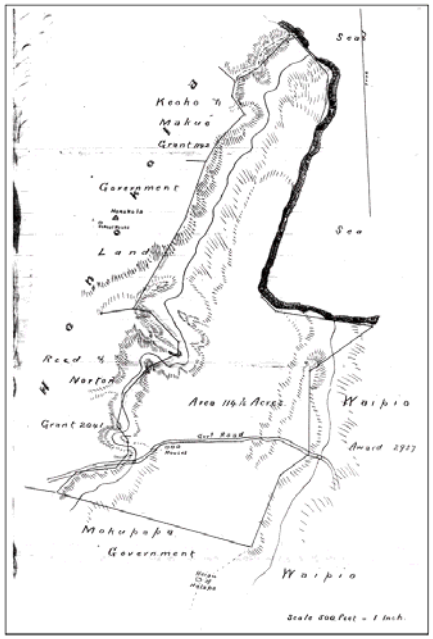

Figure 28. Royal Patent Grant No. 3202; Haleole at Mokupapaakua

M. D. Monsarrat Surveyor
Mokupapa Dec 20th 1878

So far as the survey goes this can be accepted. The Land Mokupapaakua is not in the *Mahele Book* at all - but such lands have usually been treated as Government Lands. Mr. Monsarrat conferred with Mr. Dodge the Govt. Surveyor before making this survey. C.D. Lyons – In Charge of Gov Survey.

Royal Patent No. 3214 [Figure 29]
Papaiakea
Waipio Hikina, Hamakualoa - Maui

Notes of Survey of a lot of land in Waipio East surveyed for Papaiakea: Beginning at a stone in valley near sea shore at N. E. corner of Waipio adjoining Puolua and running:
S. 65 ¼ W. 2.44 ch. along sea *pali*; S…W… along sea *pali*; N…W… along sea *pali* to N.W. corner this; S…W… along Waipio nui of Harbottle… [run 7 courses] S…W… along Waipio nui of Harbottle to edge of *pali*. S…W… along Waipio nui of Harbottle across Ravine; S…W… along Waipio nui of Harbottle… [run 5 courses] S…E… along to Road boundary of Puolua; N…E… Kahiawalu's… [run 3 courses] N…E… *Ahupuaa* of Puolua; N… E… Lalahili's; N… E… Lalahili's; N… E… Aupuni-Paolua; N… E… Kaiewe's; N… W… Kaiewe's; N… E… to *Hala*, *makai* corner Kawahines *kuleana* thence along Kaiewe's and Huluhulu's Kuleanas to place of beginning containing an area 170 Acres.

J. L. Gower Surveyor
Makawao Feb 8, 1855

Royal Patent Grant No. 3223 [Figure 30]
Kaakuamoku & Kailiau
Pauwalu (Pahoa) Koolau - Maui

Notes of Survey of part of Pauwalu in the district of Koolau, Maui, applied for by Kaakuamoku & Kailiau. Beginning at the S. E. corner of Grant 1899, (from which the Govt Survey trig. station on the ridge back of Keanae bears N 30° 27' W, true) at the top of a rocky knoll on the west bank of the Kamilo stream, which separates this land from Wailua, the boundary runs,

1. N. 67° 57' W. true 750 ft along Grant 1899, to the top of another rocky knoll;
2. N…W… 597 ft along Gr. 1899, &;
3. N…W… 139 ft along the same to & across of Palauhulu stream; Thence
4. S…W… 360 ft along do;
5. S…E… 249 ft along Palauhulu stream… [run 7 courses along Palauahulu Stream];
13. S…W… 640 ft along Palauhulu stream past waterfall at Kaoiki;
14. S…W… 370 ft along Palauhulu stream to marked rock;
15. S…E… 1005 ft across this land to Kamilo stream;
16. N…E… 1393 ft along Kamilo stream to marked tree;
17. N…E… 325 ft along Kamilo stream… [run 3 courses along Kamilo Stream];
21. N…E… 615 ft along Kamilo stream… [run 4 courses along Kamilo Stream];
26. N. 27° 57' E. 1158 ft along Kamilo stream to place of beginning, Area 120 Acres.

W. D. Alexander Surveyor Nov. 3, 1877.

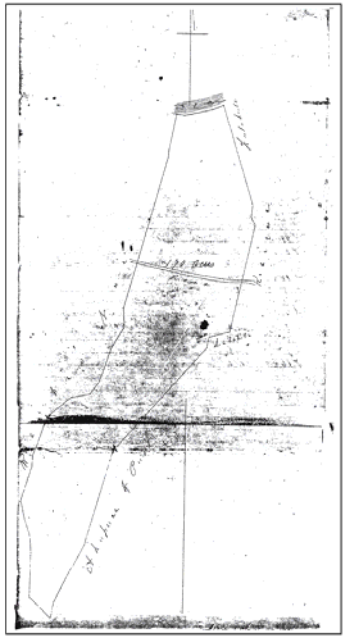

Figure 29. Royal Patent Grant 3214; Papaiakea at Waipio

Figure 30. Royal Patent Grant 3223; Kaakuamoku and Kailiau at Pahoa-Pauwalu

Royal Patent Grant No. 3375 [Figure 31]
Uluhani
Hookuli, Keanae, Maui

Notes of Survey of Hookuli, applied for by Uluhani. Beginning at a marked *ohia* tree on the boundary between the Govt land and Keanae, by a path, at the top of a small *pali*, at a place called Kaulanamoo;

1. S. 68° W. true 2199 ft along Keanae to a large marked *ohia* tree on the ridge Aina Kiki;
2. S…E… 769 ft to a tree by a watercourse at foot of the ridge;
3. S…E… 747 ft along watercourse;
4. N… E… 1645 ft to place of beginning. Area 31 Acres.

W. D. Alexander Surveyor
Oct. 1877

This is located in the general map. C.J. L. The above receipt was deposited here in 1878.

What title the Maui Book can be examined if correct R. P. to issue - Dec. 24. Malaihua of Keanae called on behalf of Uluhani who lives at Koloa, Koolau Maui —

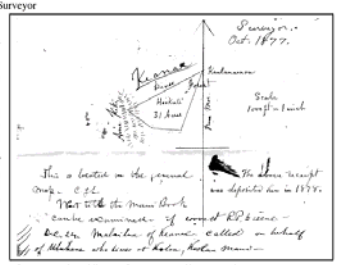

Figure 31. Royal Patent Grant 3375; Uluhani at Hookuli, Keanae

Honolulu, Dec. 28, 1883
W.D. Alexander, Surveyor General; to C. T. Gulick, Minister of the Interior:
…The enclosed survey of the land applied for by Uluhani, & the receipt by Gov. Nahaolelua, were mislaid, & lay in this office for several years. The receipt was deposited here in 1878. There is no reason that I know of why a Royal Patent should not issue to the applicant. Mr. Lyons' memoranda state that it was deposited Nov. 19, 1878, & is among "Applications." I found in 1877 that it had been occupied for many years & planted with fruit trees by Uluhanee. It is located on my general map of the district [see Register Map No. 2052]…

Patent Grant No. 4866 [Figure 32]
Hannah Awana
Wailua nui Koolau, Maui
January 18th, 1905
(R.P. Lease #52 - 4th Land District)

Description of the Ili of Kupau, Keanae, Koolau, Maui.

Beginning at a point on the West bank of Kamilo Stream, at the North corner of this land, adjoining Grant 1899 to Kaniho, et al., the coordinates from the Government Survey Trig. Station "Puu Ililua" being North 370.2 feet and West 81.8 feet, as shown on Government Survey Registered Map No. 1760, and running by true azimuths:-

1. 93° 35' 636 feet along Pauwalu, Grant 1899 to Kaniho, et al., the middle of Kamilo Stream being the boundary;
2. 49 ° 45' 904 feet along Pauwalu, Grant 1899 to Kaniho, et al., the middle of Kamilo Stream being the boundary;
3. 359° 50' 443 feet along Pauwalu, Grant 1899 to Kaniho, et al., the middle of Kamilo Stream being the boundary;
4. 62 ° 42' 287 feet along Pauwalu, Grant 1899 to Kaniho, et al., the middle of Kamilo Stream being the boundary;
5. 6° 00' 813 feet along Pauwalu, Grant 1899 to Kaniho, et al., the middle of Kamilo Stream being the boundary to rocky knoll at Northeast corner Grant 3223 to Kaakumoku, et al.;
6. 27° 57' 1158 feet along Pauwalu, Grant 3223, the middle of Kamilo Stream being the boundary;
7. 18° 00' 522 feet along Pauwalu, Grant 3223, the middle of Kamilo Stream being the boundary;
8. 27° 18' 250 feet along Pauwalu, Grant 3223, the middle of Kamilo Stream being the boundary;
9. 45° 40' 590 feet along Pauwalu, Grant 3223, the middle of Kamilo Stream being the boundary;
10. 33° 30' 405 feet along Pauwalu, Grant 3223, the middle of Kamilo Stream being the boundary;
11. 301° 35' 1030 feet along foot of pali to East bank of Hamau Stream;
12. 206° 55' 911 foot along Ili o Lakini, the middle of Hamau Stream being the boundary;
13. 257° 40' 40 feet along Ili o Lakini, the middle of Hamau Stream being the boundary;
14. 215° 40' 609 feet along Ili o Lakini, the middle of Hamau Stream being the boundary;
15. 153° 00' 146 feet along Ili o Lakini, the middle of Hamau Stream being the boundary;
16. 182° 57' 159 feet along Ili o Lakini, the middle of Hamau Stream being the boundary;

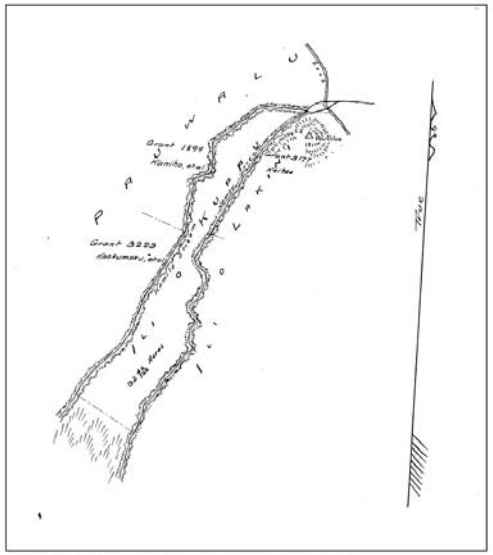

Figure 32. Royal Patent Grant 4866; Hannah Awana, at Kupau - Wailuanui

17. 221º 42' 157 feet along Ili o Lakini, the middle of Hamau Stream being the boundary;
18. 152º 10' 253 feet along Ili o Lakini, the middle of Hamau Stream being the boundary;
19. 214º 30' 208 feet along Ili o Lakini, the middle of Hamau Stream being the boundary;
20. 202º 48' 166 feet along Ili o Lakini, the middle of Hamau Stream being the boundary;
21. 198º 30' 98 feet along Ili o Lakini, the middle of Hamau Stream being the boundary;
22. 145º 23' 362 feet along Ili o Lakini, the middle of Hamau Stream being the boundary;
23. 209º 20' 320 feet along Ili o Lakini, the middle of Hamau Stream being the boundary;
24. 211º 37' 137 feet along Ili o Lakini, the middle of Hamau Stream being the boundary, to Grant 3177 to Kaihaa;
25. 206º 30' 695 feet along Ili o Lakini, the middle of Hamau Stream being the boundary;
26. 207º 25' 667 feet along Ili o Lakini, the middle of Hamau Stream being the boundary;
27. 216º 20' 420 feet along Ili o Lakini, the middle of Hamau Stream being the boundary;
28. 227º 57' 546 feet along Ili o Lakini, the middle of Hamau Stream being the boundary;
29. 155º 55' 20 feet along top of small waterfall to initial point. Area 92.46 Acres.

S. M. Kanakanui
Assistant Government Surveyor.

Sub-Agent's Report as to Fulfillment of Conditions.
Lot Kupau P. L. Map Koolau, Maui

To the Commissioner of Public Lands:
I hereby certify that I have inspected lot No. — Known as the "Ili of Kupau" at Wailua, Koolau, Maui; occupied by Mrs. Hannah Awana; under Right of Purchase Lease No. 52.; and certify as follows: Class of Land - First Class Agricultural.

Improvements – One large framed house, practically two stories, with several rooms. — Two small framed houses, and fence of wire and ferns, enclosing the entire land.

Maintenance of a Home – Occupant has as far as I can learn, maintained her home continuously upon the land, and is living there now.
Cultivation – About 25 acres under high cultivation all of the same being rice.
Number of Timber, Fruit or Shade Trees per acre. — There are easily more trees on the land than called for.

W. O. Aiken Sub-Agent Fourth Land District November 1904

Makawao, Maui
June 1st, 1929.

T.F. Tom; to Chas. T. Bailey, Commissioner of Public Lands:
…Mr. T. Apo, of Makawao, owner of Land Patent 4866 to Kupau, situated at Keanae desire to go into farming in said Land Patent. During the opening of the homesteads in that section at that time the road was laid out in such a way that it is practically impassible with modern transportation. Since the opening up of the Hana road there also has been a gap dug so as very easily to get into this property, but between this gap and said land there is a piece or property which belongs to the Territory of Hawaii. Mr. Apo requested me to write you whether or not he can secure some sort of an agreement with you as Commissioner of Public Lands for a roadway entering into his property. If this could be obtained, farm produces could be easily handled. Thanking you in advance for considering a right of way as stated above … [*Figure 33*]

June 10, 1929
C.T. Bailey, Commissioner of Public Lands; to Mr. T. Apo:
…In accordance with your request of June 1st, you are hereby authorized to cross the Government Land at Keanae, lying between the area covered by Land Patent 4866 to Kupau and the main Government Road…

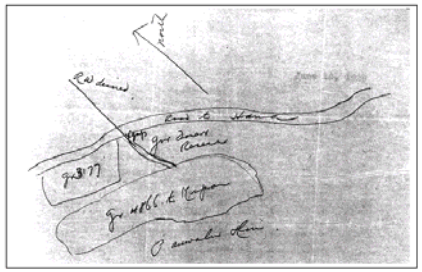

Figure 33. Sketch Map of Authorized Access between New Hana Road and Kupau (through Lakini) (T.F. Tom 1929).

Public Lands and Homesteading (ca. 1884 to 1920)
Among the important records are those associated with the Public Lands-Homesteading programs of the Hawaiian Kingdom, which was established in 1884, when the Government undertook a program to form Homestead Lots on Government Lands—a primary goal being to get more Hawaiian tenants in possession of fee-simple property (see The Homestead Act of 1884). Generally, the people who applied for homestead lots in a given land were long-time residents of the *ahupua'a*—or of neighboring lands—they applied for. The Homestead Act allowed for lots of up to 20 acres to be surveyed and granted to applicants.

In 1895, the Provisional Government of the Republic of Hawaii, passed the Land Act. In this act, three types of homestead agreements were defined: (1) the Homestead lease; (2) the Right of Purchase Lease; and (3) the Cash Freehold Agreement. The Homestead Lease was for a term of 999 years, and was issued after the applicants complied with terms and conditions of a Certificate of Occupation. The Right of Purchase Lease was a lease for 21 years with the right of purchase at anytime after the end of the third year of full compliance with the stipulated conditions of residence, cultivation, fencing, payment of taxes, and payment of the purchase price. The Cash Freehold Agreement was an agreement of sale in which the purchaser paid 25% of the purchase price in down payments, and 25% on the remainder for the next three years. (cf. George Lurer 1961)

The Land Act of 1895 specifically noted that "The lessee shall from the end of the first year of said term to the end of the fifth year thereof continuously maintain his home on such premises." (Land Act of 1895, Section 61, Subsection 2). In a decision rendered in 1904, on conditions of the Homestead Act, Attorney General, Lorrin Andrews observed:

> The subdivision of Section 61 before quoted, that "the lessee shall from the end of the first year" is mandatory. If he does not do so he forfeits his lease, and there is not provision of the law that I have been able to find that allows a public officer to take upon himself the burden of changing the conditions of a lease…
>
> The idea of the legislature in creating these leases was clearly to encourage settlement and residence upon lands of the government. It was not for the purpose of allowing persons to obtain farming lands at easy rates, but for the purpose of creating small farm homesteads where the parties would engage in farming and agricultural pursuits and increase in number the thrifty citizens of the Territory… (L. Andrews, November 25, 1904 – Hawaii State Archives; Series GOV2-8)

As will be noted in the communications cited below, the Homestead Program was one of significance in the history of lands in the Hāmākua-Ko'olau region. Several interviewees in the oral history interview program conducted as a part of this study (see *Volume II*), are beneficiaries of the nineteenth century homestead program.

Hana, Maui
November 13, 1896
Hugh Howell; to J. F. Brown, Esq., Agt. Public Lands:
[regarding revised survey of Opana; Kuloli, and graveyards pointed out]
…Enclosed please find map showing the state of things at Opana [map attached – see *Figure 34*]. The location of stone marked "H" was incorrect on Mr. Dodge's map, which shows the whole line between Opana and Keaaula too far south and west. I located "H" independently in three different ways: (1) by a short base measured with steel tape on the flat just south of Kuloli; by an auxiliary point making a triangle with Kuloli and Kapuai; & (3) by calculation of the two courses

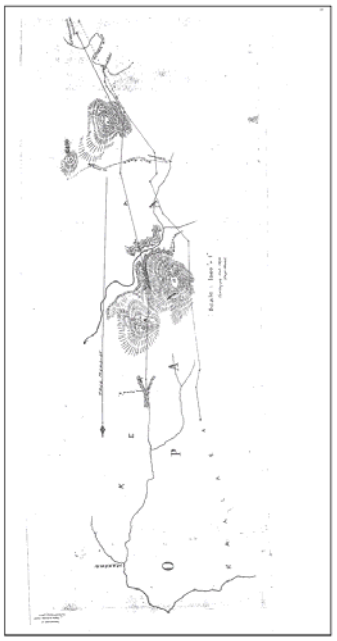

Figure 34. Survey of Opana (H. Howell, 1896)

from "the small ravine just east of Kuloli Hill which point was located by triangulation from Kuio and Kapuai. The greatest discrepancy was about two feet. My location of H and the line from "H" *mauka* is therefore correct. The government road was probably sketched on your map, as it is too far *mauka*. I located it by half a dozen stadia shots. The Hamakua Ditch was probably also only sketched, as the map does not show the bends as they now exist. I believe that the ditch was not completed at the time of your survey.

I have shown your location of Kahoohanohano's graveyard in dotted black lines. There is something wrong about that. I spent some time looking for graves near where your map shows this point, (without success) although Kahoohanohano himself—an old rascal, by the way—told me that the spot shown at end of my red line was the same you used in your survey. This point I located in three different ways, all checking closely. The triangular pits mentioned in the description can not be found—not surprising after so long a time. To adjust this survey I ran the course N27 30W 2659ft from the above mentioned grave, and found the declination of the needle at the end of this course the 11º34, which, allowing for annual increase since 1876, agrees with your declination within 0º 04'. By actual trial, this point agrees better in this respect than any other in the vicinity. I make a practice of observing the declination at each Δ. From this point I ran the next course at 32º 52' W 3942 and simply prolonged it to meet the long course from the flat by gov't road, as it is all on the steep side of Kapuai.

It is evident that the description given of Opana will not fit without radical change at the points mentioned.

This portion of the Opana survey was done for Mr. Geo. E. Beckwith and I have taken out my time for this as well as other private work in the vicinity in my October vouchers.

The concrete post on Kuloli I found at the bottom of the hill. Some vandal had probably played football with it. With some difficulty I relocated the Δ by bearings from Kapuai and found pieces of concrete, by digging, that fitted the broken post. I reset the post firmly.

The azimuth from Kuloli to your post at the N.W. cor. of Opana is incorrect in Mr. Dodge's notes. It should be 172º 36' instead of 172º 26'. Opana Δ is a large stone that shows such a wide discrepancy in azimuth from every other point that it has evidently been moved, although it must have been years ago. There are several graves on Puu Kukai.

No one seems to know which is taken as the corner of Keaaula, so I took the most prominent, about the summit of the hill—the same one that Boyd used, by the way.

Boyd's error was probably due to using the magnetic bearing instead of the true bearing, without making allowance for declination. Assuming 10º as the average declination, a rough calculation makes this evident.

If your survey in 1876 was for the Gov't, it might be just that the Gov't bear part of the expense of survey to correct the error in location of Kahoohanohano's—graves as a point on the boundary of Opana.

I have most of the Koolau kuleanas and grants plotted and am fairly started on this work now. If you wish I will keep you informed from week to week of progress in the survey, or perhaps you would prefer not to be bothered until I can send you the map showing the whole proposition in compact form [see Register Map No. 2649]… [HSA, DLNR 2-16; Public Lands Commission]

June 26, 1897
W. D. Aiken, Sub-Agent, Public Lands; to J. F. Brown, Agent, Public Lands:
[Reports on forest conditions; efforts of keeping wild cattle out; and protecting watershed from animals and fires. Asks about proposed ranger program.]

…Your favor of the 12th inst. to hand, and contents noted. As regards the appointment of a Ranger, I have as yet been unable to find a suitable person for the place. As to taking up cattle on the government lands above Huelo, I have broached the subject to a few of the residents over there, and they object strongly. They say a great part of the year, and especially now, the stock have to go up there for water, and it would be impossible to keep them away. If impounded, they would immediately go back upon being released. The old Huelo Plantation lands are now being purchased by a *Hui* of natives there, and as they are having a hard time to raise money to pay for the land, they could not afford to fence. They further say that by impounding their stock, a great hardship would be worked them, as most of them live by raising a few head of cattle, and if this was done they would have to sell their stock, and have no means of livelihood. Yet I see when this *Hui* is completed, that the number of stock there will be greatly augmented, by those of non-resident share holders, and the forest will be further endangered. So you see I have rather a delicate question to deal with, and more so as most of the parties concerned are Hawaiians. I do not care to see them entertain such hard feelings against the Government as they will in case my proposed plan is carried out, so will not do anything until I have investigated the matter fully. Reports have come to me that fires have been set in the woods up there, doing much damage to them. I am going to put up notices there warning all parties against building fires on Government land, and offering a reward of say $10.00 or $20.00 for information that will convict anyone for so doing, which I trust will have your approval. For many reasons I would prefer to have this appropriation for a Ranger at my disposal to use as I saw fit. It will be very difficult for me to find a suitable person to permanently fill the position of Ranger for the money. What I need most at times is a man here in the office, so that I could attend to matters better out of doors. Why couldn't I be appointed Ranger also, then I could afford to have a man to help me in my other work when necessary, and, give my time also to the work I would want a Ranger to do. For I must say I can think of no one that I could trust to do what I want done outside. I don't see why this could not be done… [HSA, DLNR 2-16; Commission of Public Lands]

November 2, 1897
D.W. Napihaa; to J.A. King, Minister of the Interior:

…I, D.W. Napihaa, of Keanae, Koolau, Maui, have taken the oath to the government of the Republic of the Hawaiian Islands; ask your kindness to permit me to act as Commissioner of Private Ways and Water Rights for the District of Keanae, Koolau, Maui, since there is a dispute between the Natives and the Chinamen; if it pleases you… [HSA, Interior Department – Box 35, Private ways and Water Rights]

January 7, 1898
W. D. Aiken, Sub-Agent Fourth Land District;
to J. F. Brown, Agent, Public Lands:
[Reports on disposition of Public Lands at Nāhiku and Kupa'u; and protection of Hāmākua Loa Forests]

…I beg to present the following report pertaining to Public Land matters in the Fourth Land District for the year 1897.

The chief occurrences of the year were the opening of public lands at Kahakuloa and at Nahiku, of which the latter was the most important. Small tracts have been taken up also in other localities, but, I will mention them each in their turn…

…Nahiku — The survey of the Government land at Nahiku, Hana, was completed about the 1st of Sept., the appraisement made by Sept. 11th, and the lots opened for settlement, comprised 47 lots altogether of about 100 acres each, with the exception of the Homestead lots, and was appraised at from $2.50 to $4.00 per acre. Great interest was taken in these lands, and the rush for them on Nov. 8th is well-known, the demand by far exceeding the supply. That there were so few lots taken under the Homestead Lease system, was owing to the fact that the natives did not speak for lots until too late, though I think it was a mistake not laying out more lots than was asked for, as others wanted lots later.

As will be seen from the table offered below, 12 lots went under the Special Agreement systems. These were sold at public auction at Paia, on Dec. 6th and went a little above the upset price. The following table gives in detail, the results of the opening of these lands.

The main reason for withholding the four lots mentioned, was that owing to circumstances they could not have been disposed of in full justice to the Government, and later can be done so with profit. For revenues sake, I would suggest that Lot 29, containing 261 acres be cut up into several smaller lots, and offered for sale. Lot 40, used as a shipping point by a Chinaman carrying on the wood business, should be sold to him, if to anyone as it is good for little else, and is the key to his business. — What Nahiku needs first, and needs badly, is roads, as without them it will be difficult work doing anything. — As an item of interest I would say that the 43 Nahiku settlers are composed as follows: — Americans and Europeans 13, Hawaiians 11, Portuguese 18, and Japanese 1. All Right of Purchase Leases were made out as of Dec. 1st and Special Agreements Dec. 6th, from which dates interest is due the Government… [See Register Map No. 2649; H. Howell Surveyor, 1897]

[For additional records pertaining to the disposition of Nāhiku vicinity lands and water, see letter dated July 25, 1898, below; and the section of this study titled "*E 'Olā'olā 'Ana ka Wai i nā 'Auwai—Development and Operation of the East Maui Ditch System*".]

Kupau — In Wailuanui, Koolau, the *ili* of Kupau comprising 92.46 acres, and appraised at $416.07, was taken up by H. W. Chamberlain under Rights of Purchase Lease system. Annual rent due from same is $33.30…

…Several months ago I brought up the question of protecting the forests of Hamakualoa, from the stock that roamed through them. As yet I have been unable to fully go over the ground, but it looks to me as though the only feasible way it can be done, will be to fence. But I would rather the matter would be held in abeyance, until such time, as I may be able to thoroughly cover the ground, which will be in a short time now.

There are many people looking toward the Government land at, and near Keanae, and should it be thrown open, would be quietly and eagerly taken up… [HSA, DLNR 2-16; Commission of Public Lands]

July 8, 1898
W. D. Aiken, Sub-Agent Fourth Land District;
to J. F. Brown, Agent, Public Lands:
[regarding Chinese rice planters at Ke'anae]

Napihaa, of Keanae, telephoned me yesterday that he had received instructions from you, to notify some Chinese who are using Government rice lands at Keanae, to vacate the same. Some of them he said refused, and he wanted instructions from me. I told him, in the absence of any word from you, that I could do nothing in the matter. What is the question in hand?

I intend soon to make the trip to Nahiku and could look into any such matters on the way, with definite instructions from you.

I would like to leave for Nahiku on July 25th and will plan to do so, unless you plan your trip up here about that time, or a little later. If you intend going over there, I should prefer to wait for you, to look into affairs there with you. Would like very much to know what your plans are in the matter, before I, decide upon going. Trust that I may hear from you in regard to same next week, and that you are coming up… [HSA, DLNR 2-16; Commission of Public Lands]

Honolulu, July 25, 1898.
Senator Hocking; to J. F. Brown Esq., Agent of Public Lands:
[regarding development of Nahiku Sugar Plantation and License to take water]

…Mr. H. P. Baldwin, Mr. W. F. Pogue and myself have entered into a preliminary agreement to erect a sugar mill at Nahiku Island of Maui, for the purpose of manufacturing sugar from cane grown and furnished by parties who have taken up government lands at Nahiku, Island of Maui, and also to pipe and ditch water along the heads of said lands, providing we can acquire the right from the Government to do so. Therefore providing the Company be incorporated under the law of Hawaii, will you grant it a license to use the water on said lands for the above named purpose, providing it be used for the benefit of all parties owning land in said tract, and depriving no person of their rights to water, we would necessarily like the privilege for a long term of years if you should decide to grant this license will you please state the terms… [HSA, F.O. & Ex, Public Lands Commission – 1898]

October 7, 1898
W. D. Aiken, Sub-Agent Fourth Land District;
to J. F. Brown, Agent, Public Lands:
[Describes – use of taro and rice lands at Ke'anae and Wailuanui (disagreements between Hawaiian tenants and Chinese); Chamberlain, applicant for land at Kupa'u; and Nāhiku Homestead lots.]

…I beg to report as follows upon my Hana trip, made last month through the Government lands therein, and as to how I found same.

I spent one day going over the taro and rice lands at Keanae and Wailuanui. As but little had been done towards the survey of the Keanae flat, I could determine but little therefrom.

The rice lois wanted by the Chinese I inspected, but can make no recommendations, until I see the map, as to whether the Chinese should have them or not. One old Chinaman, whose wife is a Hawaiian, but a leper on Molokai, should be granted a lot, as he has resided there for a long term of years, and has several children to support.

D. W. Napihaa asks to be given his house lot, and enough additional land *mauka* of the road to make up a Homestead Lease, which request I would recommend be granted and ask that Mr. Howell be notified to that effect. Many others want Homesteads there, but Mr. Howell tells me he has been authorized to lay off same.

Matters at Wailuanui appear to me to be rather mixed. Some rice planters claim that they are paying for more land than they have, while from my observations there, others have more than they are paying for. There is nothing very definite known in the matter. There is no reason why the Government should not derive twice the income from these lands, that they are now receiving. Much land that is now merely pasture land, could easily be made good wet lands, and rented out. I beg to recommend that the whole flat at Wailuanui be surveyed and laid off into lots, and a map furnished of the same. It would pay for itself in a very short time. Ah Kuna has promised to pay the $137.50 due from him, as soon as he takes off his crop. I will follow him up.

Mr. Chamberlain has done but little with "Kupau" as yet, but enough to fulfill the conditions.

At Nahiku I spent four days, and inspected the lots there, and the work being done pretty thoroughly. In spite of the great difficulty of lack of roads, and other adverse circumstances, a large amount of work has been done, and matters look very promising. Out of twenty-three Rights of Purchase Lease holders, eighteen, are already residing there, and doing hard work, while eight of the twelve holders of Special Agreements are improving. The balance will be at it very soon. Of the forty odd lots taken up, but one has been forfeited so far, though it looks as though another one will be. As to dividing Lot #9 in two parts, and selling them separate, it can be done of course, though I doubt if it would pay. I lean towards selling it as it is, but make no recommendation on the subject, leaving it entirely to you. When Lot 9 is sold, Lots 38 and 39, reserved before, should also be put up, and I suggest that all three be sold under the Special Agreement system. I trust that the sale may be arranged for as soon as possible, as there is considerable demand for these lots just at

present. — In laying out small lots for Homestead Leases, it seems to me that a few more than is actually asked for at the moment should be provided, so that at any time thereafter, they could be applied for without the delay of another advertisement. I have suggested this to Mr. Howell, and he may perhaps do so, provided there is land available. — Provision has already been made, I believe, with Mr. Howell, for the natives wanting Homesteads at Nahiku, so I need say nothing about it.

I beg to take this opportunity to urge upon the Land Commission the great advantage to be derived from completing a good road through Koolau, from Nahiku to Kailua, before the country is put upon the market for settlement. The value of the lands would be so largely enhanced by the same, that it would be more than paid for. The experiences gained from Nahiku has proven this…

I obtained a great deal of useful information, and a considerable knowledge of the Government lands in this section, and will find the source of advantage hereafter. The Hamakualoa and Koolau districts, I consider have great prospects in view, but Kaupo, I hardly think will ever amount to much. The soil and land is good, but it is so difficult of access, a good road up through the same, being almost out of the question… [HSA, DLNR 2-16; Commission of Public Lands]

July 15, 1899
Enos Vincent; to J.A. King Esq., Minister of the Interior:

…Please let me know when the Keanae Homesteads will be thrown open. There is a large number of people here in the district who are very anxious to know. Let me know as soon as possible… [HSA, DLNR 2-16; Commission of Public Lands]

September 5, 1900
W. D. Aiken, Sub-Agent Fourth Land District;
to J. F. Brown, Commissioner of Public Lands:
[Describes activities on Homestead-Grant lots of Nāhiku, Wailuanui, Ke'anae; and numbers of applicants for lots.]

…Having just returned from an inspection of Government lands throughout a part of Hana district, I beg to submit the following report …

…From Kaupo, I next visited Nahiku, where I found matters to be in very good condition. With one or two exceptions all of the settlers who acquired lots under the Right of Purchases Lease and Special Agreement systems, are amply fulfilling the conditions required of them. And these one or two exceptions are going right to work now, so that there will be no failure at all to report. The new road from Hana out as far as Makapipi Gulch, just above Nahiku landing, and the branch road down to the landing, have proved a great boom to settlers, and has done much to encourage them. It is regrettable that the road on towards Keanae could not have been built as well, as there was apparently sufficient money to have done it. As it is, it is nothing more than a horse trail and an exceedingly serpentine one at that. Of the Hawaiian homesteaders at Nahiku, I cannot say very much. There are two or three of them who have done nothing. Several are just commencing to clear a little, so with a little more time granted, a better showing may be made.

Wailuanui and Keanae was the next place visited, and here there were but two holdings to inspect. On the *ili* of Kupau held by H. W. Chamberlain under Right of Purchase Lease, about 10 acres is cleared and planted to rice, the work having been

done by a Chinaman under some sort of a contract or agreement. Mr. Chamberlain is at present there on the premises. At Keanae, D. W. Napihaa has his one acre of wet land planted to taro, but has as yet done nothing with his seven acres of *Kula* lands, which he holds under Homestead Lease. However, living on the premises he has done sufficient to fulfill all conditions. At Keanae and Wailuanui, some fifty-four Hawaiians applied to me for Homesteads there. But very few of them had any land at all, and all wanted a proportion of the wet land. This would practically take all the land at Wailuanui, both *Kula* and wet, and a large proportion of the *Kula* land, and all of the wet land at Keanae.

I will send you later, a list of all these applicants, stating their condition as near as I could gather.

It is to be regretted that the eight foot road from Nahiku to Keanae could not have been completed, for with the money spent there, $27000.00, it surely could have been put through, instead of only two ends, as is at present the case… [HSA, DLNR 2-16; Commission of Public Lands]

September 6, 1900
W. D. Aiken, Sub-Agent Fourth Land District;
to J. F. Brown, Commissioner of Public Lands:
[Describes activities on Homestead-Grant lots of Nāhiku, Wailuanui, Ke'anae; road in region needs improvements.]

…I regret very much that you were not able to get up to Hana, and go out to Nahiku and Keanae with me. There were many things there that I should liked to have talked over with you. The new road to Nahiku built by W. A. McKay is very good, and a great convenience to the settlers there. From Nahiku on towards Keanae the road built is a good horse trail, with the most astonishing number of curves and turns in it, most of which were unnecessary with a little more work. Had about half as much money been spent for it as was, it could be called a fair job. When it comes to widening it out into a wagon road later, a good deal of the work now done will have to be abandoned, to straighten out the curves, and consequently much money thrown away. I believe that for the amount spent there, the road or trail as it is built, could have been finished through to Keanae. As it is now over half of it is useless, until the middle section is built. However, I suppose that is out of our Department, but I think that someone should look into it.

You will remember a change in the road survey made by Howell last year through Lot 9, held by McKay, which cut off about 13 acres there, and for which he was to be given 14 acres from Lot 7, which 14 acres was duly deducted from Lot 7. You wrote me about this on July 3rd of last year, saying that Howell was to have the matter settled before the sale of Lot 7 came off. Just before you left for the coast last year, you wrote me again on the subject, and sent me a map according to the new survey. You said then that Howell had written that the two Portuguese were agreeable to the change, and that they were willing that the two small lots created, Numbered 54 and 55 on the map or sketch, should be put up at public auction, and that they did not expect to get them cheap. Now as a matter of fact Howell never saw these Portuguese upon the subject at all, and Mr. McKay denies that any arrangement was ever made with him. He says Howell spoke to him upon the subject, but that nothing definite was ever done, and that he did not agree to accept the 14 acres of Lot 7 in lieu of the 13 acres taken from the top of his lot.

Consequently McKay is today in possession of Lots 54 and 55, the holders of Lots 11 and 12 have lost about half of their road frontage, and the Government still owns 14 acres between Lots 7 and 9…

In the matter of the natives at Wailuanui and Keanae who want land. About 54 of them came to me, and I believe all of them would be qualified. What they asked, is to take up the land there under the Homestead Lease system, each one getting 8 acres upland and 1 acre taro land. The land they want is that at and in the vicinity of Keanae and Wailuanui. Every eligible Hawaiian there seems to be struck with the land fever. I will get off a list of them to you as soon as possible, though I am so rushed that I cannot do it this week. Should you have such a thing as an extra type-writer down there, I wouldn't object to taking it here in the office, if you find it in your way… [HSA, DLNR 2-16; Commission of Public Lands]

May 31, 1901
W. D. Aiken, Sub-Agent Fourth Land District;
to E. S. Boyd, Commissioner of Public Lands:
[Describes circumstances around Chamberlain's application for the 'ili of Kupa'u (now deceased); and Awana's stake in the land.]

…You are fully informed upon the Chamberlain incidents of the past three years in connection with "Kupaau" at Wailua, Koolau. The old fraud is now dead, and never made even a pretense of fulfilling the conditions of his R. P. Lease as far as residence went. He however got Awana, a very progressive Chinaman, who bears this letter, to go in with him to fulfill the cultivation part of the agreement. Awana went in with him in all good faith and has spent a large amount of money there putting a part of the land in rice. Chamberlain has forfeited all right to the land and is now dead, so it leaves Awana in rather a peculiar position. He wants to talk over the matter with you. My plan, in which Mr. Brown agreed with me, was to cancel the Chamberlain R. P. Lease, and put it up again, and let Mrs. Awana, who is a Hawaiian take it. Should any one else get it they would have to pay for the improvements which Awana has made. I feel that Awana should be protected someway. Now the people of Wailua are making Awana all the trouble that they can by shutting off his water. Not having any legal standing on the land he can hardly go into Court against them or do anything else legally. We might let Awana have the land as a tenant-at-will for a time or until something else can be done. This would be feasible as soon as we gave formal notice that the Chamberlain crowd were *pau*. If you approve of this you might arrange with him as to the yearly rental, or if you prefer that I attend to it here I will do so upon his return. Something should be done about the water question over there as the rival interests there are trying to gouge Awana, I am sure… [see also communication dated January 9, 1902, below]

However Awana will talk to you himself about the matter… [HSA, DLNR 2-16; Commission of Public Lands – see Grant No. 4866 in preceding section]

August 17, 1901
W. D. Aiken, Sub-Agent Fourth Land District;
to Edward S. Boyd, Commissioner of Public Lands:
[Regarding the 'ili of Kupa'u; and matters pertaining to preservation of forest lands; noting that cattle have done great damage to resources.]

…Two favors from your office of the 15th and 16th inst., have just come to hand. I note that you ask me to send by the return mail a new appraisement of the *Ili* of

Kupau so that you can advertise it for settlers. I can send an appraisement signed by myself alone, if this will be adequate. The law I believe requires appraisements to be made and signed by the Sub-Agent and an Appraiser together, but an Appraiser we have not here. No regular one has ever been appointed, as it is or has been more convenient to have special ones for each occasion. However I will forward herewith an appraisement of the tract as you may perhaps want it more for form.

I note further what you have to say in the matter of the forest preservation, and will see Hon. H. P. Baldwin as soon as possible as to the best method to persue [sic]. I heartily agree with the idea and in fact spoke to the Governor about the same matter some years ago when he was President of the Republic. I will have notices printed in different languages and widely posted. It occurs to me that perhaps you had better get the printing done down there, as you could get the same done in English, Hawaiian, Portuguese, Japanese and Chinese all together. Most of the above I can not get done here. I will await to hear from you on the subject.

In the matter of these forests I would also like to see something done towards keeping the cattle out of them, as there is no doubt that a great amount of damage is done by these cattle. The only way of course would be to fence, and this would require the cooperation of parties owning lands adjoining the Government lands in a large measure. However I hope that the matter of the Gov't forests will be taken up seriously before long. Yours respectfully… [HSA, DLNR 2-16; Commission of Public Lands]

January 9th, 1902
W. D. Aiken, Sub-Agent;
to Edward S. Boyd, Commissioner of Public Lands:
[Describes disposition of Government Lands in the Ko'olau and Hāmākua Loa Districts; and importance of water producing forests to the well-being of all Maui.]

…I beg to present to you the following, as my annual report on Public Land matters in the Fourth Land District for the year just passed that is 1901…

The…lot at Wailua, Koolau, Maui, known as the "Ili of Kupau", containing an area of 92.46 acres, and was awarded to Mrs. Hannah Awana [Patent Grant No. 4866], under the Right of Purchase Lease system, under date of October 1st, the purchase price of same being $924.60, and the annual rental $73.96.

During the year Seventeen lots in the Nahiku tract, in the Koolau District, have been "proved up" on, and for Thirteen of them Patents have been issued and delivered. Of these Seventeen lots, Fifteen of them were held under the Right of Purchase Lease system, and two of them under Special Agreements. The conditions on all of these were substantially fulfilled, and it can be said that these settlers were a "success"…

…I beg to include here in this report my recommendations and suggestions in regard to a majority of the Public Land tracts here on Maui, consideration of many of which will doubtless come up during the ensuing year. Beginning at Makawao, I will take them up in about the same order as we passed through them on our trip around the Island in December last.

HAIKU-UKA. – "Board of Education Land". — This land running from Piiholo hill up beyond Olinda to near the top of the mountain, and under lease to the Haleakala Ranch Co., is purely forest land, and should be kept as a forest reserve. Settlers have

already spoken for it, but upon the expiration of the lease, in Sept. 1905, I would earnestly recommend that it be made into a forest reserve…

…Nahiku. - Above the homestead lots of Nahiku is a magnificent Government forest, that should be kept as such without the least encroachment. I would recommend that it be strictly preserved.

KOOLAU, from Nahiku to Honomanu. - This tract of land, comprising thousands of acres, is practically the life of Maui. It is one vast impenetrable forest, that conserves sufficient water to supply the needs of the Island. This entire tract is so cut up with deep, rugged gulches, that with one exception, it would be impossible to find sufficient agricultural land within it's borders to hang on to. This one exception is in what is known as the Keanae valley. Here there are several hundred acres of what is the best agricultural land on the Island, but it is only several hundred out of thousands and thousands. It needs no argument to show the importance of preserving this tract for strictly forest purposes, as the welfare of the Island depends entirely upon it, for here is almost the only water supply for the main part of the Island. So this forest tract should be thoroughly fenced up, so that no stock could get a foothold therein. The question arises as to the most available means of doing this. There would be miles and miles of fence to build, and after being built to maintain. Were this tract made a National Forest Reserve all the expense of this would be on the Government, which would be considerable. The plan that I would recommend in regard to this tract, is along the lines as proposed by Hon. H. P. Baldwin in his application to you for a lease of this tract. I would recommend that the lease of this land be sold at auction to the highest bidder. That the lease contain strict provisions for the preservation of the forest; that no stock whatever would be permitted to run therein; that the lessee fence up the same in a thorough manner, and maintain such fence in an efficient state; that no trees be cut except just what might be needed for fence posts; and that the Government could at any time take possession of any agricultural land that might be found therein. Any failure to maintain and keep these conditions to work a forfeiture of the lease. The lessee would then see that the conditions were strictly kept, and the Government would secure a most efficient forest reserve, and derive a revenue therefrom. The annual rental for this privilege would have to be nominal, in view of the enormous expense that the lessee would be at in carrying out the conditions of the lease, and in developing the water supply wanted. Then too the Government would benefit again in the increase of the taxable property, brought about by the application of this large amount of water on the arid lands of the Island, of which there is now a large amount lying idle.

As to what agricultural land there is in this district, that is the Keanae valley, my recommendation in regard to the same would be that a road first be built through the same, and then the lands thrown open to settlers. By building the road first, the Government would realize sufficient to pay for the cost of the road, and also to give them a fair return for the land. Otherwise the road will cost more than the land would bring, as was the case in the Nahiku tract.

Having been through this country yourself, you will readily agree with me in my estimate of the amount of land available for settlers, and in the extreme ruggedness of the same.

KOOLAU, Honomanu to Kailua. - This district now under lease to the Hawaiian Commercial & Sugar Co., presents the same conditions as the one that I have referred to just preceding this. The lease will expire in about six years, and as there is no agricultural land whatever within the tract, I would suggest that it be again leased under the same provisions as I mentioned for the other part of Koolau. I think that I can very safely say that there is not a piece of land within the whole tract that would be large enough to grow anything on with profit. A level piece of land of more than one acre would be almost impossible to find.

Hamakualoa. - Kailua to Halehaku. - This land is in the same class exactly as the two former, but it differs in that it is higher up. The two former run to the sea, while below this tract is private lands. Being so high up there is no land that would be termed agricultural land, it all having been taken up below. All of this tract that lies below the Hamakua Ditch has been effectively cleared of forests by the stock of the people below running through it, and shows what the effects of stock are. The Plantations interested in the lease of this land have offered to fence up all the Government land to keep out all stock, and should be encouraged to do so. This tract of land should also be kept for all time as a forest reserve, giving one continuous forest reserve from Hana, to Makawao. With Kula also included the mountain of Haleakala would almost be completely encircled by a forest reserve, which is an end that one should feel proud to work for, and which would be the grandest thing that could happen for the Island of Maui… [HSA, DLNR 2-16; Commission of Public Lands]

February 21, 1902
W.L. Hardy; to S.B. Dole, Governor:
[Regarding anticipated impacts on Homesteaders, as a result of proposed sale of leases on remaining Government land and Nāhiku vicinity water rights to H.P. Baldwin et al.]

…Enclosed herewith is a petition addressed to yourself, and signed by a majority of the "homesteaders" now residing at Nahiku, Maui, praying that you use your authority to stop the proposed sale at public auction of the lease of certain pieces of Government in the district of Koolau, Island of Maui, to the highest bidder.

Your petitioners are in a position to know that the enlightened Homestead policy inaugurated by you in the days of the "Republic of Hawaii," and faithfully encouraged and adhered to ever since, will receive a serious set-back in its aspirations in this district, as will plantations and many small holdings if the lease is sold as applied for.

The party making the application for the lease has property holdings, or at least controls holdings at Nahiku which make it impracticable for others to compete in the bidding and so the apparently fair application will virtually be a walkover as far as beneficial results to the Government is concerned and are impoverishing of the district in many respects and in no long time forcing it under monopolistic control.

We thank you heartily for withdrawing lot # 3 from sale but unless lot # 2 is also withdrawn the cinch will also remain and our hands remain tied and we will be forced to struggle at great disadvantage.

Plantation and Homestead interests should be mutual and the former forced when seeking privileges to consider the latter…

(Attachment — received Feb. 24, 1902)
Petition W.L. Hardy et al.; to S.B. Dole, Governor, Territory of Hawaii:

…WHEREAS, we, the undersigned owners and occupiers of the "Nahiku Lots", have at great expense and much hard-ship undertaken to develop this previously uncultivated tract and to make homes for ourselves; and

WHEREAS, it is the intention of the Commissioner of Public Lands, as advertised in the newspapers, to sell at public auction the lease of all the government lands adjoining these lots, from seashore to the top of the mountain, thereby giving to the highest bidder the control of all the water which should belong to this district; and

WHEREAS, we, the undersigned not being financially able to compete with corporations which can bed large amounts for this land, are in great fear that the water flowing thereon and through the "Nahiku Lots" will be diverted and taken to some other district; now

THEREFORE, we, the undersigned, hereby petition The Honorable, The Governor of the Territory of Hawaii, to take such steps as are necessary to prevent this sale and to preserve for us water which is so vital to the development of our property… [HSA, Gov-1; Dole, Public Lands; see also General Lease No.'s 538 and 539, in section of study titled "*E ʻOlāʻolā ʻAna ka Wai i nā ʻAuwai—Development and Operation of the East Maui Ditch System*".]

October 31, 1904
H.P. Baldwin; to Geo. R. Carter, Esq., Governor, The Territory of Hawaii:
[Regarding application of native residents from Ke'anae for 999 Year Homestead lands in Ke'anae]

…I received a Wireless this morning as follows, although I may not have the wording exactly correct.

"A Native from Keanae goes to see you about Government land. I advise assisting them. "Mauna Loa" letter explains".

The Rev. Kaailua of Keanae is appointed as a Committee to take the Petition to you from the Keanae Natives, that they be allowed to lease the Government land at a small rental, or that it be divided up, so that they can own the house lots and taro land, where they are now living, under the Homestead Act.

The Natives have lived on the Government land at Keanae for a great many years, during the Monarchy, during the Republic of Hawaii, and since annexation went into effect; they, as I understand it, paying a small rental. There are a good many Natives there, and it has been here-to-fore a sort of recognized fact that the Government should assist them in the way of furnishing them homes, for I believe that there are practically very few Kuleanas in that Valley.

It would be a most wise thing, in my opinion, for the Government to make it easy for the Hawaiians there to obtain their homes on reasonable terms. As I understand it, most of them have houses on Government Land.

Mr. Kaailua can state the situation to you and explain the matters fully…

P.S. I have not got the Land Law before me, but according to my recollection there is a Provision in the Law; under which Hawaiians can obtain 99 [999] year leases of Homesteads, without paying for the same; they, however, being obliged to live on same. This, I think, is what they want, but Mr. Kaailua will of course explain to you their wishes. [HSA, GOV 2-8, Lands Maui]

November 2, 1904
Geo. R. Carter, Governor;
to J.W. Pratt, Esq., Commissioner of Public Lands, Territory of Hawaii:

…We have already gone over with Mr. S.K. Kaoilua the enclosed petition in reference to the sale of Keanae lands, and I send the same to you so you may have it in your files… [HSA, GOV 2-8, Lands Maui]

November 3, 1904
Jas W. Pratt, Commissioner of Public Lands;
to Geo. R. Carter, Governor of Hawaii:

…Receipt is hereby acknowledged of petition of Kaoilua et als., in re sale of Keanae and Wailua lands, Maui. Same is placed on our files pending receipt of further information promised by Rev. Kaoilua… [HSA, GOV 2-8, Lands Maui]

November 28, 1904
H.P. Baldwin; to Governor G.R. Carter:

…Two natives, P.N. Kahokualuna and Rev. Kaailua, are here from Keanae to see about the Government land that the natives there wish to take under the Nine Hundred and Ninety-nine Year Lease clause in the Homestead Act.

You may remember that the Rev. Kaailua interviewed you in regard to this matter, with a petition from those natives, something like a month ago, and that you replied to him (so I understand from their statements and from your letter to me) that you were favorable to their proposition.

As I understand it, the natives wish about thirty (30) acres of taro land, to be divided among them under the Nine Hundred and Ninety-nine year Lease in the Homestead Act. These native have, as I understand it, all been living on this land for a great many years; some for two and some for three generations, and it seems to me but right that they should have the land on as easy terms as possible… [HSA, GOV 2-8, Public Lands, Maui]

December 16, 1904
Extracts of Letters from Chinese Rice Planters at Keanae and Wailuanui of Maui; to Chinese Consul Chang:
[regarding disagreements between Native Hawaiian and Chinese residents of the Ke'anae and Wailuanui vicinity]

…Cheong Chong aged 54 years has been upwards of 30 years in the Territory of Hawaii and married to a native woman for 20 years. He has 8 children and a resident

of Maui for about 14 years. Bought the interest of Chow Lee Wai Rice Plantation at Waialua [Wailua nui] in 1896 for $2300. It was claimed that one half of the plantation land i.e. 30 acres of land belongs to the Government at a yearly rental of $315. He the said Cheong Chong, afterwards having possession of the said plantation, employed a surveyor to survey the plantation land again and the surveyor reported to him that the Government owns only 15 acres of land instead of 30 acres. He therefore petitioned to the Government to reduce the rent, but the matter was postponed till Mr. Aiken of Paia went there and collected rent only for 21 acres of land, i.e. 20 acres of rice land and one acre of *Kula* land. He claims that his children are Hawaiians and they are entitled to the same rights as the Hawaiians do…

He owns the Plantation Rice Mill worth	$1000.
8 plowing bullocks	320.
14 Mules	600.
1 Bullock Cart	20.
Dwelling house	300.
Implements, tools &c	500.

Another letter has been duly received by Consul Chang on Dec. 26, 1904, from Cheong Chong & four others. They stated briefly as follows.

The native lawyer Peter Noah and a native preacher Kaailua came to our place on last Thursday and held a meeting. They said that Governor Carter has given them full authority to divide the cultivation lands of the Chinese to the natives. They further stated the Mr. Commissioner Aiken was removed from office for some reasons and he had no more authority to attend to the business. They had put stakes on the cultivated lands of the Chinese and divided them into homestead lots for natives. It is reported to us that those natives of this place who had paid $15.00 to Peter Noah would be entitled to 2 or 3 homestead lots and those who paid him nothing, would be entitled to one lot only. Prior to the division of these homestead lots, they have never taken the trouble of putting surveyor's stakes on them. It is our opinion that fraud must have deliberately been practiced by them with a view to obtaining money from these ignorant natives… We beg you to be good enough to communicate with Governor Carter in this matter requesting him not to partition our lands as homestead lots to natives.

We have already plowed some of the lands for planting rice and in case the Government should allot our lands to the native we would suffer a great deal of loss.

Lew Tuck (Kauapua) aged 57 years has been living in this Territory for 23 years… In 1903 he has rented about one acre of land at Wailuanui…

Che Pun (Apuna) aged 62 years. Formerly a resident of Hanalei of Kauai. He has been in Keanae of Maui for about 2 years…about three ½ acres of land…
Wong Kam Fook (Ah Fook) aged 45 years has been in the Territory of Hawaii for 25 years. In 1898 he has rented little more than one acre of Government land at Keanae from a native Napihaa, an officer of the Government…

Tam Tuck Sui (Ah Tuck) aged 40 years has been in the territory of Hawaii for 21 years, and is now cultivating about ¾ acres land by an assignment of a native named Pihau…

Lew Cho (Lee Sau) has been living in Wailuanui for 22 years. Married to a native woman for a number of years… In 1898 he has rented about one acre of Government land at Wailuanui…

Cheong Lock (Ah Sion Lo) has been three years in this place and rented about 2 acres of *Kula* land at Keanae from Napihaa…

Wong Chan Him and Wong Him have been in this place for 2 ½ years. In 1900 they bought interest from Ako…about 1 acre of cultivated land at Wailuanui…

Yip Koon Wa (Ah Wa) has been a resident of this place for 20 years. Married a native woman… In 1898 he has rented about 2 acres of *Kula* land at Wailuanui… [HSA, GOV 2-8, Public Lands, Maui]

December 17, 1904
Petition from 41 residents; to Governor George R. Carter:
[regarding applications for land in Wailua]

…We, the citizens of Wailua, Koolau, Island of Maui, Territory of Hawaii, who respectfully requested you to open the Government taro and grazing lands in Wailua, and in accordance with your instructions to our Committees who appeared before your Honor, Messrs P.N. Kahokuoluna and S.K. Kaailua, hereby show that on the 14th day of the current month a meeting was duly held and the following unanimously passed:

1st. That the following gentlemen be appointed on Committee to apportion the taro and grazing lands:

Peter N. Kahokuoluna,
S.K. Kaailua,
S. Hookano,
J.P. Kahahei,
Kamaka Maukoli.

2nd. We approve the work of the Committees in apportioning the taro lands among the homestead petitioners, because the work was done honestly, equally and fairly.

3rd. In regard to the grazing lands we thought it best to lease same as a place where we can place our horses and cattle, and also to get our firewood.

4th. In witness for our approval of the work of the Committee in apportioning the taro and grazing lands, we hereby subscribe our names this 17th day of December, A.D. 1904… [HSA, GOV 2-8, Public Lands, Maui]

December 19, 1904
Peter N. Kahokuoluna, Attorney-At-Law;
to George R. Carter, Governor, Territory of Hawaii:

…Enclosed please find Reports of the Committees duly chosen by the applicants for Homestead of Keanae and Wailua for dividing taro lands among themselves as what you advised us and also their approval to the same.

There are 41 applicants for Wailua and 31, for Keanae. The committees as far as we could, examined each one as according to our Homestead Acts and found them alright.

The applications are all in my charges of which I can easily hand to Mr. Aiken as soon as I receieved an order from you.

We earnestly wish to receive good news from you when will you be ready to send the surveyor to survey each piece… [HSA, GOV 2-8, Public Lands, Maui]

December 21, 1904
Governor G.R. Carter; to D.W. Napihaa, Esq.; Keanae, Maui:
[regarding leases to Chinese rice farmers at Ke'anae-Wailua]

…Replying to yours of Dec. 16th, I was not aware that the Chinese living in Keanae have acquired any vested rights in the land for which they have paid rent, through you and W.O. Aiken, to the Government. You must remember these lands were not leased according to law at public auction, but that the occupants have been for a number of years tenants at will.

The question as to whether or not there is anymore land that these Chinamen can have can only be answered after the land Department has sent an Agent on the ground and examined whether the plan proposed by the Committee for homesteads is satisfactory, and whether there is any more land left… [HSA, GOV 2-8, Public Lands, Maui]

December 31, 1904
Peter N. Kahokuoluna, Attorney-At-Law; to George R. Carter, Governor of Hawaii:

…Please accept our many thanks for the kind reply to our petition and others in re Keanae and Wailua homestead matter. Our earnest prayers *"E ola mau ke Kiaaina Carter o Hawaii i ke Akua..."* [HSA, GOV 2-8, Public Lands, Maui]

Keanae, Maui
January 6, 1905
D.W. Napihaa; to G.R. Carter, Governor; Territory of Hawaii:
[regarding disposition of land at Ke'anae and Wailua]

…Your letter of Dec. 21st came duly to hand, and I delayed replying thereto as I did not understand the contents of the same. After perusing the same for a time I understood a part of the letter, and in reply thereto will say, that the rents of all government lands in the hands of the Chinese are already collected and are now in the hands of W. O. Aiken. I wish only to ask these few questions:1. Are the government lands to be given only to citizens of Keanae and the people of Waialua [Wailua]? If there are any government lands left after dividing the same between the people, will they be given to the Chinese?

If these questions are too much, will you please excuse me? [HSA, GOV 2-8, Public Lands, Maui]

January 11, 1905
G.R. Carter, Governor; to D.W. Napihaa; Keanae, Maui:
[regarding disposition of land at Ke'anae and Wailua]

…Replying to yours of January 6th, will say that it is impossible to allow any but American citizens homestead lands in this territory. After the demand of local citizens at Keanae and Wailua has been satisfied, then should be considered the demand, if any, from those outside of that District who are Americans. After this is

completed, if there remains lands which can be leased to non-residents or Chinese, I see no reason why it should not be done.

This whole question is in the hands of the Commissioner of Public lands, who I hope will give it his earliest attention… [HSA, GOV 2-8, Public Lands, Maui]

August 9, 1905.
Agent of Public Lands; to George Groves, Keanae, Maui:
[regarding disposition of land at Ke'anae and Wailua]

…Referring to your letter to the Commissioner of Public Lands concerning the Keanae Lands I wish to say further that the Government owns three tracts of land in Keanae, some of which will be cut up as soon as the surveyors can get around to it.

It is the policy of this government to cut up as much land as is wanted for settlement as soon as possible, but we have been tremendously handicapped by the legislature not appropriating enough money to have the surveys done at once. We are so limited with the funds for surveys that we have to nurse every dollar, and the more important pieces to be cut up are taken up first.

I am glad that you contemplate settling on some land and if I can assist you in any way I trust that you will command me. The Surveyor's Department reported to me today that the approximate available area of government land in Keanae, Koolau, Maui, is as Follows:

Keanae Flat (*mauka*)	672.0 acres
Keanae Flat (*makai*)	
Rice and Taro	12.5
Kula	25.0
Keanae Remainder	
Below the forest line and not included in above	2000.00… [HSA, GOV 2-8, Public Lands, Maui]

Further descriptions of residency, traditional and customary practices, access and collection practices; and land and water use activities from ca. 1905 to the present day, are found in the oral history interviews that were conducted as a part of the present study (*Volume II*). Through the interviews (selected topics are indexed), readers are provided with detailed first-hand accounts of events subsequent to the ca. 1905.

D. Nā Alahele me nā Alanui Aupuni (ca. 1847-1925): Routes of Access – Trails and Government Roads

Alahele (trails) and *alaloa* (regional thoroughfares) are an integral part of the cultural landscape of Hawai'i. As noted earlier in this study, as early as ca. 1600, a circle island system *"Kīpapa o Kiha-a-Pi'ilani,"* the *alaloa*, had been established, with significant construction undertaken in the Hāmākua-Ko'olau region. The *alahele* provided access for local and regional travel, subsistence activities, cultural and religious purposes, and for communication between extended families and communities. Trails were, and still remain important features of the cultural landscape.

In addition to the *alahele* and *alaloa*, running laterally with the shore, there are other trails that run from the shore to the uplands. By nature of traditional land use and residency practices, every *ahupua'a* also included one or more *mauka-makai* trail. In native terminology, these trails were generally known as — *ala pi'i uka* or *ala pi'i mauna* (trails which ascend to the uplands or mountain). Some of these trails are described in historical communications cited in this study, and almost every interviewee speaks of them as a feature known to exist within every traditional land unit.

In his writings of Hawaiian Traditions, customs, and practices, native historian S.M. Kamakau (1976), penned the following description of *alahele* (trails and roadways) in the islands:

Roadways

Narrow bare places that stretch the length and the breadth of the land are called *alanui* or *Kuamo'o*, roads. One that extends all around the land, or island, is called an *alaloa*, highway, or [poetically] *he ala o Puna,* "a road to Puna." An *alanui* that cuts across country is an *ala 'oki*, shortcut; one that ascends a *pali* ladder wise (*kana kaha)* is an *ala 'ulili*; one along the side of a *pali* is an *ala pili pali*; one along the very top of a *pali* is an *alanui kaka'i pali*. A "thread of a trail" *(wahi alanui muholi ihi)* that clings to a *pali* is called *he alanui iki a he kahuna,* "the narrow [precarious] path of the *kahuna*," or *he ala a ka manu*, "the trail of the birds." An *alanui* that goes through a stream is an *ala'au.*

In going along a road, where it rises is a *pi'ina,* an ascent; where it goes downward is an *ihoma,* a descent, a dip in the roadway is called an *'alu* and a bend is called an *uake'e;* the top of a steep ascent is a *ho'oka*, and the bottom of a steep decline is a *kuhoho* or *kumomole*. A trail with a cliff on each side is a *kunihinihi;* one that goes up and down across valleys is called a *lehulehu* or *kawahawaha* or *'alualua;* a stony roadway is an *alanui 'a'a*. A clear place like the road itself is an *alanui pu'uhonua;* a resting place along a long road is a *pu'u ho'omaha* or an *'o'i'o'ina.* Short pathways in gullies are called *ka'ele wa'a* ("canoe hulls"). Short stretches descending steep hills or the sides of hills were *holua* or sledding sites, *kahua holua.*

Sites on level open ground were *kahua pu'uhonua.* The short clear ones (*alanui po'omuku e waiho papu*), were for sports—*maika, pahe'e, koi, 'ahamoa, mohomoho*, or *ku'i.* The compact or rounded sites along the highway were burial sites, *pu'uhonua ho'oilina kupapa'u.*

Indeed, along the trails of the Hāmākua-Ko'olau region are found a wide variety of cultural resources, including, but not limited to residences (both permanent and temporary), enclosures and exclosures, wall alignments, agricultural complexes, resting places, resource collection sites, *heiau* and other ceremonial features, *ilina* (burial sites), subsidiary trails, and other sites of significance to the families who once lived in the vicinity of the trails. The trails themselves also exhibit a variety of

construction methods, generally determined by the environmental zone and natural topography of the land. "Ancient" trail construction methods included the making of worn paths on exposed *pāhoehoe* lava surfaces, curbstone and coral-cobble lined trails, *kīpapa* or cobble stepping stone pavements, and trails across cobble or sandy shores.

Following the early nineteenth century, western contact brought about changes in the methods of travel (horses and other hoofed animals were introduced). By the mid nineteenth century, wheeled carts were also being used on some of the trails. Portions of the ancient *ala hele-ala loa* were realigned (straightened out), widened, and smoothed over, while other sections were simply abandoned for more direct routes. In establishing modified trail- and early road-systems, portions of the routes were moved far enough inland so as to make a straight route, thus, taking travel away from the shoreline.

It was not until 1847, that detailed communications regarding road construction in the islands began to be preserved. It was during that time that the modified trail and road alignments became a part of a system of "roads" called the *"Alanui Aupuni"* or Government Roads. Work on the roads was funded in part by government appropriations, and through the labor or financial contributions of area residents and prisoners working off penalties (see communications below). In the Hāmākua-Ko'olau region, portions of the *Alanui Aupuni* are lined with curbstones; elevated; and/or made with stone filled "bridges" in areas that level out the contour of the roadway; and in many locations, wooden bridges were required for crossing *kahawai* (stream gulches).

On January 23, 1856, R.W. Wyllie (Minister of Foreign Relations, Minister at War) wrote to engineer, William Webster, asking him to prepare guidelines for construction of roads, that could be adopted by the Kingdom (in HSA collection). On February 22, 1856, Webster submitted the following letter, which became the basis for road making at the time:

…In reply to your letter of the 23rd, January I would state that I consider it scarcely possible to draw up any rules for road making that could be applied generally.

I may say shortly that a road, to be a good road should be laid off as direct as possible between the points desired to be connected, that it should avoid hills where they can be avoided, also the bottom of hollows, – where it is liable to become a mere water course – that it should have at least a foot deep of gravel on the top, laid on a curve to throw off water, and last that it should be thoroughly drained by means of side ditches to be kept always clean and in good order, care being taken to give vent to the water from the ditches as often as practicable.

The surface of the road when once formed ought to receive constant attention, and if from subsidence the water is found to lodge on any part, it should immediately be let off & fresh gravel applied to fill the hollow.

Regarding the latter part of your letter, I believe that each district does make its own roads, if roads they can be called, & applications is only made to government when a heavy piece of work is to be done.

I do not think that our roads will ever give much satisfaction under the present law for various reasons, among others, the road supervisors are elected, not on account of their skill, but rather on account of their electioneering influence which is maintained in many cases at the expense of the roads. The tax also is not sufficient to

make the roads even it were religiously applied to that purpose, although at the same time it is abundantly heavy on the poorer people.

I think that a land tax for the purpose of making the roads would be for the benefit of the country, the present tax being about sufficient to keep them in repair when once properly made.

Of course before levying any additional tax on account of the roads, the present law concerning the election of the Road supervisors should be repealed & the power to appoint those officers given to the Government… [Misc. Public Works – DAGS 7 Box 35; Folder 4]

In September 1856, the Pacific Commercial Advertiser offered readers the following overview of road development in the Hawaiian Islands, and noted that new guidelines and laws were being enacted that would hopefully improve conditions:

…The history of road making in this kingdom does not date far back. The first law that we find recorded was enacted in 1840, which as well as the laws of 1846 and 1850 gave to the Governors a general control of the roads, with power to make new roads and employ prisoners in their construction. But no system of road making has ever been introduced, and the whole subject has been left to be executed as chance dictated. In 1852 road supervisors were made elective by the people, at the annual election in January. This change worked no improvement in the roads, as the road supervisors, in order to remain popular, required the least possible amount of labor, and in many districts an hour or two of work in the morning was considered as a compliance with the road law. Under this law the road supervisors were pretty much to themselves, and though accountable to the Minister of the Interior, they considered favor of their constituents of more importance. This law was found productive of more evil than good, and during the last session of the legislature a new road law was passed, which goes in to force on the 1st of January 1857. This new law gives to the Minister of the Interior the appointment of road supervisors throughout the Kingdom, who are subject to such general instructions (we suppose in regard to the construction of roads) as he may issue… (The Pacific Commercial Advertiser, September 25, 1856)

Trails and Roads of Hāmākua-Ko'olau, in Government Communications

September 28, 1849
Keoni Ana, Minster of the Interior; to J.Y. Kanehoa, Governor of Maui:
A certain foreigner at Haiku has made petition to me, asking that an officer be appointed for the purpose of attending to the laying out of roads in that section and adjoining districts… In my opinion, his suggestions are good; now is the proper time to have these roads laid out in Haiku, Pauwela, Makawao, Haliimaile and Hamakuapoko. Appoint therefore an officer to direct and attend to the laying out of these roads, if you wish, appoint two officers. Harry has bought the land of Peahi, and in case he goes over to inspect his land, have him look into these road matters… Instruct your officer to enter into and make equitable settlements with land holders in those districts, so that no loss will be suffered by either party… [HSA, Interior Department Letter Book 2, Part 2:429-429-a; Archivist translation]

April 1850
Report of the Minister of the Interior, read before His Majesty to the Legislature:
…The following are the Improvements which have been carried on during the two past years:

…On account of the rapid progress of agriculture on Eastern Maui and the increased amount of produce to be transported to the different harbors an improvement of the roads in that region has become very important. An agent has therefore been appointed to lay out and survey Public roads in Hamakualoa and poko and adjoining Districts, and report to this Department. Something has been done upon the Roads in various parts of the Islands, but no reports there of have been received... [HSA, Interior Department; Misc. Box 144, 1850:6-7]

December 31, 1854
Z. Manu, Road Supervisor; to Keoni Ana, Minister of the Interior
(& duplicate, Z. Manu, Road Supervisor; to P. Nahaolelua, Governor):

ROAD REPORT FOR DISTRICT 4, OF HANA, ISLAND OF MAUI.
…I wish to report to you the number of persons subject to Road Tax labor:

Here are those who are subject, 1012 persons. The number of days worked in this district, at Koolau, 250 men, the number of days worked by each person, 6.

At Hana, 292 men; at Kipahulu, 199 men; at Kaupo, 288 men; at Kahikinui, 83 men.

The old road has been made new, and it is in good order this year, the men have done all by working , and none have paid in cash... [HSA, Interior Department Misc. Box 146]

December 31, 1854
S. Kapihe, Road Supervisor of the District of Makawao, Maui;
to Keoni Ana, Minister of the Interior:
…Here is my report on Government Roads for the year ending the 31st day of December, 1854.

Money received in cash, five, for office supplies, paper, ink, brush.
Here is the number of persons who came to work, 787 men.

1. Repairing the old Government Road from Koolau to Paeahu, at Honuaula;
2. Repairing the old Government Road from Keawakapu to Kamaole, in Kula, Maui;
3. Repairing the old Government Road from Kalepolepo to Keokea, in Kula, Maui;
4. Repairing the old Government Road from Kalepolepo to Waiohuli, at Kula, Maui;
5. Repairing the old Government Road from Kaheka to Makawao, Maui;
6. Repairing the Kuaihelumoa *pali*, at Hamakualoa.
7. Repairing the two palis at Maliko, in Hamakualoa, Maui;
8. Repairing the two palis at Pauwela, in Hamakualoa, Maui.
9. Repairing the two Government Roads and the two palis at Opuaihaa [Haiku], in Hamakualoa, Maui.

This is the amount of time taken for the above roads, 42 days work… [HSA, Interior Department Misc. Box 146]

July 16, 1866
T. H. McDaniels, Road Supervisor of Maui; to H. A. Widemann:
[describes roads of the Hāmākua-Ko'olau region]
…Since my last letter respecting the Bridges at "Kipahula" [Kipahulu] I beg to inform you for His Excellency's information that I have been to look after the work on the roads between Waihee and Lahaina and find no work was done for the year 1865 and that the Pali's are in a very bad state which I am now repairing and in some places blasting the rocks, all the natives in that part who did not work or pay their tax for 1865 I am making work 12 days this year thinking I am justified in so doing and labour being very hard to get.

On Monday last 9th Inst. I started for Hana by way of Kolau [Koolau] and would say I have worked the roads to within one mile of the woods so that carts can now go along well and shall continue direct to the woods by which time all my labour for this year will be expended in that part and then I come to 8 miles of road from the commencement of the woods to "Honomanu" in which distance I have only 13 natives to work in fact the worst road by far on the island, and it cannot be worse, as I find by the natives no work has been done in that distance for 5 years. I find it is necessary to build over two of the streams by name "Kailua", and "Nanaililihaele" bridges as the water rises so that they are impassable for days together they will want to be about 8 ft wide and about 25 ft across and I shall have to build one solid stone abutment to each so one side is solid rock. I would say there is an abundance of good timber within a mile. *Ohia* that will answer well and as soon as Mr. Lewers sends his vessel for firewood I could have plank and spike & tar landed close by. It is almost unnecessary for me to give particulars as His Exlly knows the part well. I think I can get these two bridges done well for $80 dollars each. I have made inquiries respecting native labour to do the work on the roads and I can hire labour at $12 dollars for the month.

I have made as near an estimate as I can and I think two months labour is with 12 men will do the work. In some parts new road must be made and I propose to cut the roads down the gulches 3 ft wider and clear all the small timbers and fern on either side so that the sun and wind can dry the roads after min. Two other bridges will also be necessary between Honomanu and Hana at the gulches named "Hanawi" [Hanawi] and "Ulaino", these two last I did not see as the rain came on so hard I had to return and with some difficulty got back out of the woods before the streams rose and returned to Waikapu on Friday night; if his Exclly should wish me to commence this work please let me know as I find after the July rains it will be good weather to perform the work – as also the bridges at "Kipahula". I beg further to say I have made a contract with four native masons to finish the mason work on the road leading up to the French Church for the sum of $150 dollars and have given them $30 advance. This work would have been completed now, but Mr. Treadway required their labour on the Lahainaluna buildings which has caused the delay. I have also to build a small bridge by the Bethel on account of the trials about to take place in Wailuku.

I have to remain in this district as I am a witness but am now working on the first bridge as His Exlly ordered me by building new stone work under the old bridge and

also the roads in Wailuku. On the 1st August. I have to be in Lahaina as a journeyman I intend in a few days to give an account of money's expended in each district up to 30th June last, as I find almost all the funds for taxes are expended that I had in the Governor's Office – but I shall still continue to carry on the necessary improvements. I find the bridge by Mr. Peck's Mill must shortly be replanked and other work done to it… [HSA, Interior Department – Roads, Box 43]

March 30, 1867
Ino ke Alanui o Oopuola.
(The Road of Oopuola is Bad):
…There is no comparison to the disrepair of the road (*alanui*) that extends from the stream of Oopuola out to Keeakai [perhaps Ke'anae]. There many potholes, and foul boggy areas this is great trouble for the visitors and for the people who travel there. Not only for them is this disrepair a great problem, but also for us, those who regularly travel it from week to week, transporting (our goods).

The reason that this place is in such disrepair is because the Government Road has not been worked on in this place for ten years. That is the reason this place is in such disrepair. This year we got a foreigner, Daniel, as the supervisor, and he has not worked here, though at Kailua, a bridge (*uwapo*) has been made. I heard from Keohokaua that it cost two hundred dollars for this bridge; the money of the kingdom has been wasted on that bridge, because we do not have serious problems with the stream of Kailua; not like the trouble mentioned above. Therefore, you who are our lord (above us), please respond soon to our trouble, that of the commoners who dwell in the back country. I.B. Kaakuamoku. Wailuanui, Koolau… [*Nupepa Ku Okoa*, March 30, 1867:3; Maly, translator]

December 18, 1868
Holawa, Hamakuala [Hamakualoa], East Maui
C.F. Merrill; to H. W. Hutchison, Minister of Interior:
…As you are at the head of this Department, which contracts the internal affairs of this Kingdom, and thus accepting said office, for the purpose of executing & contracting affairs aforesaid, and as Executive of said Department, it is your wish & pleasure, and those who are appointed by yourself to execute the official work of this appointment, should fully attend to and personally superintend the work committed to their hands, and as laws are enacted, and thus property taxed for the execution of said laws and for the advancement of all the interests physical, intellectual and… [illegible] …of this kingdom, and as they who are taxed, are thus obliged by law to pay their taxes. It is but right, and just that they should receive an equivalent for their taxation if they are taxed for roads it is the duty of Government to see that they have roads passable for the conveyance of the produce to market and ports of shipment, and for the purposes of travel.

The road, in this vicinity is miserably poor – it has been neglected for years, by the road Supervisors, who are paid by the Government annually for their services, but as they have so long neglected the repairing of this road, it is in a sad, sad, – yes, miserably sad condition. Impassable for a loaded cart – had they attended to their duties as road Supervisors, this road would have been in good condition.

As we have to pay our road taxes, we demand of Government its equivalent, a road passable in the Conveyance of our produce to market, and thus we appeal to you, as

Minister of Interior for a road passable as aforesaid, and we hope that you will give immediate instruction to the road Supervisor for its immediate repairs because we are thus prevented from the impassable state of this road, from the accomplishing of purposes which will ultimately open this vicinity for settlement, wide improvement.

The great interests of our natives are its agricultural, manufacturing & commercial, and as these increase & expand in greatness, so does the native become great. When these interests annul, you annul the existence of our nation; but encourage these, give to them life & power, & thus the engines inherent, vital, muscular, will be brought out into vigorous manhood, and before the expanding bridge of prosperity, the nation will become great. And the multiplicity of its greatness, in consummating the ultimate design of Duty until you behold her ships innumerable, her ocean boundless, land with the products of the world. Ocean great is the highway of the world. But roads good, are the highway of the natives' greatness… [HSA, Interior Department – Roads, Box 44]

Hana January 31st, 1870
A. Unna, Hana Road Supervisor; to F.W. Hutchison, Minister of Interior:
[Describes road and bridge work; and produce exports in the Ula'ino-Ke'anae region.]
Sir: In submitting the Road supervisors Report for the year 1869, I would make the following remarks concerning road matters… It being my desire to apply the road labor where it was most needed, no work has been performed in my neighborhood. The plantation laborers & others I put to work at Ulaino, about 6 miles from Hana proper, to make a new road over the Ulaino *pali*. Some # blasting (not much) is needed before this job can be finished. I propose to shorten the road & to get an easier road at the same time between Ulaino and Keaa in Koolau.

By crossing the Ulaino stream close by its mouth at the sea, ascending the Ulaino *pali* we find ourselves close to a narrow stream, called Heleleikeoho, passing which we come into the old road; we gain by this road in time about three quarters of an hour, we avoid the mountain travel thus favoring our animals & the principal benefit I consider it that we avoid crossing two bad streams called Haumea and Kakamalaole; these empty themselves into the Ulaino stream, which at its mouth where we cross it after entering the new road, is wide & shallow, and therefore affords us an easy passage.

(# 1 days work)
At Heleleikeoho I propose to put a bridge; there are two abutments ready to receive the bridge. Heleleikeoho is narrow & often dry; but when water comes down here, it is an ugly place to cross; the bottom of the stream is slippery, the rock being smooth & hallowing, & if an animal stumbles there, it is impossible for it to recover its footing; the force of the current will send rider and animal to sure destruction as a precipice is near by and nothing intervening that can afford salvation. The bridge should be 28 feet long so as to rest solid on each abutment and 6 feet wide. If pack animals can pass it single file, there is no necessity for its being over 6 feet wide or 5 ½ feet clear width between the two side rails. The lumber for this bridge should be landed at Ulaino; a vessel can discharge lumber there between 1st April and 1st July, when there is no Kaikoo's [high seas]. Another place at Koolau where I have commenced shortening the road is between Nahiku and Waiohue. The road on the Nahiku side of Hanawi gulch has been cut out in the *pali*. It wants paving & a few blasts are to be made to make the road serviceable.

The other side of Hanawi gulch, a gentle decline, has not been commenced on, as I am awaiting an answer from the owners of the land "Hopenui", approving an exchange of the land, where the old road runs for the prospective new road. Should this new road be laid out, then the Hanawi gulch which was the worst of access of any in Koolau will be quite easy to pass & there will also here be a considerable gain of time, as the new road runs direct, whereas the old road makes a long curve up in the mountain previous to crossing Hanawi.

The road between Hanawi & the next bad stream, Kapaula, runs over a soft & moist ground & to prevent its becoming boggy should be paved. Having made various unsuccessful attempts to get lumber on the spot for as bridge at Kapaula I am satisfied, that durable natives lumber of proper dimensions cannot be got on either side of Kapaula. A bridge of 42 feet length by 6 feet wide will answer the purpose, & the lumber for it may be landed at Kapaula in the months of April, May, June & July, which is the most favorable time.

Should my projects meet your Excellency's approval & the owners of Hopenui consent to the exchange of road alluded to, then the two bridges mentioned may be ordered, & the $53= (old appropriation) will be promptly remitted. There are more steep palis & natural obstacles to a good road in this district than in any other, that I have visited on the Islands, & the whole appropriation of $1000= may be of permanent value if judiciously expended. The annual export of taro alone from Wailua, Keanae & Honomanu amounts according to my estimate to something like $4000 – besides that the country produces tobacco, *awa & olona* the value of which I have no means of determining.

I send today to Mssr. Castle & Cooke for 25$ Giant powder to make a commencement in blasting & I shall report further as matters progress… [HSA, Interior Department – Roads, Box 44]

Hana March 9, 1871
A. Unna, Hana Road Supervisor; to F.W. Hutchison, Minister of Interior:
The undersigned hereby presents to your Excellency his report of road work performed in 1870 by his direction.…

In the next part of Kipahulu & Hana the road labor has been applied where it was thought necessary; the spare labor has been used on the Koolau roads. At Kipahulu in December last the bridge near Harbottle's came near being lost in a freshet from the mountain. The abutment was laid up with small stone, that were washed away. Had the water risen 1 foot more, the bridge would have gone to sea. 48 hours after the damage had been done I had meant to work hauling large stone to build up a new abutment; the corner towards the mountain I have poured with cement mortar.

The unusually heavy rains have done a great deal of damage to the Koolau roads. The bridge at Kapaula is put up. Until the *pali* at Ulaino is finished, the bridge at Heleleikeoho can not be put up. I propose to take men from Kipahulu to Koolau by April 1st & finish the Ulaino *pali* as the Koolau people are not willing to work at 50 cents per day. The man that put up bridge & abutments at Kapaula was asked $1 - per day by the natives at Waiohue & Nahiku; he told them, that if they were not satisfied with 50 cents per day, he would get men from the plantation to do the work; so they consented to work, provided he would furnish them with food. Not being

able to procure any man to blast, I have made myself acquainted with the use of Giant powder; I have blasted a part of the Ulaino *pali*. I propose to show my Kipahulu *luna* how to work with Giant powder. He is willing to go to Ulaino & get some Kipahulu people with him. This appears to me the most feasible & least expensive way of getting the Ulaino *pali* road done. The spare road labor in 1870 I have applied in Hanawi gulch, part of which is paved. The road here runs in zigzag 18 - ¾ chains from top to bottom, 4 chains of which have been paved. The Koolau palis offer a vast field for improvement; but the people there are an independent set. They raise a large quantity of food, which they sell on the spot to good advantage; therefore why should they care about the roads? The export by sea & by land of *paiai* from Wailua & Keanae annually I estimate at about $4000=. During the rainy season the gulches at Koolau are often impassable for 3 or 4 days in succession. This cannot be helped, but the roads may be vastly improved. If roadwork could be done by the job, it would be preferable, but I cannot think of one active & energetic person in this district, that could or would undertake any such work.

I take the liberty herewith to enclose an account of receipts and dispersements up to date… [HSA, Interior Department – Roads, Box 44]

Hana
June 30, 1871
A. Unna, Hana Road Supervisor; to F.W. Hutchison, Minister of Interior:
…The Ulaino *pali* road is now dug out & blasted out; it affords an easy access with animals. The paving I will let the people do, that are working out their tax. I owe for this & other work about $200, which Your Excellency will please to have forwarded to me. I wish also to receive 20# Giant powder; the former lot has been used up, & our bad roads require much blasting.

The Koolau people are at present working out their road tax on the palis between Wailua & Nahiku. The overseer that worked at Ulaino goes to Kahikinui & works the people through Kaupo & Kipahulu. Another overseer is engaging men to finish the Honuaula road. I would like to have Mr. Copp take say 10 men & work on Hanawi gulch. I think he would make a better overseer, than any native, that can be got. If Your Excellency approve thereof, I would request ½ doz. more picks & ½ doz. shovels.

When the Koolau overseer reaches Ulaino, he will let the men carry up the Heleleikeoho bridge to its place; I will have a native carpenter to put it up. 4 planks tarred each 27 ft long, 3 in x 8 in, are required for this bridge; we had to take them away to finish the Kapaula bridge. One of Dowsett's vessels can without trouble land the 4 planks mentioned at Ulaino… [HSA, Interior Department – Roads, Box 44]

September 18, 1871
Ferd. W. Hutchison, Minister of the Interior; to S.B. Dole, Esq.:
…I wish you to proceed to Hana, East Maui, on the part of the Government, and investigate some complaints made against Mr. A. Unna, Road Supervisor of the Districts of Kaupo, Hana & Koolau, or perhaps I should more properly say, against his deputies. The papers, petitions, certificates, &c, are in your hands, and I have explained somewhat fully to you in person the manner in which I wish you to proceed – You will be good enough to assure Mr. Unna, (if necessary), that no disrespect is intended to him by this course, and that the Govmt. have no doubt that

the complaints made are founded on a misunderstanding; but that in view of the contradictions and asseverations that reach me, I am satisfied that an investigation on the spot would be advantageous and agreeable to all parties interested in the matter… [Interior Department Letter Book Vol. 10:541]

Haiku
January 23, 1873
Sam Alexander; to E.O. Hall, Minister of the Interior:
…The Road Supervisor of this district will take to you a petition in behalf of opening a road here in Haiku [see communications of Feb. 7 & 27, 1873], which I trust you will not pass unnoticed. The road in question has been open to the public for the past ten or fifteen years & to close it up would be a great misfortune to us all… [HSA, Interior Department – Roads, Box 44]

Lahaina
February 7, 1873
A. Fornander; to E.O. Hall, Minister of the Interior:
…Your Excellency's letters of the 29th ult. enclosing a petition from fifty tax-payers in the district of Hamakualoa, Island of Maui, to open a road in that district, was received per "*Kilauea*" on the 5th inst. and all Your Excellency's request that, in accordance with the Act of July 29th 1872, Sect. 1., I would select a list of Twenty-four names from among the legal voters of the district, and otherwise proceed as specified in the law, and certify to the Department of Interior the decision as soon as arrived at.

In conformity with Your Excellency's request I have selected a list of twenty-four names among the legal voters residing within a radius of, say, five miles or less of the locality where the new road is desired to be opened, and passed the said list to Mr. W. O. Smith, Sheriff of Maui, with instructions to draw a jury of six persons to decide on the proposed measure, and forward their certified decision to the Department of Interior as soon as he receives it… [HSA, Interior Department – Roads, Box 44]

Hana
February 24, 1873
A. Unna, Hana Road Supervisor; to E.O. Hall, Minister of Interior:
…I enclose herewith my account of receipts and disbursements for roads and bridges in the district of Hana and also for Kanaio in the Waiuku district, showing a balance on February 1st 1873 of $67.60. The district of Koolau being composed of a number of large palis with streams of water passing down the intervening valleys roads get considerable improvement to become passable. In the years past with the approval of your Excellency's predecessor I have commenced making improvements on the roads of Koolau, having in view in so doing first that the improvements made should be permanent & next a proper economy in convening on the work. The first *pali* road completed was at Ulaino where a new road was partly blasted partly dug out of the almost perpendicular side of the mountain; the next *pali* is Hanawi where one side of the *pali* is completed, the other side of the road is dug out & the outer side is stoned up; but the road itself should be paved to preserve it from being washed away & from being made impassable by people traveling over it in rainy weather.

By going through Koolau in September I found the road between Keanae & Hamakua almost impassable. I had therefore in December made arrangements to fix up the worst places, & a native, Kaleba Makaena, whom I have found reliable I have put to work with 12 good natives to repair that piece of road.

Should your Excellency wish me to keep the supervision of the roads in this district I shall be happy to do the best I can for the benefit of the public… [HSA, Interior Department – Roads, Box 44]

Lahaina
February 27, 1873
A. Fornander; to E.O. Hall, Minister of the Interior:
Enclosed I have the honor to transmit to your Excellency the decision of the Jury drawn by the Sheriff of Maui, in conformity with an "Act to mend Sections 184,5, 6 of the Civil Code, approved July 29, 1872" — relative to a petition from Hamakualoa, Maui; for the opening of a new road in that District — and certified to by the District Judge of Makawao, P. Nui Esqu. I also enclose the original petition, the list of legal voters selected by me, and the six Jurors drawn there from by the Sheriff of Maui…

[Attachment]
Mea Hanohano
E.O. Hall, Kuhina Kalaiaina:
…O makou i ka poe nona na inoa malalo nei. Ke nonoi aku nei makou ia oe e wehe ia i Alanui hou ma Pauwela, Hamakualoa, Maui…

His Excellency, E.O. Hall, Minister of the Interior:

…We are the people whose names are below. We ask you to open an *Alanui hou* (new Road) at Pauwela, Hamakualoa, Maui; the road would begin at the house of William Dividi, and run on the shoreward side of the *Alanui Aupuni kahiko* (Old Government road); said road being a very old road. And at this time, it has been closed by J. Pilipili. The length of the road would be approximately 3/8 of a mile, more or less.

(Signed)

Kiko opio, Saml. T. Alexander, T. Wilkin, P.I. Puowaina, M. Punohu, Kualii, Holo, Makahiki, Mainele, Kaumiumi, Pila, Kamaka, Piimauna, Nahakina, Kauhaneliilii, Kuna, Manea, Kailihune, Koloko, Kamaka, Keani, E. Kaohu, Makaala, Papaiakea, Kewiki, Kihana, F. Warren, John Wagner, C. Farden, Puu, Kalawalea, Kaholokahiki, Kiki, Waiuaia, Waiwaiole, Paia, Ioane, P. Nui, J. Lima, M. Kapihe, J.H. Niu, Ululani, S.W. Naopuu, H.K. Kalia, J. Kealakai, Nawai, W. Paka, Pooiki, Puu 2, K. Kapunohu, Beni Taua, Daniel R. Davis [HSA, Interior Department – Roads, Box 44; Maly, translator]

Hana
May 30, 1873
A. Unna, Hana Road Supervisor; to E.O. Hall, Minister of Interior:
…The road from Keanae at Koolau to Oopuola Gulch, the boundary between Koolau and Hamakua has been repaired & the expense thereof has been $150= which amount I would ask to have remitted in order that I can pay the laborers, that have done the work. Should Your Excellency now think proper to allow one to pave the

new *pali* road of Hanawi gulch on the one side, that is as not finished in order to make it permanently good; I will apply the annual Road labor on other places where it is needed. The road labor alone is insufficient to do all that is required… [HSA, Interior Department – Roads, Box 44]

Haiku
April 17 1874
S.T. Alexander, A.H. Spencer & J.D. Havekost; to H.A. Widemann, Minister of Interior:
…We the undersigned having been appointed by your Excellency to decide upon the merits of the petition against K. Puowaina, Road Supervisor for the district of Makawao, submit the following report.

The complaint made by the petitioners, namely that Puowaina has misapplied the funds and services at his disposal as Road Supervisor of this District, in improving roads remote from the seat of travel, & neglecting those in that part of the district which are much more traveled, we find substantiated in the main by the facts of the case.

The road from Papaea [Papaaea] in Hamakualoa to Kokomo a road but little traveled, has been well worked. From Huelo to Haiku & from Lilikoi, a road a good deal fragmented, has been pretty well worked. From Lilikoi on to the East Maui Plantation, the road is good, until the exception of the *pali* of Kuaihelumoa, which is almost impassable for carts & wagons, & which would necessitate a large outlay of funds to place in first class order.

The road from East Maui Plantation to Grey's store and other Roads in Makawao proper, Though not in bad condition, still have not had a fair share of the Road supervisors attention bestowed on them. From Makawao proper to Kamaole in Kula, the road is almost impassible for carts. The two main roads from Makawao to Kahului, both of which are much travelled, have been sadly neglected for the past few years.

To what extent the road supervisor is responsible for this neglect in is not working government roads we are unable to determine. It is evident however, that he has failed to satisfy the public by not making a judicious application of the means at his disposal.

Whether this constitutes a sufficient reason for his removal from office, according to the petition under consideration, we leave for your Excellency to decide… [HSA, Interior Department – Roads, Box 44; see Register Map No. 603 for selected locations, described.]

Hana
August 14, 1874
A. Unna, Road Supervisor; to W. L. Green, Minister of the Interior:
…Having been informed, that His Majesty will arrive here in about 3 weeks, & that it is His intention to go overland from Hana through Koolau to Makawao, over a road that even in the driest times is difficult of access on account of steep palis & deep streams, I take the liberty to state in relation to the road, that the people of Koolau have about 3 weeks ago finished their work for road tax for the present year. This work barely suffices to keep the palis passable.

On the intervening spaces between the palis, there are many places, where the animals of travelers sink down into the mud up to the belly. The Koolau country is very much cut up, the soil is composed of a soft vegetable deposit, the vegetation is luxuriant. Alternating with the rich black mould is the solid basaltic rock.

It rains in Koolau, when west Maui is all dried up. I dare say without exaggeration, that nine months of the year it rains in Koolau. In Hana proper which is comparatively dry we have thus far this year not had one single week without rain. The only way of making roads in Koolau, that will last is to pave them. Pieces of new road will be here under the reign of Kamehameha V; but since then no money has been allowed for road making & the labor from the road tax is utterly inadequate. I am now taking people 8 to 10 miles from their homes at Hana over into Koolau to work, as here we can get along with the roads as they are. It is very fortunate that the people consent to travel so far from their homes to work. I thought it proper to mend temporarily as many bad places as I possibly could on a/c of His Majesty's expected arrival; & as many people as I can get to go from Hana to Koolau I will send there to work. I do not believe in doing work temporarily, I would like to do it so that it would last for years to come; but paving a road, even though the pavement may be made narrow, is expensive. By putting a piece of the Koolau road in good order every year, eventually the road would be as good as the nature of the country would admit of, but in order to do that a primary allowance should be made annually; & I beg, that Your Excellency will take this matter into consideration.

I would also call Your Excellency's attention to the fact, that there is more bad road through the district of Hana than there is within a similar space on any of the Islands… [HSA, Interior Department – Roads, Box 44]

May 6, 1876
C.T. Gulick, Interior Department Clerk; to A. Unna, Road Supervisor, Hana:
…I am directed by his Excellency the Minister of the Interior to say that Nalimanui, the old man who desired to act as your deputy in Koolau, has just called at this office and says that there are a number of people in his section who have neither paid nor worked out their road taxes, and he desires written authority to do the work required.

He was directed to you as the one to give the orders required, but a "*palapala*" was the most important thing in his estimation, hence this letter.

You will undoubtedly be able to satisfy the old man, and of course use your own judgment in the matter as it is not intended to interfere with your arrangements… [HSA, Interior Department Letter Book 13:357]

Hana, Maui
August 7, 1877
Helekunihi, Road Supervisor, Hana; to J. Mott Smith, Minister of Interior:
…I have finished the sections of Kahikinui, Kaupo, Kipahulu and Hana, there only remains the section given to A. Unna, and Koolau.

Koolau is the worst section of Roads, and there are but few people to work, thus, the work is done by contract and payment. The Governor came and pointed out the worst areas which he believed should be worked quickly; but there is not enough

money from the tax, but perhaps you may provide some funds.. Here also is this, I have applied to Hon. S.G. Wilder for wood for the bridges… [HSA, Interior Department – Roads, Box 44; Maly, translator]

Honopou
January 1, 1878
C. Merrill; to Mr. Smith, Minister of the Interior:
…The road in this District Hamkala [Hamakualoa], particularly in the *Ahupaa* [*Ahupuaa*] of Hoalua and Kailua *Kahawai ma Napuimalii* is exceedingly bad, as the rocks are loosened by the continual exposure to the rain and pressure of heavy mules, and horses, and as consequence removal, there are deep holes in the Road, such as the French call Cow Holes. So that it is very bad traveling there not only on horseback, but more particularly when the horses and mules are loaded with *Paiai* and other productions, or *ukana kaumahaloa*. Now Copper is the Road Supervisor of Kula, Makawao, Hamakualoa, Hamakuapoko, but he is now engaged in planting, ploughing & cultivating cane; and this perchance is the cause of those Cow Holes, above alluded too. It is your wish, and also your pleasure and intention and determination, that those whom you appoint as Supervisors, of any Department under our control or supervision, that they shall attend to the Duties and Functions of their official Appointment, but if they Neglect their duties, others should be appointed, who well attend to said Duties & Functions as aforesaid. They receive their pay, or at least many of them do, without rendering to the Public, an Equivalent for the amount they received from the Government. Let justice be done…

PS. In returning from Holawa this PM, I noticed on the Eastern side of the deep gully between Peahi and Halehaku, (said gully of name Kakipi.), that there was a land slide of many cart loads of land & rocks &c, into the Road, which slide nearly filled the road, [nearly to the railing]; which unless soon removed, may be Detrimental to the Government a thousand dollars, more or less.

During the last week, more rain fell, than has fallen in one rain storm for 23 years. The above fact, I am conversant with for I have been upon these Islands since Nov. 11, 1854, and have never been away from them since. And I also notice, on my way home, several places, where the Rain had worn the Road away, thus making those places very Bad… [HSA, Interior Department – Roads Box 44]

December 23, 1878
H. Schussler (for Claus Spreckels); to S.G. Wilder, Minister of the Interior:
…As I shall be compelled to take the water out of several creeks right at the Government road crossing, you would very highly oblige me in a letter of official authorization to do so. That is, to use the government road where, ever it crosses one of the streams granted to Spreckels last July, for the purpose of taking the water out of any one of those streams, where such may be required in the judgment of Spreckels or his agent. Spreckels to repair the road on as good a condition as it was heretofore.

The fact of it is that all those road crossings will be vastly improved. As I intend in several places to build bridges across the streams and take the water out underneath the bridge, also we'll be compelled to raise some of the approaches to these bridges, which will make the crossings much easier than they are now. For such improvements we will claim no offset against road tax. I have done a good deal of

work on the roads between Maliko and Halehaku and you will be pleased to see what improvements I was compelled to make as they were formerly almost impossible for heavy hauling, while now the grades are very much easier… [HSA, Interior Department – Roads Box 44]

December 23, 1878
Sam'l. G. Wilder, Minister of the Interior;
to H. Schussler, Esq. (Agt. & Atty. For C. Spreckels):
…Your letter has been duly received and in answer I beg to say – You are herby authorized to use the Government Roads in any way that will facilitate your interests – always bearing in mind the rights of the Public and leaving the Roads as accessible and in as good order as you find them.

I hear many reports of your improvement and thank you for the same... [HSA, Interior Department Letter Book 15:444-1/2]

Makawao
February 28, 1879
Petition of 58 Native and Foreign Residents; to F.W. Hutchinson, Minister of Interior:
We, the people whose names are below, humbly ask you to secure the *Alanui* (Road) that runs from Pauwela and enters the forest of Puuomalei, the land of C. Farden, and comes out at Kokomo, at the Halehui (Meeting House) and continues to Alelele.

Agree to this becoming an *Alanui Aupuni* (Government Road), that it be the new Road coming from Pauwela, to the upland forest at Puuomalei, continuing straight to the Halehui at Kokomo and joins with the *Alanui Kahiko* (Old Road), and continues to Alelele. Here is the reason that we ask this. We have seen that the new road is good, and better than the *Alanui Kahiko*.

It is because C. Farden has made that Road straight and wide; the forest has been cut back and wide, the sun and wind can come in and there are no hollows during the times of rain. The new Road is much better than the old Road, with no potholes.

We know that the *Alanui Kahiko* is not good in many places. Therefore we ask your Excellency to select a jury of 12 who will determine the need or not of this, as set forth in the Law.

We are your obedient servants. (signed)
W.T. Cooper, David Gandall, W.D. Kaupena, E. Kaihe, Ioane, Puu, Kalaaupa, Papaiakea, Nahakina, John Wagner, Wm. Doodney, J.B. Hirst, Kanuku, Kalakaua, Waikoloa, Kahope, Aa, Pila, Kanui, Lono, M. Kapunohu, D. Kahipa, K.M. Mia, Kekua, J.B. Hobletz, S.W.P. Kama, Wahahee, M. Kapihe, Mahoe, S.K. Stone, Kaii, George Brooks, S.W. Kanehoalani, W.P. Kawaa, M. Palea, John Tallett, Wm. Crowninburg, P. Naone, George Miller, S. Cleveland, G.K. Kauuwai, D. Cornwell, Wm. Wilber, W. Batamia, John Boardman, K. Hayne, R. Wilber, D. Haake, J.D. Haverkost, Kaaihue, Wm. Graham, A.H. Spencer, John Miller, T.H. Hobron, Wm. Wilcox, C. Kale, F. Shultz, Sml. T. Alexander. [HSA, Interior Department – Roads, Box 44; Maly, translator; see Register Map No. 603 for locations described above.]

David Taylor, Road Supervisor; to S.G. Wilder, Minister of the Interior
Report on the condition of Roads and Bridges on East Maui March 24th, A.D. 1880:
…Lower road that runs past Kalepolepo from Waikapu is in very bad order and is full of loose stones and holes. I do not think it has been worked for about five years. Nine miles of it is in bad condition.

From Ulupalakua to Kaupo the road is very good except one gulch which is washed out a little. I saw Mr. Paiko and got a list of tools that he has on hand which is as follows, 15 pickaxes, 19 shovels, 3 covers and 3 hammers.

From Kaupo to Kipahulu the road is passable except loose stones and some holes, it wants working but there is nothing very bad about it. One gulch called Kalepa is washed out so that you cannot cross it, but have to go down to the sea to get over.

In Kipahulu two Bridges are not safe, the abutments are bad and the Bridges are rotten.

From Kipahulu to Hana the road is passable but not in good order, it wants clearing out and working most of the way.

After leaving Hana plantation the road is good for the first two miles then it is almost closed up with grass, guava and under brush, leaving only a narrow path full of deep mud holes in places for about seven miles.

Lelekea Puupueo gulch, the bridge over this gulch is rotten and the lumber for a new one is laying there but has not been put up.

Nahiku gulch wants a new bridge, there was a bridge here but was washed away some time ago. The natives say that they will carry the lumber up and do all the work if they can have the lumber and a carpenter.

Hanawi gulch is washed out so that you connect cross it, but have to go up about two miles on to an old native road and cross it there.

Paula [Kapaulal Gulch. The material is laying here for a new bridge. The old one is now standing at Heleleikeoho Gulch. The Bridge is rotten.

The road all the way through Koolau is very bad and in many places you cannot ride but have to get off and walk, for miles the mud is up to the mules knees, some parts have been payed but the stones have turned edges up, it took me two days to get through there a distance of about Forty miles. I do not think this road has been worked since it was made. The trouble with the road is it has worn down so that it makes a regular ditch for the water to drain into. Twenty men working it for about six months I think would make it passable but I do not know if they would make a good road of it.

I saw the Road supervisor of Makawao, he has on hand 12 shovels, 12 pickaxes, 3 wheelbarrows and 4 crowbars. I asked him why he did not go on working the roads and he said that he was going to and that he wanted some more tools hammers and giant powder, I told him if he sent to you he would get them, he seems to mean well enough but is too old and easy going I think. He has worked the roads some, he is at

work now putting up a new bridge at Waikina. The roads through here are in bad order and want working all the way through these districts. Maliko gulch in the lower part is in bad order and there are some rocks that want blasting out. Through Makawao some parts of the road are very bad.

The upper road from Makawao through Kula to Ulupalakua has been worked a little way but not all through. Through Kula and towards Ulupalakua it is full of loose stones and holes and wants working very bad, and wants a new bridge at Keahuaiwi.

This is the best that I could do and get back in time to send in my report by the steamer this week… [HSA, Interior Department – Roads Box 44]

September 29, 1880
C.H. Dickey – Haiku, Maui; to H.A.P. Carter Minister of Interior:
Now that we have a new Minister satisfactory to us all I feel more hopeful of getting improvements carried out which are greatly needed in our District. I therefore desire to call your attention to Maliko Gulch. The road across this Gulch (which perhaps you personally remember) has been in a shameful condition for years and during the late legislative session a petition signed by all the leading people of this district was laid before that body asking for a special appropriation of Eight Hundred Dollars for the purpose of making a good road across the Gulch near the sea on a proper grade. The petition was laid on the table to be considered with the Appropriation Bill.

The legislature appropriated $35,000 for roads and bridges on the Island of Maui without specifying any particular works.

Since the petition went in and before the appropriation bill was passed Capt. Taylor under Mr. Wilders instructions has done some work on the Makawao Roads and has fixed up the old road at Maliko on its present grade, but it is much too steep on the Western side and to be safe ought to have an iron rail on the outer edge of it. John Lewis of Makawao, a practical road builder offers to contract the making of the road on a new grade, using the present road part way for five hundred dollars and an iron rail with strong posts could be added in the dangerous places at a slight additional cost.

I hope that you will consider the matter worthy of attention.

This road is one of the most important in the district being the approach to Maliko harbor and the connection link between Haiku, Huelo, and the outside world.

A suspension bridge is needed really, but it is too large an undertaking to be thought of… [HSA, Interior Department – Roads Box 44]

October 17, 1880
Geo. Jackson, Agent for Roads & Bridges; to J.A. Hassinger, Interior Department:
…In compliance with the written instructions dated Sept. 13th, which I received from the Minister of the Interior, I beg most respectfully to report my return to Honolulu and to submit, for the information of His Excellency, my report upon the Roads and Bridges on the Island of Maui.

Accompanying my report, you will find a daily journal of work performed and mileage of roads ridden over from time to time.

In preparing my report I have endeavored to make it as concise as possible.

It is my intention, as soon I can do so, to prepare an illustrated road map of Maui which I shall send into office when completed…

... 14 Makawao District
1st The manner in which the road repairs have been conducted with a view to durability during the present year!

The whole of the roads along the northern portion of this district, appear to be in very good order, and much seems to have been done during the last year or so, towards putting them in good repair but a sum, say $500 will be required to keep them up to their present condition, on account of so much rain falling in this district. It rained very hard at times, during my visit to this locality & consequently there was a deal of mud, but I found the roads nevertheless in very good order. After you pass Huelo however, the roads for about 3 or 4 miles are not quite so good, when you come to swampy country in which it would almost be impossible to make a good road unless at very great expense, and which is really not needed, so few people ever passing that way. After passing through this swampy country for about a mile, nothing but deep and dangerous mountain passes and gulches are encountered, thoroughly impractible for traffic and possessing only a horse trail, in the shape of a road, for the mail carrier and the few others who are compelled to go that way. To a stranger not knowing the road, it is highly dangerous and should never be attempted without an experienced guide, and on mules only. At the time of my visit, I was strongly advised by old settlers not on any account to attempt to force my way round to Hana by that road, on account of the heavy torrents which were coming down from the mountains at the time, so I turned my horse's heads (having seen sufficient to convince me of the truth of what I had heard), and returned to Makawao by the upper road through Haiku, a very excellent wide road and in thoroughly good order, in fact about the best road on Maui.

2nd The same with regard to Bridges!
The bridges of this district are, like most of the roads, in very good order and they will last many years to come being of recent construction & substantially built. There is one bridge being now built across the Kakipi gulch which will probably be finished this month. It will be substantial and will last many years. The stone work was completed when I visited the place and the contractors were about to erect the bridge…

…Two wooden bridges in Pauwela gulch with stone buttments in very good condition.

One wooden bridge in Kulanahoe Valley nearly new, in very good condition.
One wooden bridge in Waipio nearly new, in very good condition.
One wooden bridge building in Kakipi gulch and will cost when completed $300.
One stone bridge in Mokupapa gulch built this year, in very good order… [HSA, Interior Department – Roads Box 44:1, 14-17]

Hana
October 26, 1881
A. Unna; to H.A.P. Carter, Minister of Interior:
The public road through the district of Hana, a distance of about 70 miles from the hill of "Lualeilua" [sic] in Kahikini [sic] to "Oopuola" gulch in Koalau [sic] is principally a bridle path; in some places two persons may ride along side of each other; 12 feet is the extreme width of the road. Around our plantation where we have got control of the land we have set the fence back and made the road 30 ft wide and we have also induced natives to do likewise. No renumeration for the land thus given up has either been asked or expected –; & the road thus made has been kept in order by the plantation. In order to expedite matters we propose to lay down a portable narrow gauge steel tramway on one side of the public road; but before doing so, we think proper to bring the matter before Your Excellency. The 16 or 18 ft surrendered to the public road was principally for our own benefit; still others are benefited thereby; and if we now could wish to use only a very small part of whatever has been given for a narrow gauge road, would Your Excellency object, or could the public justly do so? We have here several native lawyers, that professedly from zeal for the public welfare, but in reality inconsequence of the prevailing "dog in the manger policy" might wish to indict us for maintaining a nuisance in the public road.

One word from Your Excellency might stop all proceedings in that direction. To make for all times a gift to the public and then in consequence thereof to be punished for using a part of what was given, would be somewhat hard on the donor; whereas a spirit of liberality on the part of the Government, in matters where no ones rights are violated not only would encourage industry, but would make industrious people come forward to meet Government halfways in all measures of progress… [HSA, Interior Department – Roads Box 44]

Grove Ranch
February 1st, 1889
J.W. Lowrie, Chairman; Makawao road Board;
To L. A. Thurston, Minister of the Interior:
…I am told by Hon. H. P. Baldwin that he is ready to convey to the Government for the Consideration of One Dollar, The roads leading from the Makawao road near Sunny side to Hamakuapoko, thence to main road leading to Huelo & Wailuku also the road leading from junction of Sunny side and Hamakuapoko roads to Paia with branch leading from said Paia road to Kaheke all the above roads are now used by the Public to great Convenience if they will be accepted by the Government please let us know – and we will have deeds made out… [HSA, Interior Department – Roads, Box 45]

Paia, Maui
May 10, 1889
J.W. Colville, Chairman Makawao Road Board;
to L. A. Thurston, Minister of Interior:
[New road from Makawao to Summit of Haleakalā authorized]
…At a meeting of the Makawao Road Board on Saturday last, Mr. H. P. Baldwin called the attention of the Board to the appropriation of $2500 made in the last Legislature, for the road to the summit of Haleakala, and recommended the use of the money at the present time from Olinda to the top if this money is at the disposal

of the Board; he further stated that if this was done he would put at the summit a stone house for the use of visitors and tourists.

It is the desire of the Board to learn from you whether the Makawao Board will have the Supervision of this work, and whether, if this is the case, the amount above named is now at the disposal of the Board for that purpose… [HSA, Interior Department – Roads, Box 45]

Paia
Oct. 22nd, 1889
J.W. Colville, Chairman Makawao Road Board;
to L. A. Thurston, Minister of Interior:
[regarding Makawao road work; road to summit of Haleakalā completed]
…Enclosed I hand you Quarterly report in duplicate of expenditures of Makawao Road Board for quarter ending Sept. 30, 1889. As to the work done, would beg to report Kula Blasting and widening & leveling of roads in Naalae as far as Palakukui gulch, and work commenced at Koanaoulu.

Makawao Grading leveling & widening continued on road to Paia *makai* from Paliuli as far as was desirable; some bad holes in the sandy road at Paia filled, and some few repairs effected at Makawao. The single laborer reported last quarter at work in the neighborhood of Maliko gulch, has been continued and kept profitably employed.

At the close of the month both gangs discontinued work, on account of lack of funds at the disposal of the Board for its continuance.

The road to summit of Haleakala, the direction of which was given to this Board, has been completed in accordance with the contract on file in your office, and payments made as per vouchers sent at the time drafts were made on your department.

Expenditures have been as follows

District	Labor	Material	Tools	Total
Kula	$ 1343.25	56.40	–	1399.65
Makawao	748.12	188.43	42.45	979.00…

[HSA, Interior Department – Roads, Box 45]

Paia Plantation
December 14 1889
J.W. Colville, Chairman, Makawao Road Board; to L.A. Thurston, Minister of Interior:
…A number of requests have come to me as chairman of the Road Board in this district, that a bridge be built over Maliko gulch at the wagon road crossing between Puuomalei and Kaluanui; you are personally acquainted with the location and a description of the place is unnecessary, the fact that there has been loss of life there by reason of heavy floods across the road after heavy rains, and that there is liability that the same may occur again, make the request a reasonable one to say the least; during the present week I am informed there has been 10 feet of water in the road at the crossing. Please state if you deem it advisable to build a suitable bridge, and if the amount can be appropriated out of the contingent fund for such purposes… [HSA, Interior Department – Roads Box 45]

Paia
July 15, 1890
C.H. Dickey, Chairman, Makawao Road Board;
to S. N. Spencer, Minister of the Interior:

…On Mch. 15th last a petition from his district for a fence along the road down Maliko gulch, was forwarded to your department with a request from this board that funds be granted from the Contingent fund for the construction of such a fence, and in the reply of your department Mch 20th we were authorized to draw on the continued fund as above indicated. We wish now to inquire whether the funds then promised are still at our disposal, or whether the closing of the fiscal period in the mean time necessitates our waiting for new appropriation?

We intend forwarding vouchers and draft on your department much for special appropriation from Contingent fund of $400.00 for construction of bridge over Kailua stream authorized June 20 1889, just as soon as bridge (which has only lately been completed) is inspected and the report is made to the Board… [HSA, Interior Department – Roads Box 45]

Hamakuapoko
August 2, 1891
C.H. Dickey, Chairman, Makawao Road Board;
to S. N. Spencer, Minister of the Interior:

I am instructed by the Road Board of Makawao District to ask you for a portion of the Appropriation for Roads & Bridges Makawao Section 3, $10,000.

The immediate necessity is a crossing on the Government Road at Halehaku Gulch. This crossing is at present in such a state as to be dangerous to life when the stream rises as it constantly does in the rainy season.

A bridge was proposed but could not be built for the sum you allowed $600.00. It is now proposed to put in a broad ford with rock on the spot thus spreading the stream out to four times its present channel and rendering passage safe.

It can be done for $600.00 or less. I would therefore ask for that amount from above appropriation or from Roads and Bridges, Maui in Section 1 — 19,000 to be expended in improving Halehaku Gulch. All that is not expended on the ford can be used in improving the road on both sides between the ford and the top. The Board is of the unanimous opinion that a ford is better than a bridge unless a large one is built at a cost of $2000.- to $3000.-

The travel over the gulch is liable to decrease on account of the probable abandonment of Huelo for cane raising and such a large expenditure would not be warranted. It is important however that the crossing be made safe which we proposed to do by the ford… [HSA, Interior Department – Roads Box 45]

Haiku, Maui
March 27th, 1895
C.H. Dickey, Chairman, Road Board, Makawao District;
to J. A. King, Minister of Interior:

…The Haiku Sugar Company through its Manager Mr. J.W. Colville and its Advisory Manager Hon. H.P. Baldwin has signified its willingness to make the

Government a gift of the private road belonging to the Plantation connecting Hamakuapoko with Paia Road.

This road has been used by the general public for some twelve years but has never been turned over to the Government. It should by all means belong to the Makawao Road System and I would recommend that the transfer be made to the Government thus saving all expense of opening same by means of petition, jury and appraisement.

Below I give a small drawing showing the importance of the road. It is the main road from Hamakuapoko to Paia. [*Figure 35*]

If this road were closed the travel of Hamakuapoko would have to go around by Maliko or else up the Makawao Road to the junction in either case with an additional distance of 1 ½ to 2 miles.

If you will have the deed made and sent to me I can have it executed by the President and returned to you to be executed by the Treasurer who lives in Honolulu. Or if you wish I can have the deed made here and executed by the President (H. P. Baldwin) and then sent to you. In that case if there is any particular form you prefer, let me know… [HSA, Interior Department – Roads, Box 46]

Haiku, Maui
September 11, 1897
C.H. Dickey; to Minister of Interior:

…I wish to call your attention again to the expenditure of appropriations of $500.00 for survey of a road connecting Makawao and Hana, for fear that, being a small matter, it may be forgotten.

The opening of lands at Nahiku makes a good road to Makawao more important and much good land will be made available between Makawao and Nahiku by a road connecting the northerly end of Nahiku Homestead Road with the Government road at Kailua. This is the line that I would suggest for the survey. Starting from end of Nahiku Road and running approximately on a level to the edge of Keanae Valley at a point where a good grade can be made into the bottom of Keanae valley above the rise in the bottom of same. Thence running across valley on an approximate level and out of same toward sea on a good grade. There on (I think) an approximate level across the top of Nuaailua Gulch to the edge of Honomanu at a point from which a good grade can be you to the bottom of Honomanu above the High Fall. Thence out of Honomanu Seaward and on an easy downward grade some Wahinepee, Makanale and Naiiilihaele & Kailua Gulches to the grade of the present Makawao Road at Kailua. I think that the $500.- will be extended by a mere preliminary survey fixing the main critical points and that it will cost much some to stake out the road for work… [HSA, Interior Department – Roads Box 46]

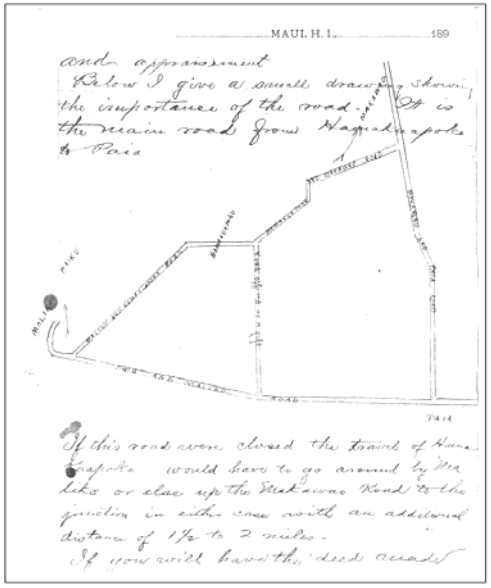

Figure 35. Alignment of Plantation "Road offered as a gift" between upper Hamakuapoko and Paia - Maliko Road (1895)

Paia, Maui
April 9, 1904
H.A. Baldwin; to G.R. Carter, Governor:

…I take the liberty of writing briefly of the conditions of our Maui roads.

The recent storms here have washed out all of our roads through the Makawao District and the Road Board, which I am a member, has practically no funds with which to make repairs. The last Legislature provided for certain amounts to be expended for new roads, to Kula and Huelo among others. These amounts to come out of the loan fund. Now these two roads have probably suffered more from the storms than any others here. It seems to me too bad that we have to spend a portion of the small amount available on these roads which will shortly be abandoned. However it is necessary for us to do so in order to keep these roads open, The new Huelo road, which is to connect Kailua with Peahi, has not even been located yet. If this location could be decided upon it is possible that in a number of cases we might instead of repairing the old road, made use of parts of the proposed new road.

In the Hana District the new road from Keanae to Kailua has been surveyed and located, as you probably know. The old road between these points is positively dangerous to travel over in places, especially at night (the mail carriers are obliged to travel over them at night continually). Unless work is begun soon on this road it will be absolutely necessary to make some repairs on the old one. And further more, unless this work is commenced soon it will hardly be possible to complete it in the time allowed by the appropriation. Much of the work in locating this road will have to be done over if it is left too long as the rains out there cause rapid growth of vegetation and frequent landslides. If the loan money is available I think it very important to get to work soon on the above roads, and I sincerely hope you can see your way to start the ball rolling.

There are many of the natives who complain a great deal and who seem to think the Republican Party is responsible.

We were much disappointed that the special session of the Legislature obliged you to put off your trip to Maui. A trip over some of our roads would convince you more than any number of letters… [HSA, GOV 2-8, Maui Roads]

It was not until 1925 that the *makai* road (the Hāna Highway) between Kailua (at Pu'uomaile) and Kopili'ula (at Kekuapa'awela) was completed. *Kūpuna* Helen Nākānelua, James Hū'eu, and Mr. Stephen Cabral provide readers with detailed descriptions of travel via the *mauka* East Maui Irrigation Company road in this region, and also describe the construction and opening of the present roadway.

E. Forests and Watershed Conservation (ca. 1840-1924)

As noted in several historical narratives cited earlier in this study, for centuries, Native Hawaiians shared a close—familial and spiritual—relationship with the natural environment around them. In the pre-western contact period of Hawaiian history, all land and natural resources were held in trust by the high chiefs (*ali'i 'ai ahupua'a* or *ali'i 'ai moku*). The rights of use of the lands and resources were given to the *hoa'āina* (native tenants) at the prerogative of the *ali'i* and their representatives. Boundaries of lands were defined, and individuals living within given *ahupua'a* (native land divisions, usually extending from the sea to the mountains) were responsible for the wise use of the resources within their home land. A thought shared among many *kūpuna* (elders) and Hawaiian people today has been expressed as *— E mālama i ka 'āina, a e mālama ho'i ka 'āina iā 'oe* (care for the land, and the land, in turn, will care for you). This basic concept is centuries old, and is rooted in the spirituality of the Hawaiian people.

The forests were the abode of the gods. Indeed, every elevational zone from sea to mountain peak was named by the ancient Hawaiians, and in the forest zone where clouds regularly rested upon the mountain slopes was called *wao akua* (literally, the region of the gods). The *wao akua* is so named because of the pattern of cloud cover and precipitation which settles upon the mountain slope—this covering was interpreted as concealing from view the activities of the deity (cf. David Malo 1959:16-18; and M.K. Pukui, pers. comm. 1975). Failure to use care when visiting the forest and mountain zones, and in collecting resources, ensured failure in one's endeavors. Lack of care and respect often led one to becoming lost, or even dying in the forest region.

One aspect of historic land use and forestry in the Hawaiian Islands that becomes clear upon review of archival literature, is that after western contact, the forests were primarily evaluated in the terms of the western economic system. While in the centuries prior to the arrival of westerners in 1778, and subsequently into the reign of Kamehameha I, the system of land tenure and management tended to mirror the natural landscape of the islands, later management systems focused on what, and how much could be gotten from the land.

Immediately, upon western contact, foreigners looked at the land—first as a source of provisions for ships; and second as a means for earning money, through the trade of natural resources such as *'iliahi* (sandalwood). In 1778, European boars, goats, rams, and ewes were introduced by Captain Cook. While offered as a "gift," one of the motivating factors was that leaving the animals would produce a breeding stock to supply other foreign ships (Beaglehole 1967:276, 578-579). Later, in 1793, cattle were brought to Hawai'i by Captain Vancouver. Given as gifts to the king, a ten-year *kapu* was placed upon the cattle to protect them and allow them to reproduce (Kamakau 1961:164). Between 1793 and c. 1811, new stock was added, and the numbers of cattle had increased dramatically. The cattle and other introduced stock were rapidly becoming a problem to the native population and forests.

While the introduced animals were making their way into the higher elevations, other economic pursuits also led to the clearing of large tracts of land. In the early 1800s (c. 1810-1829), thousands of tons of *'iliahi* (sandalwood) were cut from the forests around the islands for export to foreign ports. (cf. Kamakau 1961). By the 1830s, the forests had nearly been stripped of sandalwood and many other plants of the forest were impacted by the clearings made for collection and transportation of the *'iliahi*. Another reason that large sections of forest were cleared, was to develop lands on which western-introduced food crops (such as *'uala Kahiki* or Irish potatoes) could be cultivated and harvested for sale to visiting ships.

It is also important to note that the introduced European boar was significantly larger, and thus stronger, than the Polynesian introduced *pua'a*, or pig (Beaglehole 1967:579). Native writers have

recorded that prior to ca. 1815, when the native Hawaiians went hunting in the uplands, rather than hunting pigs or other large grazers, they hunted birds (for food, or for collection of feathers; the latter practice also entailed releasing the live birds once the choice feathers had been collected). They also collected woods, plants, and stone resources, all of which were integral to either subsistence or traditional practices. Detailed native accounts describe the sophisticated system of protocols and *kānāwai* (laws) by which these practices were undertaken. Failure to adhere to the system, often resulted in severe punishment of the offending party, and at times, even led to one's being killed (cf. Malo, 1951; I'i 1959; and Kamakau, 1961).

By the 1840s, free roaming cattle, sheep, and goats were having such a severe impact on the native dwellings (eating thatched houses) and consuming the produce of the agricultural fields, that most of the families who remained upon the land built stone walls around their residence and gardens. There are a number of historical accounts of the nineteenth century written by native Hawaiian authors, that document early efforts of protection homesteads (*kuleana*), agricultural fields, and forests from introduced animals such as cattle, goats, sheep, and the European boar. The immediate response of the *hoa'āina* (native tenants of the land) was fencing, and "*Pā hale*" (house lots enclosed with walls or fences) are recorded in several Land Commission Awards cited in this study.

In 1857, the Hawaiian language newspaper, *Ka Hae Hawaii*, published a series of articles to encourage farmers (*po'e mahi'ai*) in their practices. On April 22, 1857, the series discussed different types, and the values of fencing. The author, E. Bailey observed:

> One cannot really protect the land from animals which are not held in a pen. Nor can one prohibit the roaming of animals. Therefore, one cannot relax when crops are not in an enclosure… The stone enclosure (*pa pohaku*). It is a good enclosure in an *'a'a* place. A wall that will not rot, will not burn, will not be stolen. It is a wall that fends off (*pale*) animals well when it is built well. Goats are the only animals that it will not hold fast. Therefore, it is best to prohibit goats from farming lands… (BPBM HEN I:3242-3245)

Other types of *pā 'āina* (enclosures) discussed in the article included — *pā lepo* (dirt walls), *pā lā'au* (wooden fences), *pā uea* (wire fences), and *pā ulu* (growing fences). The latter "growing fence" was made by planting the introduced *pā nini* or prickly pear cactus in alignments. Indeed, it is from Maui, that we find one of the earliest references to the *pā pipi* or *pā nini* (prickly pear cactus) being used on Maui. In a communication dated September 29, 1852, W.P. Alexander of Maui, wrote to Reverend Armstrong, noting that cattle regularly crossed boundaries and trespassed into cultivated fields. He proposed that fences of cactus (*"pa pipi"*) be planted to prohibit their trespass (HSA Public Instruction Series 261 - Box 81; Relating to Land; June-Dec. 1852)

So significant was the threat of wild animals to the Hawaiian landscape, and the important watershed lands, that on September 19th 1876, King David Kalākaua signed into law, an "Act for the Protection and Preservation of Woods and Forests." By that Act, the Minister of the Interior was authorized to set apart and protect from "damage by trespass of animals or otherwise, such woods and forest lands, the property of government…best suited for the protection of water resources…" (Hawaii Laws Chapter XXX:39). The Law reads:

Hawaii Laws 1876
Chapter XXX.
An Act – For the Protection and Preservation of Woods and Forests.

WHEREAS, It is an established fact that the destruction of forests in any country tends to diminish the supply of water, therefore,

Be it Enacted by the King and the Legislative Assembly of the Hawaiian Islands, in the Legislature of the Kingdom assembled:

SECTION 1. That the Minister of the Interior is hereby authorized to set apart and cause to be protected from damage by trespass of animals or otherwise, such woods and forest lands, the property of government, as may in his opinion be best suited for the protection of water sources, and the supply of timber and fruit trees, cabinet woods and valuable shrubbery.

SECTION 2. For the purposes contemplated in this Act, the Minister of the Interior is hereby authorized to appoint some competent person as superintendent of woods and forests, who shall, under the direction of the said Minister, enforce such rules and regulations as may be established to protect and preserve such reserved woods and forest lands from trespass. Said superintendent shall have charge of the construction of all fences and barriers required to protect the said woods and forest lands, and shall be responsible for their being kept in good condition. He shall, under the direction of the said Minister, be empowered to cause the arrest of any trespassers on such lands, and all constabulary or police of the districts in which such woods and lands may be situated, are hereby required to assist the said superintendent in carrying out the directions of the said Minister in the premises.

And it is hereby made an offence punishable by a fine not to exceed one hundred dollars or imprisonment at hard labor not to exceed one year, upon conviction before any police or district justice, of any person who shall violate any of the rules or regulations established as aforesaid tabuing such woods and forest lands.

SECTION 3. The Minister of the Interior is hereby authorized to secure from the Commissioners of Crown Lands by lease or otherwise, such woods and lands being the property of the Crown, as may be suitable for carrying out the purposes set forth in this Act.

SECTION 4. Whenever it shall be necessary to extinguish any private right or title in any woods or lands required to fully carry out the intention of this Act, the fair valuation of the same shall be determined by referees agreed upon by and between the parties interested therein and the Minister of the Interior, and the valuation so adjudged and determined shall be the extreme limit of the price to be paid by the government for such woods or lands, and upon making tender of such price so determined by the referees, it shall be lawful for the said Minister to take possession of such woods and lands for the purposes aforesaid.

SECTION 5. The superintendent of woods and forests shall receive for the faithful performance of the duties of his office, such sum as the Minister of the Interior shall direct.

SECTION 6. The sum of — dollars is hereby appropriated for the purpose of carrying out the provisions of this Act.

Approved this 19th day of September, A. D. 1876.

KALAKAUA R. [HSA – Reading Room]

Among the early beneficiaries of this Act were the Hāmākua-Ko'olau region rain forests, portions of which in 1876, under authority of King Kalākaua, were leased for the development of the Hāmākua Ditch, and subsequently in 1878, another water lease authorized development of the Spreckels Ditch. Clauses in the original, and all subsequent leases and water licenses included requirements for protection and restoration of the forest eco-system (see documents cited in the section of this study titled "*'Olā'olā 'Ana ka Wai i nā 'Auwai—Development and Operation of the East Maui Ditch System*…").

The 1876 Act was further defined by an Act of the Legislature of the Hawaiian Kingdom, approved by Queen Lili'uokalani on January 4, 1893, which established the Bureau of Agriculture and Forestry. Among the Bureau's goals was the "preservation of forests." On June 14, 1900, the members and functions of the Bureau were absorbed by the Board of Commissioners of Agriculture and Forestry (Hawaii State Archives – Com 2, Box 11).

A Historical Overview of Forestry in the Hāmākua-Ko'olau Region

The following narratives, provide readers with a history of forestry development and conservation programs in the Hāmākua-Ko'olau region. It will be observed that great effort and partnership between Government Agencies, private entities such as Alexander and Bladwin/East Maui Irrigation Company, and members of the public were made during the time of forest reserve development (*Figure 36*). But, observations shared in the oral history interviews conducted as a part of the present study, record that the Hāmākua-Ko'olau region forests have continued to decline in spite of the efforts. The decline impacts all residents living below the forests, and those who rely on the water transported from the region to outlying lands of Maui.

July 28, 1905
Committee on Forestry,
Board of Commissioners of Agriculture and Forestry, Honolulu, T. H.:

…I have the honor to submit herewith a report with recommendations on the Proposed Forest Reserve in the Districts of Koolau and Hamakualoa, island of Maui.

The area with which this report deals may be roughly described as extending from the Hana-Koolau District boundary line, at the East end, to the land of Opana in Hamakualoa, at the West, and from the line of the Koolau and Upper Hamakua Ditch to the crest of the ridge on the North side of the crater of Mount Haleakala.

The report is based upon a personal examination of the area made by me during visits to Maui in September and November, 1904, and upon additional information obtained during and since these visits from Government officials and other persons familiar with the locality.

I would here note my special obligation to Messrs. H. P. Baldwin, H. A. Baldwin, W.F. Pogue, Hugh Howell and L. Von Tempsky for information, assistance and various courtesies extended to me.

The object of the Proposed Koolau Forest Reserve is to protect the native forest now covering the watersheds of the streams on the windward side of Maui which supply the water for irrigating the great Wailuku Plain lying between Mount Haleakala and the West Maui Mountain. This area when irrigated is among the most productive land in the Territory. Without water it is of only inferior value for grazing.

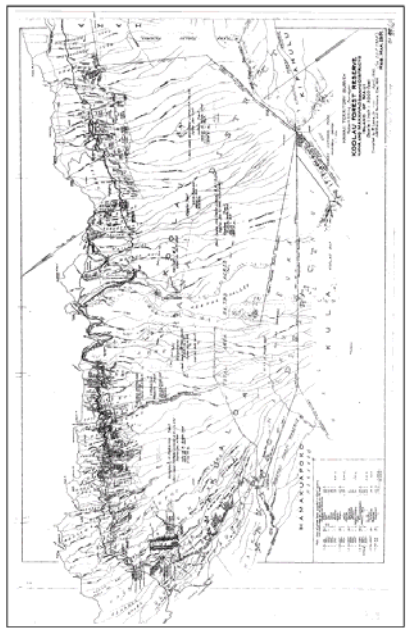

Figure 36. Koolau Forest Reserve – Honomaele to Makawao, Maui; Register Map 2891 (R. Lane, 1932 & 1934)

Under existing conditions sugar-cane is the most profitable crop that can be grown on this land; a statement which will doubtless remain true for a long time to come. But even if with altered economic conditions it were some time found advisable to substitute other crops for sugar-cane, irrigation would be none the less necessary if the most satisfactory results were to be obtained.

Because of its situation, climate and soil the central Maui Plain must forever remain one of the most highly productive areas in the Territory, provided always that it continues to receive an adequate supply of water for irrigation. Nowhere in the Territory are the benefits of irrigation more marked, while from its location in regard to transportation facilities this section possesses advantages unusual in Hawaii.

For these reasons the protection of the forest upon which depends the regularity of flow in the streams that supply its irrigation ditches, is a matter of prime importance. And it is of importance not only to the interests immediately concerned but also to the community as a whole, because through the increased production made possible by the application of water to land otherwise of little value, the Government profits both through an increase in direct taxation and also through the indirect benefits which accrue to the Territory by reason of the many and diverse interests which the main industry gives rise to and supports. It has been stated by Mr. M. M. O'Shaughnessy [1905] that for each additional 1,000,000 gallons of water per day, 100 acres of cane land can be brought under cultivation. The average number of tons of sugar per acre from the 1904 crop of the Hawaiian Commercial and Sugar Company was 7.23. These figures do not require further comment.

The Baldwin Interests which control the greater part of the Central Maui Plain, are keenly alive to the value of forest protection, and with commendable foresight have done much to protect the existing forest in the Koolau District, as well as, by extensive planting of forest trees, to extend the forest cover over other lands. Furthermore their representatives have expressed their desire and intention to cooperate with the Government in the creation and maintenance of the Koolau Reserve.

The Koolau District on Maui has many features in common with the District of Hilo on Hawaii. Each lies on the windward slope of a high mountain and so receives the benefit of the heavy rainfall that comes from the clouds brought in by the trade winds. The belt of heavy precipitation on Maui apparently extends lower down the mountain side than it does in Hilo and the maximum recorded rainfall is greater in this district than anywhere else in the Territory. Records kept during the construction of the Koolau Ditch show as is to be expected, that the rainfall is much greater in the forest belt than that recorded at the regular stations below. The rainfall gradually deminishes [sic] toward the west but throughout the Koolau District it is heavy and during a good part of the year almost continuous.

The native forest in the Koolau and Hamakualoa Districts is made up of the trees commonly found on the windward side of the Hawaiian Islands and forms where protected from injury by cattle or fire, as almost all of the Koolau Forest is, a dense, almost impenetrable jungle. At the higher elevations there are heavy stands of *Koa* (*acacia koa*) which perhaps some day may be turned to economic use. Lower down the predominant tree is the *Ohia Lehua* (*Metrosideros polymorpha*). In mixture with the *Ohia* are found a variety of the other and less important trees of the Hawaiian

forest. The undergrowth throughout Koolau is dense and luxuriant, tree and other ferns, shrubs and climbing vines covering the forest floor in great variety and profusion. On the sides and in the bottom of the numerous gulches native bananas of many kinds grow to good size, an indication that these lands may ultimately be turned to account in fruit production or perhaps in growing plants of the allied genus yielding *Manila Hemp.*

The Districts of Koolau and Hamakualoa are characterized by a succession of deeply cut gulches, an interesting example of erosion resulting from heavy rainfall. Outside of the mills following the irrigation ditches and the main Government trail near the Coast, the county is without roads of any kind. Combined with the character of the forest this fact explains why the main body of the north slope of Haleakala remains practically unexplored.

Considerable interest is just now being manifested in the Koolau District in the cultivation of rubber. A plantation has been started at Nahiku in a sheltered situation and at a low elevation, which if successful will lead to the establishment of a new industry in the islands. The plantation is still in the experimental stage but if it develops as satisfactorily as the present indications promise, there is good reason to believe that many of the gulches and some of the other protected lands along the Koolau Coast may also be used for rubber. The Nahiku Company is depending mainly on the Ceara Rubber (*Manihot glaziovii*) but is also experimenting with other rubber producing trees, notably Central American Rubber (*Castilloa elastica*) and Para Rubber (*Hevea braillienais*).

There is at present little attempt at the systematic cultivation of any other crops in the Koolau District, except in a small way near the sea. A little grazing is carried on by individuals but this also is confined to the lower lands.

After careful consideration the trail bordering the Koolau Ditch, with its Eastern and Western additions-respectively- "The Nahiku Extension" and the "New" or "Upper Hamakua Ditch" – has been taken as the lower boundary of the Koolau Reserve. The trail is taken rather than the ditch itself because it is a boundary always in evidence, whereas the ditch not infrequently becomes a tunnel and is lost to sight. When the tunnel runs through a ridge the trail follows around the hill, usually on a nearly even grade, elsewhere the trail borders the ditch itself. The trail is a well made and permanent improvement and being constantly in use by the ditch tenders forms a definite and easily maintained boundary. The ditch itself where uncovered prevents cattle from entering the forest above, while short stretches of fence across the ridges above the tunnels or along the trail will usually serve to keep them out at these points. Frequently also the topography makes fencing unnecessary.

At present the native forest comes in many places much below the lower line of the Proposed Reserve. The part of the watershed lying between the Koolau Ditch and the ditches nearer the sea is accordingly protected; an important matter as not a little water is developed from springs below the line of the Upper Ditch. Under the existing leases this forest is in a large measure protected from cattle by clauses requiring fencing; especially by a forest fence built along the Government Road under a provision of the Koolau Forest Lands lease.

On the private land which they lease or own in fee the Baldwin Interests keep the cattle out and jealously maintain the forest cover, while at the west end of the Reserve on the land of Opana, and extending there from into the District of Hamakuapoko, extensive artificial plantations of forest trees, have, as stated above, been started by the Baldwins to replace the natural forest cover of former years.

Until there is a very decided demand for the Government land between the ditches for some form of agriculture which gives more than ordinary promise of success it is believed that the best interests of the Territory will be served by maintaining the forest cover down to the lines of the lower ditches.

From the Hana-Koolau District line to the Halehaku Gulch and between the lower line of the Proposed Forest Reserve and the ocean the gross area is approximately 22,500 acres. Of this a good portion is Government land so that even with this forest area excluded there is ample room for all the development likely to occur for a considerable time to come, particularly as rubber does best only at the lower elevations.

But in settling on Forest Reserve boundaries it is desirable to draw lines which shall be as definitely fixed as reasonably may be. For a permanent lower boundary the line of the Koolau Ditch seems to come nearer to meeting the requirements than any other which could be chosen. It is permanent, definite and in itself much of the way a barrier against cattle. It has accordingly been adopted. The elevation of the Koolau Ditch at the Eeastern end of the Reserve is about 1300 feet, at the West end about 1200 feet.

On the upper side of the Reserve between the top of the woods and the crest of the crater there is a belt of open land. This is an area of light precipitation compared with the section below but as a number of streams head therein, and as the area while suitable for grazing is inaccessible, it is believed that it is the wisest policy to include it in the Reserve. A good share of this area, especially the western half is on the privately owned land of Haiku uka belonging to the Haiku Sugar Company and Paia Plantation. The elevation of the line of the top of the woods is between 6000 and 7000 feet. The crest of the crater, where the reserve line follows it on Government land is from 7500 to 8000 feet. It is confidently believed that at this elevation coniferous trees from the temperate zone could be grown to advantage. Such a plantation would be of great interest and in time of economic value.

A band of wild cattle at present wanders at large in the Koolau forest. It is thought that these animals work for the most part near the upper edge of the woods. No estimate of the number can be given but the band is not supposed to be a very large one. Systematic hunting should be undertaken to drive out or exterminate these cattle.

The lands within the Koolau Forest Reserve may for the present purposes be considered as divided into seven tracts, which beginning at the East may be described as follows:

(1) Hana Forest Tract: the portion of the Government land known as the Hana Forest Tract extending into the Koolau District; under lease to Hana Plantation Co. (Lease No. 492).

(2) Nahiku Forest Tract: Government land; Water rights leased to Hana Plantation Co. "Koolau Water Rights". (Lease 520B).

(3) Koolau Forest Lands, Tract No.2. Government land leased to H.P. Baldwin. "Koolau Forest Lands". (Lease No. 538).

(4) Koolau Forest Lands, Tract No. 1. Government land leased to H.P. Baldwin. "Keanae-Wailua 1 and 2". (Lease No. 5339).

(5) Honomanu: Government land, leased to Hawaiian Commercial and Sugar Co. (Lease No. 52).

(6) West Koolau Forest Tract: Government land; Water rights leased to Haiku Sugar Co. & Paia Plantation Co. "Hamakua & Hamakualoa Water Rights. (Leases Nos. 267 B and 475).

(7) Halehaku, Peahi, Opana & Haiku uka: Fee simple lands owned or controlled by the Baldwin Interests; lying to the south and west of the Koolau Forest Tracts.

Of the above it is proposed that the Government set apart the lands covered by water leases, namely, the Nahiku Forest Tract and the West Koolau Forest Tract, these being the only Government lands within the reserve not now under lease or on which the leases are within two years of expiration.

For the reason outlined above, which may be summarized in the statement that the protection of the forest covering the Koolau watershed is essential to the best interests of the Territory, I recommend that the Board approves the creation of a Forest Reserve within the boundaries described below, and that it requests the Governor to set apart in accordance with Law, the unleased Government lands lying therein; and further, that steps be taken to secure the cooperation of the private interests holding land within the Koolau Reserve boundaries, that the objects for which the reserve is made may be fully realized.

Following is a copy of the description of the boundaries of the Koolau Forest Reserve compiled by Mr. S.M. Kanakanui of the Government Survey Office. The original description with a map of the Koolau Reserve is on file in the Office of the Board.

DESCRITPION
PROPOSED KOOLAU FOREST RESERVE
HAMAKUALOA AND KOOLAU DISTRICTS, ISLAND OF MAUI.

It is proposed that the Koolau Forest Reserve consist of the Government lands and other tracts belonging to private individuals or corporations lying within the following boundaries;

Beginning at a point on the boundary line between the District of Hana and Koolau, where the *mauka* boundary of the Nahiku homesteads if projected easterly would intersect the said District line, the boundary runs:

(1) In a general north-westerly direction to and along the *mauka* boundary of the Nahiku Government homesteads to the gulch between the lands of Kapaula and Puakea, or Paakea, said gulch being also named Waiaaka gulch on Public Lands Map No. 20 [Register Map No. 2429] of Nahiku about 22,000 feet in a direct line;

(2) Thence, *makai* down said Waiaaka gulch to the Koolau Ditch, about 2800 feet in a direct line;

(3) Thence in a general westerly direction along the Koolau and upper Hamakua Ditch trail to the western boundary of the land of Opana in the district of Hamakualoa, about 61,000 feet in a direct line;

(4) Thence *mauka* along the westerly boundary of said Opana to the *makai* boundary of the land of Haiku uka, belonging to the Haiku Sugar Co. and Paia Plantation, about 20,000 feet in a direct line;

(5) Thence, in a general westerly direction, along the *makai* boundary of the said Haiku uka land of the Haiku Sugar Co. and Paia Plantation, to the Maliko Gulch, near Pali o Ka Moa, about 2000 feet in a direct line;

(6) Thence south 34° East, true, 17,800 feet, along the land of Makawao to the summit of the hill called Puu o Kakae;

(7) Thence south 53° 21' East, true, 42,980 feet, along the land of Kalialinui, crossing the Koolau Gap, to Pohaku Oki Aina;

(8) Thence, in a general easterly direction, along the northern crest of the Kipahulu valley to a point where the boundary line between the Districts of Koolau and Hana intersect the Kipahulu valley, about 10,000 feet in a direct line;

(9) Thence, in a general north-easterly direction, along the said boundary line between the said Districts of Koolau and Hana to the point or beginning, about 21,500 feet in a direct line;

The various distances in the above descriptions are approximate only being scaled from the map showing the Reserve boundary.

Area 42,969 acres, more or less.
Superintendent of Forestry… [HSA, GOV 2-1, Forest Reserves]

August 3, 1905
Resolution
In regard to the Proposed Forest Reserve
In the Districts of Koolau and Hamakualoa, Island of Maui

Resolved that the forest reserve on the windward side of Maui extending from the Hana-Koolau district boundary line, at the east, to the land of Opana in Hamakualoa, at the west, and from the line of Koolau and upper Hamakua ditch to the crest of the ridge on the north side of the crater of Mount Haleakala, in the districts of Koolau and Hamakualoa, island of Maui, as recommended by the committee on forestry, based upon the report of the superintendent of forestry, dated July 28, 1905, and on a map and description prepared by the survey office, now on file in the office of this board, be approved.

Resolved that the board recommends to the governor that the government lands within the boundaries of the proposed Koolau forest reserve be set apart by him, after the hearing required by law, as compartments of the Reserve.

Resolved further that the Board recommends to the Governor that all the land within the said described boundaries be approved by him to be set apart as a Forest Reserve, subject to all private rights and titles, and that all owners of private lands lying within said boundary be requested to cooperate with the Board of Agriculture and

Forestry in reserving all of said lands for forestry purposes, in accordance with the terms of Chapter 28 of the Revised Laws of Hawaii.

Passed and approved this 3rd
Day of August, 1905.
(signed) L.A. Thurston. C.S. Holloway. J.F. Brown. Alfred W. Carter. [HSA, GOV 2-1, Forest Reserves]

June 4, 1906
G.R. Carter, Governor; to R.S. Hosmer, Bureau of Agriculture:

In discussion with Secretary Atkinson, he informs me that during my absence, while he was Acting governor, the proposition was submitted by those representing Baldwin's interest in forestry lands in Koolau, Maui, which did not conform to the understanding which he supposed we had with them, particularly as the arrangement was only for ten years. He, therefore, declined to execute the document.

I had supposed that when the Government had declared its forest reservation in that region Mr. Baldwin was to do the same with his, under an agreement that if the Government ever opened up any of its land for any purpose whatsoever, then Baldwin would be free to take his lands out of the reservation. In this way a compact would be entered into which would morally obligate the Government and cause any administration in the future to hesitate before withdrawing any Government land in that district.

I approve of Secretary Atkinson's course in declining to accept their agreement, and we will let the matter stand as it is, for I consider we are now relieved from any obligation to maintain that forest reserve intact, and the Government will be free in the future to withdraw from the reservation any portion which might become more valuable for industrial purposes… [HSA, GOV 2-8, Public Lands - Maui]

July 20, 1906
G.R. Carter, Governor; to H.P. Baldwin:

Enclosed, find copy of letter written by me on June 4th to the Superintendent of Forestry, in re the forest reserves on Maui, which brought about a meeting yesterday morning between myself, Thurston, Hosmer, Smith and Olson, the sum and substance of which was that Thurston, speaking for the Forestry interests, claimed to be in that position where they were ready to accept anything. W.O. told me that during my absence, Atkinson intimated bad faith or something of that sort; but that his main contention was that the Government could not bind itself and, therefore, the plan which I had supposed was going through had not been consummated. This leaves the situation exactly where I tried to put it of records in my official letter to the Superintendent of Forestry. Govt. forest land has been put in the reservation but it is free from any moral obligation to maintain the reservation…

Now, while lawyers may stumble over the technicalities and are afraid to do anything, yet I believe it is to your interest and to the interests of the Government for us to go as far as we can in tying that land up; and I still hold to the original plant—that you turn your lands over to the Forestry Board on the sole condition that we maintain our reserve intact. It seems to me an agreement can be drawn which will release either party should the other withdraw their land… [HSA, GOV 2-8, Public Lands - Maui]

July 25th, 1906
H. P. Baldwin; to G.R. Carter, Governor, The Territory of Hawaii:

…Your favor of the 20th inst., to hand relative to "Forest Reserves on Maui:" I have also received a letter from W. O. Smith on the same subject.

So far as I am concerned, and I am sure J. P. Cooke agrees with me, I am perfectly willing to have the Forestry Agreement with the Government perpetual, providing that the Government could make an Agreement that would stand for all time. The Legislature, however, can at any time up-set the Agreement by passing a law to open up the land, so that the Government Agreement to make it perpetual, is not good.

I propose that as some of the parties connected with our Plantations, and our Lawyers, are inclined to limit the period, xxxx we make a trial period of say 18 years, which would be about the term of our Land & Water Agreement with the Government. We have the proposed Forest Reserve now enclosed with a fence, and in addition a portion of the Government Forest on the Haiku side of Honomanu, which is not in the Agreement, but the fence can be removed "*mauka*" at any time. It is wise, however, to have it under fence now, as there are stray animals all through that country that should be kept out of the Forests.

I was very sorry that Secretary Atkinson saw fit to turn down the Agreement that was made, on account of its being reduced to 10 years; for as a matter of fact, we are ready to continue it, even if the first Agreement should be only for 10 years, for an unlimited time.

Now that the Forest Reserves have been fenced off, I understand that the young trees are starting to grow finely.

Hoping that the above will meet with your approval… [HSA, GOV 2-8, Public Lands - Maui]

July 26, 1906
G.R. Carter, Governor; to H. P. Baldwin:

…From yours of July 25th, I understand that you propose a trial period of 18 years, during which, for and in consideration of a transfer by you to the Board of Forestry of your lands for their use and control, the Territory of Hawaii shall agree to maintain its forest reserve, as heretofore set aside.

Before finally accepting your proposition, I think it would be well to have Thurston and W. O. Smith get together and draft just what is proposed.

The other day I looked over a draft of the agreement proposed for ten years and it was so long and complicated that I admit my inability in the time at my disposal to grasp it all. One thing I noted, that you reserved a right of way from any point outside of the forest reserve to any point within, covering ingress and egress. While such a condition might do no harm in the hands of such men as you, yet don't you think that if such a provision is inserted in your favor the same thing ought to be allowed the Government on its reservation. What I am perfectly willing to do is to bind the Government land in exactly the same way you bind yours. If you want the right to develop, without denuding the forests, give us the same; if you want the right to secure water in your area, let the Territory have the same right; if you want a right

of way from any point without to any point within (which, of course, could be made to cover the whole area), then let us have the same. If you wish to make it for eighteen years, then we will tie the Government land up for eighteen years—that is, of course, as far as we are able to.

Now, if the attorneys you employ want to use up page after page describing the conditions under which you turn your forest lands over to the Department I can have no objections, provided your instrument contains one clause which leaves the Territory of Hawaii as free to act in relation to its forest reservations heretofore set aside as you will be under the agreement in relation to yours… [HSA, GOV 2-8, Public Lands - Maui]

August 1, 1906
H. P. Baldwin; to Geo. R. Carter, Governor, The Territory of Hawaii:

…In connection with the Forestry question - I would say that Land Commissioner Pratt has a Surveyor by the name of Wright out near the Kalua land where Mr. Pogue lives, surveying the Hanehoi and other Government lands, with a view I understand, of cutting them up for Homesteads. The proposed Forestry line is I believe in that region along the new Hamakua Ditch, but there is also Forest land below the new Hamakua Ditch in that region. I fully expect now that the Forestry Agreement will be carried out, and if it meets with your approval, the Surveyor should be instructed not to go above the proposed Forest line, and it would be well even for him not to touch Forest land below said proposed Forest line, if it can be helped. We have gone on the principal, in that whole region, of protecting all the Forest land we can, even though it be below the line of the proposed Reservation.

I understand fully that the Government has a perfect right to dispose for Homestead purposes, or otherwise, Forest land in that region, but so long as they have other lands that are just as good and perhaps better for agricultural or pasturage purposes, I see no reason why Forest land should be put out for Homesteads, and I think that the Govue lines has set land for all Homesteads that will be called for. The rainfall in that region has diminished on account of the Forests being denuded, and it is in the interests of the general public, and also the Government, who get a good annual rental from water sold, to preserve Forests as far as possible. I am sure you will agree with me fully in this matter… [HSA, GOV 2-8, Public Lands - Maui]

April 23, 1907
Committee on Forestry,
Board of Commissioners of
Agriculture and Forestry, Honolulu.:

…Act No. 4 of the Session Laws of 1907 amends Chapter 28 of the Revised Laws of Hawaii, by empowering the Governor to set apart as forest reserves government land whether it is under lease or not, provided that if the land is under lease, the reservation shall not affect the vested rights thereby acquired. Under the terms of this act I herby recommend the reservation as "lands actually set apart" of the tracts of government land now under lease, within the boundaries of the Koolau and the Hana Forest Reserves on Maui.

The reasons for the creation of the forest reserves on the windward side of Maui were fully discussed by me in former reports. The arguments there set forth apply

with equal force to the lands now under consideration, which form integral parts of the reserves as established. They need not be repeated here.

For purposes of reference it may be stated that my report upon the Koolau Forest Reserve was made under the date of July 28, 1905, published in the Forester and Agriculturist for August, Vol. II, pp 234-240. Reports on the Hana Reserve were made on March 2 and April 6, 1906, published in the Forester and Agriculturist for November, 1906, Vol. III, pp 353-358. The Koolau Forest Reserve proclamation appeared in the Forester for September 1905, Vol. II pp 272-273; that of the Hana Reserve in the issue for December 1906, Vol. III, pp 418-419.

In connection with the setting apart of the lands in the Koolau Reserve it should be borne in mind that in the agreement entered into last autumn between the Government and the Alexander and Baldwin Plantations, whereby the management of the private land in the Koolau Reserve was turned over to the Board, the Government bound itself:

> "That all lands now held and owned by said Territory of Hawaii and that it may hereafter acquire during said period of this surrender, upon such acquisition, within said boundaries herein before specifically set forth, except the lands within said boundaries covered by Government leases Nos. 538 and 539, both dated February 26, 1902, made by the Commissioner of Public Lands for and on behalf of the Territory of Hawaii to H.P. Baldwin, shall likewise be immediately set apart as a forest reserve for said purposes, as far as and as soon as it is able so to do under the laws of said Territory.
>
> That at least immediately upon the relief or release within said period of this surrender of all, or any part, of the lands covered by said Government Leases Nos. 538 and 539, from said leases, or either of them, by expiration or termination or otherwise, the lands within said boundaries so relieved or released shall be set apart as a forest reserve for said purposes; but, if possible under the laws of said Territory at any time within said period of this surrender before such relief, release or releases, then as soon as thus possible, the lands within said boundaries covered by said leases shall be set apart as forest reserve for said purposes.
>
> That all lands set apart as hereinbefore specified as a forest reserve and all lands now held, controlled or owned by said Territory of Hawaii, within said boundaries that have already been set apart as a forest reserve for said purposes, shall be used and maintained during said period of seventeen years covered by this surrender as a forest reserve for forestry purposes according to the general purposes of the present forestry laws of the Territory of Hawaii, except where such use and maintenance will be inconsistent with the rights now existing of third persons in any such right or rights, such use and maintenance shall immediately being in the lands relieved therefrom and shall thereafter continue throughout said period of seventeen years covered by this surrender."

Under the law as it stood before the amendment enacted last month, only the land of Honomanu, 2,000 acres, in the Koolau Reserve, and the small portions of E. Honomaele and the Kawela-Kaeleku tract, 80 acres, in the Hana Reserve could be set apart. The advantage of the amendment is at once apparent when in these two reserves alone it permits 22,943 acres to be put into the permanently reserved class.

That there may be no misunderstanding of the terms of the present law I may again remark that the reservation goes into full effect only on the expiration of the existing leases; all rights acquired thereunder being guaranteed to the lessee during the term of the lease.

For the reasons above set forth I now recommend that the Board request the Governor, to set apart, after the hearing required by law, the portions of the following named government tracts within the boundaries of the Koolau and Hana Forest Reserves as integral parts of those reserves.

Following is a list of the lands to be so set apart:

RESOLUTION RELATING TO THE
Koolau Maui Forest Reserve

Resolved that those certain lands in the Districts of Koolau, Island of Maui, described in general terms as follows:

Name of Land	Area in Reserve Acres	Lease Number	Lease Expires
	KOOLAU FOREST RESERVE		
# Honomanu	2,000	52	July 1, 1908.
# Keanae, Mauka	8,750	539	Feb. 26, 1923
# Wailua, 1 and 2 Mauka	1,280	539	Feb. 26, 1923
Wailua-Ulaino Forest	3,000	538	Feb. 26, 1923
Ditto	900	492	May 1, 1917
	15,930		
	HANA FOREST RESERVE		
Hana Forest	6,300	492	May 1, 1917
E. Honomaele	15		
Kawela-Kaeleku	65	474	Aug. 17, 1908
Wakiu	3	518	May 2, 1920
Koali-Puuhaoa	600	479 B	De. 5, 1913
	7,013		
	22,943		

#=Crown Land… [HSA, GOV 2-1, Forest Reserves]

April 30, 1907
Resolution Relating to the Koolau (Maui) Forest Reserve

Those portions of the government lands of Honomanu; Keanae, Mauka; Wailua, 1 and 2 Mauka; Wailua- Ulaino Forest, two tracts; Within the boundary or the Koolau Forest Reserve and containing an area of 15,930 acres, more or less, as recommended in a report of the Committee on Forestry, dated April 30, 1907, based on report of the Superintendent of Forestry, dated April 23, 1907, which reports are on file in the office of the Board of Agriculture and Forestry; the boundaries of which proposed reservation more particularly appear by and on a map made in ----------, by the Hawaiian Government Survey Department, Marked "Registered Map No. 1268," and "Koolau (Maui) Forest Reserve, Maui;" and a description

accompanying the same, numbered C. S. F. 1630, which said description is now on file in the said Survey Department; Copies of which said map and description are now on file in the office of this board and made a part hereof; be approved as portions of the Koolau (Maui) Forest Reserve.

Resolved that the Board recommends to the Governor that the government lands lying within the boundaries of the said Koolau Maui Forest reserve be set apart by him, subject to vested rights therein, after the hearing required by law, as portions of the Koolau Forest Reserve.

Adopted at a meeting of the Board of Agriculture and Forestry held on April 30 1907.

Ralph S. Hosmer, Superintendent of Forestry. [HSA, GOV 2-1, Forest Reserves]

July 22, 1907
Report by Ralph S. Hosmer, Superintendent of Forestry.
FOREST WORK IN HAWAII.

Forest work as a branch of the Territorial Government has now come to have a recognized place in Hawaii. Appropriations by successive legislatures, the enactment of comprehensive forest laws and the steady growth of public sentiment are self evident proofs of this assertion. The underlying reasons are not far to see. In Hawaii the intimate relations between a protected forest cover and regulated stream flow are apparent and well understood. Hence it is but natural that forestry should play the important part that it does in the internal economy of the Territory.

Carried on by the Division of Forestry under the direction of the Territorial Board of Commissioners of Agriculture and Forestry, the forest work of Hawaii falls under two main heads, (1) the creation and maintenance of forest reserves – essentially "protection forests" on the important watersheds – and (2) forest extension – the planting of waste and barren areas with useful trees, and the introduction of exotic trees and shrubs of value to the Territory. The creation of forest reserves holds first place in the activities of the Division but the work in forest extension is steadily progressing in interest and importance.

For the fiscal year ending June 30, 1907, a number of substantial gains are to be recorded in Hawaii's forest work. Among them are: (1) The creation of five new forest reserves with a total area of 147,715 acres, of which 120,926 acres is government land. This brings the number of established forest reserves up to a total of thirteen and the aggregate total area to 397,187 acres. The new reserves are in the Districts of Kau on Hawaii, Hana on Maui, Waianae on Oahu, and Kona and Na Pali on Kauai… (3) The ratification of an agreement between the Government and the Alexander and Baldwin Plantations on Maui whereby the management of a large area of privately owned land, in one of the Maui forest reserves, is turned over to the Government. This action is an important step and marks the beginning of a closer cooperation between the Government and the large private interests directly benefited by the forest reserves…

…The creation of forest reserves on the important water sheds of the Territory naturally became the foremost duty of the new Division, and this work has steadily held first place in its activities. The first year was largely taken up with preliminary work in the field but since then large areas have been set apart, in fairly close succession, on each of the four main islands of the group, until there are now thirteen forest reserves having an aggregate area of 397,187 acres.

Before the chain of projected forest reserves is complete about half a million acres will have been included within the reserve boundaries. Of this area the most important units have been already set apart…

…The object of the Hawaiian forest reserves is primarily that of forest protection; to secure the permanent maintenance of a forest cover on the water sheds and catchment basins of the streams needed for irrigation and power development. For the purposes of water conservation the Hawaiian forests are admirably adapted. This indeed is their chief use, for in only a few of the reserves does the commercial value of the trees play much part. But where the removal of the merchantable timber does not interfere with stream protection this aspect of the situation is not lost sight of and whenever possible the forest will ultimately be put on a revenue producing basis… [HSA, GOV 2-1, Forest Reserves]

July 30, 1907
C.S. Holloway, President, Board of Commissioners of Agriculture and Forestry;
To A.L.C. Atkinson, Acting Governor of Hawaii:

…The Board of Commissioners of Agriculture and Forestry by resolution duly adopted by a majority of said Board, at a meeting held in Honolulu, on Monday July 29, 1907, recommends that that certain piece of government land, now unleased, in the District of Hamakuapoko, Island of Maui, within the limits roughly defined below, be proclaimed by the Governor, in accordance with law, as a forest reserve, to be known as the Makawao Forest Reserve.

The proposed Makawao Forest Reserve may be described as lying on the Northwestern slope of Mt. Haleakala, bounded on the North and East by the Koolau Forest Reserve, on the South by the land of Kaliialinui, and on the West and Northwest by the remainder of the land of Makawao and containing an area of 1796 acres.

The location and metes and bounds of this reserve are more particularly shown by and on a map and description now on file in the office of this Board.

The said Board further requests that the Governor give the notice and hold the hearing or hearings required by law, more particularly by sections 397, 381 and 382 of Chapter 28 of the Revised Laws of Hawaii, as amended by Act No. 65 of the Session Laws of 1905 and by Act No. 4 of the Session Laws of 1907, and that after such notice and hearing the said described piece of land be proclaimed by him as the Makawao Forest Reserve, and definitely set apart as such under the law.

Enclosed herewith are copies of the reports of the committee on forestry and of the Superintendent of Forestry, and the resolution in regard to the above named section adopted by a majority of the Board.

There is also enclosed a draft of a By Authority Notice of the public hearing. As you know the law provides (Chapter 28, Revised Laws) that " the Governor shall give not less than fourteen (14) day's notice, by advertisement in not less that two newspapers, published in this Territory, of intention to consider the setting apart of government land for forest reservations" etc… [HSA, GOV 2-1, Forest Reserves]

July 27, 1907
Ralph Hosmer, Superintendent of Forestry;
To Committee of Forestry, Board of Agriculture and Forestry:

I have the honor to submit a report with recommendations on a proposed extension of the Koolau (Maui) Forest Reserve, by the creation of a small additional reserve to be called the Makawao Forest Reserve.

Location.
The area in question is that portion of the government land of Makawao, sometimes called the Haleakala Tract, in the District of Hamakuapoko, Island of Maui, to the east of the Kahakapao Gulch and between the Falls of Pali o ka Moa and the Hill Known as Puu Kakae. The tract may be roughly described as lying on the Northwestern slope of Mt. Haleakala bounded on the north and east by the Koolau Forest Reserve, on the South by the land of Kaliialinui and on the West and Northwest by the remainder of the land of Makawao, and containing 1796 acres.

Makawao is a government land. In December 1874 it was leased to the Board of Education for a nominal sum, and soon after subleased by that Department at a fair rental for the remainder of the term. The lease, which was held of late years by the Haleakala Ranch Company, expired on March 26, 1904.

Since then the land has continued to be used by the Ranch under a tenacity at will. The land is therefore not now under lease.

The control of Makawao by the Board of Education explains the reason for the words "Board of Education" that appear across the land on the government map of Maui.

The Question of the reservation of this part of Makawao has already received favorable consideration from the Board, in connection with a proposal made in November 1904 by the Haleakala Ranch Company to exchange certain adjoining forest lands for the remainder of Makawao, whereby those lands and the portion of Makawao now under consideration were to be made a forest reserve. I submitted a report at the time which is now on file in the office of the Board. The proposed exchange was not approved by the Governor. Consequently the matter was dropped. Later when the question of setting apart the forested portion of Makawao again came up, it was decided to wait until an accurate description of the boundary could be had. Such a description is now in hand and forms a part of this report.

Object.
The objects of the proposed Makawao Forest Reserve are to afford permanent protection to the forest cover on the watersheds of the streams rising within its limits and to extend to its natural western boundary the forest area in part protected by the existing Koolau Forest Reserve. The arguments made for the creation of the Koolau reserve are equally applicable, so far as its area goes, to the tract now proposed to be

set apart. These have already been set forth at length in my report on the Koolau Reserve and need not be repeated here as that report, made under the date of July 28, 1905, was published in the Hawaiian Forester and Agriculturist for August 1905, Vol. II, pp 234-240.

The Forest.
The forest on the portion of Makawao now proposed to be set apart as a forest reserve, is the western end of the great Koolau forest that covers all the northern side of Mt. Haleakala. It is of the same character as that further to the East, being made up chiefly of *Ohia* and *Koa*. The area is drained by the gulches that make up the Waiahiwi Stream, which is one of the principal tributaries of the Maliko Gulch. These streams, although intermittent, are of value in connection with the other streams on the windward side of Maui.

The Kahakapao Gulch is the natural western boundary of the Koolau forest. Not only has it for many years been the dividing line between forest and grazing land, but it is also practically at the point where the area of heavy precipitation gives place to the drier climate of the Kula District. The reason for this change of meteorological condition is due to topography. Makawao lies on the shoulder of the mountain. That open lands beyond are subject to different wind currents from those under forest to the eastward.

Private Reserve.
For the past ten years the proposed reserve has been treated as a private forest reserve by the Haleakala Ranch Company, which at its own expense has built and maintained fences to keep out the cattle. The gulch itself is a barrier part of the way but at both the upper and lower ends of the reserve fences are necessary. It may be said in passing that within the last two years the Haleakala Ranch Company has also fenced in and now maintains as a private forest reserve portions of its fee simple land of Kaliialinui. The official recognition of this private forest reserve will be considered with other forest questions on Maui in a future report.

Recommendation.
For the reasons above set forth I now recommend that the Board request the Governor to set apart and create as the Makawao Forest Reserve the area within the boundary herein after technically described, in accordance with law, after the hearing required by statute.

Following is the official description of the proposed Makawao Forest Reserve, prepared by the Hawaiian Government Survey Department as C. S. F. No. 1792.

Makawao Forest Reserve
Portion of Haleakala Tract
Makawao, Maui.

Beginning at rock + on "Pali o ka Moa Falls" on the boundary between this tract and the land of Haiku, the coordinates of said rock from the Government Survey Trig. Station "Piiholo" being 3773.9 feet South and 7410.0 feet East, as shown on Government Survey Registered Map No. 2394, and running by true azimuths:

1. 325º 55' 30" 17866.5 feet along the land of Haiku to top of Puu Kakae;
2. 97º 37' 6043.0 feel along the land of Kaliialinui to *mamane* post;

3. 136º 00' 924.0 feet to *mamane* post;
4. 114º 40' 617.0 feet to *mamane* post;
5. 164º 14' 2038.0 feet to *mamane* post;
6. 97º 43' 2703.0 to *mamane* post at the East edge of the Kahakapao Gulch;
7. 148º 34' 3125.0 feet to post, the East edge of the Kahakapao Gulch being the boundary;
8. 173º 10' 3924.0 Feet to post, the East edge of the Kahakapao Gulch being the boundary;
9. 202º 10' 1997.0 feet to post, the East edge of the Kahakapao Gulch being the boundary;
10. 178º 00' 1301.0 feet to post on edge of gulch above the Puali (neck) the East edge of Kahakapao Gulch being the boundary;
11. 239º 57' 2079.0 feet to the initial point.

Area 1796 acres.

Ralph S. Hosmer, Superintendent of Forestry. [HSA, GOV 2-1, Forest Reserves]

On October 10, 1924, C.S. Judd, Superintendent of Forestry, wrote the following account of forests, watershed protection and forestry in the Hawaiian Islands to Governor Farrington. Seventy-eight years later, his words still present readers with important reminders for the need of on-going efforts in protection of Hawai'i's native forest watersheds:

Forestry is practiced in the Territory of Hawaii primarily, not for timber production, but for the conservation of water. Probably in no other section of the world is the relation between a satisfactory forest cover on the mountains and the supply of water for domestic and agricultural uses better or more ably demonstrated…

The chief product, and, the most valuable, coming from the main forested and mountainous regions of the Territory, comprising about one-fourth of the total land area of the eight islands (4,099,860 acres) is water. Because of the comparatively limited terrain, short and steep watersheds, heavy rainfall in certain regions and the great need for irrigating the dry but fertile, sun-warmed lowlands, the value of this liquid product of the forest, on which domestic needs and prosperity of the community depend, is most highly appreciated and every effort is being made to conserve and maintain its sources in the forests.

Character of the Native Forest.

The forest of comparatively small trees found growing naturally on the mountain slopes is admirably suited to prevent erosion and to convert surface runoff into underground drainage, the desired outcome in water conservation. The happy combination of small trees, brushes, ferns, vines and other forms of ground cover keep the soil porous and allow the water to percolate more easily into the underground channels. The foliage of the trees breaks the force of the rain and prevents the impacting of the soil by rain drops. A considerable portion of the precipitation is let down to the ground slowly by this three-storied cover of trees, bushes, and floor plants and in this manner the rain, falling on a well-forested area, is held back and instead of rushing down to the sea rapidly in the form of destructive floods, is fed gradually to the springs and streams and to the underground artesian basins where it is held for use over a much longer interval.

Protection of the Forest.

Forest practice in the Territory of Hawaii, therefore, resolves itself into what is known as "forest protection" and the main efforts of the foresters are exerted in maintaining and build up of the native forests on the mountains so that they will function to the highest degree in conserving the rainfall.

The native forest, however, is peculiarly constituted in that it is readily susceptible to damage. The shallow-rooted trees depend for proper moisture and soil conditions on the undergrowth of bushes and ferns and when the latter, the first to be attacked by stock, are injured or removed, the tree roots dry out, the trees are weakened and begin to decline, and an opening is made in the forest for the invasion of destructive insects and fungi and of the more vigorously-growing foreign grasses and other plants which choke out native growth and prevent tree reproduction. It is always dangerous for this reason to make any opening in the native forest and the only safe way to preserve it and keep it healthy and vigorous is to maintain it inviolable from all attacks and keep the ground well shaded and dark.

Damage to the Forest.

The chief damage to the native forest is done by cattle and other grazing stock which first attack the toothsome ferns and other plants which give the shallow-rooted trees the protection which is necessary to their existence.

The fencing of exposed forest boundaries to keep out stock and the extermination of wild stock where it exists in the forest constitutes an important item in forest work in the Territory…

Forest Reserves.

Forest lands devoted to the purpose of water conservation have been officially recognized under the law and set apart as forest reserves by proclamation of the Governor. In this manner during the past two decades 50 of such forest reserves have been set aside on the five largest islands of the group. These embrace a total area of 840,984 acres of which 579,905 acres or 68 percent is land belonging to the Territory… (Hawaii State Archives – Com 2, Box 15)

Register Map No. 2891 (1932 & 1934), lays out the basic boundaries of the Ko'olau-Makawao Forest Reserve, and includes notations regarding lease and licenses in effect at the time (see *Figure 36*; page 426).

E 'OLĀ'OLĀ 'ANA KA WAI I NĀ 'AUWAI— DEVELOPMENT AND OPERATION OF THE EAST MAUI DITCH SYSTEM (1876 to Present)

In a traditional context, Hawaiian traditions, practices and beliefs, are directly tied to the health and well-being of the land or *'āina* — that which sustains. These practices and cultural values are not mutually exclusive from the larger modern community of Maui. Indeed, a healthy land makes for healthy people. One of the traditional Hawaiian proverbs that has been handed down over the generations asks us, and then instructs us — "*He ma'i ka honua, he'aha ka lā'au? (ka pane) He ua! No ka mea, uwē ka lani ho'ōla ka honua!*" (When the earth is ill, what is its medicine? (the response) Rain! Because, when the heavens cry, the earth is healed) (pers comm., Apelahama Kaho'okaumaha Moses; Hōnaunau, 1977). By this saying, it is easy to understand the Hawaiian association of water and health — The tears (rains) that fall from the heavens cause the waters to flow, and they inturn, give life to the earth; the earth in turn, sustains the people. Another old Hawaiian saying expresses the value of doing what is good, and the rewards of such action — "*Maika'i ka hana a ka lima, 'ono nō ka 'ai a ka waha!*" (When the hands do good work, the mouth eats good food!) (pers comm., Daniel Kaopuiki, Sr.; Lāna'i, 1970). The challenge that we face today, when speaking of *wai o ke ola* (the waters of life) which flow from *Maui Hikina*, is putting into action that which is good, and which will sustain our generation and those who follow us.

The historical narratives cited in preceding sections of this study, and the oral history interviews cited in *Volume II*, present readers with impotant descriptions of traditional and customary practices, customs, and beliefs associated with the *'āina* (land) and *wai* (water) of the Hāmākua-Ko'olau region of Maui Hikina. The documentation further provides us with a cultural-historical context for discussing the resources of what has come to be called the "East Maui Ditch Country," and for planning future water-actions that take into account traditional and customary values of the native Hawaiians. The historical accounts that follow, include key documentation pertaining to development of the East Maui Ditch System, and it's licensing through the 1970s.

E 'Olā'olā 'ana ka Wai i nā 'Auwai (The Water Murmurs in the Ditches): A Chronological History of the East Maui Ditch System

The modern ditch history of East Maui dates back to 1876, though it was part of a plan initiated through the efforts of missionaries and other foreign residents of the Hāmākua-Wailuku region, who planted sugar plantations as early as the 1830s. By the 1870s, growing plantation interests in the region sought out ways to turn what had become a desolate isthmus lands and neighboring *kula* lands of Maui, green with cane. Their economic plan was made viable by the passage of a Reciprocity Treaty between the United States and the Hawaiian Kingdom on January 30, 1875; and subsequent ratification of the treaty by King David Kalākaua on April 17, 1875 (Kuykendall & Day 1970). The treaty went into effect on September 9th, 1876, and on September 13th, 1876, King Kalākaua granted issuance of the first Water License for constuction of the "Haiku Ditch," and drawing water out of streams of the Hāmākua Loa District. The first license was issued to the Haiku Sugar Company, Samuel T. Alexander, Henry P. Baldwin, James M. Alexander, and Thomas H. Hobron (see Water License below). By July 4th, 1877, the ditch had been formally opened, and was supplying water, from as far east as Hoalua Stream, to the Hāmākua Poko plains. Construction was on-going at that time, and progress being made towards the Nā'ili'ilihāele Stream (F.L. Clarke, 1878:39-40; in this study).

While testimonies in some public hearings have expressed the sentiment that 'the waters were taken without permission' (for example see BLNR Hearing Transcript of May 25, 2001, in *Volume II* of this study), the initial development of the ditch system was authorized as a part of the Hawaiian Kingdom's program to promote prosperity for all the people of the Kingdom (cf. Section 42 of the Civil Code of 1859). Of importance to the native Hawaiian families of the land, each of the Water Licenses issued under the Kingdom included clauses which protected the *pono wai* (water rights) of native tenants of the respective lands through which the ditch system was developed. The original license stated:

> *PROVIDED NEVERTHELESS and the continuance of the right herebefore granted is upon this condition...that existing rights or present tenants of said lands or occupiers along said streams shall in no wise be lessened or affected injuriously by reason of anything hereinbefore granted or covenanted...* (September 13, 1876 William L. Moehonua, Minister of the Department of the Interior, Kingdom of Hawaii; to J.M. Smith, President Haiku Sugar Company, et al.)

In 1928, J.H. Foss (Chief Engineer, East Maui Irrigation Company), submitted a paper to the Public Lands Commission as a part of the appraisal process associated with General Lease No.'s 1134 (Honomanu), 974 (Hamakua), and 276-B (Spreckels). In the paper, Foss provided readers with a historical summary of the history of the East Maui Ditch System and Water Licenses:

> A brief history of Government Water Licenses on East Maui will give a background for the details to be considered in these three appraisements. There are in all five such licenses, two in addition to the above three. All of them are now somewhat interwoven due to the fact that the transportation of water from each is handled by one and the same general ditch system; accordingly, the two additional ones…are Keanae, No. 1706; and Nahiku, No. 520-B…
>
> …[T]he three licenses which are up for re-appraisal are…Spreckels License, No. 276-B…the oldest original license in force. It commenced July 8, 1878 and provided for a nominal rental of $500.00 per year for a period of thirty (30) years; furthermore, it stipulated that for the ensuing thirty (30) years (second half of the term of the license) the rental is to be agreed upon by Licensor and Licensee each ten years in advance…
>
> The original Hamakua License, however, was the forerunner of all East Maui water Licenses. It dated from 1876. The present Hamakua License, No. 974 is a new license not a renewal of the original one except as to water shed covered thereby… [T]he Spreckels and Hamakua Licenses overlap one another. They are now operated as one and the rental more or less arbitrarily proportioned off to each…
>
> Honomanu License, No. 1134, is a new license which replaced the original lease on Honomanu lands. At the expiration of said lease all improvements thereon, and in connection therewith, reverted to the Government. The present Honomanu License also provides that improvements thereon and in connection therewith revert to the Government…
>
> The present ownership of the ditches transporting water from the Honomanu and Sprecklеs-Hamakua Licenses is somewhat involved. The original ditches on the Honomanu lease are the Spreckels and M. Louis, which are to a great extent still in use. They reverted to the Government at the expiration of the Honomanu lease in

> 1908. The Koolau Ditch which also crosses the Honomanu License, but which was built under the Keanae License in 1903-1904, reverted to the Government at the expiration of that license in 1925. Thus all the aqueducts in the land of Honomanu are now, and have been for several years, the property of the Government.
>
> The Spreckels, Center, Lowrie and New and Old Haiku Ditches are still the property of East Maui Irrigation Co[19]. Those portions of those ditches located on Government land may automatically become the property of the Government at the expiration of the Spreckels License in 1938, although the Spreckels License does not provide for reversion of improvements.
>
> Those portions of the new and old Hamakua Ditch, located upon Government land, reverted to the Government with the expiration of the Hamakua (1916) and Keanae (1925) Licenses respectively; and accordingly have been the property of the Government for some time.
>
> The Wailoa Ditch, which is located on the Spreckels-Hamakua License, is still the property of East Maui Irrigation Co., but those parts which are on Government land will revert to the Government at the expiration of the Spreckels-Hamakua License in 1938…
>
> As indicated in the foregoing, the water transportation system on east Maui, has undergone vast changes from time to time. The original system was in use without any material changes for about 20 years. It consisted principally of the Hamakua and Haiku Ditches with a combined capacity of about (Haiku 55 plus Hamakua 25) 80 m.g.d. The Lowrie Ditch was then (1900) built this increasing the combined capacity by 60 m.g.d. although one reason for building the Lowrie was to deliver water at a greatly desired higher elevation on the plantation than the Old Haiku, it actually developed that it also served to increase the ditch capacity, as the Old Haiku Ditch was continued in use; especially so when in 1904 one-third of the Koolau Ditch water was added to what these two ditches had been transporting. The Koolau Ditch extends from Nahiku to Alo Gulch; it was completed in 1904 and added the Keanae and Nahiku water sheds to the system. The other two-thirds of the Koolau Ditch water was transported to the plantation by the New Hamakua Ditch, which was built at the same time as the Koolau and which had a capacity of 72 m.g.d. It also supplemented the Old Hamakua Ditch, which was becoming badly warn and leaky, although continued in use for many years thereafter. Thus in 1905 the combined capacity of East Maui Ditches had become (25 plus 55 plus 60 plus 72) 212 m.g.d, an increase over the original capacity of 165%; whereas the availability of gravity water supply on East Maui had been increased by only 40% by the addition of the Keanae and Nahiku water shed.
>
> The capacity of the East Maui Ditch System was still further increased in 1914 by the construction of the 90 m.g.d. New Haiku Ditch and the 90 m.g.d. Kauhikoa Ditch taking the place of the abandoned 55 m.g.d. Old Haiku and the abandoned 25 m.g.d. Old Hamakua, respectively. This additional net increase in capacity of (90 plus 90

[19] East Maui Irrigation Company, Ltd. (EMI) was incorporated through an Agreement between Hawaiian Commercial & Sugar Co., Haiku Sugar Co., Paia Plantation, "Five Corporations" and Maui Agricultural Co. The agreement formed EMI, and leased all ditches, water rights and casements, etc. East of the west boundary of the *Ahupuaa* of Opana, excepting as to Kaluanui Ditch to EMI. The Articles of Association of East Maui Irrigation Co. Ltd., were dated June 23, 1908 (EMI Collection – Packets 2 & 4).

> minus 25 minus 25) 100 m.g.d was not accompanied by any increase in the gravity water supply.
>
> Finally the 160 m.g.d Wailoa Ditch was built and put into service in 1923. At this same time the westerly portions of East Maui Irrigation Company's Lowrie and New Hamakua Ditches were abandoned, but the easterly portions of each are still in used — the former as a reservoir feeder, that latter as the actual eastern portion of the Kauhikoa Ditch. The Wailoa Ditch therefore gave a net increase in the capacity of the system at the delivery point of (160 minus 60 minus 72) 28 m.g.d., without any increase in the available water supply. Thus in 1923 the total capacity of the East Maui Ditch System at the delivery point became (90 plus 90 plus 160) 340 m.g.d., or an increase of 325% of its original capacity, with only a 49% increase in its available water supply… [J. Foss, Ms. 1928:1-6]

Leases and Water Licenses for the East Maui watershed lands were renewed by the Territory and State of Hawai'i from the 1930s to 1985 (see records cited below). Since 1985, the Water Licenses have been issued to East Maui Irrigation Company, Ltd., on a month-to-month permit and renewed annually (Dean Uchida – BLNR Hearing Transcript; May 25, 2001–see *Volume II*). Issues regarding the adoption of a Water Code, litigation involving the environmental requirements for the licenses, and contested case hearings have led to delays in disposition of the Water Licenses (ibid.). The May 25th hearing transcript (in *Volume II*) contains detailed descriptions of the present conditions of the East Maui Ditch System, and issues raised regarding traditional and customary practices, water rights, and environmental concerns.

Historical Records of the East Maui Water Licenses and Ditch Development (ca. 1876-1988)

The following citations provide readers with first hand accounts of how the East Maui Ditch System came to be developed (*Figure 37*). The records were viewed in the collections of the Hawai'i State—Land Division, Bureau of Conveyances and Archives. Of particular importance to those interested in further study of the licensing history are the General Lease and Water License packets (including the C.S.F. packets) of the State Land Division. The packets, numbered 267-B, 475-B, 520-B, 538, 539, 658, 974, 1134, 1706, 2027, 2656, and 3349; and C.S.F. Numbers 20,682 to 20,685, cover lands of the Nahiku, Keanae, Honomanu, and Huelo Water Licenses. The above packets are among those which were reviewed while conducting the present study, and excerpts of documentation recorded therein are cited below. Register Maps — 2482 (tracing by J. Iao, 1909); 2891 (R. Lane, 1932 & 1934); HTS Plat 1011 (tracing by J. Iao, 1915); HTS Plat 1067-A (R. Lane, 1932 & 1934); HTS Plat 1067-B (S. Hasegawa, 1987); and HTS Plat 1067-C (tracing by W. Aona, 1988) provide locational documentation and reference notes that coincide with the historical narratives that follow.

The Pacific Commercial Advertiser
June 24, 1876
Irrigation.

> It is singular that with the spirit of enterprise evinced in many other directions there should have been so little notice taken of one of the most important subjects that could possibly engage the attentions of those eager not only for their own advancement but for the development of the resources of the country, whereby national as well as individual benefit, would be enhanced. We refer to the subject of irrigation, which, in the hands of an intelligent and active administration, might be made to shower blessings upon the country and its inhabitants before unknown; and in places which are now only noted for their waste and barren condition, fertility of production in many branches of agricultural industry might be created instead…

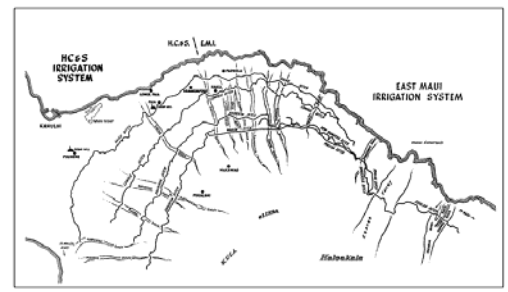

Figure 37. Ditch Alignments of the East Maui Irrigation Co. Ltd. (Ampersand Vol. VIII No. 3. – 1974:14-15)

> Between the beaches of Kahului and those of Maalaea and Kalepolepo lies a vast expanse of level land, forming an isthmus connecting east and west Maui, which as it exists is fit for nothing except the pasturage of animals and in some places not even fit for that owing to an entire destitution of water supply. The area of this land is perhaps not less than fifty thousand acres, and capable, if irrigated, of producing many thousand tons of sugar. Most of this belongs to the government, and if the spirit of enterprise were rife among those in authority, this whole plain could be turned into a garden, for there is an abundance of water running waste upon the highlands of Haleakala amply sufficient if utilized for this purpose to supply the entire tract. The subject of irrigation of this plain has been more than once brought forward for consideration, but no thorough investigations have been divulged, if they have ever been made, as to the best means of bringing down the waste water on to it, or the probable expense that would accrue, although the feasibility of the project is not to be doubted. During the reign of Kamehameha V, some investigations were said to have been made, but as to their nature or comprehensiveness the public were allowed to remain in the dark, or to be satisfied with the dicta of his imperious ministry, that the engineering would be too costly and the whole affair too ponderous to be handled by the government. The Minister of Interior, we understand, made the assertion that the cost would not fall short of $200,000; but upon what basis his calculations were made, we are at a loss to know. We are informed by others, whom we think equally competent to judge, that the cost would fall short of this figure; but allowing that it would not, even then it would almost surely prove a paying investment, as who in search of sugar land would not be willing to pay $25 or $30 an acre for well watered land?
>
> …This is certainly one of our first and greatest needs, and with reciprocity to back us there would be no fear of the result… We have heard of a suggestion to irrigate this

plain, or a part of it, by water derived from the streams of Waiehu and Waihee, much of whose water now runs to waste. But whether such a scheme would be more feasible, or less expensive that that before mentioned, it would be difficult to say… It has been estimated, by those who are competent to observe, that the cost of such an enterprise would not exceed $30,000 or $40,000 at the most… [Editorial, Pacific Commercial Advertiser; June 24, 1876:2]

August 20, 1876
Saml. N. Castle, Castle & Cooke Agents; to W. L. Moehonua, Minister of the Interior:
…The undersigned agents for the following parties engaged in the cultivation of the sugar cane and manufacture of sugar to wit. The Haiku Sugar Co. Alexander & Baldwin & James M. Alexander in the districts of Haiku & Hamakuapoko, island of Maui beg most respectfully to apply to His Majesty's Government for permission to take water from the following streams in the district of Hamakualoa, running over lands owned by the government to wit Nailiilipaele [Nailiilihaele], Kailua, Hoalua, Huelo, Holawa & Honopou for irrigating two or three thousand acres in the said districts of Haiku and Hamakuapoko and for other purposes the said water to be conducted from the said streams, to the said lands through a canal or ditch to be dug or built at the expense of the said grantees.

And the said applicants beg to represent that the said streams of water now flow through a very broken country mostly incapable of cultivation watered by abundant rains and are lost in the sea. The applicants do not wish to interfere with any water rights, if there be any, located between the points at which they propose to take the water now applied for and the sea but believe the said proposed ditch will be of the public benefit which every prosperous enterprise is in any country and may hereafter be so enlarged as to greatly promote the public prosperity.

For any detailed information we beg to refer you to Saml. T. Alexander Esq. who is at present in town & will be happy to give you any information upon this subject in his power…

P. S.
I beg to add to the above included in those who will assist in the expense of this trial ditch which if a success will be of great value as to the practice ability of such enterprises for the development of the resources of the country. Capt Thomas H. Hobron and Grove Ranch… [HSA, Interior Department Box 55 – Water Maui & Molokai, 1866 – 1887]

September 7, 1876
C.T. Gulick, Interior Department;
to Messrs. Castle and Cooke, Agents Haiku Sugar Co. :
…I am directed by His Excellency the Minister of the Interior to say in reply to your Application of the 21st August last for certain water privileges, - that the Government will grant to the Haiku Sugar Co., Alexander and Baldwin, James M. Alexander, The Grove Ranch Plantation and Thomas Hobron, and their respective and several successors heirs and assigns the license to take water from the streams named in the application and to carry the same over all Govt. lands intervening between the said Streams and the remotest of the lands to which it is now desired to carry said water for the period of twenty (20) years from date of acceptance at the rate of One Hundred Dollars ($100.-) pr Annum, upon condition:

1st That a sufficient ditch, canal or other waterway shall be at once commenced and finished in a reasonable time.

2nd *That this grant shall in no way interfere with the rights of tenants upon said Government streams or lands.*

3rd Nor shall it in any way affect the right of the Government to grant to any person or persons the right to take water (not to interfere with the water herein granted) from the same or other streams to be carried over the same land or lands for any purpose whatsoever, and if need be through the ditch or canal to be constructed by these grantees, provided however that during the said twenty years the supply of water, a right to take which is herein granted, shall not be diminished by act of the Government.

4th That at any time during the said period the government may purchase the said ditch canal or other water way, * (* upon payment of the actual cost thereof only) and in case of said purchase will continue to furnish water to these grantees and their respective and several successors, heirs and assigns at a just and reasonable rate not to exceed that paid by other parties taking water from such ditch or waterway.

I am directed to say further that as early as possible a proper instrument will be drawn embodying the foregoing conditions and executed by His Excellency in favor of the above mentioned parties… [HSA, Interior Department Letter Book 13:444-445]

September 7, 1876
Wm. R. Castle, Attorney General; to Wm. L. Moehonua, Minister of the Interior:
…The application of Messrs. Castle and Cooke representing the Haiku Sugar Company, Alexander and Baldwin, James M. Alexander, the Grove Ranch Plantation and Capt. Thos H. Hobron dated August 21, 1876, has been placed before me. This application requests permission to take water from several streams in Koolau, Maui, to be carried to their respective sugar plantations, for purposes of irrigation.

So far as I am informed, this application is new, in its nature. It is not for land, nor, as I understand, for an absolute sale or grant of the waters of the streams mentioned in the application. The application, is for a license; the license to take and use water, conveying the same in part over several government lands.

Several questions are suggested upon the matter of which the more important appear to be.

1st Has the Minister of Interior the power and authority to make such a grant?

2nd What can be conveyed or granted? &

3rd Is the use asked by the application contemplated by our law?

Upon these questions, my opinion is as follows:

The great act of 1848, confirming the gift of lands to the people, as made by Kamehameha III, confers upon the Minister of the Interior, full power to direct, superintend and dispose of said lands; provided however that the terms and

conditions of sale should be approved by the King in Privy Council. No further provision or restriction was made by law till the year 1859 when the Civil Code was published as then revised and became the law of the land. Sections 39, to 48 inclusive refer to government lands and Kingdom property. Section 42 expressly provides that "by and with the authority of the King "in Cabinet Council," he shall have "power to lease, sell or otherwise dispose of the public lands and other property in such manner as he may deem best for the promotion of agriculture and the general welfare of the Kingdom subject however to such restrictions as may from time to time be expressly provided by law." By the terms of section 40, "streams, ponds, springs, "watercourses" to constitute part of such property. Section 48 prohibits said Minister from disposing of certain springs and ponds near Honolulu and all other government water ponds, springs and streams "which may be valuable for public use." By the laws of 1874, chapter 24, the Minister is prohibited from selling any land the value of which is over $5,000 without the consent of the King in Privy Council. No other laws have been passed affecting the question. Subject, therefore to the provisions of these sections read together, the Minister of the Interior has full power to make the grant asked, for it will be seen that the law of 1874 does not apply. For the purposes of the case in hand, it needs only the consent of the King in Cabinet Council. It may be claimed that the provisions of section 48 prohibit the disposal of the water asked for. The answer to this is that as there are no cities, towns or villages, and at best but a very sparse population in that region and the waters from time immemorial run waste into the sea there can be no public use for which they are so valuable as to prevent a disposal. In addition to which, the provisions of Section 48 probably apply only to absolute alienations of title.

The application asks for the right to take water. It asks a grant of a license which may be made by deed of lease.

The answer to the third question seems to me to be very clear. It is asked that water may be taken for the purpose of irrigation, in short for the uses of agriculture, an interest particularly specified as one which the government should foster and encourage and for which a disposal of the public property may be made. The Reciprocity Treaty having passed and a brighter future opening for the country, it becomes the duty of the Government to aid and foster in every possible way, the agricultural interests of the country upon which our prosperity mainly depends. In offering and furnishing such aid anything like a monopoly must be guarded against. The government acts for all parties and should endeavor to distribute equally whatsoever of favor it may have, or, as, in this case when no favor is asked but a license is requested to guard against any injury to private rights by the establishment of any monopoly.

At some future day the government as is the case in some of the European nations may undertake the work of carrying water from place to place as, the country may need, but at present is not prepared to engage in any such development of internal resources, and for such water may demand a reasonable compensation. Its ponds, springs and streams are valuable and should be guarded and protected. Until, the government is ready to undertake such work no obstacle should be thrown in the way of others, who are able and ready, to commence such work. It seems a fit and proper thing to grant the application made by Messrs Castle and Cooke, reserving certain rights to the government as will be hereinafter specifically set further. The applicants propose to begin work immediately, they have already gone to

considerable expense as I am informed in surveys. At present of course the work is largely experimental if successful it will largely increase the value of their lands as well as those adjoining. In this the whole nation will join indirectly, and it is but just that very liberal terms should be made. It is desired to begin at once for the purpose of allowing that, I would suggest that an answer be sent to Castle and Cooke, immediately containing the following conditions and terms.

"The Government will grant to the Haiku Sugar Company, Alexander and Baldwin, James M. Alexander, the Grove Ranch Plantation and Captain Thos H. Hobron and their respective successors, heirs and assigns, the license to take water from the streams named in the application and to carry the same over all government land intervening between the said streams and the remotest land to which it is now desired to carry said water, for the period of twenty years from date of acceptance of these terms, at an annual rent of one hundred dollars, upon condition:

1st That a sufficient ditch, canal or other waterway shall be at once commenced and finished in a reasonable time.

2nd *That this grant shall not interfere with the rights of tenants upon said lands or streams.*

3rd Nor shall it in any way affect the right of the government to grant to any person or persons the right to take water (not, to interfere with the water hereby granted) from the same or other streams to be carried over the same land or lands for any purpose whatsoever, and if need be, to be carried through the ditch, canal or other waterway to be constructed by these grantees, provided however, that during the said period of twenty years the supply of water, a right to take which is hereby granted, shall not be diminished by act of the government; and

4th That at any time during said period the government may purchase the said canal, ditch or other waterway upon payment of the actual cost thoroughly, and in case of such purchase will continue to furnish water to these grantees at a just, and reasonable rate not to exceed that paid by other parties taking water from such ditch or other waterway.

In case such a communication is sent and accepted, all rights of the government will be reserved, the work can begin at once, and the necessary deeds drawn up, in accordance with the above terms at a more convenient day.

I return herewith the application of Messrs Castle & Cooke… [HSA, Interior Department Box 55 – 1866-1887; Water: Maui & Molokai]

September 8, 1876
Castle & Cooke, Agents of the Haiku Sugar Co., Alex & Bald., J. M. Alexander and J.H. Hobron for and in behalf of the Grove Ranch Plantation;
to W.L. Moehonua, Minister of the Interior:
…We beg to acknowledge the receipt of your Communication of Sept. 7th in reply to our application of Aug 21st and stating the terms and conditions under which you are willing to grant the Haiku Sugar Co. Mess Alexander & Baldwin, James M. Alexander and T. H. Hobron for & in behalf of the Grove Ranch Plantation certain water privileges from the streams of Nailiilihaele, Kailua, Hoalua, Holawa & Honopou.

In reply, we beg to state to your Excellency that we accept the terms offered.

We enclose our check on Bishop & Co. for $100 being the amount for the first year's rental of said water privileges.

Thanking you for the favourable responses to our application. We remain, Your Excellency's Obedient Servants… [HSA, Interior Department Box 55 – Water Maui & Molokai, 1866 – 1887]

September 12, 1876
Castle & Cooke, Agents; to W. L. Moehonua, Minister of Interior:
…As the Honolulu Agents for the Grove Ranch Plantation are not now ready to assume the responsibility of making the owner of that Plantation a party to the proposed agreement with the Government in regard to a water lead from the streams in Maui, mentioned in our letter of the 21st Aug. current, and as we have no authority otherwise to make him such party, we respectfully request, that the Grove Ranch Plantation, or the owner, be not made a party to the proposed agreement.

We, presume that Mr. T. H. Hobron, being a first Mortgagee on that Plantation, and also a party to the agreement will protect its interests… [HSA, Interior Department Box 55 – Water Maui & Molokai, 1866 – 1887]

September 13, 1876
William L. Moehonua, Minister of the Department of the Interior, Kingdom of Hawaii; to J.M. Smith, President Haiku Sugar Company, et al.:
Agreement Between Hamakua Ditch Company and Hawaiian Government
AN INDENTURE made and concluded this 13th day of September A.D. 1876 by and between William L. Moehonua Minister of the Department of the Interior of the Kingdom of the Hawaiian Islands of the first part and the Haiku Sugar Company a corporation established under the laws of the said Kingdom and Samuel T. Alexander and Henry P. Baldwin doing business as copartners on the Island of Maui in said Kingdom under the firm name of Alexander and Baldwin and James M. Alexander of said Island of Maui and Thomas H. Hobron of the City of Honolulu, in the Island of Oahu in aid Kingdom of the second part. Whereas the said parties of the second part being desirous of using for irrigation and otherwise the water of certain streams hereinafter named by conveying the same by means of a ditch canal pipe aqueduct or other watercourse by them to be constructed over certain lands situated on said Island of Maui and amongst them certain lands of the Hawaiian Government have recently applied to the said party of the first part and requested him that they be secured by the authority of the Hawaiian Government on such terms and conditions as it may deem just to grant unto them the right to take, draw off and use the water of said streams for their own use for purposes of irrigation or otherwise and the right to enter into Government Lands and to dig and construct there-in a water-course whereby to conduct over them the water of said streams and to continue, maintain and repair such water course with full right of egress and ingress upon and out of said lands at any and all times while and so long as the right to use said water shall be granted to them.

AND whereas the said Minister of the Department of the Interior by consent of the King in Cabinet Council has power to sell lease or otherwise dispose of the public lands and other property in such manner as he may deem best for the promotion of

agriculture and the general welfare of the Kingdom, provided that no sale of any land or lot exceeding Five Thousand Dollars in value shall be made without the consent of the King in Privy Council.

AND whereas the water of the said streams has from time immemorial flowed off into the sea and thereby become useless for irrigation or other purposes and it would promote the general welfare of the Kingdom and its agriculture if the same were utilized as aforesaid.

AND whereas the Hawaiian Government is not now ready or willing to incur the expense and undertake the labor of constructing such water course.

Now therefore this INDENTURE WITNESSETH that in consideration of the premises and also of the sum of One Hundred Dollars, paid before the signing and ensealing of these presents by the said parties of the second part to the said parties of the first part for the use of the Hawaiian Treasury the receipt whereof is hereby acknowledged and in further consideration of the promises, covenants and undertakings hereinafter mentioned on the part of the said parties of the second part by them to be kept and performed, He the said William L. Moehonua, Minister of the Department of the Interior of the Kingdom of the Hawaiian Islands by and with the consent of the King in Cabinet Council and by virtue of the authority by law in him vested, doth hereby covenant and grant with and to the Haiku Sugar Company, Alexander and Baldwin, James M. Alexander, and Thomas H. Hobron and their respective successors, representatives and assigns that it shall be lawful for them and their agents and servants and all and every person and persons for the benefit and advantage of them the said parties of the second part and of their respective successors, representatives and assigns from time to time and at all times during the term of twenty years next ensuing after the date of these presents (except as hereinafter provided) to take, draw off, conduct away and use for their own purposes of irrigation or otherwise the water in and from those certain streams and sources of water situate in the District of Hamakualoa in said Island of Maui, known as Nailiilinaile [Nailiilihaele], Kailua, Huelo, Holaua [Holawa], and Honopou and to conduct and cause said water to flow through any watercourse from the said streams or sources of water or any part or portions thereof and over any and all lands of the Hawaiian Government situate in said Island of Maui (except as hereinafter provided) over which it may be for the convenience or interest of the said parties of the second part, their successors, representatives and assigns to conduct or cause said water to flow for their use and purposes as aforesaid and to enter into and upon and pass and repass and dig up said lands and any part thereof in order to construct, maintain, repair, replace and keep in order and use such watercourse and to do all such acts in and upon said streams and sources of water and lands as shall or may be necessary in order to convey and use the water of said streams and sources of water PROVIDED NEVERTHELESS and the continuance of the right herebefore granted is upon this condition the said water course shall be constructed by the said parties of the second part within two years from the date hereof and that existing rights or present tenants of said lands or occupiers along said streams shall in no wise be lessened or affected injuriously by reason of anything hereinbefore granted or covenanted and that the said parties of the second part their successors, representatives and assigns shall pay unto the said party of the first part and his successors the sum of One Hundred Dollars during each and every year in which they shall use the said water as aforesaid by authority of these presents which said sum shall be payable in advance

on the first day of October in each of said years and also reserving and excepting unto the said party of the first part and his successors the right to conduct water or to grant to any other person or persons, corporation or corporations the right to conduct water from said streams and sources of water or from any other streams or sources of water over said lands in such manner and to such extent only as shall not diminish or interfere with the supply or use of the water as hereinbefore granted and secured to the said parties of the second part or impair or render less useful to said parties of the second part their successors, representatives or assigns the use and enjoyment of said watercourse and water. And further provided and it is hereby further agreed that at any time after the King in Privy Council shall have approved of the report of the Commissioners to be appointed under the provisions of an Act "To Develop the Resources of the Kingdom" approved on the 25th day of September A.D. 1876 defining and setting forth a place to develop the resources of the Island of Maui but more particularly in the reference to the Districts of Koolau, Hamakua, Makauao [Makawao] and Kula or any of them the said party of the first part and his successors may purchase of the said parties of the second part their successors, representatives and assigns all the material used in constructing said watercourse and all the right, title and interest, of them, and every of them in and to the same and also may discontinue all the rights of water and way hereinbefore granted upon payment of such sum of money as the construction of such watercourse and material used therein shall have cost to the completion thereof and in addition to such payment agreeing thereafter to furnish said parties of the second part their successors, representatives and assigns with water through such watercourse or otherwise in such quantities as may be required by them to irrigate their respective lands (not exceeding in amount that to which a right is hereinbefore granted) provided such quantity shall flow in such watercourse or otherwise from said streams but not for a longer period than the unexpired term hereof and upon such just and reasonable annual rates as shall in no case exceed the rates paid by any other parties for such water nor in any case during the unexpired term of this grant shall such annual rates exceed five dollars per acre to the grantees or their respective successors, representatives or assigns for land irrigated.

AND it is further agreed that if at the end of said term of twenty years the rights hereinbefore granted shall be granted to any person or persons corporation or corporations by said party of the first part or his successors they shall be offered to be renewed and continued (on like terms and conditions with those herein named) unto the said parties of the second part their successors representatives and assigns for a further term of twenty years. And the said parties of the second part for themselves and their respective successors, representative and assigns, covenant with the said party of the first part and his successors that they will pay said sum of One Hundred Dollars annually as aforesaid and that they will complete said watercourse within two years from date hereof or forfeit and surrender all rights hereinbefore granted unto them, and that in constructing, maintaining or replacing said watercourse that they will do unnecessary damage to said lands.

IN WITNESS WHEREOF the said William L. Moehonua as Minister of the Interior party of the first part and the said Haiku Sugar Company by its President and Secretary and the said Samuel T. Alexander and Henry P. Baldwin and the said

James M. Alexander and the said Thomas H. Hobron parties of the second part have herein set their respective hands and seals the year and day first above named.

William L. Moehonua
J. Mott Smith Pres. Haiku Sugar Co.
Jos. P. Cooke Secy " " "
Alexander & Baldwin per H.P. Baldwin
James M. Alexander
T.H. Hobron by his atty. in fact E.C. Hobron [Bureau of Conveyances, Liber 49:167]

Pacific Commercial Advertiser
September 16, 1876
Letter of Wm. R. Castle, Attorney General:

…On the 21st of August last, an application in writing was made to the Minister of the Interior by Messrs. Castle & Cooke on behalf of Haiku Sugar Company, Alexander & Baldwin, and James M. Alexander, for permission to take water for the purpose of irrigation, from certain streams in Koolau, Maui. The matter was duly considered in Cabinet Council, the request being considered with favor. The view was taken that while at some time the government might undertake the business of carrying water for public purposes and for the benefit of our agricultural interests, yet at present it is not prepared so to do; and that till such time, a wise and liberal policy ought to be pursued and private enterprise promoted in every manner consistent with the public good. The government looks upon the proposal of the above named persons as experimental. The result of that experiment will benefit the whole country, by showing what can be done in that behalf and what the cost of such a work will be.

While the enterprise is not new, as many plantations are now supplied by ditches, yet none so extensive and comprehensive have been attempted. Upon this view the request was granted, and I as law officer of the government, was directed to attend to the preparation of the deed and to see that the rights of the government were protected. The Minister of the Interior at once sent the application to my office for examination, and for the imposition of terms to be proposed to the applicants. On the 7th of September an opinion was sent to the Minister of the Interior… [see letter dated September 7, 1876 above; and lease executed on September 13, 1876]. [Pacific Commercial Advertiser, September 16, 1876:3]

September 25, '76 (1876)
S.T. Alexander; to G.N. Wilcox:

…I am glad to hear of your return to the Islands, & would give a good deal to see you & have a talk with you. I have no doubt but what you have had a splendid trip, & have got lots of information in regard to Machinery, the Manufacture of sugar &c. Were it possible I would beg of you to come up here to Haiku & help us engineer a new ditch, we are about starting, but I suppose that you have been away so long that you feel that you must now stop at home & attend to business. Perhaps however, you will be able to come up in the course of a few months.

The new water ditch I spoke of is going to be the making of Haiku Plantation & will cost from $25,000. to $30,000.– I propose to bring water enough to irrigate from 2000 to 3000 acres of land. There is no question about the water supply from which I

am going to draw being ample. The question is whether the ditch I propose digging is big enough to carry what water I want. The ditch, including all the bends will be about 25 miles long, & we propose giving it a uniform grade of 2 in. to the chain (66 ft.). It is to be 6 ft. broad on top, 3 ½ in the bottom & 3 ½ ft. deep. If this will not carry all the water wantrd, we can enlarge it. We have got a great many shallow, & a few deep ravines to cross.

My theory is that where the digging is good (where there is good hard clayey soil without rock requiring blasting), it will be the best plan to follow round these gulches & only make a short flume over the bottom, so that winter torrents can pass under. The Maliko Gulch however, running through our Plan. is by far the most formidable gulch we will have to contend with. It is 300 ft. deep & 800 feet broad & the sides precipitous & consisting of solid rock. I propose to pipe the water across this gulch. Have a pipe made of boiler iron & riveted, almost 18 in. in diam. which ought to be, I suppose, about 1/10 in. thick at the top of the gulch & increase in thickness up to 3/10 in. at the bottom of the gulch. This pipe, I propose, to dub well with hot tar & pitch. The probability is that we will require two pipes to carry all our water over the gulch.

Now George, I know that you are not much of a letter writer, but I want you to sit down & give me all the information on the subject of ditching you can. The length of the pipe which I propose to put across Maliko Gulch will be just 1100 feet. What will a 24 in. pipe of this length cost me in California? Are the sections of pipe riveted on to another, or have they flanges which are bolted together? Write me soon, as I want to make out my order.

What do you think about "Fryer's Concreter" for making sugar? Is it all that it is cracked up to be?

Is not there some method of clarifying juice better than our use of crude lime?

It seems to me that we darken our sugar very much by evaporating it in an open pan at a high heat to 25º or 30º before finishing off in the Vac. Pan.

Would it not be well now that we have the Treaty & want to make light sugar, to have an extra Vacuum Pan in which simply to evaporate juice before granulating in Vac. pan?

If you can answer these few questions, I will be much obliged… [Hawaiian Mission Children's Society Library – Castle & Cooke Papers, 1850-1915]

Oct. 5th, 1876
Saml. Alexander; to S.W. Castle:

…Your favor of the 2nd inst. is just at hand. I gather from it that the Government may take immediate possession of the new water ditch & prosecute the enterprise themselves.

I am well pleased with this at the same time it fills me with some apprehensions.

We have already decided on a route for the ditch which we regard is by far, the most feasible yet proposed & have commenced work on it. By the end of this work, we will have about one mile of the new ditch completed.

Now it is possible that certain parties on this island, who have "axes of their own to grind", will try & secure a different route for this ditch. This, to say the least would occasion a great deal of delay.

Again, there is a great deal of "red tape" about Government & their enterprises are not always pushed with sufficient energy.

Large bodies, I note move slowly.

As soon as it is known that this has ceased to be a private enterprise & has become a Gov. job, then there will be many applicants for the management of the enterprise, as well as subordinate positions as overseers etc. This may occasion unnecessary expense as well as serious delay. I do not wish to see the ditch cost more than is necessary, as its cost will determine to some extent the charge to be made on water in future; nor do I wish to see the enterprise delayed for one moment. Time with us is more than money.

Now if this is to be the Gov. ditch, I ask the Gov. for the general management of the enterprise, & I am satisfied that with the assistance of Baldwin and J.M. Alexander, it will be pushed forward with all possible dispatch, as well as with the utmost economy.

I question whether the Gov. have any better opportunities of securing help than we have. More than this, I should often be able to put on from 50 to 100 plantation hands. I have at present a force of 30 men regularly at work.

Before turning the ditch over to the Gov. it would be wise to consider all the pros & cons, & make the necessary stipulations… [Hawaiian Mission Children's Society Library – Castle & Cooke Papers, 1850-1915]

October 31, 1876
Wm. R. Castle, Attorney General; to Wm. L. Moehonua, Minister of the Interior:

…Herewith, I send to you the draft leases prepared for the lease of water &c. on Maui, to the Haiku Sugar Company and others. It will be observed that in some respects it differs very slightly from the agreement in brief originally entered into. The changes have been made, Not by myself, at my own volition but as the result of Cabinet consultation. It is believed that now the rights of both parties are sufficiently protected, while the enterprise of the lessees is sufficently recognized and rewarded by the Government.

Will you have two copies prepared, from this draft, for execution… [HSA Interior Department Box 55 – 1866-1887; Water: Maui & Molokai]

Pacific Commercial Advertiser
November 8, 1876
East Maui Ditch.

Mr. S.T. Alexander is actively pursuing this great work, which will be the largest undertaking of the kind in the country. He has engaged a number of the shipwrecked sailors of the late Arctic fleet, which will increase his gang now at work on the ditch to about one hundred men, and there is every prospect of its early and successful completion. He expects to avoid a number of miles of ditching by crossing ravines in wrought iron pipes about thirty inches in diameter. The ditch will probably carry water sufficient to irrigate from one to two thousand acres of land, and will transform the cultivation of cane in Haiku and the lower western slopes of Haleakala from a matter of a doubtful two and a half tons per acre, to a uniform and certain five tons per acre, raising the receipts from $375.00 to 750.00 per acre, as it has done in Lihue, Lahaina and other places. [Pacific Commercial Advertiser, November 8, 1876:3]

April 11th, 1877
Saml. Alexander; to S.W. Castle:

…Your favor of the 6th inst. in relation to the grade of this Hamakua Ditch has been received. Before surveying the route of our present ditch, I took my precaution to obtain the requisite data in regard to the best grade to be adopted. I have read a great deal in books & newspapers on the subject & have got a good deal of valuable information from parties familiar with ditching in California. I have also observed the ditches on Maui as well as those at Waihee. The result is that I am fully satisfied that 2 inches to 66 ft. is not a too high grade for our Hamakua Ditch. In Cal. many ditches of the same size as ours have a fall of 3 inches to 66 ft. Of course everything depends on the size of the ditch as well as the quality of the soil through which the ditch is dug. In this latter respect, we could not wish anything better. The Hamakua land is composed of rotten stone and a hard clayey soil. Mr. Wilkins, who is familiar with most all the ditches of California, says that our soil for good ditching, beats everything he has seen in Cal. In digging the new Waihee ditch, which has nearly the capacity of the Hamakua Ditch, we are now digging, we gave the first mile & a half a grade of 3 in. to 66 ft.; the next mile & a half 2 in. to 66 ft.; the balance 1 in. to 66 ft. No harm has resulted from the high grade of the first three miles; the ditch is perfectly sound in every respect, while the latter part of the ditch, which has 1 in. fall to the chain, has occasioned a good deal of trouble. The water flows through it so sluggishly that it fails to carry off the mud deposits of the winter season, & has to be cleared out every year.

At Lihue I noticed that the fall of the various ditches was about 1 1/4 in. to 66 ft. This was sufficient though the ditches would have stood a higher grade.

In constructing our Hamakua Ditch, my plan has been to give it as high a grade as the soil would stand without wasting. The advantages are —

1st That we secure a large volume of water without the expense of digging a very large ditch.

2nd A smaller proportion of water is lost by soakage than would otherwise be the case.

3rd The rapid passage of the water through the ditch, will keep it clear of all deposits, thus saving an immense amt. of labor in not having to clear the ditch out every year.

You can rest assured that we did not decide haphazard on the present grade of the Hamakua Ditch, but only made up our minds after obtaining ample data on the subject… [Hawaiian Mission Children's Society Library – Castle & Cooke Papers, 1850-1915]

Pacific Commercial Advertiser
July 14, 1877
The Maui Ditch.

Our Makawao friends are justly proud of their new irrigation works, the completion of which, celebrated quite appropriately on the 4th inst, marks a new era in Island agriculture. For with the secured success of the "big ditch" on Maui, we may confidently expect in the near future the commencement of similar enterprises in various parts of the Island, whereby the wealth of water now running to waste be made to largely contribute to the national prosperity. The writer of this paragraph may perhaps be pardoned for remembering at this time, that in years past and particularly in 1872, he strongly urged in these columns the plan of bringing the waters of East Maui on to the Makawao side, at a time too when high officials of the government estimated the cost at an enormous sum, and people generally looked upon the idea as quite utopian. But we hope and expect to see, within a few years, the completion of irrigation works on a large scale on all the islands of this group. The construction of such works by government aid would be a species of public improvement the wisdom of which would require no defense. A correspondent at Makawao, writing on the 4th inst. says:

> "The great display of the day was at Haiku, where several hundred Natives and Foreigners assembled to celebrate the completion of the BIG DITCH, and to see for themselves, the water from the mountain gushing through great iron pipes, emptying itself into the ditch, and rolling on to the valley, and spreading over the cane fields, making the earth glad with its presence. The motto, "THE GRASS GROWS AND WATER RUNS," was pointed on canvas and stretched across the principal avenue; flags were flying apparently from every bush,—the Wailuku brass band was in attendance and discoursed screech music. Too much credit cannot be bestowed upon Messers. Alexander and Baldwin for their perseverance and energy in completing so great and valuable an enterprise." [Pacific Commercial Advertiser; July 14, 1877:3]

September 8, 1877
Hamakua Ditch Co.; to J.M. Alexander:
Deed.

Know all men by these present that we The Haiku Sugar Company, Samuel T. Alexander and H.P. Baldwin doing business under the firm name of Alexander and Baldwin and James M. Alexander, all of the District of Makawao, Maui, H.I., and Thomas H. Hobron of Honolulu, Oahu, the aforesaid parties being joined in business and known as the Hamakua Ditch Company, for and in consideration of the sum of Three hundred and seventy five dollars to us in hand paid by James M. Alexander of Haiku, Maui, the receipt whereof is hereby acknowledged, do hereby give, grant, bargain, sell and convey unto the said James M. Alexander all of that certain piece or parcel of land, known as Waipio Komohana in Hamakualoa, Maui, and more

particularly described in Land Commission award No. 2937, recorded in Liber 10. S.C.A page 143 &c, being the same premises conveyed by William Harbottle to Charlotte H. Adams, by deed recorded in Liber 7 page 320 &c, in the Registry of Conveyances in Honolulu.

To have and to hold the said premises unto the said James M. Alexander, his heirs, executors, administrators and assigns forever, saving and reserving to themselves as the Hamakua Ditch Company, the use of all the water on the said tract *mauka* of the line of their present water ditch together with the right of way for said Ditch over the said premises, and the rights to construct other water ducts on the said premises for the purpose of diverting the water hereby reserved as aforesaid into the main ditch, reserving the said water and rights to themselves, their successors and assigns, heirs, executors and administrators…

J. Mott Smith, Pres. Haiku Sugar Co.
Joseph P. Cooke, Sec. Haiku sugar Co.
Alexander & Baldwin
James M. Alexander
W.F. Sharratt for T.H. Hobron… [Bureau of Conveyances, Liber 55:204-203]

The Hamakua-Haiku Irrigation Ditch
(F.L. Clarke, in Hawaiian Annual, 1878)

In the past the want of an abundant supply of water has seriously interfered with the cultivation of sugar-cane in many, otherwise favorable localities on these islands. Now, under the encouragement given to the agricultural industries of the group, attention has been called to the water supply to be obtained for irrigating purposes at various points; and with that energy had far-seeing sagacity which is characteristic of the management of the Haiku Plantation on Maui, the right was secured from the government, to use the water flowing in streams down the broad slopes of Haleakala to the east of the plantation, and work was at once commenced on the ditch.

The line, some seventeen miles in extent, with the exception of a few miles near the plantation, passes through the dense forest that covers the side of the mountain, and in running the levels for the work many large ravines and innumerable small valleys and gulches were encountered. In the smaller of these the ditch winds its way, [page 39] with here and there a flume striding across the hollow, while through nine of the larger the water is carried in pipes twenty-six inches in diameter.

The digging of the ditch was a work of no small magnitude. A large gang of men, sometimes numbering two hundred, was employed in the work, and the providing of food, shelter, tools, etc., was equal to the care of a regiment of soldiers on the march. As the grade of the ditch gradually carried the line of work high up into the woods, cart-roads had to be surveyed and cut from the main road to the shifting camps. All the heavy timbers for flumes, etc., were painfully dragged up hill and down, and in and out of deep gulches, severely taxing the energies and strength of man and beast, while the ever-recurring question of a satisfactory food supply created a demand for everything eatable to be obtained from the natives within ten miles, besides large supplies drawn from Honolulu and abroad.

At the head of the work many difficult ledges of rock were encountered, and blasting and tunneling were resorted to,—to reach the coveted water. While work on the ditch was thus progressing, pipe makers from San Francisco were busied riveting together the broad sheets of iron to make the huge lengths of tube fitted to cross the deep ravines. These lengths had each to be immersed in a bath of pitch and tar which coated them inside and out, preserving the iron from rust, and effectually stopping all minute leaks. The lengths thus prepared being placed in position in the bottom of the ravines, the upright lengths were fitted to each other (like lengths of stove- pipe) with the greatest care, and clamped firmly to the rocky sides of the cliffs. Their perpendicular length varies from 90 feet to 450 feet; the greatest being the pipe that carries the water down into, across, and out of Maliko gulch to the Baldwin and Alexander, and Grove Ranch Plantations. At this point everyone engaged on the work toiled at the risk of his life; for the sides of the ravine are almost perpendicular, and a "bed" had to be constructed down these sides.

Then each length of pipe was lowered into the ravine and placed carefully in position; after which the perpendicular lengths were built up to the brink. In such places the pressure of water upon the bottom lengths is very great, and the thickness of the pipe is proportionally increased.

The mouth of each length of pipe, where the water flows in from the ditch, is fitted with a trumpet-shaped box opening out from the diameter of the pipe, to the sides of the "sand-box" placed so as to catch sediment. Heavy gratings cover these boxes in order that no floating material may get into the pipes. In the ditch itself, what- [page 40] ever may be its general grade, the last 500 feet next each inlet end of pipe is reduced in grade to almost a level, and correspondingly widened.

Along the line of the ditch it is interesting to note the nature of the soil through which it is dug. Many miles pass through an underlying strata of red clay which makes a compact, water-tight bed: while in other places the soil was only made to "hold water" by packing it solidly. There is but little waste of water from soakage, far less than was anticipated, and in the pipes none at all from leakage. The grade varies considerably, being as high as twelve feet to the mile in places, and again descending with hardly a perceptible incline.

In going through the forest very many romantic views are obtained, and a rich botanical region traversed by the upper end of the ditch.

The whole work cannot yet be said to be completed, for although the water supply was introduced to Haiku's fields July 4th, 1877, within a year from its inception, it is the aim of its projectors to continue on the work till it reaches the Nailiilihaele gulch, thus taking in six principal streams for their supply, as per grant from government, viz.: Honapau [Honopou], Holawa, Huelo, Hoalua, Kailua and Nailiilihaele. The ditch is now as far as Hoalua gulch, and will be continued during the winter as the weather will permit.

Already Hamakua has awakened to participate in the benefits of the scheme, for since July there have been over 300 acres of land plowed up and planted with cane.

The cost, including all the finishing work is about $80,000, for which sum, the Company that owns the work have secured a watery Bonanza. Other works of a like

nature will probably be projected and carried out on the islands in the near future, but the original "big ditch" will always stand as a monument of intelligent enterprise energetically applied and prudently directed. [Clarke, in the Hawaiian Annual, 1878:39-41]

May 27, 1878
Wm. H. Halstead; to Mr. Smith, Minister of the Interior:
…I would like to know what you will lease the streams of:

Papaaea, Hauola, Oopuola, Makanali, Aahuali, Kolea, Wahinepee, Waiakamoi, Kapu, Mahoe all in Hamakua district of Makawao per annum. As parties have written to enquire please make no bargain with anyone else until we meet… [HSA, Interior Department, Land Files]

June 24, 1878
Claus Spreckels, Petitioner; to His Majesty Kalakaua, King of the Hawaiian Islands & the Ministry in Cabinet Council assembled:
…The undersigned most respectfully petitions and asks, that, in consideration of the sum of five hundred dollars ($500.-) to be annually paid in advance by the undersigned to the Hawaiian Government, and in consideration of the great and manifold advantages that will accrue to said government by the construction of a large and extensive system of irrigation works on the island of Maui, whereby a large district, now lying waste, will be brought to a high state of cultivation, and in further attention of the stipulations and agreement hereinafter contained and set forth, That the Minister of the Interior of the Hawaiian Kingdom be instructed to grant to the undersigned, his successors, administrators & assigns petitioners for the term of thirty (30) years, all the waters not heretofore utilized running from and on the northerly and northwesterly slopes of Mount Haleakala in streams, creeks or other watercourses into the Pacific Ocean in the Hamakua, Koolau and Hana Districts, and more definitely described as being located between the extreme eastern point of the island of Maui in the Hana District, called Kauiki Head, and a deep gorge known as the Maliko Gulch in the Hamakua District, on the island of Maui, Kingdom of Hawaii, also to grant the right to convey the said waters or such portion or proportion of the same as the petitioner his successors, administrators or assigns may elect, in one or more canals, ditches, flumes, tunnels, pipes or otherwise, over, through or above such lands in the above described districts, in any and all directions that the petitioner, his successors, administrators or assigns may deem proper and desirable. The aforesaid waters to be conducted and conveyed in and through such conduits or aqueducts to the tracts of land commonly known as the Wailuku and Waikapu Commons on the Island of Maui, and to be utilized and applied thereon for irrigation and other purposes, and on such tracts of land as the petitioner may acquire, or to be otherwise disposed of for the above purposes.

If, at the expiration of the thirty (30) years, for which term the above franchise and rights are asked to be granted, the Hawaiian Government should wish to acquire the above conduit or aqueduct, or conduits and aqueducts, they shall then pay to the petitioner, his successors, administrators or assigns the value of the aqueduct property at that time, said value to be determined by a commission of three residents of the Hawaiian Islands, one to be selected by the Hawaiian Government, the second by the petitioner his successors, administrators or assigns, and the third by the two commissioners thus selected and appointed. Upon the payment of the sum of money

so determined, to the petitioner his successors administrators or assigns, he or they shall convey quiet claim and surrender to the Hawaiian Government the aforesaid aqueduct property, provided, that the Hawaiian Government at the same time enters into an agreement with the petitioner his successors, administrators or assigns, that it will furnish and deliver for the term of an additional thirty (30) years, to the petitioner his successors administrators or assigns, at the outlet or westerly terminus of the said aqueduct or aqueducts and through and by means of the same and from the creeks and watercourses heretofore stipulates all the water that the aqueduct or aqueducts are capable of delivering and conveying at the time of the transfer on such portion or proportion of such quantity of water, as the petitioner his administrators or assigns may require.

For the water so required, delivered and measured, the petitioner his successors administrators or assigns agrees to pay to the Hawaiian Government at the rate of one dollar ($1.) for every one hundred thousand (100,000) cubic feet of water; provided that the Hawaiian Government furthermore agrees to keep in repair during the aforesaid additional term of thirty (30) years at its own expense and without cost or charge to the petitioner his successors, administrators or assigns, all dams, flumes, intakes, tunnel, aqueducts, pipes or conduits, which constitute the aqueduct property conveyed. Also to use all reasonable diligence, proper care, the best of materials and workmanship in repairing and reconstructing the broken or damaged portions of said works. If the Hawaiian Government shall neglect to keep the ditches aqueducts or conduits etc. in repair, then the petitioner his agents successors administrators or assigns shall have the right to enter upon and repair said property, the cost of which repairs to be deducted from the water rents due or coming due to the Government.

If at the end of the first term of thirty (30) years, the Hawaiian Government should not be desirous of purchasing the aforesaid aqueduct property, it shall offer to the petitioner his successors administrators or assigns, an extension of the original franchise, grants and privileges, for an additional term of thirty (30) years, on the same terms as herein stipulated.

The petitioner, his successor administrator or assigns agrees to commence work on the above aqueduct line within one year from the granting of this franchise, and to construct not less than five (5) miles or 26400 linear feet of aqueduct ditch, flume or pipeline per annum thereafter until the Naehilihili [Nailiilihaele] streams has been tapped. The petitioner, his successors administrators or assigns to be at liberty to extend their aqueduct or aqueducts to or towards the streams located beyond or easterly from the Naehilihili stream at any time during the thirty (30) years, whenever in his or their judgment a larger supply of water is wanted to meet their growing requirement.

Claus Spreckels, Petitioner
Honolulu, June 24, 1878
[HSA, Interior Department Box 55 – 1866-1887; Water: Maui & Molokai]

July 1, 1878
Crown Lands Estate; to C. Spreckels
Lease of Honomanu
Bureau of Conveyances, Liber 55:230-235
(See Executed Lease Agreement of November 19, 1878.)

Kinau Hale – July 3rd, 1878
Saml. G. Wilder, Minister of Interior; to C. Spreckels:
At a Cabinet Council held this day there were present:

His Majesty Presiding
His Excellency Sam'l. G. Wilder, Minister of the Interior
His Excellency J. M. Kapena, Minister of Foreign Affairs
His Excellency S. K. Kaai, Minister of Finance
His Excellency E. Preston, Attorney General

The minutes of the last meeting were read and approved.

A petition was received from Claus Spreckels of San Francisco, California, United States of America asking for a franchise and right to build an aquaduct or Watercourse for irrigation and other purposes in the Island of Maui in this Kingdom and his petition having been carefully discussed and considered in all its bearings is hereby granted, accepted and adopted and the Minister of the Interior is hereby authorized and directed to make out execute, acknowledge and deliver to the said Claus Spreckels the deed asked for in said petition.

I hereby Certify that the above is a true and faithful copy of the minutes of the Cabinet Council in which the petition of Claus Spreckels was received and considered and a franchise was concurred upon with the consent and sanction of His Majesty the King in full Cabinet Council Assembled as entered in the Records of said Council.

Samuel G. Wilder
Minister of the Interior…
[Bureau of Conveyances, Liber 57:201-202]

July 8, 1878
Samuel G. Wilder, Minister of Interior; to Claus Spreckels
Lease
This Indenture made and concluded this Eighth day of July A. D. 1878, by and between His Excellency Samuel G. Wilder as Minister of the Department of the Interior of the Hawaiian Islands by and with the authority of the King and his Ministry in Cabinet Council assembled party of the first part, and Claus Spreckels of San Francisco State of California United States of America party of the second parts. Whereas the said party of the second part being desirous of utilizing for irrigation and otherwise the waters not heretofore utilized running in and through certain streams, creeks or watercourses on the Island of Maui and hereinafter named by conducting said waters through and by means of a water course or aqueduct, by him to be constructed has applied to His Majesty the King and his Ministry in Cabinet Council assembled to be secured by authority of law, and of the Hawaiian Government in so doing and whereas such application has been duly considered and

deliberated upon by the King and His Ministry in Cabinet Council assembled and the franchise asked for by the party of the second part on the terms and conditions hereinafter named, is by the King and His Ministry in Cabinet Council assembled deemed and considered to be for the benefit of the agricultural interests, and the general welfare of the Hawaiian Kingdom. And whereas the expenses and labor required for constructing such watercourses and aquaducts and conducting therein the waters of the hereinafter named streams, and utilizing such waters for purposes of irrigation and otherwise are great and the Hawaiian Government is not now ready or willing to undertake such works and incur such expense. Vows therefore this Indenture of the one witnesseth that in consideration of the promises and of the covenants promises and undertakings of the said party of the second part hereinafter set forth and to be kept and performed by him or his successors administrators executors or assigns/and subject to the several conditions and reservations herein after named, and in consideration of the annual rental of five hundred dollars $500, to be annually paid in advance by the party of the second part to his Excellency the Minister of the Interior for the rights and franchises hereinafter granted, he the said Samuel G. Wilder as Minister of the Interior Department of the Hawaiian Kingdom by and with the authority of the King and his Ministry in Cabinet Council assembled, and by virtue of the authority by law in him rested, doth hereby for himself and his successors in office covenant and grant with and to the said. Claus Spreckels his heirs executors administrators and assigns. That it shall be lawful for him the said Claus Spreckels and for his successors administrators executors or assigns and for his or their servants and agents, and for all persons or corporations acting by his or their authority from time to times and at all times during the term of thirty, 30, years ensuring after the date of these presents to take draw off conduct away and use the waters not heretofores utilized of the hereinafter named creeks streams water sources and watercourses and flowing in and through the same from and on the northerly and northeasterly slopes of Mount Haleakala on the island of Maui Kingdom of Hawaii into the Pacific Ocean, said streams, creeks, or watercourses being situated and located in the Hamakua and Koolau districts on the said island of Maui, and being described and known by the following names to wit. – Haleaku [Halehaku], Ululole [?], Honopolul, Hoalava [Holawa] and a creek next to the Hoalava, Waipio, Huelo, and its west branch Alua [Hoalua], Kailua, Nailiilihaele, Papaaea, Hauola, Opoula [Oopuola] and Makanale, Kaaiea, Laanokiopihi [Laaukiopihi], Puunaluu [Punaluu], Pohakuhono [Pohakuhonu], and Kolea, Waiakamoi and its west branch Wahine Pee, and its West branch sometimes called Nahae, Puu Mahoe nui, so far as respects the Governments rights on the last mentioned stream. And for the purposes aforesaid the said Samuel G. Wilder as such Ministers as aforesaid both grant to the said Claus Spreckels, his successors administrators executors or assigns, the full rights and privileges to construct such ditches aquaducts and pipes in such manner and locations and of such sizes and dimensions as in his or their judgment seems proper, and the full rights privileges and authority and power to take draw off and conduct away by means of and in, and through such aquaducts from and out of the above named streams and watercourses, all the waters that are running in and along the same, and that are not utilized on or before the date of these presents with full power and authority for all or any the purposes aforesaid from time to time and at all times during the said term, to enter upon all government lands. Through which it shall or may be necessary for the said, ditches pipes or other aquedcuts to pass, for the purpose of constructing repairing or maintaining the same. Provided that the grant hereby made and the carrying out of the enterprise proposed by the party, of the second part shall not interfere with prior or vested rights, of the parties in and to the

waters of the streams herein before mentioned or in or to any of the said Government lands. And it is hereby declared and agreed that the party of the second part his successors administrators executors or assigns shall be allowed the period of three (3) years from the date of these presents to construct the aqueduct with one or more pipes through each one of such gulches where in his or their judgment pipes may be required from the northeasterly boundary of the tract known as the Wailuku common to the Nailiilihaele stream, and that the northeasterly stream of the above granted list of streams from which at the end of the years from the date of these presents the said Samuel G. Wilder as such, Minister as aforesaid for himself and his successors in office agrees to supply by means of such aqueduct to the party of the second part, his successors, administrators, executors or assigns, such quantities of water as the ditch or aqueduct will deliver running full to its maximum capacity for every day during an additional term of thirty years. The water rates to be paid for the water so delivered to be agreed upon for terms of ten years at a time between the Government and the party of the second part his successors, administrators, executors or assigns. Should they not be able to agree upon terms then each party shall appoint an arbitrator, and the two so selected shall appoint a third and the decision of the three arbitrators or majority of them to be final. If during the term of thirty years for which this franchise is granted the Government shall not purchase the property in the manner heretofore stipulated and agreed upon. Then at the expiration of this term of thirty years, the Government shall renew the grant to the party of the second part his successors, administrators, executors or assigns for an additional term of thirty years and the annual rental to be paid by the party of the second part his successors, administrators, executors or assigns, to the Government, for the lands, water, rights and privileges granted, shall be agreed upon between the Government and the party of the second part, his successors, administrators, executors or assigns, for terms of from ten to ten years at a time. If the two parties cannot agree upon the rent then it shall be left to the decision of three arbitrators, each party to appoint one, and the two so selected to appoint a third and the decision of the three arbitrators or a majority of them to be final. And the said Claus Spreckels for himself, his heirs, successors and administrators, doth hereby covenants promise and agree with and to the said Samuel G. Wilder as such Minister as aforesaid, and his successors in Offices that he the said Claus Spreckels shall and will with all convenient speed, commence and carry out the said works, and will pay the said rent and water rates in manner hereinbefore mentioned. In Witness whereof the said Samuel G. Wilder as such Minister as aforesaid hath hereunto set his name and caused the seal of his Department to be affixed and the said Claus Spreckels hath hereunto set his hand and seal the day and year first above mentioned.

Samuel G. Wilder
Claus Spreckels
[Bureau of Conveyances, Liber 56:77-82]

July 8, 1878
Hamakua Ditch Co.; to C. Spreckels
Agreement

This Agreement made this eighth day of July A.D. 1878 between the Haiku Sugar Company a Corporation of the Hawaiian Islands, S.T. Alexander and H.P. Baldwin doing business on the island of Maui, one of the said Hawaiian Islands under the style of Alexander and Baldwin, W.F. Sharratt, S.B. Dole, W.O. Smith, and A.H. Smith doing business on the said Island of Maui under the style of W.F. Sharratt and Company and J.M. Alexander, the parties of the first part doing business on the said Island of Maui as the Hamakua Ditch Company, and Claus Spreckels of San Francisco, of the State of California, one of the United States of America, of the second part, witnesseth. That whereas, the said Claus Spreckels, intends to construct a water course on the said Island of Maui, *makai* of the present water course of the said, Hamakua Ditch Company, now therefore the said parties of the first part in consideration of the premises, hereby grant to the said Claus Spreckels a free water way across the lands in their possession or which may hereafter come into their possession, for the construction and maintenance of the said proposed water-course, according to the general line of survey lately made by the said party of the second part. And the said parties of the first part, in consideration of the premises, hereby covenant and agree with the said party of the second part, to relinquish to him any and all water rights, which they or any of them may now have or hereafter acquire in any of the streams between the Halehaku and east branch of the Nailiilihaele streams, both inclusive and especially in the Waipio - stream below such points or levels, where the parties of the first part, can take the water out of such streams, and conduct it to their said present water-course, by its own gravitation. That they will take no water from the streams flowing across the line of their water-course except from those mentioned in the Government grant to them to wit, – the Nailiilihaele, Kailua, Hoalua, Huelo, Holawa and Honopou streams and the Halehaku, Opana and Waipio streams. That they relinquish to the party of the second part, all rights they or any of them may now have or hereafter acquire in any streams, east of the east branch of the Nailiilihaele stream, and that they will not use any of the surplus water after filling the pipes of their present water course to irrigate lands on the line of their water-course. And in consideration of the premises, the said party of the second part, hereby covenants and agrees with the parties of the first part that he will not interfere with their acquiring the right to take the water of the Halehaku stream, at such point whence it can flow into their water-course by its own gravitation. That they shall be entitled to fill their present single line of twenty-six inch pipes with their present grade, that is, that the bottom of the inlet and outlet of the pipes shall remain on their present respective levels, that they may remove the upper ten feet of their pipes and replace such parts removed with suitable mouth-piece, it being understood that the maximum amount of water to be delivered by their said ditch as measured near the Halehaku pipe and after having taken in the Halehaku and Opana streams, shall not exceed forty cubic feet a second. That in constructing and maintaining his said proposed water, course, across the lands of the parties of the first part, he will make and keep, in order the necessary fences for the protection of the said water-course, and all necessary bridges, for all existing roads and paths which cut the line of the proposed ditch, and for all future roads which may be established, by the members of the said Hamakua Ditch Company or any of them across the same, and that he will pay for all sugar cane and other property that may be damaged or destroyed by the construction thereof, and for all future damage that may be caused by the said ditch to the property of any of the parties of the first part, and that he will sell and furnish to the parties of the first part, at such points along the said proposed water, course, as they shall decide upon, water for irrigation at the rate of twenty five dollars a year for each acre covered three inches deep each week, in amount as follows, if the water delivered in the proposed water course on the north easterly line of the Wailuku Commons, shall be sufficient to irrigate only or less than five thousand acres of land three inches deep each week, then the parties of the first part shall be entitled to ten percent of the whole amount at the said rates, but if the quantity of water delivered at the Wailuku Commons as aforesaid shall exceed that amount or be more than sufficient to irrigate five thousand acres three inches deep each week, then in that case, the parties of the first part shall be entitled to sufficient water to irrigate five hundred acres of land three inches deep each week, at the above mentioned rates. It is hereby further mutually understood and agreed, that the party of the second part shall not, be liable in damages in case the water furnished to the parties of the first part, according to the said stipulations should fall below the quantity necessary to irrigate five hundred acres. And it is further agreed that all parties to this indenture shall endeavor to protect the forest growth on the northerly and north easterly slope of Haleakala, which is located on all the water sheds of the streams between Halehaku and Nuailua next east from Honomanu both inclusive, which they may now own or control or which they hereafter own or control. And it is further agreed, that this indenture shall remain in force for thirty years from the day of the date hereof, or until such time less than thirty years as the rights of water of the contracting parties hereto to water privileges in connection with their respective ditches as granted by the Hawaiian Government shall expire. It is understood that all the stipulations aforesaid are to apply to and bind the heirs, executors, administrators, successors and assigns of the respective parties hereto. It is further understood that in furnishing water as aforesaid to the parties of the first part, the party of the second part shall not be compelled to cut his ditch for that purpose at more than four points for furnishing the old Haiku Plantation at not more than two points for the Hamakua-poko plantation at not more than two points for Alexander and Baldwin's plantation, at not more than two points for Grove Ranch plantation, and not more than one point for J.M. Alexander's plantation. Witness our hands and seals… [Bureau of Conveyances, Liber 55:208-211]

August 15, 1878
Saml. G. Wilder, Minister of Interior; to Attorneys for the Haiku Ditch Co.:

…I beg to acknowledge your letter of this date, asking a certain amendment to the Contract between the Government and Haiku Ditch Co.

Your letter will receive due consideration, and an early answer… [HSA, Interior Department Letter Book 15:232]

October 7, 1878
Sam'l. G. Wilder, Minister of the Interior;
to Samuel T. Alexander, et al., Hamakua Ditch Co.:
Lease

This Indenture made and concluded this 7th day of Oct. A.D. 1878 by and between Samuel G. Wilder, Minister of the Department of the Interior of the Kingdom of the Hawaiian Islands, of the first part, and the Haiku Sugar Company a Corporation established and existing under and by virtue of the laws of said Kingdom, Samuel T. Alexander, and Henry P. Baldwin both of Makawao, Island of Maui, partners in business under the firm name of "Alexander and Baldwin" James M. Alexander of Maui and Thomas H. Hobron of Honolulu, Island of Oahu, all doing business under the firm name and style of the "Hamakua Ditch Company" of the second part.

Whereas the Hawaiian Government through William L. Moehonua then Minister of the Interior by Indenture dated September 30th A.D. 1876 recorded Liber 49 fol. 167 did grant unto the parties of the second part, for the term of twenty years certain franchises and rights to take water from certain streams on said Island of Maui and the rights to conduct said water through a ditch or water course to be by them constructed and rights of way for the same over Government Lands for the purpose of using said water for irrigation, and otherwise upon certain terms and conditions in said indenture specified and said Minister of the Interior in said Indenture reserved the right to purchase at any time during said term all the property and estate of the parties of the second part in said Ditch and to discontinue and revoke all rights granted by said Indenture. And whereas said parties of the second part have constructed said watercourse at great expense and if the Government should now exercise said right of purchase the parties of the second part would be deprived of the profits of their enterprise and would receive no adequate compensation for the risks, labor, time and expense incurred and expended by them in the construction of said water course. And whereas, the parties of the second part on the 14th day of August last by a communication in writing addressed to his Excellency the Minister of the Interior did petition the Government to make the rights, privileges and franchises granted them by said Indenture absolute for the term thereof and did offer to pay therefore the annual sum or rental of five hundred dollars, and the King and Cabinet Council did on the 7th day of Septr. A.D. 1878 consider said petition and did agree to grant the same. Now therefore this Indenture Witnesseth, that in consideration of the premises and of the increased rental to be paid by the parties of the second part the said Samuel G. Wilder, Minister of the Interior of the Hawaiian Government by and with the consent of the King in Cabinet Council and by virtue of the authority in him by law vested, doth hereby grant, confirm and make absolutely unto said Hamakua Ditch Company its successors and assigns, all the rights, privileges, franchises and easements granted to the parties of the second part hereto by said Indenture dated September 30th A.D. 1876, recorded Lib 49 fol. 167-172 for the full term of Twenty years mentioned in said Indenture and does hereby waive, release, relinquish and surrender any and all rights reserved by said Indenture to the Hawaiian Government to purchase said property of the second parties in said Ditch and franchises during said term of twenty years and covenants and agrees that upon the performance of the conditions on their part to be performed, said parties of the second part may have the full, free and uninterrupted use and enjoyment of all the rights, benefits, privileges and franchises granted them by said Indenture during the full term thereof.

And the parties of the second part inconsideration aforesaid, hereby covenant and agree to pay from this date to the party of the first part the sum of Five hundred Dollars ($500) per annum during said term in lieu of the rent reserved in said Indenture. In witness whereof, said Saml. G. Wilder as Minister of the Interior has hereunto affixed his hand and seal of the Hawaiian Government, and the parties of the second part have hereunto affixed their hands and seals the day and year first above written… [Bureau of Conveyances, Liber 57:343-345]

The Pacific Commercial Advertiser (October 12, 1878)
"Mr. Spreckles' Projected Enterprise on Maui"

Since the Reciprocity Treaty with the United Stated was ratified, its stimulating and beneficial effects have been felt in every direction of agricultural enterprise, and all kindred interests have shared in the general prosperity. Infant plantations have advanced to unexpected and great values, and the numerous sales of estates at almost fabulous figures are matters with which the public are quite familiar.

Among the newly projected enterprises in the way of establishing sugar estates, that of Mr. C. Spreckles, the well-known capitalist of San Francisco, takes a foremost place, not only from the magnitude of intended operations, but from the collateral and incidental benefits that will accrue to the community and Kingdom generally. A large and hitherto unproductive region will be brought under cultivation…

Mr. Spreckles having great interest in the sugar production of the Islands… The island of Maui appeared to have the most land, easily accessible, fitted for sugar, if water for irrigation could be obtained. Careful observation for the past year has shown that the clouds passing over the mountains, with the dew, gave an annual amount of moisture equivalent to a rain-fall of 100 inches. This moisture created many small streams, whose waters were wasted by running into the sea, and the point to be gained was to prevent this waste by diverting the water from its natural channels and conveying it to the low lands by ditches or canals, and using it for irrigating purposes…

On his return to San Francisco…he at once consulted Mr. H. Schussler, one of the ablest engineers on the coast, and asked him to take his project into consideration… The completeness of Haiku Sugar Co.'s Ditch showed beyond peradventure what could be done by wise skill and perseverance. This ditch is about 20 miles long, and its water has served to bring the plantations of Makawao to their present prosperous condition…

After receiving the engineer's opinion, Mr. Spreckles at once went to work, and, in company with Mr. Schussler, sailed for this port in May, last. On arrival here they immediately visited the place of operation, viewed the large streams which are intended to be used for the canal or ditch, and promptly determined upon the plan to be followed. A Surveying party was organized, under the direction of Mr. Schussler, consisting of an assistance, eight natives, a Japanese cook and a mule driver. The kanakas carried the chains and stakes used, and the cook and driver had for their duty to look after the tent and camp equipage. After a good breakfast, they started, and going over the mountain trail, they arrived at a little brook flowing through beautiful shrubbery, plants and tropical vegetation. Here the engineer pitched his tent, and established his headquarters.

In less than two weeks Mr. Schussler had an exact survey of the whole canal route… The line of the ditch, which is intended to be about thirty miles, is intersected by some thirty ravines or valleys. The pipes will be so laid as to receive the water of the numerous streams that may be crossed on the route.

After the completion of this survey, Mr. Schussler obtained a topographical outline of the land upon which the ditch will debouch. It has an area of two miles in width and ten miles in length, and is known as the Wailuku and Waikapu Commons [see Register Map No. 1786; Map of Specklesville Plantation]. This belt of fine land appears to be especially adapted for the production of sugar. And is bordered on two sides by the ocean, affording facilities for shipping. The ditch will run along the upper side of the land, thus rendering the work of irrigation an easy matter.

At the suggestion of the engineer, Mr. Spreckles has determined to build a narrow-gauge railroad through the middle of his 28,000 acres, with lateral branches to the neighboring plantations, thus reducing the transportation of cane to a minimum cost.

Through this enterprise, this hitherto unproductive territory will be made to yield a revenue to the Hawaiian Government, but San Francisco will also come in for a share of the benefits to be realized…

His Majesty the King and his Ministers, seeing that the advantages of bringing a hitherto unproductive region under cultivation would be very great, gave Mr. Spreckles all the necessary privileges for the carrying out of his enterprise… [see Lease and water License of July 8, 1878 above; and subsequent licenses below]

If no unforeseen obstruction occurs, the works will be so far advanced by next summer that the planting of cane will have been commenced… [Pacific Commercial Advertiser; October 12, 1878:2]

November 19, 1878
Crown Lands Estate; to C. Spreckels:
Lease

This Indenture made this 19th of November A.D. 1878, Between the Commissioners of Crown Lands of the first part and Claus Spreckels of the second part, Witnesseth: That for and in consideration of the rents, covenants and agreements hereinafter reserved and contained, on the part and behalf of the said party of the second part, his executors, administrators and assigns, to be paid, kept and performed, they, the said parties of the first part, by the virtue of the authority in them vested by the Act entitled "An Act to Relieve the Royal Domain from Encumbrances and to render the same Inalienable" approved January 3rd 1865, have demised and leased, and by these presents do demise and lease unto the said party of the second part, his executors, administrators, and assigns, All that tract and parcel of land situated in the District of Koolau, E.M. Island of Maui one of the Hawaiian Islands, known and described as follows, to wit: –

Honomanu Ahupuaa.
Beginning at Ocean at East bank of stream in Napuumahoenui Ravine which place is directly opposite Keopuka Island and is also called Keopuka and running by the true meridian:-

1. N. 84º 45' E. (Variations at W. bank of this ravine is 10º 19') 11.06 chains along ocean to top of opposite and easterly ridge of ravine to Moiki;
2. S. 46º40' E. (Var. 10º51' E.) 966 chains along ocean and across Napuumahoeliilii ravine to ridge called Puulunui.
3. S. 34º 56' E. 29.00 chains along ocean to Malakahee on the western brink of Honomanu Valley.
4. S. 10º 30' W. 24.00 chains along ocean to Honomanu valley.
5. N. (S.) 17º 12' W. 20.60 chains along ocean to eastern brink of stream in Honomanu Valley to Kalaloa.
6. S. 67º 28' E. (Variation 7º26' E.) 10.30 chains along ocean.
7. N. 66º 8' E. 20.34 chains to summit of Eastern ridge of Honomanu valley.
8. S. 45º 20' E. 26.80 chains along ocean to western brink of stream in Nuaailua Valley.
9. S. 50º 22' W. 41.74 chains along western bank of stream Nuaailua Valley.
10. S. 42º 40 W. 76.80 chains along Nuaailua stream.

11. S. 44º 40' W. 205.20 chains along Nuaailua stream to Kikau.
12. N. 45º 55 W. 106.60 chains across Honomanu Valley and ravine and along Haiku [uka] to eastern bank of stream in Napuumahoenui ravine and opposite Makahikili Hill.
13. N. 43º 22' E. 145.60 chains along Koloa and along east side of stream in Napuumahoenui ravine.
14. N. 48º 17' E. 16.50 chains along Koloa and along east side of Napuumahoenui stream.
15. N. 50º 16' E. 76.30 chains along Koloa and along east side of Napuumahoenui stream.
16. N. 29º 58' E. 36.80 chains along Koloa and along east side of Napuumahoenui stream.
17. N. 47º 45' E. 21.60 chains along Koloa and along east side of Napuumahoenui stream to Public road above Puohomoa waterfall.
18. N. 28º 50' E. 33.70 chains along east bank of stream in Napuumahoenui ravine to the beginning. Area 3260 Acres;

except the timber trees, and all young trees fit and proper to be raised and preserved for timber trees, now growing or being, or which shall thereafter grow, or be in and upon the above demised premises or any part thereof; together with free liberty of ingress, egress and regress, to and for the said parties of the first part and their successors in office. To have and to hold, all and singular the said premises above mentioned and described with the appurtenances (except as before excepted) unto the said party of the second part, his executors, administrators and assigns, for and during the term of Thirty (30) years, to commence from the first day of July A.D. 1878, the said party of the second part, his executors, administrators and assigns, yielding and paying therefore, from and immediately after the commencement of the said term and during the continuance thereof, unto the said parties of the first part and their successors in office, the yearly rent of Five hundred ($500) Dollars over and above all taxes, charges and assessments to be levied or imposed thereon by Legislative Authority, the first payment of the said rent to be made on the First day of July next ensuing the date last aforesaid. And the said party of the second part, for himself and his executors, administrators and assigns does consent, grant, promise and agree to and with the said parties of the first part and their successors in office, by these presents in manner following, that is to say: - that he the said party of the second part his executors, administrators and assigns, shall and will well and truly pay, or cause to be paid unto the said parties of the first part or their successors in office, the said yearly rent above reserved according to the true intent and meaning of these presents, clear of and over and above all taxes, impositions, charges and assessments whatsoever. And also that he the said party of the second part, his executors, administrators and assigns, shall and will, from time to time during the term of this present demise, bear, pay and discharge all taxes, charges, impositions and assessments, ordinary and extraordinary, which may hereafter at any time during the continuance of the said term, be laid, imposed, assessed or charged on the said demised premises or any part thereof or upon any improvements made or to be made thereon, or which may be imposed or charged on the said parties of the first part or their successors in office, for or in respect of the said premises or any part thereof, and shall and will indemnify the said parties of the first part and their successors in office of, from and against all damages, costs and charges which they may at any time sustain, or be put to by reason of any neglect in the due and punctual discharge

and payment of the said taxes, impositions, charges and assessments. And also that the said party of the second part his executors, administrators and assigns shall and will bear, pay and discharge as his or their own cost and expense all costs and charges for fencing the whole or any part or parcel of the above demised premises, if such fencing should be so required by any law now in force or that may be hereafter enacted by Legislative authority and shall and will indemnify the said parties of the first part, and their successors in office of, from and against all damages, costs, expenses and charges which they may at any time sustain by reason of any neglect or refusal of the party of the second part, his executors, administrators and assigns in the performance of the premises and agreements last aforesaid. And also that he the said party of the second part his executors, administrators and assigns shall not nor will at any time during the term hereby granted do or commit or permit or suffer to be done any willful or voluntary waste, spoil or destruction in and upon the above demised premises or any part thereof or cut down or permit to be cut down any trees now growing or being or which shall thereafter grow or be in and upon the above demised premises or any part thereof and will at the end or other sooner determination of the said term hereby granted, peaceably and quietly leave and yield up unto the said parties of the first part or their successors in office all and singular the premises hereby demised with all erections, buildings and improvements of whatever name or nature now on or which may be hereafter put, set up, erected and placed upon the same in as good order and condition in all respects (reasonable use, wear and tear excepted) as the same are at present or may hereafter be put by the said party of the second part, his executors, administrators or assigns. And also that he the said party of the second part, his executors or administrators or any of them shall not nor will at any time during the continuance of the said term, demise, let, set or assign over the said premises or any part thereof to any person or persons whomsoever, for any term or time whatsoever without the license and consent of the said parties of the first part or their successors in office in writing under their hands first had and obtained for such purpose. And also that he the said party of the second part his executors, administrators and assigns shall not nor will in any manner interfere with or molest the natives now living upon the said land, but will allow the said natives to live on and occupy such parts of the said land as they do now occupy and cultivate during the whole of the said term of Thirty (30) years. And the said parties of the first part for themselves and their successors in office, do covenant and grant to & with the said party of the second part, his executors, administrators and assigns, by these presents, that the said party of the second part, his executors, administrators and assigns shall or may at all times during the said term hereby granted by and under the yearly rent, covenants, conditions and agreements, herein contained, peaceably and quietly have, hold, occupy, possess and enjoy all and singular the said premises hereby demised and every part and parcel thereof with the appurtenances (except as before excepted) without the lest trouble hindrance, molestation, interruption and denial of the said parties of the first part or their successors in office or of any person or persons whatsoever lawfully claiming or to claim the same or any part or parcel thereof. Provided always, and these presents are upon this condition nevertheless, and it is the true intent and meaning of these presents, that if it shall happen that the yearly rent hereinbefore reserved shall be behind and unpaid in part or in all by the space of Thirty days after the same ought to be paid according to the reservation aforesaid and no sufficient distress can or may be found in and upon the premises, whereby the same with the arrears thereof (if any shall happen to be) can be made or if the said party of the second part, his executors or administrators shall demise, set, let or assign the said premises or any part thereof

to any person or persons for any term or time whatsoever without the license or consent of the said parties of the first part or their successors in office first had and obtained in writing or if the said party of the second part his executors administrators and assigns shall not well and truly observe, keep and perform all and singular, the covenants and agreements on his or their parts to be observed, kept and performed according to the true intent & meaning of these presents that then and from thenceforth in any of the said cases it shall and may be lawful to and for the said parties of the first part and their successors in office without warrant or other legal process into and upon the said hereby demised premises or any part thereof in the name of the whole to re-enter and the same to have again, repossess and enjoy as in their first and former estate and right this indenture or anything hereinbefore contained to the contrary thereof in anywise notwithstanding. In witness whereof, the parties to these presents have hereunto set their hands and seals the day and year first above written.…

Signed Sealed & Delivered… November 19, 1878… [Bureau of Conveyances, Liber 57:293-299]

December 5, 1878
Claus Spreckels (by H. Schussler, his Attorney in fact);
to His Majesty, Kalakaua R.:

Enclosed, your Majesty will find a petition for a supplemental franchise which explains itself. The head waters of some of our streams on Government land and especially those emanating from & near the Koolau gap are subterranean in many places and it is next to impossible to know whether a subterranean water seam (if such is found at the upper levels of our watershed), allows the water to sink down perpendicularly or more or less inclined, and comes out on discharges below the level of the sea, along the coast, or whether it does not travel this course, but rises in the shape of a spring on the lower levels in one or the other of the creeks and streams granted to Claus Spreckels. During last September & October the creeks were all very low, which fact was very much facilitated by a large portion of the water passing off in subterranean channels. The object of the supplement franchise asked for in the enclosed petition is to enter upon the Government land, on the slope of Haleakala, in the Koolau gap and the crater, if necessary, and by a system of subterranean explorations & tunneling try to prevent the water from hopelessly & uselessly sinking beneath the surface, but to try & divert it into such streams as have a watertight bottom, or directly into our canal. As your Majesty can understand, the undertaking is very difficult and costly and may be rewarded by poor success and I have therefore asked your Majesty & Ministry to place the annual rent, if any is required, at a very low figure.

I furthermore take the liberty of respectfully asking your Majesty to cause, if possible such cabinet order to be issued as will protect the forests and timber on the Government and Crown lands from destruction by cattle, sheep, cutting etc., especially on the island of Maui and particularly on the northerly & northeasterly slopes of Mt. Haleakala. I also respectfully suggest to your Majesty to sell no more Government land and lease no more Crown lands neither on Maui nor any of the other Islands of your Kingdom, except with the district reservation on the part of the Government or Crown land Commissioners of all the timber and forests on such lands and with the condition that the purchaser or lessee has to protect the forest districts by fencing if he intends to keep cattle or sheep, and that he has to apply for

special permission from the Government if he intends to cut any timber, & these permits to be granted to a very limited extent, specifying what portion of an acre he is allowed to clear, or the number of cords of wood he is allowed to cut.

As your Majesty knows, from a thorough investigation of the subject of forest culture and its influence upon climatic changes, I lay great stress upon the necessity of preserving your forests, as their destruction or even thinning out will inevitably be followed by a marked decrease of the rainfall and on account of the ground becoming more dried and more apt to absorb the rain that may fall, the yield of the creeks becomes diminished, and as history has fully established, the prosperity of a country will suffer in the same proportion as the rainfall & water resources decrease.

I am satisfied that in addition to this measure, an appeal to the good sense of the people that own and control large tracts of land and especially timber land, especially too on Hawaii will be productive of a great deal of good in this direction.

In order to be able to assist in the protection of forests on the island of Maui and particularly in or on the watersheds of the creeks granted to and leased by me, I should like to have the first privilege of purchase if the Government should conclude to sell any of the forest lands in that region… [HSA, Interior Department – Forestry & Agriculture, Box 1]

December 5, 1878
Claus Spreckels, Petitioner (by H. Schussler, his Attorney in fact);
to His Majesty, Kalakaua R.:

The petitioner having had a franchise granted to him by Your Majesty and Ministry, allowing him to appropriate the waters of a number of streams on the northerly slope of Mount Haleakala on the island of Maui, and having also leased the *ahupuaa* of Honomanu for the purpose of utilizing the waters of the streams flowing through the same as well as to thoroughly protect the forest growth on the said *ahupuaa* thereby contributing largely to the constancy of the rainfall; the petitioner, in order to perfect and complete the water privileges now controlled by him, and in order to assist if possible, in neutralizing the effect of a dry spell like the one during last September and October during which the water yield of the above streams decreased very materially and especially of those having their headwaters in or near the Koolau gap, owing to the porous character of the subsoil in that neighborhood whereby the head waters of such streams become subterranean.

Now, in order to properly utilize and if possible increase the surface waters of the streams, especially during such dry spells, the petitioner respectfully asks Your Majesty and Ministry to grant to him the sole privilege to bring to the surface of the ground, by tunneling bulk heading, crosscutting or other means such waters as may be running, flowing or percolating below the surface of the ground in gravel, sand, between boulders through crevices, fissures, porous tufa or lava or through any and all kinds of subterranean channels whatsoever, such waters as he may find below the surface of the ground in the crater of Mt. Haleakala, in the Koolau gap, and its northerly extension and on all such Government land, located in and or on the watersheds of the streams granted to me heretofore. It being preferable to bring such subterranean waters, if any can be found, to the surface; the petitioners intention being (if successful) to conduct them away in properly constructed and watertight ditches, tunnels, flumes or pipes and join them with the surface waters and his

irrigation canal, instead of exposing them in their downward subterranean flow towards the sea, to additional infiltration and absorption in the porous substrata.

The petitioners respectfully asks your Majesty and Ministry to execute the above supplemental franchise for the same term of years as the original franchise granted to me last July.

In view of the great additional expense connected with these explorations, and of the possibility of not being successful in increasing the water supply in the streams by the above mentioned work, and finally in view of the fact that such waters, if any are found, are located in the watershed already tributary to the streams granted to me, and probably join them lower down stream in the form of springs, the exact origin of which it is impossible to trace and establish, I respectfully ask Your Majesty and Your Majesty Ministry to place the annual rental for the rights herein petitioners for, at a nominal figure… [HSA, Interior Department Box 55 – Water Maui & Molokai, 1866 – 1887]

December 17, 1878
Samuel G. Wilder, Minister of the Interior;
to H. Schussler, Esqr. (Attorney for Claus Spreckels):

…In Cabinet Council held this day, your petition asking an additional franchise giving you the right to "Bulkhead" Tunnel, excavate, or by other means enable you to raise and appropriate for use, any water now running underground from the northerly slopes of Haleakala, "was duly considered."

H. H. Majesty's Government are ready to grant you your petition upon a nominal rent with the full understanding and contract, that, if any means you may use in any way lessens the supply of any stream or spring, that now discharges above high water mark on the sea shore- the franchise is void. As you will see we have no right and cannot give any franchise in and water rights, that will in any way injure other parties. – and we can only give this privilege upon Government lands.

Your letter plainly intimates that you see the result may be disastrous to streams and springs below you.

With my best wishes for your success, and my assurance of any and all proper assistances… [HSA, Interior Department Letter Book 15:444-445]

December 23, 1878
H. Schussler (for Claus Spreckels); to S.G. Wilder, Minister of the Interior:

…As I shall be compelled to take the water out of several creeks right at the Government road crossing, you would very highly oblige me in a letter of official authorization to do so. That is, to use the government road wherever it crosses one of the streams granted to Spreckels last July, for the purpose of taking the water out of any one of those streams, where such may be required in the judgment of Spreckels or his agent, Spreckels to repair the road on as good a condition as it was heretofore.

The fact of it is that all those road crossings will be vastly improved. As I intend in several places to build bridges across the streams and take the water out underneath the bridge, also we'll be compelled to raise some of the approaches to these bridges, which will make the crossings much easier than they are now. For such

improvements we will claim no offset against road tax. I have done a good deal of work on the roads between Maliko and Halehaku and you will be pleased to see what improvements I was compelled to make as they were formerly almost impossible for heavy hauling, while when the grades are very much easier… [HSA, Interior Department – Roads Box 44]

December 23, 1878
Sam'l. G. Wilder, Minister of the Interior;
to H. Schussler, Esq. (Agt. & Atty. For C. Spreckels):
…Your letter has been duly received and in answer I beg to say – You are herby authorized to use the Government Roads in any way that will facilitate your interests – always bearing in mind the rights of the Public and leaving the Roads as accessible and in as good order as you find them.

I hear many reports of your improvement and thank you for the same... [HSA, Interior Department Letter Book 15:444-1/2]

January 11, 1879
Claus Spreckels, Haiku Sugar Co. et. al; to James M. Alexander, et al.:
Deed
…KNOW ALL MEN BY THESE PRESENTS, that I, CLAUS SPRECKELS, of San Francisco, State of California U.S.A. for and in consideration of one dollar to me paid by James M. Alexander of Haiku, Island of Maui, Hawaiian Islands, do hereby remise, release and forever quit-claim unto the said James M. Alexander his heirs and assigns, all right, title and interest in and to the Waipio Stream in the district of Hamakualoa in said Island of Maui, which I may have acquired by virtue of a grant of certain water rights made to me by the Minister of the Interior of the Hawaiian Islands dated July 8th, 1878, recorded Lib. 56 fol. 77-82, or by virtue of an Indenture made between me and the Hamakua Ditch Company July 8th, A.D. 1878, recorded Lib. 55, fol. 208-211, or otherwise; and I hereby, for myself, my heirs and assigns covenant and agree not to assert or exercise any claim to said stream during the term of said Indentures. And also, in consideration of one dollar to me paid by the Haiku Sugar Company, a corporation existing under and by virtue of the laws of the Hawaiian Islands, I do hereby remise, release and quit-claim unto said Haiku Sugar Company, its successors and assigns all right, title and interest whatsoever in and to the gulches and streams lying next east of the Maliko Gulch running over land of said company known as Kanemoeala, Waikina, and its branches, and that part of the Kuiaa, sometimes called Kuiana which is situated *mauka* of the present Hamakua Ditch which I may have acquired by virtue of either of the above named Indentures, or otherwise; and I hereby, for myself my heirs and assigns, covenant and agree not to assert or exercise any claim to said streams and gulches during the term of said Indentures.

AND also, in consideration of one dollar, and other valuable considerations to me paid by the owners of the Hamakua Ditch property, I do hereby remise, release and quit-claim unto the owners of said Ditch, their heirs, successors and assigns, all right, title of interest whatsoever in or to that portion of the western branch of the Halehaku Stream known as Opana, *mauka* or above the level of said Hamakua Ditch and also in such parts, as lie above the level of the said Ditch, of all streams lying between the Opana stream on the east and inclusive, and the streams above mentioned next east of Maliko Gulch running over land of the Haiku Sugar

Company on the west which I may have acquired by virtue of either of said Indentures or otherwise; and for myself, my heirs and assigns, I hereby covenant and agree not to exercise or assert any claim to said parts of said streams, during the term of said Indentures.

And also in consideration aforesaid I for myself, my heirs and assigns, covenant and agree with the owners of said Hamakua Ditch Property, that the place of measuring the forty cubic feet of Water per second, to which they are entitled by said agreement between us dated July 8, A. D. 1878, (provided the streams granted them by the Hawaiian Government Sept. 30th, A. D. 1876 shall furnish that amount at the level of their ditch) shall be fixed at the inlet end of their present Halehaku pipe and before the waters of the Halehaku and Opana streams have been discharged into said Ditch, and not at the outlet end of the said pipe and inclusive of said two streams as formally agreed upon by said Indenture between us dated July 8 A. D. 1878, and also in case on account of drouth [sic.], the water in said ditch shall not amount to said forty cubic feet per second at said place of measurement, the owners of said ditch may take from said Halehaku stream (provided they have previously obtained the right to do so) sufficient water to complete said amount of forty cubic feet per second.

And also in consideration aforesaid I hereby for myself, my heirs and assigns covenant and agree with the owners of said Hamakua Ditch property, that they shall be entitled to alter their flumes, ditch and pipe lines west of and inclusive of the Halehaku pipes, so as to enable that westerly portion of said Hamakua Ditch to convey in addition to said forty cubic feet per second such other amounts of water as the owners of said Ditch may conduct into the same by gravitation out of the streams west and inclusive of the Halehaku. And we; the Haiku Sugar Company aforesaid, Samuel T. Alexander and Henry P. Baldwin copartners under the name of Alexander and Baldwin, Island of Maui; James M. Alexander aforesaid; William F. Sharratt, Sanford B. Dole, Alfred S. Hartwell, Alfred H. Smith and Jared K. Smith owners of the Grove Ranch Plantation on the Island of Maui; the owners of the Hamakua Ditch Property in consideration of the above covenants and of one dollar to us paid by the aforesaid Claus Spreckels, do hereby assign, transfer and set over unto the said property, Claus Spreckels, his heirs and assigns all of the right, title and interest which we may have in and to the land stream and appurtenances of Honopou, Hamakualoa, Maui, as demised and secured by lease of Charles Copp dated March 19, 1877 and recorded in Lib. 50 fol. 57 etc., excepting and reserving however to ourselves our heirs, successors or assigns the right to take water out of the said stream at any point on the level of or above the said Hamakua Ditch subject nevertheless to the performance of the covenants and conditions contained in the said lease.

And also in consideration aforesaid, we the said owners of the Hamakua Ditch Property do hereby covenant and agree that if we or our heirs, successors or assigns should at any time after the expiration of said lease, acquire any title to said land and stream during the continuance or unexpired term of the agreement between the Hamakua Ditch Company and Claus Spreckels of July 8, 1878; that such right title or interest with the above exception and reservation shall be duly transferred to the said Claus Spreckels his heirs and assigns.

And I the said Claus Spreckels, for myself, my heirs, executors administrators and assigns hereby covenant and agree to faithfully do and perform all of the covenants in said lease contain to be done and performed on the part of the said Hamakua Ditch Company and also in consideration aforesaid I hereby for myself, my heirs and assigns covenant and agree that any rights that I may have or may hereafter acquire in or to the water of the said Honopou Gulch shall in no wise be allowed to interfere with the right of the owners of the said Hamakua Ditch to take out the water of said stream at or above the level of said Ditch, subject however to said limitation of forty cubic feet per second.

And we, James M. Alexander and Henry P. Baldwin hereby and by our signatures fully endorse the act of Samuel T. Alexander in signing the original agreement between the said Hamakua Ditch Company and Claus Spreckels dated July 8, 1878, and assent to said agreement subject to modifications of this indenture.

IN WITNESS WHEREOF we, all the parties to this instrument have caused the same to be duly executed the Haiku Sugar Company by causing its corporate seal to be hereto attached and the signatures of its president and secretary, and the other parties by affixing their seals and signatures hereto this 11th day of January 1879.

(Sgd.) CLAUS SPRECKELS (Seal)
By H. Schussler his Attorney in fact
HAIKU SUGAR CO., BY (Seal)
J. Mott Smith President J.P. Cooke Secretary (Seal) S.T. Alexander (Seal)
Executed on condition that all said parties duly execute and indenture
H.P. Baldwin (Seal) J.M. Alexander (Seal)
Executed as far as the owners of Grove Ranch are concerned on condition that all the said parties duly execute said Indenture.
S. B. Dole (Seal) Alfred S. Hartwell (Seal) Alfred H. Smith (Seal)
J. K. Smith (Seal)

HAWAIIAN ISLANDS
ISLAND OF KAUAI
SS.
On this eleventh day of January A. D. 1879, personally appeared before me Alfred H. Smith and J. K. Smith, known to me to be the persons described in and who executed the foregoing Instrument, who acknowledged to me that they executed the same freely and voluntarily and for the uses and purposes therein set forth.

(Sgd.) Frank Bindt; Agt. to take acknowledgment for Island of Kauai.
HAWAIIAN ISLANDS
ISLAND OF OAHU
SS.
On this 13th day of January 1879 before me S. B. Dole and J P. Cooke as Secretary of the Haiku Sugar Company incorporated; on the 17th day of said January appeared J.M. Smith as President of said Haiku Sugar Company, all to me severally known and on the 24th day of January, 1879 appeared A.S. Hartwell to me known, and acknowledged that they executed the foregoing instrument freely and voluntarily and for the uses and purposes therein set forth.

(Sgd.) W.R. Castle; Notary Public; Seal.

HAWAIIAN ISLANDS, MAUI: SS.
Personally appeared before me this 14th day of March 1879, S.T. Alexander, J.M. Alexander and H. P. Baldwin all to me well known and acknowledged that they executed the above instrument voluntarily and for the uses and purposes therein set forth.

(Sgd.) C. H. Dickey; Notary Public; Seal.
ISLAND OF MAUI, HAWAIIAN ISLANDS: SS.
W. F. Sharratt to me well known, personally appeared before me the 14th day of March 1879 and acknowledged that he executed the above instrument voluntarily for the uses and purposes therein expressed.

(Sgd.) C.H. Dickey; Notary Public; Seal.
The insertions of the words in folio 4 hereof, numbered 1 "that part of" and 2, "which is situated *mauka* of the present Hamakua "Ditch", before the final execution hereof, relative to rights released to the Haiku Sugar Company, is hereby agreed to by the parties in interest.

In witness whereof said Haiku Sugar Company has caused its corporate seal with the names of its President and Secretary to be hereunto attached and said Claus Spreckels has hereunto set his hand and seal this day of April 1879.

THE HAIKU SUGAR COMPANY
By J. Mott Smith Pres.
By J. P. Cooke, Sec.

[Attachment to above]
Hawaiian Islands,
Island of Oahu. SS.

On this 10th day of April, 1879 personally appeared before me J. Mott Smith, President and J. P. Cooke, Secretary of the Haiku Sugar Company, incorporated and acknowledged that they for the purposes therein set forth, executed the above agreement freely and voluntarily for the uses and purposes therein set forth.

(Sgd.) W. R. Castle, Notary Public; Seal.
Hawaiian Islands, Maui. S. S.
Personally appeared before me this 11th day of April 1879 H. Schussler to me well known and acknowledged that he executed the foregoing instrument as Attorney in fact for Claus Spreckels voluntarily and for the purposes therein set forth.

(Sgd.) C. H. Dickey, Notary Public; Seal.

Register Office, Honolulu
May the 20th, 1879… [Bureau of Conveyances, Liber 59:200-205]

July 23, 1879
Saml. T. Alexander, Manager; to Claus Spreckels:
…Received from Claus Spreckels the sum of One thousand and eighty five dollars as payment in full for all cane and other property damaged and destroyed by him or his agents while constructing his ditch and pipelines over and across the lands of Haiku

and Hamakuapoko plantations on the island of Maui, both belonging to the Haiku Sugar Company, a Corporation organized under the laws of the Hawaiian Islands… [EMI Collection; Attached to H.C.& S. Co. #6-C]

September 12, 1881
Petition of J.W. Kehuhu and 12 native residents;
to H.A.P. Carter and J.S. Walker, Commissioners of Crown Lands (Aina Lei Alii):
…We, the Committee, whose names are below, we request your kind consideration. Do not dispose any of the water-rights (*pono wai*) of the Crown Lands (*aina lei alii*), those being from Honomuni, Keanae, Wailua, to the millionaire (Claus Spreckels) of Kamaomao. Because, if any of the water-rights of the above described Crown Lands are disposed of, then, the King's subjects, living on said lands, will be troubled. That which has been done by the millionaire with the waters of other lands is known, and because of these known troubles, we beg you to put an end to the taking of water from the lands which were described above.

In truth of this, we sign our names.

J.W. Kehuhu	K.E. Malailua	B.B. Kalilimoku	
K. Makaena	J.B Kaukuamoku	Kamanele	
J.K. Hueu	D.W. Napihaa	J. Kuluhiwa	
S. Kamakahiki	M. Kaleba	J.S. Lono	Kelii

[HSA, Interior Department Box 55 – Water Maui & Molokai, 1866 – 1887; Maly, translator]

Filed June 18, 1890
Submission on case agreed,
Haiku Sug. Co. et al.
vs.
Minister Interior
[Settles dispute over Water License Costs and Extends License for Period of 20 years from September 30, 1896]
In the Supreme Court of the Hawaiian Islands; The Haiku Sugar Company et al. Plaintiffs and L.A. Thurston, Minister of the Interior, Defendant; Submission on Case Agreed. To their Honors the Justices of the Supreme Court:

The Hamakua Ditch Company consisting of the Haiku Sugar Company and Paia Plantation and the Grove Ranch Plantation Company, each being a Hawaiian Corporation, hereinafter named the plaintiffs, and Lorrin A. Thurston, Minister of the Interior, hereinafter named the defendant, respectfully submit to your honors that a question in difference exists between them which might be the subject of a civil action in the Supreme Court, and that they have agreed upon the case hereunder stated containing the facts upon which the controversy depends, and do hereby present a submission of the same and request your Honors to hear and determine the said case in writing as if an action between the said parties were depending.

Case Agreed
The plaintiffs are now seized and possessed of or entitled to all the property, rights, privileges and concessions which under and by virtue of that Indenture dated the 30th day of September A. D. 1876 between William L. Moehonua, Minister of the Interior of the first part and the Haiku Sugar Company, Samuel T. Alexander, Henry

P. Baldwin, James M. Alexander and Thomas H. Hobron of the second part And also of that Indenture dated the 7th day of October A. D. 1878 between Samuel G. Wilder Minister of the Interior and the same parties of the second part are granted and assured and agreed to be granted and assured unto the said parties of the second part.

Copies of which said Indentures are hereto appended marked Exhibit A and B respectively and made part hereof.

The defendant has (for good consideration) waived the right to postpone until the end of the first term of twenty years named in said first above named Indenture whatever offer (but for such waiver) would under said Indentures be incumbent upon the Minister of the Interior to make to the said parties of the second part their successors representatives and assigns for a renewal and continuance on like terms and conditions with those named in said Indentures of the rights therein granted.

It is claimed on the part of the defendant that the Minister of the Interior is not under said Indentures precluded from utilizing for purposes of irrigation or revenue the water rights named in said Indentures, but may without offering to renew or grant the same to the plaintiffs, otherwise dispose of the same for the purpose of deriving a public revenue therefrom, by the Government instituting water works of its own and utilizing the water of said streams, or that the Government may at its option refuse to lease said waters to anyone, but may allow them to pursue their natural flow.

It is claimed on the part of the plaintiffs that upon the aforesaid waiver they are now entitled to an offer of the right granted under said Indentures for a further term of twenty years from the 30th day of September A. D. 1896 on like terms and conditions as those named in said first above named Indenture except as modified by said last above named Indenture, and that in conformity with the agreement therein contained and with said waiver as to the time of offering such grant of renewal, the defendant ought now to offer to execute and deliver to the plaintiffs an Indenture substantially in the form hereto appended and marked Exhibit C. upon the plaintiffs executing and acknowledging a counterpart thereof, which the plaintiffs hereby offer and are willing to do.

It is also hereby agreed that the said controversy is real, and that these proceedings are brought in good faith to determine the rights of the parties hereto. (Page 3)

(Attachment)
THIS ENDURTURE made this _____ day of _____ A.D. 1889 Between LORRIN A. THURSTON, Minister of the Department of the Interior of the Kingdom of the Hawaiian Islands of the first part and the HAIKU SUGAR COMPANY and the PAIA PLANTATION and the GROVE RANCH PLANTATION COMPANY Corporations incorporated and existing under the laws of said Kingdom of the second part.

WHEREAS the said Paia Plantation is now the owner of and entitled to all the property and rights granted and assured to Samuel T. Alexander and Henry P. Baldwin and James M. Alexander and the said Grove Ranch Plantation Company is now the owner of and entitled to all the property and rights granted and assured to Thomas H. Hobron by and under that certain Indenture dated the thirtieth day of

September A.D. 1876 between William L. Moehonua Minister of the Interior of the first part and the said Haiku Sugar Company Samuel T. Alexander, Henry P. Baldwin, James M. Alexander and Thomas H. Hobron of the second part and that certain Indenture dated the seventh day of October A. D. 1878 between Samuel G. Wilder, Minister of the Interior of the first part and the same Haiku Sugar Company, Samuel T. Alexander, Henry P. Baldwin, James M. Alexander and Thomas H. Hobron of the second part.

AND WHEREAS the parties hereto of the second part desire to replace the water pipe and aqueduct conducting the waters granted under said Indentures and to renew the leases of rights of way now held by them for the purposes of said aqueduct AND ALSO to make large outlays for improving the processes for making sugar from the cane irrigated by such waters but they do not regard such large expenditures as justifiable unless assured of the renewal for a second term of twenty years of the rights granted under said Indentures and they have applied to the party of the first part to be secured in such expenditures and outlay by a grant of such rights for such second term pursuant to the agreement in that behalf contained in said Indenture dated the thirtieth day of September A. D. 1878.

AND WHEREAS such application has been duly considered and deliberated upon by the King and His Ministry in Cabinet Council assembled and the franchise asked to be removed to the said parties of the second part on the terms and conditions hereinafter named is by the King and His Ministry in Cabinet Council assembled deemed and considered to be for the benefit of the agricultural interests and the general welfare of the Hawaiian Kingdom, and to comply with the agreement contained in said Indenture of said thirtieth day of September that if at the end of the terms of twenty years therein granted the rights in said Indenture granted should be granted to any person or persons corporation or corporations they should be offered to be renewed and contained unlike terms and conditions with those therein named unto the said parties of the second part therein named their successors representatives and assigns for a further term of twenty years and that by said agreement the Hawaiian Government would be precluded from otherwise utilizing the waters and rights hereinafter granted for purposes of irrigation or obtaining public revenue therefrom.

NOW THEREFORE THIS INDENTURE WITNESSETH that in consideration of the premise and of the covenants promises and undertakings of the parties of the second part hereinafter contained and to be kept and performed by them or their successors or assigns and in further consideration of the annual rental of five hundred dollars to be annually paid in advance to His Excellency the Minister of the Interior for the rights and franchises hereinafter granted he the said Lorrin A. Thurston as Minister of the Department of the Interior of the Kingdom of the Hawaiian Islands by and with the authority of the King in Cabinet Council assembled and by virtue of the authority by law in him vested doth hereby for himself and his successors in office COVENANT AND GRANT with and to the said Haiku Sugar Company and Paia Plantation and Grove Ranch Plantation Company their successors and assigns that it shall be lawful for them and their agents and servants, and all and every person and persons for the benefit and advantage of them the said parties of the second part and of their respective successors representatives and assigns, from time to time, and at all times, during the term of twenty years, from the thirtieth day of September A. D. 1896 (except as hereinafter provided) to

take draw off conduct away and use for their own purposes of irrigation or otherwise, the water in and from those certain streams, and sources of water situate in the District of Hamakualoa in said Island of Maui known as Naiilihaele [Naiiliihaele], Kailua, Hoalua, Huelo, Halawa [Holawa] and Honopou and to conduct and cause said water to flow through any water course from the said streams or sources of water on any part or portion thereof, and over any and all lands of the Hawaiian Government situate in said Island of Maui (except as hereinafter provided) over which it may be for the convenience or interest of the said parties of the second part, their successors representatives and assigns to conduct or cause said water to flow for their uses and purposes as aforesaid, and to enter into and upon and pass and repass, and dig up said lands, and any part thereof, in order to construct, maintain, repair, replace and keep in order, and use such water course, and to do all such acts in and upon said stream and sources of water and lands as shall or may be necessary in order of convey and use, the water of said streams and sources of water.

PROVIDED NEVERTHELESS, and the continuance of the rights hereinbefore granted is upon this condition that existing rights of present tenants of said lands, or occupiers along said streams shall in no wise be lessened or affected injuriously by reason of anything hereinbefore granted or covenanted and that the said parties of the second part their successors, representatives and assigns shall pay unto the said party of the first part and his successors the sum of five hundred dollars during each and every year in which they shall use the said water as aforesaid by authority of those presents, which said sum shall be payable in advance on the first day of October in each of said years and also reserving and excepting unto the said party of the first part and his successors, the right to conduct water or to grant to any other person or persons, corporation or corporations, the right to conduct water from said streams and sources of water or from any other streams or sources of water, over said lands, in such manner and to such extent only as shall not diminish or interfere with the supply or use of the water as hereinbefore granted and secured to the said parties of the second part, or impair or render less useful to said parties of the second part their successors representatives or assigns the use and enjoyment of said water course and water.

And the said parties of the second part for themselves and their respective successors representatives and assigns, covenant with the said party of the first part and his successors that they will pay said sum of five hundred dollars annually as aforesaid and that in constructing maintaining or replacing said watercourse they will do no unnecessary damages to said lands.

IN WITNESS WHEREOF the said Lorrin A. Thurston as Minister of the Interior party of the first part and the said Haiku Sugar Company and Paia Plantation and Grove Ranch Plantation Company by their respective Presidents and Secretaries parties of the second part have hereunto set their respective parties of the second part have hereunto set their respective hands and seals the day and year first above named. [HSA, Interior Department Box 55 – Water Maui & Molokai; Folder June 1888-1900]

August 10, 1893
J.A. King, Minister of the Interior;
to Haiku Sugar Company and Paia Plantation Company:
[Extension of Lease - from the 30th of Sept. 1893, to the 30th of Sept. 1916]

An Indenture made this 10th day of August, A.D. 1893, by and between His Excellency, James A. King, Minister of the Interior of the Hawaiian Islands, acting with the advice and consent of the Executive Council of the Provisional Government of said Islands, of the first part, and The Haiku Sugar Company and the Paia Plantation Company, Corporations established and existing under and by virtue of the laws of the said Islands, of the second part;

Whereas said parties of the second part hold a certain grant of the right to take water for purposes of irrigation from certain streams on the Island of Maui, and the right of way across certain Government Lands for a ditch to convey such water, which said grant is contained in an Indenture made by and between W.L. Moehonua, Minister of the Interior, acting with the consent of the King in Cabinet Council, of the first part, and the Haiku Sugar Company, James M. Alexander, Alexander and Baldwin and T.H. Hobron, of the second part, dated Sept. 30th, 1876, of record in the Hawaiian Registry of Deeds in Lib. 49, Fols. 167-172, which said grant is for the term of twenty years;

And Whereas said Indenture was, on the 7th day of Oct. 1878, modified by agreement of the parties, of record in said Registry in Lib. 57, Fols. 343-345, the parties of the second part, then associated under the name of the Hamakua Ditch Company, on consideration of the waiver by the party of the first part of the right reserved to purchase said ditch and appurtenances, agreeing to pay the sum of Five hundred Dollars ($500.00) per annum rental;

And Whereas the Paia Plantation Co. has acquired all of the rights of said James M. Alexander, Alexander and Baldwin, and T.H. Hobron in said Indenture;

And Whereas said indenture contains a covenant for renewal for a further term of twenty years, provided the rights therein granted should be granted to any person or corporation;

And Whereas the parties of the second part have applied for an extension of said agreement and a renewal and continuance of the privileges therein named for the further period of twenty years as provided by terms thereof;

And Whereas the streams of water therein named are not available for public use, and the government can only render them productive by leasing to others, and the parties have agreed upon the rent below named;

Now Therefore This Indenture Witnesseth:

That the party of the first part, acting on behalf of the Hawaiian Government, by and with the advice and consent of the Executive Council, in consideration of the covenants below contained on the part of the party of the second part, and in pursuance of the authority in him vested by law, and of the obligations imposed upon him by said Indenture, doth extend the term of said Indenture first above named, being the same dated Sept. 30th, 1876 of records in said Registry in Lib. 49

Fols. 167-172 and doth renew and continue all the rights and privileges granted in the same unto the parties of the second part, their successors and assigns, for their use and benefit, for the further period of twenty years, to wit: from Sept. 30th, 1896, to Sept. 30th, 1916, upon same terms and conditions as set forth in said Indenture, except as modified by said agreement of Oct. 7th, 1878, and as below modified.

And the parties of the second part in consideration aforesaid do hereby agree to pay the party of the first part and his successors in office, the sum of Five Thousand dollars ($5000) per annum, in full compensation for the rights and privileges aforesaid from the 30th of Sept. 1893, to the 30th of Sept. 1916… [Bureau of Conveyances, Liber 144:108-110]

Honolulu, July 25, 1898.
Senator Hocking; to J. F. Brown Esq., Agent of Public Lands:

…Mr. H. P. Baldwin, Mr. W. F. Pogue and myself have entered into a preliminary agreement to erect a sugar mill at Nahiku, Island of Maui, for the purpose of manufacturing sugar from cane grown and furnished by parties who have taken up government lands at Nahiku, Island of Maui, and also to pipe and ditch water along the heads of said lands, providing we can acquire the right from the Government to do so. Therefore providing the Company be incorporated under the law of Hawaii, will you grant it a license to use the water on said lands for the above named purpose, providing it be used for the benefit of all parties owning land in said tract, and depriving no person of their rights to water, we would necessarily like the privilege for a long term of years if you should decide to grant this license will you please state the terms… [HSA, F.O. & Ex, Public Lands Commission – 1898]

Haiku Sugar Company, Hamakuapoko
July 25, 1898
H.P. Baldwin; to S. B. Dole, President:

…Senator Hocking writes me that he has made application of the Minister of Interior on behalf of the homestead people of Nahiku, Maui, and a Sugar Mill Co. it is proposed to start there. For certain water streams that run through the homestead lots, said water to be used by the homestead people for irrigation purposes and by the Mill Co. for fluming cane and general mill purposes.

The streams Mr. Hocking refers to run through the Nahiku land and have from time immemorial run to waste into the sea. There is one large stream the (the Hanawi) and several small ones.

It is proposed that the water be ditched out by the homesteads and the proposed Mill Co. jointly. The Homesteads on the lower lands will require water for irrigating cane and the Mill Co. will need it principally for fluming purposes.

The water belongs to the Nahiku land, and it seems to me their leave should be granted for its use on this land… [HSA, F.O. & Ex, Public Lands Commission – 1898]

July 29, 1898.
J.F. Brown, Agent, Public Lands; to S. B. Dole Esq., President:

…I enclose herewith an application of W. Hocking in the matter of a license to take water from a certain tract in Hana and Koolau, Maui.

The tracts from which it is proposed to take such water, is that tract lying on the mountain side above the lots laid out and known as the Nahiku tract. The Commissioners of Public Lands at meeting of July 25th considered this matter and resolved to recommend to the Executive that a License for the purpose of using the water on said tract be granted to the proposed Company to be incorporated, for the rental of $500 per year and with the proviso that such water shall be used for the benefit of all parties holding land in said Nahiku tract and that no person be deprived of their rights to water which might exist in the absence of such license.

The applicant asks for a license for a "long term of years" but the Commissioners do not understand that they could grant a longer term than the limit of 21 years prescribed in Land Act for general leases.

It is not clear to the Commissioners whether such license may be issued directly or must be made at auction.

They would be glad to have an expression of opinion on this point from the Executive Council… [HSA, F.O. & Ex, Public Lands Commission – 1898]

August 2, 1898
Land License No. 520-B
Public Lands Commission;
to H. P. Baldwin, W. F. Pogue and A. Hocking (Nahiku Sugar Co.):

By this LAND LICENSE issued this 2nd day of August, 1898, H. P. Baldwin, W. F. Pogue and A. Hocking all of the Island of Maui, Hawaiian Islands, on behalf of the proposed Nahiku Sugar Co, are authorized and empowered to enter upon that tract of Government land in the District of Koolau, Maui, lying above and adjoining the lands comprising the "Nahiku tract' as shown on Public lands Map No. 20, and extending from the line of lease No. 492 to the Hana Plantation Co., to , and including the Puakea stream between the lands of Kapaula and Puakea, and to take and use any water belonging to the Government lands within such tract, and to construct dams, ditches and flumes or other structures necessary for the utilization of such water for the term of thirty years from date on the following terms and conditions:

The rental to be paid under this License shall be the sum of $500.00 per year, payable semi-annually in advance for the first ten years of the term and $1000.00 per year payable semiannually in advance for the remaining years of the term.

The water from this tract shall be used for the general benefit of the owners and occupiers of lands within the Nahiku tract of Public Lands Map No. 20, for irrigation and domestic purposes, and for cane fluming and general Mill and Plantation purposes, and no person or persons shall be deprived of the use of any water to which they would have been entitled in the absence of this License.

The right as regards the use of the land to be occupied under this license, is limited to such operations as are required for ditching, building dams, flumes and for the utilization and conveyance of water, no rights of taking timber except for construction of such dams, flumes and c, and no rights of using the said tract for other purposes being granted.

At the expiration of the term of this license all flumes, pipes and improvements for conducting said water shall remain upon said land and shall revert to the Government.

The said H. P. Baldwin, W. F. Pogue and A. Hocking on behalf of the proposed Nahiku Sugar Co. hereby accept and confirm all the stipulations and conditions of this License and further agree that upon a violation of any of such conditions and stipulations, the said License and all rights and privileges thereunder may be terminated at the discretion of the grantors of their successors in Office.

This License shall take effect and be of full force upon the incorporation of the Nahiku Sugar Co. under the laws at such date in force in the Hawaiian Islands.

In witness whereof we have hereto set our hands and seals as of the year and day first above written.

(signed) J.A. King
Frank S. Dodge
J. F. Brown,
Commissioners of Public Lands
(signed)H. P. Baldwin
W. F. Pogue
A Hocking…

(Attachment)

Public Lands Office,
June 13th, 1902.
Know all men by these presents that permission is hereby granted by the undersigned, Commissioner of Public Lands, of the Territory of Hawaii, to H. P. Baldwin, W. F. Pogue and A. Hocking, on behalf of the Nahiku Sugar Co. Limited, holder of a certain Land License issued to the said H. P. Baldwin, W. F. Pogue and A. Hocking on behalf of the said Company, dated August 2nd, 1898, to assign to the Hana Plantation Company, all their right, title and interest in said Land License, and subject to all stipulations and conditions thereof.

And this permission is further conditioned that the Hana Plantation Co. will use every endeavor to protect and encourage the present forest growth and under-brush that is or may hereafter grow upon the said land as described in said Land License, and will not permit any livestock to run at large on said premises, to build and maintain at their own expense such fences as may be necessary to prevent such live-stock from trespassing upon said land, of the necessity of which the Commissioner of Public Lands shall be sole Judge; and also will not suffer to be made any fires on said land which will injure the forest thereon.

This is on the express condition that no other or further transfer of interest under said Land License shall be made without the written consent of the Commissioner of Public Lands being first obtained.

EDWARD S. BOYD, Commissioner of Public Lands…
[HSA, F.O. & Ex, Public Lands Commission]

February 21, 1902
W.L. Hardy; to S.B. Dole, Governor:
…Enclosed herewith is a petition addressed to yourself, and signed by a majority of the "homesteaders" now residing at Nahiku, Maui, praying that you use your authority to stop the proposed sale at public auction of the lease of certain pieces of Government in the district of Koolau, Island of Maui, to the highest bidder.

Your petitioners are in a position to know that the enlightened Homestead policy inaugurated by you in the days of the "Republic of Hawaii," and faithfully encouraged and adhered to ever since, will receive a serious set-back in its aspirations in this district, as will plantations and many small holdings if the lease is sold as applied for.

The party making the application for the lease has property holdings, or at least controls holdings at Nahiku which make it impracticable for others to compete in the bidding ad so the apparently fair application will virtually be a walkover as far as beneficial results to the Government is concerned and are impoverishing of the district in many respects and in no long time forcing it under monopolistic control.

We thank you heartily for withdrawing lot # 3 from sale but unless lot # 2 is also withdrawn the cinch will also remain and our hands remain tied and we will be forced to struggle at great disadvantage.

Plantation and Homestead interests should be mutual and the former forced when seeking privileges to consider the latter…

(Attachment — received Feb. 24, 1902)
Petition W.L. Hardy et. al: to S.B. Dole, Governor, Territory of Hawaii:
…WHEREAS, we, the undersigned owners and occupiers of the "Nahiku Lots", have at great expense and much hard-ship undertaken to develop this previously uncultivated tract and to make homes for ourselves; and

WHEREAS, it is the intention of the Commissioner of Public Lands, as advertised in the newspapers, to sell at public auction the lease of all of the government lands adjoining these lots, from seashore to the top of the mountain, thereby giving to the highest bidder the control of all the water which should belong to this district; and

WHEREAS, we, the undersigned not being financially able to compete with corporations which can bed large amounts for this land, are in great fear that the water flowing thereon and through the "Nahiku Lots" will be diverted and taken to some other district; now

THEREFORE, we, the undersigned, hereby petition The Honorable, The Governor of the Territory of Hawaii, to take such steps as are necessary to prevent this sale and to preserve for us water which is so vital to the development of our property…
[HSA, Gov-1; Dole, Public Lands]

February 26, 1902
GENERAL LEASE NO. 538
Commissioner of Public Lands on behalf of the Government of the Territory of Hawaii; to H.P. Baldwin:
This Indenture, made this 26th day of February A.D. 1902, between the Commissioner of Public, for and on behalf of the Government of the Territory of Hawaii, of the first part, hereinafter called the Lessor, and H.P. Baldwin of Haiku, Island of Maui, said Territory, of the second part, hereinafter called the Lessee.

Witnesseth:- That for and in consideration of the rents, covenants and agreements hereinafter reserved and contained, on the part and on behalf of the said Lessee, his executors, administrators and permitted assigns, to be paid, kept and performed, he, the said Lessor, by virtue of the authority in him vested by law, has demised, and by these presents does hereby demise and lease unto the said Lessee, his executors, administrators and assigns, all that certain tract or parcel of forest land in possession of the Government of the Territory of Hawaii, situate in the District of Koolau, on the Island of Maui, Territory aforesaid, extending from the Western brink of gulch of Wailua-iki (said gulch of Wailua-iki being the next gulch westward of the gulch that bounds the Western side of Grant 1164 in Kuliae) to the Western brink of gulch between the lands of Kapaula and Puakea (or Paakea), said gulch being also named "Waiaaka" gulch on Public Lands Map No. 20 of Nahiku, this tract extending from the Ocean to the boundary of Haiku above, and being shown in plan herewith as Tract Number Two. [*Figure 38*]

Area 6,500 acres, more or less; excepting there from a portion of the land of Keanae, being the "Keanae flat", lying *makai* of the present public road, bounded on the north and east by the sea, on the west by the sea and the foot of the bluff that forms the natural boundary of this flat.

To have and to hold, all and singular the said premises above mentioned and described, together with all rights, privileges and appurtenances thereto belonging or in anywise appertaining (subject, however, to all vested interest in water of land-owners in Keanae and Wailuanui and of all other third parties) unto the said Lessee, his executors, administrators and assigns, for and during the term of twenty-one (21) years form the date hereof…

And said Lessee, does hereby for himself and his executors, administrators and assigns, covenant with said Lessor and his successors in office, that and they will not do or commit or permit or suffer to be done or committed any waste, spoil or destruction in and upon the demised premises. Or any part thereof, or cut down or permit to be cut down any trees, or cut or clear or permit to be cut or cleared any forest or undergrowth, now growing or being, or which shall hereafter grow or be , in and upon the above described premises, except for the purpose of fencing said land, or for domestic purposes of the Lessee, his agents, executors, administrators and assigns, residing on said premises, or for the development, storage, transportation or other utilization of the water which is thereon; and will not make or

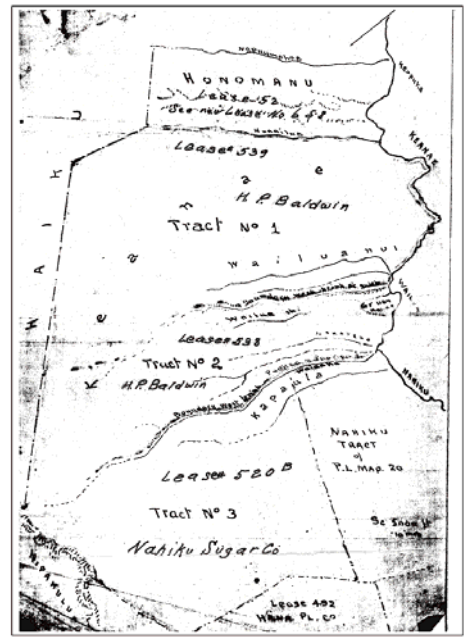

Figure 38. Lands of Keanae-Nahiku Region, Covered in General Leases 520 B, 538 & 539 (1902)

suffer to be made any fires on said land which will injure the forest thereon, and will use every endeavor to protect and encourage the growth of forest and underbrush now upon said land, and renew the same in places where it is absent or shall appear to be in process of dimution; and will not permit any live-stock to run at large on said land, and, at his and their own cost and expense, within a reasonable time after the date hereof, shall build and maintain a fence on the upper side of the old Government road, along its entire length, to prevent stock from trespassing on said land; and will not interfere with the vested interests in water of land-owners in Keanae or Wailuanui or of other third parties, and will, at the end or other sooner determination of this lease, peaceable and quietly yield up unto the Lessor or his successors in office, all and singular the premises hereby demised, with all erections, buildings, flumes and improvements of whatever name or nature, now on or which may hereafter during said term be put, set up, erected, laid or placed upon the same, in as good order and condition in all respect (reasonable use and wear thereof expected) as the same are at present or may hereafter be put by Lessee, his executors, administrators or assigns.

And also, that the Lessee shall furnish from the water obtained from the land hereby demised, at such points of the ditches, flumes and reservoirs used for the conveyance or storage of such water, as shall be reasonably convenient to the applicants, water to Government Homesteader applying therefore for domestic use or irrigation upon their respective homesteads, at such rates as shall be approved by the Commissioner of Public Lands…

The word "Homesteaders" in this instrument shall be construed to mean all persons or their heirs or assigns holding land taken out of existing public lands along the line of such ditches, flumes and reservoirs, under "An Act to Facilitate the Acquiring and Settlement of Homesteaders." Enacted in the year 1884, and its amendments, and homestead leases, rights of purchase leases, freehold agreements, and special agreements of sale under the Land Act of 1895 and its amendments… [in Collection of the State Land Division – Packet, General Lease No. 538]

February 26, 1902
GENERAL LEASE NO. 539
Commissioner of Public Lands on behalf of the Government of the Territory of Hawaii; to H.P. Baldwin:
This Indenture, made this 26th day of February A.D. 1902, between the Commissioner of Publis [sic], for and on behalf of the Government of the Territory of Hawaii, of the first part, hereinafter called the Lessor, and H.P. Baldwin of Haiku, Island of Maui, said Territory, of the second part, hereinafter called the Lessee.

Witnesseth:- That for and in consideration of the rents, covenants and agreements hereinafter reserved and contained, on the part and on behalf of the said Lessee, his executors, administrators and permitted assigns, to be paid, kept and performed, he, the said Lessor, by virtue of the authority in him vested by law, has demised, and by these presents does hereby demise and lease unto the said Lessee, his executors, administrators and assigns, all that certain tract or parcel of forest land in possession of the Government of the Territory of Hawaii, situate in the District of Koolau, on the Island of Maui, Territory aforesaid, extending from the Eastern boundary of the *Ahupuaa* of Honomanu to the Western brink of the Gulch of Wailua-iki (said gulch

of Wailua-iki being the next gulch Westward of the gulch that bounds the Western side of Grant #1164 in Kuliae) and from the Ocean to the boundry of Haiku above, as shown in plan hereto attached as Tract Number One. Containing an area of 12,500 acres, more or less; excepting there from a portion of the land of Keanae, being the "Keanae flat" lying *makai* of the present public road, bounded on the north and east by the sea, on the west by the sea and the foot of the bluff that forms the natural boundary of this flat… [see *Figure 38*, above]

[Conditions and Requirements of the General Lease as stated in General Lease No. 538 — in Collection of the State Land Division – Packet, General Lease No. 539]

June 19, 1908
East Maui Irrigation Company Agreement:
East Maui Irrigation Company, Ltd. (EMI) was incorporated through an Agreement between Hawaiian Commercial & Sugar Co., Haiku Sugar Co., Paia Plantation, "Five Corporations" and Maui Agricultural Co. The agreement formed EMI, and leased all ditches, water rights and casements, etc. East of the west boundary of the *Ahupuaa* of Opana, excepting as to Kaluanui Ditch to EMI. The Articles of Association of East Maui Irrigation Co. Ltd., dated June 23, 1908 [EMI Collection – Packets 2 & 4].

1913
Department of the Interior United States Geological Survey
George Otis Smith, Director
Water-Supply Paper 318 – Water Resources of Hawaii, 1909-1911
Prepared under the Direction of M.O. Leighton; by W.F. Martin and C.H. Pierce[20]
…Island of Maui
General Features
Maui has an area of 728 square miles and is the second largest island in the group. Its greatest length is about 47 miles from northwest to southeast. The greatest width across the island is about 25 miles, and the least width across the isthmus is 6 or 7 miles… [p. 197] …East Maui is one of the younger mountains of the group. Its crater, Haleakala, at the summit, 10,000 feet above sea level, is the largest extinct crater in the world, and is as well preserved as if its fires were extinguished but yesterday. The crater is 20 miles in circumference and 2,000 feet deep, and contains many cinder cones, some of which rise 700 feet above its floor. There are two great gaps in the rim of the crater, Koolau at the north and Kaupo at the southeast, through which liter lava flows poured into the sea at Keanae and Kaupo, respectively. Although there seems to be no record of the date, it is probable that the last flow took place through the Kaupo Gap only a few hundred years ago.

From the rim of the crater the slope is uniform in all directions, being steepest on the south. Erosion has not yet produced any of the knife-edge ridges and deep gorges that are so numerous on West Maui. Keanae Valley, on the northeastern slope, is the most prominent topographic feature, but it probably originated in a faulting rupture. Honomanu Gulch attains the proportions of a canyon for a short distance back from the sea, and next to Keanae is the most prominent of the East Maui gulches.

[20] Readers please note: the following narratives include verbatim excerpts pertaining to key descriptions of the East Maui Ditch Country" and components of the system. The texts include detailed tables and lengthy narratives, and should be reviewed for additional documentation.

Halehaku and Maliko are also long deep gulches on the northern slope of East Maui. The western and southern slopes are practically devoid of deep gulches. All the permanent streams are on the northeastern and southeastern slopes.

The shore line of Maui is fairly regular, there being no prominent points or capes. Cliffs exist on the northeastern coast, but they are not very high. Maalaea, on the south side of the isthmus, is the largest bay. Hana is a small bay at the east end. The only harbor is Kahului, on the north side of the isthmus. Considerable coral exists along the west coast of West Maui and around Kahului Harbor on the north coast.

The rainfall varies greatly in different parts of Maui. On the west and south coasts it ranges from 20 to 30 inches annually and semiarid conditions prevail. On the northeast coast the rainfall is heavy, ranging from 100 to 300 inches or more on East Maui and from 150 to 200 or 300 inches in the mountains of West Maui.

The forest cover is confined almost entirely to the northeastern slope of East Maui and the higher mountains of West Maui. Very little vegetation exists on the western and southern slopes of West Maui except at the higher elevations.

Streams are numerous on the northeastern and southeastern slopes of East Maui. The largest and most constant streams, however, are on West Maui. Practically all the streams are used to irrigate [p. 198] cane and taro. The cane belt is on the western and eastern sides of West Maui, the northwestern and southeastern sides of East Maui, and on the isthmus. Taro is grown in some of the valleys, and a small quantity of rice is also grown. Both taro and rice require irrigation.

Good roads exist on central Maui, along the western and southern coasts of West Maui, along the northern coast of East Maui as far as Kailua, and along the southeastern coast. Around the other parts of the island there is only a horse trail… [p. 199]

East Maui
The Ditch Country
The northeastern coast of East Maui is known locally as the "ditch country" on account of the large ditches which extend into this region from the west. These ditches have been built at different levels and at various times since 1879, all being extended eastward into the water-bearing regions. They form a regular system which takes water from all the streams west of Nahiku, the total number of streams intercepted being more than 40. West of Halehaku Stream there are six ditches, including the Kula pipe line which has recently been constructed at 4,000 feet elevation for domestic supply. West of Puohakamoa Stream there are four main ditches, one of which starts from the Makapipi Stream near Nahiku.

This region has been opened largely through the construction of these ditch systems. From Kailua near the center of the region to Nahiku at the east it is impossible to travel except on horseback or afoot, and then only along ditch trails for a greater part of the distance. The trip through this region is one of the most interesting in the group, with its numerous gulches and waterfalls and frequent glimpses of the blue sea a mile or two distant and from 1,000 to 1,500 feet below. The rainfall is exceedingly heavy in this region, ranging from 100 to 300 inches.

On account of the complicated system of diversions and impossibility of travel except along the ditches, all water-supply investigations in this region have been made along the ditch levels. It has also been necessary to depend on the ditch tenders for gauge observers, and this limits the range that can be reached, as their other duties will not permit them to depart far from the ditch trail.

All the stations are considered in order along the ditches from east to west.

Although the present system of ditches takes practically the entire water supply of this region at times when the streams are low, yet it is safe to say that but a fractional part of the total run-off is conserved and put to beneficial use owing to the lack of storage capacity. Streams which have a flow of but a few second-feet ordinarily may become raging torrents with a discharge of several thousand second-feet at times of heavy rainfall. The streams subside quickly when the rain ceases, but the periods of heavy rainfall are so frequent that a much greater supply of water than that now utilized might be had if sufficient storage capacity could be provided near the points of diversion. [p. 259]

Koolau Ditch Region
General Features

By the Koolau ditch region is meant that section of the northeast slope of East Maui from Keanae eastward to Nahiku.

Koolau ditch heads in Makapipi Stream above Nahiku and intercepts the water of all streams westward to Keanae inclusive. West of Keanae this ditch runs through an almost continuous tunnel and is not supposed to pick up any water east of Alo division weir. The principal streams contributing water to this ditch are Makapipi, Hanawi, Kapaula, Waiaaka, Paukea, Wiaohue [sic], Kopiliula, East and West Wailuaiki, Wailuanui, and the various branches of Keanae Stream. All these streams rise in a region where the rainfall is from 200 to 300 inches. Water in excess of what the ditch can carry passes on down to the sea.

Koolau Ditch Near Keanae, Maui.

A staff gauge was installed in Koolau ditch above Keanae shortly after its completion in 1904. Since that time readings have been made twice daily and the records kept in the office of the Maui Agricultural Co. The gauge is graduated in inches and is placed on the left or *mauka* side of the ditch at an open section which appears to be permanent.

The Geological Survey has made a rating of the section by current meter measurements from which the daily discharge has been computed by means of the gauge-height records furnished by the Maui Agricultural Co. The gauge-height readings for this period were made under the immediate supervision of George Tripp. The discharge at this station shows the amount of water collected by the Koolau ditch from streams east of this point. This water is carried through tunnels to

the Alo division weir several miles farther east without being augmented by inflow from other streams… [p. 260 – Table and Ditch features cited in text]

Spreckels Ditch Region
General Features

The Spreckels ditch region embraces that section of the ditch country west of Keanae and east of Kailua. Spreckels ditch heads in Nuaailua Stream at an elevation somewhat less than 2,000 feet, and intercepts all streams westward to Nailiilihaele Stream. This ditch is one of the early ditches built in the islands and consists of a series of ditches which take out water from one stream, carry it across the ridge, and drop it into another stream, to be picked up in a similar manner lower down. This ditch is really an extension of the Haiku ditch. It intercepts water from the following streams: Nuaailua, Honomanu, Ulawina [sic], Kolea Nos. 1, 2, and 3, Haipuaena, Puohakamoa, Alo, Waikamoi, Kolea, Punaluu, and Oopuola.

The largest streams contributing water to this ditch are Honomanu, Haipuaena, and Puohakamoa, which rise on the northern slope of Haleakala at a distance of 6 or 8 miles from the sea.

Haipuaena Stream Near Huelo, Maui

Haipuaena is one of the large streams intercepted by the East Maui ditches. It is just east of Puohakamoa Stream and is west of Honomanu. It rises well up on the mountain side and its flow is fairly good at all times… [p. 268 – Table and Ditch features cited in text]

Puohakamoa Stream Near Huelo, Maui

Puohakamoa Stream is one of the largest streams intercepted by the East Maui ditches. It is east of Waikamoi and west of Haipuaena streams and reaches high up on the slope of Haleakala… [p. 271 – Table and Ditch features cited in text]

Alo Stream Near Huelo, Maui

Alo Stream is one of the small streams intercepted by the East Maui ditches. It is tributary to Waikamoi Stream from the east a short distance below the Alo Division weir. Spreckels ditch enters this stream a short distance above the weir and about 50 feet below the trail bridge crossing… [p. 274 – Table and Ditch features cited in text]

Waikamoi Stream Near Huelo, Maui

Waikamoi is one of the fairly large streams intercepted by the East Maui ditches. It is the first large stream west of Puohakamoa… [p. 276 – Table and Ditch features cited in text]

Oopuola Stream Near Huelo, Maui

Oopuola Stream is a small stream west of Waikamoi and East of Nailiilihaele. Its water is intercepted by Spreckels and Center Ditches… [p. 278 – Table and Ditch features cited in text]

Spreckels Ditch at Station No. 1, Near Huelo, Maui

Spreckels ditch heads in the Nuaailua Stream east of Honomanu Stream. Eight gauging stations have been placed on this ditch between its source and the reservoir near Kailua.

Station No. 1, which is at the trail crossing of Ulawina [sic] Stream, was established December 18, 1910… [p. 281 – Table and Ditch features cited in text]

Spreckels Ditch at Station No. 2, Near Huelo, Maui

Station No. 2 on Spreckels ditch is 75 feet east of Kolea Stream No. 2 and about 7 ½ miles by trail southeast of Kailua (Huelo post office). It was established November 6, 1911… [p. 284 – Table and Ditch features cited in text]

Spreckels Ditch at Station No. 3, Near Huelo, Maui

Station No. 3 on Spreckels ditch, which is about 300 feet east of Haipuaena Stream and about 6 ¾ miles by trail southeast of Kailua (Huelo post office), was established December 18, 1910… [p. 285 – Table and Ditch features cited in text]

Spreckels Ditch at Station No. 4, Near Huelo, Maui [sic]

Station No. 4 on Spreckels ditch was established December 18, 1910. It is about 300 feet below the trail crossing and ditch intake at Haipuaena Stream, and about 6 ¼ miles southeast of Kailua (Huelo post office). A staff gage, graduated into tenths of feet, is fastened to the right bank. Measurements are made from a log across the ditch about 125 feet above the gauge… [p. 287 – Table and Ditch features cited in text]

Spreckels Ditch at Station No. 5, Near Huelo, Maui

Station No. 5 on Spreckels ditch is about 150 feet above the ditchman's house at Alo division weir and about 5 miles by trail southeast of Kailua (Huelo post office). The station was established November 6, 1911… [p. 290 – Table and Ditch features cited in text]

Spreckels Ditch at Station No. 6, Near Huelo, Maui

Station No. 6 on Spreckels ditch is about 115 feet below the intake of Kolea Stream west of Waikamoi, and about 4 miles by trail from Kailua (Huelo post office)… Between this station and Station No. 5, Spreckels ditch receives the combined flow of Alo, Waikamoi, and Kolea streams at low and medium stage, and also one-third of the water of Koolau ditch, which enters the Spreckels ditch below the Alo division weir… [p. 291 – Table and Ditch features cited in text]

Spreckels Ditch at Station No. 7, Near Huelo, Maui

Station No. 7 on Spreckels ditch is located about 40 feet below the lower portal of the first tunnel west of Oopuola Stream and about 1 ¾ miles east of Kailua (Huelo post office). It was established November 6, 1911… Between this station and station No. 6 Spreckels ditch receives the combined flow of Pohakuhame [Pohakuhonu], Punaluu, Kauiea, Makanale, and Oopuola streams at low and medium stages. Water may be turned out of the ditch at Oopuola Stream when so desired and picked up again by Center ditch at a lower elevation… [p. 292 – Table and Ditch features cited in text]

Spreckels Ditch at Station No. 8, Near Huelo, Maui

Station No. 8 on Spreckels ditch was established November 8, 1911, about 275 feet above the weir outlet into the Papaaea reservoir 1 mile east of Kailua (Huelo post office)… [p. 293 – Table and Ditch features cited in text]

Center Ditch Region
Center Ditch Near Huelo, Maui

Center ditch region includes that part of the ditch country of East Maui below Spreckels ditch east of Nailiilihaele Stream and west of Honomanu.

Center ditch is an extension of Lowrie ditch east of Nailiilihaele Stream. It takes up water from the streams which originate below or pass Spreckels ditch.

A staff gauge, graduated in inches, is used by the Hawaiian Commercials & Sugar Co. to obtain the daily stage of the ditch. This gage is located near the ditchman's house, about 3 miles by trail from Kailua (Huelo Post office). It is between Kolea and Punaluu Streams… [p. 294 – Table and Ditch features cited in text]

Hamakua Ditch Region
General Features

The Hamakua ditch region includes that part of the ditch country of East Maui west of Nailiilihaele Stream. Five ditches at different levels are used to convey the water from this region to the cane fields on the isthmus of Maui. In order of elevation they are Haiku, Lowrie, Old Hamakua, New Hamakua, and Kaluanui ditches. They cross about 20 gulches east of Maliko, all of which have more or less water at all times and large quantities after storms.

The Hamakua ditch proper begins at Nailiilihaele Stream. From the Alo division weir to the Nailiilihaele two-thirds of the water from the Koolau ditch is carried by the Hamakua ditch extension. No water is taken into this ditch between these two points. The old Hamakua ditch, built by H. P. Baldwin and Sam Alexander in 1876-78, started from the main branch of the Nailiilihaele at a much higher elevation than the present intake of the new Hamakua ditch. It was of irregular grade, dropping into gulches and taking out again farther down, finally delivering the water to the lands of the Haiku Sugar Co. and the Paia Plantation at an elevation of 850 feet. The total length of the ditch was 34 miles and its capacity 40 second-feet.

The new Hamakua ditch, starting at an elevation of 1,190 feet, has a regular grade of 5 feet to the mile and a length of 16 miles. Its maximum capacity is 120 second-feet. The two ditches cross in Hoolawanui Stream, just east of Lupi.

All of the measurements made in this region have been made near the trails which follow these two ditches.

Nailiilihaele Stream Near Huelo, Maui

Nailiilihaele is one of the largest of the streams supplying water to the East Maui ditches. It rises far up on the northern slope of Haleakala, where the rainfall is heavy. The total flow of the stream at low stages is taken by the new Hamakua ditch; at higher stages water passes down the stream to the Lowrie and Haiku ditches below.

The gauging station was established on Nailiilihaele Stream just above the crossing of new Hamakua ditch, about 1 ½ miles south of Kailua (Huelo post office), December 9, 1910. A staff gauge, graduated in tenths of feet and consisting of two parts, is fastened to the right bank about 12 feet above the ditch. Only wading measurements have been made. The discharge at this point gives the total flow of the stream above all diversions.

A large tributary from the west joins the main Nailiilihaele Stream about half a mile above the gauging station… [p. 298 – Table and Ditch features cited in text]

Kailua Stream Near Huelo, Maui

Kailua Stream, which is just west of Nailiilihaele Stream, is one of the large streams supplying the East Maui ditches. Its principal tributary is Oanui Stream, which enters it from the west just below the new Hamakua ditch. The total flow of Kailua Stream at low stages is taken by the new Hamakua ditch; at higher stages water passes down to the Lowrie and Haiku ditches below… [p. 301 – Table and Ditch features cited in text]

Oanui [Ohanui] Stream Near Huelo, Maui

Oanui Stream is tributary to Kailua Stream from the west, entering a short distance below the crossing of the new Hamakua ditch… [p. 303 – Table and Ditch features cited in text]

Hoolawaliili Stream Near Huelo, Maui

Hoolawa Stream, which drains the area just west of Huelo Stream and east of Honopou, is one of the important streams supplying the East Maui ditches. It has two principal branches, known as Hoolawaliili and Hoolawanui (small Hoolawa and large Hoolawa)… [p. 306 – Table and Ditch features cited in text]

Honopou Stream Near Huelo, Maui

Honopou Stream is just west of Holawa Stream in the East Maui ditch country. The water of this stream is intercepted by the old and new Hamakua ditches, which take the entire flow at low and medium stages; at higher stages water passes down to the Lowrie and Haiku ditches below… [p. 310 – Table and Ditch features cited in text]

Halehaku Stream Near Huelo, Maui

Halehaku is one of the large gulches on the northern slope of Haleakala crossed by the East Maui ditches. As is often the case in Hawaii, this gulch has various names in different places, and at the crossing of the Government road about 2 miles from the sea it is known as Kakipi. The principal tributary of Halehaku Stream is Opana Stream, which joins it from the west below the old and new Hamakua ditches and above the Lowrie ditch… p. 312 – Table and Ditch features cited in text]

Opana Stream Near Huelo, Maui

Opana Stream is tributary to Halehaku Stream from the west. Its water is intercepted by the Old and New Hamakua ditches.

A gauging station was established on this stream December 13, 1910, at a point about 300 feet below the bridge on the trail crossing, about 150 feet above the ditch siphon, and 7 ½ miles west of Kailua (Huelo post office)… [p. 316 – Table and Ditch features cited in text]

Opana Ditch Near Huelo, Maui

The Opana ditch is a feeder for the New Hamakua ditch. It diverts water from Opana Stream several hundred feet above the bridge on the trail crossing, and at low and medium stages takes the entire flow of the stream… [p. 317 – Table and Ditch features cited in text]

New Hamakua Ditch at Nailiilihaele Weir, Near Huelo, Maui

New Hamakua ditch heads at the Alo division weir and receives two-thirds of the water delivered by the Koolau ditch at that point. It runs through an almost

continuous tunnel from the division weir to Nailiilihaele Stream without intercepting any water on the way… [p. 318 – Table and Ditch features cited in text]

Kaluanui Ditch at Puuomalei, Near Hamakuapoko, Maui

Kaluanui ditch heads in Opana Stream at an elevation of 2,500 feet. It collects water from several small streams above Puuomalei and finally joins the New Hamakua ditch west of Maliko Gulch… [p. 324 – Table and Ditch features cited in text]

Pumped Water on East Maui

Considerable water is pumped for irrigation on the west end of East Maui and on the isthmus connecting East and West Maui. About 15 pumping stations have been established by the Hawaiian Commercial & Sugar Co. and the Maui Agricultural Co. These pumping stations are only run during parts of the year when there is a shortage in the gravity supply delivered by the ditches… [p. 331 – Table and Ditch features cited in text].. [Martin and Pierce, 1913]

HAMAKUA LICENSE
General Lease 974 Water License

December 10, 1917
Territory of Hawaii; to East Maui Irrigation Co.:
Term: 21 yrs. from date; Expiring December 10, 1938
Recorded: In Land Office
Rental: $13,500.00 for the first year, payable semi-annually, thereafter (beginning Dec. 10, 1918) annual rental, payable semi-annually for 10-year periods, to be determined by a Board of Appraisers. (Present Rental: $22,652.00)

Waters and Lands Affected: All of the waters belonging to the Territory flowing in the streams situate in the District of Hamakualoa, Island of Maui, known as:

Nailiilihaele
Kailua
Hoalua
Huelo (Hanehoi ?)
Halawa (Hoolawa)
Honopou

and all other waters belonging to the Territory arising and flowing upon any of the Govt. lands lying between the land of Papaaeanui on the East and Halehaku on the West, excepting +++++ waters as are held under license issued to Claus Spreckels on July 8, 1878…

Conditions: Right to enter upon Govt. lands (as above) and with the approval of Licensor, develop additional water, with right to construct additional ditches, etc. upon locations as may be approved by the Licensor.

Licensor, may upon two years written notice, withdraw the whole or any part of the water, for reclamation, home-stead, or other public uses and purposes. If portion of the water is withdrawn, the rental shall be reduced proportionately, such reduction to be determined by three arbitrators.

It is expressly agreed that all waters flowing from the land of Haiku-uka or from any other privately owned lands into any of the streams hereinbefore named or upon any of the Government lands involved in, or covered in any respect by this license, shall in no way be considered to be granted or covered by this license but shall be considered as excluded therefrom.

License may be cancelled by violation or failure to observe or perform any of the covenants and on 60 days' notice if not remedied, all improvements shall revert to the Territory, except that Licensee shall have the right to transport its own waters over the necessary ditches included in any license or agreement in force at the time.

Licensee may, within 60 days after cancellation or termination, remove any power plants {but not including - buildings), +++++ together with poles, wires, +++++ and other electrical appliances.

All other improvements revert to the Territory on the expiration of the license. [State Land Division]

Water Supply and Crop Development Since 1894
on Maui Agricultural Co. Lands, Island of Maui
Showing Detailed Costs of KAUHIKOA DITCH
by A.W. Collins
(1918)

In 1918, A.W. Collins (Engineer, Maui Agricultural Co.), prepared a detailed historical overview of ditch development in East Maui as a part of a report on the construction of the Kauhikoa Ditch. Collins (1918) reported:

> On September 30th, 1876, Haiku Sugar Co., Alexander & Baldwin, James Alexander and T.H. Hobron, under the firm name of Hamakua Ditch Co., obtained a lease from the Hawaiian government to take water from the streams Naiiilihaele, Kailua, Huelo, Holawa and Honopou, on the Island of Maui, and the right to construct a ditch to convey this water to the various plantations interested, with the provision, however, that the work would be completed in two years or by September 30th, 1878.
>
> This was the start of the first irrigation project in the Hawaiian Islands—a wonderful undertaking at that time, considering the many difficulties encountered and the lack of any previous experience along this line.
>
> Quoting from Mr. Arthur D. Baldwin's book, "Henry Perrine Baldwin," on this work, gives one a good idea of its magnitude:
>
> > The project, the pioneer operation of its kind in the Islands, had been for some time in the minds of Mr. Alexander and Mr. Baldwin. The rain in the Islands is carried by the northeast trade winds and falls on the windward slopes of the mountains, which are too rough for cultivation, being cut by large gorges, down which the water runs back to the sea without benefiting man other than by decorating for him one of the loveliest districts in the world. The plantations were situated on the level tracts of land farther to the southwest, upon which very little rain fell and where in consequence vegetation did not thrive. With that constructive imagination fundamental in successful captains of industry, the partners conceived the idea of carrying this water through tunnel and ditch from the gorges of East Maui to the potentially fertile but dry lands of central Maui. Accordingly, they commenced negotiations with the government and obtained from it a lease dated September 30th, 1876, by which they were authorized to build an aqueduct to carry certain water to the desired territory, but upon condition that the ditch should be completed by September 30th, 1878.

This lease ran in favor of Haiku Sugar Co. (situated to the northeast of Paia and managed by Mr. Alexander), Alexander & Baldwin Co-partners, James Alexander and T. H. Hobron (private sugar planters), all of whom on November 2, 1876, organized the Hamakua Ditch Company.

The old Haiku plantation record contains the following entry for August 24, 1876 [p. 7]:

> Mr. A. said that he had had Mr. J. M. Alexander to survey most of the distance, and that according to their views the undertaking was feasible. The estimate for the cost of the ditch was not over $25,000 according to his own ideas. He hoped to be able to bring the water into their fields as early as May, 1877, if the grant and water privileges could be obtained from the government.
>
> As it turned out, Mr. Alexander was unduly optimistic, both as to the time for finishing the project and in his estimate of the amount of money which would be needed. In fact, the cost of the ditch was about eighty thousand dollars; and to obtain this sum proved very difficult. It was a new kind of enterprise not then proven successful, and business men timidly shook their heads when it was proposed that they should assist with their capital. In the end Castle & Cooke, agents for the plantations concerned, were persuaded to advance the necessary money, and the work was commenced. Mr. Baldwin then threw himself into the task with his accustomed energy, notwithstanding that he was still so little recovered from his almost fatal accident that during those days in the "ditch country" he was often obliged to ride away into the woods by himself, dismount from his horse and, unseen by the laborers, lie down until rested sufficiently to proceed.
>
> When the ditch builders came to the last great obstacle, the deep gorge of Maliko, it became necessary in connection with the laying of the pipe down and up the sides of the precipices there encountered, for the workman to lower themselves over the cliffs by rope, hand over hand. This at first they absolutely refused to do. The crisis was serious. Mr. Baldwin met it by himself sliding down a rope, using his legs and one arm, with which he alternately gripped and released the rope to take a fresh hold lower down. This was done before his injured arm had healed and with a straight fall of two hundred feet to the rocks below! The work men were so shamed by this exhibition of courage on the part of their one-armed manager, that they did not hesitate to follow him down the rope. To keep the heart in them and to watch the progress of the work Mr. Baldwin day after day went through this dangerous performance.
>
> Before the ditch was completed, a new danger appeared. Claus Spreckels, who exerted a great influence over King Kalakaua, obtained on July 8, 1878, a lease of the waters, including those in the section to be traversed by the Hamakua ditch, "That are not utilized on or before the date of these presents—provided that such grant shall not interfere with prior or vested [p. 8] rights of other parties in and to water of said streams or on government lands."

This lease made it absolutely essential that the work be completed—otherwise the water would go to Mr. Spreckels. Unfortunately, on July 9, 1878—within the time limit, namely, September 30, 1878—Samuel Alexander left on a trip to Europe with his brother William, probably not being aware of the lease to Mr. Spreckels, and it was left to Mr. Baldwin, without the help of his partner and without assistance from any trained engineer, to carry the task to completion before his rights be forfeited.

Mr. Langford, who superintended the work, was, in fact, a carpenter by trade and consulted with Mr. Baldwin about all details, while the overseers (selected from a band of shipwrecked sailors) and the laborers were quite inexperienced in the kind of work required… The wonderful results obtained throughout the Islands by means of irrigation stand today as a fitting tribute to the ability and far-sightedness of those men who were willing to stake their all on their new project.

The Hamakua ditch as built had a carrying capacity of 40 cubic feet per second. The grade was naturally very irregular, due to the primitive methods used in establishing levels. The total drop from Naiiilihuele to the western side of Maliko gulch was 790 feet. The pipe lines were of 26-inch diameter and were made of iron.

This was the main source of water supplying Haiku Sugar Co. and Paia Plantation Co. up to the year 1897, when the small pump was installed at Maliko gulch by Haiku Sugar Co. to furnish more water during the dry months. This pump had a rated capacity of 4 ½ million gallons per day, delivered to a height of 250 feet. [p. 14] The next year the large pump was put in at Maliko and the two at Paia. The capacities of these pumps were as follows: [*Figure 39*]

Maliko (large) 5 million gallons to elevation 433
Paia (large) 5 million gallons to elevation 417
Paia (small) 5 million gallons to elevation 214

As there was still a large tract of land available for cane, it was proposed along about 1901 or 1902 to do further ditch construction—water measurements were started and surveys of different lines begun.

This resulted in the building of the Koolau and the New Hamakua ditches.

The Koolau ditch is eight miles in length and the Nahiku extension taps all water from Keanae to Nahiku. It ends at Waikamoi at an elevation of 1200 feet and delivers 80 million gallons per day, or 124 cubic feet per second. Its total cost was $477,000.00, and was financed by both Haiku and Paia on one side, and the Hawaiian Commercial & Sugar Co. on the other, the latter paying one-third and receiving that much of the water. This ditch was a very good construction, being nearly all tunnels with a grade of from five to seven feet per mile, and partly lined with concrete.

The new Hamakua ditch begins at Waikamoi and delivers 78 million gallons a day to the plantation, at an elevation of 1100 feet. Its total cost was $366,000.00, and, unlike the Koolau, was of rather poor construction. This was due mainly to the desire to speed up construction, and in many cases where one tunnel of 1500 feet to 2000

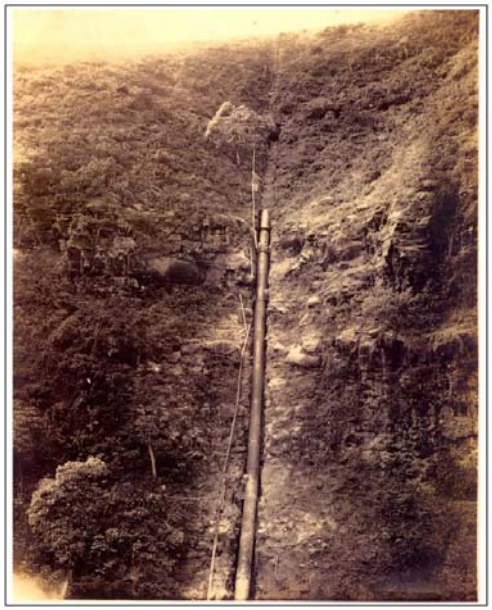

Figure 39. Maliko Pipe Line — Kauhikoa Ditch; 1915 (Courtesy of EMI Co. Ltd.)

feet should have been made, shorter tunnels running down the gulches and through the ridges were put in.

In this way the material encountered was very bad and caused considerable caving; these places were roofed in some instances with green *ohia* from the forest. Naturally, this ditch is giving considerable trouble at the present time.

Along about the time prior to building these two ditches negotiations have been pending for combining Haiku Sugar Co. and Paia Plantation Co. This was accomplished in the fall of 1903—and together with the five companies which represented the purchase of 5000 acres from Kihei Plantation Co., they were incorporated under the name of Maui Agricultural Co., with the mill and office at Paia. As more water became available from time to time, more cane was planted and a steady growth resulted—until in 1915, Maui Agricultural Co. turned out its banner crop of 39,620 tons. [p. 19]

That the water supply has been the main cause of this steady progress is shown by the following table of the sugar output from the year 1894. The years 1894, 1897, 1901 and 1913 were very dry and the direct results of these droughts are clearly shown by the short crops … [see Table of crop tonnage for years of 1894 to 1917]

At the time of constructing the New Hamakua ditch, it was thought that possibly the Hamakua ditch could be abandoned, but more land had been opened in the dry sections west of Kailua gulch [this being Kailua which is the Wailuku boundary of Hāmākua Poko], and it was found that the old ditch was very valuable to bring along surplus water to that section where the rainfall is very light. However, by this time the ditch was beginning to show signs of its many years of usefulness: the open ditch sections were raveled badly, in some places being fifteen to twenty feet wide where they were originally six to eight; the pipe lines [p. 20] were in very bad shape, requiring constant attention. This became worse, as the ditch, being used for practically only surplus water, was wet one day and dry the next.

With so large an acreage in cane the old ditch was deemed valuable enough to warrant extensive repairs or an entirely new line. An examination of the old ditch, a survey for an entirely new line between Opana and the plantation, and a report recommending the construction of new line was made by the writer during the latter part of 1911.

As proposed and built the line known as the Kauhikoa Ditch starts below the measuring weir in Opana at elevation 1018, practically the same as the old Hamakua ditch, at this point.

It is fed by the old Hamakua ditch, which is still in use from Opana to Waipio, and by surplus water in Halehaku and Opana gulches. It consists chiefly of tunnels, and runs on a grade of 2 feet in a thousand to West Kuiaha, where there is a drop of 80 feet.

It was planned originally to construct a reservoir here, but to date this has not been done, and probably never will be, due to the porous nature of material.

The line starts again at elevation 916 and continues on a grade of 2 feet per thousand, to Maliko gulch; this is crossed in a steel pipe, 52 inches in diameter, 880 feet long, encased in four inches of concrete. The line ends at the hydro-electric station, back of the Maunaolu Seminary, and delivers water to the relocated old Hamakua ditch, at elevation 857.3.

The size of tunnels is 6 feet wide and 6 ½ feet high.

It was planned to make as permanent construction as possible, and to have as few open ditch intakes as possible, so as to have complete control during storm periods.

Excavation was started June, 1912, and was carried on entirely by Japanese tunnel men.

Some very hard rock was encountered, which held up the work considerably. There was 400 feet of very tough rock under the Kauhikoa hill, in a tunnel 2016 feet long. In the longest tunnel (3062 feet), on the west side of Maliko gulch, 800 feet of very hard rock was excavated where the progress was very slow. No power drills were used.

In several tunnels, where water was in evidence, considerable difficulty was experienced from cave-ins. These places were timbered with enough clearance so that concreting, as wanted, could be carried on inside without further trouble.

Excavation was finished September, 1914, and lining started at once. The lining consisted mostly of concrete 4 inches in thickness, with a mix of 1:3:5. The walls were 4 feet 9 inches above the floor grade to allow for a full ditch of 4 ½ feet. [p. 23]

There was, however, hand-plastering placed in the dry tunnels. This was 1 inch thick and was reinforced with No. 19 chicken wire, 1 ½-inch mesh, which was stapled into the earth.

Wherever roofing was necessary, a 6-inch slab was put in, reinforced in some instances with second-hand rails, and in some instances with ¾-inch cup bars spaced 10 inches.

The two flumes in Avalau [Awalau] and Lilikoi gulches were of reinforced concrete, 20-foot spans and an 8-inch wall with 6-inch floor. These were all done in one continuous pour.

The pipe at Maliko was a very difficult piece of work, due to the steep sides of the gulch. The maximum head is 308 feet, the thickness of plate at bottom is 3/8 inch and on the upper half section ¼ inch. This pipe is carried 20 feet above the bed of the stream on a 60-foot concrete bridge. There is a blow-off valve and a manhole at the bottom. The concrete was all mixed at ends of pipe and shot into place through a 6-inch pipe. The forms were semi-circular and were wired around the pipe. This work was done very speedily and looks like a very satisfactory method of protecting the pipe from falling stones and from corrosion.

The capacity of this ditch is 100 million gallons per day. It is now thought that more construction will be done soon to bring Koolau ditch water along to Halehaku in a

lined canal. This would necessitate a new ditch, as the water could not be stopped long enough for work of any magnitude to be completed.

This ditch, if constructed, should be large, say with a capacity of 150 million gallons, so that in dry weather practically all water could come in it as far as Halehaku and be distributed there… [p. 24]. [Collins, 1918]

HONOMANU LICENSE
General Lease 1134 Water License
October 17, 1919
Territory of Hawaii; to East Maui Irrigation Co.:

Term: 21 yrs. from July 26, 1919, expiring July 26, 1940.
Recorded: In Land Office

Rental: $25,820.00 per annum for the first ten years, paid semi-annually, for the next 11 years (beginning July 26, 1929) annual rental, payable semi-annually, to be determined by a Board of Appraisers. (Present rental, $10,712.00)

Waters and Land affected: All the natural surface waters, waters developed by tunneling, and all power and energy +++++ upon the *Ahupuaa* of Honomanu, district of Koolau, Island of Maui, with the privilege of developing additional water and power, etc. etc.

Reserving there from water now being used for the wet lands in the *Ahupuaa*, and as may be necessary for domestic purposes of persons now living on said land… [State Land Division]

Brief Outline of the History of The Hui Aina o Huelo (ca. 1924)

1. In 1877, Sir William Renney Watson of the Mirlees-Watson Co. of Glasgow visited Hawaii and during his visit he obtained contracts for the machinery of several new sugar mills.
2. Robert Catton, representing Mirlees-Watson Co. erected several mills in Hawaii before going to Huelo to erect a mill in 1879. He remained in Huelo to run the mill to grind cane for Akanaliilii and the Chinese associated with him.
3. Between 1877 to 1880 (inclusive), Akanaliilii purchased or leased the greater part of what later became the "Huelo Hui Lands."
4. The mill evidently ran till 1883, at which time, Robert Catton returned to Honolulu.
5. Akanaliilii became heavily indebted to W. R. Watson. Consequently, the Superior Court in Equity ordered the sale of Akanaliilii's property at a public auction. A Court order was filed on Nov. 6, 1886 confirming the sale of the property to W. R. Watson.
6. The history of the land from 1886 to 1896 is very vague. However, it appears that between 1885 to 1896, cane was grown by representatives of Mr. Watson. The venture did not seem to be successful and Mr. Watson authorized Robert Catton to dispose of the Huelo lands.

7. Mr. Catton could have easily disposed the lands to some Maui corporations but he felt the land should become the property of Hawaiians in the district so he accordingly made them a very liberal offer in September of 1896. The offer was a total of $7,000.00. $4,000.00 was payable at the time of the sale and the remaining $3,000.00 with 9% interest within three years.
8. Mr. Catton corresponded with Mr. J. K. Smythe on the land matter.
9. On September 12, 1896, the Hawaiian residents of Huelo met and formed a Hui for the purpose of purchasing the land. It was decided that there shall be 100 shares in the organization and the offer to purchase the land would be made only to Hawaiians. All shareholders were required to make their payments within six months from Oct. 1, 1896. The approximate area of land was 1,459 acres.
10. At the Oct. 17, 1896 meeting, it was reported that 88 shares of the Hui were subscribed for by 84 members.
11. Kupihea, who appears to have been acting as the Hui's business agent in Honolulu advised the formation of the "Huelo Land Company".
12. At the February 25, 1897 meeting, "*Hui Aina o Huelo*" was agreed upon as the name of the Hui. It was also agreed that the initial payment per share should be $10.00.
13. From the letter dated March 29, 1897, it appears that the Hui had been able to raise about $1,000.00 towards making the initial $4,000.00 payment which was due on March 31st. Efforts were made by Kupihea to find someone to take a mortgage on the Hui's lands but he was not successful. About this time, Mr. Castle (probably an attorney for HC&S Co.), who had been approached by Kupihea, was investigating the problem of the Hui.
14. The executive committee of the Hui decided at their March 31, 1897 meeting to recommend to the Hui to allow other races to become members of the Hui. They also asked Mr. Catton for an extension of deadline for the initial payment of $4,000.00.
15. By April 27, 1897, $2,070.00 of the initial payment of $4,000.00 was raised. However, in May, Mr. Watson informed Mr. Catton that he wished to sell the land right away. Therefore, Mr. Catton agreed to accept $3,000.00 as part payment and the balance on mortgage. Kupihea hoped to get a loan of $6,000.00 from Mr. Castle but he could get only $3,000.00. Consequently, Kupihea made another proposal of installment payment which was accepted by Mr. Catton. Mr. John Richardson attempted to get Mr. Catton to withdraw his offer to the Huelo Hui but it was futile.
16. At the August 5, 1897 meeting, the Hui decided to make 70 shares available at $100.00 per share instead of 100 shares at $70.00. The matter of right-of-way and water rights for Spreckels Ditch was discussed.
17. On September 28, 1897, a mortgage loan of $4,500.00 with 9% interest was recorded from Mr. J. K. Smythe, Trustee of the Hui to Mr. Watson.
18. At the Nov. 12, 1897 executive committee meeting, the paying of taxes on the Hui's lands was discussed. Kaiapa suggested that HC&SCo. pay the $60.00 due as an alternative to making payment for its Spreckels Ditch right-of-way and water rights. (There is nothing in the minutes to show that this went through.)
19. At the May 26, 1898 meeting, the proposal by Akanaliilii, a member of the Hui, that water rights be leased from year to year was approved.

20. On October 20, 1898, all of the Huelo Hui lands and water rights and all other rights appurtenant to the land was given to Akanaliilii by J. K. Smythe for a term of twenty years at $600.00 rental per year with extension privileges.
21. On November 4, 1898, Akanaliilii assigns his lease to T. Kat Poo.
22. At the November 10, 1898 meeting, it was decided that all members be asked to pay their share in full and those who are delinquent be required to pay interest.
23. On or about June 1899, a resolution prepared by Wm. J. Coelho, a member of the Hui, seems to indicate a dissension among the Hui members pertaining to the Akanaliilii lease.
24. On July 28, 1899, L. Papoko and wife sold their Hui share to HC&SCo.
25. On July 29, 1899, T. K. Pa and wife sold their Hui share to HC&SCo.
26. A letter dated Aug. 11, 1899 from Mr. Coelho to Mr. Catton indicates problems with the Hui.
27. By the December 21, 1899 Hui meeting, HC&SCo. held title to 6 shares.
28. During January 1900, a bill for injunction and to cancel the lease held by Akanaliilii was filled by HC&SCo. et al vs. Maui Sugar Co. et al. Maui Sugar Co. was incorporated by the Huelo Sugar Mill Company and Wong Kwai. In the petition, the shareholders who disapproved the lease were listed as Plaintiffs and the remaining shareholders as defendants.
29. By the March 8, 1900 Hui meeting, HC&SCo. held title to 36 shares. A. N. Kepoikai was appointed by HC&SCo. on their behalf. The old officers resigned and the following were elected. A. N. Kepoikai, President; H. P. Baldwin, Vice-President; F. C. Allen, Secretary; W. J. Lowrie, Treasurer; and H. N. Landford, Auditor. It was unanimously approved that the Hui shareholder may sell their shares to whomsoever they wish. The minutes of this meeting were the last written in the Hawaiian language.
30. Between Nov. 16 and Dec. 18, 1900, there were 6 Hui letters pertaining to the original Smythe-Akanaliilii lease and the Smythe-Watson mortgage. The Smythe-Watson mortgage which was held by Yee Chin suddenly became due. Yee Chin refused to offer HC&SCo. an assignment of the mortgage.
31. The Smythe-Watson mortgage was advertised for foreclosure in Dec. 1900. A meeting of the Hui members were held on Dec. 20, 1900. The meeting was represented by all 70 shares of which HC&SCo. held 39 shares. The financial affairs of the Hui came to crisis with the mortgage being advertised for foreclosure.
32. On January 3, 1901, A&B, Ltd. on behalf of HC&SCo. paid the Yee Chin mortgage amounting to $2,600.00 plus interest. No mortgage was entered between the Hui and HC&SCo. The money matter was handled as an account on the HC&SCo. books. Collections made from time to time were turned over to the company and by June 1901, all shareholders had paid practically all due on their shares. The few remaining outstanding accounts were settled when a $12.00 per share dividend was declared on Sept. 24, 1903.
33. By the Jan. 11, 1901 meeting, HC&SCo. held title to 39 shares.
34. The controversy regarding the use of water in the streams from Hoolawanui to Huelo was settled by HC&SCo. taking the water from 6 pm to 6 am and Maui Sugar Co. taking it from 6 am to 6 pm. HC&SCo. also agreed to request the

ratification of the Smythe-Akanaliilii lease by the Hui Aina o Huelo. Maui Sugar Company granted HC&SCo. full rights-of-way for the Lowrie and Spreckels ditches across lands which it then held under the Akanaliilii lease.

35. By the July 11, 1902 meeting, HC&SCo. held title to 44 shares.
36. On January 23, 1903, the following were elected. H. P. Baldwin, President; J. K. Smythe, Vice-President; G. L. Keeney, Treasurer; A. N. Kepoikai, Secretary; and H. N. Landford, Auditor. With the Huelo Sugar Company surrendering its lease with the Hui, the matter of obtaining money to meet the taxes due on the land was discussed. Mr. Baldwin stated HC&SCo. might pay the taxes for the current year.
37. On January 21, 1910, the following were elected. F. F. Baldwin, President; J. K. Smythe, Vice-President; William Walsh, Treasurer; A. N. Kepoikai, Secretary; and D. B. Murdock, Auditor.
38. On September 19, 1924, a special Hui meeting was held. All 70 shares were represented either in person or by proxy. The object of the meeting was to discuss the advisability of partitioning off the lands of the Hui. Mr. Pogue stated he was informed that at a meeting of the minority shareholders, it was unanimously understood among them, that it would be agreeable to them, if each of the minority shareholders received the acreage equivalent to their shares, plus five acres additional per share for water rights and also to receive a perpetual supply of water for domestic purposes and for their cattle. Furthermore, each minority shareholder were to select his own area he wants. If more than one party selects an area, a drawing would be held to select the one who will receive the land.

Mr. H. A. Baldwin brought up the point regarding the planting of taro in the gulches by the shareholders, stating that with favorable rain, the shareholders may be inclined to plant taro and that when dry weather would set in, water may be expected to irrigate their crop. This phase of the situation was carefully explained to the shareholders present and it was the consensus of opinion that all understood that water was not to be provided by the plantation for irrigation purposes.

At the time of this special meeting, HC&SCo. had 45 shares, Kahului Railroad Co. had 5 shares, and H. A. Baldwin had 3 shares. [EMI Co., Collection]

KEANAE - WAILUA LICENSE
General Lease 1706 Water License
August 10, 1925
Territory of Hawaii; to East Maui Irrigation Co.:

Term: 21 yrs. from June 22, 1925, expiring June 22, 1946.
Recorded: In Land Office
Rental: $30,000.00 per annum for first 10 years, payable semi-annually; for the next 11 years (beginning June 23, 1935) annual rental, payable semi-annually to be determined by a Board of Appraisers. (Present Rental, $26,500.00)

Waters and Lands Affected: Portions of the Govt. lands of Keanae, Wailua 1 & 2, and the Kapehu Tract within the Koolau Forest Reserve, district of Koolau, Island of Maui, containing 15,387 acres. Note: The boundaries of the Koolau Forest Reserve have since been extended so that there are now 16,959 acres of Govt. land in the above three tracts in forest reserve, and 44.40 acres of privately owned land. License

grants the privilege +++++ all of the Govt. owned natural running surface waters within (the lands above described) and such other waters as may be developed, together with all power and energy capable of being developed;

Except: Such waters as are used for domestic purposes and for wet land cultivated by parties living on Govt. land *makai*, and waters to which kuleanas are entitled… [State Land Division]

January 15, 1929
Hui Kuai Aina o Ulumalu
Short History of the Sub-Division of Ulumalu Hui
Prepared by E.D. Baldwin, Maui Agricultural Co. Eng. Dept.
& J.H. Foss, Chief Engineer

This Hui, called the *Hui Kuai Aina o Ulumalu*, was similar to many other Huis such as the Peahi Hui, the Huelo Hui, etc., gotten up by natives, wherein by combination they were able to purchase quite a tract of land…

Ulumalu Hui was organized along about the latter part of 1883, and shortly afterwards elected a full set of officers, such as President, Vice President, treasurer, Secretary and Vice Secretary. During the year 1889 they published a full set of the Rules and By-Laws of the Hui.

From a perusal of the Ulumalu Secretary's records, in the possession of Haiku Pineapple Co. Ltd., the Hui does not seem to have been of much success and finally about 1910, or thereabouts, went to pieces. Along about 1912, the then Haiku Fruit & Packing Co. Ltd. began buying up the Ulumalu owners and succeeded up to 1915 in purchasing practically a 2/3 interest in the Hui. The old Hui was defunct and had not functioned for years.

Maui Agricultural Co. Ltd. and Hawaiian Commercial Sugar Co. Ltd. had also acquired considerable interests in the Hui, mainly for the protection of their numerous ditch rights-of-way crossing Ulumalu.

It was the wish of the two above companies to have Ulumalu Hui partitioned, and with the help of the largest owner, the Haiku Pineapple Co., work was commenced on the outside boundaries of the Hui lands.

All of the larger owners felt that they did not wish to take this subdivision to court, but that some other and cheaper method could be found to subdivide same.

With this idea in view, we began this work during November 1926 with the assistance of the Haiku Pineapple Co. Ltd.

They placed their Coelho Abstract at our service. This Abstract was only up to June 21, 1915, but it was of great assistance to us as with a few exceptions of missed deeds, we were able to bring all of the 50 titles up to a complete record of June 21, 1915.

Portions of the 50 original holders in many cases had not been sold, and in many cases both natives and Portuguese had changed their names making it very difficult

to trace them up. Also many had left Maui and gone to the other Islands to live. We chased them all over Maui, Honolulu to Waianae, down to Kauai and up to Hilo, Hawaii, and finally located every present owner in Ulumalu Hui.

We made absolutely certain that we had located every owner. At this point Haiku Pineapple Co. Ltd. bought up some six of the straggling owners, which greatly assisted our final work of partitioning.

In the meantime the Haiku Pineapple Co. and we went right on with our field work in locating and establishing the outside boundaries of the Ulumalu Hui lands.

Mr. J. R. Souza of Haiku Pineapple Co. made the controlling triangulation and topographical work, and also surveyed the Kaupakulua-Ulumalu boundary line from sea to mountain while we with the assistance of S. Okada ran the Opana-Ulumalu boundary line from mountain to sea.

On the completion of our title search, we found many bad deeds and deeds that sold more land than the original holder owned; many of these affected Haiku Pineapple Co. and to satisfy them that we were correct Mr. John Souza and I went over all of the Haiku Pineapple Co. deeds. We finally found that they were at a loss of nearly 60 acres from bad deeds. Maui Agricultural Co. Ltd. also lost 30 acres and Hawaiian Commercial & Sugar Co. Ltd. lost 30 acres from the same source. Also there had to be many more adjustments of the same kind with other owners, all of whom we had to see and satisfy them that we were correct.

Upon the completion of our title work, we made the Report of June 1927 as filed herein.

About the latter part of June 1927 D. C. Lindsay, J. H. Foss, John Souza and myself met at Haiku Pineapple Co. Ltd's. office to go over our report and decide upon the method of partitioning Ulumalu Hui.

In this meeting D. C. Lindsay and J. H. Foss represented over 80 per cent of the ownership Ulumalu Hui.

The method proposed, was to have all of the present owners of Ulumalu Hui land deed over to a "Dummy" and then divide out each ones interest and have the "Dummy" deed same back to them by a tied up description of their lot or lots.

This, it was pointed out, would not be satisfactory to the Portuguese owning interests in Ulumalu Hui as they claimed they did this in the subdivision of Kaupakulua Hui, and that they were done up by the "Dummy".

As to the truth of this matter we did not go into same, but I suggested that we first divide out their interests, get each one satisfied with same, and mark the lots upon the ground and then when we had everyone fixed and satisfied with their sub-division we would have them all deed over to a "Dummy" and the "Dummy" would immediately deed back to them.

This was satisfactory and we decided to adopt this method. Mr. John Souza and I were delegated to carry same out. We found this no easy task. Mr. Souza made the sub-divisions of all the lots, and we, with the assistance of S. Okada, surveyed out all of the ditch trail and road right-of-ways… [page 2]

At times we felt that we would finally have to carry the matter to Court as some of the Portuguese were very hard to satisfy. But finally we got every one satisfied, when it seemed again our plan was all upset by Manuel Burans and Kealo buying a small interest and attempting to jump same where they pleased to locate it. They consulted lawyers at Wailuku and they advised them that they had a right to select their undivided interest wherever they pleased.

I went out and called Mr. Burans and finally convinced him that he was only antagonizing the large interests and he came in and sold his interest to Haiku Pineapple Co.

Along about September 1928, I was asked to act as the "Dummy". I had already drawn up all the deeds and it was only a matter of completing same and having them typewritten.

On completion of the typewriting which was very neatly done by Mrs. Taylor, we started out the latter part of October 1928 to get our main deed signed up. Haiku Pineapple Co. Ltd. immediately signed up and then Mr. John Souza, and Mr. Cooper Notary Public and myself started out making a day of it. We succeeded in getting most of the signatures out in the country. I then took the deed with Moses Kahiapo as Notary Public and got the signatures of those at Paia, Puunene and Wailuku.

The main deed carried 94% of the owners.

All of the complicated deeds and deeds of natives on the other islands we kept on special separate deeds so as not to delay our main deed. These special deeds took considerable time and it was not until _____ that we finally completed the job.

In this work we wish to highly commend the assistance given us by the Haiku Pineapple Co. Ltd. through its manager Mr. D. C. Lindsay and John R. Souza, their surveyor. Mr. John R. Souza did all of the triangulation and lot subdivision surveys, all of which work I carefully checked up and found same of an excellent quality.

We completed a general map, 400 feet to the inch, showing all of the subdivisions, during January 1929. We wish to state that dates of beginning and completion of this job do not represent the time put upon same as J. R. Souza was very busy with other Haiku Pineapple work and we were busy also with many other jobs during the two years from November 1926 to January 1929.

(s) E. D. Baldwin
January 15, 1929
Maui Agricultural Co. Eng. Dept.
J. H. Foss, Chief Engineer
[EMI Collection – A&B Legal Packet]

Nahiku License
General Lease 2027 Water License
February 3, 1930
Territory of Hawaii; to East Maui Irrigation Co.:

Term: 21 years commencing January 17, 1930 Expiring January 17, 1951.
Recorded: In Land Office
Rental: $9,000.00 per annum, payable semi-annually for the first 10 years; for the next 11 years (beginning Jan. 17, 1940) annual rental payable semi-annually to be determined by a Board of Appraisers (Present Rental: $9,000.00)

Waters and Lands Affected; Land in the Koolau Forest Reserve, district of Koolau, Island of Maui, bounded in general terms as follows:

1. On the West by watershed of the Waiaka Stream;
2. On the South by the Koolau-Hana district boundary;
3. On the East by the same to Puu Hinai;
4. On the North by the Nahiku Homestead Tract.

NOTE: Water license same as in G.L. 974, 1134 & 1706, except such waters as are used for domestic purposes, and on land cultivated by parties living on Govt. land *makai* of the area covered by this license, and waters to which Kuleanas are entitled… [State Land Division]

Land License
Bearing
General Lease NO. 2027
February 6, 1930:
(Old Lease #520-B, L.B. #1209, AdBk 9-6)

KNOW ALL MEN B Y THESE PRESNTS:-

THAT, THE TERRITORY OF HAWAII, hereinafter called the Licensor, by C.T. BAILEY, its Commissioner of Public Lands, acting under the authority in him vested, pursuant to Section 73 of the Hawaiian Organic Act and the Revised Laws of Hawaii 1925, advertised and offered for sale at public auction, held January 17, 1930, a Land License for the right, privilege and authority to enter and go upon that tract of Government land in the Koolau Forest Reserve on the Koolau-Hana side of Maui, bounded in general terms as follows:
On the West: by the easterly line of the water shed of the stream, which is known at the Koolau ditch as Waiaaka, and the continuation of this water shed division to Pohaku Palaha;

On the South: by the boundary between the districts of Koolau and Hana;

On the East: by the boundary between the said districts to Puu Hinai;

On the North: by the southerly boundary of the Nahiku Homestead Tract, and to thereupon take, draw off and conduct away and utilize the Government waters therein, at which sale the EAST MAUI IRRIGATION COMPANY, LIMITED, an

Hawaiian corporation, hereinafter called the Licensee, was the highest bidder therefore, and… [page 1] …THAT, pursuant to said sale and in consideration of the conditions, covenants and agreements hereinafter contained on the part of the Licensee to be observed and performed, the Licensor does hereby grant to the said Licensee a License, right, privilege and authority to enter and go upon the land next above referred to, and to thereupon take, draw off, conduct away and utilize for its own purposes, or for sale to others, all of the Government owned natural running surface waters and such other waters as may be developed through tunneling or other artificial means, together with all power and energy capable of being developed therefrom, *except, however, such waters as are used for domestic purposes, and on land cultivated by parties living on Government land makai of the area covered by this License, and waters to which Kuleanas are entitled*, together with the further right to construct and maintain such ditches, flumes, aqueducts, tunnels, dams and other structures as may be necessary to enable Licensee to so take and utilize such waters for the purposes for which this License is issued…

(1) The term of this License is for twenty-one (21) years commencing January 17, 1930… [page 2 of 8] [State Land Division – G.L. 2027]

1934
Summary of Rights of Way For
Wailoa Ditch - New Hamakua Ditch - Kauhikoa Ditch from Opana –
Ulumalu Boundary to the top of the Westerly pali of Maliko Gulch.
…In Ulumalu these ditches were constructed, with the practical acquiescence of other owners in the Hui Land, under the ownership by the predecessors of Maui Agricultural Co. Ltd. and Hawaiian Commercial & Sugar Co. Ltd. and associated individuals of undivided interests in the Hui Land and/or (in the case of the New Hamakua and Kauhikoa Ditches) the portions of the Hui Land occupied by them… [East Maui Irrigation Co. Packet No. 194(1)]

C.S.F. 7154 & Map
September 6, 1934
Thomas C. Ryan, Senior Engineering Aide, Territory of Hawaii;
to East Maui Irrigation Co. Ltd:

Limited Perpetual Easement
PARCEL 3: New Haiku Ditch Right-of-Way (30 feet wide) across portion of the Government land of Honopou.

Situate at Honopou, Hamakualoa, Maui.

Being a strip of land 30 feet wide, the center line of which is described as follows:

Beginning on the center line at the West end of this right-of-way, and on the East boundary of the land of Halehaku, the coordinates of said point of beginning referred to Government Survey Triangulation Station "Kapuai" being 5927.22 feet North and 8928.70 feet East, as shown on Government Survey Registered Map 2744, and running by azimuths measured clockwise from true South… [State Survey Division]

C.S.F. 7156 & Map
September 6, 1934
Thomas C. Ryan, Senior Engineering Aide, Territory of Hawaii;
to East Maui Irrigation Co. Ltd:

Limited Perpetual Easement
PARCEL 7: New Haiku Ditch Right-of-Way (30 feet wide) across portion of the Government land of Puolua.

Situate at Hamakualoa, Maui.

Being a strip of land 30 feet wide, the center line of which is described as follows:

Beginning on the center line at the Northwest end of this right-of-way, and on the boundary between the lands of Waipio and Puolua, the coordinates of said point of beginning referred to Government Survey Triangulation Station "Kapuai" being 179.48 feet North and 17235.40 feet East, as shown on Government Survey Registered Map 2745, and running by azimuths measured clockwise from true South… [State Survey Division]

C.S.F. 7157 & Map
September 6, 1934
Thomas C. Ryan, Senior Engineering Aide, Territory of Hawaii;
to East Maui Irrigation Co. Ltd:

Limited Perpetual Easement
PARCEL 10: New Haiku Ditch Right-of-Way (30 feet wide) across portion of the Government land of Hanehoi.

Situate at Hamakualoa, Maui.
Being a strip of land 30 feet wide, the center line of which is described as follows:

Beginning on the center line at the West end of this right-of-way, said point being in the middle of Hanehoi Stream and on the boundary between the lands of Hanehoi and Huelo, the coordinates of said point of beginning referred to Government Survey Triangulation Station "Kapuai" being 602.97 feet South and 17,902.77 feet East, as shown on Government Survey Registered Map 2745, and running by azimuths measured clockwise from true South… [State Survey Division]

C.S.F. 7158 & Map
September 6, 1934
Thomas C. Ryan, Senior Engineering Aide, Territory of Hawaii;
to East Maui Irrigation Co. Ltd:

Limited Perpetual Easement
PARCEL 12: Lowrie Ditch Right-of-Way (30 feet wide) across portion of the Government land of Hanehoi.

Situate at Hamakualoa, Maui. Being a strip of land 30 feet wide, the center line of which is described as follows:

Beginning on the center line at the West end of this right-of-way, said point being in the middle of Hanehoi Stream and on the boundary between the lands of Huelo and Hanehoi, the coordinates of said point of beginning referred to Government Survey Triangulation Station "Kapuai" being 2907.84 feet South and 17,878.15 feet East, as shown on Government Survey Registered Map 2745, and running by azimuths measured clockwise from true South… [State Survey Division]

C.S.F. 7159 & Map
September 6, 1934
Thomas C. Ryan, Senior Engineering Aide, Territory of Hawaii;
to East Maui Irrigation Co. Ltd:

Limited Perpetual Easement
PARCEL 17: Spreckels Ditch Right-of-Way (30 feet wide) across the Government land of Papaaea.

Situate at Hamakualoa, Maui.
Being a strip of land 30 feet wide, the center line of which is described as follows:-

Beginning on the center line at the Northwest end of this right-of-way, said point being in the middle of Kailua Stream and on the boundary between the lands of Puuomaile and Papaaea, the coordinates of said point of beginning referred to Government Survey Triangulation Station "Puu Kukui" being 1606.28 feet South and 2736.20 feet West, as shown on Government Survey Registered Map 2747, and running by azimuths measured clockwise from true South… [State Survey Division]

General Lease No. 3349
Report on Proposed Keanae License November 15, 1972
Wm. J. Hull, Appraiser;
to Sunao Kido, Chairman Board of Land & Natural Resources, State of Hawaii:
…Attached hereto are four copies of my report on the "Appraisal of the State Water of Keanae, Maui," as requested in your letter of June 29, 1972…

INTRODUCTION
The State of Hawaii is the owner of certain waters in East Maui arising on the contiguous lands of Nahiku, Keanae, Honomanu and Huelo. Collectively they furnish the largest amount of fresh mountain water anywhere in the State.

State water from these lands, together with water from private lands, have been collected and used principally for irrigation for almost one hundred years.

The development and collection system was constructed starting about 1876 in Huelo, the westerly portion of these lands, and gradually extended eastward to Nahiku.

Construction of the major ditches and tunnels was substantially completed by the year 1915. No major additions have been made since. The major aqueduct system which originally cost about $4,000,000 has long since been written off the books. The cost to replace such a system today would be staggering.

As development proceeded during this period, water licenses were granted to certain individuals and companies with the end result that a very large, flexible integrated collection system of ditches, tunnels and appurtenant structures was consolidated under one operator (East Maui Irrigation Company) as the lands irrigated by the water conveyed through these ditches were brought under the control of one sugar company (Hawaiian Commercial & Sugar Co. – now a division of Alexander & Baldwin, Ltd.).

It is not believed necessary here to go into the detailed sequence of events giving the order of construction of the many ditches and the details of the many water licenses of the past, although the licenses were for different terms with different covenants. From time to time, they were renewed and changed until presently there are four State water licenses held by the East Maui Irrigation Company with staggered terms as follows:

Huelo (GL 3578) 1960-1981
Honomanu (GL 3695) 1962-1986
Keanae (GL 3349) 1950-1971 (expired -presently covered by revocable permit)
Nahiku (GL 3505) 1955-1976… [General Lease No. L 3349; 1972:1]

…Comparable Values of Waters
Unlike land and leases of lands where there are thousands of transactions per year upon which to base appraisals of other lands and leases, there are very few water licenses and leases throughout the State. Historically, water licenses have been for terms of a minimum of 20 years to a maximum of 50 years.

In the early 1900's, long terms were granted, since it was an era of water development requiring large capital expenditures, and a long term was needed to amortize those expenditures. The cost of the water itself was very small, since the licensee was required in most cases to make large capital expenditures. Practically all the water sources in the State large enough to produce sufficient water to irrigate sugar cane have been developed.

The development costs have been mostly amortized with the result that water licenses now are for shorter terms, generally 20 to 35 years. Most State water licenses are for terms of 21 to 30 years with private licenses going as high as 35 years.

Water licenses negotiated prior to 1960 are now obsolete for comparative purposes due to inflation and changed conditions. For this reason, your appraiser used only licenses negotiated since 1960. The following licenses have been selected as being comparable in some respects to Keanae. They are listed below with comments:

COMPARABLE I. HONOMANU - STATE - E.M.I. (GL-3695)
Term: 7/1/62 to 6/30/86. Rental: $2.80 per MG at 6 ct. sugar. Rental: $3.30 per MG at 8.25ct. sugar or over. The maximum rate of $3.30 was reached when the sugar price rose to 8.25 ct. by the end of 1970, or only 8 ½ years into the term so that for the last 15 ½ years of the term, the rate is frozen at $3.30/MG. The 1971 average sugar price was 8.52 ct. and for the period January 1 to October 31, 1972, the average was 9.07ct. Had no ceiling applied, the rate for water now would be about

$3.46. (Note the Nahiku license (1955-1976) has a 7.5ct. sugar ceiling price which was reached in 1968 or 13 years into the 21-year term. These waters are from lands adjacent to Keanae on the west and are very comparable, except that the quantity is less and it is less reliable than Keanae.

COMPARABLE 2. HUELO- STATE -E.M.I. (GL-3578)
Term: 1960-1981. Rental: $3.556 per MG at 6t. sugar. .Maximum: $4.006 per MG at 8.25ct. sugar and over. The maximum rate of $4.006 was reached when the sugar price reached 8.25t. by the end of 1970 or only 11 years into the term. For the remaining 10 years of the term, the rate is frozen at $4.006. Had no ceiling applied, the rate for water would be $4.17 (based on the 1972 sugar price average from January 1, 1972 to October 31, 1972).

The quantity of water diverted from Huelo (15,078 MG/Yr.) is more than Keanae (12,864 MG/Yr.); however, it is not as reliable a source as Keanae… [General Lease No. L 3349; 1972:5-6]

C.S.F. 20,505 & Map
January 20, 1987
Melvin M. Masuda, Land Surveyor, State of Hawaii Survey Division
WATER LICENSE

Within portions of Koolau Forest Reserve, Governor's Proclamation dated June 12, 1907, Hanawi Natural Area Reserve, Governor's Executive Order 3351, and portions of the Lands of Halehaku to Papaaea Nui below the Koolau Forest Reserve Boundary.

Makawao and Hana Districts, Maui, Hawaii:
Beginning in the middle of Kuhiwa Gulch at the northeast corner of this parcel of land and at the southeast corner of Grant 11379 to Maui Agricultural Company, Limited… [run 30 courses] …containing a Gross Area of 31,864 Acres, More or Less after excluding therefrom Private Lands (3001 Acres, more or less)… [State Survey Division]

C.S.F. No. 20,682 & HSS Plat Map No. 1067-B
January 21, 1988
Melvin M. Masuda, Land Surveyor, State of Hawaii Survey Division
NAHIKU WATER LEASE

Situated within portions of Koolau Forest Reserve, Governor's Proclamation dated June 12, 1907 as modified by Governor's Proclamation dated May 2, 1938 and Hanawi Natural Area Reserve, Governor's Executive Order 3351.

Hana, Maui, Hawaii

Beginning on the easterly watershed of Kuhiwa Gulch at the northeast corner of this parcel of land and on the south boundary of Grant 4448 to W. Goodness… [run 7 courses] … containing a Gross Area of 4374 Acres, More or Less after excluding therefrom Private Lands (241 Acres, more or less) (Compiled from H.S.S. Plat Map 1067-B and Govt. Survey Records) [State Survey Division]

C.S.F. No. 20,683 & HSS Plat Map No. 1067-B
January 21, 1988
Melvin M. Masuda, Land Surveyor, State of Hawaii Survey Division
KEANAE WATER LEASE

Situated within portions of Koolau Forest Reserve, Governor's Proclamation dated June 12, 1907 as modified by Governor's Proclamation dated May 2, 1938 and Hanawi Natural Area Reserve, Governor's Executive Order 3351.

Hana, Maui, Hawaii

Beginning on the easterly watershed of Waiohue Stream at the southeast corner of this parcel of land and on the northerly boundary of Haleakala National Park (Grant S-14945 to The United States of America)… [running 9 courses] …containing a Gross Area of 13,547 Acres, More or Less after excluding therefrom Private Lands (39 Acres, more or less)… (Compiled from H.S.S. Plat Map 1067-B and Govt. Survey Records) [State Survey Division]

C.S.F. No. 20,684 & HSS Plat Map No. 1067-B
January 21, 1988
Melvin M. Masuda, Land Surveyor, State of Hawaii Survey Division
HONOMANU WATER LEASE

Situated within portion of Koolau Forest Reserve, Governor's Proclamation dated June 12, 1907 as modified by Governor's Proclamation dated May 2, 1938.

Hana, Maui, Hawaii
Beginning on the crest of the dividing ridge between Nuaailua Valley and Keanae Valley at the southeast corner of this parcel of land and on the northwesterly boundary of the Land of Haiku Uka (Grant 182 to M. Kekuanaoa for V. Kamamalu)… [running 7 courses];
…8. Thence southwesterly along the dividing ridge between Nuaailua Valley and Keanae Valley along Keanae Water Lease to the point of beginning and containing a Gross Area of 1719 Acres, More or Less… (Compiled from H.S.S. Plat Map 1067-B and Govt. Survey Records) [State Survey Division]

C.S.F. No. 20,685 & Map
January 21, 1988
Melvin M. Masuda, Land Surveyor, State of Hawaii Survey Division
HUELO WATER LEASE

Situated within portion of Koolau Forest Reserve, Governor's Proclamation dated June 12, 1907 as modified by Governor's Proclamation dated May 2, 1938 and portions of the Land of Halehaku to Papaaea Nui *makai* of the Koolau Forest Reserve Boundary.

Makawao and Hana Districts, Maui, Hawaii.
Beginning on the dividing ridge between Haipuena Valley and Puohokamoa Valley at the southeast corner of this parcel of land and on the northwesterly boundary of the Land of Haiku Uka (Grant 182 to M. Kekuanaoa for V. Kamamalu), thence running:-… [14 courses]'

…15. Thence southwesterly along the dividing ridge between Haipuena Valley and Puohokamoa valley along Honomanu Water License to the point of beginning and containing a Gross Area of 12,459 Acres, More or Less and a Net Area of 9176 Acres, more or less after excluding therefrom private lands (3283 Acres, more or less)… (Compiled from H.S.S. Plat Map 1067-B and Govt. Survey Records) [State Survey Division]

ARCHAEOLOGICAL AND ETHNOGRAPHIC STUDIES IN THE HĀMĀKUA-KO'OLAU REGION

Because of the nature of the landscape and land use in the Hāmākua-Ko'olau region, only limited ethnographic and archaeological research has been undertaken to date. This said, there are a few important manuscripts available that provide readers with ethnographic and archaeological data pertaining to the Hāmākua-Ko'olau region. These include, but are not limited to Thos. Thrums' "*Heiau of Maui*" (Hawaiian Annual 1909 & 1938); Winslow M. Walkers' *"Archaeology of Maui"* (ms. 1931); Elspeth Sterlings' *"Sites of Maui"* (1998), both which cover localities around the island of Maui; and *"Kalo Kanu o ka 'Āina, A Cultural Landscape Study of Ke'anae and Wailuanui, Ko'olau District, Island of Maui*," prepared for the County of Maui Planning Department by Group 70 International, Inc. Davianna McGregor, Ph.D., and Cultural Surveys Hawaii, Inc. (1995). These manuscripts report on significant traditions, sites, customs, and beliefs associated with the people and land, and are widely available in public libraries and collections. The citations below, provide readers here with a general introduction to sites and practices described in the various publications, and identify those features which are described in historical narratives and oral history interviews cited in the larger study herein.

Bold face printing of place and site names is used in the narratives below, to indicate occurrence of accounts from primary literature and interview sources cited in this study.

Heiau of Maui - Recorded by Thrum (1909 & 1938)

One of the earliest papers reporting on traditional sites (specifically *heiau*),was published in the Hawaiian Annual in 1909 (and recompilation and notes of 1938). Thomas G. Thrum conducted a literature study, and often visited *heiau* in the field on all of the main islands. In 1909, he named the following *heiau* in the Hāmākua-Ko'olau region for which he had found information:

Kailua……Makawao, one-half mile west of Makawao-Wailuku road; about 80x50 ft. in size; its ruins yet to be seen.
……Kula, Makawao, on grant 3085, M. Previer. No particulars obtained further than it is still standing.
Leleiwi……Koolau. A sacred shrine situate near the shore; visited by Kamehameha II, on his first royal progress.
Pakanaloa……..Keanae. A war *heiau* dedicated to Kanehekili.
Paliuli
Kaluanui
Makehau
Kuikuiaupuni No particulars learned of these Keanae temples. [Thrum 1909:39]

In 1938, Thrum republished the list of *heiau* named on Maui, and added other names, based on subsequent findings up to 1938, to the list. In annotating the list, Thrum observed that an asterisk (*) indicated that the temple was a place of human sacrifice, and a question mark (?) indicated that the name of the site was forgotten (Thrum 1938:121). The *heiau* added to the list included:

…Haleaha…….Makepipi [Makapipi], Nahiku, no particulars.
Halekini……..Puumaile, Nahiku, no particulars.
Hinalekahi*…..Hanehoi, a high-terraced *heiau*, in ruins.
Huelo?…….Huelo, size and class unknown, now destroyed.
Kahiwamua…..Kukui, Nahiku, no particulars. [probably Kuhiwa-mua]

Kaluakelea…….Nahiku, no particulars.
Kanekauolono…Keanae, small, all destroyed.
Kukuiopuni*….Keanae, large, platform type, foundations only remain. [Kukuiaupuni in 1909 list]
Kula?…….Kula, Makawao, no particulars further than that it is yet standing.
Moomuku*……Makawao, not found.
Ololokaua……..Puumaile, Nahiku, no particulars.
Paaokalepa*….Huelo, of platform type, all gone.
Poohoolewa*….Honopou, in ruins, no particulars.
Puuokaupui*…..Honokala, now a house site… [Thrum 1938:128-132]

Archaeology of Maui (ms. 1931) and Sites of Maui (1998)

In 1929-1930, W.M. Walker, conducted a study of archaeological sites on the island of Maui for the Bishop Museum. As a result of his field work, informant interviews, and research, Walker prepared a manuscript titled "Archaeology of Maui," reporting on a wide range of sites and traditions of places around the island (Walker, ms. 1931). Though Walker's work has yet to be formally published as a stand-alone document by the Bishop Museum, it has regularly been referenced from manuscript files in the Museum collection. In 1998, Bishop Museum published "Sites of Maui." In the 1950s-1960s, E. Sterling compiled a collection of historical archival narratives and conducted field work and interviews on Maui, to record a history for the island. Her work continued through 1970, and has been widely referenced since that time. In Sites of Maui, she also included citation from Walkers' 1931 manuscript, and the 1998 publication of "Sites of Maui" incorporate those site descriptions.

The following notes are paraphrased from Sterling (1998); the original publication should be referenced for full accounts:

Hamakuapoko

…3. Sand Burials – in dunes below Spreckelsville.
…5. Kailua Heiau, Walker Site 58. Near Kailua Gulch.
…11. Winds and Rain. *'Ukiu* – a soft drizzle (the familiar rain of Makawao)… (Sterling 1998:96-99).

Hamakualoa

…3. Rain. Rain of Hamakua, *Ka ua pe'e puhala o Hamakua*, "the rain that makes one run to the *hala* tree to hide."

…5. Springs of Kane – Kaneloa said to Kane, "We have circled Hawaii let us go to Maui." They sailed to and landed on Maui. They toured Maui until they reached Hamakua. They drank *awa* but because there was no water they caused the fresh water to flow and drank all of the *awa*. They continued on and the water which they had caused to flow was called the water of Kaneloa. This water flows unto this day.

6. *Heiau* Sites Destroyed
On the northeast coast of Maui:
Site 61. Kapuai o Menehune at Kuloli, Ulumalu
Site 62. Paboa at Opana; only a remnant of a small platform remains
Site 63. Puuokaniau at Peahi
Site 65. Kaapahu at Kakipi
Site 75. Honomauuloa at Hanawana
Site 76. Halepaahau at Hanawana

Site 79. Halekanaloa at Papaea
Site 80. Kalaeohia at Papaeaiki
Site 81. Nakeikiikalalaomakaiwa at Makaiwa.

7. Kaohekanu, Place of Robbers – in Hamakualoa along the Kihapiilani Road.

…9. **Kokomo**, Haiku. Koa saw mill at Kailiili above Kokomo (originally Koa-Komo).

…11. Pakialele Heiau, Walker Site 59 – Location: In a field near Pauwela. A small platform said to have been 25 feet square and 4 feet high. Destroyed.

12. *Heiau* At Waikikena, Walker Site 60 – Location: Hanapopolo at Kuiaha. Said to have been a large three terraced platform walled on the sides. Destroyed.

13. Mokahio, Walker Site 64 – Location: On the top of a small knoll in a gulch a quarter of a mile from the sea at Peahi. An irregular structure terraced on several sides. The outline follows the contour of the hill in general. Measurements of walls and terrace facings: 130x 60x 35x 50x 20x 50x 55 feet. Construction of water-worn stones and pebbles, interior disturbed. Greatest distance front to back 85 feet. [page 102]

…15. Walker Site 66 – On the bluff just above Halehaku Bay at edge of pineapple fields. A good sized *heiau* partly destroyed to plant pineapples. The north side measures 128 feet and the east side 120 feet. At a point 68 feet from the northeast corner a wall runs back dividing the *heiau* into two divisions. The back measures 115 feet. The north and west sides have been terraced in two or three steps. The height of the front wall facing is 4 feet. No coral or pebbles seen.

16. Piilani, Walker Site 67 – On shore at Halehaku Bay about 50 yards from the sea. A massive structure of beach rocks terraced on the front to a height of 10 feet. It extends parallel to the shore for 150 feet. The greatest with grass and bushes. A terrace 2 feet high forms the back against the hill; no coral found. Numerous enclosures at the base of the hill indicate a good sized village site, now mostly gone.

17. **Kapuai o Kamehameha** – "…the imprint of Kamehameha's foot remains on the face of one of the hills to this day."

18. **Kipapa of Kihapiilani** at Halehaku. Missionaries Richards, Andrews and Green toured Maui, and on August 22, 1828, having descended from the summit of Haleakala, they came down to a small village on the Halehaku seashore. On the next day, proceeding toward Hana, they came upon "a pavement said to have been built by Kihapiilani, a king… It extends more that 30 miles, and is a work of considerable magnitude. This pavement afforded us no inconsiderable assistance in traveling as we ascended and descended a great number of steep and difficult paries (paiis)."

…20. Poohoolewa Heiau, Walker Site 68 – at Apiapi on the high bluff beyond Honopou Gulch to the east. A large walled *heiau* probably of sacrificial class. It is 300 feet long, 130 feet wide at the front. A large open court occupies the distance of 200 feet from the front of the *heiau*. The remaining 100 feet is divided into two 50 foot enclosures with walls 5 feet high and 6 thick. The western side has been broken

down to permit planting of pineapples. Beach stones, pebbles, and basalt are used in its construction.

21. Puuokaupu Heiau, Walker Site 69 – at Honokala. Half a mile from the sea on a hill. Destroyed.

22. Mokupapaakua Heiau, Walker Site 70 – Near Gulch of Mokupapa. Destroyed.

23. Oanapele Heiau, Walker Site 71 – Waipio. At Puuoneone 200 feet north of the school and main road. A *heiau* measuring about 60 x 100 feet with a terrace facing 10 feet high. The *heiau* has been demolished to provide stone for the road.

24. Puuokalepa Heiau, Walker Site 72 – Huelo. 800 feet east of the Protestant church on top of a small knoll overlooking a steep gulch. Outlines only remain indicating size of 65x 100 feet. Front is faced to height of 20 feet on hillside. Stokes reports it as sacrificial.

25. Kupaikaa Heiau, Walker Site 73 – Hanehoi. At Hinalekahi on the hillside just below the Kailua ditch and west of the Kailua Protestant church.

…28. Kauhihale Heiau, Walker Site 77 – at Moii in Puuomaile on the *mauka* side of the road opposite the store. A big mango tree is growing in the center. A walled enclosure showing two and three terraces on the sides. It is also of the L-shaped type measuring 200 feet long and 137 feet at the widest part. The northeast corner is triple terraced 10 feet high. An enclosure 38x 22 occupies the northwest corner. Construction is of rough basalt. No coral or pebbles.

29. Pohakuokaia Heiau, Walker Site 74 - Kailua Gulch. At Hoalua below the church on a bluff near the end of the pineapple field. Small notched-shaped *heiau* with walls of basalt 3 feet high and 6 feet thick. Measures 60x30x20x12x28x50 feet. Beach stones used but no coral or pebbles seen.

30. Pohakuokane? Walker Site 78 – Kailua Gulch. In a dense thicket of *hau* on the ridge just east of Kailua gulch below the road. Small notched-shaped *heiau* enclosure built of stream worn basaltic rocks. The walls are 4 to 6 feet thick and 5 feet high at the corners. Measures 66 x 36 x 32 x 6 x 32 x 36… [Sterling 1998:100-107]

Koolau

…3. *Heiau* Sites Destroyed Or Not Found

Site 82. Kukuiolono on point of Keanae peninsula
Site 83. Lalaola on point of Keanae peninsula
Site 84. Leleiwi at Koolau
Site 86. Paliuli
Site 87. Kanekauolono
Site 88. Kamokukupeu
Site 89. **Puu o Kohola** at Honomanu
Site 90. Kawalimukala at Pauwalu
Site 91. **Kupau** above the road in Keanae valley toward the ditch trail, 84 feet of terrace wall is all that remains
Site 92. **Kualani** on top of ridge on west side of **Waiokane** Falls.

…8. **Honomanu Valley**. I have heard from various sources that there are a lot of burials in the upper part of this Valley…I am told that quite a number of people do not like to be in the Valley after dark, and that the *Ali'i* are said to walk there at such times… [see also, interview with Kupuna Helen Nākānelua]

…11. Kukuialono Heiau – Keanae. Returned about 2p.m. and after lunch walked over peninsula. Was shown site of a *heiau*, Kukuialono at the point 150 feet from sea on land of same name.

Also by Mrs. Lono Kaholokahiki of another *heiau* Lalaola on E side of peninsula. Site seen. Also that Pa Kanaloa, a *kahua*, was on the upper slopes of Keanae, not far from sea. Not visited as time was too short.

…13. Ka-Imu-Ki – Keanae. In famine times ti roots were gathered from the forest in large quantities and steamed in great ovens, then grated mashed, mixed with water, and drunk…At Keanae, Maui there was…a great *imu ki*, a pit in the lava (now filled) on the west side of the peninsula, near where the road passes on the old boat landing.

14. Fish Pond – Keanae. Bishop Museum Site A4-9. Pu'u Olu Pond appears to be almost an arm of the sea, cut off by a large gravel and sand bar. It lies at the mouth of a small, steep valley south of Pauwalu Point and is about 10 feet in diameter. No flow of water was observed, and the depth does not appear to be great. Most of the surface is covered with pond scum. Some portions of a fairly massive stone wall can still be seen bordering the north side of the pond.

…17. Kamilo Heiau, Walker Site 93 – Wailuanui. At Kawaloa on the north side of the stream in a dense grove of *hau* and *puhala*. A small enclosure 22x25 feet built of rough basalt and some pebbles. Walls 3 feet high and 3 feet thick.

18. *Heiau* of Ohia, Walker Site 94 – Wailuanui. At Ohia in the valley three quarters of a mile from the sea. Stones removed to build pig pen, and outlines thus lost. Probably an agricultural *heiau* built by a chief Kaimuki. (Information obtained by Stokes in 1916.)

19. Kaluanui Heiau, Walker Site 95 – Wailuanui. At Kaluanui on the east side of taro patches a third of a mile from the sea. Combination of enclosure with higher terrace on one side. The enclosure measures 15 x 29 feet and the terrace at the south end is 11 feet wide. The west side is 6 feet wide and 4 feet high. Stokes in 1916 saw an oval pit in the terrace pavement near the southern end, 6.5 feet long, 4 feet wide, and about 2 feet deep. This can not now be seen.

20. Kukuiaupuni **Heiau**, Walker Site 96 – Wailuanui, At Pauwalu on the top of the slope 300 feet south of the road and 500 feet southwest of the school. A terraced platform facing NW by N and with a height of 12 feet at this point. Length 50 feet, width 42 feet. The other platform is about 200 feet away and measures 47 x 51 x 5 feet.

21. Makehau Heiau, Walker Site 97 – Wailuanui. At Makehau on a level piece of land 1/4 of a mile from the Wailua road and 150 feet in from the Makehau road. Said to have been a *heiau* of two platforms of which only the upper preserves much of its original outline. It measures 72 x 43 feet and is 5 feet high. The eight coconuts growing on it were said to have been planted by Kaniho, the last *kahu* of the *heiau*. Water-worn stones and pebbles on the platform. (Information obtained by Stokes in 1916.)

…29. Kaluaakelea Heiau, Walker Site 98 – At Honolulunui on the ridge just west of Makapipi gulch. A *heiau* partly destroyed by the rubber plantation. It measures about 50x45 feet. At the northwest corner are three low terraces reaching a total height of 6 feet. No coral or pebbles seen.

30. Pohoula Heiau, Walker Site 99 – Makapipi. Near the village of Nahiku on the east side of Makapipi gulch. A *heiau* of the open platform type facing the sea. It measures 72 x 72 x 65 x 64 feet and extends into the hill on the west and south sides. The height at the northeast corner is 8 feet and a wall runs along the east side 3 feet high and 4 feet thick. The platform is built of stream worn stone and pebbles, but no coral. Two terraces form the top, the higher one being 36 x 25 feet and only a foot above the general level.

31. Haleaka Heiau, Walker Site 100 – Makapipi. On the east bank of Makapipi stream about 300 yards from the school. A platform on a high hill, whose irregular outline is shown in the plan. It is built up 4 feet on the front and 6 feet at the back, where it forms a wall. It is of rough construction with stream-worn stones inside, but cattle and pigs have destroyed any interior structures. At the northwest corner the slope is double terraced.

…33. Heiau At Lanikele, Walker Site 101 – Ulaino. On the top of the bluff just west of Lanikele gulch at the shore. A walled structure 116 x 90 feet with a commanding location of a stretch of shore from Huelo [Hianaulua?] Point on the west to Honokalani on the east. The edge of the *pali* is only 30 feet away where it drops sheer 150 feet to the shore. The walls are 6 and 8 feet high and have a thickness of 12 feet on the east and south sides. The east wall is the only one which is double terraced. A well marked gate exists on the south side. It is 8 feet wide, 4 feet high, and 12 feet long. A low 2 foot wall closes it at the end. There are no interior structures of any kind unless the pile of rocks in the northwest corner can be interpreted as a platform. The outer terrace is paved with pebbles but there is nothing but scattered rocks inside.

From the strategic location of this *heiau* and its position commanding the old canoe landing and trail up Lanikele Gulch it looks as though this *heiau* was also intended as a fort. But no corroboration of this could be obtained… [Sterling 1998:108-117]

Kalo Kanu o ka 'Āina (1995)

The most detailed study to date for lands of the Ke'anae-Wailuanui vicinity—including archival historical literature research, oral history interviews and mapping, and archaeological field work—was prepared on behalf of the Maui County Planning Department by Group 70 International, Inc., Davianna McGregor, Ph.D., and Cultural Surveys Hawaii, Inc. (1995)[21]. The study is an important collection that describes sites of the natural landscape in their cultural context, demonstrating the on-going attachment of native Hawaiian residents to the lands, customs and practices of their ancestors. The study includes lore and history from the pre- and post-contact period, and tracks changes in the make up and residential settlements of the community from ca. the 1840s to 1995. Native Hawaiian elders and residents of the Ke'anae-Wailuanui vicinity contributed personal knowledge to the 1995 study[22].

Of particular interest to the present study are discussions of the importance of *'āina* (land), *kalo* (taro) and *wai* (water) in past and continuing practices of the native Hawaiian residents of the Ke'anae-Wailuanui vicinity. The 1995 study also describes the cultural resources in the context of the National Historic Preservation Act, and criteria of National Register Bulletin 38 and State Historic Preservation Division—identifying sites that may qualify as traditional cultural properties.

[21] Ms. Vicki Creed of Cultural Surveys Hawaii, and contributor to the 1995 study graciously provided a copy to Maly for review.
[22] Several of the *kūpuna* interviewed in 1995, were also interviewed as a part of the present study (see *Volume II*).

CLOSING REMARKS

It was the goal of the authors to provide readers with access to a broad cross section of the historical narratives that may be found in archival collections pertaining to the Hāmākua-Ko'olau region of East Maui. While not every historic communication, document, report or publication previously written about the cultural-historical landscape of the region was cited (or known to the authors), the present study draws on many primary (first hand and eye-witness) accounts. The narratives cited, were authored by both native Hawaiian residents and writers (a number of the accounts had not been previously available in English), and foreign residents or visitors. While lengthy quotes from some of the significant historical narratives have been reproduced in this study, it was deemed appropriate to do so, as the original or eye-witness accounts are much more revealing than our modern summaries of past events can be.

The study also introduces readers to some of the personal histories and recollections of native Hawaiians and *kama'āina* residents of the Hāmākua-Ko'olau region. Nearly all of the interview participants are descended from families with generations of residency upon lands of the Hāmākua-Ko'olau region. The interviewees shared a wide range of information pertaining to traditional and customary practices, as handed down from their elders; traditions of *wahi pana* (storied landscapes); practices associated with land and water use, and fisheries (including collection practices); historical descriptions of development and management of the East Maui Irrigation System, and water flow; past and on-going resource stewardship practices; and the relationship between regional communities and the East Maui Irrigation Company, Ltd.

The present study reflects the care and interest of Alexander & Baldwin and East Maui Irrigation Company, Ltd., in the lands and resources they have held—in some cases for more than 150 years; and also conveys to readers the rich history of *Maui Hikina*, as found in historical literature, and in the hearts and minds of the families of the land. Many people contributed to the completion of the study, it being a work of some magnitude. But as the *kūpuna* have instructed us —

A'ohe hana nui ke alu 'ia!
(It is not too difficult a task, when done together by all!)

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VOLUME II
WAI O KE OLA:
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Lo'i Kalo and 'Auwai at Lākini ('Āina Ho'olina a Kupuna Helena Nākānelua mā), Wailua nui, East Maui (KPA Photo No. 2197)

*"**Wai o ke ola! Wai, waiwai nui! Wai, nō mea a pau, ka wai, waiwai no kēlā!**"*
(Water is life! Water is of great value! Water, the water is that which is of value for all things!)
(Kupuna Joseph C. Rosa; Oral History Interview, November 8, 2001)

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Preparation of this study was made possible because many people agreed to come together and share in the process of contributing to its completion. The oral history interview study presents readers with significant glimpses into the personal knowledge and experiences of individuals with genealogical attachments to lands of *Maui Hikina*—including descent from traditional families of various lands in the Hāmākua Poko-Ko'olau region. The interviews recorded as a part of this study, bring life to the cultural and natural landscape, and give names and history to those who have come before us.

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We say — ***Mahalo nui nō, a ke aloha o ke Akua pū me 'oukou a pau!***

We also wish to note here, that while a sincere effort was made, it was impossible to record everything that could be said about the land and traditions of the lands and families of Hāmākua Poko, Hāmākua Loa and Ko'olau . But, every effort has been made to present readers with an overview of the rich and varied history of the area, and to accurately relay the recollections, thoughts, and recommendations of the people who contributed to this study.

māua nō me ke aloha kau palena 'ole — Kepā a me Onaona Maly

O ka mea maika'i mālama, o ka mea maika'i 'ole, kāpae 'ia
(Keep the good, set the bad aside)

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INTRODUCTION

Background

At the request of Garret Hew, Manager of East Maui Irrigation Company (EMI), *Kumu Pono Associates* conducted a two phased study of cultural-historical resources in the lands of Hāmākua Poko, Hāmākua Loa, and Ko'olau, in the region of *Maui Hikina* (East Maui), Island of Maui. The study included—conducting detailed research of historical records in public and private collections (*Volume I*); and conducting oral history interviews with individuals known to be familiar with the cultural and natural landscape, and history of land use in the *Maui Hikina* study area (*Volume II*). This study was conducted in conjunction with the Water License Application of the East Maui Irrigation Company, and land use planning processes of the Board of Land and Natural Resources of the State of Hawai'i.

The study area includes 72 *ahupua'a* (native land divisions extending from fisheries to the mountain region) which make up the *moku o loko* (districts) of Hāmākua Poko, Hāmākua Loa, and Ko'olau, Maui. Situated on the eastern slopes of Haleakalā, the lands are a part of the region generally known as *Maui Hikina* (East Maui). These lands comprise a large portion of the rich water producing forest of the East Maui Watershed, which collects rains from the *ko'olau* or windward weather systems that prevail upon the Hawaiian Islands.

From ancient times, the abundant rains, supported the development of rich forests which are now threatened by invasive species (including both plants and animals). The rains and forests have in turn led to the formation of hundreds of streams (*kahawai*) and thousands of small feeder tributaries (e.g., *waikahe* and *kahawai li'ili'i*), that have molded the landscape of *Maui Hikina* into one with many large valleys (*awāwa*) and smaller gulches (*kahawai*). These watered valleys and gulches, and their associated flat lands (*kula*), have been home to and sustained Native Hawaiian families for centuries.

The specific scope of this study sought to understand the wide range of issues related to Native Hawaiian and historic practices associated with water (*wai*), and its usage. In order to understand the cultural-historical context of water resources — including uses which have been handed down from antiquity, and those which were both protected and permitted in 1876 by King David Kalākaua, and subsequently licensed by the Republic, Territory and State of Hawai'i — this study looks at the larger cultural-historical landscape of *Maui Hikina*.

Wai (water) is integral to all aspects of Hawaiian culture and life. As noted during the interview with Kupuna Joe Rosa of Honopou, "*Wai o ke ola! Wai, waiwai nui! Wai, nā mea a pau, ka wai, waiwai no kēlā!*" (Water is life! Water is of great value! Water, the water is that which is of value for all things!) (oral history interview of November 8, 2001). Thus, in discussing water and life upon the land, one will naturally find that like water which flows from the mountains to the sea, so run the beliefs, traditions, customs and practices of the Hawaiian people upon the land. The oral history interviews cited in this volume, connect the life and well being of the people and the land to the flow of water.

An Overview of the Oral History Interview Process

Oral history interviews help to demonstrate how certain knowledge is handed down through time, from generation to generation. Often, because the experiences conveyed are personal, the narratives are richer and more animated than those that are typically found in reports that are purely academic or archival in nature. Thus, through the process of conducting oral history interviews things are learned that are at times overlooked in other forms of studies. Also, with the passing of time, knowledge and personal recollections undergo changes. Sometimes, that which was once important is forgotten, or assigned a lesser value. So today, when individuals—particularly those from outside the culture which originally assigned the cultural values—evaluate things such as resources, cultural practices, and history, their importance is diminished. Thus, oral historical narratives provide both present and future generations with an opportunity to understand the cultural attachment—relationship—shared between people and their natural and cultural environments.

In selecting interviewees, the authors followed several standard criteria for selection of those who might be most knowledgeable about the study area. Among the criteria were:

1. The interviewee's genealogical ties to early residents of lands within or adjoining the study area;
2. Age. The older the informant, the greater the likelihood that the individual had had personal communications or first-hand experiences with even older, now deceased Hawaiians and area residents; and
3. An individuals' identity in the community as being someone possessing specific knowledge of lore or historical wisdom pertaining to the lands, families, practices, and land use and subsistence activities in the study area.

Readers are asked to keep in mind that while this component of the study records a depth of cultural and historical knowledge of *Maui Hikina*, the documentation is incomplete. In the process of conducting oral history interviews, it is impossible to record all the knowledge or information that the interviewees possess. Thus, the records provide readers with only glimpses into the stories being told, and of the lives of the interview participants. The author/interviewer has made every effort to accurately relay the recollections, thoughts and recommendations of the people who shared their personal histories in this study.

As would be expected, participants in oral history interviews sometimes have different recollections of history, or for the same location or events of a particular period. There are a number of reasons that differences are recorded in oral history interviews, among them are that:

1. Recollections result from varying values assigned to an area or occurrences during an interviewees formative years;
2. They reflect localized or familial interpretations of the particular history being conveyed;
3. With the passing of many years, sometimes that which was heard from elders during one's childhood 70 or more years ago, may transform into that which the interviewee recalls having actually experienced;
4. In some cases it can be the result of the introduction of information into traditions that is of more recent historical origin; and

5. Some aspects of an interviewee's recollections may be shaped by a broader world view. In the face of continual change to one's cultural and natural landscapes, there can evolve a sense of urgency in caring for what has been.

In general, it will be seen that the few differences of history and recollections in the cited interviews are minor. If anything, the differences help direct us to questions which may be answered through additional research, or in some cases, pose questions which may never be answered. Diversity in the stories told, should be seen as something that will enhance interpretation, preservation, and long-term management of the land and water resources of *Maui Hikina*.

It should also be noted here, that reconciliation of information among informants is inappropriate within the interview process and is inconsistent with the purpose of oral historical research. *The main objective of the oral history interview process is to record the ideas and sentiments personally held by the interviewees as accurately and respectfully as possible, without judgment.* Adhering to these standards ensures both the quality and quantity of information obtained from individual interviewees, and facilitates the recording of information that will be of benefit to present and future generations. The oral history process also has another value to contemporary issues such as the flow of water in *Maui Hikina*. It provides a means of initiating a meaningful dialogue and partnership with local communities by communicating on the basis, and in a form that is respectful of cultural values and perspectives of individuals representative of their community.

Interview Methodology: Approach to Conducting the Study

The oral history interviews conducted as a part of this study were performed in a manner consistent with Federal and State laws and guidelines for such research. Among the referenced laws and guidelines were the National Historic Preservation Act (NHPA) of 1966, as amended in 1992; the Advisory Council on Historic Preservation's "*Guidelines for Consideration of Traditional Cultural Values in Historic Preservation Review*" (ACHP 1985); National Register Bulletin 38, "*Guidelines for Evaluating and Documenting Traditional Cultural Properties*" (Parker and King 1990); the Hawai'i State Historic Preservation Statute (Chapter 6E), which affords protection to historic sites, including traditional cultural properties of ongoing cultural significance; the criteria, standards, and guidelines currently utilized by the Department of Land and Natural Resources-State Historic Preservation Division (DLNR-SHPD) for the evaluation and documentation of cultural sites (cf. Title 13, Sub-Title 13:274-4,5,6; 275:6 – draft of Dec. 12, 1996); and guidelines for cultural impact assessment studies, adopted by the Office of Environmental Quality Control (November 1997).

While preparing to initiate the oral history interview program, Maly developed a general questionnaire outline (*Figure 1*) to help give direction to the process of conducting the oral history interviews. Prospective interviewees were identified through three primary sources, those known to Maly (through family and previous work); individuals suggested by Garret Hew and Jackie Honoka'upu of East Maui Irrigation Company; and in consultation with Moses Haia and Alan Murakami, legal counsel of the Native Hawaiian Legal Corporation (representing several Native Hawaiian families of *Maui Hikina* and the Native Hawaiian organization, *Nā Moku Aupuni o Ko'olau Hui*).

General Question Outline:
The Hāmākua Poko–Hāmākua Loa–Ko'olau, East Maui
Oral History Interview Program

This oral history interview is being conducted as a part of a detailed study of archival and historical literature, for lands of Hāmākua Poko, Hāmākua Loa, and Ko'olau, on the island of Maui. The interviews and archival-historical research, are being conducted in conjunction with the Water License Application of the East Maui Irrigation Company (EMI), and land use planning process of the Board of Land and Natural Resources of the State of Hawai'i.

The interviews are meant to: (1) document various aspects of traditional and historical Hawaiian residency, land use, water systems, travel, and traditional and customary practices in the Maui Hikina study area; and (2) help identify places and resources of importance to the families of the land. With your permission, the interview or portions of it, will be included in study documenting the history of the *Maui Hikina* region, and used to help agencies, the applicant (EMI), and interested parties determine the best actions for land and water use, and protection of the cultural-natural landscape of Maui Hikina.

The following questions are meant to set a basic foundation for discussion during the oral history interview. Your personal knowledge and experiences will provide direction for the formulation of other detailed questions, determine the need for site visits, and/or other forms of documentation which may be necessary.

Interviewee–Family Background:

Name:_____ Phone #:_____

Address:_____

Interview Date:_____ Time:____to_____ Location:_____ Interviewer:_____

When were you born? _____ Where were you born?_____

Parents? (father) _____ (mother) _____

Grew up where?_____ Also lived at? _____

- Additional family background pertinent to the Maui Hikina region — Such as generations of family residency in area... (time period)?
- Kinds of information learned/activities participated in, and how learned...?
- Naming of the *ahupua'a* or sections of the land that are of particular significance in the history of the land and to native practices…?
- Knowledge of agricultural fields and practices, and areas of residency (water resources, types of crops, how used…)? The *lo'i kalo – 'auwai* systems…
- Names of native- and resident-families, and where they lived?
- Who were/are the other families that came and/or come to collect area resources, and protocol?
- Gathering practices (who and what)? Shore line and *mauka-makai* trail accesses?

Figure 1. Oral History Interview Questionnaire
(designed to provide general guidance during the interview process)

- Knowledge of *heiau* (or other ceremonial sites), other cultural resources (for example – *kū'ula, ilina…*), and families or practices associated with those sites?

  Burial sites, practices, beliefs, and areas or sites of concern (ancient unmarked, historic marked/unmarked, family)…? Representing who and when interred…?
- Fishing — describe practices (i.e., where occurred/occurring, types of fish; names of fishermen; and what protocols were observed…? (such as: permission granted, practices and methods of collection…?); land based *ko'a* (cross *ahupua'a*) — ocean based *ko'a*; *kilo i'a* (fish spotting stations) locations and types of fish? Names of *heiau* and *ko'a* etc.?
- Knowledge of villages or house sites – church, stores, community activities.
- Historic and Current Practices — What was growing on the land during youth (planted and wild)? How was water obtained – for *kahawai* (streams), *punawai* (springs), other? Changes in water systems and the cultural-natural landscape observed in your life time?
- Relationships with neighboring *ahupua'a* and residence locations?
- Historic Land Use: Agriculture (traditional and economic crops)… for example – *lo'i kalo* and *'auwai*; use and care of the *kahawai*; dry land planting activities; collection of natural resources (such as marine, stream and forest resources); routes and methods of access; hunting and other practices…
- Do you have any early photographs of the area?
- Are there particular sites or locations that are of cultural significance or concern to you?
- Recommendations on how best to care for the water systems and cultural-natural resources in the *Maui Hikina* region?
- Do you have recommendations — such as: the future of water use, cultural resource- and site-protection needs, and habitat restoration in the *Maui Hikina* region? (definition of site/location boundaries…)

(Kumu Pono Associates – MaHikina59, April 2001)

Figure 1. Oral History Interview Questionnaire (continued)

Maly contacted prospective interviewees, told them about the study being conducted as a part of the EMI Water License Application before the BLNR, and asked if they would be willing to participate in an interview. Participants in the oral history program included Native Hawaiian *kūpuna* (in this case, individuals in their 80s and 90s), and members of the *mākua* generation (in this case, individuals in their 30s to 70s), all of whom were known to be knowledgeable about the resources and issues associated with land and water use in the *Maui Hikina* study area (*Table 1*). Nearly all of the interviewees are descended from Native Hawaiian families who have resided on and been sustained by the land for generations (many predating the *Māhele 'Āina* or Land Division of 1848).

All but one of the individuals contacted agreed to participate in the oral history interview study. On May 25th, Moses Haia, Esquire, introduced Maly to Mr. Edward Wendt, President of *Nā Moku Aupuni o Ko'olau Hui*. Unfortunately, Mr. Wendt declined to participate in an interview. Mr. Wendt did speak on the Water License matter at a BLNR hearing on May 25, 2001 (see page 475 in this study).

Each of the individuals who agreed to participate in the interview program was given a packet of historic maps covering the region from Hāmākua Poko to the Ko'olau-Hāna boundary. The oral history interview questionnaire outline was used to set the general direction of the interviews, though it did not limit interviewees to those topics. Various aspects of general and personal family histories, and personal experiences which stood out as important to the interview participants were recorded as well. During the interviews various historic maps (copies of the same maps provided to each participant) were also referenced, and when appropriate, the approximate locations of sites discussed were marked on one or more of the maps. *Figure 2* (at the end of this volume) is an annotated map (a compilation of various sites described during interviews), depicting the approximate location of many of the sites and features that were referenced by the interviewees. It should be noted here, that in addition to the interviewees notation of sites, Mr. Garret Hew (EMI Co.), who is also very knowledgeable about the region and the ditch system, assisted in map development by marking locations described during the interviews with Kupuna James Keolaokalani Hū'eu, Jr., and Mr. Stephen Cabral.

Between April 11th to November 8th 2001, Maly conducted twelve (12) oral history interviews, including site visits and follow up discussions with seventeen (17) participants. The interviews were recorded with a Sony-Mini Disc (digital recorder, MZ-R70). The interviewees range in age from 90 years old to their late 30s. Additionally, a Board of Land and Natural Resources Hearing, held on May 25, 2001, was attended and portions of the hearing, recorded. A verbatim transcript of statements and testimonies from selected participants in the hearing was prepared by *Kumu Pono Associates*. The transcript, cited in this study, focuses on: (1) Statements by members and representatives of the Board of Land and Natural Resources, and Alexander & Baldwin/East Maui Irrigation Company, regarding ditch history, the Water License Application, and the review agency process; and (2) testimonies from the public—with particular emphasis on Native Hawaiian tenants of the affected lands—and others who did not support the application, or who raised questions and concerns regarding the nature and extent of the Water License. A number of issues pertaining to cultural-historical resources, raised during the hearing, were also covered during the formal oral history program, and other points of historical interest are described in historical documents in *Volume I* of this study.

Table 1. Oral History Interview Participants (alphabetical list)

Name	*Year Born*	*Birthplace*	*Residence*
Helen Akiona-Näkänelua	1911	Honolulu, O'ahu (raised at Läkini from age of one month)	Wailua nui
Stephen Cabral	1929	Nähiku	Kailua, Pu'uomaile
James Keolaokalani Hū'eu, Jr.	1919	Ke'anae	Ke'anae-Pauwalu (Kahului)
Florence Lehualani Seulan Dang-Harold	1928	Pu'u Nënë	Ha'ikü and Huelo vicinity
Marjorie Kaleialoha-Wallett (with Lyn Scott)	1932	Honokahua	Honopou and Ha'ikü
Beatrice Pualani Kepani-Kekahuna (with Wanda Vierra)	1932	Häna Hospital (raised at Honopou)	Honopou and Ha'ikü
Mina Marciel-Atai	1916	Kaupö (moved to Honomanu in 1936)	Ke'anae
Mary McEldowney-Evanson	1921	Mänoa, O'ahu	Ha'iku (Kapua'a-ho'ohui)
Helen Pualani Range-Wilhelm (with Robert and Harvey Wilhelm; and Albert and Jackie Honoka'upu)	1914	Päpa'a'ea	Kailua, Pu'uomaile
Joseph C. Rosa, Jr. (with Nälani Magliato)	1916	Hölawa	Honopou and Ha'ikü

Review and Release of Interview Records

All of the formal recorded interviews were transcribed[1] and the draft transcripts returned (with the recordings) to the interviewees. Follow up discussions were also conducted in review of the draft-transcripts, and the review process sometimes resulted in the recording of additional narratives with the interviewees, and modifications to the interview transcripts. Following completion of the interview process, all of the participants in the tape recorded interviews gave Maly their verbal permission to include the interviews in this study, and for future reference of the documentation by Maly. Records of the release process are cited in *Appendix A*, at the end of this volume. Copies of the complete study have been given to each of the interview study participants, and will also be curated in the collections of East Maui Irrigation Company/Alexander & Baldwin; and with appropriate review agencies.

[1] When discernable (based on pronunciation by the speakers), diacritical marks (the glottal and macron) have been used with Hawaiian words spoken in the interview narratives. While elder native speakers do not use such marks in the written word (as they understand the context of words being used, and thus the appropriate or emphasis of pronunciation), this is not always the case with those less familiar with the Hawaiian language. Because pronunciation of place names and words is integral to the traditions and perpetuation of practices, we have chosen to use the marks in this study.

Readers are humbly asked here, to respect the interviewees and their families. If specific points of information from the interviews are quoted, it is the responsibility of the individual/organization citing the material to do so in the context as originally spoken by the interviewee. The larger interviews should not be cited without direct permission from the interviewees or their descendants, and proper source of publication documentation should be given.

Water Matters: An Overview of Interviewee Comments and Recommendations

The notes below, paraphrase some of the comments and recommendations offered by the oral history interview participants. A more detailed summary of, and a page-index to specific topics raised, may be found at the beginning of each interview.

In summary, *all interview participants feel strongly about the waters* of *Maui Hikina.* Comments, concerns, observations and recommendations shared by the interviewees included, but are not limited to the following topics:

- There is a great traditional-cultural significance of water in Hawaiian beliefs and cultural practices.
- The health of the land—including forests, streams, and marine fisheries—is integral to the health of the people, and the right of continuing traditional and customary practices.

  For the people of a *ko'olau* (windward) facing landscape, the flow of water from mountain to sea is integral to the health of the land. A healthy land makes for healthy people, and healthy people have the ability to sustain themselves.
- It was observed that water flowing from mountain to shore was not "wasted" water, but is instead, the sign of a healthy system.
- The weather and the plant makeup of forests have changed (even in the last 15 years).
- The Alexander & Baldwin (Spreckel's)/East Maui Irrigation Company ditch and tunnel systems have worked in the past (dating from the first Water License issued by King David Kaläkaua, in 1876). While similar amounts of water may still be harvested from the *Maui Hikina Watershed*, the watershed output is perceived as having diminished (in the lifetimes of most people interviewed). The demands from a growing population, including households and agricultural interests (both traditional and commercial) has increased as well.
- The increased demand for water is a particular concern to the interviewees. For example, it was observed that 40 or more years ago there were primarily only native families living below the intakes. Those families had the right of access to the remaining water in the *kahawai* (a flow that was significantly diminished from the pre-ditch era).

  Today, there are many new residents living at various elevations near the *kahawai*, most of whom have tapped into (by permit or without), the remaining water resource. This means that the few Native Hawaiian families—most of whom reside on Kuleana and Royal Patent Grant lands (with rights of residency often pre-dating 1850s)—who for generations have relied upon the water flow for their *lo'i kalo* and domestic water needs, have a significantly decreased (at times, non-existent) water resource with which to sustain their way of life.
- The elder interviewees all observed that water used to flow *mauka-makai* in all of the streams (in the primary *Maui Hikina* study area) 50 and more years ago. This is not the case today.
- Some interviewees expressed the feeling that while there may have been occasional problems with access to water 50 or more years ago, the relationship between EMI Co., and the community was generally good.
- Before, families worked together to keep the stream ways clean, and the water flowing to the *'auwai* and *lo'i kalo* (and ultimately to the shore). For a variety of reasons, this has changed as well.
- Maintenance of the ditch-tunnel system is important. EMI Co. has the knowledge and man-power to care for the system. (This expertise is believed to exceed that of Maui County, or any others who have yet come forward.)
- New methods of water transfer need to be developed in order to maximize the retention of water that is drawn off, and transported to outlying regions.
- The present system of "throwing" water out of the ditch-tunnel system during periods of heavy rainfall (wherein most times there is very limited flow), causes amplified erosion of the stream beds. The "throwing" out of large amounts of water in short periods, also causes damage to, and at times destroys features—such as *'auwai* (irrigation channels), *lo'i kalo* and *kuäuna* (taro pond fields and banks), and *kümano* (in-stream water catchments or small dams)—that have been made to manage the native subsistence agricultural system. The continual ripping down of what has been built up, gives people the sense of "kill fight!" Why waste the time?
- Diminished flow of water has led to the "warming" of the remaining waters which trickle over rocks heated by the sun. Warm water kills the native stream fish (such as *'o'opu, 'öpae*, and *päpü*), and causes *kalo* to rot in the field. An adequate level of water flow needs to be restored to the *kahawai*, to enable restoration of both cultural and natural systems.
- It is recognized that the water needs of Maui are important, but it is believed by interviewees, that the lands and families of *Maui Hikina* should not have to pay the environmental and cultural price for that need.

'Ölelo No'eau a nä Küpuna:
He ma'i ka honua, he 'aha ka lä'au? He ua!
No ka mea — Uwë ka lani ho'öla ka honua!
The land is ill, what is its medicine? Rain!
For when the heavens cry, the land is healed!
(Kupuna Apelahana Kaho'okaumaha Moses, 1977 and Kupuna Joseph C. Rosa, Jr. 2001)

NÄ MO'OLELO 'OHANA: FAMILY TRADITIONS–ORAL HISTORY INTERVIEWS (2001)

James Keolaokalani Hū'eu, Jr. Oral History Interview # 1 – Ko'olau and Hämäkua Region. April 11, 2001 (with Kepä Maly and Garret Hew)

Kupuna James Keolaokalani Hū'eu, Jr.
(KPA Photo No. 1406)

James Keolaokalani Hū'eu Jr. was born in 1914, at Ke'anae. His mother's genealogy ties him to families who have resided at Ke'anae and in neighboring lands for many generations. His *küpuna* were awarded lands in the *Mähele 'Äina* of 1848, and his family maintains ancestral lands in the region, and continues to cultivate *kalo* (taro) in *lo'i* (pond fields), and is sustained by the varied resources of the land and ocean.

Kupuna Hū'eu was raised on the land, and traveled from shore to mountain with his elders, and subsequently as an employee of the CCC program and EMI Company. He is a historian of traditions and land use history in the Ko'olau region, and also has intimate knowledge of lands in the larger *Maui Hikina* region. Kupuna Hū'eu has also been an active proponent of Hawaiian rights and land issues.

Kupuna Hū'eu participated in three interviews (April 11th and 25th, and November 6th 2001) as a part of this study, including one field trip to lands of the Hämäkua Loa–Ko'olau region. Garret Hew of EMI, who himself is very knowledgeable about EMI Company's history, assisted during two of the interviews. Following Kupuna Hū'eu's review and release of first two interview transcripts, Hew kindly agreed to assist by mapping out specific sites described, and locations visited during the field trip of April 25th 2001.

Readers will find that Kupuna Hū'eu is a gifted *mea ha'i mo'olelo* (historian), and that his recollections recorded herein, are a significant contribution to the history of the region. During the interviews Kupuna Hū'eu shared important accounts pertaining to native traditions (how place names were given); native customs and practices; and historic residency, and land and water use in *Maui Hikina*.

During the interviews, Kupuna Hū'eu shared traditions and discussed many important historical events and observations pertaining to land and water use. These included, but are not limited to the following points:

Summary of Topic	*Page*
Discusses routes of access, 19-teens to 1930s; the EMI Trail (road), though private, was open to people for travel between Kailua and Kikokiko.	17
Discusses the varieties of *kalo* grown, methods of cultivation, and water flow from the 19-teens; also describes *'o'opu, 'öpae*, and *päpü* found in streams. Does not believe that EMI has caused a problem with water in the Ke'anae vicinity; water used by the families is from cool springs below the ditch system.	19
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The interviews were conducted in Hawaiian and English, and the narratives are given verbatim. Kupuna Hū'eu gave his personal release of the three interviews to Maly on November 6, 2001.

Interview Transcript

JH: [discussing Garrett's call, asking to visit and conduct the interview] …Come *niele*.

KM: Well, *mahalo*!

JH: [speaking to Garret] You know what is *niele*?

GH: *Niele*?

JH: Us, we never *niele*, so we never know. *Niele* means, you ask questions.

GH: Right.

JH: Us, we never ask questions of all our *küpuna*, so we lose out.

KM: Yes, that's why we have to now. Some, before days, they never like to talk story, but now, everything, *nalowale. Loli ka 'äina…*

JH: *'Ae*.

KM: *Loli ka hana. Pono iä käkou e noi aku i nä küpuna, "He'aha ka hana? O wai ka mea…he'aha ka hana 'ana." No laila, mahalo nui i kou ho'okipa 'ana mai.*

JH: *A'ole wau 'ike mai ka po'e küpuna mai.*

KM: *Akä, ua lohe 'oe i ka mo'olelo…*

JH: Yes. *Ka mo'olelo*…see, these haoles, they come to the YMCA. Now they go to the library, Wailuku. So they come ask me, "Jimmy what is *lele kawa*?" I know what is *lele kawa*. The Hawaiians, they jump in the pond, they never dive eh.

KM: *'Ae*.

JH: So then I told him, bum-by he look at me and went back into the library. He came back he ask me " Jimmy, I hear Kahekili was a great *lele kawa* person. And me I turned around and said, "Oh, yes he's a great *lele kawa* man." But I never know. He said, "He did *lele kawa* in Ke'anae." I look at him I said, "Oh yes, I think he *lele kawa* in Ke'anae…" [chuckling] You see, when I was young kid, I used to go fish *'o'opu*, but I went way up…

KM: *Kahawai*?

JH: *Kahawai*. At the end one long pond, so when they up there they had one cave in the pond, had two human beings. The man's *ule* hanging down… *E lewalewa 'ana ka ule mai luna a i ka wai*. When I was about 11 years old, I saw that, and the *po'e küpuna* called that "*Ka ule o Kahekili*." And I could tie my canoe to that. I seen that when I was a young boy.

KM: *E lewalewa 'ana ka pöhaku*?

JH: Just like the man's *ule* hanging down, stone, two hanging down. I used to tie my canoe [chuckling]. So one day I went one more time, and the big water broke and come down. I never go back again, that's 1926 I went up there…I never go back again. So when I was going to the Smithsonian (1988), had this *haole* boy, he came down and he started to question me. So I told him "Go inside there look if that thing hanging down." He dove inside but he look around, he tell me "no." …'*Ike 'oe iä Näpokä*?

KM: *'Ae*.

JH: '*Elua läua, Näpokä, me këia keiki mai* Smithsonian. . .

KM: Hmm, *küpaianaha*!

JH: Yeah, and that's how I heard of Kahekili at Ke'anae.

[Discusses *lele kawa* at Waia'ōlohe[2], Ke'anae.]

JH: . . .That's why *no'ono'o wau, kēlā manawa, ka haole nīele ia'u, 'ike 'oe ka pane*, but *a'ole wau 'ike iā Kahekili. Noho mai kēia haole, wala'au 'ana ia'u*, but *a'ole 'oia lo'a ka mo'olelo pololei*. You see this man was talking to me, he went to the library, and they had about this story so he know. But me, I never know. But by asking me, I can answer the question to solve those things. Then he told me "Kahekili, went jump in this pond in Ke'anae." I tell him, "yeah." So I tell him where the place that pond is, Waia'ōlohe.

KM: Oh, Waia'ōlohe. Here [opening map], this is Register Map 2238 for Ke'anae. *Kala mai*, I'm sorry here's the stream come in. This is the *muliwai*, yeah?

JH: Yeah.

KM: Wai-a-'ōlohe?

JH: Yeah. The *kawa*, but the *pali* there is called Pahupi'ina'au. *Lo'a iā 'oe*?

KM: [looking at map for place name?]

JH: It's a trig station Pahupi'ina'au.

KM: But not Pi'ina'au stream?

JH: No, this right around that end.

KM: How interesting, Pahupi'ina'au?

JH: Pahupi'ina'au. He get one trig station.

KM: Trig station on top?

JH: But a lot of guys don't know. Even you ask Ke'anae people they don't know. But me, from young time, I *lohe*.

KM: *'Ae, lohe i ka mo'olelo*.

JH: Yeah.

KM: Oh, there's a Trig Station right here [pointing to location on map].

JH: Yeah, they call that Pahupi'ina'au.

KM: Right by the ocean?

JH: No, right on the *kawa*, that's where he jumped. The *kawa* is right over there.

KM: So by the *muliwai*?

JH: Yeah, the *muliwai* start from there. You see up here get *mana* [division], get two *kahawai*. One come down from, they call Pi'ina'au stream.

KM: *'Ae*.

JH: The other one is Palauhulu stream.

[2] Waia'ōlohe (may be literally translated as the "Water-of-the-experts;" perhaps descriptive of those who were skilled in the art of *lele kawa* (the Hawaiian sport of leaping or diving into the water). At times during the interview, *kupuna* Hū'eu also pronounced the name as "Wai'ōlohe." Both pronunciations may be translated in the same way.

KM: Palauhulu?

JH: And they meet there. They go to meet over there, they call that Waia'ōlohe. Right on top, that's where the Trig Station.

KM: And uncle, you *hānau makai*?

JH: Down the flat.

KM: *O wai kou inoa*?

JH: James Keolaokalani Hū'eu, Jr.

KM: *Hānau 'oe i ka makahiki*?

JH: *Makahiki*, 1914, July, 22.

KM: *Maika'i nō*.

JH: But *a'ole wau hele i ke kula*.

KM: *Ua hele 'oe i ke kula o ka 'āina*!

JH: *'Ae, pololei*. I never go…I only went to seventh grade. Ke'anae sixth grade and then you *pau*. I went to Honolulu, I stayed with Patsy's grandma [Patsy Ku'ikāhi-Navares] Lilly Ku'ikāhi, that's the mama of David Ku'ikāhi. And David married… [thinking]

KM: Kaōpūiki? [prior to our interview we discussed his family relations to my *kahu hānai*, Daniel Kaōpūiki Sr.]

JH: Kaōpūiki.

KM: *'Ae*.

JH: I stayed with them one semester at Pu'unēnē I only went to seventh grade. If I went *puka* school I would be the Governor of Hawai'i [chuckling]. I would give the *kanaka* all back their land, and no more troubles [chuckling].

KM: Yeah. So, you *hānau makai*?

JH: Yeah.

KM: If we look at this map, it shows the map number, and this map for Ke'anae is in your packet here.

[Discusses his family tie to recipients of *kuleana* in the *Māhele* of 1848; and the 999 year Homestead Program.]

JH: I think the lands, that *inoa* is Kealina.

KM: Oh, Kealina's *'āina*, yes okay.

JH: That all belong Halemanō, Kealina, Ka'ea.

KM: *'Ae*, I recognize the name, I'm just looking, you'll see in here, get the *Māhele 'āina* in here from the *Māhele*, yeah?

JH: Yeah.

KM: This is Register Map 2238. I see Malailua, Makea, Mamaikawaha, Napiha'a…

JH: Yeah.

KM: That's homesteads.

JH: Napiha'a, they stay right down, and then Halemanō is on top.

KM: Halemanu or Halemanō?

JH: Halemanō.

KM: Oh, he *ohana*?

JH: That's my great-grandparents.

KM: Halemanō.

KM: *Male 'oia iā* Pierce. And the *pololei* Pierce became… Pierce is one of the missionary, and he married into Papa. So my grandmother is Papa line, but I don't know how many generations down. My grandmother was a Pierce then she married Halemanō.

KM: But it's Halemanō?

JH: Halemanō.

KM: *A 'oia pololei*?

JH: Yeah, *'oia pololei*.

KM: Yeah, very interesting. So by and by, here's, you'll see the different names… Where do you think you were living when, if you look at this *'āina* here, now, if you can see. [moving map closer to Mr. Hū'eu] I know it's a little…

JH: Behind here is all 999 year land.

KM: Nine ninety-nine year homestead, yeah?

JH: Yeah. You look by Tau'ā, in front, that's where I live. Tau'ā is right down by the beach. I don't know what lot that, you look down 999.

KM: I got to get one other map that shows that. If the church is over here, this is the church lot *ma'ane'i*?

JH: Yeah.

KM: These are the 999 year lots, yeah? *Makai*?

JH: Yeah, it got to be around here.

KM: You were somewhere down this side?

JH: Yeah.

KM: Oh, you see uncle, all of this *'āina, lo'i kalo e*?

JH: Yeah.

KM: You see all of that, *i kou wā li'ili'i, pehea, ka nui o kēia 'āina he lo'i kalo*?

JH: *Pau kēlā 'āina*.

KM: *Pau kēlā 'āina i ka lo'i kalo*?

JH: Yeah. They all go under the 999 year lease. That's why they said, the 999 was Hawaiian Homes. No!

KM: No, it's not. *Mamua loa o ka* Hawaiian Homes.

JH: Yes. Way before, you know when they went *Māhele* the land, the Hawaiian who can afford…I don't know how they went get *kuleana*. So, the other people no can afford. You pay five dollar they give you house lot and taro patch.

KM: *'Ae*.

JH: So every one had. Like me, I understand, but those people, they no understand.

KM: So uncle, that's how it was for your *ohana* at Ke'anae?

JH: Yeah.

KM: *Lo'a ka pa hale*?

JH: Yes.

KM: *Lo'a lo'i kalo*?

JH: Yes.

KM: Were there also *māla'ai* dry land planting areas that you folks had, or mostly all *kalo*?

JH: Down there was all *lo'i, wai*.

KM: So you folks, how did you live? You grew taro?

JH: Yes.

KM: And you *hele lawai'a paha*?

JH: Well, you know, when I was small… Well, just happened at my age, they got the depression. Then had the CCC, I enrolled over there. I listen, that's why I know, plenty stuff, I know. The archaeologist was Sterns; Stems and Murphy. As a young boy I listened to them, so I know how. That's why, a lot of guys tell me "ah, what do you know?" But I know more than them. I never go school, but I know.

KM: Yes, you listened.

JH: Yes.

KM: And that's how you know, "*he lohe ke ola, he kuli ka make*." *'Oia ka 'ōlelo a nā kūpuna*.

JH: Right.

KM: So, can you tell me what was it like when you were growing up? Were there plenty families living down with you folks?

JH: Well, during my day when I was living, well my dad had a land up (above). It's a Hui land, up on the flat. We live up there but my mom died when we were young, so my dad remarried. I lived with my brother who lived with my brother, William Roback. My mother was first married to a Roback and then he died. He worked for Hilo Electric, he was electrocuted.

KM: *'Auwē*!

JH: She had five boys, then my dad married her and then he had five children. Four girls and me. And then when my mom died he remarried a Kekahuna girl, and he had three children. So I'm in between two families. So that's how I get quite a big family.

KM: Yeah, big family. All half brothers, sisters?

JH: Yeah, right.

KM: And were there other families living by you folks?

[Discusses routes of access – 19-teens to 1930s; the EMI Trail (road), though private, it was open to people for travel between Kailua and Kikokiko.]

JH: Yeah, they have families. Well anyway, then had more families living in Ke'anae than now. In those days the only way you can get there is by boat, or trail. On the horse, or canoe. From Ha'ikū to Ke'anae you go on the canoe.

KM: That's how, you canoe.

JH: Nāhiku was a very industrious place. They had plant rubber.

KM: Yes.

JH: And they started EMI Ditch, so they all had jobs. So Wilson came and he macadamed the road at Nāhiku, to Kopili'ula. But from there to Ke'anae, no more road. And Ke'anae to Kailua, no more road.

KM: You go *alahele*?

JH: Yeah, *alahele*. But when EMI made the ditch, they got better road, so the community used the EMI trails.

KM: So that's how they used the trail go up Kikokiko like that, all the way.

JH: Yeah, right. That's all for EMI.

KM: I see. Garret took me up yesterday.

JH: Yeah.

KM: In 1922 the bridge date, you know when you go Kikokiko?

JH: Yes. Most of those bridges 1922, 1923. But the old Hawaiian bridges, the one below they go back to 1911. In those days never had lot of people take care, so they would rather go EMI trail.

KM: Had the older Government Road more *makai*?

JH: Yes.

KM: And had bridge crossing, *Alanui Aupuni*?

JH: Yes.

KM: But this EMI Road *mauka*, Kikokiko was actually private?

JH: Right. But even the old, old road the Pi'ilani Trail, we hardly used that.

KM: Oh, that's the old *alaloa*.

Kikokiko Bridge (1922), EMI mauka Route between Pāpa'a'ea and Kopili'ula (KPA Photo No. 1397)

JH: No more grade, you just go over the *pali* and then you switch back.

KM: Switch back.

JH: So when they went dedicate the road over there, they wanted me to go and talk, but I had no chance to talk. They had this boy… [thinking] you know, Eddie Marciel is his father. . . Sam Ka'ai. He did all the talking, me, I shut my mouth. He knew what they had written. But we hardly used the old trail.

KM: You folks, in your lifetime, when you wanted to leave Ke'anae, you got to go canoe?

JH: Yeah.

KM: Or you go walk feet or ride horse up the old trail?

JH: Or the inter-island boat, it stopped by once a month.

KM: At Ke'anae?

JH: Yeah.

KM: So, not *Humuula, Hawaii*, the *Bee*, or?

JH: Yeah, *Hawaii, Kilauea, Maunakea*.

KM: *'Ae*, oh.

JH: *Hualalai* and *Waialeale*, they're in the late part.

KM: Later.

JH: So when we want to go, only once a month. If the ship past Ke'anae and they look white water, they cannot land. They go straight to Hāna.

KM: Yeah.

JH: When they come back if clear they stop. If not then the whole month you got to go by land and get their food. Our food came through the boat inter-island.

[Discusses the varieties of *kalo* grown, methods of cultivation, and water flow from the 19-teens; also describes *'o'opu*, *'ōpae*, and *pāpū* found in streams. Does not believe that EMI has caused a problem with water in the Ke'anae vicinity; water used by the families is from cool springs below the ditch system.]

KM: How did you folks live…you grew taro?

JH: Yes.

KM: What kinds of taro did you grow?

JH: Well those days, we only had *hāpu'u*, *ha'akea*, *piko*, *mana*.

KM: *'Ae*.

JH: We never had these new…now that they introduce a new one they call *moi*.

KM: *A, moi*.

JH: That's a better taro.

KM: *Ha'akea*, *piko*, *hāpu'u* like that?

JH: Yeah.

KM: And all in the *lo'i*?

JH: Yeah all in the water.

KM: How was your water flow back then, plenty water came down? And did you flood the fields all the time, or was it seasonal?

JH: Well, we had water all the time. Actually, you no need plenty water to raise the taro, but lot of people think you need water. No, as long as you can damp, only you got to work harder. What they use water is they flood the place, the grass [gestures drops down].

KM: The weeds no grow?

JH: The weeds yeah.

KM: You no need go *wāele*.

JH: Yeah. So that's why when I hear, they ask "Why you folks don't plant taro?" "Oh, EMI take all the water." I tell 'em "EMI was over hundred years ago. You never hear the old people cry."

KM: You had plenty of enough water?

JH: Oh yeah.

KM: It wasn't a problem when you were growing up as a child?

JH: It wasn't the water, because we have a spring. We use spring water, so no more water from the stream that we use.

KM: How about, did you folks plant your taro in a cycle, certain *lo'i* plant now, a few months later certain *lo'i* plant? So that all year round you had taro?

JH: Yeah, that's how we plant, you have to… [pauses]

KM: Rotate?

JH: Yeah.

KM: And how about *ho'omaha paha ka 'āina i kekāhi manawa*?

JH: Well, we *ho'omaha* maybe, you don't plant maybe two or three months. You let 'em rest. But today, they pull today, tomorrow, plant.

KM: They plant already.

JH: They plant already.

KM: So the ground comes weak, yeah?

JH: Yeah.

KM: In your *lo'i kalo*, did *'o'opu*, or were there *pūpū lōloa kahawai paha*, were there things in your *lo'i* before?

JH: We had *pūpū*, but our *pūpū* was the Chinese one. Get *limu* on top.

KM: Oh, yes.

JH: So that never bother the taro. Then the Filipino had the same kind *pūpū* but no more *limu*.

KM:` Oh yeah, when you were young?

JH: Yeah. But now, they get these now, he eat the taro and everything.

KM: Terrible yeah. How about, so no more native *pūpū* live in the *lo'i* when you were young that you remember?

JH: I hardly see any.

KM: But get *'o'opu*, or no more come in?

[Discusses varieties of *'o'opu* in Ke'anae vicinity streams, and the former residences of families in the uplands; exchange between upland and near-shore residences took place.]

JH: No, no more, now. Our days used to have, *'o'opu*, gold fish.

KM: Ah, so the *'o'opu* when you were young, would come. What kind of *'o'opu* did you folks catch?

JH: We had mostly, *nākea*. The *'owau*, they stay in the brackish water.

KM: What kind?

JH: *'Owau*.

KM: Yeah, that's the kind *makai*.

JH: The one in the brackish water.

KM: *Wai hapa kai*?

JH: Yeah.

KM: But that's *'o'opu* too, eh?

JH: Yeah. And then they have the *nāpili*, the one *pipili* on the side, and there's the one that's still red they call that… [thinking] I forget that name. But you cannot eat that *'o'opu*, even the cat won't eat 'em.

KM: For real. So, you folks sometime you stay *makai*… Well, you live *makai*, you grow taro. You folks went *mauka* sometimes also?

JH: During our days we hardly walked. The days before we were, the up people, they all farm.

KM: So there were people before?

JH: Oh yeah.

KM: *Kauhale ai mauka nei, a kekāhi 'ohana, makai*?

JH: Yes, that's the one I was telling you Pi'ina'au. They call that, what is that name… [thinking] He had a special name. So the guys up there plant taro, and then they trade with us.

KM: Is it dry land kind taro, or get *kahawai* also?

JH: They had *kahawai* and dry land. The *kahawai* is way up there.

GH: How far up Pi'ina'au Road they go?

JH: Yeah, you go inside there.

GH: By where the rain can, they planted in that area?

JH: You know where the station?

GH: Yeah.

JH: Right up till you hit the…

KM: Hau'olowahine, up as far…?

JH: Hau'oliwahine[3] this side, but inside there, they call Pi'ina'au Valley. They get one name Kaho'okuli.

KM: Kaho'okuli?

JH: By and by you look in your map [chuckles].

KM: Okay, I'll bring you the other set of maps next week. Kaho'okuli?

[3] Kupuna Hū'eu uses the pronunciation "Hau'oli-wahine," and later in the interview specifically references "Happy" (*hau'oli*), in the context of the place name. An 1877 map, Register Map No. 2052, gives the name as "Hauoloahine," and EMI maps give the name as "Hauolowahine." Kupuna Hū'eu's use of the name is cited in this transcript.

JH: Yeah.

KM: That's where the people lived *mauka*?

[Tells a story of a family that resided in the uplands of Kaho'okuli, and an account of a shark man.]

JH: They lived *mauka* and they traded with the people at Ke'anae. Now this old fellow told me a story. He was living up there, they had one…he was living in a cave. But he was a young boy, and in that cave they had canoes. Any kind dead men in that cave, but he was a young boy, so they trade. Now one day they came lower Ke'anae and these people never go fish so they started put fish bone and fish tail, they put 'em in the bag. They grab the bag they go back up there. When they pull it out, they had all rubbish, but that thing when change into… One changed into a shark. So the baby shark, they raised him up there.

KM: *Mauka nei*?

JH: Way up.

KM: Kaho'okuli?

JH: At Kaho'okuli. Right in that stream. As he grew bigger, it went down, ran down that stream.

KM: Pi'ina'au.

JH: And then land down where the Ke'anae at the end.

KM: The *muliwai*?

JH: Yeah.

JH: And then under there, had one tunnel. You go right down to where Dr. Keppler lived. Under there get one tunnel, so that shark used to live under there.

KM: So he could go out to the ocean too?

JH: Yeah, he was under there. If you related to that shark you no worry, you fall in the sea, they bring you back.

KM: *Po'e 'aumakua*?

JH: Yes.

Palauhulu Stream (Plunkett Spring just over first low rise in foreground) – View mauka to Kaho'okuli Vicinity (on west) and Hau'oliwahine on Pali. (KPA Photo No. 1389)

KM: *Manō kanaka.*

JH: I heard this old man telling me.

KM: Do you remember who this old man?

JH: Yeah, his name was Edward Akiona.

KM: Akiona.

JH: But he is gone now. He get one son living in Hilo and his name is Edward. And he get one in Kona, they call him James Pi'iwai. That's the only two I think, living. But he has the land down there.

[In old days, families lived in *mauka* and *makai* regions; it was the custom to exchange goods between one region and the other.]

KM: Some of the *ohana* would stay *mauka*, and that's what they did?

JH: Yeah.

KM: And then you folks would *kuapo* back and forth?

JH: Yeah. But like me, I never lived those days.

KM: Yes, but that's what you heard, *kuapo 'ana lākou*?

JH: Yeah, that's how they lived.

KM: How they lived before days? *Ka po'e o uka, kanu ka mea 'ai i ka māla 'ai paha*?

JH: Yes.

KM: *Ka po'e o kahakai, hele i ka lawai'a, kanu ke kalo, a kuapo nō ho'i*?

JH: Yes. So when this fellow came to school age, he went to Kamehameha School at about 18.

KM: Akiona?

JH: Yeah. So the class might be the third class of Kamehameha. So when he came back, he never come back Ke'anae. He went to Hilo, he had a job, he work Hilo Electric. He worked over there for about thirty or forty years. So he retired, now when he retired he had twenty-five dollars a month [chuckles]. He came back to Ke'anae to his *'āina*. So he come back and go back down there. He wanted to show me where they used to live. He and I went up and down, up and down.

KM: Too hard, *loli ka 'āina*?

JH: I tell him, "No need. They not going show him, because of me." Alright, I kept that story, then I told two guys, they get *haole* blood, Thomas. I told the story, that two boys came back to Ke'anae while I was living there. They went out go look the first week they went, no more. They came back one more day they went. Hey, they waited, I was in Wailuku. When I went home he told me "Hey" they think "they found the place." The next day they took me up, I look, I said, "I think so, don't talk, just let 'em go." When I'm dead, then you two guys can go look. So if I don't die by 87 years old, you come we go up there, but I don't know who we get permission. Maybe from Garret [chuckles].

KM: Could be.

GH: You no need permission, you get.

KM: Yeah, cause your *'ohana* generations at that *'āina*, yeah, Ke'anae, long time.

JH: Yeah.

KM: And these…

JH: My *ohana*, in the "Great Mahele," they already had Grant Land. I don't know how they paid the surveyor, but they had.

KM: Five dollar yeah, for the house lot and what.

JH: I don't know, no more money that time [chuckles].

KM: Who was your *ohana* that got the *Māhele* land?

JH: That one Halemanō.

KM: Halemanō. Who was the other name you said?

JH: Halemanō, marry Pierce.

KM: And the other Hawaiian name, Ka'ea? That's *ohana* too?

JH: Yeah, that's the land name.

KM: The land you was on?

JH: Yeah.

KM: Okay.

JH: So anytime you looking at the map you see Kealina or Ka'ea, that all belongs to Halemanō.

KM: Yes, that's it oh.

JH: Had the Halemanō and the Maka'enas, they had land.

KM: I'm going through all of the *Māhele*, all of the claims. Bringing it all together so that we know who all of these *ohana* were, the old *kama'āina*.

JH: Had this letter from this Vicky Creed. You know her?

KM: I know her name.

JH: She came one time with us, I took her but…maybe when you go Honolulu you take the address.

KM: Yeah. We're doing the whole *Māhele* thing in this study, so it's really good.

JH: Maybe you working with her [chuckling]?

KM: No, different. It's so important you know. Like you were saying, so had your *ohana*, you remembered Kiakona?

JH: Yeah.

KM: Kaiapa?

JH: Yeah, but most of them was from Pe'ahi…

But now when had this guy R.A. Drummond, he used to live in Hāna. Now he went away, he sold all his property, but plenty he took away from the Hawaiians, and he sold 'em all to EMI That's how EMI had all the land. But EMI don't want the land, they want land in the forest.

KM: *Kuahiwi*?

JH: Yeah. So they never like the land below, but he sold 'em all to EMI. Even look the record from Drummond, but he went take over plenty land from the Hawaiians, not the haoles [chuckling]. The haoles they when pay for their land.

KM: So was Drummond part-Hawaiian?

JH: Nah, *Pukiki* [chuckles]. His name Drummond but he's Portuguese.

KM: You remember Kaiapa?

JH: Kaiapa, Charlie I know but the old Kaiapa.

KM: You didn't know so Charlie Kaiapa Plunkett yeah?

JH: Yeah, I know him.

KM: You remember Robert Kamohoali'i Plunkett, Robert Plunkett?

JH: Yeah, Robert he was living down in Lā'ie.

KM: He moved Lā'ie, and then John yeah?

JH: John was staying Ke'anae.

KM: Is that, there's a place Garret showed me yesterday, they call Plunkett Spring.

JH: Yeah, he live up there, and they call it Plunkett Spring.

KM: He live up there on *'āina kuleana* or he took care?

JH: No. He take care of EMI. EMI had houses.

GH: That's where the rain can?

JH: The rain can, had a big house. And they accommodate anybody that goes through, no more place for sleep.

KM: Oh, when they travel, just like they can rest *hale ho'omaha*?

JH: Yeah, they *ho'omaha* over there, and then they continue. Belong EMI, but Plunkett was the last guy. They had the Tripp's, the Waites, they all were there. Tripp came Makawao, I think.

KM: Funny, cause Tripp is Pomroy relation. Also, one married Lehua Dang *mā* them, Lehua & Puna Dang *mā*, I don't know if you remember?

JH: Puna Dang is Kiakona.

KM: Kiakona, yes.

JH: You see had David Kiakona and I don't know the one more, I forget his name. But David is a bald head they call him Ata. But he had only one daughter and she married Akau. So they went change their land at Pe'ahi with EMI, that's how they own plenty land in Ke'anae. The one you see all on the Akau, that belonged to Kiakona. They went exchange Pe'ahi land with EMI.

KM: Do you remember Caroline Hubbell? The name Hubbell?

JH: Well, I don't have the… But sometimes I see them on the…they live way up there Hubbell… You went up there, Hubbell's place?

GH: Yeah.

JH: The house was still there, when I was.

KM: See cause Hubbell, Kiakona was the last husband. The old man Kiakona, Wong Soon, and then Akuna also ties in. But that's how and then, but Hubbell's first *kāne* was Kaiapa. So that's how they all come *pili* like that.

JH: Oh!. . .

KM: . . .And that's how Akau them, they all come under there.

JH: Akau's mama, I think she comes through the Kiakona. And then they don't know and they marry eh. Her name was Violet. Had Rachel, Violet.

KM: You remember Violet Kaiapa?

JH: Yeah, that's Pomroy.

KM: That's right, see, cause Violet Kaiapa is Walter Pomroy's mama.

JH: Oh!

KM: But married Pomroy who was supposed to be Pukui. So that's how all, too much! All kinds of connections yeah. Just like you, you said your *'ohana* on papa's side, Hū'eu. But that's the *ali'i* Hū'eu or different Hū'eu? George Hū'eu Davis?

JH: He had a long story. Coming from George.

KM: Yeah, from George Davis Hū'eu.

JH: When Captain Cook, came to Hawai'i the first time he took all these Hawaiian ladies, had all good time. One Hawaiian been touch one of the *haole* [chuckles]. You see they thought they were gods. Smoke comes out of their nostrils. He been touch, he tell the other Hawaiian, eh look like human being. We fix them up the next trip. And the next trip when Captain Cook came, the Hawaiians went attack them. These two guys, John Young, and Isaac Davis they had hard time, but they want to keep those two *haole*. So they when give 'em Hawaiian wife. Now, I don't know who's John Young's wife. But Davis wife was princess.

KM: Yes.

JH: And then her name is Hū'eu, that's where the Hū'eu came in. I tell my sister guys, one old guy been telling me, they don't like believe me.

KM: What does Hū'eu mean?

JH: Witty guy.

KM: Witty? Rascal? [chuckles] *Piha 'eu nō ho'i*?

JH: *Piha 'eu*, yeah. [chuckling] Just last Saturday I had one party, my *mo'opuna*. Had this guy, he's a Portuguese, but he's family. He surprised me, he came out with all that about them. I don't know where he went, but he went marry one Kaiwi girl. He listen, quite interested.

KM: Yeah. Uncle, when you were young, no more families lived more *mauka*, up into like where you were saying Kaho'okuli?

[Discusses residency and road development in the ca. 1920s-1930s.]

JH: Well going toward Wailua place, had a lot of people.

KM: Wailua had?

JH: You see had Waikani… But those days no more road over there, only had the trail.

KM: *Alahele*.

JH: But now when they had put this road in Ke'anae. We had one engineer Paul Low. He was a good engineer, but we had Sam Kalama he was the Chairman. They wanted the road and they when cut 'em, that's where they cut 'em all Waikani. The road was not there. The old road was way down, or the EMI Road, *mauka*.

KM: *Mauka*, Kikokiko.

JH: He been tell this guy, Paul Low he was the engineer. But the surveyor was this guy Robinson, Covel Robinson. That's Kula Robinson's brother.

KM: *'Ae*.

JH: Covel, he was the surveyor. He was the guy who surveyed the road.

GH: That was relationship to Foster Robinson?

JH: Yeah, the brother.

GH: Foster's brother.

JH: He was the guy that surveyed the road. Him he like drink *'awa* root. So he go down to my family place, Roback. Roback was the German guy, he went jump ship he when marry my grand aunt Lalilimoku.

KM: Ah, Lalilimoku.

JH: So he became Hawaiian [chuckles]. So this guy he going down, drink *'awa* root. I used to go pound *'awa* root for them. I was only about eight or nine years old. That guy Covel was the surveyor. He has one descendent living at Kū'au right now. She married George Kahanu. Her name is Beatrice. She had land, EMI too. She lives right by Kū'au in the big house over there, that's the Robinson estate.

GH: Yeah, right.

JH: The lady stay and that's her granddaughter Miss Universe. You know the Miss Universe?

GH: Brookes Lee.

JH: Yeah, Brookes Lee, that's her granddaughter. She went marry my cousin, but anyway she related to me through Cockett. Her dad is Cockett. Cockett married a Robinson.

KM: *'Ae*. Uncle, you folks grew taro you said? You were also growing *'awa* or you went up *kuahiwi* to gather your *'awa*?

JH: Those days get plenty *'awa*.

KM: Plenty *'awa*, even *makai* or you go *kuahiwi*?

JH: Well not really in the *kuahiwi*, just a little bit up.

KM: Up as far as Plunkett Spring, or more low?

JH: More low than Plunkett.

[Discusses nature of forest lands and *kahawai* when he was young; *kahawai* formerly tended and kept clear of growth.]

KM: More lower than there. What was the forest, now get all eucalyptus you go in there. Before, no more eucalyptus when you were young?

JH: No more. They only get the Hawaiian trees and grass. Down here where the road is, all grass. You go right through until 1934. Had few *kukui* trees.

KM: *Kukui*, *'ōhi'a*?

JH: *'Ōhia 'ai* (also called *pā'ihi* on Maui), yeah. But the *hau* they went use that for fence post.

KM: *Hau*, oh that's how the *hau* went start?

JH: Yeah, that's how it started but the old Hawaiians they used to trim 'em.

KM: They would trim, keep 'em back.

JH: Yeah. The new guys they lazy trim, the thing run away.

KM: Oh so that's why. Before they use the *hau* for make fence?

JH: Yeah. Down there they always trim 'em.

KM: Yeah. That's how too, when you *'oki* the *hau* and the ground damp, you put it in, it's going to grow.

JH: Yeah, it falls down, it grows.

KM: Yeah.

JH: Get one more, the *hau*, there's a *hau kū* [as pronounced] he stand out. Something like the *wiliwili*. Get two kinds of *hau*, the one that crawl.

KM: *Hau kolo*, *hau kū*?

JH: Yeah. Get by this place Maka'ā [as pronounced]. You see that *hau* that's the kind.

GH: Kind of white?

JH: Yeah. Now you know where [chuckles]. Pāpa'ea[4] had, but now they went cut 'em.

GH: By Ha'ikū Ditch, you know Holokula Intake, over there get.

JH: That is *hau kū*.

KM: All these place names like this though, like you mentioned Waikani earlier. Is it *kani* or *kāne*?

JH: They call 'em *kani* when he drops down he makes noise.

KM: Get sound, so Waikani, not *kāne*?

JH: *Kani*. The spring water in my place, that is Kāne.

KM: That's Waikāne.

JH: Yeah. You saw that?

KM: *'Ae*.

JH: That's my land right there.

KM: *Maika'i*. You folks would go up you gather *'o'opu*? You go up as far get *hīhīwai* or *wī* up your place before, *mauka*?

JH: Oh yeah, we would. You no need go way up. But today all covered with bushes…no more.

KM: Because the river all close up?

JH: Yeah.

KM: The *nahelehele* now, no more?

JH: Well, maybe a few.

KM: How about you folks, go up to get *'ōpae*?

JH: Oh yeah before you no need… Like me, I work EMI, I no need go in the river. I jump in one intake, all I need.

KM: Kā'e'e [gestures using a scoop net], you get net?

JH: Yeah. But when we closed the ditch for clean up, you only go with the bag, you scoop 'em. When I first work for EMI, I see them come out they get bag, the barley bag. Today you go right through if you get quarter bag you lucky.

KM: When did you start working for EMI?

JH: 1947.

KM: And you worked till when?

JH: I worked till '79, I worked 32 years.

KM: Yeah. Hmm. Did you folks have any place where you made *pa'akai*? You folks made *pa'akai* in your lifetime?

[4] Papa'ea. Later during the interview, Kupuna Hū'eu noted that the place name "Papa'ea" should be "Pāpa'a'ea;" but that most people now pronounce it as Papa'ea. The older usage of the place name (with diacritical marks to preserve pronunciation) is used throughout the interview transcript.

JH: No.

KM: Hard yeah?

JH: Yeah. Only in Kaua'i.

KM: Where did you folks get your salt from? You *kaula'i i'a*?

JH: Yeah, *kaula'i* but I don't know, we went buy.

KM: You buy.

JH: I think Kaupō, Kahikinui.

KM: Yeah, see maybe they *kuapo* even that far.

JH: Maybe.

KM: 'Cause your *'āina, maū*, wet yeah?

JH: Like down Kalaupapa certain time of the year, you go down there.

KM: Yes, the *kāheka*.

JH: Yes.

KM: Maybe they go exchange or something then.

JH: You see, I went to work in Kaua'i, I stayed down in Wainiha. But on the other side of the island…

KM: Hanapepe, Waimea?

JH: Yes. From Wainiha you had to come all the way around. I went down there work.

KM: As a part of a company?

JH: Yeah, that's the place McBryde and HC&S, EMI all the same. But I went over there work, but they never had…all the old people died. They had a tunnel, so was only EMI left. I went with four boys.

KM: Hmm. And you go *holoholo* all over?

JH: Oh yeah. Waihe'e, I worked over there. Pu'u Nēnē. Well Eighteen [chuckles] I work over there.

GH: Wailuku Shaft?

JH: Yeah. I went down the shaft with Cataluna. [begin track 2]

GH: Don Cataluna.

KM: That's the one in OHA now, or different Cataluna?

GH: Yes.

JH: He stay Kaua'i.

KM: Yeah.

GH: The daughter what's her name write in the paper…Lee.

KM: Yeah, Lee Cataluna.

JH: She still back Maui, no?

KM: No.

GH: Honolulu.

[Discusses customs of resource collections; the *ahupua'a – Konohiki* systems practiced in his youth. Explains the origin and traditions of place names in the Ko'olau region.]

KM: Honolulu, I think. So uncle, when you were young did the *'ohana* sometimes go *mauka* to gather, you said *'awa*. People would go mountain sometime and come. What kinds of things did they gather besides *'awa*?

JH: That's what I hear today, they talk about gathering. During my day, they hardly went.

KM: No need?

JH: Yeah. Today they greedy, they take everything.

[In the old days, people collected resources from within their own *ahupua'a; Konohiki* oversaw the collection of resources. Also shares two accounts pertaining to the naming of Ke'anae.]

KM: Well that's an interesting thing, if you lived in this *'āina*, if your *ahupua'a* or what. Did people come *lālau* all from anywhere go take whatever they want, or did they?

JH: No. Each *ahupua'a* they get their *konohiki* over there.

KM: *'Ae*. What was the famous fish for Ke'anae?

JH: Ke'anae was mullet.

KM: Mullet, so the *'anae*?

JH: Yes.

KM: Is that how come you call … *'Oia ke kumu i hea ai Ke – 'anae*?

JH: Yes. But I hear one more version of Ke – 'anae. When the last lava flow came down… Well, according to what I look, Ke'anae no was in the picture. When this last lava flow came, you can see when you go where the YMCA.

KM: Yes.

JH: You look under, it's all stream bed. So this last lava, flow only on the top and what went spill over made Ke'anae. So now they went call Ke'anae, "'Animoku." 'Ani–moku, that's the "Shiny-*moku* (section). So now the Hawaiians they put fill on top. They went carry dirt, fill all Ke'anae. Now when they carried the dirt, they had this *'auamo*. That's why they call that *kea*, just like cross.

KM: Yes.

JH: Then you put the bag or what kind.

KM: *Nae* when they…the net or bag like.

JH: Yeah. So they went carry that until some of them came *paupauaho*.

KM: Hmm, out of breath, *nō ho'i*.

JH: That's asthma, like. They call that *nae*, eh. So that's one version, Kea–nae, from carrying the soil down, they went get *nae* [chuckles].

KM: Weak, short of breath.

JH: Short of breath. You know that's one version of Ke'anae.

KM: You heard that when you were young, or later?

JH: When I was a young boy, I heard about that.

KM: Hmm, *'oia ka mo'olelo a ka po'e mākua, nā kūpuna*?

JH: Yes. Even if I look, even if you happen to go there, you look at the YMCA. You see under, old river bed. So the river was on top there before, and then all the *'iwa* birds used to live there.

KM: Is that why the next place is called Honomanu?

JH: Yes. Well, when the lava flow came down I think it was only right there. Ke'anae, that peninsula. But I have to tell, had this guy Halemanu, he was a Tax Assessor. John his name.

KM: John Halemanu.

JH: He was a smart guy. He told me "Why the name of that place was Manupāki'i?" That's, the YMCA. But now they only call it YMCA.

KM: So Manupāki'i?

JH: Manupāki'i. I tell him "why?" He said, "Was the *'iwa* bird, they cannot fly until they get wind. So when get wind they drop down. The *'iwa* used to live there." Now after that lava flow, they move out to, they call the place Moku Mana. But they call that Bird Island. No, that's Moku Mana. You see that picture over there? [indicating a photograph on the wall]

KM: *'Ae*, that's right there. That's how come, branched, *mana*, the branching?

JH: Yeah. And that guy behind, they call the Statue of Liberty. [indicating a stone formation at Moku Mana]

KM: *'Ae*, I can see why.

JH: But his name is… [thinking] What his name now? See Moku Mana was a pretty girl, but he got, Nānāhoa.

KM: Oh, Nānāhoa.

JH: [chuckling] Yeah. So he when attack.

KM: Oh, he *puni* her.

JH: Kahumanu that's why get that cup [like formation on Moku Mana]. That's why they call that Mana. If anybody tell you Bird Island, you tell no, that's Mana.

KM: Moku Mana. So the two branches like?

JH: Yes. And that's Nānāhoa behind. But this cave is under. And Papillion, right on top that where they went jump for Papillion.

KM: For who?

JH: That show, Papillion.

KM: Oh.

JH: So we take one week, they go there, I go down there watch until they went…where they went jump is low. But the motion picture come high. [chuckling]

KM: That's right, you can do anything you like in movie picture, yeah?

JH: [chuckling]

KM: Uncle, what *'āina* is this in?

JH: That is Pauwalu.

KM: Pauwalu. Is there a *mo'olelo* about Pauwalu?

JH: Yes. Pauwalu, in the old days had nine men went fishing. They went out, there's a rock over there they call Kauwalu. So they went on Kauwalu. Now the eight guys went jump in the ocean, but one never jump. The shark went eat the eight guys, that's why they said Pau–walu.

KM: So eight?

JH: *Walu* is eight, and *pau*, no more.

KM: No more, eight lost like?

JH: Eight lost. Now had one guy that came back tell the story. So the senior citizens told me " Eh you like go look the grave of that Pauwalu?" I tell, "They no more grave." They tell "why?" I tell "The shark went eat them." [chuckling]

KM: *Ai no i ka ōpū manō*!

JH: Yeah. Bumby they tell, "you smart." I said, "No, common sense."

Group: [chuckling]

JH: Common sense.

KM: That's right, yeah.

JH: The shark went eat the eight guys. That's why they call *pau–walu*. But that's one Trig Station.

KM: Trig Station.

JH: Right on that Pauwalu Point.

KM: Uncle, *pehea 'oe, maika'i*? You okay?

JH: Yeah.

KM: It sounds like each of these place names, your *'āina* out here, each have a story?

JH: Oh, yes, yes.

KM: Some history to them?

JH: Yes. That's why they get one story Kau–mahina. They don't know why they call that place Kaumahina. But you sit on the porch in Ke'anae, one new moon, you going see the new moon. Bumby a few hours no more the moon, it set, come all dark.

And it's just the other side where the moon sets. They call that… [thinking] Kaumahina. You know after the moon set, what they call that in Hawaiian? [thinking] …It get one name anyway, that's the meaning of Kaumahina. You only going see that one when new moon. Plenty guys don't know what is the meaning. And then right over there get one place Kilo–'ānuenue. That's the "Sight-of-the-rainbow." Right over there get one little stream, when the water drop out the sun hit 'em, you see rainbow. So every time the rainbow going start, it's from there.

KM: From there, Kilo'ānuenue?

JH: Kilo'ānuenue.

KM: Beautiful.

JH: Remember Kilo'ānuenue is by Kaumahina.

KM: That's by Kaumahina?

JH: Yeah. Just before you get there. But the other place, the other side is Kū'ele'ele [as pronounced]. When the moon set, all dark. You stand in the dark. The Hawaiians never give one place name without a legend.

KM: *'Ae*. So all of these place names… Like how about, is it Pi'ina'au or Pīnau [as sometimes pronounced]? What is that?

JH: That Pi'ina'au, they climbing up eh. Come up eh. You going up.

KM: Pi'ina'au. Other names like they get Hau'olowahine is that right?

JH: Hau'oliwahine.

KM: *Hau'oli*?

JH: Must be a Happy-woman [chuckling].

KM: Maybe she's happy because she got the top already.

JH: Yeah [chuckles]. You went up Hau'oliwahine?

GH: Yeah.

JH: You went through the tunnel?

GH: Yeah. Only get two places you told me, "EMI, the ditch goes backwards."

JH: Yeah, it goes back. The guys say "Hey where's the water, that goes back to Hāna, it drops down?"

GH: Ka-nō [as pronounced].

KM: Kanō?

JH: Kanō means the water sink. So certain time of the year, that whole stream, no more water.

KM: Even *mamua loa*?

JH: From before. And the water only comes…they call this place Waiakuna, they call Ching Stream.

KM: Wai…?

JH: Waiakuna.

KM: Waiakuna for Akuna. Oh, so that's modern name kind of?

JH: Yeah. The one they call Ching Spring, they don't know. But the name is Waiakuna.

KM: That's the one just next by Wailua, just a little before, just below the Pi'ina'au Road. The river yeah?

JH: Yeah, you go up.

GH: How come they call it Store Spring, because of the Ching Store, before over there?

JH: Well these new guys, eh.

GH: They call 'em Store Spring.

JH: Just like over there, they call Number Eight, Number Nine and all that. They got to put number for the Japanese, they no can pronounce the Hawaiian. So they tell "Hey where you going?" "Number Eight." You no can tell the name of the place the Japanese get hard time. That's why they call them Number Eight, Number Seven. But actually the name is different. There's Number Eleven, Number Twelve.

GH: Kikokiko.

JH: Yeah, Kikokiko well, that's a name.

KM: Yeah. What's Kikokiko?

JH: That's the one with the high waterfall.

KM: What Kikokiko, what does that mean?

JH: Just like how you making [chuckles].

KM: Spot around, that kind?

JH: Yeah. Just like that kind horse, they get different color.

KM: How long did it take you? Did you walk that old trail before, when you go young boy? How long did it take you to go from Ke'anae, walk up go up Kikokiko, come down to Nāhiku?

JH: [thinking] We used to walk Kopili'ula, take about three hours.

KM: Kopili'ula?

JH: Yeah.

KM: From Ke'anae?

JH: From Ke'anae we go up and walk. When you get Kopili'ula you get car over there.

KM: Oh, they get car already, cause the road was in.

GH: The road to Kopili'ula.

[Discusses traditional practice — when you harvest something you plant something again, so that there will be more next time.]

KM: Kopili'ula, you know when we were up there yesterday we saw, I think *pōpō'ulu* banana?

JH: Hmm.

KM: Banana tree kind of growing up wild up on the mountain yet. Was that planted by the old people living up there or…?

JH: Well, used to be they just…maybe the old people that plant.

KM: *Mamua loa*?

JH: Yeah. But today, they only know how to take, they no put back. Before our day, you cut one banana, you put one back.

KM: Hmm, *'oia ka mea ma'amau a nā kūpuna*.

JH: Yeah. If you take this, you put something back. So every time you get.

KM: That's right. Just like when you go if you *lawai'a*, or you know when you *'ohi limu*, you with care yeah?

JH: Yeah.

KM: And you put back.

JH: Like when I was in Kaua'i, had this guy Henry Gomes. I don't know if you know him.

KM: I know the name.

JH: [chuckling] He was quite a guy. He take care down there and then he go fishing, but he go clean the *limu*. When *pau hana*, he take tourist out go fishing he make about $300.00 one afternoon. He go dive, he clean all the *limu*, and the fish come back. Maybe he don't catch fish, but the tourist, he made extra money. Henry Gomes, that's quite a guy.

KM: *Hoihoi loa*, this is so… [pauses] Some day, would you be interested to go *holoholo*? Garret said he would take us, to go up.

JH: [chuckles] As long no need walk far, I go. If not eh.

KM: He going drive you.

GH: I drive you.

KM: Would be nice yeah to go back visit the *'āina* like that?

JH: You see, most of those roads when I first work, I was a bulldozer operator. I been widen up most of the roads.

And now I drive the tractor I get stuck for about two, three weeks. No worry, hard time we get for *hemo*. We had the old machine, now they get good machine.

KM: The machine different, yeah. They improved the design. So, in your *mana'o*, has the weather changed? Is there a difference in the water today than there was before, or should there still be the same amount? Like you said earlier, people say, "Oh no more water, EMI this or that…" You said, you didn't think so yeah?

[Discusses 1938 earthquake.]

JH: Well, had little change. After the big earthquake, we had little change.

KM: What year was the earthquake?

JH: 1938.

KM: Here?

JH: Yeah. Had a big earthquake, the whole of Maui.

GH: I have something on that.

KM: Oh! There was an earthquake, and what, the *pali hāne'e*, or just inside you think changed?

JH: Well, there are plenty place that get crack.

KM: Cracks, oh! So at that time you already saw that there was a change?

JH: Very little change. But of course now, well all around the same thing, eh. But not that about growing taro and all that the water line. They used to use the spring water.

KM: The spring, for you folks at Ke'anae like that and stuff? You had your water always flowing?

JH: Oh yeah, all the time.

GH: Same with Wailua? Wailua same thing?

JH: Yeah.

KM: What is the name for Banana Spring? Is there a proper name for that?

JH: Banana Spring is… [thinking], he get one name…Ka'akeke.

KM: Ka'akeke, *'ae*. I've seen the name, there's an *'ili* or something in there.

JH: Yeah.

KM: Ka'akeke, that's Banana Spring?

JH: Yeah.

KM: How about in your early days, even when you were working, did they try to take care of the forest? 'Cause I see the forest, you said no more eucalyptus when you were young, right?

JH: Yeah.

KM: No more or had, little bit?

JH: The old *Robusta* was planted before even my time. That's why they went plan that little trail, you look all eucalyptus. Only from Honomanū[5] to Pi'ina'au, they put only one tree. The rest all of them. But they only had planted *Robusta*. When came CCC, we planted all kinds. Then after that they brought the one they call *Seliga*, that's the shiny one, that's in 1957.

[Discusses changes in weather.]

KM: In your experience, do you think that the weather has changed from when you were young till now? Have you seen a change in the weather?

JH: Well, today's weather, during our day we can predict, but not today. It has changed a little.

KM: When you were young, you knew when it was going to be rain time?

JH: Yeah.

KM: When was the rain time and when was the dry time, when you were young?

JH: The rain time was after September, so when it comes to April you only have a here and there rain. The rest all going be not the heavy rain.

KM: Yes.

JH: But one year we was trying to go make rain [chuckles]. And that was very interesting. A lot of guys they laugh and you know they laugh. I said "possible we can make rain, but we cannot control the rain." That's why we never did. But we took the money, my boss Bob Bruce. As long as you have experiment money he just take [chuckles]. We had a lot of fun, I learned plenty.

KM: The idea was they were going to seed clouds?

JH: Seed the clouds, and can. We made the rig up on the ridge Pi'ina'au, and then you wait till the clouds get low, if you shoot one gallon of water in the clouds, ten gallon that one gallon will bring down.

KM: For real, you tried that?

JH: Yeah, but you cannot control 'em. You shoot over there, and the water drop in the Pu'u Nēnē or… [gestures over]

KM: So the clouds fly away?

JH: But what we used, copper sulfate. And we shoot, we put cans here and there, and we funnel. It goes as far as Kula and Mākena.

KM: So that's how you tested where it was going?

JH: Yeah.

KM: So you used the copper sulfate to see where it was going?

[5] Honomanū. This place name is generally pronounced "Honomanū" by all elder native speakers interviewed as a part of this oral history program. They all recall the name being pronounced with a long " ū " – though they all shared that the name should be "Hono-manu." The "manu" referring to the birds of the area.

JH: Where it would drop.

KM: Cause no good right, you don't want to make your rain with chemical right? So you were seeding it with water?

JH: Yeah. Just seeding it to find out. So we went all around, lot of people don't talk about all of that.

KM: When was this, in the fifties?

JH: In '57.

KM: I've seen some of the notes. So they tried, but no can, couldn't control where?

JH: To me can, but how you going control that?.

KM: You know uncle, *kūkū*, I look at you. You say you never went to school, sixth grade, *pou*, part of seventh. *Lohe 'ana wau i kou leo, 'ike 'oe. He na'auao 'oe. Aia ma ka 'āina, ma ka mea protocol. Maopopo wau he kanaka makua 'oe. Mahalo!*

JH: *'Ike 'oe i ke keiki o Kiope Raymond*?

KM: *'Ae lohe wau i kona inoa.*

JH: *Pololei, hui 'oe me ia? Akamai kēlā keiki.*

GH: Stanley's son, cousin's, cousin's. My cousin, because Stanley's father, G.G. Raymond is my uncle. Married my father's sister.

JH: Oh! I think his sister married the Ni'ihau boy.

GH: Who's sister?

JH: Kiope.

GH: Yeah.

JH: He's *akamai i ka 'ōlelo Hawai'i*. But *kēlā kuahiwi, a malalo, o ka 'āina, 'ike au.*

KM: *'Ae*.

JH: You know, get a lot of places, when we go in the tunnel we find the river under the, what's covered.

KM: Under the mountain?

JH: Yeah.

GH: I see that Makapipi, the tunnel get plenty.

JH: Yeah. [pauses]

KM: Wonderful though.

JH: Yeah, I learned plenty when I worked EMI. My boss, he was a Scotchman [chuckles]. So lot of guys they mad with him, but hey you learn plenty, you work with him.

[Discusses changes in rivers – now that they are all "choked up."]

KM: How now, the water? Get *'o'opu* or no more?

JH: Well, have *'o'opu*, but not as it used to be. 'Cause the river all choke up, eh.

KM: It's interesting. That's an important point, so because the river is getting overgrown, and things change too. But you said this big earthquake in 1938 changed the land too, yeah?

JH: Oh yeah.

KM: The way the water flow. That's amazing.

JH: What ever you do with the river, even if a small rock, you go try and shake it. The minute you shake 'em loose, big water come and you take 'em all away.

KM: That's right, yeah.

JH: That's what we did down Waihe'e. We drill…next day you come look, no more the rock, the big water take 'em

GH: We had to make that wall again.

JH: [chuckling] You mean the Waihe'e one?

GH: Yeah. The intake, the double intake, where the shack was?

JH: Yeah. We used to live up there, the shack.

GH: Six months, you guys was up there.

JH: That's why when we was making the trail, hey we sleep up the mountain, just like mountain pig. [chuckling]

KM: When you were young did you folks go hunting?

JH: Oh yeah.

[Used to go hunting pigs in the mountain.]

KM: You go hunt *pu'a*?

JH: Yeah.

KM: How far up mountain?

JH: Nah, you work EMI, you no need go far [chuckling]. Sometime the *pu'a* come to you.

KM: When you folks were young when you hunt, you go only with *'ilio* or you *ki pū*?

JH: Yeah, only with *'ilio* and cane knife.

KM: Amazing!

JH: No more *pū*. The *pū* you saved the dog but danger. That's when we were there cane knife the pig over there you give 'em one chop on the back, it split. We used to live in the mountain way up Kūhiwa. We had one house up there. We used to live up there, we sleep up there with the pig and everything. You never go up there?

GH: That's by the CCC house, Kūhiwa Camp?

JH: Yeah.

GH: I never go up there.

JH: All fall down I guess.

GH: I think so.

KM: You traveled all of this *'āina*? From Nāhiku all over?

JH: Yeah.

[Discusses EMI Tunnel and Ditch design and construction.]

KM: Who were the people that made the tunnels?

JH: Well, the first guy was a Japanese, he came from Japan. His name was Okada. And he cannot write English or speak English. He did all this contour during the day, at night he sit by a kerosene lamp, he figure. And when they start digging they go so many gulches, they dig cross cut. When you get in one gang go this way, one gang go that way. But he used the cross cut to dump your dirt.

And you go the next gulch, he do the same. He never, they never work one gulch. They worked about five gulches. And they work twelve hours a day. He did a wonderful job.

KM: Was it mostly Japanese?

JH: Well, they had Korean, they had Filipinos, the Hawaiian's they no like get a good job, eh. They either time keeper or they drive locomotion [chuckling].

KM: Too good yeah, smart.

JH: If Hawaiians dig tunnel big, fat tunnel. The Japanese he small, the tunnel low.

GH: Had Chinese dig tunnel too?

JH: Yeah, Chinese, get all different kind.

KM: You know uncle, yesterday when Garret took me *mauka* up Pi'ina'au, there's a place…

JH: You seen one graveyard?

KM: Yes.

GH: That's one Japanese boy, I think some family, died up there, they buried.

KM: He was working tunnel or something?

JH: No, he's a baby.

KM: He was young, so the parents, the father was working.

JH: The parents was working.

KM: Did they make camps up in the mountain in areas, too?

JH: Yeah. They hardly see the village. [chuckling] They work twelve hours, they sleep, they go back twelve hours.

KM: When the guys were doing the tunnel work like that, they actually had camps up the different gulches?

JH: Yes, yes.

KM: So they didn't go up day, come down evening time. They stay *mauka*?

JH: Yeah. Even Patsy Mink's grandparents, they used to live up the mountain.

KM: What was it Takemoto?

JH: On her mother's side. Tateyama. But Takemoto he worked as a surveyor. He was a good surveyor.

GH: Tateyama had house by Waikamoi?

JH: Yeah.

GH: Spreckel's Ditch?

JH: Yeah. They live up there all of them. Masa guys used to live up there.

GH: Yeah, I found a picture of that, the old house 1924.

JH: Where did you find that picture?

GH: When Kyomi moved from Kailua down here, we went up clean the house in Kailua. We *kūkua* her, and we find picture, she was going throw 'um away. It was in the envelope, bumby we look at 'em and see the house.

JH: That's why I was disappointed with that guy, why he never keep all the…EMI had lot of old pictures. They had baseball team pictures, they had Duke Kahanamoku. Every fourth of July Duke Kahanamoku would come to Kailua. They celebrate about one week, and he would jump. You know the waterfall behind, they call Haki'ole—over there he dive down. And this guy Joe Pacheco, he'd jump, *lele kawa*. Hey they had good fun!

GH: Haki'ole is on Kailua Stream?

JH: Yeah.

GH: The start of the Ha'ikū Ditch.

JH: Yeah, that's Haki'ole.

KM: Haki'ole?

JH: Yeah. High. Duke he dive, the Portuguese, he jump.

KM: No broke. Haki'ole means like, "no-broke?"

JH: Yeah, Haki-'ole, no broke [chuckling].

Group: [laughing]

KM: Lucky the water deep enough, you no broke when you *lele kawa*.

JH: Yeah. I was happy I worked for EMI. Every day you get different experience.

KM: That's right and I guess every day because it was the weather, whatever was happening with the water, you always have to *mālama*?

JH: Yeah. And they have a rain day, work, or clear day. There was never a day that they tell you go home. That's one thing with Mr. Bruce, if he want a dollar-half worth of lumber, he send the whole gang go down the plantation, broke one house for get the dollar half lumber [chuckling]. These new guys they put one order. Send up the lumber, but him no. That means you come in the morning, you get job.

KM: You get job, yeah.

GH: Jimmy, you know when you work EMI, in your days how many employees at EMI?

JH: Well, during the years I worked, I think had about forty or fifty.

GH: Only in Ke'anae?

JH: No, in Ke'anae we had about twenty.

GH: Maybe about sixty or seventy about there.

JH: Today only get one.

GH: Seventeen we get today.

JH: No, Ke'anae one.

GH: One man Ke'anae.

Group: [chuckles]

KM: [pauses] Oh, this is wonderful! So we go *holoholo* one day. Would be good, yeah. Nice to see the *'āina*.

JH: Yeah, okay.

KM: He go drive us. And then we can go we just talk story. And you go see these places.

JH: Where are you living now, Honolulu?

KM: No, Hilo, I going come back. My wife, Pomroy's daughter going come up, not this coming week next week the twenty-third.

JH: She's Pomroy's daughter.

KM: Pomroy's daughter, my wife.

JH: The Pomroy from?

KM: Kaua'i now, but Pomroy is Kaiapa's *mo'opuna*.

JH: Hmm. You better look for young Charlie.

KM: I going look for young Charlie Kaiapa, he's two years younger than you about?

JH: Yeah, I think he's little bit younger than me. Get only him left, but he have four boys.

KM: He live out that side too? He went *hānau* out Ke'anae side?

JH: Charlie?

KM: Yeah.

JH: No, I think he *hānau* in Pā'ia.

KM: Pā'ia, Pe'ahi *paha*?

JH: Yeah, either Pā'ia or Pe'ahi. But when he went to Ke'anae, worked on the road, he was a young boy.

KM: I don't know if you remember Hannah Akau? The mama lived in Hilo, they lived Hilo, Hannah just about your age.

JH: Hannah was married too, before she married to Alu?

KM: That's right. This one is the aunty, Hannah Akau Bowman. She's about your age. I went talk to her too, because she's the *'ohana*. And before, she spoke about leaving the house at Pe'ahi, they ride car to Kailua then the trail, just what you were saying they come down, go down Plunkett *mā* house. Lei Tau'ā *mā*.

JH: But the thing was, when Pogue was the chairman, he went end the road by Pāpa'a'ea. They had a big prison camp over there, so they went use prison labor for work on the *alanui*. And from Ke'anae they had this guy Ben Tau'ā and had Nāhiku and Hāna men and they came over. But they had this guy Colburn. You know where Honolulu is Colburn Street?

KM: Yeah, Colburn, *'ohana*.

JH: Well he was running the jail over there.

KM: That's right, he was the jail man. Colburn. So Colburn, he came over here too, with the prisoners, or just Honolulu?

JH: Only over there, but after that I never did see him. But I was a young boy.

KM: Ben Tau'ā took the road from the Nāhiku side come to Ke'anae?

JH: Yeah from Ke'anae.

KM: Ah. And who you said the one who made the road from this side go to Ke'anae, was?

JH: The prisoner's under Colburn.

KM: Colburn. And you said…is it Pāpa'ea or Pāpa'a'ea?

[Discusses various place names; their traditions and pronunciation. Also shares account as to why the Maui people call a fern similar to the *hō'i'o*, "*pohole*."]

JH: Pāpa'a'ea. What does that mean [chuckling]?

KM: But I see when they write it they put P-a-p-a, Papa, and then a-e-a on the old maps, Pāpa'a'ea?

JH: That's why they get one place where they call only Pā [as pronounced]. Then they get Pāpā [as pronounced], and they get one *pā*.

GH: Where the rainbow eucalyptus.

JH: Yeah. They call that Pā.

KM: So the enclosure, that place yeah?

JH: [speaking to Garret] Too bad you have to study the Hawaiian. [speaking to Kepā] But like you, you get 'em, eh [chuckling].

KM: Interesting though, your story about the place names. Every place so amazing yeah, get *mo'olelo*. And these wonderful stories.

JH: That's why lot of guys say, Pohakumoa. It's not Pohakumoa, Pu'ohākamoa[6] [as pronounced].

KM: Pu'ohākamoa, startled *nō ho'i*.

JH: Yeah. That's why I when make one story about that. And as you hear you laugh, eh [chuckles]. That's why lot of guys, they no pronounce the words right.

KM: That's right, mess up.

JH: Like Waikamoi, no, it's Wai-a-ka-mō'i[7]. That's where the *ali'i* used to bathe. So one day this *ali'i* lady went bath, she *pau* bathe she was walking, going home. She was going towards East end. And this guy, Kamapu'a [as pronounced], follow behind. She turn around, and the buggah was coming from behind. She walk fast, she went to this place Wahinepe'e. The uncle was in the garden. She tell the uncle about the guy. So the uncle told her, go hide there under the rock. Right on the trail had one big flat rock. That's why they call it Wahinepe'e.

KM: Woman hiding.

JH: Now this guy Kamapu'a he went, no more her. He keep on going, hey he land on Wailua Bay. When he land down there, had guys was fishing. From over there they get the *kilo i'a* on the Wailuaiki. Then the head fisherman he stay way outside one place there called Hō'uluea. Get one reef out there. Now, the guys, they don't know about the name. Anyway, the *kilo i'a* is on top, and he give signal to the guy, you better come on shore. Get one guy he like make the grade with this *wahine*. So the guy, he came up he had his paddle. When he came out the guy had one big bunch bananas, he eat 'em all, Kamapua'a. When the guy came up he club him with the paddle, he changed himself into a pig, he give 'um one *'eku*, and the guy fly up Waikani, up the hill. He went up there and gave one more snout, and he fly up to Ke'anae. So when he went land over there, the old Hawaiian name (of that place), they call that Kū'ō [as pronounced]. So they named that place Kū'ō. That Hawaiian man, he *kū 'ō*. So now he like catch the old trail and go back to Wailua, he figure he slide down the *pali*. When he went slide down he get abrasion. So the abrasion, they call that Pohole [chuckling].

Group: [laughing]

JH: And that's how they get that plant, *pohole*.

KM: Hmm.

JH: You see how all the Hawaiians name (places), they make story.

[6] Pu'ohākamoa. This place name is generally written as Puohakamoa. *Kupuna* Hū'eu's pronunciation is Pu'ohākamoa, and in these interviews, he shares an account of how the place name came about, as well as it's association with other locations in the vicinity.

[7] Wai-a-ka-mō'i. As a youth, *kupuna* Hū'eu learned that this place name should be "Wai-a-ka-mō'i." In this interview, he shared the account he learned of the place name and it's association with other place names in the region. Today, the name is generally pronounced as Waikamoi (and the translation of "Water-of-the-moi-taro" is given).

KM: Wonderful.

JH: That's why the guy, they tell "In Hilo they call *hō'i'o*, Maui they call *pohole*." I tell yeah, "*Pohole* and *hō'i'o* is two different things." But this Hawaiian no understand. What they selling now is *hō'i'o*. That came from Hawai'i that grow at any place. Pohole only grow up here.

But that's how it happened, with the Kamapu'a. So that's why you watch how these guys that talk about *pohole*, that's not that same thing. You look the one, Hawai'i one different. The one I'm talking about, *pohole*, is mostly up the mountains. But this other one grow anywhere, even down the beach.

KM: Yes.

JH: But *kēia po'e, a'ole maopopo*. . . But too bad you know, I never go learn Hawaiian. I used to run around with Larry Kimura and *anakala*. I used to run around with them.

KM: Maka'ai *mā* like that, Joe Maka'ai.

JH: Yeah. Joe still living?

KM: *Pau, ua ha'alele 'oia*. . .

JH: *Ha'alele*? Oh. . . This guy Larry Kimura he composed one song. But he no more *hā'ina*, cause the song never *pau*. But he had one young boy from Lāhaina.

KM: Pekelo?

JH: Keanu Kia. *Hele 'oia i ka* Air force.

KM: Hmm. . . [begin tract 3] *Kūkā, mahalo nui i kou ho'okipa 'ana mai iā māua. Mahalo i kou wehe 'ana i kēia mo'olelo. Pono ia'u e unuhi nō ho'i, ke* transcribe *i kēia, a ho'iho'i 'ana wau iā 'oe*. But *inā hiki ia'u ke ho'ohui i kou mo'olelo me kekāhi mau mo'olelo o nā kūpuna o kēia 'āina. He mea pono, me nui* for this study that we are doing. *Mahalo i kou mo'olelo*.

JH: *Pono ka manawa, hele mai o Kiope, ki'i ia'u*, but *kēia manawa,* strike [chuckling]!

KM: Yeah. So we're working on this so we can do this study to bring together the history, so that all of these *mo'olelo* come back to the families and to help, you know, cause the Agencies, they're going to look at, you know, if the Water License should be renewed, or how… So they need an understanding of the history and the relationship of the families to the land and how you did things you know. So *mahalo*. Thank you so much. Good fun.

JH: Yeah.

KM: So if we, you get certain days you do stuff that you no like, you *pa'a*, or any day you like go, we go *holoholo*.

JH: Yeah, but not tomorrow. Tomorrow my daughter going to Honolulu. . .

[speaking to Garret] . . .You be the historian too?

GH: No.

KM: He's been learning from you.

[Discusses the names of some streams and *'ili* in the Wailua vicinity.]

GH: I forget the name of the spring, the one you told me? I get 'em in my office I went write 'em down. You know where Kūlani, Waiokamilo meet, above Kūlani, get one spring.

JH: [thinking – chuckles]

GH: What the name you told me, I forget.

JH: Above [thinking]?

GH: Above Lākini on the Kūlani side.

JH: [thinking] Get one little river over there they call Hāma-ū.

GH: That's the one.

KM: Is it Hāmau…?

JH: Hāma-ū [as pronounced]. I don't know maybe Hāmau [chuckles].

KM: *'Ae*. Hāma-ū. Just like there's an *'ili* in Wailua, or something they call Kupau, or Kūpa'u?

JH: That's where Kūpa'u is.

KM: Kūpa'u?

JH: Yeah. Right inside the gap.

GH: Anthony Kam own that?

JH: Yeah. That stream on the other side, that's Hāma-ū.

GH: Right Hāma-ū and Waiokamilo.

JH: Then come down Waiokamilo.

KM: So Kūpa'u is in the middle?

JH: Yeah.

GH: Right in the middle of Waiokamilo and…

KM: Waiokamilo is on the west side and Hāma-ū is on the east side?

JH: Yeah. But they going meet before that.

KM: They converge?

GH: They meet above Lākini?

JH: Yeah, right above the intake.

GH: Right.

[Discusses customs and practices associated with planting – including nights of the moon; everyone got together and worked in the community.]

KM: Uncle, when you were young were there still people that would chant like that, they *'oli* they *kahea*, you know like how before days? Did people leave offering like when you go into the *lo'i kalo*. Do they offer *pule* or anything before?

JH: Well, during my time there were few, you know most guys were modern already, but there were a few old guys. Sometimes you hear them, eh, you run for go help eh. Just like they carrying a load [chuckles]. When they plant banana. They yell, they call *kōkua* the buggah in trouble, eh. But he carry the banana, he put inside.

KM: Making like heavy?

JH: Just like heavy! *Kōkua*! "Hey, the guy get trouble." But only make like that, he's planting banana, and it's going to come big like that so he's going to need help.

KM: They were still doing that. Were there certain nights of the moon that you folks planted, or?

JH: Well yeah, the old Hawaiians they plant by the moon. They no plant any old time. But some new Hawaiians, they plant 'em any old day but when come the moon time they go over there special.

KM: Interesting.

JH: And the old Hawaiian they make *poi*, the small kind, more hard, so they give to the chickens [chuckling]. They only use the big one.

KM: They *hānai moa, pua'a*. So before there were still, you know when it was time to clean the *lo'i kalo* like that, did plenty families come together or was it only one family take care their own?

JH: Before they all get together. Especially when you going open one new land. They get together.

KM: They build *kuāuna* here, they build?

JH: Yeah.

KM: How, *lepo* kind or get *pōhaku* inside, too?

JH: Where get *pōhaku* they use. Like up at the Smithsonian, we had one guy he make *pōhaku*, but he when make my *lo'i* all with the plastic bag. But no more the bag, so this stone wall guy, he put the stone, and then they cover with the *lepo*. So had three *lo'i* and the whole thing hey, where they going get the water. Right from the pipe.

KM: [chuckles]

JH: So the first *lo'i*, go second *lo'i*, three *lo'i*. Had three *lo'i*. When they hit the third patch they put one big tub and they went pump 'em.

GH: Pump 'em back.

KM: So circulate?

JH: That's what I telling you guys, they got to do that, see the *haole* smart. They do that, you no need grumble about water, you circulate 'em.

KM; So before, in your time, had *'auwai* go down, but someone would use the water, but then it would continue go down, and so everyone share yeah?

JH: Yeah, yeah.

KM: And what when they go down *hana 'auwai* everyone *kōkua*, clean up like that?

JH: Well in the old days, but around the forties no, you on your own.

KM: From the forties on like that?

JH: But the old days they all go help. You never had trouble.

KM: Because everyone *lōkāhi*?

JH: Yeah. but today, no can.

KM: People come *lili*...

JH: They come greedy.

KM: Hmm. *Ua 'ōlelo mai nā kūpuna, "I ka lōkāhi, ko kākou ola ai!"*

JH: And Pomroy's wife is a Kaua'i girl?

KM: Adams, Moloka'i.

JH: Same Adams that was working telephone?

KM: Yeah, telephone Dick and Mike, the brothers.

JH: Yeah, I know them.

KM: Yeah, that's the brothers. In fact I called Dick's wife Mable. She says oh, you got to go talk to Jimmy Hū'eu. I said, I already get the name.

JH: [chuckles] They live on Maui.

KM: *'Ae*.

JH: One time I met him they had one I think *'ohana* for them. He came, I look at him, he laugh they work telephone company when they get broke pole they give 'em to me.

KM: Oh, nice.

JH: He get one Adams, Maui too. . .

KM: *Kākā mahalo nui i kou aloha, i ka ho'okipa 'ana mai, mahalo*!

JH: *Mahalo iā 'oe*. . .

KM: . . .*Mahalo nui i kou wehe 'ana i kēia mau mo'olelo e pili 'ana nā inoa 'āina*. We can preserve this, keep it alive. . . Uncle, I was just thinking, you mentioned Pu'ohākamoa?

JH: Yeah.

KM: Must get story, how come the *moa* went *pā'iwa* over there? *Pu'ohā*?

JH: Yeah, that's why the *mo'olelo* when they had one big avalanche over there. When that *pali* went down make so much noise that's how went get that *moku* outside there. They call it Keōpuka.

KM: Keōpuka.

JH: I went make one story of how came. But when that avalanche was so much noise, but bumby the sea went eat between, and left that island by itself. But one time this guy Dr. Ka'ōnohi, he wanted one *lā'au* they call the *mokou*. Only that island, had.

KM: *Mokou*? [perhaps the *mākou – Peucedanum sandwicense*]

JH: *Mokou, ka inoa*. So I had one grand-uncle he was police Honolulu, an old man. His name was Kalilimoku. In the young days he used to live in Ke'anae. He knew where this plant grew. So that was in 1931, they came to Maui, my dad was living yet. They got one canoe, and my brother Roback he supposed to climb that *moku* for go get the medicine. He bring one more old man from Honolulu for *pule*. Now when we went down there, gee I look the *moku*, I figure "no can, you climb you fall down you *make*." I tell my brother, "Me I single, him he get family. Let me go climb." My brother tell "okay." My brother can climb any kind *pali*. I look he get family, I figure *make* he no can get up there. So, I went climb, I put the rope behind me I don't know how I going get up. These two old man they stay on the canoe they pray, they pray their prayer.

KM: *Pule*.

JH: Hey, I get, I put the rope I don't know one *hala* tree, since I went get up that half way, I went right up the top and I look to Ke'anae. Well, I think I'm the only human being been climb the top. I came north, I was alright I get half bag of that medicine but I never ask them for what the use.

KM: Mokou?

JH: Yeah.

JH: I never asked them what the use.

KM: Was it a low viney plant or a little?

JH: Yeah, just like dahlias. When the dahlia *make*, then he grow. So every time going stay. I came down, one time I was telling the story, and this Bob Hobdy, he went down on the kayak, he went look he see the plant. I tell Bob, "why you never climb?" He tell, "no way." I tell, "get one helicopter." That's the only guy, he know.

KM: What is the name of the island?

JH: They call 'em Keōpuka, but that's Pu'ohākamoa.

KM: Pu'ohākamoa? I saw the name.

JH: When we go over there, I show you.

KM: The *pali* went *hāne'e* so the *moa* was all…

JH: *Pā'iwa*, that's why they tell Pu'ohā, like the little chick when the sky…

KM: Fall down [chuckles], Chicken Little.

JH: That's what it means when you hear Pu'ohā, they get excited. But the guys they no pay attention, but me I, nobody the old people never tell me but I…

KM: Dr. Ka'ōnohi?

JH: Yeah, you know him?

KM: Yeah, famous for *lapa'au*.

JH: He when die young.

KM: Yeah.

JH: That's the first Hawaiian herbalist. This other herbalist I went see, Auwae, Henry.

KM: Yeah, *ua hala*.

JH: He was the one, we went to Smithsonian.

KM: *Ua hala 'oia*, in January, 90 years old, I think.

JH: When we went up he was 81 and I was 75 [chuckles].

KM: Wonderful! I'm amazed how many of these places you know the *mo'olelo*. These stories like that. All over from *kahakai* up to the mountain they would gather *lā'au* like that?

JH: Oh, yeah. Now no more old people for you, and they no like come *niele* me. "Ahh, that guy young [chuckles], young, young old man."

KM: *Mahalo*. On the 25th we go *holoholo*, we take lunch, take our time but *inā lohi 'oe, 'ōlelo mai i a'u. Hele i ka huaka'i. Na ke Akua i wehe i ke alahele. Mahalo nui!*

JH: *Ua hele a wala'au me Helen Nākānelua*?

KM: *Nehinei, ua hele wau. 'Akāhi no wau i launa pū me 'ia, kolekole wale no*.

JH: *'Ae. O wau, inā wau 'ike, wala'au, mahape, nalowale*.

KM: *'Ae, pololei 'oe! Nalowale a loli,* everything change.

JH: That's why *ku'u keiki kāne*, I tell him…

KM: Did you see your boy on TV the other week, Kamehameha Schools?

JH: Yeah, that was a nice program.

KM: *He inoa paha ka Ekalesia ma Ke'anae*?

JH: *'Ae, Lanakila 'Ihi'ihi o Iehova o nā Kauwā*. Get one big meaning to the church. . . *Lanakila 'Ihi'ihi o Iehova o nā Kauwā* means The Supreme Victory of Jehovah, God for the Outcasts. So the meaning comes right. But they don't think, the outcasts were us. Just like we were outcast, they were going to take the church.

KM: Hmm, the Supreme Victory.

JH: That's why the guy, Reverend Mersberg, he was happy. I asked him, "right?" He said, "I think so." You know the Hawaiians, you no try overpower their…they had meaning for everything.

KM: That's why it important to pronounce the names correctly.

JH: Yes.

KM: And if you go change 'um, *pilikia*.

JH: Yes. Now I hear one changed. Lucky no more old people. You pass over there, he get the name… [looking at Garret] Wahinepe'e, what the name now? [thinking] …Garden of Eden. That's the one I was telling you, Wahinepe'e, the lady went hide.

KM: Yes.

GH: I was telling Kepā yesterday at the Garden of Eden this guy come from Colorado, he came and he made that over there. Five dollars to look at the plants.

JH: That's why I don't know what's the matter with this State before you no can come over there make any kind, cut the road. They stop you.

KM: Yeah.

JH: Now they get all kind road over there and they put the… One time, I was at Ke'anae, had these people came. They said "Sir," I say, "yeah." "You know where is Blue Pond?" I said, "no." But I know where [chuckling].

GH: 'Ula'ino.

JH: I tell 'em no, "if you get a map, maybe I can help you." "We have no map." I cannot help you, but I know. I know that's not the name.

KM: So 'Ula'ino?

JH: Yeah. [chuckling] You no more the map, I no can help you.

KM: 'Ula'ino though, already red something…not a Blue Pond [chuckling].

JH: Over here change all this for attract the tourists.

GH: Yeah.

JH: Just like Ke'anae get one church they call the Miracle Church, so they come they ask me, you know where's the Miracle Church? [chuckles] I don't know, I know that's the Catholic one. You see they call 'em the Miracle Church. In those old days they have to get the coral for get the mortar. The Catholic went get all the mortar, they finish their church. . .

Just like 'Ōhe'o. They call 'Ōhe'o, "The Seven Sacred Pools" [chuckling]. That name is 'Ōhe'o. In 1934, I work CCC and Kīpahulu hard time get water. After work we go down there bathe, so they tell me where is the Seven? I don't know, only I know 'Ōhe'o. I went make fence way up the line Kaumakani, we went up there put fence in, and we used to bathe down there. So I went go here and there work, I know.

KM: Yeah.

JH: But I tell 'em, I don't know. If you get map, I can help you, but you no more map, no can.

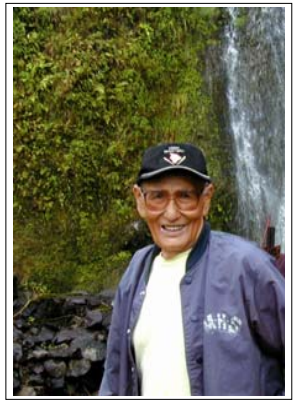
KM: *Mahalo*, good, *maika'i*. . . [end of interview]

James Keolaokalani Hū'eu, Jr.
Oral History Interview # 2 –
April 25, 2001
Hāmākua Loa – Ko'olau Region
Field Trip with Kepā Maly (Garret Hew and Onaona Maly)
(interview released November 6, 2001)

As in the first interview of April 11th, Kupuna Hū'eu shared further details pertaining to, and revisited various aspects of — Native Hawaiian land use practices; traditions of place names; gathering resources from mountain to sea; travel; and changes he's observed in the landscape during his life time.

At points during interview, Maly referenced place names and/or mile markers to identify locations being described, and to assist with the mapping out of areas discussed. Garret Hew, kindly agreed to assist with the mapping process, and *Figure* 2, is in part the result of Mr. Hew's efforts and knowledge of the region.

The interview was conducted in Hawaiian and English, and the narratives are given verbatim (release granted on November 6, 2001).



Kupuna Hū'eu at High Falls, West Honomanu Stream; Spreckel's Ditch Intake. (KPA Photo No. 1464-c)

The list below, provides readers with an overview of selected topics of discussion raised by Kupuna Hū'eu during the interview. Readers should note that this is not an exhaustive list, and that there are many specific sites, features, and points of history described by Kupuna Hū'eu in this interview:

Summary of Selected Topics	***Page***
Describes road system in early 1900s and native trails; and access to the Ke'anae vicinity.	56
Describes different *'o'opu*, while speaking of 'O'opuola.	60
Discusses traditions and land use in the Waiakamō'ī - Wahinepe'e region.	63
Discusses changes in the forest landscape (diminished native growth and increased presence of alien species) since he was last in the uplands of the Kōlea-Honomanu region, some 25 years ago.	69
Gathered *'ohe* (Hawaiian bamboo) to be used for weaving.	72

Discusses EMI Ditch and Tunnel operations; the Kōlea Hydro-electric Plant; and pronunciation of place name, "Honomanu," (generally pronounced "Honomanū"). 75

Discusses collection of *'ōpae*; cultivation and uses of *mai'a maoli* (native bananas). Learned that families lived in the Honomanu uplands, and knows of an old *'auwai* that fed upland *lo'i kalo*. During his youth and working days, pigs were hunted in the upland region. 98

Discusses *'ōpae* in ditch at Kōlea Hydro-electric Plant. 116

Discusses *heiau*; knows of a *heiau* near the shore at 'Ula'ino; also traveled trail to uplands of Haleakalā, through Kūhiwa. 120

Asked if he'd heard of *huaka'i pō* (night marchers); discussed the old *alaloa* (trail system), and recalled an event in the Ke'anae EMI Base Yard. 132

'Awa formerly grown and collected up at Nu'a'ailua. 134

Discusses respect of resources; traditional practice of always putting back, when you harvest something. 134

Ditch system does not affect Ke'anae taro lands; Ke'anae springs used to irrigate the *lo'i kalo*. Describes old days — the community worked together to care for *'auwai* and field system. 136

Does not believe that EMI takes "all the water;" also observed that EMI has the men and working experience to maintain the ditch system. Ke'anae and Wailua people have springs which feed their system of *lo'i kalo*. 138

Discusses *heiau* in Pauwalu *mauka*. 152

Interview Transcript

[Driving from Kailua to Wahinepe'e; discussing various streams-bridge crossings, place names, and history.]

JK: …Kailua Stream?

KM: Wherever you want to talk uncle, any place like that.

JH: And then when you go up, they call 'Ōhānui. Up here used to have scout camp.

GH: Yeah, Girl Scout Camp.

JH: Nice place.

GH: Today has big water.

JH: Not too big [chuckling].

GH: This morning, more big though.

JH: What they call that pool down there.. Oh, this is Dog Pond [chuckling].

GH: The one below, is Haki'ole.

JH: Duke Kahanamoku, every year Pogue made *lū'au*, and Duke Kahanamoku would come up here and he stay here about one week. They made *lū'au* one week. Duke he dive down that…

GH: Haki'ole Pond?

JH: Yeah. The old man Joe Pacheco, he *lele kawa*. You know, the old Hawaiians, they get *lele kawa*.

KM: At Haki'ole?

JH: Yeah at Haki'ole.

KM: And what no broke over there [chuckles]?

JH: No broke [chuckles]. See, Haki'ole means "no broke."

KM: Before the road used to end here at Kailua?

JH: No, I'll show you where.

KM: Wonderful!

JH: See, Mr. Pogue was also the Chairman of the County of Maui. I think he made the road end up here. He used to have a dairy up here, Homelani Dairy. That's his dairy.

KM: This *kahawai* we just passed this is Pāpa'a'ea?

JH: Nā'ili'ilihāele.

KM: Nā'ili'ilihāele.

JH: That's the *'ili'ili* and the *hāele*, not really black.

KM: Grayish kind?

JH: Yeah. Like that *'ōpihi* they call *hāele*.

KM: Beautiful though. You know the *inoa* of this *'āina* here, it's P-a-p-a-a-e-a?

JH: Yeah.

KM: How do you pronounce it?

JH: Pāpa'a'ea.

KM: Pāpa'a'ea, so they drop one 'a' out of it, yeah?

JH: Yeah and then they have one other place over there only Pā.

GH: Pā Intake.

JH: Pā and Pāpa'a'ea.

KM: I see on the old maps they write it like it would be Pāpa'a'ea or something. P-a-p-a-a-e-a but you pronounce it Pāpa'a'ea?

JH: Well, like me I'm not really too… Bumby you stop over there, right here.

KM: By the gate?

[Describes road system in early 1900s and native trails; and access to the Ke'anae vicinity.]

JH: From 1923 the road ended right here.

KM: Oh, right at this gate here.

JH: When they started this road they had prison labor, and they build a prison camp right in here.

KM: On the *kula*, flat here?

JH: Yeah. On this flat. The Prison Superintendent over there the person from Honolulu is Colburn.

KM: Colburn, yes.

JH: You know where Colburn Street?

KM: Yes, that's right, named for him.

JH: You don't know that?

GH: No.

JH: His name was Colburn and he take care the prisoners. The prisoners were the labor, but they had other men they worked. They started from here. And then we used to go on horseback, we go up here on the trail, and then we go in and come down Pi'ina'au.

GH: This is the east-side gate of Pāpa'a'ea he's talking about.

JH: Yeah.

KM: Uncle, so the old *alahele* then went *mauka*?

JH: Yeah, the old *alahele* is right up here somewhere. Plenty places this new *alahele* only went pass.

KM: Over?

JH: You know in the old Hawaiian trail you cannot make the road, 'cause no more bridge they go right over the *pali*, enough.

GH: This was the camp over here?

KM: They had a camp.

GH: That's how come back here have one charcoal pit?

JH: Yeah.

GH: Okay.

JH: They had prisoners living here.

GH: I see, no wonder.

JH: They put that only for build this road when *pau* they went to Olinda.

GH: Yeah, Olinda Prison Camp.

KM: Uncle, in 1923 about?

JH: In 1923 they started and, they got to Ke'anae, they celebrated in 1925.

KM: Wonderful!

JH: Those days no more equipment only one steam-shovel. So they sent it to Ke'anae all in parts, and then they put 'em together.

KM: On the *moku*?

JH: On the *moku* they had the inter-island boat.

KM: Like *Kilauea*?

JH: *Kilauea*, *Maunakea*.

KM: *'Ae*.

JH: *Hualalai* and *Waialeale* came late. And the boat go to Hāna. From Kahului go Hāna come Kahului go back.

KM: Wonderful!

JH: They go Hawai'i they go Lāhaina. We live in Ke'anae we were isolated. So a lot of people never see Wailuku.

Group: [chuckling]

KM: Amazing yeah?

JH: Yeah.

KM: *Mahalo*, it's so wonderful. Yesterday we went and we saw Mina Atai.

JH: Mina Atai is from Kaupō. Her husband is from Honomanū.

KM: *'Ae*. Was so interesting what you said how they took the steam-shovel apart, put together on the boat bring 'em back over here?

JH: Yeah.

KM: She was saying similar, they took the Model-T car on the boat rafted it in. Get no more road to Kaupō but when she was a child they had four Model-Ts right in there. On the boat same thing [chuckles].

JH: Yeah. Kaupō, they had landing they call Mokulau, right by the Hawaiian Church. So it was interesting.

KM: It is. *Mahalo nui*!

JH: I seen those old days. I've seen the middle time. And now. Now is interesting living.

KM: Now interesting, oh good, good for you. *Mahalo*, okay *holo*. [driving from Pāpa'a'ea]

JH: So over here he can go come down Pi'ina'au.

GH: Wahinepe'e.

JH: Pi'ina'au.

GH: Only thing Nu'a'ailua, *pilau*.

JH: Those days Wahinepe'e, bypass. But before, horse trail.

GH: Horse trail, yeah.

KM: You know uncle if I may then there is one thing. I was noticing the date on some of these bridges along here it says 1912 like that.

JH: Yeah.

KM: How come get bridge or certain area where the road went through?

JH: That's what I said the old Hawaiians, maybe they went dream going get cars. So when these new people came they say, only ten ton. The bridge was made in 1912, there were no automobile over here.

GH: Right.

KM: Amazing!

JH: They made 'em out of beach gravel.

KM: Aggregate like, so strong?

GH: Yeah, Honomanū stuff.

JH: Yeah. They said only ten tons. But we used to run eighteen-ton, trailers with gravel.

KM: Wow!

JH: The old people had some kind of idea that something…

KM: Yeah.

JH: Yeah. That's how when you go on EMI trail most bridges are 1923, but the old bridges are 1912, 1911.

KM: Even though it was *alahele wāwae* down here they were making the bridges with that kind vision already?

JH: Yeah, right. . . That's why *kēia po'e hou*, you know where we live [Hale Maha'olu], they put *alanui nani*, but that is *alahele*.

KM: *'Ae*, *alahele*.

JH: I tell 'em *alanui* is this kind, *alahele* is a walking trail.

KM: Trail, walk path, yeah.

JH: Excuse me I never know Hawaiian too much until I went meet… You know our days they stop you, "Don't you use Hawaiian."

KM: Even when you were young uncle at Ke'anae, they said don't talk?

JH: Yeah, we don't. Our parents never did speak Hawaiian.

KM: To you folks?

JH: I learned from some of my grandparents. And then our grandparents, you don't *niele*, they ain't telling you anything. You don't know how to *niele*. *Niele* you ask questions.

KM: Ask with easy kind approach. How blessed we are that you were…that you took the time to ask, because so many *mo'olelo*.

JH: Yeah, *pololei*.

KM: *Mahalo nui i kou 'ike pāpālua*. You knew already, I think.

JH: *'Ike 'oe i kēia 'ohana o Edward Akiona mai Hilo*?

KM: *Lohe au ka inoa. Akiona no Hilo*?

JH: Yeah. But *ko lākou papa, ua hala. Ka inoa Edward, 'oia, 'ike*.

KM: *No ka mea kama'āina lākou me kēia 'āina, Ke'anae, Wailua*?

JH: Yeah. *Lo'a 'āina ma Pauwalu*.

KM: *Pauwalu, kēlā 'āina i kapa 'ia no ka manō?*

JH: *'Ae*. I think they call this place, Hauola.

KM: Hauola. These names each one tells a story.

[Describes different *'o'opu*, while speaking of 'O'opuola Stream.]

JH: Yeah. Each one has a…when you go in there, that's 'O'opuola.

KM: *'O'opu*?

JH: 'O'opuola.

KM: *'Ae*, 'O'opuola. We just passed the seven mile marker.

GH: Yeah.

JH: Now get different name, down there is Maka'iwa.

KM: We're coming close to Maka'iwa now?

JH: Maka'iwa is down here.

KM: *Makai*?

JH: Before you can look right to here.

GH: Maka'iwa Bay, right there.

KM: Beautiful.

JH: That was the Makawao and Hāna District.

GH: Right, that's the boundary.

JH: That's the boundary line. Over here is Makawao.

GH: East side, yeah.

JH: From the bridge and over, Hāna. Now they change 'em so much you don't know where is the boundary.

KM: *'Ae*.

JH: But like us, we knew the boundary that's the thing they got to take care. Like this map get all that…

KM: Names yeah?

JH: Yeah.

KM: I brought you some more maps, I got a few more old maps, nice you know I bought the copies along for you so you could see. It is interesting to see the old names like that. Mile marker eight, this is Maka'iwa?

JH: No, down. Over here they call 'O'opuola. But the end (down) is Maka'iwa.

KM: Nice, yeah.

GH: Yeah, 'O'opuola.

KM: *Mamua, nui paha ka 'o'opu ma kēia wahi*?

JH: Yeah, I think the *'o'opu, hele mai, mai Maka'iwa.* But the *'o'opu nākea*, if there's one high waterfall, *pau.*

KM: No can?

JH: They never can go above that. They end right there. But the *nāpili*, that's the one with the sucker…

GH: Suction cups.

JH: They climb.

KM: Too good. So *Maka'iwa ai makai*?

JH: Yeah. . .

KM: [counting/naming bridges from 'O'opuola]

JH: This is Makanale [this place name is now recorded as Makanali on HSS Maps].

KM: Makanale? Oh, okay.

GH: Makanale goes into 'O'opuola.

KM: It's a tributary into 'O'opuola.

JH: Yeah. Above, they call Banana Intake. It goes into Honomanū.

GH: Honomanū. Get High Fall, Main Honomanū, East Honomanū and then Banana Intake.

JH: That's a wonderful place too, when high water.

GH: Yeah.

JH: Like today, Oh, you look at that waterfall.

KM: What is this place here? This was someone's ranch?

JH: This is Ka'aiea.

KM: Ka'aiea?

JH: Ka'aiea. Yeah, that's this gulch. When they made the road they moved that house, the one from Pāpa'a'ea they moved 'um one time, until here.

KM: To that elevation?

JH: The next move, they moved to Ke'anae.

GH: Right.

JH: You know the old house I used to live in?

GH: Yeah.

JH: That house had history, so we moved.

KM: *E kala mai* this is Ka'aiea?

JH: Yeah.

KM: This stream and ditch section. What ditch is this here?

GH: Center Ditch.

JH: Center Ditch, it goes to Lowrie, Nā'ili'ilihāele. They call this Center Ditch. As you go way over, you get Manuel Luis Ditch. So the Pukiki had dig ditch too.

KM: Who?

JH: Manuel Luis.

KM: He was around when you were working?

JH: No.

KM: *Pau*? That was before?

JH: Yeah. I was born in 1914.

KM: *'Ae.*

JH: I think these ditches were already made.

GH: Yeah.

JH: Only the Ko'olau Ditch was…

GH: This one what Jimmy?

JH: Punalu'u.

KM: Punalu'u.

JH: Down there get one *puna*, you have to *lu'u*.

KM: Nine mile marker, Punalu'u.

JH: They used to use this trail to go.

KM: Go *mauka*?

JH: Yeah.

GH: Yeah.

JH: For go Ke'anae they come through here.

GH: Now no more.

JH: No more. They all lead to Pi'ina'au.

KM: Pi'ina'au is where all…?

JH: Pi'ina'au, the name is Kaho'okuli.

KM: Kaho'okuli?

JH: Yeah.

KM: That's the name of the area?

JH: Of that area.

KM: I wonder *kuli paha kekāhi*?

JH: [chuckling] *Ho'okuli paha lākou*!

KM: [chuckling] This is such a beautiful day!

JH: They call this place Kōlea.

KM: Kōlea, so this little valley.

JH: Get one *punawai* up here.

GH: Yeah. Kōlea Reservoir.

KM: Beautiful [commenting on water flow in streams].

GH: Full now.

KM: *Nehinei, 'ano malo'o, ho'okāhi pō, lo'a ka ua, kahe 'ana ka wai. He wai ola*?

JH: Yeah.

KM: Now this park area here…

JH: Kōlea.

GH: Kōlea Park.

JH: You go up there, we went build one park up there.

GH: Still have, yeah.

JH: That is Tateyama Park.

KM: Tateyama?

GH: He went put that as park but the State came over and they call this Kōlea.

[Discusses traditions and land use in the Waiakamō'ī - Wahinepe'e region.]

KM: Uncle, the Waikamoi [pronounced as generally written] that they have now?

JH: Yeah, Waiakamō'ī is next.

KM: And it's Waiakamō'ī?

JH: Waiakamō'ī.

KM: *'Ae*.

JH: That's where the *ali'i* used to bath. You know up on the old trail.

KM: There's a pool there?

JH: Yeah. This is the only gulch that goes right to Haleakalā.

KM: This gulch goes all the way up, and this is Waiakamō'ī Gulch?

GH: Yeah, this is Waiakamō'ī Gulch.

KM: *Nani*! Look at this beautiful waterfall today. This one goes all the way up to Haleakalā?

JH: Yeah. And they get Olinda water reserve…

KM: [begin Track 2] Okay Honomanu. And see the bridge says 1912?

JH: Yeah.

KM: Amazing!... [begin Track 3]

JH: …That road and this Pāpa'a'ea Road, they met right there. The two shovel operators they went try, who going get the last bucket of dirt. The Ke'anae guy had 'em, his name was Watson.

GH: Watson?

JH: Watson and he been living Waipi'o by Huelo.

KM: Is that Mina's, Mina Watson?

JH: Mina Watson's dad. He came from Honolulu, but he lived in Ke'anae. He was the shovel operator. From this section all the Ke'anae, Hāna, Nāhiku people, work here. This one you can go up you get the old trail.

GH: Yeah, old trail go up. From Waiakamō'ī over, Jimmy used to take care.

KM: Oh.

GH: The ditch we going to pass here is Manuel Luis Ditch…at Waiakamō'ī.

JH: That's the one the Portuguese [chuckles].

GH: Yeah, Manuel Luis. The Center Ditch starts at Waiakamō'ī.

KM: Oh, I see. It must have been some job for these people to make this road with only hand tools and steam-shovel?

JH: Yeah, only by hand.

KM: And you look the cuts on to the *pali* like that.

JH: Of course afterwards they did the repair.

KM: Yeah, machine operation… *Ka inoa o kēia wahi*?

JH: Wahinepe'e.

KM: *'Ae*.

JH: Garden of Eden [chuckling – shaking his head].

KM: *Huikau nō ho'i ka po'e haole*!

Group: [entering the Wahinepe'e Trail]

JH: *Huikau. Mamua,* only one *puka pā. Kēia manawa, nui ka puka pā.*

KM: This story, *ka mo'olelo 'oe i hā'awi mai ia'u i kēlā pule aku nei, pili 'ana Wahinepe'e nui ke aloha.*

JH: Yeah.

KM: *Maika'i*! And each place name get one reason, yeah?

JH: Yeah. The old trail, come over there so that flat rock is some place over there [near the present day gate to the Wahinepe'e *mauka* trail]. [Speaking to Onaona] You know why they call this Wahinepe'e? One time this *ali'i* girl went to bathe at Waiakamō'ī, when she got through bathing she was coming home on this end. When she look behind this guy, a man, was following her. That was Kamapu'a [as pronounced]. When she came here her uncle was in the farm. She told the uncle "somebody following." He told her, "go hide under the rock." She hid under the rock. Kamapu'a went straight he went to look, no more the *wahine*. That's why they call Wahinepe'e. 'Cause she went hide under the rock. I myself never find the rock but it's up there on the old trail.

KM: Along the old *alahele*?

JH: Right below the gate. The old trail go right through.

KM: Interesting.

JH: Patsy Mink's mama them, they used to live up here.

KM: Oh yeah, Wahinepe'e?

JH: Yeah. Way up the ditch.

KM: Was a camp or a ditch house?

JH: Camp, yeah.

KM: You said later on they made a store at Kailua, Tateyama?

JH: Yeah, then they moved Kailua.

KM: I see. Sort of where that Kailua Maui Gardens the place where we met this morning?

JH: Yeah.

KM: That's where the store was? You said even had little gas house?

JH: Yeah. That store and they used to raise pineapple.

KM: We've cut up now, Wahinepe'e and we going up the *alanui* to go up to?

GH: Honomanū.

KM: When the *kāpuna* were doing cultivation on this land it was *māla'ai*, dry land kind stuff?

JH: Yeah, yeah.

KM: Sweet potato *paha*?

JH: Before had people living up here.

GH: Yeah.

JH: They go to Ke'anae School, they go on horse.

GH: The Akoi family used to own this property.

KM: Akoi?

JH: Yeah.

KM: Is that same Akoi with Mina Atai *mā*?

JH: The family of Mina Atai.

KM: The father-in-law's brother took the name Akoi rather than Atai.

JH: Sam he went Sam Ahling.

GH: Sam Ahling, yeah.

JH: Their brother Atai. But Atai that's his first name he never wanted Akoi but he is Akoi and they come from Honolulu, Kailua. They were not people from here but they came in the early time.

KM: That's what she was saying, that they came from Maunawili side, Kailua what you said.

JH: Yeah. They had a big land, they had a dairy and all that.

[Points out Akoi ('Īkoa) family graves.]

GH: That's their family tomb.

KM: Who's is this?

GH: Akoi.

KM: Oh, so this is Akoi *mā*.

JH: The old people they call 'Īkoa, Esekia 'Īkoa, that's the Grant [Royal Patent Grant 1396]. He is the one had land here.

KM: Was he *kama'āina…'Īkoa, he kanaka Hawai'i*?

JH: 'Īkoa, *kanaka* Hawai'i. He had plenty land and he give to Sam AhLing.

KM: Sam I guess married…

JH: The young Sam.

KM: Married the daughter or something?

JH: Married a Tau'ā girl.

KM: So just before the second gate (Wahinepe'e Road) is the family plot.

JH: This is Hui land, all get Hui.

KM: All the families come together, *hui*.

JH: Yeah.

KM: What's the Hui? What do they call this Hui land?

JH: Wahinepe'e.

KM: Wahinepe'e Hui. All the families came together got this *'āina*?

JH: Yeah.

JH: In Kaua'i the assistant Chief of Police is my nephew his name is Ihu.

KM: He was *hānau* here or…?

JH: *Hānau* in Ke'anae.

KM: Oh!

JH: The mother is living in Wailuku.

GH: Everybody okay on this road?

Group: [good]

JH: The eucalyptus get all kinds of varieties. This one they call Blue Gum, the one with the rough skin is Robusta. They get the new pretty looking one is *Seligna*.

GH: *Seligna.*

[He did not see *clidemia* during his years in the field.]

KM: And this *clidemia* in here uncle, you *kama'āina* with that *clidemia*? It's a more recent plant.

JH: What plant?

KM: This one, see the green right here?

JH: Yeah.

KM: That one, new plant yeah?

JH: Oh, I don't know.

KM: You don't remember that one?

JH: No.

KM: It came in later in the seventies or something like that and it's evidently a terrible pest. It grows and it spreads everywhere wiping out all. That wasn't here when you were young?

JH: No, no.

KM: You don't remember that one. Thank you Garrett, that one there it's terrible. Little blueberries on it like, and it spread all over the place. This one you didn't see?

JH: No, no.

KM: Even when you were working?

JH: No, I never did see.

GH: This one first appeared at Makapipi in the early '90s.

KM: Oh, wow!

GH: And then spread.

KM: Its spread…look how far its spread over then.

JH: And *miconia*.

KM: *Miconia*.

JH: When that came?

GH: *Miconia* came when, what's that guys name in Hāna the nursery? He brought it in.

JH: Cooper.

GH: Howard Cooper brought it in.

KM: Terrible yeah.

GH: This *clidemia* the common name is Koster's curse.

KM: Oh. I know terrible yeah our State really has to put a halt to allowing anyone to bring any kind ornamental. Just 'cause it's pretty you know doesn't count.

GH: You know Kepā, Mary Evanson was one of the first people that realized that this *clidemia* was a big problem in the early '90s. They saw it at Makapipi and they wanted to do something to stop it.

KM: That's what she was saying. Uncle before you folks if there were weed kind plants was a part of your job…. You folks were always taking care of the forest and pulling up bad stuff. Did you folks go out in the field and pull up?

JH: No, so far we didn't, but they had certain people and the prisoners coming to Olinda. You know when they had gorse.

KM: Yes.

GH: Gorse.

JH: That one is terrible.

KM: *Pilau*?

JH: Yeah.

GH: Jimmy you know 'Ōpana Forest, where the eucalyptus?

JH: Yeah.

GH: Didn't Bob Bruce make the EMI employees go over there prune the forest, at one time?

JH: Yeah.

GH: He did, yeah?

JH: Yeah.

GH: That's what I thought, Stephen's days.

JH: He was with that Rotary Club.

KM: Rotary?

GH: Yeah.

JH: That's why that Kaumahina Park, he started.

KM: Bob Bruce?

GH: Bob Bruce was the former manager of EMI.

JH: My days never have this.

KM: Never have the *clidemia* like that. How, was the guava all *pa'a* like now too or not?

JH: The guava was over.

KM: Coming in?

JH: But this is, never did...

GH: [begin Track 4] This is the Manuel Luis Ditch.

KM: Manuel Luis was the foreman or something on the ditch crew?

JH: He must have been.

GH: Yeah, I think.

JH: Like at Kailua they had Pachecos. But I never did hear any ditch called Pacheco Ditch. Maybe Manuel Luis and Spreckels were friends.

GH: I think so.

KM: Oh, that far back.

[Discusses changes in the forest landscape (diminished native growth and increased presence of alien species) since he was last in the uplands of the Kōlea-Honomanu region, some 25 years ago.]

GH: Jimmy, the last time you came up Wahinepe'e Road was about twenty-five years ago?

JH: About.

GH: About. Look different?

JH: Yeah.

KM: How is it different from when you came up last?

JH: They made the drain deeper.

GH: The vegetation changed too?

JH: Yeah. With this new…

KM: …*clidemia*, Koster's curse.

JH: In our days hardly any. I didn't know what.

KM: Were there places still up here that they would…did people come up to gather *'awa* or any kind of stuff up here that you remember?

JH: Was a long time before my time they used to come. When they had the Tongans and Samoans, then they wipe everything out.

KM: Yeah, *luku ka 'āina.*

JH: During our days we had plenty men so they cannot.

KM: Was there *maile* in areas up here before?

JH: Yeah, get.

KM: I wonder now with all this.

JH: Even went way down to the beach.

KM: Right down to the beach, oh my.

GH: Now I know only of a few patches here and there.

KM: Was there a special kind of *maile* that you folks gathered up here or was it just the *maile lau-li'i* or *lau-nui* kind or what?

JH: We had *maile lau-nui* here. But in Olinda get lot of *maile lau-li'i*. In 1942 I went to Olinda work, you go with a grass knife you cut the *maile*.

KM: Wow, amazing!

JH: Today, no more.

GH: No more *maile*.

JH: Those days we went we cut the line for the electric, all *maile*.

KM: You know that place name Hāli'imaile?

JH: Hāli'imaile yeah.

KM: I wonder if, must have had plenty *maile* there before?

JH: Must be, that's why they call 'em Hāli'imaile.

KM: Hāli'imaile, the layering, the blanket of *maile*, just like. Must have been beautiful.

JH: The Hawaiian never named a place without a meaning or story. [pauses – begin Track 5] …Kailua crew?

GH: Yeah.

KM: This is their section, the Kailua crew?

GH: Actually you know when Jimmy was working they had Ke'anae and Kailua division but…

JH: Now we get only one guy in Ke'anae.

GH: Right.

KM: That's Akiu?

GH: Nelson Akiu. When I started in '85 there were three people in Ke'anae, now we have only one.

JH: One time we had twenty-three.

KM: Wow! Has there been some thought about the longevity, the lifetime that these ditches will be able to sustain and hold water? The water not going eventually cut it down or break through or something? You folks always had to maintain the ditches?

JH: Yeah, yeah.

KM: Did they sometimes *puka* or something and you got to go?

GH: All the time.

JH: Oh, yeah. Like open ditches they have land slide even in the tunnel.

KM: In the tunnel, that must be spooky kind.

JH: We used to go with the rickshaw, then they bought that machine, he go right through [chuckles]. What's that bobcat?

GH: We still get the rickshaw, we use the rickshaw.

KM: What is the rickshaw?

GH: The rickshaw is a little cart has three wheels. Two back wheels and the front has a wheel and the front wheel swivels and there's like a handle like a rickshaw you can pull. What we do is the rickshaw goes in the tunnel because tunnels are narrow we have maybe two people pulling the front and maybe two in the back pushing. Some places you cannot bring in the bobcat front, end loader, too deep the water.

KM: The height of the tunnels average is?

GH: On the big tunnel like Wailoa maybe you have six, seven feet some smaller ones five feet, six feet all depends.

JH: And then the low one, that's short people, the high one, that's the tall guys.

GH: Yeah.

KM: Oh, I see some *'ie'ie*, uncle there's *'ie'ie* up here now among the eucalyptus. *Mamua, ua lohe paha 'oe i kekāhi mo'olelo, inā 'ike 'oe i ka 'ie'ie, lo'a ka maile*?

JH: *Lo'a nui ka mo'olelo e pili 'ana ka 'ie'ie. A kēlā himeni, lo'a kekāhi himeni o ka 'ie'ie me ka maile.*

KM: Hmm. *Kama'āina 'oe me kēlā himeni*?

JH: *A'ale, lohe wale no.*

KM: Hmm. I see young *hāpu'u* still yet. I saw the hoe-a-Maui kind of fern, the single long fern some native fern.

GH: Yeah. Have some *'awapuhi* ginger on the side. This is mostly exotic already, forest. We're going to the native ones pretty soon. As you go further up the forest is more native.

KM: More native, more intact.

GH: Yeah. These are the old telemark lines, you see these poles here?

KM: Oh, yes.

GH: This was to transmit ditch data to the offices. But this one is out of service. We've been trying to do it remotely by radio now so we've done that. This one we need to convert still yet.

KM: You know when you mentioned the gorse and then looking at how the alien plants have come in, the other day we saw Stephen Cabral.

JH: Yeah.

KM: He was talking about some crew I guess came with trucks from the other side, Olinda or a little further over side and that's when the gorse started first coming into this side. He said, he would make them pull wherever they could.

GH: This is our main intersection Kepā. This one here, we're at the top of our main jeep road up on Wahinepe'e road. If you go on this side to the west.

KM: You go back towards?

GH: You can come out on Kaupakulua Road.

KM: Oh for real, Kaupakulua?

GH: Dry day, very dry day, you can come out Ke'anae.

KM: For real, wow!

JH: This one goes to Spreckel's.

KM: The *mauka* one? Actually it's a four way intersection, yeah?

GH: Yeah.

KM: The road go *mauka* in the middle?

GH: Goes to the Spreckel's Ditch.

JH: This one you come back to this road.

GH: This one, yeah. No can…one place, too narrow. Got to walk, car too big already.

KM: This *pala'ā* fern is beautiful along here. I see this small native fern.

GH: Which is the *pala'ā*?

[Gathered *'ohe* (Hawaiian bamboo) to be used for weaving.]

KM: It was on the side on the right side, next time we see. And uncle I see this *'ohe* up here all this bamboo. Is there any Hawaiian bamboo up here now or is this all oriental, Asian type bamboo now?

JH: On the lower section, I see some Hawaiian bamboo.

KM: Did you hear names of different kinds of bamboos, the Hawaiian kind?

JH: No, no.

KM: I know one they call *kā'eke'eke* or *'ohe kā'eke*. Long, the *puna* in between each one, real long.

JH: This the Hawaiian type.

KM: *'Ae. Mamua, ua hana lākou i ka pahūpahū* with that *kā'eke'eke*.

JH: I used to get that one to make for weaving. When I was young I used to make.

KM: Yes, yes. 'Cause thin the wall?

JH: Yes.

KM: But the *puna* long in between.

JH: By Nu'a'ailua, plenty.

KM: Nu'a'ailua. Oh this *'ie'ie* now.

JH: During my days never have too much of this.

KM: No.

GH: No.

KM: How about now this is something that's interesting people talk. You know, *nui ka limu ma kahakai, kekāhi limu, he lā'au.*

JH: Yes.

KM: *Pehea ka limu wai, he lā'au paha.*

JH: *Ua lohe wau.*

KM: *Ua lohe*, hmm. *'O 'oe, ua hele a 'ohi limu wai a hana lā'au, no kou kūpuna paha*?

JH: *A'ole. Kēia wā, hele 'oe i ke kauka* [chuckles].

KM: *'Ae.* How about these *mai'a* up here, this here.

[Native *iholena* banana plants still growing in mountain lands.]

JH: This one is *iholena.*

KM: *Iholena*, oh. These are *mai'a maoli*?

JH: *Mai'a* in the mountain, the tree is too tall.

KM: I think, is this *kōpiko* in here?

JH: Yeah.

KM: All of these things before the *kūpuna* used?

JH: Yeah.

OM: There's some more *pala'ā.*

KM: Oh yes, Garret, it's that pretty lacy fern *pala'ā.* The *palapalai* is similar but broader leaf and the green is a lighter yellow.

GH: Is that the one we saw at Honopou?

KM: Yes when we went to Honopou.

GH: I know which one. Jimmy when you were working were there plenty banyan trees up here?

JH: Not too much.

KM: Look at this banyan here?

GH: The roots. This one here is on a paper bark tree, killed the paper bark tree.

KM: Gosh! This banyan *pilau* yeah?

GH: Yeah, *pilau.*

KM: Did you folks pull banyan before or you no need? Did you pull banyans up to get rid of them before or you let 'em go?

GH: Not too much before.

JH: Yeah, not too much.

GH: Now have plenty the thing killing all the native trees.

JH: [begin Track 6] Had all *'ie'ie* over here.

KM: Do we know approximately where we are by a place name, what *'āina* we're in now?

JH: We are going to Pu'ohākamoa [as pronounced].

KM: Pu'ohākamoa, you told us the beautiful story about that the other week. This *'āina* here then was all *'ie'ie* before?

JH: Most *'ie'ie* you find around here.

KM: Did you folks still come gather *'ie'ie* to make basket for snare fish or anything?

JH: The Hawaiians, *mamua* [chuckling], but now the *haole*, yes they make good use.

KM: Yeah, but *mamua loa nā kūpuna, ua 'ohi lākou i ka 'a'a o ka 'ie'ie.*

JH: *'Ae.*

KM: *Ulana, o hili ka hina'i, mea basket nō ho'i.*

JH: Yeah.

KM: This is what ditch area, tunnel?

JH: This is Pu'ohākamoa.

KM: Pu'ohākamoa.

GH: Spreckel's Ditch on Pu'ohākamoa.

JH: The main ditch is under.

GH: The main Ko'olau Ditch is under, the tunnel. We can stop here.

KM: We'll stop here so we can take a photo.

GH: Wait till we get to the waterfall over there.

JH: Before they had power plant.

GH: Kōlea Power Plant.

JH: Every time high water, that's why they moved the plant.

GH: Come we go out Jimmy. [going out of car] I don't know if we can go to Honomanū. You can cross, we go.

KM: What ever is *pono.*

Group: [Walk to Pu'ohākamoa Stream overlook Spreckel's Ditch and Ko'olau Ditch Intake Tunnel.]

[Discusses EMI Ditch and Tunnel operations; the Kōlea hydro-electric plant; and pronunciation of place name, "Honomanu," (generally pronounced "Honomanū").]

GH: Yeah.

JH: [begin Track 7] … Went dig one tunnel.

GH: Yeah, right in the middle of the stream?

JH: Yeah. That's why Bums, he doubted it. Ephram blasted 'em.

GH: Yeah. This is the Ko'olau Ditch Intake on Pu'ohākamoa stream.

JH: And that one is Spreckel's.

GH: We go up to the waterfall.

KM: Okay.

GH: Usually this one down here we don't have water unless on a day like today.

JH: I never know that was fenced, our day had hardly any fence.

GH: Yeah.

OM: Your day you didn't have fence?

JH: No, we had.

OM: Had.

JH: We put this in.

OM: You put this in?

JH: Yeah, and we have a tunnel under.

GH: See this gate here…the ditch is tunnel underground. They don't want to fill up the tunnel too much with water because if you put too much it hits the ceiling and what happens is the water slows down and you get less flow.

KM: Oh.

GH: Each one of the main streams, they put this automatic radial gate.

KM: So this, even though it looks kind of rusty now it's still working automatically?

GH: It's still working. This cable here goes all the way down into the ditch and there's a float chamber.

KM: Oh, I see.

GH: What happens is when the ditch comes up the float comes up, the gate goes out.

KM: The gate drops?

GH: Right. When the ditch goes down the float goes down and the gate opens up some more.

KM: Wow! Uncle, this is how you folks operated it, or was this later?

JH: Same.

GH: Same.

KM: Amazing! Did you folks put this in or was it before?

JH: The one below we put in. This was already here.

KM: The floater like that?

GH: Right.

JH: Yeah.

KM: How intelligent, yeah?

GH: Yeah.

JH: Yeah.

GH: And all pulley's you see, like here. Go down there, one more pulley. The ditch is maybe, probably eighty feet or so below us.

KM: Wow!

GH: I can take you down I show you one good picture that's…

JH: That's why they go down and the floater moves under there.

KM: Uncle, I was going to ask you in all of the time that you folks were doing this work and when you were digging tunnel and having to go clean like if there was a collapse. Did anyone ever get injured, *make* or something?

JH: Yeah. Not *make*, but injured.

KM: Injured, must have been a very dangerous work?

JH: Yeah, over here was. They usually don't listen, so you must be very careful.

KM: In your time before, as a Hawaiian and when the Hawaiians that you were working with. Did you folks gather and have *pule* or things like that as you know before you folks go out or when you go to a certain place like that?

JH: As Hawaiians, yes we do. When you get any old people, if you die they just put you on the side. They keep on going.

GH: Yeah.

KM: Amazing, yeah?

JH: Yeah. When you had only Hawaiians they did that.

KM: In your time was it mostly Hawaiians working here?

JH: No. We had Japanese, Filipino.

KM: A mix?

JH: Yeah.

KM: All people. The original people who dug this though…

JH: Were Japanese and Filipino, had Hawaiians but they had all the top job. Time keeper or…

KM: Oh, too good yeah?

JH: …driving locomotive.

GH: How about the Chinese, had Chinese?

JH: Yeah, Chinese had.

KM: I think, when I see so many of the Hawaiian families out in this side that are part you look Kiakona, you look Alu, you look Atai all of these, Akiu, Akoi, Akiona, you look these names. Plenty Hawaiian-Chinese?

JH: Yeah.

KM: You think must have been part of that?

JH: Kiakona had one, the rest no, they work County. EMI is the hated one in the town [chuckles]. They think they steal the water.

KM: For real?

JH: Yeah.

KM: Even back then?

JH: No back then, was no more trouble.

KM: Now days?

JH: Oh, yeah.

KM: And what, are they stealing the water?

JH: No.

KM: Get enough to share if they manage it?

JH: Oh, yeah.

KM: That's your *mana'o*?

JH: Yeah. I work with the bosses, they tell me Jimmy give them, I say, "don't commit yourself."

KM: [chuckles]

JH: "Oh, we going give that." You see, "don't you ever commit yourself." Then they going say you wrong, but only misunderstand.

KM: Yeah.

JH: My son-in-law had worked EMI, so they cannot talk to him about that, Lloyd. Because he knows. A lot of guys talk, but him, he know.

GH: Kepā, I'm going to take you go down here.

KM: Okay.

GH/OM: [stay near car, talking story]

JH: [run Tracks 8-10] …They cannot hire too much men, so the place is not kept clean.

OM: Only one person now?

JH: Yeah.

OM: When you was working how many people had?

JH: They had twenty-three, so one guy he cannot.

OM: I wonder why only one person now?

JH: The machine and all the…

OM: Took the place of all the work you guys all did before?

JH: The machine will tell you where the trouble but you got to get men. With the machine you know where there's trouble. But it's very interesting.

OM: Yes, it is. . .

JH: In the old days they had the power plant there run by water. Only big water rushing into the plant they took it below. Now they did away with that. You know the water turn in the pond, and right back in the ditch and irrigate the cane field.

OM: That's wonderful!

JH: Yeah. . . I went to Kaua'i, I worked down Wainiha same thing water but only theirs for electricity.

OM: What year was that?

JH: In 1959.

OM: Wainiha is a beautiful area.

JH: We lived way up where they had the camp. They had a Japanese family, but I think they're all gone.

OM: What company were you working with?

JH: McBryde and A & B.

OM: Oh, they all the same. They flew you to Kaua'i to work for a little while?

JH: Yeah, I went with four men. They found out we were the only ones that worked…

OM: How long were you there?

JH: About a month and a half.

OM: You folks had to teach the people over there on Kaua'i?

JH: Yeah.

OM: Do you remember had some Hawaiian people working over there too?

JH: Yeah. We had this Henry Gomes, I think you know him.

OM: Yeah.

JH: He's quite a guy. And then we had a family from way over, Dry Cave. Tae Hook, his in-laws he was just like the governor [chuckling].

OM: What kind name is that?

JH: Chinese-Hawaiian. He was just like the governor of Wainiha.

OM: Everybody knew him?

JH: Yeah, everybody knew him. Henry Gomes everybody, Hanalei all over they all know him.

OM: That was long time ago?

JH: Yeah, they all gone.

OM: Where'd they go, down below?

JH: Yeah, they cannot go too far. Garret is alright, he came work not too long but he understands.

OM: Yeah, he's *ma'a* already.

JH: He understands.

OM: Just like he's been here long time.

JH: Yeah, yeah. . . But we're going to Honomanū, that's a beautiful high valley.

OM: So, is it Honomanū or Honomanu?

JH: Honomanu, you're right. [chuckling] A lot of people, they say Honomanū, but it is Honomanu.

OM: Honomanu.

JH: The Hawaiians their pronunciation sometimes not correct.

OM: Makes a big difference in the meaning if you say it wrong.

JH: I'm ashamed of myself, your husband he knows more Hawaiian than me.

OM: *A'ole*, you're the *kūpuna*, you're the expert.

GH/KM: [rejoin Mr. Hū'eu and Onaona]

JH: . . .And how's Mina Atai, alright?

KM: *Maika'i*, she said to tell Mr. Hū'eu, "*Aloha*." You're very well respected…everyone so much *aloha* for you.

OM: Everybody loves you.

KM: The water pumping, just flowing the water. . . [looking at photo, on following page] . . . The picture, it's dark…dark in there. It's almost black but the light came out good. The water is just flowing.

JH: This is the first time you've been up here?

KM: First time.

JH: In the old days before my time had the power plant right up there. But only the overflow, so they moved it. But they did away with that.

KM: This power plant was called what?

Ko'olau Ditch Tunnel Intake on Pu'ohākamoa Stream (KPA Photo No. 1446)

JH: It was Kōlea, but I don't know what they called it.

KM: Was this how you folks got your power at Ke'anae?

JH: Yeah, Ke'anae and…Kailua.

KM: When you were young had power?

JH: Yeah.

KM: Amazing yeah! Most people no more power right?

JH: Until 1937.

KM: Amazing, but you folks because of the hydro-electric?

JH: Yes, we had power.

KM: That's amazing!

JH: Ke'anae and Kailua. Kailua was more modern. They had all…like Fred Wilhelm, you heard about him?

KM: Yes, I've heard the name, Wilhelm. So Ke'anae was more country, but get power.

Group: [leave intake vicinity and begin drive back down to Wahinepe'e Road; begin Track 11]

GH: …This bridge 1925.

KM: I'll take a picture of that.

JH: Even down there is Spreckel's Ditch.

JH: That is Spreckel's Ditch.

GH: Yeah, Spreckel's Ditch.

OM: That's awesome!

JH: You know one time they took Ha'ipua'ena water and they threw it in Kōlea.

GH: Right.

JH: For turn the power plant.

GH: The power plant the old ditch?

JH: Yeah. Lot of guys never see that intake. You never see?

GH: The one way up?

JH: Yeah.

GH: We never did go up there.

OM: Why, the road is too rough?

Spreckel's Ditch Overflow, Pu'ohākamoa Stream; EMI CO. Bridge (1925). (KPA Photo No. 1448)

GH: No more road.

JH: No more road, walk feet [chuckles].

OM: You got to walk feet?

JH: I used to go up there and Bruce he'd take his grandson that buggah five years old, he no can walk. He carry him [chuckling].

GH: Kepā, look at the bridge. What do you notice about the bridge [the road surface is level with the top of the side railing]?

KM: Was it a flume?

GH: No more sides.

KM: Yeah.

GH: You know why?

KM: Cause it goes over?

GH: No, because Jimmy you remember we had that six by six before and what job was that you guys was doing? Had, I forget what job was, Štephen was truck driver?

JH: Yeah. And then had one guy Arakawa we called him Ōpū.

GH: Ōpū, right.

JH: So we had to make it that way so the back wheel could go.

GH: See this bridge here, we had a truck about six by six, had dual wheels couldn't go over the bridge. They filled up the bridge so the outside tire can run on the outside.

KM: Oh, I see. That's dangerous work!

JH: How did you get that story?

GH: Stephen.

JH: [chuckling] That guy Arakawa, he was the driver. He jump up, let him go.

GH: He drive?

KM: No scared?

JH: No scared.

KM: Amazing!

GH: True story though, yeah?

JH: Yeah.

KM: That's why I was thinking maybe it was a flume or something.

GH: You know if you go to the A & B building in Honolulu on the first floor there's a picture of this with a fall. They have people crossing this bridge with mules, donkey or horse whatever had cart but you only can see from here up, that was before the bridge was pau.

KM: Amazing, I'll see if I can get a copy of that photo.

JH: Right over here they had a power plant.

GH: They had a power plant.

KM: Right up here?

JH: Yeah.

GH: Actually more down on the lower road.

JH: No, on the road there, then they took 'em.

GH: Right here?

JH: Yeah, but the water…

GH: Eat 'em up.

KM: That was the earlier one?

JH: Yeah.

GH: That's when they made Kōlea?

JH: Yeah.

OM: Around what year was that when had the one that was right here?

JH: I think was in, the last time it was here, was in about 1938, I didn't work for the company yet.

OM: When you guys went way high, walk feet did you guys spend the night up there? Up at the top.

JH: Yeah, we sleep up the mountain.

OM: Had a cabin up there?

JH: No, we make tent. We sleep like wild pig [chuckles].

OM: Gee.

JH: How long you folks live in Hilo?

OM: About 10, 11 years now.

JH: My mom came from Kohala, but I have family in Hilo.

OM: Hū'eu family in Hilo?

JH: No… [thinking] Keamo family, but the old people are all gone. They have a son and daughter still there.

OM: Yeah.

KM: [taking photo] Your car will never be the same.

GH: No, no this is a work car, EMI all work car. If we get tourist car we no can work EMI.

KM: No can.

Group: [chuckling]

JH: You with Bob Bruce you get one jeep all tie up with wire [chuckling].

Group: [laughing]

GH: Lucky we no more Bob Bruce [chuckling].

KM: Bob Bruce, what time was he working about?

JH: About from 1945, I think.

GH: About there, '45 to '68, and then '68 I think, Phil Scott came.

JH: Yeah.

KM: Now just before we move this waterfall that's off the side you said is actually Spreckel's Ditch?

GH: You mean the small?

KM: Yeah, the small one, the man-made one on the side.

GH: The big waterfall?

KM: Yeah.

GH: Yeah.

KM: That's Spreckel's Ditch and you said it feeds off Nu'a'ailua?

GH: Nu'a'ailua, Honomanu, Ha'ipua'ena and come over here.

KM: That's what feeds here and the small fall back behind the bridge the twin falls, that's Pu'ohākamoa?

GH: Right.

KM: *Pololei*?

JH: Yeah.

KM: *Mahalo*.

JH: At one time when the power plant was running, Ha'ipua'ena water we run 'em back and went down that ditch.

GH: Right, turn the generator. They had the ditch from Ha'ipua'ena go back Kōlea.

KM: It's so beautiful when you come up into the mountain, and you start to see the native forest.

JH: [begin Track 12] Most of these trails I did the bulldozing. I bulldoze, I powder.

KM: After the forties or before?

JH: Yeah, after the forties.

KM: There's the Pu'ohākamoa Falls.

JH: I think they did this in '47.

GH: Kepā, you know the sugar cane we were talking about?

KM: Yes.

GH: I don't know if that's the one we saw down at Waipi'o the first day.

KM: How come there's sugar cane up here, uncle?

GH: The hunters planted 'em. I don't know what type this is.

JH: That's the Hawaiian cane.

GH: Hawaiian cane.

KM: Looks like, yeah. I don't know *manu lele* or what, I can't…

JH: I *poina* the *inoa*.

KM: *Poina*.

JH: The other one is [thinking], *uahiapele*.

KM: Beautiful that *uahiapele*, this one looks a little bit like…

JH: This one is sweet.

GH: This one's been here probably maybe five, six, seven years. Because when I first started, no more so I would say maybe five, six, seven years ago somebody threw one…

JH: You know this guy Kaho'okele from Nāhiku he had plenty old cane left.

GH: Jimmy?

JH: Jimmy's father.

KM: What was the father's name?

JH: David.

KM: David Kaho'okele. . .

JH: . . .This man Enos Akina, from Wailua. He knows about canoes. Before they get ditch man all around here so many miles.

GH: Yeah, take care.

KM: They lived in little camps at various locations?

JH: Yeah. They get their own house, the camp was for those who dig tunnels. The ditch-men they had house.

KM: Individual?

JH: Yeah. So many miles.

KM: That's what Stephen was saying.

GH: Yeah.

KM: Maybe twelve or thirteen ditch-men house *paha*?

JH: Yeah.

GH: Stephen always used to tell me there were sixteen ditch-men before.

KM: For real?

GH: Yeah.

KM: Oh.

JH: The main ditch they had home.

KM: Look at this cluster of *'ie'ie*, beautiful.

JH: Had one down Punalu'u for that Hussey, he used to live over there.

KM: From Kohala that one? Hussey?

JH: I don't know where, but he was from Hāna.

KM: Hmm. So this is your automated…?

GH: This one is not. This went out of service because we're having service with the telephone company to provide us service. We plan to convert this one day. This is

the Spreckel's Ditch from Ha'ipua'ena gauging station. This is one of those that we had to maintain when we had our four Water License areas.

JH: Get the old Ha'ipua'ena, the Kula one?

GH: Yeah. Kula diversion from Ha'ipua'ena, the flume, get this one get that one down Manuel Luis, Pu'ohākamoa, the station now. That one there remember the swinging bridge?

JH: Yeah.

GH: Had the swinging bridge from west side, Pu'ohākamoa and you cross the swinging bridge, you walk the trail you go to the station house. Remember that bridge?

JH: Yeah.

GH: When I first came to EMI, I'd go service those stations. One day I went, I was walking across the bridge, I get funny feeling. The bridge collapsed on me and I end up in the stream. Lucky no more big water.

JH: You know the Nā'ili'ilihāele one, on the main ditch, one time that went collapse.

GH: With you on top?

JH: [chuckling]

GH: Yeah, that one collapsed but this one collapsed when I was on top. Fall down I land right on one big *pōhaku* sitting in the middle of the stream. Lucky thing the cable went catch under my arm so I go like that, the thing slow the fall down. I was lucky.

KM: *Mahalo ke Akua*.

GH: Yeah.

KM: Were you by yourself?

GH: By myself. I called Stephen, I thought my leg broke. "Hey, I fell off the bridge." He tell, "What?" He said, "You can drive?" I say, "Yeah, I can drive, I'm going Ke'anae." Robert heard me, Robert go over there, "hey boy what's the matter, what's the matter?" "Hey, the bridge collapse." Little bit rope burn under here he look at that, "Oh, I put some stuff over there for you, it's alright no problem." Lucky though.

KM: *'Ae*. Uncle, *Ha'ipua'ena, 'oia ka inoa o kēia wahi*?

JH: Yeah, Ha'ipua'ena. Over there get one Trig Station.

GH: Trig Station.

JH: Pu'uokoholā.

KM: Pu'uokoholā? That's where the Trig Station is?

GH: Yeah.

JH: Yeah.

KM: Uncle, it's Ha'ipua'ena [as he pronounced it]?

JH: Ha'ipua'ena.

KM: What do you think…*maopopo 'oe i ka mana'o, Ha'ipua'ena*?

JH: *A'ole. Ha'i, haki e*.

KM: Hmm.

JH: I hear that place down below, get one *ana*, and people lost at sea in between there, you don't find them, you go under there.

KM: Oh, so the tide bring 'em in?

JH: Yeah.

KM: This is on shore.

JH: Right there they call Kaumahina. When the moon set get one place called Kū'ele'ele, right in Ha'ipua'ena. I hear had *lo'i* down there. So had people *mamua loa*.

KM: *'Ae*. So interesting, that's beautiful *pala'ā* up there.

GH: Yeah, *pala'ā*.

KM: Ha'ipua'ena and then Kū'ele'ele and Kaumahina all close together those places?

GH: Yeah. Kilo'ānuenue is above.

KM: Kilo'ānuenue beautiful these names.

JH: Yeah.

KM: Wow, this place must have been so beautiful. You see the remnant of a forest, the *hāpu'u*.

JH: You can tell before 1934 that's when they came and plant all these things.

KM: Oh, the eucalyptus like that? CCC?

JH: Yeah. That's why Stephen, every time he blame, "Hey, you the guy went plant the trees." [chuckling]

KM: You went work CCC before? Who was the supervisor on Maui, for CCC?

JH: One guy by the name of Laitle, he married a Grand Hotel daughter, Eddie Walls. Eddie Walls used to run Grand Hotel and Bill Walls he run Kahului Railroad. Bill Walls, he mean guy [chuckling].

KM: What is this crossing here?

GH: Ha'ipua'ena Stream.

KM: This is Ha'ipua'ena Stream here.

JH: Very seldom get water.

GH: Sometime get though. If this is flowing, this overflows and goes down you cannot cross.

KM: Cannot?

GH: Cannot, but sometime like this you going to Honomanu no can come back home but we have shortcut road go down.

KM: Lucky thing. This stream here is natural?

GH: Yes.

KM: Ha'ipua'ena, only the modification was right here where they divert the water into the Spreckel's Ditch here?

GH: Correct. The water from Nu'a'ailua, Honomanu, comes into Ha'ipua'ena Stream right up here and then divert. The old ditch building was not a continuous straight line grade, they utilized streams for conveyance. They dropped it, went on…

KM: Step, or tiered?

GH: Step, tiered exactly.

KM: It's tiered layer by layer?

GH: Exactly.

KM: Starting more high, coming down so you can transport it across the distance?

GH: Correct, correct.

JH: And then up there they had one intake that take this water back to Kōlea.

GH: Kōlea, right.

JH: To turn the…

GH: …the hydro plant.

JH: And then it goes right back in the main ditch.

KM: Beautiful, all of these names, these places. And there was some ingenuity that was put into planning out this whole ditch system, you know. It's quite amazing!

GH: Oh, yeah.

KM: Nice the *koa* up here too. Oh look, uncle *kama'āina 'oe me kēlā lā'au* [indicating a patch of *'ōhāwai*].

JH: Yeah, that's the one they *kahea* when you no more *wai* you get the seed.

KM: *'Ōhāwai*?

JH: Yeah *'ōhāwai*.

KM: If it's blooming, I'd like to stop and photograph it if I may and I think it's blooming. May we try?

GH: Sure.

KM: This is an endemic member of the lobelia family.

OM: It has a little blossom?

JH: Yeah. Then get a fruit kind of orange color. When you go in the mountains you thirsty you go get that and sip 'em for water.

OM: Smart the Hawaiians were?

JH: Yeah.

OM: Everything with the land.

JH: Yeah, the Hawaiian people were smart people.

OM: They weren't *molowā*, the *kūpuna* from before.

JH: Yeah. [begin Track 13] I never even think that I would come back up here. During those days I was working up here was beautiful.

OM: It was mostly all native things before, didn't have all these introduced stuff?

JH: Yeah. That's why they have that *pohole* and *hō'i'o*. Lot of people say in Hilo they say *hō'i'o*, in Maui *pohole*. Those are two different things. The one up here is *pohole*, the one on the lower end is *hō'i'o*. Two different they not same.

OM: Wow, that's interesting!

JH: Lot of people they…in Hilo they call *hō'i'o* that's the name but this other one the one that grow up here there's few over there that's the *pohole*.

OM: *Pohole*?

JH: Yeah.

OM: Oh, that is interesting…

JH: That's why somebody better correct this generation, the young one…

OM: That tree is very special, native.

JH: Better tell Garrett clean that tree good.

OM: *'Ae*, I think that's what they were talking about. I think Kepā was telling him to make sure they take care of it.

JH: Yeah.

OM: Only one of a kind not going have left.

JH: Good thing Kepā he know where and what is.

OM: Yeah, I know he sees things out in the forest. We always just *mahalo ke Akua*.

JH: Must be, when get warm maybe it will blossom.

OM: *'Ae*. Must be just budding now, just ready.

JH: Yeah.

OM: Did you folks see plenty *pueo* up here before?

JH: The next gulch but not way up here, below Pu'ohākamoa over there get *pueo*. I don't know they get on church in Huelo they call Kaulanapueo. I don't know why but maybe over there they get plenty *pueo*.

OM: Must be.

JH: You heard about that church Kaulanapueo in Huelo?

OM: It's an old Hawaiian church?

JH: Yeah…

OM: [begin Track 14] Before, you always drank the water up here when you were thirsty?

JH: Yeah.

OM: Sweet?

JH: As long as the water is running we drink 'em.

GH/KM: [return to car]

KM: Look like *pohole*, but not.

JH: That's how I was telling her lot of people you got to correct 'em, Garrett. They tell the Hilo people say *hō'i'o* and Maui *pohole*. No, *pohole* and *hō'i'o* that's two different things.

GH: Different things right.

KM: Okay.

JH: Lot of these people don't know.

KM: Yeah.

JH: You know what they taking down and selling *pohole*, no that is…

KM: *Hō'i'o*.

JH: *Pohole* you only find up here.

KM: *Mauka*?

JH: Yeah.

KM: Did the old folks eat the *pohole*, the sprouts?

JH: I don't know. This tree you better make canoe out of.

GH: This one, nice straight one. Too heavy, sink. [chuckling] You know that guy from Fiji the one they go Lāhaina make the canoe. They go use that *albezia* now.

KM: Yeah.

GH: They said in Tahiti they have that *miconia*, two-thirds of the native forest gone so no *koa*. Only the *albezia* can survive because that one there grows tall.

JH: Over here, all over the place.

GH: You know Kaupakulua Reservoir, had plenty that kind tree, they come they harvest.

KM: Look at your *mai'a* down here again.

JH: Yeah.

GH: USGS the gauging station over there that's why they have their weir. So the main Ha'ipua'ena Stream is from here and where the Spreckel's Ditch water comes in, is over here.

KM: Uncle, before were there people in the old, old days they lived up in places like this sometimes?

JH: I think some places you find get *lo'i*, that's where they were living. As long as get water, I think they were living there.

KM: I wonder if it was seasonal time, maybe when a little bit more *malo'o* you can come up here and...

JH: Oh, might be. That's why, Banana Intake you go up they get tunnel.

GH: Get tunnel?

JH: Yeah. The old guys they know about tunnel.

GH: How come they made tunnels up there?

JH: I don't know. One day we chased pigs they run in the tunnel.

GH: How far above Banana Intake?

JH: About maybe mile and a half.

GH: I never went up there yet.

JH: From there you can go right up Ka'ili'ili.

GH: Hit the trail and come down Hobitt's house?

JH: Yeah. Way up here Uluwini[8], can go right over.

KM: Uluwini?

GH: Uluwini. Swampy for walk up?

JH: No, instead of go around we used to go out through there.

GH: You know now plenty pigs. The trail *pilau*… Kepā, is that another one?

KM: That's more there. That one back there where we stopped uncle, was really nice because the old log fell down, just like a little nursery all of the *'ōhāwai* seedlings popping up. . .

GH: Hey, the pigs been here. See where get the leak in the ditch over there.

JH: Get pig.

GH: Yeah, get pigs they stay right here, fresh. This ditch hard to stop leak, yeah?

JH: Yeah.

KM: Still Spreckel's, this one?

GH: Still Spreckel's.

KM: That's 1876 like that?

GH: Yeah.

KM: Old.

[8] Uluwini (as pronounced) – this place name is also written as "Uluini" on recent maps.

GH: You know to me Kepā, a ditch built, I think they made it to last at least hundred years. You figure now we're on the hundred twenty-five years, so our time is like more wear and tear and more, you know.

KM: Disintegration kind of?

GH: Yeah, right. Jimmy's time was real hard work trying to make improvements to the system, make the road better.

KM: Now it's just kind of…

GH: Try to maintain.

KM: …maintain, fire-fighting.

GH: Yes.

JH: I have one copy of the agreement of Spreckel's with the Hawaiians from over there, when he started Spreckel's Ditch. I give 'em to my son, I give 'em to Harry I don't know if he keep. "You hang on to this 'cause get my great-grandfather he went sign."

GH: What's his name?

JH: J. K. Hū'eu. His name was Jacob.

KM: Uncle, did you folks see native birds up here before? Like the *'ōma'o*, the thrush?

JH: Yeah. Had native birds.

KM: Red one too, like the *'i'iwi* like that *mamua loa*?

JH: Yeah. I think most of the birds went up Olinda. Had Olinda forest you can find many Hawaiian plants.

KM: Olinda that's one, what's the proper name of that place Olinda you heard?

JH: No.

KM: How come they call it Olinda?

JH: Up there had one dairy, they called 'em Ukulele, that's when they had the dog flea [chuckles]. They call it Ukulele.

GH: This the road you take in case you cannot cross all the time.

KM: Ha'ipua'ena.

GH: We just went clean that road. The intake for the power plant was right over here, the Spreckel's Ditch..

JH: This road cover that, go right through the…

GH: Pen stop, we can go down there, I think it's alright. Right in here that's the only place I know get one small patch *maile* down the other side.

KM: I see one more *ōhāwai* down there too. Look, someone went plant red hibiscus. Had house over here before or?

JH: Had ditch man.

KM: I guess they planted some things sometimes that they liked around them, yeah?

JH: Yeah.

GH: Yeah.

JH: The last ditch man used to be at Waiakamō'ī, he had one son, I don't know if you heard of this guy, Castro, from Hāna.

GH: Joe Castro?

JH: No, he worked with the MEO, not Joe Castro. The Hāna, Castro.

GH: I don't know him.

JH: That boy was raised in the mountain. He went Maui Memorial, he just retired.

KM: He lived *mauka* here?

JH: He used to live in…yeah.

KM: Waiakamō'ī?

JH: Yeah.

KM: Oh, we should talk to him maybe.

JH: What's this, that's Kōlea?

GH: This is Kōlea. This one we get the H-1 over here so they no can go Honomanū and then you know we had the valve over here. Open the valve for let the water go.

KM: What is H-1?

GH: You see this gate here?

KM: Yeah.

GH: Right past this gate we don't let anybody go past this gate with a car because…well when we go you can see. [chuckles] It's like going up Kikokiko real narrow the road.

JH: If you ever go off, it's good-bye Hawaiian.

KM: *'Auwē nō ho'i.*

GH: Me, I no go up, I hit the bank before I go up, I smash the car first.

Group: [all laughing]

JH: Ha'ipua'ena water used to bring 'em back here. This water go down, turn the power.

KM: Yeah, hydro-electric. Uncle, *pehea*, you need water to drink?

JH: No, no. The ditch goes there on the turn. This one go right down to the main ditch.

KM: Do these waters still reach…are there some water that goes all the way down to the ocean from these places?

JH: Yeah.

KM: Still the water flows down some?

JH: Yeah.

KM: The *'ohana* must have come up here. Were there places where you gather *'ōpae*, *hīhīwai* or anything?

JH: Like over here maybe *'ōpae* they get, but *hihiwai* [shaking head].

KM: More lower?

JH: Yeah.

KM: How about *'o'opu* come up here too, *nōpili* or something like that?

JH: Since I worked I never see *'o'opu*, once we get a high waterfall.

KM: They cannot come up?

JH: Yeah.

KM: How did all these *'ape* like taro stuff get up here, ornamental?

JH: Must be the ditch people brought 'um.

GH: Today, if you go past Honomanu and Nu'a'ailua, you get stuck in the swamp over there and then you no come out [chuckles].

KM: Uncle, you see this plant here, do you recognize this little red?

JH: I don't know the name it's almost like the *māmaki*. Plenty people mistake that.

KM: Did you hear the name *ōpuhe*?

JH: No, I didn't. That is?

KM: *Ōpuhe* same family as *māmaki*.

JH: I used to see that, but I used to think.

GH: It's a flower?

KM: Yeah. Beautiful this is a rare plant now.

JH: Oh.

GH: What they call this now?

KM: I think it's *ōpuhe*.

GH: Let me see where else I see this.

KM: You know you look at that, you know how *māmaki* get the little fruit the mulberry on top?

JH: Yeah.

KM: You know what this is what they call *ōpuhe*, that's the close relative to *māmaki*, *piptunus*, *ōpuhe*. See the little white, I think that's the mulberry fruit like right there.

GH: You see on the bottom Kepā, the bigger leaves?

KM: Yeah.

GH: Is that the same plant in the juvenile form?

KM: Yes, that's the shoot, juvenile.

[*Māmaki* used as tea and medicine.]

JH: That's why *māmaki* you get the red and white.

KM: *'Ae*. This is the *ōpuhe* then.

JH: In Honomanū we used to get plenty *māmaki*.

KM: Did you folks use *māmaki* for tea or something?

JH: Yeah.

KM: Good tea, medicine like?

JH: Yeah.

KM: This *'ie'ie* is so beautiful!

GH: *'Ie'ie*?

KM: *'Ae*, *'ie'ie*.

GH: Had something called *'io'io*?

KM: I'm not familiar with that off hand.

GH: You know get this weed, get blue flower?

KM: Oh, *ha'uowi*.

JH: That's the one they make for strain?

KM: That's the one.

GH: Yeah.

KM: That's actually an introduced, it's in the mint family, but it's introduction.

GH: Right, okay.

KM: *'Ie'ie* it's like the *hala*, a climbing screwpine. There's more of that *'ōhāwai*. Nice!

GH: You notice that the forest little bit changing?

KM: Yeah.

GH: But you see how the banyan?

KM: Banyan.

GH: It climbs anything.

KM: It's going to be terrible.

GH: Climb the paper bark, inside here it climbs the *'ōhi'a*, the *koa* trees.

KM: Yeah.

[Notices that *'ie'ie* is dying back.]

JH: [run through Tracks 15-16] This *'ie'ie* is dying off. Before, it would go way down, there was lots of *'ie'ie*.

KM: Even near the *kahakai paha*.

JH: Yeah.

KM: This *'ie'ie* when it blooms so beautiful.

JH: Is it kind of orange?

KM: Yes, orange, salmon colored. This is a perfect place, I going just take a picture of the *'ie'ie*. Uncle you said this *'ie'ie* really *'emi* (diminishing) now?

JH: *'Emi*! And yet only twenty years ago.

KM: [taking photo] Uncle, one *'ōma'o*, one thrush just went call the Hawaiian one, the *'ōma'o*. That's your radio calling?

Group: [all laughing]

KM: I wonder if before if this *koa*…Did people come up make canoes up here before you think?

JH: I think so.

KM: You never hear your *kākā mā*, *hele 'ana kekāhi, kālai wa'a*?

JH: Last one I know they had at Wailuaiki.

KM: Wailuaiki?

GH: Yeah, that's what I heard too.

KM: Who was that?

JH: This guy Kaho'okele.

KM: Kaho'okele.

JH: …The last one never finish.

GH: Never finish.

KM: You know that's funny when we went down Wailuaiki the other day still get one log down there. I was telling Onaona, I think someone was trying to make canoe but all *popopo* already.

JH: Where?

KM: A little below Helen Nākānelua's house.

GH: You mean Wailua?

KM: Yeah, Wailua *kala mai*.

GH: Spreckel's Ditch over here.

KM: Your folks canoe because uncle you said before, you went out canoe *holo lawai'a* like that? Where did your canoes come from your *kūpuna* time?

JH: Like me, I'm a poor fisherman. I get *poluea* [chuckling]

KM: *Aloha nō*!

GH: Onaona, you no like the bridge? Too narrow?

OM: Narrow, yeah.

KM: These *maiʻa*, still you think that's native *maiʻa*?

JH: Yeah, most is *iholena*, inside pink.

KM: You know if the *maiʻa* is up here means people had to come up here before?

JH: Yeah.

KM: Cause the *maiʻa* no travel by itself.

JH: No. Thirty, forty years ago, plenty *maiʻa*. That's why the person like to check ditch, when he end up, he get plenty *maiʻa* [chuckling].

GH: That's the benefit.

JH: That's the benefit… That pig was digging on the road.

GH: Yeah. The pigs spread this, what you call this. You guys call this *ʻape*?

KM: Uncle, what you call?

JH: Yeah, they call ʻem *ʻape*.

KM: Yeah.

JH: *ʻApeʻape* he get the round leaf.

KM: That's right the native but that's endemic the *ʻapeʻape*.

GH: The pigs dig and the thing spread.

KM: Yeah, they eating, you see they eating the root.

GH: Yeah. [begin Track 17] When was that, last year some time when hurricane Daniel was coming on Maui so everybody wanted to be prepared to deal with the rain and the storm coming. It was decided we was going shut down the ditches at EMI, so they wanted to shut it down on Saturday because they figure the storm hitting on Sunday. We called all the boys up Saturday, "Eh, you can come out work, you can come and *kōkua* us." Yeah, they come out, I think only nine guys could come out work and everybody partnered up. We had this area and one other area that no partner so I told Jackie's husband, Albert, "Hey Albert go let the young guys go take the place they know, I going come Honomanu cause bum by danger." I come here had one big tree on the road right up over here, cannot go with the car. Got to carry the bar go to Banana Intake open the gate.

KM: We're coming in back Honomanu now?

GH: Yeah, we're coming from the west side going in.

JH: We never pass Uluwini Bridge?

GH: No, Uluwini Bridge pretty soon, right up here.

[Discusses collection of *ʻōpae*; cultivation and uses of *maiʻa māoli* (native bananas). Learned that families lived in the Honomanu uplands, and knows of an old *ʻauwai* that fed upland *loʻi kalo*. During his youth and working days, pigs were hunted in the upland region.]

KM: Look at all that *maiʻa* down there.

JH: There's Uluwini.

KM: Uluwini?

JH: That's where right there get *ʻōpae*, when the water low.

GH: Honomanu, yeah, guarantee go to High Fall.

JH: Yeah.

GH: These pigs though…

KM: Terrible, just rooting up. And they spread this *clidemia*, everything too.

GH: Big pig too.

KM: Is this the back of Honomanu here?

GH: Yeah.

KM: We're in the back?

GH: We're in the back, we're in Uluwini stream.

JH: In the west side.

GH: West side. Uluwini the next one is Honomanu, this is the Spreckel's Ditch if you jump in here you go all the way the first intake you hit is High Fall at Honomanu.

KM: And uncle you said this place here, *loʻa ʻōpae*?

JH: Yeah, you go inside. Get plenty *puʻa* over here.

GH: You see the hunters they scared…

JH: They no like walk in here.

GH: …they no like walk in here because you know the gate, if not they come in here. Plus when you come to Honomanu you look at the *pali*, the pigs they smart they come in here they hear the dogs they run towards the cliffs and they get these little trails go down in the tunnel. When the pigs run the dogs chase and the dogs they just follow.

KM: [chuckles] Over the *pali*?

GH: Over the *pali*.

KM: *ʻAuwē*!

JH: This one go right down, go right over the electric pole bumby, gone.

GH: Yeah, *aloha*.

KM: Oh boy, so the pig smart then?

GH: The pig smart that's why big pigs over here.

OM: They live long life?

GH: They live long life.

JH: Sometime I come here I see pig, I call Stephen, no eat the pig. [chuckling] Some days you drive around here they coming down.

OM/KM: Beautiful view.

GH: One time the boys was going Kikokiko go across by number eleven the steep *pali*. The pig, the mother run away they hear the boys coming the small pigs jump off the *pali*.

KM: Uncle, this *maiʻa* you see in the dark like that?

JH: That's one type of, they get two *pōpōʻulu* and *kahiki*, I don't know what the name they get one different name.

KM: It has the dark?

JH: If *kahiki*, they call *pūhi*, that's the long one. *Pōpōʻulu* is the short one.

KM: The *maiʻa* you know some they call *maiʻa ʻeleʻele* the one you can weave with?

JH: That's different *maiʻa* stay up.

KM: Stay up, stand up?

JH: Yeah. That's the one they make hats.

KM: That's right for weave the designs.

JH: Yeah. I think this, maybe you can.

KM: You think this one *kahiki* then?

JH: Yeah.

KM: *He maiʻa māoli*?

JH: Yeah, Hawaiian banana sometime, you should take home some.

GH: I take home. I get one, I took home one for my father, the *pōpōʻulu* for my father from Kikokiko.

JH: That one is the white one, they call that *lahi*, that's thin. They get one thick, same but more big banana, only about two or three in one bunch. That one is good. They get different types, get the *lahi*.

KM: *Lahi*, thin skin.

JH: In another ten years I think, no more.

KM: No more here I think, you're right. *ʻŌlelo mai nā lawaiʻa, inā hele ʻoe me ka maiʻa "Pohole ka maiʻa*!"

JH: Yeah, "*pohole ka maiʻa*!" [chuckling]. That's why, when ever a guy goes fishing, don't you take banana, he quit he no like go fishing.

GH: He no like go fishing?

KM: No.

GH: Why, if you take bananas when you go fishing that's?

JH: Yeah, that's *pohole ka maiʻa*..

KM: *Pohole*, no more nothing *pohole*, just like skinless.

GH: Why is that?

KM: ʻCause when you peel ʻem, eat ʻem pau, no more nothing inside right?

GH: Yeah.

KM: *Pohole ka maiʻa*, you get nothing.

GH: Right.

KM: Beautiful to see this forest with the *maiʻa*, the *ʻōhāwai*, the *ʻieʻie*, *kōpiko*.

JH: And then you go down here, you go to the intake, the Koʻolau intake.

GH: Get the cross-cut?

JH: Yeah, this side the other side.

GH: Yeah. This the one, Number Seven.

KM: And Number Seven is what?

GH: Number Seven is Number Seven Intake, we call them the lower pipeline.

JH: They call that Kaʻiliʻili Trail, where you see all the eucalyptus.

GH: They planted eucalyptus right in the lower boundary, Between EMI and the State.

JH: We found this, that's how we go up, only about one hour walk.

GH: About there, yeah.

JH: Otherwise go all around, the only thing you go all around you drive over here you walk.

GH: Even if you go around you start Number One, you walk to Number Seven, that's about hour and a half, two hours.

JH: Yeah. Just like you've been work thirty years.

GH: [chuckles] I walk ʻem that's why.

KM: A cluster of *ʻōhāwai* here. So beautiful!

OM: What elevation are we at, about?

GH: We're about maybe fourteen-hundred around there. I live at about 3,400 so I don't think going grow. I tried plants up there, *māmaki* grows, I tried *ʻōlena*.

JH: That's why Makapipi Bridge you get the elevation over there.

GH: Yeah, get the bench mark. Kikokiko get, Piʻinaʻau Bridge get. Piʻinaʻau Bridge I think is 1,348 or something. Get the bronze marker.

JH: Yeah.

GH: This is the best place for dressing the road.

KM: For get stone you mean?

GH: No. You see this stuff here, the thing is real good if you put this stuff on the road you run ʻem over with the tractor the thing packs real good. That's why you see this road not swampy, we put ʻem on the road we run ʻem over with the tractor. This is Honomanu.

KM: We're in the back of Honomanu?

GH: Yeah.

JH: You go down there, get one small ditch (*ʻauwai*), I don't know where the water go.

GH: Which one is this, Jimmy?

JH: I don't know, down there. They use that I wonder where go?

GH: I wonder if was for the *loʻi* down side?

JH: Maybe.

GH: Because from here down, no more nothing?

JH: No more.

KM: No more ditches like that you mean?

GH: No more this is the last but then…

JH: By High Waterfall get one.

KM: Is that one pipe line?

GH: Yeah. This is our drain, we get one intake up here.

KM: Uncle, you folks went plant *lāʻi* up here or was up here already?

JH: I think that those who used to live here they plant.

GH: [begin Track 18] …You got Nuʻaʻailua and then you get Keʻanae.

KM: So this is the back of Honomanu? Back here or?

GH: When you say back, what do you mean?

KM: This big valley now, Honomanu?

GH: Yeah.

JH: That's the main one.

GH: This is the main one.

JH: And they have Banana Intake, then they get one there.

KM: Is that a natural waterfall there?

GH: Yes. You can see the bridge and the road going all the way across to Keʻanae.

KM: Is there a name for this falls, uncle?

JH: Yeah, supposed to get name.

GH: The EMI name is East Honomanu?

JH: They have a Hawaiian name.

GH: Yeah, I don't know what.

JH: When I used to work get plenty *māmaki* growing. Now no more.

GH: No more. [driving] Get little bit over here.

KM: *Māmaki*.

GH: Had slide over here. You know every time slide, comes three time before stop. We park the tractor up here maybe two, three months every time come down. I don't know if too wet maybe for you guys. I can open the back we can go out and then stay under.

JH: Tell me if the High Fall water drop. If he take one picture of that, beautiful, go all the way down.

KM: You would come back here when you were working?

JH: After I retired, I never did come back.

KM: You never came back again. [begin Track 19] When you were working this was your *ʻāina* you would always come in?

JH: Yeah.

KM: Take care like that?

JH: At least once or twice a week I come here.

KM: A week?

JH: Yeah, a week.

KM: Now, when you were a young boy growing up, before working with EMI.

JH: Yeah. When I went to Honolulu, this is the trail we go along Piʻinaʻau.

KM: The trail. You would go Piʻinaʻau?

JH: Yeah.

KM: You have to come around?

JH: Come around through here.

KM: No more road. You *hānau*?

JH: In 1914.

KM: You said the road *makai* came in ʻ23 about or ʻ22?

JH: The big road yeah, ʻ25, finished.

KM: Finished in ʻ25.

JH: It started in ʻ23.

KM: Okay. Up until that time, you were already ten, eleven years old still, you had to come here?

JH: I came through here. Not too often…

KM: Not too often long trail.

JH: The mailman used to go through here, they go at night. They had Filipino. My grandfather, he was a mailman.

GH: One of Stephen's relatives was mailman too?

JH: His dad but then they hire guys, so they only come with the car. They had a Filipino and they come night time. They travel with cash, when payday, nobody harm them.

KM: Yeah. Before, and speaking of traveling with cash then, and nobody humbug them?

JH: Yeah no more humbug.

KM: Did you ever hear a story if there used to be *'ōlohe* up here sometimes?

JH: No, no.

KM: No, you never heard? These *'ōlohe* were the kind they wayside travelers, they rob them like *pōwā*?

JH: Yeah.

KM: Some, they push them over the cliff or what.

JH: Yeah, like King Kamehameha they…his feet went get stuck in the crack they came for club him. That's why what law is that?

KM: *Māmalahoa Kānāwai*.

JH: Not to harm anybody.

KM: Before days if the families *makai*, if people wanted to come up here if they would gather *'ōpae* or something. *Hiki nō*?

JH: Well, yeah.

KM: They came.

JH: But, too far for them.

KM: No need come this far?

JH: No need.

KM: You could stay lower?

JH: Yeah. I don't know about the people from the village.

KM: Honomanu?

JH: Yeah. They had people down there, I don't know how far up they come.

KM: This is beautiful.

JH: But you see all that paper bark trees they planted that in 1934.

GH: Hey get break we go walk High Fall, we go quick before rain come.

JH: I no like go down.

GH: No, you don't need.

KM: Right there you see the fall.

JH: Yeah. This one beautiful but not running.

KM: Little bit.

GH: Look like never get too much rain.

JH: Yeah.

KM: *Pehea kou mana'o i ka ho'i 'ana i kēia 'āina aloha?*

JH: *Mahalo wau iā 'oukou. Inā a'ole hele mai, a'ole 'ike hou. Hau'oli!*

KM: *Mahalo iā 'oe. Nani a kamaha'o kēia 'āina*. Look at this *pali* up here, *pali pōhaku*. Amazing yeah!

JH: Yeah. [sound of waterfall – begin Track 20] …I been work with the bulldozer, small bulldozer.

Portion of "High Fall" West Honomanu, to Spreckel's Ditch Intake. (KPA Photo No. 1463)

KM: Yes, small what kind, D?

JH: They get [thinking] D-2.

KM: The D-2, kind real small one, the early days?

JH: Yeah. Bumby them make the International one they had the Three that's what we used.

KM: *'Ae*. This is after war time?

JH: Way, way after.

GH: They had the 10-10 and 20-10 tractor in those days?

JH: Yeah. Now, what they have?

GH: We get John Deer 400, John Deer 350, and we get Caterpillar, D-3.

KM: Oh my goodness!

GH: All the way down…beautiful!

KM: What does this fall come from, natural or man-made?

JH: They get natural.

GH: This is all tributary, High Fall, East Honomanu, Banana Intake and the main one is inside there.

JH: They had tunnel, throw the water down Uluwini.

GH: Right, but abandoned now.

KM: This *mamua* get Hawaiian name then, now they call High Falls?

JH: We call High Fall, but get Hawaiian name.

KM: Even from when you were young, High Fall?

JH: Yeah, but I think the map get the Hawaiian.

KM: We go look, I'll look at the older map see what we can find.

GH: You know why that was to indicate EMI, we had problem High Fall, we go High Fall you clean intake you go East Honomanu…

JH: Those days had only Japanese so you no can tell the Hawaiian names. You use number or…

KM: Yeah, oh.

JH: Above there had big tunnel, but now they throw all the water… [end of CD # 1 – begin # 2; Run tracks 1-3]

JH: [speaking of Honomanu Valley] …When the invaders come in they travel in there.

GH: They no can run away.

JH: Honomanu is for the jail-birds.

Group: [laughing]

JH: The Hawaiians, they *akamai* they know what going happen. Very smart.

KM: Yeah. Amazing they named this place Honomanu, how many generations ago and now war time already they come, they put like you said the prisoners there.

GH: Bring back memories over here yeah, Jimmy?

JH: Yeah.

GH: Banana Intake over there.

JH: That's where Nu'a'ailua, you look you see the water drop. One time we went on the helicopter, I look where the water come from. Hey when I look down all mountain caves. Bruce used to tell us, "hey, the tunnel leaking." Ah, that more high than…

GH: Yeah cause the cross cut is over there for Ko'olau?

JH: Yeah.

GH: Right inside there.

JH: Down here get two.

GH: Get two, one here… When we went in the last time I poke my head out the cross cut, I was trying to see where the thing stay but no can see too much because the thing fill up.

JH: How you folks went?

GH: Through Pi'ina'au, walk down. Had big *pōhaku* stuck in there.

JH: That's why the ditch went get all humbug, when the old man Jimmy Bruce was…he went raise all the old floor.

GH: Right, he went put the tile?

JH: Yeah. He think he put in more water but you choking the space.

GH: Yeah, you backing up the ditch.

JH: The water hit the roof.

GH: Right and you back up.

KM: Was Jimmy Bruce, Bob Bruce's son or something?

GH: Brother?

JH: Yeah, older brother he was with Kohala Plantation.

KM: Oh, 'cause they had ditch system too yeah?

GH: Yeah.

JH: My family is the Kohala Campbells, the poor Campbell. John Campbell was an inspector for the Territory. He lived till 97 years and he still never used glasses.

KM: Wow!

JH: He lived at Niuli'i. That's why I told Fred Trotter, "you came from the rich Campbell" [chuckling]. Me, I come from the poor Campbells. Fred Trotter is with Campbell Estate.

GH: His half-brother is Lindy?

JH: Yeah. How Lindy he still around?

GH: Yeah, I saw him last year we went to his ranch on Kaua'i, Kīpū kai. Beautiful place.

KM: It is, incredible.

GH: He's trying to figure out how to save it from the State because of I guess the last of the family passed away and they got to get rid of it.

KM: Yeah, that was a part of the way the will had been set up.

GH: Right, exactly. . .

KM: . . .So beautiful! [begin Track 4] You know *'ēlapa*? The pretty leaf, this one right here, flutter when the wind blow, the shiny one right in front of us here. On the side of the *uluhe*. You heard of that *'ēlapa* or *lapalapa*?

JH: No.

KM: It's a nice native.

JH: That belongs to the *hula*.

KM: *'Ae, pololei 'oe*.

JH: Gee, *hānau 'oe i ka 'āina haole*, but.

KM: *Nui ku'u aloha iā 'oukou, nā kūpuna, nā kama'āina…* Look at that *'ie'ie* just climbing up the *koa*, up the stump. Beautiful!

GH: Actually it's not one *koa*, looks like a…something else, I don't know what it is.

JH: Had one tree that tall, *'ahakea*, I no see that tree. That's the one they make paddle.

KM: Yes, it's related to the *kōpiko* too, same family *'ahakea* for the canoe or for the *mo'o wa'a*?

JH: Yeah.

KM: Whitish wood, I think.

JH: One time this Japanese, he old already but he know about it. He ask me, "You know what is *pā'ihi*, I said, "yeah, I know." Almost like *lehua*.

KM: *'Ae*.

JH: Now hard to find, it had red berry.

KM: *Pā'ihi*, did you hear sometime they call *'ōhi'a hā*?

JH: Yeah.

KM: Okay. *Pā'ihi, 'oia ka inoa o ka Maui*?

JH: Yeah

KM: Like you said like the *'ōhi'a*, little bit.

JH: When I first joined CCC, that's our job we go split posts. Bob Plunkett was our foreman. He knew all kind trees.

KM: What type of posts did you make? What kinds of trees?

JH: We go for *lehua* and *pā'ihi*. The one that *hā'ule* in the mud.

KM: *'Ae*. He no cut new one?

JH: No. Bob he never had children. Had one boy been *hā'ule*. He had one brother Percy, he had children. Percy I think they call him John and had one Tau'ā.

GH: This one good one for you, I show you.

KM: Uncle, we'll be right back.

JH: What is the good one [chuckles]?

GH: You know before all labor, so you see the short tunnel instead of open they just dig the tunnel, more easy.

JH: Yeah.

GH: Because no more equipment.

JH: We named that tunnel Nishi Tunnel.

GH: Nishi Tunnel, yeah [chuckling].

OM: How come, the guys name was Nishi?

JH: He was one of the working man, Nishioka, so we called 'em Nishi Tunnel [KPA Photo No. 1465].

OM: How come they never make one Hū'eu Tunnel?

Group: [chuckling]

OM: Too hard for them to pronounce?

JH: Hū'eu and Bruce never get tunnel. And Bruce was an important man.

OM: You're important!

JH: Me, no. [chuckling]

OM: Yes.

JH: Too bad all these new trees grew out the old trees, all die off.

OM: So sad, all the non-Hawaiians coming out now.

JH: Yeah.

OM: So the people that lived up here, the ditch-men, they didn't have electricity?

JH: No, we never had was all kerosene oil lamp.

OM: They had fireplace like that if it's cold.

JH: I doubt it [chuckling]. I just can imagine the sun go down you go to bed.

OM: That's right.

JH: No more television, no more radio. You got to find some old ditch-man. No more I think.

GH: All *make*.

JH: They're the ones that were over here, they really get the history.

GH: No more.

JH: That guy Willie Range from Kaupō he went live around here.

KM: Is that Joe Range's?

JH: Joe Range's brother.

GH: He still living?

JH: No.

GH: *Make* already.

JH: He and Joe Range half-brothers.

KM: That's right.

JH: Joe had a Hawaiian mom, him, he had one Portuguese…

GH: …mom, yeah.

KM: That's what he said, three time marry. Three times the papa Range when marry.

JH: You know when he had Joe he was seventy-five years old.

KM: Yeah, amazing!

JH: The old man.

KM: That's why he died when Joe was young.

JH: And Joe had a brother, Peter he died too, and he get two sisters. One married to this guy Bobby Wilhelm.

GH: Yeah, right the one live Kailua. In fact Bobby was just in the hospital.

KM: Yeah, he's still in evidently.

GH: The heart no good.

KM: We're going to try and talk with the wife.

GH: Aunty Helen.

KM: Yeah.

JH: Oh.

KM: When the time comes right, 'cause they said her memory is good for that place…

JH: You talked to Joe?

KM: We talked to him, yes, a little bit.

GH: Joe Rosa was there last night.

JH: Who?

GH: You know Joe Rosa?

JH: Yeah, the one stay Ha'ikū by Lowrie Ditch.

GH: Yeah, he talked to Kepā.

JH: *Hiki 'ōlelo Hawai'i.*

KM: *'Ae.*

JH: His father used to be on the wharf in Honolulu. So my grandparents in Honolulu they brought him back and they raised him but he was kind of big. . . The old man Joe Rosa, his wife was the last of the *lā'au kahea*, the one that knows about *lā'au kahea.*

KM: This is the mother of Joe Rosa now?

JH: Yeah, yeah.

KM: Is she Kepani?

JH: No.

KM: What *'ohana* is she do you know?

JH: [thinking] Ka'imiola.

KM: Ka'imiola, oh beautiful these names. Like your name too Keolaokalani, beautiful. *Inoa kūpuna, Keolaokalani*?

JH: [chuckles] *Kupuna paha*, but when I went look back, he came from one *haole*, Davis.

KM: Under the Davis line?

JH: Yeah.

KM: Isaac Davis *mā*…George Hū'eu.

JH: Yeah.

KM: [chuckling] You big *ali'i*, you folks!

JH: My sister and all them they no like listen. I get one sister she's Mormon and she get all the genealogy I tell you only get what was written down.

KM: That's right, not the other story.

JH: You don't get what you seen.

KM: *'Ae*, they really *mālama mo'okū'auhau* they like the genealogy like that.

JH: Yeah. That's why if you get *'āina* they *pili* [chuckles].

KM: You *pili*. That's why if you Isaac Davis, Hū'eu *mā* oh you *ali'i nui* you folks.

JH: Yeah, that's why I tell, me, "I *ali'i nui*" [chuckling]. They laughing, but one Japanese went follow up "Hey Jimmy"…too bad, I no get the book my girl in Honolulu. Hey you look at that you laugh, but when I tell them my sisters the story of how these guys went get to Ke'anae they look at me they tell, "Where the hell you get that?" The guy went call me *ho'opunipuni*, but no, real. These guys came to Maui with Ikuwā Purdy.

KM: *'Ae.*

JH: They came for catch all the wild *pipi*. Ikuwā went settle at 'Ulupalakua. But this guy Davis one of the Hū'eu line, I don't know how much down, he saddled his horse he went East Maui.

KM: That's how they came from Hawai'i?

JH: When he went to East Maui, he went meet my great-grandmother. She is family of the Pierce. And then he went like make good with her. My great-grandmother Halemanō is the *kāne*. So they been *hākākā*, he went get the scissors he went poke Halemanō by the eye.

KM: *'Auwē*!

JH: The eye, I tell them you folks don't know why his eye but this man went tell me his name was Paul Elia. You never hear of that man?

KM: Elia?

JH: You hear of him?

KM: Elia, because some Elia *'ohana* at Puna, Hawai'i.

JH: This Paul Elia last lived in Moloka'i, he get one boy over there. He married my families wife, Kalilimoku, and she's the Pā family from down Wainiha. He been marry her so they had two boys, I believe one stay Moloka'i. If you ever over on Moloka'i you ask for Elia the boy is there, he married *haole* wife.

KM: I heard a story the reason Ikuwā left Parker Ranch side he became upset with Hartwell Carter for a while. They left so they came Maui and so that's the time when your *'ohana* came?

JH: Yeah that's the time he came with that cowboy.

KM: Yeah, go work 'Ulupalakua?

JH: Yeah. That cowboy went Ke'anae. That's why I tell them…hey, they no listen. [chuckles] I think…

KM: *Pololei 'oe*?

JH: *Pololei wau.*

KM: Your *kūpuna* at the Ke'anae side Halemanō, Kealina you said?

JH: That's *kupuna* on my grandmother's.

KM: On your grandmother's side, yes.

JH: These Davis on my grandfather.

KM: Yeah, because they married into the *'ohana* there.

JH: Yeah.

KM: I see and on that map I gave you from Ke'anae you can see your *'ohana* name near Waia'ōlohe, Kealina *mā* like that?

JH: Yeah, right that's Kalilimoku. Kalilimoku they went marry the same *wahine* only Davis he no more land he no more *'āina*, he cowboy. So, Kalilimoku I think came from the *konohiki* family, so he had *'āina*.

KM: He married good then.

Group: [laughing]

JH: You know that interests me to hear that. Like my sister them they think I went listen and *ho'opunipuni*. That's why I tell them hundred words he tell you not all the hundred words *ho'opunipuni*.

KM: That's right.

JH: Maybe one or two so the two words they told me was right.

KM: You know it's interesting because what you're telling, I've heard from old people too. About, like how Ikuwā *mā* left because they went *ho'opa'apa'a* with someone at Parker *mā*, you know at one point. But then later they went back even I think the old man Willie Kaniho came over too.

JH: Oh!

KM: Sonny's papa.

JH: Sonny yeah.

KM: The papa I think. They all came and left 'cause there had been a change in the management style at Parker Ranch for a while; they came to Maui, but then they went home worked with Eben Low *mā*.

JH: Oh. Eben Low was *pili* with Ikuwā.

KM: *'Ae.*

JH: How's Sonny Kaniho?

KM: He's okay, he's more than ten years younger than you. I think he was born in '25, '26 *paha*.

JH: Oh!

KM: Are we okay?

GH: Yeah, no problem get tractor up here maybe we can have Jimmy drive. Yeah, Jimmy, if we get stuck you go get the tractor? Can?

JH: I almost no can walk [chuckling].

Group: [laughing]

GH: These buggas touch these roads now, *pilau*.

KM: Really.

GH: But you know if you don't do maintenance you cannot see the road then when you go Honomanu get stuck no can cross. Ha'ipua'ena is the only way home right there.

JH: Who the operator of that?

GH: This one, David.

KM: Uncle, did you ever hear stories about some of the plants. They say *kinolau* for certain things like that?

JH: I heard the word *kinolau*.

KM: Like the *'ie'ie* they say that's *kinolau*… What's this?

GH: This was from that Kōlea penstock line, the overflow.

JH: Yeah, you go inside there.

GH: Over here we can see 'em from the road.

JH: Yeah. You go over there get one strainer.

GH: Yeah. Good they never touch this over here. What they had before was the penstock line.

KM: Oh, I see that's what's left of the…?

GH: Yeah. From the Spreckel's Ditch they drop water down through here go down through here and the power house is here, spin the generator and the water go back in the Ko'olau Ditch.

KM: Oh! Very smart use, good use.

GH: Yeah.

JH: The one who used to take care, stay in Pā'ia. And when get a short-out, they call, and he had to come up night time.

GH: Yeah.

KM: You know uncle, this system of water management, where you take water from one area bring it down to another place but then you put it back in. It's like the old Hawaiian style of the *'auwai* and things I think, yeah?

JH: Yeah.

KM: You no waste or just throw 'em out just somewhere else. [driving] I don't think this truck going last as long as your other one.

GH: Why?

KM: Hard job you put 'em through.

GH: No, no it's good, good road. Got to work…

JH: [begin Track 5] …Night time wind the strainer block up.

GH: Got to come back up.

JH: But he live right down here.

GH: Who was that, Jimmy?

JH: The last guy was Sam Akoi AhLing. Had the old man Kanahā, he was here, but was under Maui Electric.

KM: It's amazing you know that you folks had hydro-electric plant out here. As you were saying earlier long before plenty other people had electricity already the people at Ke'anae?

JH: Yeah, Kailua and Ke'anae had.

KM: That's amazing!

JH: But these new guys, when they came, they want to put a hydro up Wailuaiki. Hey!

GH: Big noise.

JH: I tell them, "Hey, listen, let 'em go. Maybe by only making the road, they broke. You ain't going get that water! The water going right back in the ditch."

GH: Yeah.

JH: No, no they taking away. I said, "No, going right back into the ditch."

GH: Right back in the ditch.

JH: But they lose out, they hard head.

GH: They never like?

JH: Yeah. And then when we go down for contest, get about 200 guys. Get Mākena guys, and this is only about Ke'anae. But me I knew.

KM: You no like come up this road… [chuckles] Good for go down.

JH: For come up, you never going get up [chuckles].

KM: Uncle, *olonā* up at any of these places you folks heard of?

JH: No, in Ke'anae and Pi'ina'au had, where they call Kaho'okuli.

KM: Kaho'okuli.

JH: On the way to Hāna by Nāhiku, get one field, but they should keep 'em clear.

KM: Hanawī too maybe or no more?

GH: Get right along the road, we can go there if we get time.

KM: Were people…when you were a child was anyone still making *olonā* nets or things like that?

JH: No.

KM: Not that you remember. What were your folks net...

JH: They had cord though, but making, no.

KM: What were your folks fishing nets or fishing lines made of when you were young already?

JH: They order that gilling cord. Then they make their nets.

KM: Did they still dye it with *kukui* or anything?

JH: Yeah.

GH: Had ditch-man over here Jimmy? Had ditch-man, somebody lived here?

JH: Yeah. This guy Hussey, Hussey's parents.

KM: What is that lemon or citron like?

JH: Citrus, they had all kinds fruit up here.

KM: What place are we in now?

GH: Kōlea.

JH: They call this Kōlea.

KM: Is that an old name or named for the *po'e Kōlea*?

JH: Well, [chuckles] I don't know, it's an old name but…way down, they call Punalau [an *'ili* in Honomanu].

GH: Punalau, right.

JH: Down the main road.

GH: Up here we call Kōlea.

JH: Yeah. And then when you call for help you tell Kōlea on a certain ditch, otherwise the mechanic, get all puzzled up.

GH: Yeah, he don't know which one.

KM: Cause Kōlea is a big area?

GH: Yeah. Kōlea and Ko'olau Ditch. Kōlea up by Spreckel's Ditch. Kōlea by Center Ditch. Get all kinds. This is the power plant right here.

JH: Yeah.

KM: Oh, so still get the turbine or the wheel there.

GH: [stops car at old hydro-electric plant]

JH: The big post Phil Scott…

GH: Took the post? Yeah, I know. [chuckling] I know, Phil Scott took the post.

JH: You see one time this power plant was up that side.

KM: That's what you said the old one *mamua loa*. When do you think the plant was built *mauka* first?

JH: I don't know when, but Kailua guys they had electricity early.

GH: Yeah.

KM: Even when you were born had electricity?

JH: No, after.

KM: So, after 1914?

JH: I think in the twenties.

KM: The first one they put *mauka*, but had *pilikia*?

JH: Yeah.

KM: They came down, about how old were you, you think when came down here?

JH: [thinking] I went work CCC already. So in the 30s. I'd say '32, '33, 'cause '34 I worked CCC already, and had.

GH: Yeah, and then Maui Electric bought the main line to Hāna in what '60?

JH: EMI used to take care.

GH: Yeah, but the one that goes straight to Hāna? That was fifties or sixties?

JH: Maui Electric what's that company from Honolulu [thinking]… This was High Grade.

GH: High Grade Electric, yeah.

JH: And then you got Paul Sakamoto working for them, bumby he had his own company, Maunakea Electric.

KM: Oh yes, still going.

JH: Maunakea Electric take care us, I think even in Hawai'i.

KM: Yeah still they working on some of the country lines.

JH: The originator of that is Paul Sakamoto.

GH: [looking at old generator ruins – begin track 6] …The old wheel and used to discharge right back into the ditch over here.

Ruins of Kōlea Power Plant (KPA Photo No. 1468)

JH: Big leather belt.

KM: It was a leather belt?

JH: Yeah. From the fly wheel.

KM: Where was the turbine set?

JH: Right here.

GH: At the house right here.

JH: Right in the house.

GH: On the cement pad.

[Discusses *'ōpae* in ditch at Kōlea Hydro-electric Plant.]

JH: And then they had it right in the back. Those days the *'ōpae*, the water, you look right here.

KM: Right here in this section?

GH: Yeah.

JH: When I first worked EMI, I come over here they coming out with eighteen bags of *'ōpae*. Hey, they give everybody! Now days you come out with half bag you lucky. See the water from up come down over here.

GH: You know where we open the gate up on the top when it's Honomanu. This is the same stream coming down here, this is the Ko'olau Ditch.

JH: And then you go down there you get Manuel Luis (Ditch).

KM: Is there, you know the name of this gulch or stream area now?

GH: Kōlea.

KM: All of this ?

JH: Kōlea, but like below, Punalau.

GH: We know this as Kōlea. all the way.

JH: They had one trail you can go right through up there.

GH: Yeah.

JH: Get one trail you go right up.

GH: That's the one you know up top we get the road go down to the skimming dam and then the water we take 'em from Uluwini, come down this way and then had the trail over there go through.

JH: Yeah.

KM: When I spoke with Stephen Cabral the other day he was talking about some sort of algae or something that's been growing on the rocks. He said before, I'm trying to remember if it was this, he said before plenty *'ōpae* but he's noticed that there's like this black algae. Did you…or something now he says where that grows no more *'ōpae*. Have you?

JH: Really, I don't know. But there is something that's causing it. In the river they still have.

KM: Still have.

JH: Me, I think they shoot too much poison.

OM: Poison from where?

JH: They shoot grass, pesticide.

OM: Everything you put into the ground, comes out and it's not good.

JH: Right. [begin Track 7] …Yeah, see the water comes down and right in there they get a big barrel. There's this fin, and this one turn generator. That's for the generator in the back.

OM: Is this where somebody lived?

JH: No, no. They live up there on the turn.

OM: Where had the citrus?

JH: Yeah. So when they had some kind of alarm, trouble, they come down.

OM: Did this thing make lots of noise?

JH: No, not too much noise. And it doesn't change the temperature for water. Lot of people say, "Oh, it's going to change that." No, no.

OM: Wow, so it kept everything the same?

JH: Yeah. Doesn't change the temperature. But lot of people don't understand. . . You know had one Japanese he just died, he had a store in Ha'ikū.

GH: Fukushima?

JH: Yeah. He get, you know he was the last cut-stone guy.

GH: Cut-stone guy yeah, Mr. Fukushima. I think he was 82 he passed away, he was the last guy that did the cut-stone. When you go up Wailuku the wall up there, he did the wall.

JH: And then if you go in the tunnel they made arch with cut-stone. You don't know how they did it.

GH: How they put it together.

KM: That border inside, hold it together?

JH: Yeah, they put mortar. How they did the last key? [shaking head in amazement]

GH: They fit 'em so that the pressure is on the side.

KM: Yes.

GH: It cannot go down.

KM: Because the key is holding it?

GH: Right the key is holding it.

JH: Our time, we made form with plywood [laughing]. No, these old guys.

GH: They know how.

KM: Fukushima?

GH: Fukushima.

KM: He just cut stone like that?

JH: Yeah. I don't know if he did tunnel jobs.

GH: He did some for EMI I think, but I don't know where.

JH: Cut stone.

GH: He was the fire-chief at one time, retired fire-chief or fire-captain.

JH: Him he like his this kind [pointing to an old bottle].

GH: That's the one I was telling you he only drink his bourbon from Kentucky, I forget the name but only that he drink. Jimmy, you remember that sluice gate? That bar stuff? Remember when Phil Scott one time he went mainland, he went to this show. He looked, "Hey that buggah is a good one," so he bring 'em he make change over there and then was hard for open, the sluice gate.

JH: [chuckling – shaking his head]

KM: What was the idea?

JH: You mean that tool, there, never even open it.

GH: Never open, because didn't work [laughing]. The idea behind this was that this supposed to catch and the thing open.

KM: Yeah, like a jack?

GH: Yeah.

KM: But no more you got to have the teeth…

GH: Like this is the standard one.

KM: Oh, that's funny.

GH: This no can, no can open.

KM: No can cause once you let go, going down.

GH: Going down. But this I think supposed to hold 'em back.

KM: Yeah, you're supposed to have a spring lock?

GH: Right.

KM: The spring lock would lock the bar then you can take your next bite and go but…

GH: Yeah… We go.

JH: So, this is Kōlea.

GH: Kōlea.

JH: Kōlea is Korean.

KM: But also the native bird or a tree, yeah.

JH: Yeah.

KM: We don't know if this Kōlea is *kahiko* or…?

JH: What kind of Kōlea they mean.

KM: I going look through the old place names if I see [Kōlea is cited in the old land names for the region – See Volume I of this study].

JH: Like us, we just call Kōlea. But, why? [pointing to a tree] That's one orange tree. I know they had lot of oranges all up here. I used to know somewhere around here get wild Hawaiian orange.

KM: Oh!

JH: Right in this area get plenty *palapalai* and all that, I don't know if still yet.

KM: I don't know maybe the *'awapuhi* everything cover over. Oh look even get red ginger up here. Blooming up there.

JH: They had people here.

GH: Yeah, they had people here.

JH: The last ditch-man over was named Castillo, but then he went Maui Electric. He had one boy was working in the hospital, he just been retired. He get one boy in Hāna… Alfred Castro.

KM: Oh, that's the one you were saying.

JH: He married a Mailou family.

GH: Paul Mailou's family?

JH: Yeah. The guy Castro is Paul Mailou's brother-in-law. He get a daughter married a Kaiwi. . .

GH: [run Tracks 8-11; driving *makai* to main highway] . . .You and Masa Tateyama, you guys did one report for Phil Scott and Warzeka I still get 'em it was 1971 I think it was. I still get 'em.

JH: Before every month we had to make monthly report so one time, Bill Haines son, went go. . .

GH: Bill Haines was the former manager of HC & S. He stayed only a little while, and then he became the water director of Maui. But his son, Jeff Haines worked for EMI for a while…

[Discusses *heiau*; knows of a *heiau* near the shore at 'Ula'ino; also traveled trail to uplands of Haleakalā, through Kūhiwa.]

KM: [begin Track 12] . . .Uncle, did you ever hear of *heiau* up on the upland areas here or special places where they go *ho'omana* or something?

JH: The only one I know is the one at 'Ula'ino.

KM: 'Ula'ino, where is that *heiau*?

JH: That's past…by Kā'elekū, Hāna.

KM: The *heiau* was on the *mauka* or *makai* side?

JH: *Makai*.

KM: You never heard of *heiau* up in the mountains, that was pointed out by anyone?

JH: No. That's why one time a guy said, "Oh this is a *heiau*." They not putting one *heiau* way up in the mountains, if you got to sacrifice a big guy, you going get hard time to take him up there.

KM: Or you make him walk up first. [chuckling]

JH: Up the mountain I never did.

KM: You never heard.

JH: But we had a house way up the mountain, we used to live up there. From there we go to Haleakalā, make trail. We call that upper Kūhiwa. But now I think all fall down.

GH: Yeah.

JH: One time these two Portuguese went hunting, one shot the pig…Medeiros, he went get excited he died way up in the mountain. The kid Junior Freitas, he run down, he was hunting barefooted. He run down, we all went up bring him down...

KM: . . .Now this is a different bridge right?

GH: Yeah.

KM: The filled up one, this one they filled up also?

GH: Yeah, we just making one big loop. This is Ha'ipua'ena Stream.

KM: The lower section?

GH: The lower one.

KM: 'Cause when we were further *mauka*.

GH: We crossed the place where was overflow and we saw that log with the…

KM: Yes.

GH: You brought your map today, Kepā?

KM: Yes.

GH: Oh good, you know why I forgot mine in the office. Good, then we can mark where we went.

KM: Good, good…

JH: [begin Track 13] Right Pu'ohākamoa.

KM: P-u-o-h-a-k-a-m-o-a, Pu'ohā, I think is something like is startled, surprised fluttering. Neat story uncle was sharing about that. Beautiful!

JH: That Ha'ipua'ena now, that water is going down Manuel Luis (Ditch)?

GH: Manuel Luis.

JH: The water going drop in the main ditch (Wailoa)?

GH: We only get that small four inch pipe over there because the main Ha'ipua'ena on the top we catch 'em on the Spreckel's. Usually down below only small water so we put four inch pipe we throw 'em in the cross-cut over there and he go inside the Ko'olau. And then what ever left over we catch 'em down Manuel Luis.

KM: This stream here is Pu'ohākamoa. This is an important thing though, now no more water in this stream?

GH: Right.

KM: Before though, it did flow all the time?

JH: No.

KM: Not in your life-time?

JH: I don't know if before they made the ditch.

KM: You look you can tell the way the stone is washed.

JH: Yeah. You go below, that's where they go swim and all that. There's a bridge.

KM: Where does this come out on the road, what land?

GH: We show you.

KM: Okay.

GH: We going come out over there. You see this bridge here, Stephen used to tell me they put rails over here. I tell, "How come only this bridge get rail, and the other

bridge no more rail?" He tell me, "Because this one here when big water come over the water…

JH: Yeah.

GH: …come over, the waterfall hit the bridge. So I tell 'em nah no can be. He says, "You watch one day, you no work here long enough." One day I came up here the waterfall hitting this bridge over here.

JH: That's why when they put that tunnel, went save it.

GH: Yeah.

KM: Amazing! You no like come here that time…*pau*.

GH: No, we don't come big water all over forget it. And then you see get that tunnel right there with the pipe?

KM: Yes.

GH: That's where the Ko'olau Ditch is, that's where the cable comes down and we got the floater in there.

KM: Oh, where the floater is, here?

GH: Yes. This is how we can jump in over here because right by Ha'ipua'ena, if you come in the Ko'olau Ditch the buggah get one drop yeah?

JH: Yeah, yeah.

GH: Yeah, [chuckling] and the buggah you roll there's a height difference at Ha'ipua'ena on the Ko'olau Ditch that if you forget about it or don't know about it the thing going take you down maybe six, eight feet while the thing is going like that and you go to…

KM: Really struggle to get out?

GH: Yeah.

JH: One time Masa got in there.

GH: Yeah, he no can come out?

JH: No can.

GH: I know. That's why we go inside this cross-cut here at Pu'ohākamoa and we walk up stream up to Ha'ipua'ena and then we can go from here go down. From Kōlea Power House you come in you go to Ha'ipua'ena that's it.

JH: Yeah.

KM: It's amazing I guess, that more people didn't loose their lives working here yeah. You got to be real *maka'ala* the *wai*.

JH: How long you work EMI?

GH: Total this year, is eighteen years.

JH: You know more than the guy who went work over twenty years.

GH: Yeah [chuckles], I lucky, I went with Stephen, I went with Robert, I go with the old-timers and they teach me how. Just like you know Lyman Ko'omoa, he work here twenty plus years and we had you know on top Kikokiko where the intake stay. The wall washed out so we went go up there one day we mix cement and then we fly 'em up with the helicopter so we bring everybody and Lyman come. He go up there he tell me, "Gee, this is the first time I come up here." I tell, "Hah, what you mean you never did come up Kikokiko?" He says, "No, never did come up Kikokiko?" "No."

JH: He went work out of Kailua.

GH: Yeah. I tell Albert, "Hey Albert, you know this is shameful, we got to make sure everybody went every place so that in case we need, people know where they going." Lucky I spent a lot of time with Robert so I go all this kind place.

KM: That's Pu'u?

GH: Pu'u right. Robert taught me all this area.

KM: Last night we were talking with a Ko'omoa.

GH: Lyman.

KM: From last night was Lyman?

GH: Yeah, Lyman.

KM: Oh, okay. That Ko'omoa name they come from Hawai'i.

JH: Right.

GH: Yeah, right.

JH: Had Ko'omoa and Kuhia, they came from Hawai'i. Then Kuhia went work for the County, then he married a girl from there so he moved to Maui Pine, but when the tractor went *huli*, he died. Ko'omoa lived at Nāhiku.

KM: We know those names from Hawai'i island.

JH: They come from Hawai'i.

KM: Kuhia were in Kona. Ko'omoa originally was Kona but then they went to Hilo too. When you were young did your *'ohana* used to get the Hawaiian newspaper? *Ka Hōkū o Hawai'i*?

JH: Yeah.

KM: Ko'omoa used to write articles in that often. He was very active in the Hawaiian newspaper. I think maybe his brother.

JH: Not him, maybe his brother.

KM: The brother must have been the one still staying Hilo side.

JH: Yeah. The one that came here was kind of bashful. He married a Kaho'okele. Kaho'okele they're kind of active. They came to Nāhiku when they were opening the road in 1923.

KM: . . .This is that intersection again [mauka intersection on Wahinepe'e Road to power plant]?

GH: Yes.

KM: Beautiful! The middle one you said goes up to Spreckel's (Ditch) right?

GH: Yes.

KM: And the other one goes west?

GH: Goes west towards Kailua side.

JH: That one goes to 'Ōpana.

GH: Yeah, come out 'Ōpana.

KM: Oh, 'Ōpana all the way?

GH: All the way.

KM: Wow!

GH: All the way.

JH: There's lot of place where you go down… [begin track 14] No more nothing over there?

GH: No more. The only thing left over there is the pipeline. The one that goes up little bit for take the water for the house. We was working over there and then I was walking inside there, I look "hey the pipe." I walk up, I look, "hey this is where they had the pipe for the house."

JH: The house is the new one, the one close to the ditch is the old one.

GH: Yeah, that's the old one, right. In fact I had one picture of that I gave Kyomi's daughter, Jean cause when…

JH: That's where they used to live.

GH: Right, the Tateyama family. Because when Kyomi moved to town…

JH: Halemakua.

GH: Yeah, Halemakua. We helped clean the house. So you know we went throw away all the rubbish, you know *kōkua* them and then had some pictures so the boys when just take 'em in the office and put 'em in the file. And then when Stephen retired I went through the office to clean 'em up and then I found the pictures.

JH: That's why Kailua when they wreck all that old house, they never keep those old pictures.

GH: Old pictures yeah.

KM: Too bad.

JH: The old baseball players.

GH: Yeah… And then once the old-timers go you don't know who in the picture. I got this picture from my mother she says this was your grandfathers picture. I think had about ten, twelve of them September 30th, 1941 they all was kneeling in front

of Fong's store they all look like they just went *holoholo*, maybe to Kahului or something. But then I try identify all the people. So I ask some of the old people up there some they forget who. . .

JH: . . . [begin Track 16 – back at area of 2nd gate on Wahinepe'e Road, just above Highway] The old man used to live up here. His name is Hesekia 'Īkoa.

KM: Hesekia 'Īkoa.

JH: Yeah. He owned a big share over here.

KM: He got Grant Land before, was old Grant Land or something?

JH: This is mostly Hui.

KM: The big Hui.

JH: I think maybe get little bit Grant. They had many people living here they had a church, but no more school.

KM: Was Wahinepe'e Hui lands?

JH: Yeah.

KM: And when they say they partitioned the lands, do you know what that means? Sometimes they say the Huelo Partition or something like that…Ulumalu? No?

GH: Like the Huelo Hui partition?

KM: Yeah.

GH: That's when they…

JH: In Huelo they had one Club.

GH: Right.

KM: What kind?

GH: It was like a, you read that Huelo Hui Partition Agreement, Kepā?

KM: *'Ae*, yeah.

GH: One day all the land was Hui land and then there was some problem with the taxes and all that stuff.

KM: Yes.

GH: What happened I guess was HC & S came in and basically said, we going pay off all the taxes but all you guys Water Rights, we get 'em but we going give you guys fee simple land, X amount of acres, with the right of a one inch pipe line for domestic. That solved the problem of undivided land where some of these families owned, and they had so much share they could own fee simple land.

KM: Yeah.

GH: But in return they had to surrender the Water Rights, that's how they did it in their days.

JH: Those guys who had *kuleana* they had the Water Rights.

GH: Apparently so, right. I don't know if the Huelo Hui Partition was in 1926 or something like that so, I don't know how they did it but had that Chinese guy over in Huelo, that Akana li'ili'i he was the…

KM: Big owner before times.

GH: Yeah, big before. But him *Pākē* guy, they give him Hawaiian name 'cause no can say the Chinese name. So they named him Akana li'ili'i. [chuckling]

JH: Wahinepe'e is up here and down.

KM: Yes.

JH: I think EMI changed all their share for up here and they took all down. And the other people had their share…

KM: [run Tracks 17-18] … So when you were young yet?

JH: Yeah.

KM: And you said they had pineapple going back towards Kailua side?

JH: Yeah from here hard. But to take 'em over. Then lost lot of…the cannery stopped picking. They had great pineapple here. And Takabayashi, he had a tailor shop. . .

Group: [return to highway, continue drive to Ke'anae]

JH: See these *huole* live over here get one spring down here used to pump.

GH: Yeah, the water come up.

KM: So after Wahinepe'e, this bridge crosses what stream?

JH: Pu'ohākamoa.

KM: This is Pu'ohākamoa.

JH: Wahinepe'e is the flat up there.

KM: Yeah. So the stream we were up above?

JH: Yeah.

GH: This is the same stream. We crossed this stream one, two, now three times.

JH: These places they had very important legends. That's where the Pu'ohākamoa happened, that's why had the island out there.

KM: The little island you said?

JH: That little island out there, they call that Ke-ō-puka.

KM: Keōpuka.

JH: One time had an avalanche over here it made a big, big noise. That's when the chicken when *pū'iwa* that's why they call Pu'ohā-ka-moa. That's how had that island from the avalanche but of course the soft part, the sea had wash out, so it left the big part. That's where get the island.

KM: Keōpuka Island.

JH: That island, get one medicine they was trying to know about that, but nobody know only…

GH: That's the one you was telling about, you went climb up?

JH: I went climb right on the…the only guy today know about that is Bob Hobdy.

GH: I just was talking to him yesterday, I forget ask him about that.

JH: He went on the kayak.

GH: He go look.

JH: Up here is Puʻuokoholā, someplace up there.

KM: So above here?

JH: Yeah. Before had one old mango tree I don't know if that thing still there.

KM: This bridge we coming to?

GH: Haʻipuaʻena.

JH: We had one road.

KM: Haʻipuaʻena. Above the Haʻipuaʻena Bridge, on the ridge is Puʻuokoholā?

JH: Yeah. They had the Trig Station.

KM: Trig Station, yes.

GH: You know on our EMI map, Kepā, get all the EMI Trig Stations on the map. You can see ʻum. But most of these sites here, EMI put all the trig stations in because they were the people that first came.

KM: Doing the survey?

GH: Yeah, the survey as a part of the ditch construction.

KM: You know that Puʻuokoholā, you know is there a *moʻolelo* you think to that?

JH: Yeah, supposed to be but, I don't know the…you got to make up [chuckling].

KM: No [chuckling].

JH: Something to do with the whale.

KM: Yeah, *koholā* maybe they see or something from over there.

JH: I don't know why they call it that. Don't tell me the big whale was…and the head land up there [chuckles]. That, you got to make your own *moʻolelo*.

Group: [laughing]

JH: When we reach down there I show you where Kūʻeleʻele.

KM: *ʻAe*. . .

JH: This is the part they call Kūʻeleʻele, the park is Kaumahina. They call that Kaumahina because when the new moon, you going see the new moon. And then all of the sudden it sets, so you stand in the dark. They call over there Kūʻeleʻele. Over here Kaumahina when you stay Keʻanae new moon you going see the moon then you don't see ʻem.

KM: Beautiful yeah. So each place has it's name, this little park now, made up here.

JH: Lot of people they don't know about the *moʻolelo*.

KM: *ʻAe*.

JH: And then right down here is Kiloʻāinuenue. Whenever the rainbow starts it's over here. Over here get a little water spring, and when the sun catch ʻem you see rainbow. Every time when get rainbow it starts over here, right at this gulch. They call it Kiloʻāinuenue.

KM: Sort of the first big horseshoe bend, a little valley past Kaumahina Park.

JH: Yeah. You know a lot of people living in Keʻanae, they don't know. They only live there. So the outside people come and tell them what is what.

KM: And uncle, where you see Keʻanae [indicating view from along road] and then the island out there?

JH: That is Mokuhōlua.

KM: Mokuhōlua?

JH: Yeah. Inside there get a hole like.

KM: You also were talking about Moku Mana the other time?

JH: Yeah, Moku Mana is over.

KM: Farther over?

JH: They call that Bird Island, but no, it's Moku Mana.

KM: Two you said?

JH: Yeah. I have a picture of that.

KM: Yes, you showed us.

JH: When you listen to the legend it makes sense.

KM: Yes.

JH: And then they call that Pauwalu, where the eight guys got eaten by the shark.

KM: Out here in front towards the Keʻanae Flat, there's also a little rock islet out there. See right out there in front of Keʻanae?

JH: Yeah. That is Mokuhōlua.

KM: This little rocky one here?

JH: Yeah.

KM: Oh. The big one past the other side of Keʻanae?

JH: That's Moku Mana.

KM: *ʻAe*, beautiful!

JH: *Mana* can be powerful. But there, that means just like twins.

KM: Branch or twins or two.

JH: This point they call Hāliʻi [the high point on the west side, overlooking Honomanu].

KM: Hāliʻi. And *Honomanu ai malalo nei*?

JH: Yeah. The one way inside, they call Punalau and up, we call Kōlea.

KM: That's right. Punalau is an *ʻili* name you look on the old map I give you for Honomanu, you'll see that it's the *ʻili o Punalau*.

JH: Oh!

KM: Get *ʻili o Halelāʻau*…Honomanu. Get *ʻāina kuleana*, that's where the old man Atai was living *makai*?

JH: Yeah, *makai*. When Atai first came over here he lived on the other side. He was living on Territorial land and he moved inside.

KM: That's Honomanu we just passed, the stream?

GH: No.

JH: That's Punalau.

KM: This is Punalau, okay. Honomanu is the next one.

JH: I see somebody cutting line over here.

GH: I saw that Jimmy, right here. I think this is one lot or something over here.

KM: Old homestead, maybe?

GH: Yeah, look like somebody. I heard before that guy that owned that lot you know the one Gomes, he build houses?

JH: Yeah.

GH: I thought he bought that.

JH: The one the other side, had this guy Tin Fook, but used to be that old man Perreira from out Kula. He had land Nāhiku.

GH: I don't know which one.

JH: Simeon Perreira? But I think it was Tom Tin Fook bought ʻum. Over here was clean one time. John Sakamoto he used to plant banana.

GH: And this is Honomanu. This is where the people supposedly pick *pohole*.

KM: That's *hōʻiʻo*.

JH: That's *hōʻiʻo*.

KM: I could see the *hōʻiʻo*.

JH: [chuckling] That's why, you have to correct them, they think they're right but they're not right.

GH: That's *hōʻiʻo*. *Pohole* and *hōʻiʻo* is same family?

JH: *Pohole* they grow most upland.

GH: *Pohole* upland, this is *hōʻiʻo* right?

JH: Yeah. *Hōʻiʻo* you can find it way down.

KM: This shiny leaf like that.

JH: Yeah.

KM: I think *pohole* is not shiny.

JH: Yeah.

GH: When you eat it, what?

JH: *Pohole* get little bit slimy.

GH: I see.

JH: So you get difference, but they tell you no, "In Hilo, it's different." When the power plant used to bring their light down come up there on the hill. You know where the air pole is, right up there. Had one Alaskan guy came down he climb up here the… [chuckling]

GH: …Excavator. Yeah, that buggah too good. You know Stephen and I went take him mountain. The last day the guy was on the job, we take him mountain. We took him up Piʻinaʻau go across to Wailua go Honomanu, Stephen said, "What, you think you can make this kind road over here?" He tell me, "Oh boy, solid rock!" That's the one work for Goodfellow?

JH: Yeah.

KM: What year was that the slide happened.

JH: Two years ago.

GH: Yeah, two years ago right over there.

JH: I used to work all on this road. Had one guy was blown up by the powder.

KM: *ʻAuwē*!

GH: Jimmy, over there was *pilau* because one year had big rain the big wash out but they throw all kind stone and mud and everything and they pave ʻem over.

JH: Yeah.

GH: That's how come wash again.

JH: Some day under here going break, and then that's the end. They have to make tunnel.

GH: Yeah, they got to make tunnel.

JH: This used to be the worst place, every time slide. But now you look, nice. They don't know, but that's the worst part of it.

GH: Over here, yeah.

KM: Uncle, do you have a song for your *ʻāina* out here at Keʻanae that you *aloha*?

JH: Yeah, they had one song composed by this guy George Akiu. I know the words, but I'm not a singer. [begins singing]

Aloha no Keʻanae, ka home o ka ʻehu kai.

ʻĀina ua kaulana, wai kau i ka lāʻau.

That's why Keʻanae is famous for the flume, nothing else.

KM: So "*wai kau i ka lāʻau*."

JH: Yeah, the water up on the *lāʻau*. That's why if anybody tell you about Keʻanae is famous for taro. No, it's famous because of the flume. The flume was hanging on the lumber.

KM: Yeah, lumber like that. Beautiful. . .

JH: . . .This is Hawaiian bamboo over here. Before plenty over here but they no take care. Bumby no more.

KM: Did that little valley over there have a name?

JH: Nuʻaʻailua. . . When they cut down this cliff here, had a name over here they call Poupou. Poupou means steep cliff. I think that's the lookout of Keʻanae right down there. They look they can see way down there, way this side. They call it Poupou, that's why when they came and cut the road plenty people angry. Me, I went like, look now after all *pau*. Otherwise every time car stuck. Now this place that's where I found…Gee, if I was strong enough, I take you up there. This man Jim Chamberlain he lived down Keʻanae, he went dig his own ditch, now he went tap on the stone, he went put the name and the date, his name down and put the name of the gulch. Plenty guys don't know.

GH: What's the name of the gulch?

JH: [thinking] Waihāʻowā, that means the water been separated.

GH: How far up?

JH: It doesn't go Nuʻaʻailua. [thinking] I don't know how far maybe by Nuʻaʻailua.

GH: Big stone he went make ʻem on?

JH: Yeah. Someday you try go up there.

GH: I go walk. Left side or right side of the stream?

JH: Right on the intake, he went dig one for go down. Right over there get one flat stone.

GH: Get one intake up there?

JH: Well, we used to use the intake for YMCA. Until they get County water.

GH: Yeah, right.

JH: When they had County water, they went do away with it.

GH: Right.

KM: That Waihāʻowā is just before the YMCA?

JH: Yeah.

KM: This little stream, this is the Keʻanae or this one here?

JH: This one?

KM: Yeah.

JH: This the one they call Piʻinaʻau. And this one here, they call Palauhulu.

KM: You were telling us there was some sort of a story.

JH: If you go from way up there this comes from Ka-nō [as pronounced], way up.

KM: This is Palauhulu?

JH: Yeah.

KM: Palauhulu you said had a story about that I think?

JH: To me had a story. And Pahupiʻinaʻau is one Trig Station on top of here.

GH: Aunty Mina.

KM: She went Kahului today, *hololoholo*.

GH: Today Wednesday yeah she go *hololoholo*. In fact Kepā, the first time we saw her was on a Wednesday, we were at A & B?

KM: Yeah.

GH: Nelson Akiu's mother's house.

[stop at Keʻanae Base Yard]

JH: [begin Track 19] I used to live right over there. And I get one house down the gulch. But the one up by the watercress, I gave my daughter.

GH: The Keʻanae people had a dry day, wet day job, poison and who the ditch man.

JH: [begin Track 20 – Asked if he'd heard of *huakaʻi pō* (night marchers); discussed the old *alaloa* (trail system) and recalled an event in the Keʻanae EMI Base Yard.]

…The *haole* boys and *pāʻele* boys, I tell, "Well, as long as you was not Hawaiian, If Hawaiian I wouldn't believe because I live over here how long, never happen to me." I told him, "That is a *menehune*," they look and say, "What is the meaning of that?" I said, "Well, usually supposed to stay only one week, you stayed too long. [chuckling] They tell you get the hell out of here [chuckling]. I told my daughter, she never believe me. One day one *haole* boy came, ask if I could go look at one building. "Why." I was here and four little guys. He called me, I told you, but you never believe me, no I come back. He take him to the Maui News, that would be a good story.

KM: Along this old *alahele* at Keʻanae or places like this, I guess the old people still walking?

JH: Get, certain time of the month.

KM: Did you ever see *huakaʻi pō* or *pō Kāne* time?

JH: No. I hear music, but I never did see *huakaʻi*.

GH: The old road over here, when they made the new road?

JH: The new road?

GH: Yeah, the existing road.

JH: Long time ago they made that road but they used the old road. Maybe over here was alright but when you go up the hill, all switch back. They made their own trail. When EMI been start, they went use EMI road.

GH: Yeah.

JH: EMI take care. According to the old road that's where the president's wife wanted to know, she think that was the old road. They went call me for, I went over there that guy Sam Ka'ai, he talking so I let 'em go. They think, the President's wife, that this road to Hāna is on the old Hawaiian trail.

GH: It's not.

KM: No.

JH: The only part on the old Hawaiian trail is from Nāhiku School to 'Ula'ino. You went on that?

GH: Yeah.

JH: That's the only part. The rest no more. Waiakamō'ī, the old road he get, come through, come Wahinepe'e, but nobody use.

GH: That's when they dedicated the Hāna Highway as a Historic Passage. That's why Kaupakulua, they put that stone marking?

JH: That stone they call that Kaupakulua Road, but actually that is Pe'ahi. But the road goes to Kaupakulua. . .

GH: So when Mrs. Clinton came out here she saw the road, she thought was the old road.

JH: The old Hawaiian road.

GH: But that's not?

JH: No. Lucky had EMI, most people went use the EMI roads.

KM: Otherwise only narrow *alahele*?

JH: They went make, like from Wailua to Kopili'ula, that road they had been surveyed. Had a new cut. This guy Covel Robinson, he was the surveyor. Was under Sam Kalama. That road they went cut new.

GH: Yeah, that's right because out here no more survey.

JH: No more.

GH: I know they say the center line of the road, twenty-five feet both sides has the right of way.

JH: From Wailua to Kopili'ula.

GH: Get survey?

JH: Yeah. The guy Covel Robinson was a brother to the one up Kula.

GH: Foster Robinson.

JH: Yeah, that's his brother. He was young those days, but I was young boy. I used to pound *'awa* root. He like to drink *'awa* [chuckling]. I pound.

KM: Was he part-Hawaiian, Robinson or pure *haole*?

JH: Get little Hawaiian.

GH: I think so, I remember him because my grandfather and him were good friends. I remember one picture of Foster Robinson, my grandfather and couple other friends. I don't know where they was but they must have *inu* plenty and they stay in *hula* skirts with the coconut shell over here and they you know [chuckling].

JH: That Robinson, the lady stays down at Kū'au, George Kahanu wife, Beatrice her name. Her father was Cockett and her mother was Robinson. She's still living in that house the old house. That's the Robinson Estate.

GH: The one up Kula where Foster used to live now they name 'em Casa Blanca.

JH: Oh? And no more family up there?

GH: Not that I know of.

KM: You mentioned *'awa* like that. You folks still would go up gather *'awa* or you grew at home?

[*'Awa* formerly grown and collected up at Nu'a'ailua.]

JH: No, we go up. Those days, you just walk up little bit in Nu'a'ailua, on the slope, all the *'awa*.

KM: What kind of *'awa*? Had names?

JH: Yeah, they had names but I only knew three kinds. One time I was Kaua'i at the airport had this young boy came and he got *'awa* from Kaua'i. I tell him, "How many varieties?" He tell me, "Nine" [chuckles]. Get nine variety of *'awa*.

KM: You folks when you were young someone even your *kūkū*, did you make *'awa* for your *kūkū* them or?

JH: They used to tell me go pound.

KM: You would go up gather sections of the root?

JH: No, no they went and get 'em but pounding.

KM: You got to pound it?

JH: Yeah.

[Discusses respect of resources; traditional practice of always putting back, when you harvest something.]

KM: Oh. How, you know it was interesting you had shared, like even when we went to go get, you talk about the *mai'a*. That when you take you always put something back?

JH: Yeah.

KM: Was that the style of your *kūpuna*?

JH: Yeah, when they take something out of the forest.

KM: You plant some back.

JH: Every time somebody else have…today, they take everything and even take the dirt.

KM: Wipe 'em out, wipe 'em out. What did you pound your *'awa* with, like a *pōhaku ku'i*?

JH: No, they had one bar and they made kind of round and then they pound.

KM: A bar, metal kind?

JH: Metal.

KM: *Ua lohe 'oe, naunau lākou*?

JH: I think before. I know the *'uala*, sweet potato, they make for drink. They chew 'em. The old people they used to drink the potato.

GH: Yeah.

KM: So, then they spit…You must, got to be hard up if you want to drink that

Group: [laughing]

[Retells the account of the family shark raised at Kaho'okuli; and how another shark was cared for by it's mother, near the shore of Ke'anae.]

JH: . . .When you go back Hilo try look for the Akionas…Their dad was from here, the dad has some interesting stories to tell me but I scared I no go look. But I wait till I get eighty-seven years, then we going over there, up Pi'ina'au. Very interesting.

KM: Get *ana* inside you said?

JH: Uh-hmm, right in the *ana*. This old man used to live up there, now they trade with Ke'anae. They trade fish for what they raising. Now one day they came down. These people lazy they never fish, so they put fish bone, fish tail, all in the bag. They go up home, and when they pour out, get the fish tail. But this one tail turned into one shark. They raised the shark, when the shark came kind of big, he came down that river. And that river went down at the end and then under there, under Ke'anae get one tunnel. I know where the stone [Luahi'u] stay; the tunnel come out by Dr. Keppler's. Nobody ever…when you look, it's all block up. That's where the shark go.

KM: The shark would come in, could come in and out?

JH: Yeah. If you get trouble the other side, go through the shark he save the family.

KM: Was that *'ohana* from up mountain, Pi'ina'au?

JH: I don't know from where, but the shark came from this fish-bone.

KM: Interesting.

JH: And then the one right down here over here, the same guy, Akiona. When he was small, when he was living on the flat. One day his aunty gave birth, when they look, hey the baby, funny. The bottom part was fish and the top part was a human being. They run go see their grandfather, when they came back no more, the thing went go down the river. I know where. It lived on the river. When it came big, went down the ocean. Every time the lady go catch *'ōpihi* she feeding that.

KM: *Hānai poli*?

JH: Yeah. I know where the place from the old man. He told one other story but he went on tape, so Larry Kimura them brought to me, 'cause I know the place. I explained to them what that old man was talking about. But he really know. Edward Akiona, he really know.

KM: Has a place name for that place?

JH: They call that Kilo.

KM: Kilo.

JH: Right down here. That old man he had plenty history.

KM: Inside get stuff to make *olonā* in that cave or something?

JH: I think, he told me had canoes, get cloaks all kinds he wanted to show me but he never did find. Somebody had blocked 'em off. These two boys I think they found the stone wall. I told them wait till the full eighty-seven years [chuckling]. Garret got to be around when we open that.

GH: You call me, I take you up there.

JH: I hope I be around.

GH: You going be Jimmy, I guarantee.

JH: My family in Hilo is the Keamo family. The older ones they all gone, only the children left. Had one boy, I think in the police. . .

KM: When's the last time you went work *lo'i*?

JH: [thinking] In 1980 [chuckling]. I work the *lo'i* no can come out [chuckles].

KM: The mud, stuck.

JH: You know all these guys they talk about *lo'i*, I said but me I went Smithsonian. We go show the people how to plant taro, how to pound *poi*. When those people look they went home make *poi*, they had taro but they just plant 'em in the *kahawai*. They went home they make their own *lo'i*. Had three *lo'i* and we went irrigate 'em with the faucet water and went hit the last *lo'i* get one big tub over there, they pump 'em back. You see how smart the *haole* [chuckling].

KM: Too good.

JH: The Hawaiians got to make like that.

[Ditch system does not affect Ke'anae taro lands; Ke'anae springs used to irrigate the *lo'i kalo*. Describes old days — the community worked together to care for *'auwai* and field system.]

KM: Your *lo'i* down here, this spring the river… The Ditch system you said doesn't affect your water down at Ke'anae?

JH: No.

KM: You have springs down here?

JH: Yeah, we get spring out here.

KM: Do those springs have names?

JH: One they call Waiopuna.

KM: Waiopuna?

JH: Waiopuna it's right up here. The road to go down, all block off plenty water. I think that's the same water that goes to 'Ōhi'a. The 'Ōhi'a Spring, *kahawai* is Waianu.

KM: You said *anuanu kēlā wai*?

JH: *'Ae, 'ae*.

KM: So when you flood your *lo'i* here at Ke'anae the water you can flood it right away because it's cold?

JH: Yeah.

KM: Don't come *palahū* or something?

JH: Yeah. The water you got to let 'em flow. If you hold 'um still, going *palahū*.

KM: So you folks when you plant your *kalo*, do you flood from the very beginning?

JH: No. When you get about two or three leaves. Why they flood 'em is no more grass.

KM: That's right for keep the weeds out.

JH: No more. That's why Hanalei they flood 'em, you go Hanalei they hardly get the *'ohā*. When I was working Waiohia, I go with Hanalei, he pull the taro no more roots but small. "Ah, this one not ready." I no talk. You talking to the guy who knows taro. Young taro you no can just pull 'em all *make* already, no more roots.

KM: That's right.

JH: You know that one, old. You know why they plant 'em close so they only get taro, no more *'ohā*. You plant 'em far apart then you get the *'ohā*, now my boy was telling me get one new kind *hulī*. I never see 'em one new *hulī*. I don't know from where.

KM: Not Hawaiian kind then?

JH: I don't think so.

KM: Mess up yeah. And then when someone they introduced that snail, they think they bringing in new stuff, sometimes no good.

JH: Yeah, this snail is no good.

KM: Apple snail or something?

JH: Yeah. That one he eat the taro, he eat anything.

KM: Oh, *aloha*.

JH: That's why I *aloha* over here.

KM: Not like your time, before days? And all the families worked together?

JH: Yeah.

KM: How about, did they have days where they would go clean the *'auwai*, go up the mountain or streams like that?

JH: Yeah. Certain days they clean *'auwai*, everybody go.

KM: Everybody go.

[Does not believe that EMI takes "all the water;" also observed that EMI has the men and working experience to maintain the ditch system. Ke'anae and Wailua people have springs which feed their system of *lo'i kalo*.]

JH: Today, you ask, "Why you no plant?" "Oh EMI take all the water" [chuckling] So lucky Garret he *malihini*. If he was like me or Stephen, they say, "that's the two guys" [chuckling]. Stephen he no care, he run over, they talk about water. He knows. They don't know. Us, we know. Garrett, they don't know him.

KM: You think that, what do you think about as you know there's going to be a new License come up for the ditches? If they continue using the water or, is that…? What do you think about their continuing to use the water for the ditches?

JH: Well, if going use, the only people who know is East Maui Irrigation. County one time wanted to take over, Elmer Carvalho, he cannot they never give him. He started first. He cannot, he no can find men like those that work for East Maui Irrigation. You get County guys they look at the water they ain't getting in the ditch [chuckles].

Most of the *haole*, they come, they like see water in the stream and all going to waste. I always tell them (EMI), "you give the people the water, don't let the people come to the water." I said "they close one plantation all the plantation guys come live around the stream all you get, nothing." They're worse than snails, they eat everything up, and you get nothing. Sometimes, no, they think otherwise, these new ones, or our kind. I tell my kids don't you get involved with them.

KM: Main thing when you work the land, if you need the water you can work the stream, clean like that.

JH: Yeah. And then if you don't have enough water then you go to EMI. But to me that's nothing, you get spring water. When their springs all dry, then you go to EMI.

KM: The Ke'anae people, Wailua people like that…?

JH: Spring water.

KM: Spring feed. These *'āina* are good, get springs. But some *'āina* no more spring.

JH: Yeah. On the way over plenty all going into the ocean.

KM: *'Ae*.

JH: Nobody down working. That's why they supposed to go get the water. No, too much expense. You get this stream Hanawī, you get about twelve to fifteen million gallons going into the ocean. Way down get one tunnel come out, the water flow. See, when they went drill, they never get to where the water start, but it came way down the road. They get one house right along side the road. They only pump about seventy thousand. No more even one million.

KM: Hanawī?

JH: When they take water they. . .otherwise they got to buy the water. Maui Pine that's the only one.

KM: I guess all of these places before had *'ohana*, families in the old days, the old Hawaiian families. Your grandparents, great-grandparents time. Must have had people in all of these little valleys like that, yeah?

JH: Oh, yeah. When I walk someplace way in the mountain, get *lo'i*, so had people. They had no way, no more car so they got to live. That's why I tell my *keiki* you want to eat dinner you just go to the hamburger stand [chuckling]. Our days take you three days by then you *make* [chuckles].

KM: And then no more hamburger stand to begin with [chuckles]. You got to every day yeah. I guess the *kūpuna* had many of things, like about "Your hands, work… *Maika'i ka hana a ka lima, 'ono no ka 'ai a ka waha*" these kinds of things.

JH: That's why when they get no more fish or what they go, they call that… [thinking] *papa li'ili'i*. That means they go hook small fish, they go by the *kāheka*, hey, enough for pass a meal. Or they *lāwalu* the *lā'au* leaf, you eat, you no like eat you starve.

KM: [chuckles] And the *kūpuna* too, they say "*A'ole uwē 'ana ka 'ai iā 'oe*…" The food not going cry for you. "'*O 'oe, ka mea e uwē 'ana i ka 'ai, mai ho'opau.*" No waste. . .

JH: . . .I can talk and I can say the old days. My children, *pa'a* their *waha*. . .

Group: [Prepares to leave Ke'anae Base Yard and drive to Makapipi. The following narratives are the key points of interest to the present interview program — for example, those which describe: land and water use practices; changes in the landscape; residency; ditch development; native practices and customs; and resource use and collection.]

JH: . . .You know they were going to put one sugar mill down Nāhiku. You ever did go down there?

GH: The sugar mill by where, the landing?

JH: Where that shack. You went go down there? Get one shack down there.

GH: Yeah, the cabin I stayed down there.

JH: Over there.

GH: The mill over there?

JH: Yeah, we went put the mill over there. But when they find out they better take the water out. That was down by the landing, they made a stone wall, prepared it for the mill over there.

GH: Oh, I didn't realize that. . . This is what, 'Ōhi'a Spring?

JH: 'Ōhi'a, yeah.

KM: So this area here, is 'Ōhi'a?

JH: Yes, until here. But the spring, they call it Waianu.

GH: And the spring is right here.

KM: Who's living down here now?

JH: My daughter.

KM: So this is your *'āina*?

JH: Yes, used to be my *'āina*.

KM: How many *lo'i kalo* did you have in here?

JH: About this much, only now we plant watercress.

KM: So about four or five *lo'i*?

JH: About. Then we had rubber trees. When I was working the prison camp, we went and tapped the rubber trees.

KM: This was back in World War II time?

JH: Yes. And we had produced rubber. A lot of guys, they were talking about rubber, "Oh Nahiku Rubber Company." But I said "No, they went broke." They planted the trees, but I was the one, I took the inmates from Oahu Prison. They sent 'um over, and I went with them.

KM: So you took them out to Nāhiku, where Nahiku Rubber Company was before.

JH: Yeah, Nāhiku had the most. One guy had down there. Everyday, we go and tap the trees. But you have to go early in the morning, come about 10, pau, they stop.

KM: Hmm. What were they using the rubber for, out here?

JH: They never use 'um out here. We sent 'um away. I don't know what they did with it. We only make 'um in strips.

KM: Hmm. So this is Wailua now, that we're passing?

JH: Yeah, Wailua, you go down. This part of the road was the new one. Never had road before. The road was either you down there, *makai*, or you go up Pi'ina'au.

KM: *'Ae*.

JH: They call this, here, Lākini. That's where Helen Nākānelua is. But she's Akiona.

KM: *'Ae*. Now Lākini. that's an old name?

JH: Yeah. [chuckling] How you interpret that?

KM: Oh I don't know, hard, yeah?

JH: Yeah.

KM: *Kini* is multitudes, many.

JH: Yeah. And *Lā* is the sun. Maybe the sun was here all the time.

KM: Yeah. So maybe a lot of sun.

JH: Yeah. . .

KM: Yeah, amazing, every place name can tell us a story.

JH: Yeah.

GH: [stops at Kūpa'u – Ke'anae Valley Overlook]

JH: This is what they call Kūpa'u. That's where Anthony Tam is. But right here is State land. But the one above is Tam.

GH: This is Ke'anae Valley. Jimmy, 'Ōhi'a Spring, did that ever go dry?

JH: No.

GH: Even drought, still flow?

JH: Small, it goes small, but never dry. But me, I think that comes from that place Waiakuna. The one that goes to Ke'anae. Over there, I think, get one passage. Right over there, get one waterfall, one big pond. But too bad now, get hard time for go up there.

GH: Yeah.

JH: We used to walk up to the bridge. We had one trail where we live, but they never keep up. You go over there, nice.

GH: You know Kūpa'u, the Chinese used to grow rice here?

JH The Okinawans, way back in the '20s. So they had the Okinawans raise rice here.

GH/KM: Hmm.

JH: And then they get wagon, they take 'um all the way down to the pier.

GH: Ke'anae?

JH: Yeah.

GH: And where did they used to ship it to?

JH: I don't know where they ship it to.

GH: Hmm. . .

JH: So this is Kūpa'u, the flats, and way up there is Kikokiko.

KM: *'Ae*. And Hau'oliwahine?

JH: Hau'oliwahine is way up the other end. That one goes this way.

GH: Yeah, the tunnel, it goes backwards.

JH: But in case, the water flows, it goes to Ke'anae.

GH: That one goes down to Palauhulu?

JH: Yeah. And then up here, get one Kūlani.

GH: Yeah.

KM: What is that, Kūlani.

JH: We have one small intake.

KM: Hmm.

JH: But I think, had people living up here before. I found a big kind tub. Only the handle, no more the bottom. So I think had people living up here.

Group: [departs from overlook]

KM: When do you think the Okinawans stopped growing rice at Kūpa'u?

JH: Well, when 1923, already stopped. I don't know how long before that, they came. Not too long.

KM: Hmm.

JH: Then after that, Tom Tin Fook, he's family with Apoli'ili'i, he took up the place, plant taro, bananas, vegetables.

GH: When did Anthony Tam get Kūpa'u.

JH: I don't know, as far as I remember, from his dad. He's older than me, 90, I think.

GH: Wow!

JH: Waikani is that waterfall, and they call this Wailuanui.

KM: *'Ae*.

JH: And the other one, Wailuaiki.

KM: *'Ae*.

GH: A lot of people call this [small fall, nearer the highway] Waikani, but actually, it's that one.

JH: The falls is that one. You know why, when the water rough, it makes noise, *kani*.

KM: Hmm.

JH: That water got to rise up.

GH: Yeah, it has to go in the pond before it hits the ditch.

JH: The ditch came up here, but when they made the road. . .

Group: [Stop along on road, waiting for an opening in traffic – film crew working in vicinity.]

KM: …Wailuanui is so beautiful.

JH: This bridge, the guy Akiona, contractor, he built this bridge.

KM: Are there two Wailuas on Maui? Is there another one?

JH: Yeah, way over, Kīpahulu side.

KM: Hmm. …And you said that Number 6, 7, 8, & 9, all feed into?

GH: Wailua, they are intakes.

JH: They gave 'um numbers because had Japanese all take care.

KM: Yes, you said easier to pronounce. . . (20 mile mark is still Wailuanui)

GH: Now this is Wailuaiki.

JH: Yeah, and when you hear guys tell Number 38, that's the rain can up here.

GH: Yeah. and the top one is by a *loulu* palm.

JH: Yeah.

KM: Uncle, Garret just mentioned *loulu*. In the old days, did your *'ohana* weave *loulu*, or weave *lauhala* like that?

JH: Well, I see a few, but I don't know if that's…they get different kind of *loulu*. The one we get up here, that's the one you get seed, you can eat.

KM: Yes, *'ai hāwane*.

JH: Yeah. But hear on Lāna'i, it's like crawling kind.

KM: Yeah. (21 mile marker Wailuaiki)

JH: Before old days, get one trail, so we go up the ditch trail, we climb up there.

GH: The road used to be over there before.

JH: Yeah, we walk up. Had these guys, George Gohara and Takumi.

GH: Yeah, with USGS.

JH: So when you hear the guys say "38," it's right up here.

KM: So that's the rain can?

GH: Yeah.

JH: Right there.

KM: Oh, right there, that's *olonā*. Your memory is sharp.

JH: That's why, one time Wesley Wong, like *olonā*, you go certain place, he come pick up.

GH: This one is East Wailuaiki. . .

KM: . . .Are there *neneleau* trees out here, the native sumach?

JH: I used to see before. I don't know what happened to them.

KM: Hmm. . .

Group: [stop at Kopili'ula – walk to stream. Note that water does not flow in stream below the ditch intake. (see photo on next page)]

KM: . . .So this is Kopili'ula?

JH: Yeah. See before, they had the road open, we had to come here and catch car. . . When we made the Kopili'ula Flume, we'd run 18-ton trucks across this bridge.

GH: Wow!

Kopili'ula Stream – Ko'olau Ditch Intake (KPA Photo No. 1469)

JH: But now, cannot, you end up paying for the big trailer. [pointing out a plant on the ground] This is *laukāhi*.

KM: Did you folks use that before?

JH: Yeah, yeah. Even now, you get boil or high blood pressure.

KM: Hmm, a tea?

JH: Yeah. [pointing out route alignment up west bank of Kopili'ula] That's why, over there, you go right through. We never had car road, we had the company road.

GH: That was the EMI Road, it goes all the way around. All the way to where we went up, the other day, at Kikokiko.

KM: Oh so this is the road.

GH: Yes, to Kikokiko and come down Pi'ina'au Road, where we went.

KM: Amazing. And from Kopili'ula, this section of the road, went out to Hāna?

GH: Right.

JH: That's why when they had the rubber plantation, they had this road. And then when they started the ditch, they brought all the gravel from Nāhiku. That's why this side had road. I think Wilson built the road. You know the Mayor of Honolulu, one time?

KM: Yeah. . .

Group: [return to car – drive towards Nāhiku]

JH: . . .This ditch we covered with wood. The people come and they jump in the ditch.

GH: Because it is drinking water for Up-country.

KM: So Ko'olau Ditch?

GH: Ko'olau Ditch, and then at Alo, Ko'olau Ditch comes into the Wailoa Ditch.

KM: Is there any ditch below us, like Hāmākua side?

GH: No. From Punalau, Honomanu, there's only one ditch.

KM: Ahh.

JH: I think they had a ditch camp over here too. The last one is over there, Wai'aka.

GH: Yeah, that's what Stephen was telling me.

KM: So there was Kopili'ula Camp?

JH: Yeah.

KM: Then Wai'aka?

JH: But Wai'aka stayed until the '60s.

GH: Yeah.

JH: Even when we made the Kūhiwa Trail, that one was still there. And right here, they get the gulch name wrong. This is Pua'aka'a Park, that's Waiohue. Pua'aka'a is back here. So wrong.

KM: This gulch here, Pua'aka'a?

JH: This is Pua'aka'a (rolling pig) [chuckles].

KM: Hmm.

GH: This is Pua'aka'a, so they went name 'em wrong?

JH: Yeah, that one over there is Waiohue.

GH: And you know, has the two flumes by Wai'aka?

JH: Yeah, that's to Waiohue.

GH: And get Puakea and Pa'akea?

JH: Yeah. One in Pa'akea and one in Puakea.

KM: And those are old *ahupua'a* names?

JH: Yeah. You go up to Waiohue, you go up through here.

GH: Yeah, that's our gate going up to Waiohue.

KM: Oh.

GH: So this one, they should have named it Waiohue State Park, instead of Puaka'a?

JH: Yeah.

KM: And it's Pua'aka'a, yeah?

JH: *Pua'a*, not *pua* [chuckling]. *Pua* is flower, *pua'a* is pig.

KM: Is there a *mo'olelo* that you heard, why they called it Pua'aka'a?

JH: No. Only I figure pigs used to come over there and you go catch, and they roll down.

KM: Hmm.

JH: These two *kahawai* go down meet into one, Waiohue. We used to go down there fishing, plenty fish! Hoo, bumby you come back, you look up the hill [chuckling].

GH: You got to carry up.

JH: Yeah.

KM: What kind of fish, you went for down there?

JH: *Āhole, moi*, all these white fish, *'ō'io*.

KM: Hmm.

JH: We had a stone house over there.

GHL Yeah.

JH: Where are all those stones? Pā'ia?

GH: No, the University of Hawai'i took 'um. That was the core house, they call 'um.

JH: The core of the rock.

GH: What they wanted to do, was find Big Spring, eh Jimmy?

JH: Yeah. and they get 'um all marked. You know how many feet down, and you know what kind of material.

KM: Oh, so it was the core of the drilling?

JH/GH: Yeah.

GH: Two inch cores.

JH: The camp was right here, Amalu, the EMI Camp.

KM: Amalu?

JH: It was down there and up side. But most of over here, they call Kapā'ula and Waiohue, that's these two gulches. And I think people used to live down here, Kapā'ula.

KM: *'Ae*. There were *kuleana* awarded in the *Māhele*, if I recall.

GH: Yeah.

KM: These are small *ahupua'a* out this side.

JH: That's why when Vicky Creed came, the name she had was Pa'ula. She went back and she wrote to me, "I think you're right, was Kapā'ula."

KM: *'Ae, pololei, Kapā'ula, 'oia ka inoa kahiko. . .*

JH: Vicky, she's alright, but some of these young guys, they throw everything out.

KM: Well to me, the most important thing is that you come and talk to the old *kama'āina*.

JH: Yeah.

GH: Now this is Hanawī.

JH: Down this gulch, they call Big Spring. There's a lot of water.

KM: Hmm. So Hanawī, we just passed the 24 mile mark a little ways.

GH: Right.

JH: Now, they have changed the mile marker.

GH: Yeah, at Kaupakulua.

JH: So when you go by mile marker, a lot of the guys get mixed up.

GH/KM: Yeah.

GH: The Ko'olau Ditch is about 200 yards up here.

KM: Hmm. . .

JH: For a while I had to go down here every day for read the meter, below Big Spring.

KM: When did they dig Big Spring?

GH: It's a natural spring.

KM: Oh. Weren't they trying to drill out here?

GH: They were drilling to find the source of Big Spring, but I don't think they could find it.

JH: Yeah. They tried to find, but they never get 'um. . . Right here.

GH: Yeah, there's the *olonā*.

KM/OM: Ohh!

KM: Plenty, but these weeds are going take over. The Job's tears and ginger.

GH: They come clean every once in a while. And see, this water rises below of our ditch, it's not coming from the ditch.

JH: The name of this water is Honolulu.

KM: Honolulu. Has Honolulunui and Honoluluiki?

JH: Yeah.

KM: Had *kuleana* in there too. (25 mile mark)

JH: Yeah. . .

GH: This is our last road, it goes up to Makapipi.

KM: Oh.

GH: This stream here, is the beginning of the ditch system.

KM: Makapipi?

GH: Makapipi.

KM: And this *ahupua'a* also, they had *kuleana* claims that were made. So there were *'ohana* in all of these places.

JH: Yeah, yeah. . .

KM: And this side road goes all the way down to the ocean?

JH: Yeah. This was like a city before. They had everything down here.

KM: Hmm. . .

Group: [turn around and begin drive back to Ke'anae]

JH: . . . From Nāhiku, you get Hanawī, and that part of the old road, still get.

GH: Yeah.

JH: Then from Hanawī, all block up. You like go, you go by the beach. . . My dad worked for EMI, he was a boat man, when they hauled the gravel up.

KM: Hmm.

JH: Honomanū and Ke'anae, they had one cable and they get one winch, and they pull the gravel out. They two sampans, they call 'em *Makaena* and *Makaiwa*. That's the one haul the sand. So my dad used to work on that. The guy who was the captain was Calaboose, and his wife is family to Mailou. . .

KM: Hmm. . .

Group: [arrive at Wai'aka]

JH: One year, the rain can had almost 40 inches of rain, no more eight hours.

KM/OM: Wow!

JH: That's why when they say Pa'akea rainfall, it's right here.

KM: Hmm.

JH: Before, Louis Wilhelm, lived up here.

GH: Hmm.

JH: . . . Engineer this tunnel. Him and the sugar guy at Mākena, and these guys never let anyone know. They were drilling on top, and the powder. Just happened to blow.

GH: So they were gone.

JH: His name was Okada. The boy, Steven, worked for the County. . .

GH: At that weir, that's where the Nāhiku Water License ends. Nāhiku Water License goes all the way from Makapipi to Wai'aka. So what they did is make the weir so they could measure the water.

KM: Hmm. . . No streams are tapped into after, or Hāna side of Makapipi? That's it?

GH: That's it. Makapipi is the last one.

KM: Is Makapipi the last regular flowing stream? Or are there…

JH: No, they have streams beyond that.

GH: But I think they stopped the ditch at Makapipi because the lave flow that side is real porous eh.

JH: Yeah, so they only get development tunnel.

GH: Because when you come to Kūhiwa, Kūhiwa is dry.

JH: Yeah. And then Makapipi, way up there, get Pogue Tunnel. They bring the water, throw 'em in there.

GH: Right, west to east.

JH: But if you want to go up to the house we were living, up the mountain.

GH: The CCC one.

JH: You go up Makapipi Steam, it will take you right to the house.

GH: Yeah.

KM: Does Honomā'ele have water all year round?

JH: Honomā'ele, not all year round, no.

GH: That's why, when they made the ditch, Makapipi was the last productive stream.

JH: Yeah.

GH: So they figure, why continue on, when only get water when rain. But you look Makapipi, Wai'aka, Hanawī, Kapā'ula, they're all productive streams.

KM: Hmm.

GH: Kūhiwa dry, only when get big rain.

KM: Kūhiwa is still in Nāhiku, or it comes into Hāna?

GH: Nāhiku. . .

JH: After Makapipi is Kūhiwa.

KM: Okay. . . Uncle, you know, when you folks would be preparing for either dry land planting or *lo'i* planting like that, did you folks *kipulu* (mulch) or something like that? Use *hau, kukui*, or anything in your planting?

JH: No, but today, you pull today, tomorrow you plant. But our day, we let the roots ferment, *ho'omaha*.

KM: Yes. And did you stagger the planting so certain time a field comes ready, and then another time, the next field?

JH: Yeah when we plant, we stagger. But today, the guys plant for sell, they plant any time.

KM: That's going to be damaging to the land because eventually the land won't be able to restore itself.

JH: Yeah, yeah.

GH: But nowadays, they put fertilizer.

KM: So then you eat chemicals.

GH: Exactly, and where is the water going? Straight out to the sea.

KM: So not only you eating chemicals, but the fish. And then you eat the fish and more chemicals, you get.

JH: Chemicals, you get slow death.

GH/KM: Yeah.

KM: Uncle, on an average, in the Ke'anae Flat, these areas, how many *lo'i* would each family carry for itself, in your youth?

JH: Well, all depends on the size. You go by the area. Some they get about a half acre, some, one acre. They never did keep many *lo'i*.

KM: Within a half acre, how many *lo'i* might you put?

JH: All depends, if your land flat, you put less *lo'i*. But if plenty [gestures slope], you have to terrace.

KM: Yes.

JH: But Hawaiians before our time, hey! Any place, they had *lo'i*.

KM: Yes, because they were supporting themselves and the *ali'i* like that.

JH: Yeah. That's their tax.

Group: [describing small islet seen from overlook at Wailuanui]

JH: They call it Hō'aluea. A lot of guys don't know. They went drill eye bolt, and when those old whalers used to come in, they land at Wailua, they get hard time to go out, so they run the winch with a cable. They hook the boat and pull 'em out. That's what the name is Hō'aluea.

KM: Ohh! So literally, "Loosen the wire."

JH: Yeah. So, when they gave name any place, they had a meaning, reason.

KM: So was there a landing down at Wailua also?

JH: No, no landing just for canoes.

KM: Hmm. So did those ships come in and just cable things in?

JH: I don't know those days, how it was. But in my time, they would come into Ke'anae. Ke'anae and Nāhiku.

KM: This Wailua, below here is 999 year Homesteads?

JH: Well they get plenty 999. So that came way before Hawaiian Homes. A lot of guys say that's Hawaiian Homes. But no, Hawaiian Homes only came about 1921.

KM: Yeah.

JH: And then some people had *kuleana* from the Great Māhele. But not everyone could pay for their *kuleana*. So eventually they made that 999 year. You get house lot and taro patch.

KM: Yeah.

JH: But in 1946, had this Wendell Cockett, Percy Lydgate, They went to Honolulu and they went change the law. Those that live on the land for 10 years, can buy ‘um out right. That’s how all these guys got their own. So today, only two lots the can buy.

GH: Which two lots?

JH: One in Ke‘anae, belongs to Tau‘ā, and one in Wailua belongs to Akuna. That’s the only two.

GH: Oh. . .

JH: That, they can still buy, but they no make effort.

KM: Hmm. Was this flat all down here in taro?

JH: Yeah, that’s all taro before. In 1959 had more taro than today. So they blame EMI. Hey 1959, EMI was around.

GH: Now, no more nothing.

KM: Mostly all pasture.

JH: *Molowā.* See that’s the talk, “EMI take all the water.” But EMI is more than 100 years already.

KM: So just a few key families growing taro now?

JH: Yeah. Yesterday I talked to an Akina.

GH: Yeah, Sam.

JH: He said, only a few. He used to have a big area, but since the wife pass away, he give up.

KM: Hard work yeah.

JH: Yeah. If you have children, alright. But when they grow bigger, they ain’t going back to that [chuckles]. They’re not going in the taro patch. That’s why I tell my kids, “You cannot live like the old days.” When I hear they say “We want to live like that.” I say, “No way!” And then they get mad with me. “How come that old man…?” But I know. They cannot.

GH/KM: Yeah. . .

KM: So this is Lākini again?

JH: Yeah, Lākini, mostly owned by Akiona.

KM: Yes, so aunty Helen Nākānelua *mā*, they still go up take care?

JH: Yeah. That’s all Akiona family. Nākānelua, he came from Waipi‘o.

KM: *‘Ae. . .*

Group: [Driving towards the Ke‘anae School Lot – discusses *heiau* in Pauwalu *mauka.*]

KM: So uncle, *mauka* of here by the school, has a *heiau*?

JH: Yeah, up here, on top here.

KM: Hmm. Did you hear the name of that *heiau*?

JH: No, no. Bumby you try look up by Ke‘anae School, on the west side. One time had guys, they no can find it, but I know where. Had these people come for find. But I think, “If I *wala‘au* bumby *pilikia.*” So they look all around, they no can get ‘um. I found ‘um, but only a small one. Get one down Wailua, small, it’s just like a resting place. Some *heiau,* they come, they rest. Then they go. So the old road goes behind there.

KM: That *heiau*, did you hear what purpose or how it was used?

JH: No, no. But I know there is a *heiau* there.

KM: Hmm. . . Uncle, were there certain *ko‘a,* fishing stations off the ocean that you folks would go to in the old days? Or that your *kūpuna* would use. *Ko‘a ‘ōpelu, ko‘a ‘ahi,* the fishing places?

JH: Yeah, but *wau, a‘ale wau he* fisherman [chuckles]. *A‘ale wau ‘ike.*

KM: Hmm, *he mahi‘ai ‘oe*?

JH: But *lo‘a,* fishing guys, they know the *ko‘a.* They know where get *enenue,* they know where get any kind of *i‘a.*

KM: Yes, each particular kind of fish.

JH: Yeah. Sometimes, they only go feed the *ko‘a,* and then they go later, fish.

KM: Yes. . .

JH: [passing Wahinepe‘e] This place get name, ‘Ihi‘ihinui, I think.

KM: Oh, so ‘Ihi‘ihinui, just Wailuku side of Wahinepe‘e?

JH: Yeah.

KM: And you said that “*makai*, had *lo‘i,* in the little valley?”

JH: Yeah. Over there, they had gold fish all kinds.

OM/KM: Ohh.

GH: Who used to grow in the *lo‘i*?

JH: Was the old people up there, old man ‘Īkoa. Him the one who let the land with Akoi.

KM: Ahh. Did Akoi marry into the family with ‘Īkoa?

JH: ‘Īkoa’s *mo‘opuna* was his mother.

KM: Oh.

JH: The mother married to Sam AhLing Sr.

KM: Hmm.

JH: Before, *maile* right on top here, you get. You like *maile*, you just climb up here.

GH: Not any more.

KM: What’s this stream?

JH: Waiakamō‘ī. And there’s the Hawaiian bamboo, right down there.

KM: Oh yes. Long *puna* and thin wall?

JH: Yeah.

KM: Did you ever hear if anyone would gather the *pua ‘ohe* to make medicine?

JH: No. But I know that we used to go get ‘um to make for weave.

KM: So you would gather the *‘ohe*?

JH: Yeah, you boil ‘em, you peel ‘em.

KM: When you boiled it, what color did it become?

JH: It comes kind of *lena.* But some guys started putting in the Clorox and it became white.

KM: So was that to weave designs into the *lauhala*?

JH: They mix ‘um up with the *lauhala.* And then, when they make *kālolo*, they put it inside the *‘ohe* and steam it. They *kālua* that. They pour the ingredients in.

KM: Oh, interesting. So the *puna* long and it also gets wide, four or five inches.

JH: Yeah. And that’s the bamboo they use when they go *pana āhole.*

KM: Hmm.

JH: But every season, you have to change bamboo.

KM: Yes. . .Your history is so important, your words speak for themselves.

JH: We used to have one ditch house over here, and Hashi used to live over here. . .

Group: [passing Maka‘iwa]

JH: In Ke‘anae, we get one *lo‘i* called Maka‘iwa, and we also get one pool called Maka‘iwa.

KM: Hmm. So here’s Makanale, and then Maka‘iwa.

JH: Yeah.

GH: And then ‘O‘opuola.

KM: Yes. . .

Group: [return to Kailua]

KM: *. . .Kākū, mahalo nui iā ‘oe i kou aloha a lokomaika‘i. . .* [end of recorded interview]

James Keolaokalani Hū‘eu, Jr.
Oral History Interview (‘Ōhi‘a-Ke‘anae Vicinity, Ko‘olau District)
November 6, 2001, with Kepā Maly (Interview # 3)
(interview released at time of recording – November 6, 2001)

This follow up interview was conducted because Kupuna Hū‘eu wanted to share his recollections of some of the *mo‘olelo* he’d learned from his own elders, pertaining to the naming of ‘Ōhi‘a, Wai-Kāne, Wai-Kanaloa, Waiakuna, and other locations or events of the Ke‘anae Vicinity.

Selected topics of discussion covered by Kupuna Hū‘eu include, but are not limited to:

Summary of Selected Topics	***Page***
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Water is important, a source of life; dirtying the water source, and failure to care for it, can lead to it’s disappearing.	155
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Interview Transcript

KM: *. . .Mahalo!* So, *i ko kāua huaka‘i i kou ‘āina aloha ma Ko‘olau, ua ‘ōlelo ‘oe, kou ‘āina ma Waianu e?*

JH: *Ae.*

KM: *‘Oia ka ‘āina o ‘Ōhi‘a?*

JH: *‘Ōhia.*

KM: *He ahupua‘a o ‘Ōhi‘a?*

JH: *‘Ae.*

KM: *O Waianu, ke kahawai?*

JH: Well, *he kahawai malaila,* but *ka inoa o ke kahawai, a‘ole wau mana‘o loa.*

KM: Hmm.

JH: But *‘elua kahawai.*

KM: Ahh.

JH: But *kēia puka wai, o Wai-kāne.*

KM: *O Wai-Kāne.*

JH: *Ka mo‘olelo o kēia puka wai. Mamua, ‘elua ‘elemakule, ku‘i i ka ‘awa. Akā, a‘ole lo‘a wai. ‘Ōlelo mai kekāhi ‘elemakule, “Hiki ia‘u lo‘a ka wai.” Ua ha‘i ‘oia ho‘okāhi kumu ‘ōhi‘a, a pahū ‘oia i loko o ka pā‘ia o ka pali, a puka mai kēia wai.*

KM: *‘Oia!*

JH: *Kēlā ‘elemakule, ‘ae, “Inā hiki ‘oe, hiki ia‘u.” A pahū ‘oia, a ‘oia ke kumu, lo‘a ‘elua puka wai, kahea ‘ia Kāne me Kanaloa, kēlā ‘Ōhia.*

KM: *O!*

JH: *Pololei ka inoa, Kāne me Kanaloa.*

KM: *‘Oia ka inoa o kēlā mau puka ‘elua?*

JH: *‘Ae.* But *no ka mea, ua pahū ‘ia me ka lā‘au ‘ōhi‘a, kahea ‘ia “‘Ōhia Spring.”*

KM: *A ‘oia ke kumu i lo‘a ka inoa, ka Punawai o ‘Ōhia?*

JH: *‘Ae.*

KM: *Ua hana kēia po‘e ‘elemakule…?*

JH: *‘Ae.*

KM: *Ho‘okāhi, ‘elemakule o Kāne?*

JH: *‘Ae.*

KM: *A ho‘okāhi, ka inoa o Kanaloa?*

JH: *‘Ae.*

KM: *A ‘elua a lāua, pahū i ka pā‘ia pali?*

JH: *A lo‘a ‘elua puka wai.*

[Water is important, a source of life; dirtying the water source, and failure to care for it, can lead to it’s disappearing.]

KM: *He wai ola kēlā?*

JH: *‘Ae.*

KM: *He wai maika‘i, momona?*

JH: Yeah. *A ka wai, mai ka pahū ‘ana.*

KM: Hmm. *Pehea kou mana‘o o ka wai, he mea nui ka wai iā ‘oukou, nā Hawai‘i?*

JH: Oh yes! *Mamua, mākou, a‘ole lo‘a wai, hele mākou ‘au‘au i ka kahawai, a kēlā manawa ‘oe ho‘i mai, hāpai ‘oe i ka wai. Halihali wai, ho‘i. A‘ole lo‘a wai, hele.*

KM: Hmm. *He mea nui ka wai…?*

JH: *He mea nui.*

KM: *Mamua, ua kapu paha kekāhi wahi wai? Hele ‘oe ‘ohi wai no ka inu ‘ana, a kekāhi wahi, hiki iā ‘oe ke ‘au‘au i kēlā wahi? Māhele ‘ia ka hana, ka* uses *o ka wai?*

JH: *‘Ae, ‘ae. A‘ole ‘oe, ma kēia puka wai, a‘ole ‘oe hele malaila, a‘ole hele hana haumia. Inā puka ka wai hele i lalo, hiki. Inā hele ‘ana ‘oe ma laila ho‘okake, puka ‘ana i kēlā wai i kāhi ē.*

KM: Hmm. So *ua nalowale ka wai, inā haumia?*

JH: Yeah.

KM: *Inā ho‘okake paha, holo ‘ana ka wai i kāhi ē?*

JH: *Pau i ka holo.*

KM: Hmm. *‘Oia ka mo‘olelo au i lohe ai mai kou mākua, kūpuna?*

JH: Yeah. So *‘ōlelo wau i ku‘u mo‘opuna a pau, "A‘ale lākou ho‘okake i kēlā wai." Inā puka ka wai i lalo a holo, a‘ole pilikia.*

[Discusses the place names Waiakuna and Kanō – and describes how the water flows underground to springs at ‘Ōhi‘a and Ke‘anae. He does not believe that EMI has impacted the waters at Ke‘anae.]

KM: Hmm. *Ua lohe wau, ka wai no nā Hawai‘i, he mea ola. Wai o ke ola. A kēia inoa, Wai-Kāne, a‘ale like me Wai-kani ma Wailua? ‘Oko‘a?*

JH: *‘Oko‘a.*

KM: *Wai-Kāne, o Kāne ke kumu o ka wai?*

JH: Yeah.

KM: *Ka wai o ke ola?*

JH: Yeah. *Kēia wai, lo‘a ho‘okāhi puka, wai hele i Ke‘anae. He waipuna kēlā.*

KM: Hmm.

JH: *Kahea ‘ia kēlā kawa, o Wai-a-kuna.*

KM: Waiakuna. Now, *e kala mai ia‘u, ninau ka‘u iā ‘oe, o kēia Waiakuna, he inoa Kahiko?*

JH: *He inoa kahiko.*

KM: *‘Ae. A‘ole no Akuna ka Pākē?*

JH: *A‘ale. Waiakuna… But hele wau ninau i ka po‘e, "He‘aha kēlā?" ‘Ōlelo mai, "He* water eel.*"*

KM: *‘Ae, kuna. A kuna, he ‘ano kūpua i kekāhi mo‘olelo, he pūhi.*

JH: *‘Ae.*

KM: *Ua ‘ōlelo mai kekāhi?*

JH: *Ua ‘ōlelo mai "He* water eel.*" But a‘ole wau ‘ike.*

KM: Hmm. *Mamua, ua hele paha ʻoe ʻinikiniki i ka pūhi?*

JH: Yeah, *like pū kēlā. Aʻole wau hele,* but *kuʻu anakē, hele.*

KM: *Aia ma kahakai, ka muliwai?*

JH: Yeah. That's why *lohe wau, "Wai-a-kuna, he* water eel *kēlā." But malaila ka wai hele mai i ʻŌhiʻa Spring a me Keʻanae.*

KM: Hmm. *Mai Waiakuna?*

JH: Yeah.

KM: *Loʻa ka wai o ʻŌhiʻa a me Keʻanae?*

JH: *ʻAe, ʻoia ke kumu. Maloʻo ke kahawai,* but *malaila ka wai. Loʻa hoʻokāhi kahawai i ukā loa, kahea ʻia Kanō. A kēlā wai* [gestures with hand – going underground], *nalowale a puka malaila.* But *kēia poʻe ʻāpiopio, aʻole ʻike, "Ah no, lawe ka EMI i ka wai." Aʻole! Ka inoa o Kanō, o nō ka wai* [gestures, water dipping down with hand].

KM: So *nō,* to sink underneath?

JH: Yeah.

KM: It goes underneath and *holo, puka ma kekāhi wahi e aʻe?*

JH: *Puka mai kēlā wai ma Waiakuna.*

KM: *Mai Waiakuna. A puka ka wai i…?*

JH: *Keʻanae.* And I think, *hoʻokāhi, hele i ʻŌhiʻa.*

KM: Hmm. *Ka inoa Wai-Kāne me Wai-Kanaloa, ma ka punawai o ʻŌhiʻa?*

JH: Yeah.

KM: Now, *loʻa ka inoa o Wai-anu,* "Cold-water" *ē*?

JH: Yeah.

KM: *He ʻili ʻāina paha o Waianu, aiʻole, he wahi wale no?*

JH: [thinking] Well *kēlā* whole flat, *kahea ʻia Waianu.*

KM: Oh, so it's a big place?

JH: Yeah.

[Discusses Kahoʻokuli and story of the *manō* (shark) that was raised in the uplands; when grown, the *manō* swam down stream to Waiaʻōlohe, and lived in the *muliwai* (estuary); Luahiʻu, a red stone in the stream, marks the *kōwā* (channel) from the stream out to the sea.]

KM: *Like me ʻoe i ʻōlelo mai Kahoʻokuli?*

JH: *ʻAe, ʻae.*

KM: *Ua hele wau, nana, huli i ka moʻolelo Māhele, mai nā kupa o ka ʻāina, a loʻa kēlā inoa.*

JH: *Loʻa kēlā inoa?*

KM: *Loʻa ka inoa! He ʻili ʻāina kēlā no ka poʻe o kēlā wahi. A ua noi aku lākou i wahi ʻāina, i kuleana no lākou. Aia i Kahoʻokuli. . .*

JH: Hmm. . . *Kēlā wahi, ʻoia ka home, ʻōlelo mai kēia kupuna o Edward Akiona. Mamua, lawe i kēia poʻe i Keʻanae, i mea ʻai o ka ʻāina e.*

KM: *ʻAe.*

JH: *Kuapo. Hele kēia poʻe, hele kiʻi iʻa. Hoʻokāhi manawa, hele kēia poʻe i lalo,* and I think *molowā ka poʻe, aʻole hele i ka lawaiʻa.* So *hoʻokomo i loko o ka ʻeke, ka iwi o ka iʻa, ka huelo, a hāpai kēia poʻe i uka. Kēlā manawa e lū ʻana* [gestures opening the bag and spreading out the contents], *loʻa hoʻokāhi manō. Manō Iʻiliʻi. Hānai ʻia kēlā manō malaila. A nui mai kēlā manō, hele kēlā manō ma ke kahawai a pae lālo, i kēia wahi o Waiaʻōlohe. A kahea ʻia kēlā pōhaku ʻulaʻula, Lua-hiʻu.*

KM: Luahiʻu?

JH: Yeah. That's why *loʻa ka inoa, Luahiʻu.*

KM: *O kēia Luahiʻu, ai makai?*

JH: *ʻAe, ai lalo. Ka manō noho malaila. A i lalo o Keʻanae, loʻa hoʻokāhi konelo.*

KM: *ʻAe.*

JH: So *hele kēia manō, puka i kai a hoi mai.*

KM: Hmm. *I ka muliwai*?

JH: *ʻAe.*

KM: Now, *Luahiʻu, aia ma Waiaʻōlohe*?

JH: *ʻAe, kokoke hele iloko o ke kai.*

KM: Hmm.

JH: *ʻOia ka Luahiʻu.*

KM: So *he kōwā, he channel nō hoʻi ai malalo, you said konelo?*

JH: Yeah. I think *kēia poʻe hou, aʻole ʻike.*

KM: *Aʻole.*

[Fears that if he does not tell the stories they will be lost when he passes away. Wants his stories to be known and shared in the historical study, so that the traditions of the place names, families, and practices can be remembered.]

JH: So *inā ʻoe ʻike* [chuckles], *o noʻonoʻo ʻoe, a mahope ʻōlelo ʻoe i kuʻu keiki. Aia aʻole hoʻolohe mai* [shaking head – chuckling]…

KM: *ʻAe! ʻOia ka mea nui, kou* transcripts *nō hoʻi* [holding the two interview transcripts], *mai ka* interview *mamua, kēlā ʻelua mau* interviews, *he mea nui kēia no ka hoʻomanaʻo ʻana o ka moʻolelo ʻāina. Ka hana a ʻoukou a me nā kūpuna.*

Muliwai at Keʻanae – Area of Waiaʻōlohe and Luahiʻu (KPA Photo No. 1430)

JH: *ʻAe.*

KM: *He waiwai nui kēia.*

JH: *ʻAe.*

KM: *Mahalo nui.* So, *ua hiki iaʻu ke hana kēia* [holding up transcripts]…

JH: *Hiki.*

KM: *…no kēia* study *aʻu i hana aiʻ…?*

JH: *ʻAe, ʻae.*

KM: *No ka hoʻolaha ʻana o ka moʻolelo o ka ʻāina.*

JH: Yeah.

KM: *E hana pono. O ka hana pono ka mea nui.*

JH: *ʻOia kuʻu manaʻo, inā hala au, aʻole poʻe ʻike.* So *ʻoia ke kumu.*

[Discusses 1957 rain making experiments.]

So, in 1957 they had one grant for rain making program [chuckling].

KM: *ʻAe.*

JH: So my boss, Robert Bruce, he like that kind of grant. So he got the money, and I took care of all the boys to go sleep up the mountain. We got PVC pipe, all up the

mountain, make ready. When the clouds come low, we *ki* (shoot) this *wai* to the clouds. Maybe you shoot one gallon of water in the cloud, ten gallons fall down. But, we know we can make rain, but we no can tell where the rain going fall. [shaking his head – smiling]

KM: [chuckling]

JH: But we know we can make rain.

KM: So *ki ʻoukou i ka wai i ke ao ma Maui Hikina. . .*

JH: Way up there.

KM: *Aloʻa ka ua ma Māʻalaea paha*?

JH: Yeah. We put this kind copper sulfate, and we go find, we get copper here and there. We find. Go Māʻalaea, we know, but we no can make rain ʻcause we don't know where it's going to fall.

KM: Hmm, *pohō.*

JH: Yeah. The people, they laugh, "You crazy!" "No, I tell you, can." *Hiki, hiki!*

KM: *Hoihoi loa! Mahalo!*

JH: *Ua lohe ʻoe kēia*, Rain Making Program.

KM: Yeah.

JH: In 1957.

KM: You know, *Kūkū, i ka wā o ko poʻe kūpuna, i ka wā kahiko. Ua noʻonoʻo nā kūpuna, hiki iā lākou ke hana ua. Akā, ua hana ua lākou me leo pule.*

JH: *ʻAe.*

KM: *Loʻa kekāhi ʻano heiau, heiau hoʻoulu ulu ua. ʻOia ka inoa o kēlā ʻano heiau. Ua hele lākou a mōhai i ka mea kū pono, noi aku iā Kāne… No ka mea, o Kāne ke kumu o ka wai eʻ?*

JH: *ʻAe.*

KM: *I ka wā kahiko. Noi iā Kāne, "Ho mai ka ua." Aloʻa ka ua.* So what you were doing, the *kūpuna* did too, but they did it with *pule* (prayer).

JH: Yeah [chuckling].

KM: [chuckling] Interesting, though yeah?

[Discusses trail from Keʻanae to Summit region of Haleakalā.]

JH: Yeah. That's how I found the shortest way from Haleakalā to Keʻanae. And I think only three guys know where that is. Now we *ʻelemakule,* no can go over there, *minamina.* You go up Hosmer Grove and you come down, only about six hours, you *puka.*

KM: Wow! So what's the name of the land at Hosmer Grove? The Hawaiian name?

JH: [thinking] *Aʻole wau ʻike.*

KM: Okay, I'll get it (situated in Makawao District, near Puʻu Nianiau – Haleakalā).

JH: You know where's Hosmer Grove?

KM: Yes. I'll find the name.

JH: From over there, we came down to Keʻanae. We found the shortest way.

KM: What, down a *kualapa*?

JH: Yeah, come down *kua*. But you see, our boss, he took three of us up there. He told, "Okay.." He pick up these two men. I thought me the one, but he said, "You two guys, here's one map." [chuckling] That's only an air map. I tell him, "Boss, you don't do that, if from up you go down, bumby you can't go more down, and you no can go back, you *pau*."

KM: That's right.

JH: "If you come from down, you no can go no more, you can go back.

KM: Yeah.

JH: No, he let ʻum go [chuckling].

KM: From the top?

JH: From the top. He tells me, "Okay, you go back to Keʻanae and you go up, find them." So I think ahh [shaking his head]. Pretty hard. when I go up, I find them way down, they found the road. These two boys. But one make and one still living. At Kailua, where you know, his name is Range.

KM: Joe?

JH: [chuckling] Joe Range. He was one of them. So *ai no ʻoia ke ola nei.*

KM: *ʻAe, ikaika, ʻoia.*

JH: But the other one, Puʻu, *pau*, he *hala.*

KM: Oh, Robert Puʻu?

JH: Robert, *ua hala ʻoia*. But Joe, *ai no ʻoia. Lāua, loʻa kēia ala hele.*

KM: *Pehea kou manaʻo, mamua, nā kūpuna, ua loʻa paha lākou i kekāhi ala hele holo i ke kuahiwi?*

JH: Oh yeah, *loʻa.*

KM: *ʻAe, kamaʻāina lākou me nā kuahiwi, kualono, wao nahele…*

JH: Yeah. *ʻIke lākou.* But *kēia wā hou, poʻe hele wale no.*

KM: A, *ma ke kaʻa,* four wheel drive. . .

JH: Yeah.

KM: Thank you.

JH: Yeah. So I went get the interest in that.

KM: Yes, *mahalo ke Akua!* As I finish up here with your interview and tutu Helen Nākānelua, Mina Atai *mā*, like that; Stephen Cabral them, and bring all the interviews together into this study. In January or February, I'll be *pau* and then I'll bring the whole thing home for you. You'll be interested. All the *Māhele*

material, the communications from the ditches, how they made roads, *alanui*, and all these things. You'll really enjoy the full study.

JH: You know, for make that ditch, had one *Kepanī* surveyor.

KM: Hmm.

JH: The *Kepanī*, not the *haole, kanaka* or what, no, *Kepanī.*

KM: Smart.

JH: Smart. And he died in that ditch. He took his *ʻaikāne*, go *holoholo*, but never let know, and they went powder, and they were right under.

KM: Ohh, *minamina*!

JH: Was one *Kepanī.*

KM: What ditch was that?

JH: The Koʻolau Ditch. They start with Koʻolau till they come down with Wailoa.

KM: The first ditch was Haʻikū Ditch? Is that right?

JH: Well Haʻikū Ditch is the lower ditch.

KM: Yes, I think that's the older, first ditch.

JH: Yeah. Haʻikū and Spreckel's. But then they made tunnel. Spreckel's only just along.

KM: Yeah.

JH: But if Spreckels had come back to Hawaiʻi, hey, he would be the king of Hawaiʻi [chuckling]. Him and Kalākaua were *pili* [gestures – fingers crossed]. But he never come back.

[Feels that there needs to be a balance in use of water – water for the native families and water for continued use in the ditch system.]

KM: No, never. [pauses – thinking] You know, with all this *pilikia* with the water now, do you think that there is a way that there could be a balance so that some water can still go to the *makai* lands, and some water still be used with the ditch system? Is there a way to have a balance, or should they just take the water back home to the *kahawai*?

JH: Well you see, for this water, they don't have enough storage, reservoir. When rain, all goes down, no more nothing, they don't keep. The County, they don't care, their flume ready for *helele ʻi.* They don't care.

KM: Hmm, that's right, that County flume is almost. . .

JH: Yeah. The flume all give up.

KM: *Popopo*.

JH: *Popopo*. But, plenty water they can save.

KM: Yeah. They've got to have a balance. You know, you talk with Eddie Wendt *mā*, at Wailua like that, they want to have the water come back down. . .

JH: . . . I tell, "I'd rather see the water go to the people, you don't let the people come to the water." Then you will get nothing. If they shut down this HC&S Plantation, all these working men move over there, you no more nothing. They would eat the stones and everything. So you have to balance.

KM: Yes.

JH: But, that's how they go. They don't know, they just *wala'au, wala'au*. . . [chuckling]

KM: *Kupuna, mahalo nui!* Your sharing of these stories, the practices, the history of the land, is so important. There are few people like you. And you know, it's amazing, you and tutu Helen Nākānelua, you two compliment one another in your recollections, and tying the stories of place names and practices together. We know that what you have shared is *pono*, not just *ka'ao, ka'ao*. Beautiful. It is so important. That's why we're trying to preserve some of this history.

JH: Yeah, yeah. That's why you get that, real good.

KM: *Mahalo!* [end of interview]

Stephen Cabral
Oral History Interview – Ko'olau-Hāmākua Region
April 23, 2001,
with Kepā Maly
(at Kailua)

Stephen Cabral (KPA Photo No. 1409)

Stephen Cabral was born in 1929, at Nāhiku. His grandparents moved to the Hawaiian Islands from Portugal in the late nineteenth century, and he spent his life growing up, and working with Hawaiians of the Nāhiku-Ko'olau, and larger *Maui Hikina* region. Mr. Cabral worked for EMI Company, and in this interview, he discusses land use practices, stream flow and ditch operations for the period between ca. 1939 to the 1980s. He is well known for his knowledge of the East Maui Ditch System, and for his personal experiences on the land. He is also knowledgeable of the practices of old-time families of the land, in the water system, and in the near shore fisheries.

Though he retired from EMI in 2000, Mr. Cabral remains active on the land, and maintains cattle grazing leases on some of the EMI parcels. He has also served on a Maui County Water Commission, and understands the water needs of the larger island community. Mr. Cabral kindly agreed to participate in the interview study, and demonstrated a clear recollection of the history of the EMI Ditch System. His interview is an important contribution to the historical record of water and ditch operations in East Maui. Mr. Cabral gave his personal release of the interview transcript to Maly, on November 7, 2001.

During the interview, Mr. Cabral shared discussions of important historical events and observations pertaining to land and water use. These included, but are not limited to the following points:

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Describes EMI operations in the 1940s-1950s; shares descriptions of earlier "Ditch Man Camps" for maintaining the system from Wai'aka to Hāmākua Poko. 178

The forest was beautiful in those early days, and care was taken when working in the forest lands. Describes weather cycles — rainy periods could be predicted; the cycle has changed. 180

Discusses water flow, and practice of EMI to ensure that water flowed for those families who maintained *lo'i kalo*. 182

Describes maintenance problems with Maui County's "Waikamoi Flume" System. 187

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Discusses collection of *'ōpae* (some remote sections still have *'ōpae*). Describes the close relationship between the community and EMI; the company was always there to help families in times of need. 192

Detailed description of the placement of Ditch Man's Houses and Camps along the EMI System – Wai'aka to Kamole. 195

As in the interviews with Kupuna James Hū'eu, Garret Hew, contributed to the mapping process in this interview. Locational information on *Figure 2*, was annotated with the assistance of Mr. Hew.

Interview Transcript

KM: *Aloha*.

SC: *Aloha*.

KM: Mr. Cabral, thank you very much. We're going to just be talking story. If I could please ask you your full name and date of birth?

SC: Stephen Cabral, December 7th, 1929.

KM: Where were you born?

SC: Nāhiku.

KM: What I did is when we spoke the other week you'd mentioned that to me. This is Register Map 2649. It's from 1897, a little bit before your time [chuckling].

SC: Yeah, that was before my time.

[Describes the Nāhiku Region – homesteading, rubber plantation, and historical activities.]

KM: It's the basic Nāhiku area. You were born out there? What was your family doing, what brought you? You're pure Portuguese, is that right?

SC: Yeah.

KM: What was your family doing that brought you out here to Nāhiku?

SC: [thinking] I don't remember my grandfather. My grandfather, when he came from Portugal he went to Kula. I guess he didn't like Kula because was dry or something. He bought a piece of land in Nāhiku.

KM: Yeah. When we were looking, I'm just trying to remember you showed me… [pointing to names on map] Here's Bailey, here's McKay wasn't there? Here's a Manuel Cabral, you said this one you weren't sure if he was?

SC: No, that's different Cabral.

KM: Different. Here's Jose Cabral, that's?

SC: That's my grandfather.

KM: Oh, okay. It says his lot was Grant 4-5-0-5…

SC: Lot 15.

KM: Yeah, Lot 15 and the Grant number.

SC: Before my time he sold this or something. Then he bought on the west side of the gulch, a four acre parcel that my mother owns.

KM: This is, Kahawaihāpapa?

SC: Yeah, see 15 is on Kawaihāpapa [as pronounced].

KM: Yeah.

SC: This is west. It doesn't have on that map, the four acre lot.

KM: Here's a 4.35 acre maybe, right here. Was it Lot 45 or something? Just on the other side of the gulch?

SC: No, not Kawaihāpapa across the next gulch.

KM: Okay.

SC: I don't think that was in the map.

KM: Yeah, the map is a little early?

SC: Yeah.

KM: Here's this Kahalaoaka Gulch, Fukuda, Nishwitz.

SC: Nishwitz. You see that's all these people who were before my time.

KM: Before your time.

SC: Yeah.

KM: What was your father's…I see there's a Lemon on the *mauka* side too.

SC: My father took a homestead in my uncle's name. That was above the road it was a nine acre parcel. What my uncle did was he exchanged with EMI, three acres of it. That's why you have the new map I can tell you.

KM: This is the newest one I got. This is sort of the overall [sound of map] it may not have enough detail. This is a 1970 EMI section map.

SC: Uh-hmm.

KM: Here this comes out, I think no more enough [looking at the map].

SC: This is Nāhiku Landing.

KM: Here's the road.

SC: This is the road.

KM: Yeah.

SC: [looking at the map] Hanawī, Makapipi. Even this map doesn't show.

KM: It doesn't, it's too big to show all the detail.

SC: We ended up with a six acre parcel on the top of the road and four acres, that was for my grandfather.

KM: What were you folks doing out there?

SC: My father worked for the Nahiku Rubber Company. My grandfather was just a farmer. The four acres, the whole four acres had every, even the small rock like this piled up.

KM: Wow!

SC: Just made walls and plant corn in Nāhiku. But he died before my time.

KM: He died before.

SC: My grandmother eventually stayed with us about fifteen years. She died right in the house.

KM: Hmm. Was there a special, specific name for the area where your house was?

SC: No. We just called that area Upper Nāhiku. From Makapipi…well from Kūhiwa down to Honomā'ele Gulch, that's classified in Nāhiku area.

KM: *'Ae*. I see on the older map here's Kūhiwa over here.

SC: Yeah. Then you go to Honomā'ele Gulch. And from there had cane at that time. At my time had cane.

KM: Yeah. Did the rubber come before the cane, the Ko'olau Sugar or was it?

SC: The Nāhiku cane was before the rubber and then the rubber took over.

KM: That's what I thought. In fact I guess Nāhiku maybe had, was kind of was *pili* with the Hāna Sugar people too or something?

SC: I don't know who was that. Kīpahulu had one, Hāna had, and Nāhiku. But Brewer, the Hāna Plantation I know, because I worked for them. In fact when it closed that's when Hāna just folded up.

KM: Yeah. So in 1929 was your father still working for the Rubber Company at that time? Or was the Rubber…?

SC: I'm not sure, I really not sure.

KM: Did it ever make a big business? Did they get planted and stuff like that, do you remember?

SC: Oh yeah, they got rubber. During the war the prisoner's tapped the rubber again.

KM: Oh, for real! They were actually processing? Drawing the sap out?

SC: Yeah, right.

KM: Wow! Was this from the highway, *makai* go down, or also on the *mauka* side?

SC: Most *makai*. They had two types they had what they call the Sera rubber and the Haven rubber. The Haven trees…there's some Sera rubber growing here and there, but the Haven trees the rows are still there where they planted.

KM: Amazing!

SC: In fact James Hū'eu has about five of those trees in his property in Ke'anae.

KM: What type again?

SC: Haven rubber.

KM: Haven?

SC: Yeah. The prisoners tapped it during the war.

KM: That's amazing! As a youth you went *holoholo*? I think you were sharing.

SC: Oh, yeah.

KM: What did you do?

SC: We walked to Ke'anae.

KM: All the way to Ke'anae?

SC: Yeah. When we were kids.

KM: Did you go along, had the road come in yet between…?

[Father used to deliver mail between Nāhiku and Kailua, traveling via the *mauka* route from Kopili'ula to Kikokiko, and on to Pāpa'a'ea.]

SC: Yeah, they opened the road in 1926. My father…you see the road was open to Kopili'ula Gulch and then the EMI trail.

KM: The one that goes up to Kikokiko?

SC: Right. My father used to haul the mail on the horse, and bring it to Kailua.

KM: Wow!

SC: And then, the road opened afterwards.

KM: In 1926 about, the road opened?

SC: That's when it opened from Wailua to Kopili'ula. I have a picture of the Model T cars over there at Kopili'ula bridge. I don't know the people though. I have a big framed picture.

KM: I see here, Ko'olau Rubber Company, maybe they had a main office inside here.

SC: They owned plenty. But in my time that was all cut up. This guy Frank Stoppe, a German, he owned Lots 14, 15, 13, 11, 12, and he owned below the road too.

KM: He bought out…?

SC: Yeah. Frank Stoppe, from Germany. I started working for him when I was about seven years old, twenty-five cents a day.

KM: That's what you were saying, what a story.

SC: He's the one kept us going. When he died that property was sold, kind of break up. Joe Akana bought some, Allencastre bought some, I think was about $35.00 an acre. They bought that.

KM: Amazing!

SC: The Allencastre's bought Lots 14, 15, 11, 12, and 13. They swapped with EMI. Lot 13 was swapped with EMI. On the lower part that's where the Haven Rubber is, Lot 19. That's below the road.

KM: Lot 19 yeah I see it right here.

SC: [pointing to trail on map] There's the trail that we used to.

KM: Yes, there's the trail.

SC: We used to ride our horse.

KM: In fact it says this is Pu'u Kaluanui?

SC: Right.

KM: The trail went down?

SC: Yeah. Go down catch the old Government Road.

KM: Yes, here's the Old Government Road.

SC: Right.

KM: And that goes out to the Nāhiku Landing?

SC: Right.

KM: Were there Hawaiian families still living?

SC: Yeah. Down Lower Nāhiku, was all Hawaiians.

KM: Who were some of the families that you recall living out there?

SC: Kaiwi, Ko'omoas. The Ko'omoas, the two grandsons work for EMI.

KM: Ko'omoa?

SC: Ko'omoa, yeah. These boys father worked with me for many years, then he retired over here. Then I hired the two sons, they're still working.

KM: Wow! Kaiwi, Ko'omoa?

SC: Kaho'okele.

KM: Kaho'okele?

SC: Yeah.

KM: Is there still an old man Kaho'okele that's living yet? Jimmy?

SC: The boys are still living, there's Alfred and there's James. James is still living in Nāhiku.

KM: Is James your age or…?

SC: James is little younger than me. Alfred, Lono we call him he's older than me. But in 1948, him and the brother Abraham, Abraham died. We were working in EMI, and then they left. Alfred went to the service. Then he came back after the service, he wanted to work EMI. I wanted to hire him back he went to the doctor and they said he has a heart condition. The guy still living, he fooled every doctor.

SC/KM: [chuckling]

KM: He got 'em?

SC: Yeah.

KM: I've heard Kaho'okeles' name, my wife's uncle Mike Adams used to work phone company before. I guess in the '70s, '80s about like that one of the Kaho'okele men was working Hanawī area with *olonā*. You know what *olonā* is?

SC: Yeah. You want to grow *olonā* I have all the information. This guy by the name of Willie, he's a *haole* guy, Willie. He came out here, we took him, he made the study, took seeds and stuff. He sent me the whole folder, how to plant, how to propagate it.

KM: Were there families doing things like that when you were young that you remember, that would go up *mauka*?

SC: The only guy was, the old man Hokoana.

KM: Hokoana.

SC: Used to make *'upena* for *kā 'ōpae*, he used to make with *olonā*.

KM: For real? The kind get the stick and he…?

SC: Yeah you make the stick.

KM: He *kā'e'e* to go.

SC: Yeah. Then they get the *'o'opu*, and put the *'ōpae* inside.

KM: So Hokoana?

SC: Yeah. The boy used to work with us, he retired from EMI. He live right down here. He was married to the Honoka'upu girl. Had one other Hokoana family in Kū'au. I think there's couple still living, but this guy was from Nāhiku.

KM: Hmm. So he would go gather *olonā* make the nets like that, still yet?

SC: Yeah. Did Jimmy tell you about the *olonā*?

KM: Not yet, we didn't talk about *olonā*.

SC: You ask him.

KM: Okay.

SC: Apparently there's a cave up there somewhere in Ke'anae, Pi'ina'au Valley, all the *olonā* tools was in there, they sealed it up.

KM: Yes. He was telling me, he did tell us about that.

SC: He told me before he died he going tell me where. [chuckling] I said, "I think I going die first" [chuckling].

KM: [chuckling] He did mentioned that. And he said that had *'ohana*, Akiona. One of the Hawaiian *hapa Pākē*, had lived *mauka* and had one *ana* up there. He did talk a little bit about that, but not in the context of the *olonā*.

[Discusses changes in rivers, water flow, and collection of *'ōpae*. When he was young the Hawaiian families and other residents collected enough for personal use, not for sale. *'Ōpae* could be collected all the way out to Hāmākua Poko; Wailoa Ditch was "home of the *'ōpae*;" a newly introduced (black) algae seems to be one cause of the diminishing population.]

When you were young did you folks go out to gather *'ōpae*? Do you call it *wī* or *hīhīwai* over here?

SC: *Hīhīwai*.

KM: Some, they call *wī*.

SC: Us, *'ōpae* was our…my father was a great *moi* fisherman. Not by net, it's hook, we make our own hooks and everything.

KM: Wow! You made your own hooks too?

SC: Yeah. I used to make but now, no more *moi*, I give up. I took over my father's grounds.

KM: You folks go *kuahiwi*, go up mountain or this *'ōpae* was just down?

SC: Yeah. We just go catch enough for *palu* and enough for eat. Nobody was selling, like now. Those days was the best, a lot of *'ōpae*.

KM: Were there special places? What we come to is, we have a lot of discussion today about rivers and healthy ecosystems and the stream flow or water quality and things like that.

SC: Uh-hmm.

KM: You born in '29, in your personal opinion have you seen changes in the resources?

SC: Oh, yeah.

KM: What kind of changes?

SC: We go back to the *'ōpae*, shrimp. Now, these Hawaiians blasting about the *'ōpae* is gone. "Oh, we go hunt *'ōpae*." I never heard such a thing with the Hawaiians. Either you go make *'ōpae* or you go *kā 'ōpae*. You no go over there for catch *'ōpae* for sell, you take enough for eat then you go home.

KM: Yes.

SC: But anyway, working with EMI the Wailoa Ditch was the home of the *'ōpae*. The *'ōpae* went all the way to Baldwin Avenue. That's where had the most *'ōpae*, in that siphon. That siphon, when we shut down the ditch you look down the siphon. You ever seen a honey bee hive?

KM: Yes.

SC: Just like a honey bee hive.

KM: Amazing! The siphon, and I'm sorry, pardon me Baldwin?

SC: Baldwin Avenue.

KM: You mean all the way out in Hāmākua Poko?

SC: Yeah. That's why I tell these Hawaiians, "eh, if the people didn't build the ditch." There's two things I'd say, (1) From Kailua over I don't think you would see one spring along the ocean if didn't have the ditches.

KM: How come?

SC: Because of the seepage of the ditches. That's all the seepage of the ditches. And the *'ōpae*. I said "You mean to tell me only East Maui had Hawaiians?" The people in Hāli'imaile used to catch *'ōpae*. After the Wailoa Ditch, it goes into the Hāmākua Ditch, the *'ōpae* goes down right under, by Hāli'imaile right where the old store. Now you can't find 'em. There's nothing, but from all my years I've been observing, there's a white fungus that is growing on the cement and the stones. And every place you have the white fungus the *'ōpae* just disappear. I think that's what's killing the *'ōpae*.

KM: Was that white fungus you think there when you were a child?

SC: No way, was all black.

KM: Even when you were young?

SC: All black. Today if you go to the ditch, I don't know I've been away one year. If you go to the ditch you go up on Kikokiko Tunnel you can catch all the *'ōpae* you want because it's black. The *limu* there is still black not like some other places.

KM: That *limu* before, *limu wai* was it regular, was it long, stringy kind?

SC: There's some places long but you look, even in the rivers, you walk on the rivers you look that brown, there's no *'ōpae*. We used to catch the *'ōpae* in the rivers,

Kapā'ula, Makapipi. In fact Makapipi used to dry every time we have a little drought. That's what we want because the *'ōpae*, all stay in one pond.

KM: In one place.

SC: You just scoop what you like and off you go. All the bait you want.

KM: Was that, and that's I think a really important thing that you're describing it sounds like at least in your life time, and the practice that you saw the guys above you was, you took enough for you? Were they selling *'ōpae* out to people, that you know of?

SC: Very seldom, you know people, they need some money.

KM: Yeah.

SC: Okay, they go get whatever. They sell 'em to their neighbors you know it's just like fish.

KM: Sure. Now, what you think? The *'eke* full?

SC: Oh, two hundred fifty dollars a gallon! And now cannot sell 'em, you can black market the thing for five hundred dollars a gallon. That's just like gold.

KM: Were there places you know you know this is an interesting thing like you look here, Makapu'u or 'Ula'ino. You come in through these places. In fact I see like this Helele'ikeoho in here. This name and that's actually not far from where your folks lot was, I think.

SC: Yes.

KM: Were there places before where people would go and this was their *'āina*? If they live like you know the *ahupua'a*?

SC: Yeah.

KM: Did someone from some place far, other way come in and gather *'ōpae* from here?

SC: Some times.

KM: Some times they did.

SC: But you see the *'ōpae*, Makapipi Gulch stop. Where I live, no *'ōpae*. Only west of Makapipi, and you know, because of the ditches.

KM: Yeah.

SC: That's where the water is.

KM: By this time coming further east into Hāna the water is not as…?

SC: No more running water.

KM: That's right.

SC: And where I live we had our own water. We dammed up one pond and then when dry we haul water from the springs by Hanawī, along the road.

KM: Oh.

SC: Hey, when God made Maui, [pointing on map to various land sections] dry, wet, dry. If they didn't put the ditches, like I say, this island would be nothing. And that's what I keep telling, the old timers know that.

KM: Yeah.

SC: These young boys don't, young people don't.

KM: We obviously see a lot of channels, a lot of *kahawai* and stuff along here. In your life time has the flow do you think, remained basically the same? Is there similarity, or has the weather changed even from when you?

SC: The weather changed all together. When we were kids in Nāhiku it rained every day. We have this small drizzle rain, sometime it rained the whole month, never stop.

KM: Just the light drizzle kind?

SC: You go feed your pigs you get wet, you go milk the cow, you get wet. It just would rain. Like I said I was born in the bad times, that's when was depression. I seen the good days, now I'm cruising.

KM: [chuckles]

SC: It's not that great, if I was a young man I'd move out of here. About five or six years ago I would move on it, it's no fun anymore.

KM: Change?

[Discusses *moi* fishing, and fishing customs taught to his father by elder Hawaiians, and to him, by his father; fishing at Hiana'ulua.]

SC: I go hook *moi* at Nāhiku, where George Harrison has. We used to go, that's right below our house. We used to go with my father on the horse, and we'd go in the night, go down there. I used to go from here in my car, I leave home say eleven o'clock at night. I go over there, I go down the cliff, I'm all prepared. I spend two or three hours there. I come home with a whole bag of *moi*. You see the Hawaiian custom is, if you go fishing and you come out of the ocean, come out of any place. The first guy you meet you supposed to give some fish.

KM: Hmm.

SC: But, I go night time nobody see me [chuckling].

KM: [chuckling] So that's something that was being practiced when you were growing up?

SC: Yeah, right. That's what the Hawaiians do.

KM: You *aloha*, you share?

SC: Hmm.

KM: Where did you go *moi* fishing?

SC: Right where Kahawaihāpapa Gulch, where George Harrison is.

KM: Let me just see. I saw [looking at map] here's Mokulehua, we just saw it. Here's Helele'ikeoho, Waione Gulch. Right here, so down here I think.

SC: Yeah.

KM: Kahawaihāpapa.

SC: You see this branch?

KM: Yes.

SC: We go down, this is all cliff. Sheer cliffs and we fish right in here. There's a point over here you can fish. But we used to come with the horse…our house is up here, here's the road. We come down Lot 17. Where's Lot 17?

KM: Okay, let me just see here's 17 right here. Here's the trail I think, you were talking about.

SC: Right.

KM: It cuts right over.

SC: You come down and we go right down by this gulch.

KM: Kuwili.

SC: Tie the horse here and go down on the cliff and go along the place.

KM: To the point?

SC: Go down to where the water. You fish right there.

KM: Did you hear that name, Hiana'ulua?

SC: Yeah.

KM: You folks would come along from this *kahawai*, go down around the point?

SC: Yeah, you go down the cliff and you walk on the edge and go down. Once you get over here then you walking on the rocks. Then right on the bay is all *'ili'ili*.

KM: Yeah. So the *moi* all come inside there.

SC: You go fish night time, you get one watchman over there. Had one *puhi uhā*, you catch enough fish.

KM: He come up already?

SC: If he come up you go home.

KM: You go home. This *puhi uhā* come up?

SC: Yeah. He come right by the sand, right there in front of you in the moonlight.

KM: Wow!

SC: With *moi* you got to hook with the moon. One time I play smart [chuckles] my father went teach us, "Hey when you see that, you go home." "I going catch this guy, I like see how big him." I put the hook like that, he bite. He just go out just like one rock keep going, going, going. You see we make our own hook with the spring from the car seats.

KM: Oh, wow, yeah.

SC: We temper 'um with salt water, put 'em over the kerosene lamp, and we dunk 'em in the salt water enough so the *moi* won't open 'em. That *puhi* went open 'um.

KM: The *puhi uhā* just went straighten 'em off?

SC: Straight [chuckles], and off he goes.

KM: Wow, amazing! Your father had been taught that by somebody?

SC: Yeah.

KM: You see that *puhi uhā* come up, *pau* go home.

SC: During the day get one yellow striped *enenue*. You hooking during the day, you get enough the *enenue* come over there, time to go.

KM: Amazing, yeah! Interesting how the old families they keep these stories and things, they believe that everything connects.

SC: I believe, I see it happen.

KM: You see it.

SC: My father he used to wear a hat but on his hat had this *moi* line.

KM: For real? He was ready all the time.

SC: We buy linen we dye 'em with *kukui*, the *kukui* bark come red.

KM: *'Ae*. That's right.

SC: Before no more *sugi*, we use linen and wire lead.

KM: Amazing!

SC: We used to make our own hooks.

[Began working from EMI in 1947; recalls who the senior workers were at the time.]

KM: When did you start working for the company?

SC: In 1947, July.

KM: Who were the old-timers working around you at that time?

SC: James Vierra was one, and John Plunkett was the foreman. He was the superintendent. Ke'anae was big at those time we had a camp in Nāhiku, about four miles away from where I was born. Those guys had electricity, the power plant was owned by EMI and they supplied Ke'anae just for that camp in Nāhiku.

KM: Was it hydraulic or was it diesel? The power plant, generator?

SC: No, was hydro. It closed in 1960 when Maui Electric put in. I cannot say now when Maui Electric took it over from EMI. Because EMI, at that time they had a caretaker up there, up Wahinepe'e where the hydro was.

KM: Uh-hmm.

SC: They had two, they had one hydro in Ha'ipua'ena, and then apparently was before my time something happened so they moved it to Kōlea. I think when they build the Wailoa Ditch that's when they moved it to Kōlea. The water generates electricity and go right into the Wailoa Ditch. Nothing is wasted.

KM: Yeah.

SC: You know you take like the Ke'anae people, all these old-timers lived with electricity. That's why the old-timers that know EMI, they'll never fight EMI. They would never fight EMI. The first store in Ke'anae, they didn't have roads to get out there. They had the Landing, EMI built the Landing for the stuff to come in. They walked up the Pi'ina'au Road and got on the EMI road, the EMI trails.

KM: So the company had a policy it almost sounds like, they tried to take care of the families also?

SC: They still do, I don't know now but my time.

KM: You said Hū'eu, had John Plunkett?

SC: John Plunkett was the superintendent.

KM: Is that the one they call Plunkett Spring?

SC: Yeah.

KM: Pi'ina'au, you go up. He had a place?

SC: Yeah, he was a ditch man up there, Pi'ina'au. His son used to work for us, Tau'ā Plunkett.

KM: *'Ae*.

SC: One thing his kids, the girls are still around here. The boy, was in Lāna'i he died, Tau'ā Plunkett. He died about two, three years ago. The father was Tau'ā too. The broken house in Makawao is still there on Baldwin Avenue. I don't know his first wife, John Plunkett. He remarried. Tau'ā was from his first wife and… [thinking] then Tau'ā married the Ko'omoa. She's still living but her kids she had one… [thinking] five girls and one boy. The boy just died, the father died quite a while. But the old man Plunketts' second wife she's still living she's in Kula. She's ninety something.

KM: Wow!

SC: She had one girl and four boys, the boys are still there.

KM: They must be close to their seventies also?

SC: They younger than me.

KM: Mrs. Plunkett. Do you remember her first name?

SC: The second wife?

KM: Yeah, the second.

SC: Nancy, yeah she's there. She was family to the Matson.

KM: So Plunkett, Hū'eu… Who were the people working for the company when you started then? Out this side?

SC: We had Tau'ā, Harry Pahukoa, he was James Hū'eus' father-in-law. We had one of the Pahukoa brothers, Nicky we used to call him. That one died, Harry died. Ephram Bergau, he's half-German. They lived out Nāhiku. John Kaiwi was there. John Kaiwi, Ephram, they used to come out by horse. They come up to the old ditch camp work. When I started I did the same thing. I come home I was with the horse. Report there at the old ditch camp, but then I worked there two years, 1949, we got to move here.

KM: So you came out to Kailua?

SC: Yeah.

KM: What was your work? What did you do?

SC: Everything, everything. Cutting grass, blasting powder, you learn everything. The beauty about EMI is they never contract anything out. Not any more. Example, they build the redwood flumes.

KM: What area?

SC: Nāhiku. Our boss what he did he hired this guy from the mainland in here. He says, "Hey, teach this guy how to build flumes." We changed everything, eleven flumes. When I left EMI there were two more flumes to build and it's still there out of redwood. The rest we converted. Hey, I was young boy I learned how to lay the steel, in them days, carpenters. Everything was done.

KM: Are there points in the history, the time that you were working that stand out? Where there was some really unique phenomenon that occurred? Time of real big rain or flood or drought? You also mentioned that the weather seems to have changed?

SC: Yeah.

KM: Are the changes for the better…?

SC: [shakes head – no]

KM: …the worse kind of?

[Describes EMI operations in the 1940s-1950s; and shares account of earlier "Ditch Man Camps" for maintaining the system from Wai'aka to Hāmākua Poko.]

SC: Well, as far as storms. In the old days when you have a big storm, you got to figure about three or four months to open up the ditches.

KM: Wow!

SC: Because along the ditches, most of the places the streams just drop in the ditch. All these years we been putting something. They take this redwood and my time they put into concrete. We call it overpasses.

KM: Yes.

SC: When the big storm come we have enough room for the small water go in, but the big stuff with all the rubbish, goes right over. In the old days you know, didn't have equipment. Some times you stay one month cutting the *honohono* grass by hand and throwing them out of the way. Now, it's easy. We had something like

eighty something people. When I left there was only eighteen people, that's including bosses.

KM: So when you started it's like about eighty people?

SC: Right.

KM: Where were the camps? You said Nāhiku had?

SC: Nāhiku had one and then Kailua. Ke'anae was the headquarters, but Nāhiku had an EMI camp. All EMI had houses and all. People stayed, the ditch man stayed. Right along the ditch had houses, for the ditch.

KM: Oh! Even at what ditch?

SC: The top ditch.

KM: The top, Wailoa?

SC: Yeah.

KM: People were living that far *mauka*?

SC: Yeah. Before the Wailoa Ditch, the old Hāmākua Ditch. They had something like thirteen ditch houses.

KM: At various locations? Had a house?

SC: Yeah. Every so many miles, one house.

KM: Get family?

SC: Each guy take care…

KM: That section?

SC: Yeah.

KM: That's how they divvied up the work?

SC: Right.

KM: Flood time or storm or something they were always out able to…?

SC: They had a telephone line, mag-phones.

KM: That was smart. You figure, you get people up along the ditch. Ko'olau Ditch, Hāmākua?

SC: Ko'olau too. If you look where the camp was, like Wai'aka. And from Wai'aka to Makapipi, and to Kopili'ula, had one guy he stayed in the camp there. From there over, they had the guy at Pi'ina'au. Plunkett was one of them, before Plunkett I don't know.

KM: Yeah.

SC: The last guy we had up there was one Filipino guy we used to call, Loquino. He was the last guy staying up Pi'ina'au.

KM: No one stays up along the ditch now?

SC: No. The houses are all gone.

KM: Do you remember people going up? Could anyone go up, go gather if they want, were people getting any…?

SC: You know in the old days, nobody, these guys go, "eh, he going catch *'ōpae*, he going make *'ōpae*, or *kā 'ōpae*." Now days they tell you go hunt but, nobody. The Territorial days, the ranger… EMI property, now its conservation. Before, no, they turn 'em over to the forest.

KM: Uh-hmm.

SC: The ranger had the say. My uncle was the ranger and he used to watch us like hawks [chuckling]. We couldn't go up Makapipi because had drinking water, we had to sneak.

KM: Who was your uncle?

SC: Marion Cabral. He was older than my father, he lived till he was 93, he died.

KM: He worked under the Territorial Forestry?

SC: Yeah.

KM: Who was the overall Forester over here?

SC: [thinking] Lindsey.

KM: That's right, Lindsey.

SC: Holt. But my uncle was…you know, you cut one branch that's just like cutting his hand. I remember when we extended the Kūhiwa Road and went up. We had to cut some branches, he'd go with us. The trucks going up loaded, and that branch going. He's there with us. Only what you had to cut.

KM: What was the thought behind the forest then?

[The forest was beautiful in those early days, and care was taken when working in the forest lands. Describes weather cycles — rainy periods could be predicted; the cycle has changed.]

SC: The forest was beautiful.

KM: How come you took care of the forest?

SC: Me?

KM: How come they wanted to take care of the forest?

SC: The rangers, even the old people until today, you cut one Hawaiian tree, it's got to be right in my way.

KM: Yeah.

SC: Otherwise the cutting of *lehua* or the cutting of *koa*. Only when they made roads and all but today is just…

KM: I understand when you get forest on the ground, more water. Now you look how things are… Mess up yeah, and more grass land the water run away.

SC: And the weeds are just coming in now.

KM: What was the season? Did it rain all year round or were there times when you knew it was going to have more rain period or not?

SC: Well, you know June supposed to be a dry month. September supposed to be dry month. The winter months you know, after September it rain right through.

KM: That was steady?

SC: July, we used to call that pineapple rain, we used to call. Every time July rains that's pineapple rain. That's when the fruit, before no more all this chemicals. Summer time, the pineapple ripe, so that's why the kids could work cannery and stuff but July, we always called it pineapple rain.

KM: Pineapple rain, it was the more dryer period like that?

SC: Yeah.

KM: But still come rain?

SC: June dry, and then July, the rain coming. Now, two winters or something, this past years September, November had the last rain. Before November, December, January, February, rain.

KM: All the time, steady? Occasionally you had drought or you don't remember anything like how it is now?

SC: Not during the winter months, summer time maybe. But see, my gauge of a drought is Makapipi Stream itself, the ditch pick up the water, below the ditch there's another swale. It comes down, it crosses under the bridge and the main road. Below the road there's another spring and she dries…

KM: [looking at the ca. 1970 EMI Ditch Map] Here's Makapipi, here's the road.

SC: Yeah.

KM: This is the Ko'olau Ditch here?

SC: Yeah, Ko'olau Ditch. Okay, this the ocean?

KM: *'Ae*.

SC: Right below the Ko'olau Ditch, there was a spring, when I don't see water down the road, you watch out.

KM: Dry?

SC: Drought. The one below, going down Lower Nāhiku, that one takes little longer to dry out. Had this guy Frank Marciel work for the Water Department. When they built the Nāhiku School. That's why the Hawaiians say, "No *hana 'ino* the water" (don't fool around with the water); don't get smart with the water. Frank Marciel told me, when they put the Nāhiku School in, "they hook up the pipe on that lower spring and it dried." They moved the pipe to the top spring right above the road, and that dried. Then we moved the pipe right into the tunnel, and it's still there.

KM: You had to take the pipe all the way up?

SC: They had to. The County. This is county.

KM: Yeah.

SC: The old people say, "Oh that place don't dry, always get water, get *'ōpae*." But, it dried right up. You take Makapipi you look water, still get water on the road in that lower spring, get water. You go down by the ocean, no more water. The water coming in the ocean someplace. You come back Kūhiwa Stream, that's another dry stream. You go down the Kūhiwa Stream, there's a pond half-way down between the road. Clear, clear water and it only comes to a certain height, and that's it. You go down the ocean, you get in the water right on the point of Kūhiwa you feel the cold water.

KM: The cold water coming up.

[Discusses water flow, and practice of EMI to ensure that water flowed for those families who maintained *lo'i kalo*.]

There's a lot of discussion about the change in the water flow and if they're taking water. Was it the company policy to make sure that water kept going down *makai* to the *kuleana* lands like that?

SC: In Territory days, the way that I was taught was so long as a guy planting taro you give them water, you don't plant taro don't give them water. Now, it's all changed.

KM: Were families going up you know before when we talk with the old-timers, they talk about when you go out you *hana wai* or you take care the *'auwai* like that, so always. Were the families still going up, working even if they didn't work for EMI, going to clean *'auwai* or stuff like that?

SC: Yeah. But you see the Ke'anae people, Ke'anae and Wailua people get nothing to do with EMI. Their water is below the EMI ditches.

KM: Springs?

SC: They got two springs, they're gifted. You take these people out here, they plant taro they cannot plant taro in the water. They got to plant 'em dry.

KM: Yeah.

SC: And then after six months put the water.

KM: You can put the water in?

SC: Yeah.

KM: You were talking the other day and uncle Jimmy was talking about it too, the other week when we met. There's something about temperature, variation of stuff like that. What is that?

SC: See, those guys have springs, and the springs are close to their taro patches (*lo'i*). When she comes, the water is cold, so they can plant. Over here you don't see that it sits, most of it's surface water.

KM: Warmer already?

SC: Yeah, it's warmer.

KM: That cause *palahū*, the taro come all…

SC: Oh, yeah…*palahū*. Now there's not one…maybe Mike, where Mike? Hey Mike you still planting taro? [Mike answered – Yes.] Okay, that's the only guy. He took over the Rosa patches [see interview with Joe Rosa and Nālani Magliato, in this study].

KM: Oh.

SC: That's the one, the two pipes over the ditch. That used to be in the gate.

KM: Which place?

SC: At Honopou.

KM: Oh, Honopou, I saw that.

SC: Okay, this guy he works EMI somehow he goes back and forth. He makes sure the pipes are running. But, he's the only guy plant taro, he probably only get one taro patch. When the old man was there his wife's grandfather, he had that whole place all taro. Every time he needed work done, I used to help him… [someone comes up to speak with Mr. Cabral – recorder off; begin Track 2]

SC: …The Watson lady.

KM: Mina?

SC: Yeah, Mina. But Mrs. Meyers kept her taro patch right through. She has a two inch pipe and she had nine taro patches. But like I said, she plant accordingly. Six month dry, they flood 'em but they dry.

KM: And rotate fields?

SC: Yeah.

SC: But she had enough water.

KM: So that is a practice of the company? That where people planting taro, the water runs through?

SC: That's the way I was taught. That's the way the bosses are. I helped every taro guy. Even Ke'anae get this guy Robert Pu'u and James Hū'eu. Wailua when real dry, get one ditch from Waikani, coming back. Those guys on the far corner before used to come right up. We'd go over there clean the ditch for them. Small water, but the biggest problem now is not enough guys planting, so nobody taking care of the 'auwais.

KM: That's right. When the *'auwai* cause when we went up Pi'ina'au and then up along Plunkett side like that you see the *hau* everything. Just *nahelehele*, everything.

SC: Yeah.

KM: Going all over. Big work I think before days we hear when the people go *'auwai* like that.

SC: They used to work, but they smart you know. They have like at one time they had a guy, a Councilman over there. EMI said, we going have one work day, they formed a work day they went clean the *'auwai*. They had the *hau*, rose apple covered, turn all under, at Lākini. That was their safety…no flood. These guys don't know no better they went and they cut down everything, right across. One storm came, some taro was on the road but they were lucky that the grass came and it plugged up the whole ditch.

KM: Otherwise wipe out.

SC: I told them, you guys lucky, the whole taro patch would have been gone.

KM: This was Lākini?

SC: Yeah. But those guys are gifted, they have the flow.

KM: They get the water?

SC: Yeah.

KM: That's an interesting thing though about when your water cold, *pūhau* the kind cold water, the taro is good. But if the water is warm you got to dry plant first then you flood little later. When the taro comes stronger I guess.

SC: Yeah, if not it just rots away… [Mike Magliato comes up to speak with Mr. Cabral – recorder off; begin Track 3] …In Honokalā, up Hōlawa road, and his taro patches were in Honopou.

KM: You know it's really interesting because you'll see as we're pulling out the original *Māhele* documentation. We see plenty of these guys, that's how you say it Honokalā?

SC: Yeah.

KM: You see some Honopou, some Hōlawa, and some in Honokalā; different locations, they had different *'āina*. Maybe the *pā hale* the house lot was over here, maybe one *lo'i* here. Some went claim all the way *mauka* to *ohia* stuff, even like Pu'umaile was famous evidently the old days too. I get stuff from the 1850s, they were talking about going way up mountain or *mauka* side like that.

MM: I'll try to get Joe Rosa out here tomorrow but kind of hard.

KM: Oh good, good. Would be nice…

SC: That Joe Rosa that he's talking about, that's this guys father I'm talking about. Joe Rosa knows me too because he knows I used to help his father. The old man Joe Rosa…

MM: The old man, he used to work EMI before? Train operator or something?

SC: That's before my time.

KM: I saw a photo of him doing…they had a narrow rail where they were running. I guess when they were doing construction or something up by the ditch side. By Māliko side, I saw a photo, I think of him.

MM: Okay… [says goodbye, leaves Kailua Base Yard]

SC: Yeah, these maps, all undivided parcels.

KM: So what do you think about continuation of the ditch system and operation here?

SC: [thinking] We go back to what I said about seepage from the ditches causing all these springs. If you go on the main road at Māliko Gulch, on the west side of that water coming out of the rocks. You drink that water it's sweet, but then right in Māliko gulch we have one pump, Pump 11 we call. When you run that pump, you pump 'em into the Ha'ikū Ditch on top of the hill. That spring get salty, I know it's seepage.

KM: Wow! That is interesting.

SC: I've used color and seen where the color come out. If not this side, this side more dry. You go Mākena and those places, you no see water, you no see springs.

KM: Of course not, no.

SC: If they had ditches, you know those guys in Waihe'e, they lucky because the water there.

KM: That's right, yeah. You know it's interesting, if we come back what you were talking about, the idea about forest. They were real protective I guess?

SC: Oh, yeah everything was fenced. Cattle couldn't get in. Animals go in, you got to get 'em out.

KM: Yeah.

SC: You know what, I don't know if you heard me the day I went down to the office, and I was telling Garrett… "You just as bad as the rest to worry about the pigs." That's all they worrying about is the pigs, that's bull. That, I don't believe.

I can see the guava and stuff, but the other plants is growing. The guava is not too bad. Me, I worked with the land, I cleared land and I know what tree is sucking up the water and what not. You know if you go to Kaupō, Kaupō supposed to be a dry place. If you coming back on the lower side now towards Kīpahulu, they have water, over there has shrimp too. Those gulches are running. Kaupō Ranch…and Dwight Baldwin had Kaupō Ranch. He owned all that almost to Kīpahulu, but he used to use that as his wet area, Kaupō Gap itself is dry.

KM: Yeah.

SC: He moved the cattle back here. [begin track 4] This new guys, all they looking for is money. They sold all that Kīpahulu area, every time they come in and they say "We have a drought we suffer, the cattle." I say "It's bull, it's your own damn fault!" The old people knew what they were all doing. You take like 'Ulupalakua Ranch, when Baldwin was running that, he had Kipahulu, one section. Every time it gets dry over here, he'd send 'um out to Kīpahulu. But when Erdman bought 'Ulupalakua Ranch, him and the wife split. He had to give up Kīpahulu because his wife took that. Hey, he take cattle from 'Ulupalakua drop 'em Kīpahulu we come from Hāna side pick up the same cattle we take 'em by the barge, ship 'em out.

KM: Wow! There was a broad area that they could rotate?

SC: Right.

KM: When they had dry one area, you could come around?

SC: Right.

KM: That's really important because now look this only [gestures money with hand] the dollar?

SC: Yeah, that's all it was, it's for the dollar.

KM: When you cut small land then you think when the weather change, *pau*, no more rain no more feed.

SC: Yeah. "No come cry to me," I tell 'em that you, you hang yours up just looking for the dollar.

KM: Yeah.

SC: You take Kaupō, coming back, we have this guava, big trees. You go over there and you see these big trees, acres and acres and acres on the mountain. That's what's drying the place out.

KM: Yeah, you're right, when you take care.

SC: And that's what's happening here.

KM: You see it. And if I understand it from you, it was a policy you took care of the trees, the plants and stuff. Did you folks actually, if something was coming in did you have crews go out and pull stuff too, when you were?

SC: Okay, we have the gorse.

KM: Yes. You get gorse over here?

SC: We have the gorse. Sometime we have these guys harvesting the trees. They working up Olinda and their trucks come here and it started to grow on their landing, the staging area. I go after them every year. And the upper Waikamoi, after the second gate it's all EMI. I carried gorse run from that pipe line come all the way out and throw 'em in the State land. But now nobody taking care of it.

KM: That's an amazing thing just like water you got to take care and if you no take care your plants, your forest *make*. She all die…

SC: I can drive and show you. Just today, I was telling the boys, I passed them up there. Look that gulch that's Hawaiian forest look that banyan, look that guava. They're just coming in. The bamboo, banyans, African tulips [shaking his head].

KM: Yes. So the carrying capacity, or the how much water the land takes, really changes from when you go from the Hawaiian to this modern stuff?

SC: Right.

KM: The bamboo only cover everything and I think like you said suck the water out, everything run off when rain.

SC: Yeah, no more nothing. I've seen the forest change, it's sad. That's why, makes me… Like now they're after the *miconia* because they got money. They're going after the *miconia*. What about the rest, it started forty, fifty years ago. When State

people came, right here on this desk. They came here and they talked to the boys about *miconia*. I was ready, I bought that blue berry stuff with me. After the guy was through, I threw it on the table.

KM: The *clidemia*?

SC: No, we call 'em ink berries. That started about forty-five, fifty years ago. In the same area that the *miconia*.

KM: Ink berry?

SC: Ink berry. [looks out in yard of base camp] Maybe they're cleaning this place too good, no more. The only thing going to control 'em is you put grass cover like the pastures and you pull 'em out.

KM: So what, someone brought it in for ornamental?

SC: We don't know, must have been.

KM: Is that bright red?

SC: It started right there in Wākiu (Hāna). No, kind of pink or purple, reddish and then come purple when ripe. That's all over. And the *hau* same thing. I guess they got rid of it had some small ones here.

KM: When you were working, you stayed basically out this area or did you go the whole, all the way out as far as Māliko and what?

SC: No. I come down this office five, five-thirty after seven-thirty you don't see me here. I'm gone.

KM: Oh, yeah you got to be out in the field?

SC: Yeah.

KM: You were all over, the whole place?

SC: Oh, yeah. In the old days was easy we didn't have the water, the Waikamoi back then. Now, I don't know I think they changed that flume. I was working on the flume. It was one month after I retired, the flume collapsed.

KM: You're kidding, wow! This flume was a part of what?

SC: In 19… [thinking] Well anyway, we took a twenty year contract we went up there and we built a bigger flume. But we used the same trestle.

KM: On what ditch?

[Describes maintenance problems with Maui County's Waikamoi Flume System.]

SC: The County system, up Waikamoi. For the drinking water. We went there, we put a bigger flume, double the size on top the same trestle.

KM: Same trestle…oh.

SC: We guarantee it for twenty years. Twenty years came, stood up still get water. I tell, like I say looking for…it's politics. No extend the contract, only one year. I said, "No extend the contract, I know how bad that flume is." Because I was there working on it when we put the new one. I made it last about six years in fact I still

had 'em last from when I retired. But I was jacking up, I finally got permission, the County went buy lumber and I was jacking 'em up putting 'um under the bridge, inside out. Coming out, then I retired. And what was it they tell me, I didn't go up. About two-thousand feet from where I was…

KM: Went down? That came in the teens or twenties or, even later the flume?

SC: That came in later.

KM: Much later?

SC: Yeah.

KM: That's the one you were saying after forty something…? Who was the guy who came in? You said for make all the redwood, the flumes like that? You said someone came in from the mainland or something?

SC: No, no that's different.

KM: Oh, okay.

SC: That one we had new boss already. The cement thing was on the main Ko'olau Ditch. You know, every time I read or I hear or see on the TV one bridge collapse, all the dam engineers. You go up here, just yesterday I had a nephew from California, him and the family. "I give you a short tour." Up here we have a flume, cement flume and the bridge. We cross over and when they build that didn't have a road, they packed everything by mule. The dam thing still standing.

KM: Yeah.

SC: I just can't understand. To me the biggest problem is the concrete. Now, even over here I don't want Ready Mix, when I was working here, my job I don't put Ready Mix. I mix my own over here because of the aggregates. They put small aggregates for pumping you cannot pump big aggregates, so they like you pump it. Take this garage here when we poured this floor, this hundred by thirty-five. We poured 'em in sections, I bet with the contractor that he put the building but we put the floor. That apron outside was Ready Mix. And when we poured the floor I bet that the contractor I said, "Hey, after ten years give me a quart of whiskey, you'll never find a crack." I said "The apron, you going find a crack." Sure enough, he gave me the quart whiskey [chuckling].

KM: [chuckling] It's a matter of workmanship isn't it?

SC: Yeah, the big rock. I've seen the old people, we used to get everything from Honomanu, all our gravel.

KM: *Makai* on the flat?

SC: Yeah. We used to haul night time and all, and when we became a State, you cannot do this, cannot take that. But you know everything is mixed you have the big rock, the sand everything all ready. Only thing you got to wash the salt, no problem. I did a job right in Māliko. It was simple to get Ready Mix. It's the floor of the ditch, and now we used equipment in the tunnels, so I went order Number 4 rock, and I mix it up with my mix. It's still standing.

KM: Still going.

SC: Got to get big rock.

KM: You mentioned and something just came into my mind because you talk about going down Honomanu or these places like this. Did you ever come across old Hawaiian places up on the mountain? Or someplace that they say someone live here or *heiau* or burial? Were there places that were pointed out that should have been taken of, should be taken care of?

SC: You know one thing, this modern guys they see one pile of rocks they say "that's one *heiau*." They don't know. Like right across here, the Okinawans planted pineapples. They couldn't plant pineapple on this knoll here, so they piled all the rocks there. These guys come here tell me "this is one *heiau*." I say, "get the hell out of here, you guys are full of it!" No such thing.

KM: Plenty was for clean the land for make everything so you could?

SC: Yeah.

KM: Even in your pasture, today if you get *pōhaku* in your pasture, what?

SC: You clean 'em. We just cleaned this whole section here. You can tell if….hey if you can find one *heiau* in the mountain, I'll shake your hand.

KM: Okay.

SC: No dam such thing. You think the Hawaiians are dumb? They going carry one body in the mountain for bury 'em and carry the rock. Every *heiau* is along the ocean and I can show you all the heiaus all the way to Nāhiku.

KM: These places were pointed out *makai* to you by the old people, and you could see?

SC: Yeah. The biggest one in is in Honomā'ele. But we have one down in Halehaku, it's right there by the ocean. They not going carry beach rock. You know the Hawaiians not going work that hard.

KM: They maximize their output.

SC: Yeah, they know what their doing. It's much easier to bring the body down.

KM: Yeah.

SC: Like these guys telling me that "hey, *heiau* in the mountain." You might have some caves that they hide something. Like on top of the crater there on top Hāna mountain, there's a lake. I didn't see it myself but I know couple guys been there. There's a canoe inside that cave, and I guess those mountain guys wanted to learn how to paddle their canoes. They made one canoe right up there and they left it there.

[Discusses 1938 earthquake.]

KM: Hmm. Did you hear any stories about any of these places? You heard about night marchers before? Did you ever hear anyone talk about [chuckling]?

SC: I tell you what, 1938 I was small boy we had that big earthquake.

KM: Oh, yes!

SC: I was coming home from…our house was far apart and I was coming home on the horse. My dog was with me, I had a dog. I coming home, almost home, and I heard this whistle. I thought guys maybe I forgot something or they come looking for me, I stopped but the horse ears drop. I call, nobody answer. I go up there, they whistle again. You know, I young boy nine, ten years old. The third time that whistle [chuckles – gestures, takes off]

KM: You took off?

SC: Not even hang the saddle. Threw the saddle, turned the horse loose, went inside the house [chuckling]. The next day we went work for the old man Stoppe. We go early in the morning, he give us contract, and you finish, that's it. He give you one contract and you work and he walks with his cane knife, he go chew tobacco. Sometime he not even reach down the road we stay in the back of him, we finish we cut the guava. "Where you boys going?" "We going home Mr. Stoppe, we finish." "Oh you bunch of crooks, tomorrow I give you bigger place."

KM: [chuckles]

SC: Anyway, we were going up in the morning, us young boys. One big ball of fire. Had one corral over there, and that's where we lived. The old man's house was up on the hill. This big ball of fire came, all of us seen it and disappeared. That night we had earthquake.

KM: How interesting. That earthquake, 1938 you said. Did it change…was there a change in the landscape in the water flow?

SC: I didn't know anything about that.

KM: You were young yet that's right.

SC: I never felt it.

KM: Before the earthquake, the morning before, you said had one fire ball?

SC: Had the fire ball.

KM: Wow, that's really cool! Hawaiians talk about *pōpō ahi* (fireballs), they call that.

SC: Yeah, I know when I got up, they carried my bed because I was the youngest in the family. They carried my bed we were all in one room, the whole family. My parents prayed, and then I got up.

KM: What's going on?

SC: Dishes all over the floor.

KM: How amazing!

SC: That was a big one, but I never felt it.

KM: You slept right through it?

SC: Slept right through it.

KM: Hmm. Sorry… [thinking] You went to school, where was school?

SC: Hāna.

[Discusses Hāna Plantation and Flume system.]

KM: Hāna, that's what you were saying. You were sharing an interesting story. Hāna they had water flowing from flume system also?

SC: Yeah.

KM: Where was their system?

SC: Honomā'ele Gulch, up in there, they had a square flume right on top of the mountain that goes to Hāna. If you look from that hotel you look the big hill Pu'u Hīna'i, you look up there, that's where the water comes from. They had all these take-offs, for feed wherever they going flume the cane to the train.

KM: That's where it was, the flume for Hāna came out of Honomā'ele? Was that the last big water place?

SC: Yeah, that's close to Nāhiku so get the rain up there.

KM: The flume took it, goes out, and then Pu'u Hīna'i?

SC: Yeah, it goes all the way to Hāna.

KM: Before you said they had cut-offs?

SC: Yeah. Coming down Honomā'ele, in fact on Honomā'ele had twin gulches. They had one v-notch flume coming up from on top that Pu'u Hīna'i, we call that. We had this v-notch flume come down, then there's these two reservoirs over here. The train station was down Honomā'ele, they had cane both sides of the road. Everybody carry to this road, *hāpai kō*, they call that. They drop 'em inside the flume and goes to the train.

KM: Oh.

SC: But then the tract go all the way to the Hāna Mill.

KM: You were sharing an interesting thing I think. When they flume, you rode bus to school by that time?

SC: Rode bus, every morning we go.

KM: What happened when you ride bus and you cross the flume?

SC: As soon as the bus comes, they signal the flag. They stop, right across the road they turn the flume, then we go pass.

KM: The water flow stop?

SC: Water all over the road.

KM: The sugar no can go down yet?

SC: No. They stop. That's why, they know about more or less the time when these guys stop throwing in the flume from the *mauka* side.

KM: Wow! What a system?

SC: Yeah. When they went to trucks, that's when they went broke.

KM: That's right.

SC: But like I said the weather went change didn't have enough water.

KM: The weather changed, not enough water? They started trucking?

SC: Yeah. And you know how hilly, Hāna?

KM: Yeah. When do you think about when they started trucking?

SC: [thinking] Must be in the late thirties, early forties.

KM: Wow! Early on the weather was, there were changes occurring already?

SC: Weather changes already.

KM: How, the sugar cane out there did they irrigate with that water too, or they no need irrigate? Was just field?

SC: Yeah, was all hilly. When the war started most of the labor went, so us juniors and seniors, every Thursday and Friday we go work in field, cut cane.

KM: *'Auwē*! And still *hāpai* you got to *hāpai kō*?

SC: No, we cut, and you know the cane burning. By that time already was trucks.

KM: Some job, yeah?

SC: Yeah. We had, our foreman was one guy with one arm, one hand he can put the bridle, the horse inside here. He ride with the horse. You know like I said when the sugar was growing in Hāna that was heaven, Hāna was beautiful.

KM: Hāna was heavenly [chuckles].

SC: Yeah. Ka'elekū had one community there. They had theater, had the store. We used to walk from Nāhiku just to go eat one ice cream.

KM: Amazing! Good! You know as we're just trying to wrap up a little bit, anything stand out about some unique feature or some event that happened out here when you were?

SC: [thinking] I no can think. We did so much, the old days.

KM: Was there a typical day for you? You said you come in as early as five-thirty?

SC: Every day, every day I enjoyed every day I worked.

[Discusses collection of *'ōpae* (some remote sections still have *'ōpae*). Describes the close relationship between the community and EMI; the company was always there to help families in times of need.]

KM: Even when you were still working into your later years before when you retired. Were there still *'ōpae* and the *hīhīwai* or had things slowed down?

SC: Like I said places I know, Kikokiko still have *'ōpae* today.

KM: Yeah.

SC: You take over there up by Baldwin Avenue, every so often they clear 'um out. They give you five years. I go over there two o'clock in the morning, we start throwing the water away and we going clean the basin. I go there with one of the ditch men and you walk on top *'ōpae* inside the water.

KM: Wow!

SC: And you just scoop 'em, just scoop 'em by the bags. And the plantation people, them the one come with the cranes and stuff. We had one guy Kaholokula one time he catch nine barley bags.

KM: What was his name?

SC: Kaholokula. He used to be in charge of the equipment, bring 'em up. They come early, I go more early but I go there, me and one ditch man, we catch four bags for EMI and we give 'em to the boys. I remember, I wasn't working EMI yet, Harry Baldwin. They made a birthday party for Harry Baldwin. And we went to the Nāhiku side for catch *'ōpae* with the EMI boys because I had one brother-in-law worked EMI. Only in Nāhiku we caught six barley bags. They made one big party down Baldwin Park, but we never did go, we stay in Nāhiku.

KM: Yeah, yeah.

SC: We went with EMI boys. You see what made up my mind to work for EMI was this. When I left, when I graduated, the principal, we had a Hawaiian principal, William Haia. He was part-Hawaiian, in fact some of the family still living in there. He told us… you know was only twelve of us at Hāna. When we graduated, twelve of us he said, "You know you students, you going out into the world. You guys going to college, you're going out there to look for a job. Don't look for the job with the most money." That's his exact words, I'll never forget that. But in 1946, we had the tidal wave.

KM: That's right, in April?

SC: Yeah, April 1st. We were going to school on the bus and we get to outside of Hāna we look outside, "Hey the canoes outside in the bay, oh *akule* today." We get to school…big tidal wave, everybody go home. We had one girl, they called that Hawaiian sick [chuckles]. But hey, she just break out screaming. You know our school had big porch. And this girl, six of us senior boys we pile on her we try hang on her.

KM: No can?

SC: We couldn't hold her. And she dragging us, had another girl with a green sweater in her mind her aunty was coming for her, her aunty died. But they say that afterwards we found out that the aunty had a green sweater and this other girl she scream. And us hanging on her. We couldn't knock her down, they called the doctor. The doctor came, Dr. Shapiro I never forget.

KM: Shapiro?

SC: Yeah. He reach over there and us hanging on this girl and she screaming. He gave her one slap [sound of slap] she…

KM: Woke up?

SC: Woke up.

KM: Wow! She saw the girl with the green sweater thought was her aunty?

SC: Thought was her aunty.

KM: Dead aunty coming for her?

SC: Yeah. And then all the Hawaiian kids was saying "that's Hawaiian sick." But you know with the excitement of the…but…

KM: That was the *tsunami* time one?

SC: Yeah, you know, the thing just happened. We came home, and like I said my brother-in-law used to work for EMI. They came by with all the EMI boys, we went to Hāmoa, go search for the victims. That's why I say. "you know community, anything happens in the community, EMI was there." They fold up everything and go.

KM: They go?

SC: Yeah. We went there searched for the ones that died. Then we came back to Ke'anae.

KM: Did families?

SC: Ke'anae two lost. Over there had nine, at Hāmoa.

KM: Nine at Hāmoa?

SC: Yeah, one family.

KM: Two went die at Ke'anae?

SC: Ke'anae, in Ke'anae was older people. You see the fish.

KM: Up on the flats?

SC: Yeah.

KM: Up on the *lo'i* even *paha*? Amazing!

SC: From that time I had to say, this company.

KM: So that was the thing that moved you. You saw that they worked with?

SC: When the principal told me that I said "that's the kind company I like work for. They go for the community." They were working up Kūhiwa, and I got on my horse, this was July. I got on my horse, I going over meet the boss. They had one assistant manager Richard Thomas, his name, tall guy. I'm going up the Kūhiwa Road with my horse and he's coming down. I stop him, I told him, "hey I looking for a job." He tell me, "show up at the camp tomorrow morning." I reached over there early in the morning. John Plunkett, "what you doing here boy," he tell me.

KM: [chuckles]

SC: Told him, "Mr. Thomas said I can work." That's how I started, but you know like now you got to go doctor, you got to go this.

KM: Yeah, yeah big change.

SC: We used to hire guys come out of prison and they work for us right through and raise their family. Nowadays, no.

KM: Hmm. . .

SC: It's no more the *aloha* like before. It's all on the bosses. . .

[Detailed description of the placement of Ditch Man's Houses and Camps along the EMI System – Wai'aka to Kamole.]

KM: May I come just for a moment and I know it's getting late. But if we look at kind of an idea where the camps were. You said there were maybe like thirteen camps or so about? [opens ca. 1970 EMI Ditch Map] This is the whole length now this comes out Halehaku, Māliko this side over here.

SC: Okay [looking at map], Māliko Bay, Wailoa Ditch.

KM: This is Kamole Weir.

SC: Kamole had one.

KM: Kamole had a camp.

SC: Not a camp, a house, a ditch man house. I don't know prior to that. Then we come over here by Kaluanui.

KM: Kaluanui, okay. Here's Liliko'i Gulch…kind of small, the writing.

SC: Kaupakulua. No more the Ditch?

KM: This is Huluhulunui, Pauwela, something road. Here's Halehaku.

SC: Okay Halehaku had one.

KM: So Kaluanui had one also?

SC: Had one more somewhere in here.

KM: Okay.

SC: What's this Kaupakulua?

KM: Kapua'aho'ohui. Kokomo is just… You get Kamole?

SC: Yeah.

KM: You said Kaluanui?

SC: Yeah.

KM: It says Pauwela, okay.

SC: And then Halehaku.

KM: Halehaku.

SC: And then Lupi.

KM: Okay, Lupi. Had one more?

SC: Yeah. And then you come up Nā'ili(hāele).

KM: Which place?

SC: Nā'ili'ilihāele, right up next to Kailua stream.

KM: Okay.

SC: Had one more. This is Kailua road.

KM: Yeah, Kailua.

SC: Nā'ilihāele Stream.

KM: Oh, Nā'ili'ilihāele yes. Okay so had here.

SC: Yeah. And then you go Kōlea where Patsy Mink's mother was born.

KM: Oh yes.

SC: They had one over there.

KM: Okay.

SC: And you know Masa Tateyama, Patsy's uncle. That's where he was born. Over here on the Wahinepe'e Road.

KM: Yeah, right there Wahinepe'e Road.

SC: When you coming down Wahinepe'e Road, get two houses over there. Kind of fairly new ones, and then you… See the Wahinepe'e Road was built for the hydro. That was built all by hand. I was about seven years old I think, I went there. Because the guy that was caretaker there was staying at the camp and my father had one old little pickup truck, and I rode with the guy. Right there in Kōlea where the Power House Road, had just like a little camp. Had the caretaker's house, then had the power plant, then had one long house. Right over there. Before my time had one more house down in the hollow over there.

KM: In fact I see it says "Kolea Power House" right there.

SC: Right there, that's where has a little camp like. When you come back Wahinepe'e road on the way down they had two houses, but I don't know who was staying over there. Then you go by Ha'ipua'ena had one more house right above from the power plant.

KM: Okay.

SC: Then you go all the way to Pi'ina'au.

KM: Pi'ina'au next one?

SC: They had just like a camp there they had the big house, I remember the big house but then had three or four houses over there.

KM: And is that by what they also call Plunkett Spring or different?

SC: Plunkett Spring is?

KM: *Makai*?

SC: Yeah, in the gulch.

KM: Okay.

SC: That's where the houses was. And then you go all the way to Nāhiku the ditch camp.

KM: Oh, okay. In between sort of the Pi'ina'au and Nāhiku ditch camp?

SC: No more.

KM: It was in these various places that a guy was stationed and usually with family or one guy by himself?

SC: Sometimes family.

KM: Sometimes families. And so their responsibility was a certain stretch of the system, and they would always… The daily thing was to go out and you check, how things were going, if blockages or what, like that?

SC: Yeah. Then you come down the main road, the lower ditches like the Center Ditch?

KM: Yes.

SC: Punalu'u had one ditch man house right by the house right off the main road. And then Kailua, was at Pāpa'a'ea, the camp. Camp house this was the big hotel.

KM: [chuckling] Here?

SC: Yeah. Over here was the Pogues.

KM: Yeah.

SC: And then you go by Kāpala'alaea Reservoir, there was another house for the ditch man. That I remember. The last ditch man staying there, a Japanese guy, small guy. He used to clean his section with a sickle. He used to clean with the hoe. Scrape all the grass from the ditch bank, all the dirt ditches. The bosses didn't like that, they wanted…that's the time they started to spray and stuff. They took the hoes and stuff away from him, he do 'em with the sickle, he sharp the part, come chop-chop with the sickle. That guy was a smart, smart man. I worked with him when I first came, an old man sharp guy. He listened to the Japanese news, and he'd tell me everything. His boy is still living.

KM: What was his name?

SC: Fujizawa.

KM: Oh, wow!

SC: He bought two houses from EMI. The Wahinepe'e houses and he built 'em up there by Pe'ahi, the house is still there. And the two boys still living.

KM: Okay.

SC: Then they had one guy he stay in his own house, that's after they got rid of all these ditch men up in the mountains. These guys used to go with horse than afterwards they went with jeep. This guy Fujizawa, we had Tanayose, Five Corners, and then we had one Filipino guy in Pe'ahi, Xavier. They used to go with the jeep.

KM: When did they take the guys out of the *mauka* camps?

SC: That's before I came.

KM: Before you came already? Oh! Even when you were working Plunkett wasn't *mauka* already?

SC: No.

KM: Oh.

SC: Plunkett was staying…he had his house in Nāhiku.

KM: Oh, wow! So change had already occurred, but the jeep never come in. Horse first, then after the war the jeeps became available?

SC: Right.

KM: Interesting.

SC: When I started working Nāhiku that's when they started making all these roads.

KM: Yeah, I see. Thank you very much, just to talk story gather some of these recollections.

SC: [begin Track 5] You know I don't know how these politicians going to take this, these young guys. You see when this water license expired when we had the long twenty-one year lease. I told the bosses, "You guys better go for twenty-one more years." And then they said, "no, no much cheaper." They only see money again. "Much cheaper with the revocable permits." I said, "you folks going be sorry." And you know what, this thing came up lots of times before that.

KM: That's right.

SC: You get one new guy in the State let's go to… Then they get all this reaction, and they forget, they get scared. You got to get one guy with guts. You have to get one governor there that has some guts.

KM: Hmm. See that's a part of why now, we have to…my job is to try and go out and talk story with people like you and others that are familiar with the land. To try and get a history so that we can understand some of what occurred, and what the experience has been. . . Thank you very much for being willing to share some of your recollections and history. I'll get this transcribed and back home to you. You review it, and if there's anything that needs to be corrected…

SC: No, I'm not worried about that. If it came out of my mouth, it happened. . . [end of interview].

Mary McEldowney-Evanson
Oral History Interview – Ko'olau and Hāmākua Region, East Maui
April 24, 2001, with Kepā and Onaona Maly (at Kapua'a-ho'ohui, Ha'ikū)

Mary McEldowney-Evanson (KPA Photo No. 1418)

Mary McEldowney-Evanson was born at Mānoa, O'ahu, in 1921. Her family moved to Hawai'i around 1910, and her father worked for the Hawaiian Sugar Planters Association (HSPA) and the Experiment Station under Dr. Harold Lyon.

At an early age, while traveling in the field with her father, Mary Evanson gained an appreciation, love, and understanding of the unique environment of the Hawaiian islands. As a youth, she also frequented Maui, where her family had a home and farm lot in the Kula Homesteads. In the 1970s, After having raised her children, Mary returned to Maui as a full time resident of Ha'ikū, Hāmākua Loa.

Residing in her sheltered valley, watered by Kapua'aho'ohui Stream, with a few remnant *koa* trees, renewed Mary's interest in the natural landscape of the islands, and she became active in the community out-reach programs of the Sierra Club. She soon found herself walking the lands of the East Maui Watershed, working on community service projects, and gaining a deep appreciation and love for the unique and fragile environment of the Haleakalā Watershed and larger landscape.

During the interview, Mary shared several observations and thoughts pertaining to East Maui forestry and watershed issues; stream flow and land use practices; and she also offered recommendations for habitat and resource stabilization, and community partnerships in resource stewardship. It was also during the interview, that Mary mentioned her former position as a teacher at a pre-school on O'ahu, named "Waiokeola" (Water of life). While in conversation, following her reference to the school name (also a traditional phrase), Maly realized that the title of the present study should include the phrase "Wai-o-ke-ola" as well, for such are the waters of *Maui Hikina*. Mary Evanson gave Maly her personal release of the interview transcript on November 19, 2001.

During the interview, Mrs. Evanson shared several thoughts and recommendations regarding the use of land and water, and the condition of the ecosystem. These included, but are not limited to the following points:

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Interview Transcript

KM: It's April 24th, 2001, and it's just about 8:30 a.m. We're here with Mrs. Mary Evanson. I want to say *aloha* and *mahalo*, thank you so much for being willing to talk story.

ME: I'm very happy to be here [chuckles].

KM: Yes, us too [chuckles].

ME: Happy to participate.

KM: May I ask you, please, would you share with me your full name and date of birth?

ME: My full name is Mary McEldowney Evanson. I was born in Honolulu, December 20, 1921.

KM: Wonderful. What part of Honolulu or what part of O'ahu?

[Overview of historic activities undertaken by HSPA in the area of watershed restoration. The introduction of cattle and other ungulates, and the collection of wood to supply ships in the 1800s led to problems on the land and in water resources.]

ME: I was born in Mānoa, and moved out to Wahiawā when I was about five years old. My father worked for Hawaiian Sugar Planters Association and the Experiment

Station under Dr. Harold Lyon. Out in Wahiawā he was in charge of the Forest Nursery where they grew plants to reforest.

KM: Yes. That's an interesting thought, out of curiosity, there was already, under HSPA, the Hawai'i Planters Sugar Association, there had already been this concern that evolved about the…?

ME: Oh yes. That the native forest were dying, and Dr. Harold Lyon was one who was very strong in that theory. That the native forest was dying, and that the sugar needed a lot of water. So there was concern about revegetating, planting trees, and Dr. Harold Lyon traveled the world looking for appropriate trees. All aliens, they didn't look…they wanted fast growing trees. Eucalyptus, paper bark, and all that.

KM: That's an interesting thought, so there was a realization from the sugar growers at that time, and I understand the Territorial Forestry.

ME: Water!

KM: Water, and it was directly relative to the healthy, to the well being of the forest lands, yeah?

ME: Yes.

KM: As the forests were disappearing or dying off?

ME: So they perceived. They had brought in cattle.

KM: Yes, of course.

ME: They brought in goats and they brought in pigs. So there were many places where the forest was definitely dying.

KM: That's really amazing.

ME: And the islands were young, they didn't have you know, the huge wet forests that we see today, you know, down in South America and places like that. So there were many, you see, some of the old photos of O'ahu, the hills looked pretty bare.

KM: Oh, yes.

ME: And it probably didn't have substantial forest.

KM: I wonder how much of that might be a reflection, if you take as an example, you were born at Mānoa, lived there for the first five years of your life.

ME: Yes.

KM: Did your family still maintain a home at Mānoa?

ME: Yeah.

KM: Okay. I wonder how much is just like Lāna'i. You know, when we see these sort of turn of the century photos of Lāna'i, 1900, 1920s like that, Lāna'i Hale is just this barren…

ME: Nothing.

KM: You know. What of that is a reflection of just the great depredation that was brought about as the goats and cattle and things…?

ME: The need for wood.

KM: Yeah, you're right.

ME: The need for wood for the ships, for building, for railroad ties, for cooking dinner.

KM: What you're describing too, makes me think, because we actually do hear these stories coming into the 1840s coming into *Māhele* claims, where the native tenants are describing that they have patches of *'uala kahiki* as the foreign or Irish potatoes. You know, foreign potatoes, and things like that because there was this broad clearing of lands.

ME: Yeah.

KM: So they could supply ships with food material and wood for fires and things like that. So a number of factors then contributed to this deforestation?

ME: Yes, well I think this area itself.

KM: Yes, and where are we sitting please?

[The Kokomo (Koakomo) area, formerly forested in native *koa* trees.]

ME: We're sitting at my house. . .Kaupakulua Road in upper Ha'ikū. In an area that was and is called today, Kokomo.

KM: *'Ae*.

ME: Which actually is "Koakomo," which is the "beginning of the *koa* forest." The only *koa* you see today are *koa* that are growing in the gulches.

KM: *'Ae*.

ME: And there used to be a *koa* sawmill, Ka'ili'ili, a site, about two miles *mauka* of here. And that was a sawmill that was built, I think, in the early 1900's perhaps late 1800s to mill the *koa*. The mill itself was driven by the stream, so it was a hydro thing. But anyhow, there evidently was enough *koa* in this area to support a mill. And I had read somewhere that toward the end, the wood was only good for burning down in the Pā'ia Mill.

KM: Oh, *aloha.*

ME: I mean this was the sort of thing that happened.

KM: Obviously they chose, the choice woods first for logging, and then they were getting to the end of that process. I wonder if there was any thought at that time, of any kind of reforestation, or if they just left the land open to grazing.

ME: For cattle, yeah. The area, Ka'ili'ili, is now owned by Haleakalā Ranch, they run cattle on it.

KM: Okay, Haleakalā Ranch. Now it's interesting, cause you mentioned, so if this is Koakomo. I like your little description, because you can almost see it as "the entry way into the *koa*." There's also, not far from here, a place called Kauhikoa, is that correct?

ME: Yeah, right.

KM: Yeah, a *pu'u* in fact, and you might almost, if we were to break it down, *ka-uhi* (the covering) of *koa, Ka-uhi-koa*.

ME: Yes. And there's no *koa* now.

KM: Yes, except for right here in your little valley?

ME: Yes. And that's why I bought this place, because of the *koa* [chuckling].

KM: It's beautiful, beautiful. So you were growing up in a family that already had some sense and interest in ecosystem health?

ME: Yeah, I learned the word conservation from my father. I remember him…we used to hike a lot on O'ahu. We'd go into areas where they were denuded. You know, it was just bare.

KM: Yes.

ME: And erosion was terrible, and he would talk about how this area needs to be planted. It needs to be saved by putting in plants. But there again, the mentality was, something that will grow fast.

KM: That's right. Isn't it funny, that thing, it's the quick return versus…

ME: Uh-hmm.

KM: Because of course, the natives like your *koa*, or *ōhi'a* bringing in a wide range of others, it's a slow growing process.

ME: Yeah. That was paper bark, and paper bark was acceptable because it was fire resistant, and there were fires in those days.

KM: Yes. In fact, around the time you were born, there was that terrible Waiākea forest fire you know.

ME: Yes.

KM: And other fires on the various islands where, you know, sections of forest or scrub land were…

ME: Yes.

KM: Now, out of curiosity, was it your father that came to Hawai'i or had they been here earlier?

ME: My father's brother came to Hawai'i first. Robert McEldowney. And exactly why he came I don't know but this was, I think around 1910 or something like that. My father and mother came to Hawai'i on their honeymoon, and I mean like travelers today [chuckling], "I want to live here."

KM: Good, well it was lucky for us today, that they did.

ME: And he met Dr. Harold Lyon at that time. My father was a Civil Engineer, he was not a botanist, he was not trained in plant growing or anything. But anyhow, they evidently clicked and my father got along. Then my father came back, he worked for the City and County, Territory of Hawai'i for a while as a surveyor. Then he went to work for the Hawaiian Sugar Plantation.

KM: That's interesting. What was your papa's name?

ME: George McEldowney.

KM: George McEldowney, oh. I'll try to look through the field books to see if I can find any of his field survey books. Might be interesting.

ME: Yeah, cause I know I have photos of him with his transect.

KM: Good. Okay, so you were brought up already in a family where this concern of conservation.

ME: Outdoors, yes.

ME: Things were going on. Can we do just a brief overview of, you know, from that time up to the interest of how you came to be here on Maui, and your interest in this watershed?

ME: Yes. My parents bought a piece of property up in Kula, and he built a house there. It was kind of a summer place and also for when they retired they would move over here. We used to come over on summers, and before I even started school my mother brought my brother Bob and I over to Maui, we spent a year on Maui. I just love Maui, I mean I just even as a little kid, it was a wonderful time to grow up. And so I used to cry when it was time to go back to O'ahu.

KM: How did you come here by the way?

ME: By boat.

KM: Was it the *Hawaii*, or *Kilauea*?

ME: There were different boats, and we would put the car on the boat and have it loaded up with everything.

KM: Did you come into Kahului?

ME: We'd come into Kahului. Leave Honolulu early evening or late afternoon, I don't remember what time, then we'd get to Kahului.

KM: Over night come in the morning?

ME: Stop off Kaunakakai, never went into Kaunakakai. And then get into Kahului and they would unload the car, then we'd go to Maui Ice and Soda to get soda water [chuckling]. And then head up the hill.

KM: Hmm. I guess, was that part of the Grant Lands up on Kula? There was a homesteading grant?

ME: It was a homesteading, yeah. It was land that had been farmed with corn. I have a photo of the house in the middle of a cornfield. Then my father would come over during the summers and plant stuff over there. Here again, aliens [chuckles]. Then when he retired, he moved over to full-time. Maui has always been very, very special to me.

KM: Good.

ME: I used to write in my books in high school, "*Maui no ka 'oi*."

Group: [laughing]

KM: Where did you go to school, on Oahu?

ME: I went to, well Elementary School I went to Leilehua, which is the school that was next to Schofield, until I was in eighth grade and then eighth grade I transferred to Punahou and graduated from Punahou.

KM: Yes, good. Now, you obviously you grew up, graduated. Did you go to…?

ME: I went to the UH for a year and then there was all this war stuff. I wanted to help the war effort and I went to work out at Schofield until after the war broke out. Then I was shipped off to the mainland, spent the war years in the mainland.

KM: And then when you came home, I had mentioned, that last week I was flying back, and I knew of course, that for years you have had involvement and interest in the Sierra Club and things. I've known the Kupchak's for years and they said that you used to teach at a school with her mother?

ME: Right, yeah. I always say I started school when my youngest child did. We both went to preschool together.

KM: Yes [chuckling]. Yeah . . .I was looking for something to do. Through a friend I met Marian Walsh and her youngest child needed to be taken care of while Marian was at school. I think Debbie was…well was the same age as Billy. She was two and a half at the time. I took care of Marian's child until…she had just started the Waiokeola Preschool. She asked if I wanted to come and teach. It was just, liberation [chuckling].

KM: Wonderful, yeah. You know there's something that's very interesting I think and opportune to our conversation today as we will be coming back to Maui shortly. Waiokeola?

ME: Yes.

KM: Is the name of the school…which is?

ME: Water of life.

KM: [pauses, thinking]

ME: I haven't thought of that for a long time [chuckles].

KM: Isn't it, it's interesting though you know, that there's a…?

ME: Yeah. I hadn't really thought of it in that context, but it was very true. It opened up. I wrote Patty after her mother died, I owed so much to her mother for opening up and saving me.

KM: You got to *mahalo ke Akua* sometimes. You know how things unfold at times. When did you fall into an interest with Sierra Club and the larger conservation issues?

ME: Not until I really moved to Maui. I worked at Waiokeola for five or six years and then Kilohana Church in Niu Valley asked if I would come and start a preschool there.

KM: Wonderful.

ME: I went there and started a preschool at Kilohana. I worked there for six or seven years, and by that time my three year old was in college, he was going to the UH and I told him I said "you know, as long as you're going to school, I'll help and I'll work. . ." Then I was just, you know, "what am I doing here?" [chuckling] And so I had a friend who was living on Maui, and I came over and visited her. And I thought, yeah.

KM: It's time?

ME: Yeah.

KM: Time, time to come back to "*Maui no ka 'oi*," yeah?

ME: I told the school this was in the middle of the year, I got the school all planned out for the whole year. I told 'em I said, "you guys can handle it yourselves, I'm leaving" [chuckles].

KM: What year was that?

ME: That was in '76, '77.

KM: Okay.

ME: I came to Maui, left my kids. As I tell people, ran to Maui get away from my kids. They were all on O'ahu.

KM: Yes.

ME: I lived in Lāhaina for a month, then moved to Kahului while I was looking for a place and then found this place and then moved up here. That was in 1978 that I bought this place. Walking down the driveway and saw the *koa* trees [chuckling – holds hand over her heart]

KM: You knew you were home?

ME: Yeah, it was just that feeling. This place was just all covered with guava and stuff.

KM: I see that now, you're fostering the growth of the *koa*. But you have some wonderful natives, the *kokiʻo*, *pōpalā*, your *hālapepe*, *māmaki*, and these things. You've tried to renaturalize, re-native…?

ME: Last night I was talking to Peter Baldwin who has…his father has given him this piece of property up here, where Kaʻilʻili is. It's a huge piece, six hundred acres or so, it's all pasture land. His wife to be said he wanted to plant a banyan.

KM: [Takes a breath – shakes head]

ME: When we came home…they brought me home last night, he said, "what's that tree over there?" I said, "that's a *koa*. I said, "isn't it magnificent?" He said, "yeah." Afterwards I thought, I'm going to start seedlings, I'm going to start planting *koa*. [chuckling] "These are what you're going to plant up there."

KM: How wonderful. How old is Peter, about?

ME: He's in his sixties or so.

KM: Oh. I wonder if, you know and I hadn't thought of that but I wonder if any member of the Baldwin family, an older member of the Baldwin family might have a connection to some of the history, recollections of…?

ME: He didn't seem to know, when I was talking about Kaʻiliʻili he didn't know that.

KM: Okay.

ME: He hadn't heard that. I know when his wife told me he wants to plant a banyan, I said, "Tell him it's too high elevation, it won't grow" [chuckling]. But it is an opportunity to get koas back on that land up there.

KM: Yes, wonderful imagine. It's actually a six hundred acre parcel?

ME: I believe it is.

KM: Imagine you could actually do a really intriguing Hawaiian reforestation project.

ME: Yes. The ranch did plant a plot up above Ukulele Camp, but it was all Big Island *koa* and they fenced it and all. They have a sense of… [pauses]

KM: Conservation, forestation?

ME: Yes.

KM: Good. You came here, you purchased this *ʻāina* in '78? Your father's *ʻāina* at Kula was sold earlier or in the family?

ME: Well, my mother died and my father remarried.

KM: Okay…

KM: May I ask real quickly, your niece is Holly McEldowney?

ME: Yes.

KM: She's with the State Historic Preservation Division. Her father is…?

ME: He's my older brother George. He's George Shiel, my father was George A. McEldowney.

KM: Okay, wow that's amazing! Holly has done so much work in the history and the historic preservation process, that's really great. Wow, neat family!

ME: Oh, yeah.

KM: Lot of good influence on where we are. So?

ME: When I came to Maui, I spent the first two years after I bought this property, just clearing it. Just doing a lot of work on it. And then I got called to Jury Duty, and it was kind of traumatic because I've been here for two years just fussing around here, hadn't really paid any attention to what was going on out there at all.

KM: [chuckling]

ME: Hardly read the paper, listened to the radio.

KM: Oh, so you were the perfect juror [chuckling].

ME: But anyhow, I was called to Jury Duty, and it was an interesting case of where some guy had hit another car, and he said he was blinded by sugar smoke, burning

smoke. The jury was mostly made up of local people, the poor guy didn't have a chance.

KM: [chuckling]

ME: I mean it was just…bull! [chuckles] But then in being on the jury, it was about a week or so. I awakened to the fact that there was a world out there and I needed to get more involved in stuff. I started going to meetings and then I've always enjoyed hiking, so I got involved with the Sierra Club through the hiking program. And really neat people. I got involved with some of the conservation issues, and started going up to the National Park, where the Sierra Club was doing some fencing projects.

KM: Yes.

ME: I remember going up to the guy who was the coordinator and saying, "This really sounds like fun, but what can I do as far as building fences?" And he said "Oh, you can carry the tools" [chuckling]. So, I got that connection with the National Park, which still today I'm still involved very much with the National Park. Then I got to know Renè Sylva through the Sierra Club, cause he was leading hikes at that time. He's the one who really taught me a lot about native plants and got me interested.

KM: What a wonderful knowledge he has.

ME: Yes. And he at that time was working down at the Maui Botanical Garden. So, I got involved with that group, and I still am involved with the Botanical Gardens. Things just kind of evolved.

KM: Evolved, grew?

ME: Yes.

KM: As we look at this East Maui Watershed, as it might be called today, but this beautiful mountain resource that is Haleakalā with it's diversity. The wet forest, the lands, and I'm reflecting back on Waiokeola, because it's so true. In fact the Hawaiian word for water is *wai*. The Hawaiian word for wealth is *waiwai*, because when you had water…

ME: You're right.

KM; …there was wealth. In the older context, it wasn't *kalā* (money) right?

ME: No, no, no [chuckling].

KM: It was the wealth [chuckling].

ME: It was what made life happen.

[Discusses the East Maui Watershed lands – mountain to sea – and water resources.]

KM: *ʻAe*. Before the interview, you shared with me an important thought, and if you could develop it further about the relationship. That it's not just one part, that it's the whole system, from the top to the bottom.

ME: Yes.

KM: You want to talk a little bit about your sense of the relationship of mountain to sea?

ME: Well, I mean it's, particularly when you go out and walk in this area of the ditch country, they call it, the Watershed Lands. And you see how it's all connected, you know, the plants themselves and the diversity of the whole mountain. This is what I find so incredible about Haleakalā, is that you have this area over here that is so very wet, all the way up to the top of this mountain, you have this forest up to Waikamoi.

KM: This is the Koʻolau region basically?

ME: Yeah.

KM: Nāhiku into the Koʻolau. All the way up to Waikamoi. [Also pronounced Waiakamōʻi by elder natives.]

ME: Right. All the way up to the crater, all the way up to the Puʻu Nianiau. And then just a few miles on the other side, is this completely desolate, southwest rift zone that is a completely different ecosystem.

KM: Yes.

ME: It's gorgeous.

KM: It is alive. It's just very different?

ME: Yes, very different, it's fascinating. But it shows, you know, the water is so important. But it is, it's all connected.

KM: One of the amazing things that I hear from old native families and others that have life-time attachments to landscapes like this is the relationship of water flow from the mountains, and continuing, insuring life continuing in those regions. Even down, you know, into the *muliwai*, into the estuaries, and into the ponds or the near shore fisheries.

ME: Yes.

KM: And there's a relationship between water coming from *mauka* going down to the sea. Is there, do you have some thoughts?

ME: You mean as far as it, the free flowing?

KM: Yes. What is your thought about this region and the condition of the streams? Are the streams healthy today as they were in the '70s? And if we go back to earlier times or earlier accounts, have you heard from families when you're out in the field walking or from old timers? What's our condition today, and has the weather changed?

[Banyans are a significant threat to the watershed ecosystem. Discusses their introduction; notes that it was not until the 1950s, that the insect necessary for their pollination was introduced. Prior to that, the trees could not spread.]

ME: [thinking] I think that's really complex, because from my perspective, a lot of the areas are very different, probably than they were. I don't know, you know, never…I often, when I'm out there, I wonder what this place looked like two

hundred years ago? What was the vegetation like? What could it have been like? What I am most taken with, is the alien species.

The banyans, out in the EMI country that suck up water and cause a great deal of damage. This is a plant that never should have come here, but the reason it was brought in, and here again by Dr. Harold Lyon. It was a tree that would not be used for lumber, it would be a tree that people would leave alone. All the other trees they were planting I guess were being cut down [chuckling] for fire wood or what. But because the banyan is so, it wouldn't be cut down. And that the insect that was needed to pollinate was not here.

KM: Ah, okay now that's interesting.

ME: Then the insect came in, and so now you have banyans everywhere, and they're a terribly invasive pest.

KM: This is an interesting point that you bring up, so that when Harold Lyon brought the banyan in before. It was planted and it basically stayed in the location that it was planted in.

ME: Yes, right.

KM: We now see that the banyan is spreading and taking over vast tracks, large area.

ME: It is.

KM: And that's the result of, some time later, an insect being introduced? What type of insect?

ME: That's what I understand. It was the pollinator, made it's way here.

KM: A wasp?

ME: It was a wasp, yeah. There again, who was to know?

KM: Yeah, that's the funny thing.

ME: I go up to the Waikamoi Reservoir, through pasture land, and then you get into the Makawao Forest Reserve that was an area that Renè Sylva says he remembers there being *hāpuʻu* everywhere. And they went in there and bulldozed all the *hāpuʻu* and pushed them and planted pines. It's just like man's inhumanity towards Mother Earth.

KM: Uh-hmm.

ME: But as far as change in stream levels or anything like that, I have no way of knowing. But, I can imagine that a lot of these places, if they had free flowing streams all the way to the ocean, they would look very different.

KM: Are there some issues that you think are, important then, to continued use of the waters? Because obviously these *wai o ke ola*, these waters of life, are important not only to the well-being of East Maui, but the system, island wide is kind of evolved with a dependency upon. Are there issues? …There's a little wasp, speaking of wasps. [gestures to a wasp flying around]

OM: There, be careful. [begin Track 2]

[Discusses relationship of water systems and development on Maui.]

ME: I read a lot about central Maui. And you see it when you're up on Haleakalā, looking down, and you see this isthmus, and you read about how, it probably was nothing but sand dunes going all the way from Waiehu to Kīhei, eight miles of sand dunes. Today you look down there you see nothing but *kiawe*, and *haole koa*, and stuff. If it hadn't been for the water being brought from here down to central Maui, it would be nothing but a dust bowl. You can see it when they turn off the water before harvesting or before burning.

KM: You can see the plumes of dust rising off of the landscape?

ME: Yes. So I think the water is more important for Central Maui than it is for out here. I mean a lot of people disagree with me. But as I say, you turn off the water for central Maui, overnight you're going to have nothing but weeds and a dust bowl. Wouldn't you rather have sugar cane than that, or houses? I know there many people here, and I know personally, some of them who want to have their streams restored. I don't think it's realistic. I don't know what this piece of property would be like if this water was not diverted up above, and it's picked up for two gulches I believe, possibly three, and then dumped into this [thinking], I'm trying to think of the name of this gulch. Kapua'aho'ohui.

KM: [looking at ca. 1970 EMI Ditch Map] Kapua'aho'ohui, yes I saw the name. I'm just going to look, this is a 1970 Ditch Map.

ME: And then this water goes down and is into a ditch and then it's picked up. Here's Māliko [looking at map] where is?

KM: Here's Liliko'i, Pauwela, Huluhulunui, this is the East Kuiaha here's Kaupakulua Road, 'Ōpae. I was sure I'd seen the name Kapua'aho'ohui.

ME: Where's, I don't know…

KM: I know it's kind of small.

ME: Pu'uehu.

KM: That's what your Kokomo, Koakomo, Kaluanui, Awalau gulch.

ME: I'm having a hard time.

KM: Yeah, sorry I know it's so small. Kapua'aho'ohui, is that this gulch actually that's in front of us, or the more *mauka*?

ME: No, this is it.

KM: Okay, well that's good.

ME: Awalau, we're over here.

KM: Yeah, here's the, so maybe it doesn't come quite far enough up that's why.

ME: Yeah.

KM: Okay. Are we above Wailoa, we're above Wailoa right, the Wailoa Ditch?

ME: Yes.

KM: There's no ditch above, is there a ditch above us also?

ME: There's a ditch… Awalau we're over [thinking] this is Pu'uehu, and the ditch goes around Pu'uehu, and then the water is dropped into this.

KM: What's the name of that ditch up there do you know?

ME: I don't know that it has a name.

KM: Is it a more recent ditch or is it?

ME: It probably is, and I don't know when it was built.

KM: Okay. So Kapua'aho'ohui that's this gulch area that we're in?

ME: Yes.

KM: Okay. Do you think, is that an example? Did this gulch here flow or was it…?

ME: I don't know. I know that most of these streams in this area are intermittent.

KM: Intermittent, yes. I think because we've come far enough over to the west where your real wet section.

ME: Yes.

KM: Goes back into the Nāhiku and then Honomā'ele kind of it ends, and then the Hāna intermittent streams again in that area.

ME: Right, yeah. Māliko probably flowed all the time, and that's big. It doesn't now, because it's diverted. But the water is very complex, and very important of course. And very interesting.

KM: Yes, it is. I don't know if this is realistic, or…perhaps there is something more of a balance that can be reached, that will… I'll share with you I have spoken, I had a wonderful interview a week ago or so with James Hū'eu. He's 86, born and raised he's descended by generations from native families of Ke'anae. Spoken with aunty Helen Nākānelua, with Stephen Cabral, we're going to be talking story. One of the interesting things when I did a series of field trips out just so I could become a little bit more familiar with the land. Garret Hew took me out. We see that there are these mechanisms, where ever there were *kuleana* that were using water, in taro lands or other forms of cultivation like that.

ME: Yes.

KM: It appears that the EMI…from A & B to EMI, that they've had this history of insuring continued water flow down at some level to the *kuleana*. Maybe there's a way, you know, that somehow some balance might be struck. I don't know if the families at Ke'anae, or Wailua like that if there's… I know that there's this concern that's evolved now.

ME: Oh yeah, yeah.

[Discusses water flow issues; importance to island of Maui; and varying points of view and alternatives discussed in community.]

KM: Do you have some thoughts about perhaps, some people that we should try to talk to as a part of this interview-consultation process on this study that might share some thoughts or insight, about the condition of water and what the future of water use might be?

ME: I think you probably have the contacts of the people. Like the Hū'eus and the people who have lived out there for generations. I mean there are a lot of people, I have distanced myself from the Sierra Club now.

KM: Hmm.

ME: I've been quite vocal in saying I'm no longer with the Sierra Club and I've distanced myself from them because of their new philosophies which I don't agree with. That is, well a lot of them are anti-business, or anti-corporation, and A & B is you know the pits. You know this is a small island, we all have to work together.

KM: Yes.

ME: And if you can't sit down and talk to A & B, how can you resolve anything. Don't just go into these meetings and start yelling and screaming, you know, "what you're doing is wrong!" And "stop the cane burning," and all that kind stuff. I think, and they are very vocal on this diversion, A & B is taking all the water. But then you know again, if you turn off the water and central Maui turns into a dust bowl, what's going to happen? I feel there's a choice of either continuing growing sugar as long as possible, which isn't going to be forever.

KM: Uh-hmm.

ME: What is the alternative?

KM: Yeah.

ME: I talked to a woman the other day, she says "Well they've got to come up with some alternative crops." And I said, "Why don't you help them?" [chuckles]

KM: Yes. It is easy to say "why don't you?" versus "lets get in." And that's a real Hawaiian value, this thing about, that you don't just stand and look, but turn the hand down and work, yeah?

ME: Yeah.

KM: And make something. You know, I'm reflecting on your comment about a change in philosophy of this organization. You know what I really see the difference is? We have a continental driven sort of mentality.

ME: Yes.

KM: The me, myself and I thing again, versus an island community. This comes back to your love, I think, and conservation and the ecosystems is that everything is integrated. Is a part of, there is nothing that stands alone, and if it does it's going become extinct, really.

ME: Exactly.

KM: Which is why this thing again, about the balance. Somehow, I have to tell you, I've already heard it from several of the *kūpuna* that I've spoken to, the old Hawaiian families, and others. It's easy to say that you want, and this, this, and this, and this, but all of them reflect, and this is the teller, all of them reflect that from when they were young, or when they were still actively…of course, Helen

Nākānelua at 90, is still in the taro patch (*lo'i*) almost on a daily basis. When she looks around and she sees that where there was once taro across the flats.

ME: Yeah.

KM: Or across these areas now, a few. And it is hard work, but again that continental mentality, the American thinking is brought up this thing about it; it's easier to put the hand out you know [gestures hand out, palm up].

ME: Yeah.

KM: So, these are important issues. Matters that you bring up again, somehow in an island there's got to be a balance, I guess.

ME: Yeah, I mean, things are changing, and a lot more people, a lot more everything. But we've got to work together in order to resolve it. I mean that's why I got involved and continue to get involved with environmental issues, because I think I can help.

KM: Yes, and you bring years of experience and interest. Lets come back to this, if there are issues, and you brought up a good example, banyan, or we see the *clidemia* now. And these things, or feral animals, pigs, goats or whatever. What do you think, do you have some thoughts, have you laid out a plan already of what you think would be? What do we need to do to ensure that this environment can continue sustaining and developing the water resources and things that are needed? Have you thought about?

ME: Yeah and I think that…and I was quoted as saying this in the paper the other day is that "Everybody has to take care of their own little *kuleana*."

KM: Yes.

ME: Your own life, what you do, day to day. Again, getting back to the Sierra Club, with fighting the expansion of the electric plant. And you go to houses up in Pukalani, they are air-conditioned. There is a need for a bigger power plant, because everybody is demanding electricity for air-conditioning in Pukalani? Give me a break [chuckling]!

KM: Yeah, like open your windows.

ME: Yeah, the windows don't open, you can't open them.

KM: Isn't that terrible, yes.

ME: I know that just blew me away when I went to an open house.

KM: I noticed something here that you did, and this was probably a little bit earlier, but see your windows… Of course you live in an area of valley, I imagine there's generally a breeze coming down?

ME: Oh, yeah.

KM: Which is wonderful. I see what you've even done here in leaving the screens open here [indicating open-screened panels above windows]

ME: Yes.

KM: And I don't know if you have pukas down below on the floor level.

ME: No, I get too much rain.

KM: You already get this circulation going through?

ME: Of course. Yeah, I've got windows that will open.

KM: Is your house ever so hot that you can't handle it?

ME: No. I seem to be able to survive.

KM: Yeah, funny yeah. It is an interesting thing, the *kuleana*. I also, I hear really a very Hawaiian thing when you say that you must take responsibility for your own *kuleana*. If you were in a land area, if you were on a water system, if you're in a valley and the water isn't flowing the way it should. You know in the old days, public works projects.

ME: Yeah.

KM: Whether we're talking in your childhood, in your fathers time, or if we're talking the pre-contact time. I've been told time and time again, when the chief called, you came.

ME: Yeah, oh yeah.

KM: And work was done. That's an interesting thought, what about though, these plants like the *clidemia* and I don't know if *miconia* is a problem. The banyans or the pigs; and are there ways of striking a balance?

ME: [thinking] It's a tough one, but I think, like *miconia*, it is a giant problem, and we have to face the fact that we do have a problem. We have to do something about it. And either through giving money to hire people to do it, or to get out there and volunteer and pull up the little seedlings. We have to recognize that there is a problem. And it's the same thing with the feral animals, we've got to recognize that we have a problem. We may think the deer are cute, and like to watch them, but they are a problem. It's out of control. We have waited too long to control the deer, they're everywhere, they come in my backyard. The same thing with the pigs, we've got to recognize that the pigs have done tremendous damage in the forest. It isn't, this is a hard one, working with the hunters, to say, "hey, you can hunt over here" but "cannot hunt there", and we've got to eradicate.

KM; Yes. In some areas, but we've found I think in our State experience, we've also found that there is very limited success in a fencing and eradication program that does not also address all the other factors. Suddenly you've eradicated, you've got no pigs, or no goats, or no sheep or deer or whatever it is, but what comes back in? If you've got a resurgence of alien stuff that's fire prone like that somehow again, it's coming to a balance.

ME: Yes. It's real hard. But there again, I feel Hawai'i has given me a wonderful life. And still is, and I feel I owe it, I owe this *'āina* as much as I can do to help it. It's never ending, too.

KM; *'Ae*, that's wonderful. It isn't (ending) you know, it's a daily process.

ME: Oh, yeah.

KM: It's a way of life, not like the clothes we put off and on when we feel like it.

ME: I just heard a few days ago…I learned last week, Haleakalā National Park is going to be resurfacing part of the road all the way up to the top. They are going to be closing the road at times in order to resurface. They are going to be resurfacing all the parking lots and stuff like that. I've formed this Friends of Haleakalā National Park, we're their support group. They didn't let us know anything about this, and the more we hear about this project, the more outraged we are [chuckles]. It's just things like that, they're going to widen the road by three feet, and we said, "Hey, that is a major impact!"

KM: That's right.

ME: Have you done environmental studies on the *ua'u*, about the archaeological sites? "No." So [shaking her head, chuckles]?

KM; I can't imagine that they could undertake it, as a Federal Agency, the entire Section 106 Consultation process. The Historic Preservation Act, the NEPA processes, I think it would all come.

ME: They say they are exempt.

KM: Why?

ME: Because they are a Federal Agency, and they're just working on a road.

KM: I doubt that.

ME: I think, the people up at Science City, I think are going to sue [chuckles]. Sue the Federal Government, all right [chuckling]! It's distressing, because we had asked a year ago to let us know, if you're doing any major projects up there, we can help you. But it's just an example of trying to work with Government Agencies.

KM: Out of touch, out of mind. That's one of the weaknesses, I used to work with the Park Service also, at Hawai'i Volcanoes and I actually think that one of the greatest detriments that we have in the system is the fact that, so much, particularly at the management level, but even some of the front line grunt level, is transient. They're here on their way to somewhere else.

ME: Yeah. This is the worst, yeah.

KM: And it's sad, because I'm sure it's the same everywhere but in a place like Hawai'i, where there is such great diversity and the uniqueness, and the cultural, natural, geological issues are so diverse. You need people that have an attachment to place.

ME: Uh-hmm. I don't know whether you know the latest project that I'm proposing, that's a new National Park for Maui. From La Perouse, this is down south Maui. From La Perouse Bay down to and including Kanaloa. It's a six mile stretch that at one time was proposed for a State Park, back in 1977. It was a wonderful, Mākena-La Perouse State Park plan that came out. I thought, oh great, but the State has been unable to control that area at all. The archeological sites are being destroyed by four wheel drive, by campers, so about a year ago, I came up with this bright idea, "Okay State, if you can't do it, we're going to turn to the Federal Government." And so I wrote a proposal, and sent it off to Patsy Mink, and everybody else, and this has been the most wonderful experience, because it's been very positive.

KM: Wow!

ME: I've had 100% support on this. The State House passed a resolution, thanks to Mina Morita, a couple of weeks ago in support of it. The County has come out with a resolution in support of it. And it's the sort of thing that, you know, the State Government gets so political, and they keep saying they are undermanned, under funded, and they can't do anything. It's standard when they come into this controlling of alien species, they can't do it. And this is where the private sector's got to pick up, or give it to the Federal Government.

KM: And community, they need to be in touch with it, again. And I think we see this particularly in some of your earlier Sierra Club adventures and things like, if your community is not a part of it, or this Haleakalā Road widening thing, if they fail to communicate to those who are their friends.

ME: Yeah…you've made enemies [chuckling].

KM: Yes, that's right. And ultimately, if it's something that members of the community feel are detrimental, and if there's no other avenue, sabotage becomes a process.

ME: Yeah, exactly.

KM: You put a fence up, the fence goes down, you know?

ME: Yeah.

ME: You put a gate in, the gate's broke,.

ME: Yeah.

KM: And there's this stuff that…

ME: Work together.

KM: Communication?

ME: Yeah.

KM: Communication is a key thing.

ME: Yeah.

KM: And it's not lip service either, it has to be a real meaningful, give and take thing.

ME: Exactly. This is what happens too often, that they go through the process. Holding public hearing. The State is the worst. I've been trying to get a copy of a Management Plan for Kanahā Pond that came up some time ago. I was on the Advisory Group, we worked for years to come up with this Management Plan, and they did it, they got a Management Plan. They won't give me a copy, it's being reviewed internally, so they're shoving it around. But in the meantime they're…

KM: It's a bunch of detached people, I'm sure, who have no real interest, it's just another piece of paper to push off their desk.

ME: They don't. I feel at this point, that you don't want me to see it, right? You don't want me to know what you're going to do there [chuckling]. But I mean that's just an example of not communicating with the public and giving them information.

KM: If we look at some possible thoughts about, even with this water lease issue that's going to be coming up again, a renewal process and stuff like this, some of it is, is that, you know, communicate. There are I think resource issues, there needs to be better care that at least along the system that alien species are managed. And, you know, when I was talking with Steve Cabral them, and Jimmy them, they said you know what, when they were young working…and of course Mr. Hū'eu started working in the '30s. Early or mid '30s working. There was a program, they were out controlling, monitoring weeds, there was this continual thing, Mr. Cabral spoke about the gorse.

ME: Yeah.

KM: And he said it actually was brought in from around this side they brought trucks someone else had come in and opened up an area. He says, "you know, we were out there pulling it."

ME: Yeah.

KM: Now they don't.

ME: Yeah, yeah, and why? Well, they don't have as many employees now as they used to.

KM: That's true, when Cabral was working he said there were eighty, when Jimmy Hū'eu was working, there were more in the early years.

ME: Yeah. We went out to help EMI eradicate banyans. When I was with the Sierra Club, we had service trips. That's the other thing, I'm trying to get the Sierra Club to revive their service trip program.

KM: Oh, you mean it's not?

ME: They don't do it any more. To me this is the best way that people can get out into areas where normally they can't get out into, and they can learn so much by pulling up weeds, or gorse.

KM; That's right. The fellowship, the interaction that occurs out in the field.

ME: Yeah, and you're doing good, you come home [chuckles]. We went and worked with Stephen Cabral, and Garret, and we got rid of a lot of banyans.

KM: Have you been involved at all with a particular area along this region, that's sort of within the Hāmākua, Ko'olau lands and restoration or care of a particular area of native plants, *olonā* or other things?

ME: Not really. When I go out in that area, it's more just to enjoy it. I mean, it's my favorite hiking place, and I find it so very, very interesting. I wish somebody would write a history of the EMI ditch system. Carol Wilcox touched on it a little bit but…

KM: Is that published? Carol Wilcox, what was it?

ME: From Kaua'i, she did a book on it.

KM: It's "Sugar Water" or something like that.

ME: Yeah.

KM: That's right.

ME: She touched a little bit on EMI.

KM: I'm going to try and do…we've been pulling out, Onaona and I. We've been pulling out as much as we can because I figured it would be a benefit to pull as much as possible, and understanding the history of that process coming together. To understand how the system has developed and evolved, which is why these interviews with people are so important.

ME: You have Stearns and McDonald?

KM: Yes.

ME: One of my favorite hikes is going out to Makapipi, at the start of the ditch system. I've got some of the maps of the Stearns and McDonald, and all the exploratory wells that they dug, trying to tap Big Spring.

KM: Yes.

ME: To me it's fascinating, and I went down to Big Spring one day. It's the only time we've ever been able to find the trail down to it [chuckles]. How that whole ditch system works, and to see the workmanship. The rock work along the side of the ditch is all this cut rock.

KM: Cut stone, the old man there was an old Japanese man, I don't remember his name… [Mr. Fukushima] just died a couple of weeks ago. I guess he was one of the last known cutters, of that period.

ME: Yeah. And to me it's just fascinating and it's beautiful. It's just so much history, and you know just the thought of the engineering that went into that system. That it's all gravity flow.

KM: Yeah, it is amazing isn't it?

ME: When I was involved with the Sierra Club, we did a series of water hikes. We had Stephen and Garret come and do a program about the water system, and then we'd go out and do these different portions of the ditch system. It was fascinating, the Waikamoi, and then the Pi'iholo, and then down to the lower, and go out and start at Makapipi, and then walk.

KM: *'Ae*, come back along. Do you know, were there field notes? Were there descriptive narratives of the trips ever developed within Sierra Club, that you recall?

ME: I don't know. [thinking] I don't remember. I know we did it for several years. But then the reason I liked it out at Makapipi, is there's still native, it's still full on native out there, with the *ōhi'a* trees, and all kinds of neat stuff. Then the further you come this way, then you get into the aliens, and… [shaking her head –

chuckling]. And going up into the Wahinepe'e area, you run into the bamboo, but it still is beautiful.

KM: You got to see this interview, and we're going to see Mr. Hū'eu again tomorrow. This interview I did a week and a half or so ago with him, he's really a unique individual.

ME: Oh, yes, isn't he.

KM: He speaks the language of course but he had these interesting…these ears that picked up and listened to… He's telling us how the place name Wahinepe'e, as an example came about or Waikani. Various places, these wonderful, wonderful accounts.

ME: I love that guy, he is so neat [chuckles].

KM: Yeah, it's wonderful that's what I'm so excited about is that we have this opportunity to bring these kinds of histories together.

ME: Yeah.

KM: These thoughts from people that are of your time and your interest, and the old native families and others that just, let's bring a history together so that…

ME: Yeah.

KM: As planning for the future.

ME: Yes.

KM: Uses or whatever, stewardship.

ME: Yeah.

KM: That we can have some sort of a foundational, platform to work from so we can understand a little bit more.

ME: Yeah.

KM: Again, this *Māhele* history is going to be real intriguing as the native tenants are describing the kinds of land and uses. One of the most beautiful things that we came across just real quickly relative to *olonā* as an example is that in Pu'umaile when J. T. Gower was surveying the *Māhele* claims.

ME: Yes.

KM: In 1850, 1852 like that. The native tenants were required to pay a five dollar commutation fee, often for the survey of their lots. The families there, he writes at that time that the native families don't have the money to pay for the survey.

ME: Right, five dollars.

KM: That's right five dollars. But he's asked he says they do excellent work with *olonā* and cordage, he says they asked if they might be able to give *olonā* in payment.

ME: Yeah.

KM: Instead, and so he's inquiring if they can.

ME: Interesting though.

KM: Yes. These things were going on so we're going to hear about whether, where their *hihiwai* or *'o'opu* that was the other one. The *'o'opu* he said some of the claims I see in the native tenants there, "I have *'o'opu* at this place or I have *'ōpae*."

ME: Yeah.

KM: You see it will help us understand these broad patterns, and where they were going. Do we still see *'o'opu* there today, or not? You know?

ME: Yes.

KM: What is that a reflection of? And that's way beyond me because I'm not a biologist, but maybe someone, by having this information can help broaden their understanding of that part of an assessment.

ME: Yeah.

KM: Healthy ecosystems or not.

ME: Yeah, that's going to be so interesting.

KM: It really is. I'm excited about it.

ME: Yes.

KM: I wonder you know you've mentioned and I've met Rene Sylva a couple of times over the years back. I wonder if I should try to talk with Rene about his *mana'o* or thoughts?

ME: I would. . . He is a wealth of information, and he has hiked all over the place, and he knows this country out there very well. That's how I got to learn so much, was from him.

KM: I think I'll try and, is he still doing some work at the Maui Botanical?

ME: No. He does work with Anna Palamino, who has a native plant nursery out in Ha'ikū somewhere. He definitely is very knowledgeable.

[Discusses possible methods for maximizing water retention in ditch system; lining or covering the ditches are possible solutions to maximizing water retention and transfer.]

KM: . . . [begin Track 3] I like this, you have helped, thank you. It's important to touch bases. I may be putting you a little bit on the spot, I'd like to if you think about it are there some, and we've touched it a couple of times. Are there just some good thoughts about, steps that might be taken in future use, or future planning for future use right now, of say this region and the watershed. Are there things that you just know, need to be done to take care of it?

ME: One thing, I've spoken to Garret about it, and then hiking all these ditch systems, I know them pretty well, and I say you know, "Why don't you line some of the ditches, or why don't you pipe?" A lot of the water goes down into the ground.

And this is kind of a, you know, two sided thing, is it replenishing the aquifer, or is it being lost?

KM: Oh.

ME: If they were to line the ditches, or to pipe the water, maybe there would be enough water to restore some of these streams. I don't know…

KM: It's an interesting thought, as it is now if there is loss that is occurring, of course if it's loosing though, you brought up another. What is a loss, as long as it's not evaporation, but even evaporation is going back into the cloud system, and regenerating.

ME: Yes, exactly.

KM: Maybe you would actually need to take less from the flowing streams, if everything that you were taking…?

ME: …was going where you wanted.

KM: Exactly. Now see, that's a very important kind of observation, and a potential recommendation, because when we were talking about balance earlier, maybe that's a part of a way of achieving it.

ME: Yeah.

KM: Because, you see, if you need to take less from the sources, because everything that you are taking is going where you want it. The rest is going down, because this was a real different perspective. The haoles saw the water flowing in and not all of us by the way.

ME: Yeah.

KM: Saw the water flowing into the ocean, as being a waste.

ME: Wasted. Well, they still say that, "it's being wasted." I don't think so.

KM: That's correct, a waste. But for the native tenants, the native families, and the way the land evolved, that was all a part of the cycle.

ME: Sure, yeah.

KM: Good rain, good forest cover, versus grassland and banyans and you know which just everything runs off you know anyway, for the most part. Good stuff up there, good fisheries and that's how simple it is. A healthy mountain, healthy fisheries, healthy people.

[Discusses differences between healthy native forest system and predominately alien system.]

ME: Yes. That's true. The run off, like in the Wailuaiki area, it's terrible. There's no understory at all, there's the roseapple which is the worst. I've got it here. Nothing grows under it, so when it's raining hard there, and I've seen it, the waters just sheeting off of the mountains, it's not going down at all, and it's just lost.

KM: Sure, because the soils compacted, all of this stuff is going on. It's an unnatural, unhealthy system.

ME: Right, and that's why you go up into the Waikamoi area, and you see these beautiful native forests, and this is what it's supposed to be.

KM: That's right.

ME: Different layers, the mosses and the ferns, and things.

KM: That's right, the overstory, under?

ME: Yeah. If that was still there, it would be a completely different ecosystem.

KM: Yeah. That's a very interesting thought about the potential of lining or piping, you know, potentially, because you would ultimately take. I think you'd have to take less, because more would be getting to where you wanted it.

ME: And then there's so much grasses and alien stuff, too.

KM: A program of trying to maintain some of that habitat restoration, must get, I don't know, there would have to be some good natives that could be brought back in, and with care.

ME: Yeah. I don't know I get so, I think it's too late already, you know.

KM: So you see, where do we expand our energy then? Lets start at the places that are most intact, but threatened, is that?

ME: That's it you need to…right, protect those places, or save those places that you can save. I know that just being here a short time, only 20 years that I've been hiking out here and seeing the changes. Hanawī for one, the lower Hanawī, is just, it's a different ecosystem, then it was fifteen years ago.

KM: What do you have, is it the *wai wi*, roseapple, stuff like that?

ME: Banyan.

KM: Banyan, you're kidding, that thick?

ME: They're coming down, the banyans are being washed down.

KM: The banyans were planted along the ditch purposefully or?

ME: I think it was just part of the reforestation, so they're here and there.

KM: I hear there a real detriment. I can't imagine, in talking with Garret, or Steve Cabral them, Jimmy Hū'eu them, the banyan they just see it as a scourge.

ME: Right.

KM: It's destructive to the system.

ME: They go in the tunnel system, the roots would go like wild. And yet down at the Maui Botanical Garden there is a banyan tree. The County has told us we are not to touch that, "that is a treasure for Maui County, and we must not to do anything to it." [shakes her head]

KM: There are some of those, the broad leafed banyan, that some famed being of another culture sat under. I'll tell you this could get me into trouble every time I go to 'Iolani Palace and the State Archives.

ME: Oh, yeah.

KM: Have you been in? Every time I go there I just think I realize that someone great and grand gave this to our queen… And Onaona's great grand aunt, Lydia Aholo was the *hānai* daughter of Lili'uokalani, but every time I go there, I think, "my God, someone should just cut this thing down and poison it, and put something less intrusive, and maybe even native in."

ME: Yeah. It's a tough one, because, the Lāhaina banyan, and those people, like my father were so proud of what he was doing. They really felt, that they were saving, the forest. Difference in mind set.

KM: Yeah, values.

ME: I was out in Hotel Hāna Maui for the Taro Festival, and the Hotel Hāna Maui, I don't know exactly when it was built, sometime in the fifties, and to look at their landscape. African tulips and Australian tree ferns, two species that are causing a great deal of problem in the watershed. And two species that are spread by the wind, blowing the seeds. The seeds, sometimes it's like snow coming down. I was telling somebody, that the age of those trees, that those could have been the grandfather of all the African tulips that we see on the road to Hāna now.

KM: Yeah, wow, just amazing. People don't think this whole thing. If I were to make a recommendation, and this isn't my program, but I think we would stop the introduction of anything further, and no matter how beautiful these guy's bromeliads are, or their gingers or heliconias and stuff are; we don't need any more [chuckling].

ME: Yeah. That was one of the things with the expansion of the Kahului Airport. That was how we stopped it was you got to have some alien intervention but still no they won't do it. They don't want to spend the money to do it, and yet, the money that these aliens are costing. The waste.

KM: The waste what you said, yes.

ME: We're trying to raise millions to keep *miconia* under control.

KM: Yeah, and when we look at the forest, the mountain slopes on Tahiti, and see what has occurred with *miconia*, wow, it's scary. . .

ME: Yeah. It's hard, but day to day and doing what you.

KM" See that's the wonderful thing, you do the best you can.

ME: Yeah.

KM: And you know that's wonderful.

ME: That's why I can sleep at night.

KM: *'Ae*.

ME: [chuckling] And it's fun, I enjoy it. [begin Track 4 – goes to get a picture board] I took this to a Sierra Club meeting. These photos were all service trips that we had done in the past.

KM: Sam Gon.

ME: That's when he was working up…you know getting people out and having fun while you're doing good. I had some photos of the banyan, but I didn't put it on the board.

KM: Wonderful.

ME: Just an example of how people can get involved and do stuff. This is the native red geranium (*nohoanu*), up at Polipoli. And this was the flower, it grew in this area and putting up the fence to protect it. This was the sort of thing that I want them to start doing again. Getting to go to Kaho'olawe several times which is so great, so much fun. And getting to meet people like Sam Gon, Ron Nagata, and Terry. To me, this is what people can do. There's no reason why they don't. Particularly a group like Sierra Club. Stop complaining about everything, get busy think positive.

KM: Good, *mahalo*. Thank you so much for being willing to talk story.

ME: . . .This whole ditch system, it's fascinating. And the Wahinepe'e area where you cross five different ditches. It's very, very interesting, a lot of water.

KM: I went up the Pi'ina'au section to look over to Hau'olowahine and Kanō, and to Kikokiko. Onaona grandmother's cousin's were the Plunkett brothers John and Charlie them, what they call Plunkett Spring right up there above.

ME: Oh, yeah.

KM: It was when the ditch system was started that's a real interesting part of the history. Stephen Cabral was discussing it the other day and you see in the historical records. When they were doing the ditch they had established these series of camps along the ditch because the whole process was they had someone up there managing sections.

ME: Yeah.

KM: They were watching, whether it was eradication or maintenance. That was a real good system because it allowed for daily observation.

ME: Yeah.

KM: That's how the Plunkett family was up on that side.

ME: That would be interesting to have where these little areas located. You can tell where they were by fruit trees.

KM: That's right.

ME: Or hibiscus or.

KM: Some of what they left behind [chuckling].

ME: Whatever that they had.

KM: Yes, well we have recorded that, and we're talking more with Mr. Hū'eu about it tomorrow as well. We've named about twelve or thirteen of the areas where the camps were, through the old stuff. Onaona's typing something out now from George Bower, the Directory of Hawaiian Islands in 1880. They also discuss that this was the reasoning behind it because it was as they were going along with the ditch. Of course no roads and stuff, it was all trail right?

ME: Yeah, horse, yeah.

KM: That's an interesting thing though, you'll also see the evidence.

ME: Yeah, and right sometimes you'll see the evidence of the narrow trail.

KM: Yes.

ME: Which now is a big, wide ditch trail.

KM: Good, *mahalo*.

ME: And the CCC did a lot.

KM: Oh yes, that was quite a program really.

ME: That was something I was talking to somebody the other day, that nobody did a history of the CCC on Maui and yet they did so much.

KM: Was your brother George, Holly's father, involved with the CCC?

ME: No.

KM: I guess it was a little bit later, I've done a lot of work with old time CCC guys on Hawai'i and your brothers name comes up but I guess it was he was working?

ME: He worked with Glover Construction.

KM: Yeah, Glover's, that's why so it was afterwards. I guess a lot of the CCC guys were there, involved with him so I keep hearing his name because a lot of them remember him.

ME: Yeah.

KM: He was a pretty fair and honest guy.

ME: Yeah. It's a shame that we didn't get on the CCC story before, most of them are gone.

KM: Most of them are gone now, yeah.

ME: I know there was a CCC camp out Kūhiwa, and I know when we were working on the Wailuaiki hydro project, part of the old CCC trail was still there. While we were going out there they went in and bulldozed part of the trail [shaking her head – chuckling]. There must be records.

KM: There are but it's still so nice when you can get out, like I took an old man Johnny AhSan, from Hawai'i. He was 95, he just passed away at the beginning of the year. We went out *holoholo* around Mauna Kea, I'll send you, I wasn't sure if you had the larger Mauna Kea study?

ME: No.

KM: I'll put it in the mail to you, a nice summary of history, and it will introduce you to Johnny AhSan. The work that they were doing, the whole thing. The guy on Hawai'i you know Bill Bryan was very…he brought in the aliens and stuff like that. It was that same mentality, that same time with your father but it was because they saw the great run off and things. The impacts on life, and so it was a fire fighting mode, emergency rescue, bring it in, plant what you can to cover it.

ME: Yeah, right.

KM: Not realizing that years down the line. It was a dammed if you do or don't kind of situation. There was a real interest in native plants and restoration and caring for the trail systems. There is documentation that can be brought forward out of those old programs. It's nice when you have a few guys your age a little bit older that were out in the field working CCC like that.

ME: Yes.

KM: Animating it, they give you little anecdotes.

ME: Yes, I have a photograph of a rock that's been etched into this rock CCC and it's got the date on when they were working on the Haleakalā National Park Trail. [chuckles]

KM: *Mahalo*, thank you so much.

ME: We're fighting, up on Haleakalā the TV towers.

KM: Not the, are they still looking at, aren't they looking at some telescopes also, or not?

ME: [thinking] Well, so far all the telescopes are staying within this eighteen acres that was set aside back in...

KM: Oh, they not asking for more now? [laughing]

ME: This new sensitive Air Force telescope up there. They're complaining about the TV broadcaster's which are right adjacent to them. This came up about four years ago. The State helping them to relocate, told them they could go down, a mile down the rift zone to Kalepeamoa. And now they are back again because the FCC has told them they've got to go digital and digital is more radio interference. We've told them…we're working with Charlie Maxwell on this thing, that they cannot go to Kalepeamoa. As Charlie's said, "we've drawn the line in the sand, in the cinders" that between the FAA site down to and including Kanahau. "No, you cannot put anything in there. If you want to go down Polipoli or 'Ulupalakua, no problem." But the gist of this whole thing is that they send their radio signal from Honolulu to Haleakalā back to Windward O'ahu and to Kona. The people of Maui don't benefit this is just for all this development on the Kona side and Windward O'ahu [chuckling].

KM: What can you say?

ME: I don't know whether we're going to be able to stop it or not. Because it's very political.

KM: Yeah, a lot of *kenikeni*, ten cents going into it. How interesting. This is interesting you bring up Kalepeamoa and these places. We find that wherever place names are that, and they may not be remembered now but there are stories, there are traditions associated with these places.

ME: Yeah.

KM: It tells us.

ME: Kalepeamoa looks like Kalepeamoa. I went up there with, it's a beautiful area on the southwest rift. I went there with Tim Hurley who was the reporter for the Maui News, some years ago.

KM: Yes.

ME: We drove down the Skyline Road and we would stop and we'd go this way and go that way and we got way down we were walking along. I said, "Tim, there it is!" [chuckling] And there was this red outcropping of rock that was just so… Standing out, I said, "that's Kalepeamoa." [chuckling]

KM: *'Ae*.

ME: That's the other thing and this is where with this National Park proposal, I'm trying to learn more about the place names. Why was it named that? Like down there at La Perouse, Pu'u o Kanaloa then you have Kanaloa point and then the ancient name for Kaho'olawe which is Kanaloa.

KM: *'Ae*, Kanaloa.

ME: Why? [begin Track 5] . . .Kanaloa coming to the shore there Keone'ō'io, and sticking the *'ō'ō* in, and then the water coming forth.

KM: *'Ae*.

ME: That well is still there, it's still producing water. That's why I thought, you know this is a very important place. But the place names, why was it called that?

KM: Is there a Kualapa name out on that side?

ME: Kaluaolapa. It's where there were burials and where the last lava flow occurred.

KM: Wonderful, wonderful accounts. If I can be of help or if I come across now that we've talked I'll know that I can drop you a little note. Here's a source that someone can go to look to or possibly translate for something over there.

ME: Yes.

KM: Good.

ME: I've asked Kiope Raymond if he would get some of his students to do some research on it.

KM: Good… [end of interview]

Mina Marciel-Atai
Oral History Interview – April 24, 2001
Ke'anae-Honomanu Vicinity, East Maui (and recollections of Kaupō)
with Kepā and Onaona Maly

Kupuna Mina Marciel-Atai (KPA Photo No. 1435)

Kupuna Mina Marciel-Atai was born at Kaupō in 1916. Her family has generations of residency in the Kaupō-Kahikinui region, and during this interview, she shared rich historical recollections of the area.

In 1936, Kupuna Atai married her late husband, Benjamin A. Atai, whose family resided on Homestead lands at Honomanū (the localized pronunciation for Honomanu) and Ke'anae. By marriage, the members of the Atai line (who also carry the name Akoi), are also connected to the ʻĪkoa line of Wahinepe'e. Kupuna Atai resided at Honomanū on the family homestead, in the *'ili* of Punalau (situated on the western, near-shore side of the valley). The family maintained their residence and *lo'i kalo* on the land for a number of years. In the 1940s, she and her husband built a home on family homestead land overlooking Ke'anae Peninsula where she still resides today. Like the other *kūpuna* who participated in this interview study, Kupuna Atai's family sustained itself through the cultivation of *kalo*, and the care and use of water resources.

Because of her knowledge of the Hawaiian language and various aspects of the culture, she was identified as one of the early participants in the *Kūpuna* program of the Department of Education, and for several years, she worked at Ke'anae Elementary School. Kupuna Atai is an animated story teller, and in her interview she shared important observations pertaining to historic residency and land use in the Honomanu-Ke'anae vicinity.

During the interview, Kupuna Atai spoke of native traditions and discussed many important historical events and observations pertaining to land and water use. These included, but are not limited to the following points:

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Interview Transcript

KM: *Kūkū, mahalo nui i kou hoʻokipa ʻana mai. A hauʻoli kēia hui hou ʻana…*

MA: Well, I just was curious that… *Kēlā Pākē*, I met him not too many times.

KM: Uh-hmm [Garret Hew].

MA: But his boss, before him, was kind of *'ohana*. His cousin, something, married my brother. You know, so they tell, "Us *'ohana*."

KM: Yes.

MA: So every time this guy comes, the *Pākē* used to come.

KM: *'Ae*.

MA: So when that guy retired, he tell me, "No more Stephen, I can kiss you too." [chuckling]

KM: [chuckling]

MA: But then, *mau kākū walaʻau*, "He's from Kula." And we *walaʻau, walaʻau*, and he said, "You know my aunty – so-and-so?" "That's my aunty." "You know, something tells me we're *'ohana*." Well, I said, "Like my mother, some times, if she's good friend with you, then you going be *'ohana*."

KM: *'Ae, kapa 'ia* "aunty…"

MA: Yes. Then every time when he see me, he call me. But I never see him for a long time. So when he yell at me, I didn't know I was going get in trouble. [chuckling – discussing when we first met in Kahului on April 11, 2001]

KM: [chuckling] No, we're not going to make trouble. But *kākū*, these maps here, are nice old maps of the *'āina* out here.

MA: Uh-hmm.

KM: And since you mentioned, your *'ohana* is out at Kaupō?

MA: Yes, Kaupō.

KM: I will try to find some nice old maps of that place, and it will probably show your *kūpuna* on the land there. The names and things.

MA: Yes.

KM: So I'll get you a copy of a nice old map.

MA: According to my grandfather… My grandfather came from Portugal on a whaling ship. He says his father is "From France. He went to Portugal, married this Portuguese *wahine*. They had children, then they had a hard time." So I don't know if two of them, or three of them brothers, came on a whaling ship. And they said "it was a hard life." When he got to Honolulu, he jumped ship, and then he worked for somebody there, and then from Honolulu, he came to Kahikinui.

KM: Hmm.

MA: Worked for a man named Enos. I don't know what this man's first name was. But he said he worked for this man for his living and food. After so many years, I think 25 years, he married my grandmother from Kahikinui.

KM: And what was grandmother's name?

MA: Naihe'ula [corrected to Ka'ilikea, below]… Wait, I got to think, maybe later on.

KM: *'Ae*.

MA: He married my grandmother up there. Then after a while, this man Enos was buying, little by little, so he told my grandfather, "You go to Kaupō and find a place where you want to build a house." And my grandfather said, "I cannot go build a house." He said, "I don't have money, I don't have anything." And the man said "I didn't ask you for money, you go look for two acres of land, and you tell me what you want." So my grandfather went and got this place where the Kaupō Ranch house is now. My grandfather said, "This is the one."

So the man went and got two different carpenters from Kaupō and built this house. And then he told my grandfather, "This is what I owe you for all the years you worked for me." So my grandfather was so grateful too, for this land. And he also gave a couple heads of cattle. So my grandfather stayed over there, and as he made his living, little by little, he bought more land. And they say at one time, he owned Haleakalā Crater. And when the State or what, the Territory, at that time wanted the crater. If he wasn't going to sell, they were going to condemn. So that's how they got Haleakalā.

KM: Hmm. *Kūkū*, the Marciel, how do you spell that?

MA: M-a-r-c-i-e-l.

KM: Okay.

MA: And my grandfather was Antone Marciel. My father was Joseph. There were five boys and a girl. My father was the second one.

KM: *Ae*. So your *kupuna wahine, he Hawai'i piha 'oia*?

MA: That's right, she was pure Hawaiian.

KM: *No Kahikinui*?

MA: Yes. Oh, *koʻu tūtū wahine*, she's Kaʻilikea.

KM: *Kaʻilikea, kamaʻāina wau me kēlā inoa.*

MA: I don't know if Ka'ilikea was first name or last name, but that's the name we knew her by, *tūtū* Ka'ilikea.

KM: *Ae. Ma kona ʻaoʻao [o Onaona mā] o ka makuakāne, o Kapukuʻi, pili lākou me Kaʻilikea. A kekāhi o nā Kaʻilikea, mai Kohala mai i ka wā mamua. Neʻe mai Hawai'i, i Kohala, a i kēia ʻāina o Kahikinui. And then kekāhi o ka ʻohana, aia ma Kaua'i.*

MA: Yes, I've met two different boys from there, they get different job and got mixed up with my brothers. They were Ka'ilikea, but they didn't know my grandmother, or what.

KM: Hmm.

MA: I cannot remember. But they were just like my brother's ages. There were two Ka'ilikea boys from Kaua'i, but they didn't know if my grandmother was *'ohana* to them, or not.

KM: Hmm, *pili* or what? So your *tūtū wahine* Ka'ilikea?

MA: Yes, we call her *tūtū wahine*, but she was Ka'ilikea. Whether it was her first name or last name, we didn't know, but she was from Kahikinui.

KM: Hmm. And your papa was?

MA: Joseph.

KM: And he married your mama who was?

MA: My mother was Josephine Kealoha Akiona.

KM: Oh, Akiona. And *pili* to this side [Ko'olau], or not, the Akiona *mā*?

MA: *A'ole*. Now, we figure, you know the olden days, the Hawaiians, they cannot say the name and they pronounce it in their own way.

KM: Yes.

MA: Actually, my mother, I think, is supposed to be… Her father was Ah Chong Soon, but the Hawaiians couldn't say Ah Chong, they went Akiona. So my mother was *kaulana* by that name, Akiona.

KM: Hmm.

MA: That's what we think. Because she is cousins with the Soon that used to own Kaupō Store.

KM: Oh, so they're *pili* to that side out there?

MA: Yes, but my mother was known as Akiona.

KM: *Ae*.

MA: Get *'ohana* in Hilo, they married, and married, and they changed the name.

KM: Now there is also a Ka'alakea, but that is different, not Ka'ilikea?

MA: There is a Ka'alakea, they're different, from Kīpahulu.

KM: So Papa Ka'alakea like that, different?

MA: Yes. We knew who they were.

KM: Okay. So the Akiona that were out here in Ko'olau…

MA: Yes, we know this Akiona…my mother knew who they were, but *a'ole 'ohana*.

KM: Hmm, interesting.

MA: Uh-hmm.

KM: That's what happened with Onaona's *'ohana*. Her great grandmother, Caroline Hubbel. Her first *kāne* was Kaiapa. *Hala 'oia, a male hou*. A *Pākē*, Wong Soong, I think. Then Akuna comes into there. But they called him Wong Soong, and then Kiakona, because he was Deacon at the church, Kaulanpueo, at Huelo.

MA: Uh-hmm.

KM: So they called him Kiakona – Deacon.

MA: Uh-hmm.

KM: So *kapa 'ia nā keiki a Kiakona*.

MA: Uh-hmm. Just like this lady over here, she was Akiona and she married Nākānelua from the Big Island, Waipi'o side. She asked me, "How come your mother's name is Akiona? Related to my *kungkung*?" I said, "I don't think so. I think the Hawaiians couldn't say Ah Chong, so they went Akiona. Because I have a cousin that is named Ah Chong Akiona." So I think, because the Hawaiians couldn't pronounce, like a lot of other *haole* names, so they put their own, they went Hawaiian.

KM: Yes. So the Hawaiians Hawaiianized the Chinese names like that.

MA: Yes. So that's what it is.

KM: *Hoihoi loa. But nui ka huikau no nā keiki o kēia mau lā. A'ole hiki iā lākou ke huli moʻokūʻauhau, because loli ka inoa.*

MA: Well, *kekāhi manawa, aʻole wā mamake iā ʻoe, aʻole wau makemake e ʻōlelo, "He ʻohana kūua."*

KM: *'Ae*.

MA: *No laila hoʻololi ʻia.*

KM: *Pololei*.

MA: Yes, that's how, *kēia manawa* [chuckling].

KM: [chuckling]

MA: Oh, I don't want to be related to you. But you got no choice. Good or no good, you are related. "*O, kēlā mea paʻa aku nei i ka paʻahao!*" I tell, "Oh, what you going do? That's your family, you know."

KM: That's right.

MA: *Inā kolohe, hoʻopaʻa ʻia.*

KM: *'Ae, pololei 'oe*. No can help.

MA: [chuckling] Yeah.

KM: Hmm. *A ua hānau ʻoe i Kaupō*?

MA: Kaupō.

KM: Hmm. *Makahiki ʻoe i hānau ai*?

MA: You no like take me go movies tonight eh [chuckling]?

KM: No [laughing].

MA: Nineteen-sixteen.

KM: *O pōmaikaʻi*!

MA: *Pau ka pono, hopena, luahine* [chuckling].

KM: *Aʻole loa*!

MA: *Kāhi manawa, poina.*

KM: *'Eleu ma ka noʻonoʻo.*

MA: *Ke wau nānā, ma ka helehelena*, I look at people, "I know you, but I cannot remember your name."

KM: But you are entitled, look at you, *hānau i 1916.*

MA: Uh-hmm.

KM: How many things you've seen, none of us will ever see. So you *hānau* at Kaupō, and you had brothers and sisters?

MA: I have brothers and sisters, there were thirteen of us. Well, fourteen, one died. Now I was just thinking, I have brothers that died and now three sisters. So a few of us. My oldest brother is still living, 97 years old. . .

KM: Oh. . .! You folks all strong *'ohana* then. *Lōʻihi ka makahiki.*

MA: *Kolohe wau*! [chuckling]

KM: [laughing]

MA: My grandfather lived until he was 92. And my grandfather was still walking, and *hāʻule*, you know. He was still running the ranch. In the meantime, after everybody went, my father was still living there, but we had moved. My mother had *'āina*, so we moved, built a house, and my father had more *'āina*. Then uncle, my father's oldest brother was living over there. His *wahine* was a school teacher at Kaupō. My grandfather lived by himself, but some of us lived with him, on and off. We live over there, when we were tired, we go home, another one comes over.

It just so happened I had a brother over there, and that day my grandfather was walking around checking the horses, and he fell down. So my brother—a younger one—he ran home and called my father. They came. Those days we had a Model-T, so he went, got my grandfather. He was alright, but limping. So I don't know how…those days no more *alanui*, so how they got across... [shaking her head] I remember I had a sister, sick, they carried over this trail. But how they got my grandfather over? I wasn't home, I was away at school. But they took my grandfather to Wailuku. Aunty, his other daughter was living in Wailuku. And he was in the hospital for a couple of months, and then he died.

KM: Hmm. From Kaupō, was it the standard practice, how did your family come around? Did they go out Kahikinui, or…?

MA: We came through Kīpahulu. We only went around Kahikinui…it was all horse trail, and they went to Kahikinui when you *lawe pipi*. Or if you going to 'Ulupalakua or Kahikinui. But most of the time, we were going to this side of the island. We came to Kīpahulu, and you had to *kahea*, make arrangements, a car to be over there to pick you up.

KM: Yes.

MA: Or if people coming to Kaupō, they call you, "I'm coming. I'm leaving here at 8 'o clock." Then we'd be there with the horses waiting for them.

KM: I see. So from Kaupō through Kīpahulu, no more *alanui ka'a*?

MA: No, those days, no more.

KM: So it was *ala hele*?

MA: Yes.

KM: And you folks would ride horse?

MA: Ride horse. We want to go very badly, we'd walk. But usually we had animals to go.

KM: Hmm. Where was the road, when you were a child say, up to 10 or 15 years old, where did the road go out to? How far did the *alanui ka'a* go?

MA: Well as far as I know, when I came here [Ke'anae vicinity], already had road. But they said from Kailua to Ke'anae, it was trail. Ke'anae to Nāhiku, some place, had a car road.

KM: Yes, at Kopili'ula.

MA: Yes. And then I guess in Hāna to Kīpahulu. At Kaupō, we had our own car road, our side. From up our house it went down, about three miles of road. There were about four Model-Ts. We had one, the store had one, my uncle had one, and the Smith family had one. [smiling] We had these Model Ts, we went store, we went church, only in this place.

KM: So how did they get the *ka'a* out there?

MA: Ahh, we had boat once a month.

KM: Hmm.

MA: And the boat came. The boat didn't come in the harbor. The boat came, anchor outside, and on the small boat… I was big enough to know. Not ours, ours was already there, but that car that they brought, they put two of these small boats with the planks across, and they put this car, and they took 'um. Do you know where Mokulau Church is? The landing is way over here by the *pali* side. But Mokulau Church is over there, where you go down to 'Ili'ili.

KM: *'Ae*.

MA: And so the boat came in as far as can go, and then the people just dragged this car on shore.

KM: Amazing, yeah!

MA: I saw that.

KM: Hmm. So four cars came, couldn't drive out, so they brought 'um on the boat…?

MA: You bring 'um on the boat and land over there.

KM: What the *moku pipi*, like *Humuula* or what?

MA: *Humuula* or what ever. They take *'ukana* from island to island. Once a month, I don't know if it came to Ke'anae also. But once a month the boat came to Kaupō. So this boat came. Like out there, then they load on the small boat and come inside. They get this boom…and sometimes when we come home from school, and it happened to be boat days, and my father would call. The school would put us on the boat at Kahului. We'd go over there and come through this way. then when the waves go down, the boat goes down, and you hanging on the boom [chuckling]. The landing is small, the steps only about like this [gestures depth with hands].

KM: So about two and one-half feet wide.

MA: Go down. We're on the boat, it goes down, we catch the rope, before you catch your balance, the wave goes down and you hanging in the air. Then the boat comes back and you get your balance. Oh, we looked like monkeys.

KM: *O, hau'oli nō ho'i*!

MA: But that was the fast way to reach home.

KM Oh yes. Like you said, before, the road only went out to Kailua, then *pau*, you have to use the trail come up *mauka*, and then down to Kopili'ula.

MA: That's right.

KM: And then the rest of Hāna.

MA: Yeah. Then from what I understand, on this side, they had prisoners open the road, up where the YMCA is now.

KM: Yes.

MA: But going to Kaupō, it was local labor that was working on the road. But they didn't have machines, everything was by hand. You hang on the rope, and all that.

KM: Hmm, *nui ka hana*!

MA: The best they had was a tractor for push the *lepo*.

KM: Hmm.

MA: But all was hand labor.

KM: Amazing.

MA: Yeah.

KM: So when did you move out to this area?

MA: When I found a husband [chuckling].

KM: Oh! Now, your *kāne, he hapa Hawai'i 'oia*?

MA: Hawaiian-Chinese. A-t-a-i.

KM: His *'ohana, pili lākou me nā 'ohana o kēia 'āina*?

MA: Well, I understand my father-in-law was from Maunawili, Kailua.

KM: Oh!

MA: How he came over here, I don't know. But he had a sister that was married to the Akiu family. I don't know if he came because of the sister or what. But he had a younger brother that came here too, and married a girl here. He went by the name of Akoi.

KM: Oh yes, I saw the name Akoi, *makai* at the church, *pā ilina*.

MA: Yes. And I think my father-in-law, Atai was his middle name. So Atai Akoi, but he went by the name Atai. But he came from Honolulu with his wife. And I hear he got the homestead down here.

KM: At Ke'anae or Honomanu?

MA: Yes, Ke'anae. That's the story I hear.

KM: Okay.

MA: And his brother and the wife lived with him. . .Then he gave up his homestead to the brother, and moved to Honomanū [as pronounced]. In the mean time, he had bought a place at Honomanū, and they lived at Honomanū.

But Akoi, we call him, Ah Ling, his wife was from Wahinepe'e side. She was the *mo'opuna* of 'Īkoa. And 'Īkoa had a big *'āina* up there [Royal Patent Grant 1396]. They still have *ilina* up there.

KM: I've seen 'Īkoa's name in some of the old land documents, and when I went up Wahinepe'e road, the family *pā ilina* was pointed out to me.

MA: Yes, there used to be plenty of people there.

KM: In the packet of maps I've left for you, you'll see those areas, and some of the grant lands indicated. Also, there's Register Map Number 2467, it's the old Honomanu map. And *kākū, e kala mai, lohe 'ana wau i kou pū 'ana, Honomanu ai 'ole Honomanū*?

MA: Well, *ko'u hele 'ana mai, a maopopo, Honomanū*. But, *'ālelo mai ka Bishop i ka wā mamua, Honomanu. Ka home kēlā no ka po'e manu.*

KM: *Ā*!

MA: They say Honomanu. But for *ka po'e kama'āina, Honomanū*.

KM: *'Oia ka lākou pū 'ana*?

MA: But, *ka pololoi o kēlā inoa, Honomanu.*

KM: But *ua lohe 'oe i ka Honomanū, 'ano* drag out…*kō 'ia ka ū, e*?

MA: *Honomanū. Mai ku'u manawa mua i lohe ai kēlā inoa, o Honomanū.*

KM: Hmm, interesting.

MA: But *'ōlelo mai ka Bishop*, They said, *inoa, a'ole pololei. Honomanu, ka home kēlā no ka manu.*

KM: Hmm. *Nui paha ka manu mamua? He manu 'iwa paha, ua'u paha*?

MA: To me, it was no different than other places, *like nō*. Maybe *mamua loa*.

[Discusses residency, land and water use, fisheries, and collection of resources in the Honomanū vicinity.]

KM: *'Ae*. This is a 1909 map of Honomanu. [pointing to various reference points on Register Map No. 2467 (portion of map cited on next page)] Here's the *kahakai*.

MA: Uh-hmm.

KM: Here are some names here, like Malai'ula, Palaile. These are older *Māhele* period names.

MA: Yeah.

KM: Kinolau. And there are some homestead lots. I see different lot numbers. It says taro.

MA: Uh-hmm. The Kinolau name, I heard from my father-in-law. They were gone by my time, but I understand that there may still be some heirs to the old Kinolau line.

KM: Hmm. There's a lot of different *'ohana* that were here. And this is the *kahawai*, here?

MA: Yeah, yeah.

KM: And here's the *muliwai a me ke kai o waho.*

MA: Uh-hmm.

KM: Where do you think your *'ohana* was?

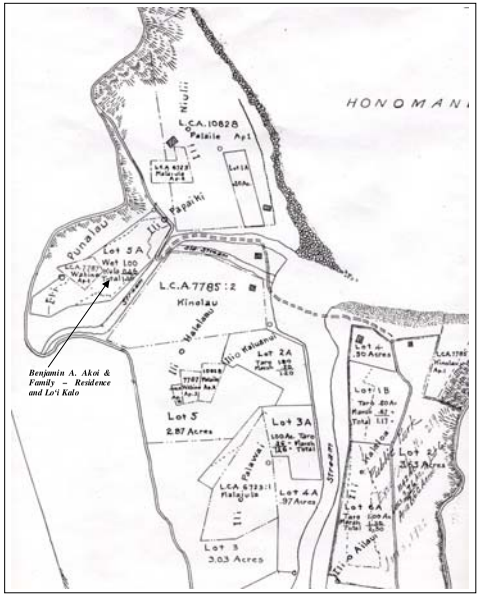

Figure 3. Portion of Honomanu Valley (Register Map No. 2467) Showing 'Ili of Punalau, Neighboring 'Ili, Kuleana and Homestead Lots.

MA: We were over here on this side [the Hāmākua Loa side]. According to my father-in-law, he said he was over here [on the Hāna side]. But then the County wanted the place, and he didn't want to give, but they were going to condemn. He had a place, they were right along side. Punalau comes over there. There was a little [looking at map]…

KM: Here's Punalau, right here, the little stream side.

MA: We were right by this *kahawai*, so right around over here.

KM: This says Lot 5-A. Was there taro land there also?

MA: That… Is this the road?

KM: Yes, this is the *alanui*.

MA: Well, accordingly, my father-in-law owned the land, and it went way up here. So the house lot was over here, and this was all taro patch (*lo'i*). But he leased taro patch across, over here, across the *kahawai*.

KM: Hmm, by the *pali* side.

MA: Yeah, but later on, sold that place.

Portion of Honomanu Valley; 'Ili of Punalau now under growth of Hau Trees (KPA Photo No. 1437)

KM: They also have some little names like Papaiki, Niuli'i.

MA: Hmm, I don't know.

KM: Yeah. But you knew Punalau?

MA: That's right.

KM: So this is Punalau, *ma'ane'i*.

[Water was flumed from Punalau Stream to the *'auwai* and *lo'i kalo* of the family. Stream was also the source of drinking water.]

MA: That's where our water came from. The water for the taro patch (*lo'i*). It came, and had a ditch across the road, and my father-in-law flumed water to the *'āina*.

KM: Hmm, so he would flume, or was it *'auwai*.

MA: He made a flume, from the end of this place. Because they had to get the water away from the road. The water crossed the road and came down to this place. So he came, went down the *pali*, he put a flume across the *kahawai*. It was long, I think from over here to down at the road. Maybe not that long.

KM: So maybe 150, 200 feet?

MA: He made.

KM: Wooden flume?

MA: Yeah.

KM: *Nāna no i hana kēlā hā wai*?

MA: Him and the boys. They made it across, and then fall down to the edge of his *'āina*, and that's how we got the water for the *lo'i*. In fact, we got our drinking water from up there, up side the *pali*. So they piped the water, came across the *kahawai*, by the bridge. That's how we had our drinking water.

KM: *Pehea kēlā wai, momona, sweet nō ho'i*?

MA: To me it was clean. Of course now with all the hippies around, you don't trust to drink anything.

KM: *'Ae pilikia*.

MA: But then, nobody bothered, because we got the water from on top of the spring. And that's the same *kahawai* that goes down where it crosses the road, and that's where we took for taro patch (*lo'i*). It's cold, fresh water.

KM: Hmm *pūhau*, real cool.

MA: Yes.

KM: So your father-in-law ended up down here. Did you stay down here some, with them?

MA: When we first got married [in 1936], we stayed there with them. And then when I had two children. Then my father came one time and he saw a flood [smiling]. My father said this is no place to live with children. And then there was water all over. You have to be alert, what you are doing because the kids running around.

KM: *'Ae*.

MA: So my father asked my father-in-law if he didn't have any other place? And my father-in-law said he had this place up here.

KM: This *'āina* here, where we are?

MA: Yes. So he said "Why don't you build and move away?" My father-in-law said… My husband had an older brother, and sister, and he had a *hānai* brother. My father-in-law had a sister who died from child birth. So they hanai'd this boy. So my father-in-law said, "The first one go build a place, he can have it." So my husband started to come and clean. So within the year we had… My house was further back then.

KM: Is it the old house back there?

MA: The old house was here where the garage is now. But that [over there] is the garage from the old house. The olden days people…people now *hele no kū ma ka puka*. But my father said, "*A'ole, kū ke ka'a ma'ō*…" [chuckling]

KM: *'Ae*.

MA: Yeah. And so that's how. So we moved, I had two children when we moved up here.

KM: Hmm. What year did you marry?

MA: Thirty-six.

KM: What is your kāne's name?

MA: Benjamin Achoi Atai.

KM: Oh, is he namesake for…? Who was his father.

MA: Ben Atai.

KM: Okay. So Akoi and Achoi different.

MA: Yeah. My father-in-law went by the name of Atai, until they had that finger print in thirty-nine or something. He wanted to go Akoi. I said, "I'm not going to change my name, and my children." Those days, it' cost money! So we stayed like that. In fact, the rest of his…my husband's older brother has a different name, Akai.

KM: Oh you're kidding?

MA: . . . I guess that's how the people were in the olden days. Those two are brothers, but they both have different names. We don't know how or what. But now I realize that maybe it was like that.

KM: Hmm, interesting. Did you ever hear stories from your in-laws or any of the old families about Honomanū? Like are there places that they would go *'ohi 'ōpae, hīhīwai*, or things like that?

[Punalau Stream formed a *muliwai* (estuarine pond system), which the family used; native fishes, *'ōpae 'oeha'a*, and *koi* were caught in the area. The family also went to the uplands for *'ōpae* and *hīhīwai*.]

MA: There were different places, not… Honomanū was… At Honomanū, the sea water went in. And my father-in-law used to raise *koi* in the river. And the people never bothered, not like today. If you go in there, we used to catch the *'ōpae 'oeha'a*. You hardly found this kind *'ōpae*, now. We went other places. We came up here or went to the other places, those regular *kahawai* to go catch *'ōpae*. We came up here to the arboretum to make *hīhīwai*. But right there in Honomanū, because there was a spring not too far up, and came down, and half of this *kahawai* was sea water, going in.

KM: *He wai hapa kai*?

MA: Yes. And he would raise *koi*.

KM: How about *awa* or *'ama'ama*?

MA: Outside in the ocean, yeah.

KM: Oh, did they make a *muliwai* pond inside and bring the little fish in with the *koi*?

MA: No. He had a fishpond in his yard. [thinking] But now, I don't know what they had inside. Maybe he had some *koi*, but he raised most of the *koi* in the river. That's the first time I saw this kind of colorful fish, and all that kind. It was in this main river and people didn't bother.

KM: *Ua 'ai paha 'oia i kēlā koi*?

MA: I think so. *Poina*.

KM: You never eat [chuckling]?

MA: I think we ate, because he went and get this fish for medicine. if somebody was sick, he had to go get the blood from the *koi* or something. So they would cook this fish.

KM: I see.

MA: Most of the time they make steamed fish or soup.

KM: *'Ae*. I wonder if that's a *Pākē*, Chinese medicine?

MA: I really don't know. But when certain people, I don't know what kind of sick. "*Hele nānā koi, hāpai ke koi*." I don't know, they make *puka* on the head to get the blood. Those days, we never pay attention.

KM: Hmm. So *mamua, kēlā makuakāne, ua hana lā'au 'oia? Lā'au Hawai'i?*

MA: *A'ole*, but maybe in their own way.

KM: *Hoihoi loa*! So you came out here, *male 'oe i kāu kāne, a hānau keiki. 'Ehia mau keiki*?

MA: *'Elima. 'Ehā keiki kāne, ho'okāhi kaikamahine. Kukapaila e*!

KM: *Maika'i*! *Ua hānau keiki 'oe ma ka hale*?

MA: *A'ale, hele i ka hakupila. A'ale wau mamake hānau ma hale*!

KM: *Ihea ka hakupila*?

MA: *'Elua i Wailuku, 'ekolu i Hāna*.

KM: *O, lō'ihi ke alahele*.

MA: 'Cause *kēlā manawa, loa'a alanui ka'a. Hele 'oe i ke kauka. But kāhi manawa hele wau i ke kauka 'oko'a. 'Ōlelo mai ke kauka, na'u no hānau kāu po'e keiki, hele mai ia'u*. That's why, *'elua ka'u keiki i Wailuku, a kekāhi 'ekolu, i Hāna. Ka'u keiki mua, a'ole wau maopopo, hānau 'ana wau*.

KM: Hmm [chuckling].

MA: *A ku'u kāne, hele i ka hana. Hele i ka pule, a'ole hoi mai. No laila Pōakāhi, hele 'oia i ka hana, hele wau noho me ka 'ohana i Hāna. A hoi mai 'oia Pōalima, pau ka hana, a'ole wau hoi mai. Ho'okāhi hele hou ka hana, a 'elua pule, hānau wau. Ku'u hānau 'ana, kēlā pō hānau. 'Ōla'i*, thunder and lightning!

KM: Oh!

MA: *Hele wau i ka hakupila, a hānau wau i kēlā lā. Kokoke 'ekolu pule a'ole hiki ia'u ke hoi mai. A'ole alanui. Hiolo ka alanui*.

KM: *A no ka ua nui, kahe 'ana ka wai*?

MA: *'Ae, i 'ane'i nei*. So *hoi mai kāu kāne, a'ole hiki ho'iho'i mai ia'u me ka pepe, halihali ma kēia 'ano alanui. 'Ekolu pule mamua o ko'u ho'i 'ana mai*.

KM: Hoo! So *ua noho 'oe i Hāna*?

MA: *Noho wau i Hāna me ka 'ohana*.

KM: Hmm.

MA: *Weliweli e*! [chuckling]

KM: *'Ae. Mea hoihoi loa! A pehea ka inoa o kēlā keiki?*

MA: Hillary.

KM: Hmm. *A'ole pili me ka 'ōlapa 'ana o ka…* [chuckling] *'ōwaka 'ana no ka lani*?

MA: *Ku'u uncle, ka mea wau i noho like ai, hana a hoi mai. Ku'u hoi mai 'ana i kauhale, a 'ōlelo, "He'aha ka inoa o kēia keiki?" 'Ōlelo mai nei, mamake wau kēia inoa Hawai'i, Keli'inaue…" A'ole wau mamake inoa Hawai'i. Ku'u manawa 'ōpiopio, 'ōlelo mai ku'u mama, " Kona manawa hāpai 'ana, ninau ho'okāhi aunty." Ninau mai, "Hānau kekāhi kaikamahine, hiki ia'u ke hā'awi inoa?" Kēia aunty, a'ole ona kamali'i. So 'ae ku'u makuahine. Ka manawa hānau ai ku'u makuahine…* I think *ku'u aunty i kēlā manawa noho 'ana i Waikapū*, plantation. The boss, move from this plantation to the other plantation.

KM: *'Ae*.

MA: *Hānau ku'u makuahine i kaikamahine. Ku'u aunty, kona kāne, he Kelamania, so kahea 'ia Wilamina, a ka inoa Hawai'i, Kawehiokaolalani*.

KM: Beautiful.

MA: *Maopopo wau, lohe wau kēlā inoa, but a'ole wau kahea 'ia inoa, Mina wale no. Kahea 'ia wau Mina*.

KM: Hmm.

MA: So *hele a i ke kula ki'eki'e, a noho wau me ia. Kēlā manawa ai 'oia i Lāhaina. So hele aku wau noho me ia. A kahea mai nei ia'u ma kēlā inoa. So maopopo ia'u, ko'u inoa kēlā. Kahea mai nei 'oia ia'u, pane wau. Ho'okāhi mahina paha, mai. A'ole wau maopopo, a'ole hiki ia'u ke hele i ke kula*, any kind.

KM: *O 'oe*?

MA: Yeah. So I don't know, *pehea lā? Lāua kahea aku, hele mai ku'u mama. So ho'okāhi pō hele mākou i kēia wahi. Pō'ele kēia hale, kukui hele pō wale no. Wau maka'u, a'ole wau i maopopo. So, ho'oponopono, a 'ōlelo mai kēia inoa, a'ole maika'i. Pehea lā 'oe i lo'a kēia inoa? 'Ōlelo mai ku'u makuahine, "mai ku'u aunty, kēia inoa." Hele 'oia i kona pā hale, nānā, no'ono'o, "O kēia inoa, a'ole maika'i. 'Oki 'ia kēlā inoa."* So *ka manawa lo'a au i ka'u kamali'i, koi mai nei nā po'e pau loa, inoa Hawai'i. 'Ōlelo wau, "A'ole wau mamake inoa Hawai'i, no ka mea, maopopo wau ka 'eha'eha 'ana ka hā'awi 'ana." No laila, ku'u kamali'i, a'ole lo'a inoa Hawai'i. Ku'u kaikamahine, po'o pa'akiki ka'u kāne. Nu'u no i kahea inoa o ka'u po'e kamali'i keiki kāne. No laila, kahea 'ana 'oia i ka inoa kaikamahine. Kahea 'ia ka'u inoa, kona inoa, o Kawehilani*.

KM: Hmm.

MA: So after it went through, I didn't want to change.

KM: So your children, you never…?

MA: They said, "How come your children no more Hawaiian name?" I said, "After what I went through, I don't want to." Because *a'ole wau maopopo kāhi i hele ai ho'oponopono i kēia manawa, e*.

KM: *'Ae. A i kēlā mau lā, o nā po'e kahiko, he mau kapu e?*

MA: Yes.

KM: *A i kēia manawa, a'ole mākou i maopopo inā pono ke 'ai i kekāhi mea, ke hehi i kekāhi wahi*.

MA: Yes.

KM: *Nui no nā kapu*.

MA: Yes. *Pono e ho'oka'awale*.

KM: Hmm. *Mea hoihoi loa kēia*!

MA: [chuckles]

KM: These things are so important because today, the children, *'ano huikau kekāhi*.

MA: But *ke wala'au wau i kekāhi, "Ho'omanamana wale nō!"* But we went through this. And me, it's kind of spooky, I wouldn't want to see my family go through that.

KM: The *'eha, kaumaha*.

OM: *'Ae*.

MA: Because *ai 'oe maopopo ka po'e ho'oponopono i kēia manawa. Maika'i paha, a'ole paha* [chuckling].

KM: Yes. [pauses] So you folks moved up here. And what is the name of this place, is there a special name to this area?

MA: *Lohe wau i kekāhi inoa, Waia'ōlohe*. But I don't know if this is Waia'ōlohe. They get plenty small names.

KM: Yes, the *'ili 'āina*. I've seen the name *makai*, near the *lo'i*, Waia'ōlohe.

MA: *'Ae, 'oia kēia muliwai, Waia'ōlohe*. But *aia no kēia wahi, Waia'ōlohe*? Get plenty little names.

KM: Yes, and these names all had stories.

MA: Yes.

KM: *Kākū inā makemake 'oe e puhi, e puhi 'oe. 'Ike wau i kou paka*.

MA: *Nanea kēia kole 'ana, poina wau i ka paka* [chuckling].

KM: *Maika'i*. I didn't want you to think, ah…

MA: No, no.

KM: But Ke'anae, *'oia ka inoa o kēia ahupua'a*?

MA: Yes. Ke'anae, and yet, *li'ili'i loa ka po'e ma'ane'i. Hele i Wailua, hapa nui ka po'e ma ka Wailua. Ai na'e ke Ke'anae kēlā. Hapa nui ka po'e ai ma kēlā 'ao'ao*.

KM: Hmm. *O Wailua, he ahupua'a, ai 'ole he 'āpana iloko o Ke'anae*?

MA: *A'ole mapopo*.

KM: Hmm.

MA: But *ke 'ae wala'au Ke'anae*, and then *Wailua, pau loa*. But *ke hele mai 'oe i Ke'anae*, "*Athea o mea? Ai i Wailua*." So I guess the whole name is Ke'anae, but they have this Wailua, and then over there is 'Ōhia. And yet they are all in Ke'anae.

KM: *'Ae*. What were the things that were being done by the families when you were younger? *'Ike wau i kēia moena. Ua ulana paha*?

MA: *Ike wau ka mea, ku'u makuahine, ulana moena*.

KM: *Kou makuahine ma Kaupō*?

MA: Yes.

KM: *Pehea, he ulu hala paha ka 'oukou*?

MA: *A'ole, hele mākou, ma'ō a ma'ane'i. Inā hele ma'ane'i, maika'i ka lauhala, hele mau 'ana mākou i laila. No laila, Kaupō, 'elua wahi i ku'u manawa. I ko mākou hale, ai uka loa i ke kuahiwi, ho'okāhi kumu lauhala ma kēlā wahi. Hele mākou 'ohi ma laila. Inā a'ale, hele mai mākou i Kīpahulu, he wahi 'ohi lauhala. Hele mai mākou i Hāna, he wahi hele i 'ohi lauhala. Kēia manawa, a'ole i kēlā po'e kahiko loa no. Pau ka pono, komo ka holoholona*.

KM: *'Ae pau i ka 'ai 'ia.*

MA: Yeah. So *hele ku'u makuahine 'ohi lauhala, ulana 'oia i kēia moena, 'ōlelo mai "A'ale lawa ke koana, hele kula mākou koe koana, pau kula ka hana ku'u makuakāne, hele mai noho pāki lauhala. Kēia manawa 'ōlelo mai noho mai o mea, "Mahu!" Ka manawa 'ōpiopio, hana like mākou e!*

KM: *'Ae. . .*

MA: *. . .Hana like mākou. Ka mea wale no mākou a'ole hana, ke koana pāpale, no ka mea li'ili'i, o moku.* But *nā moena, nā mea like 'ole, hana. Ko mākou hale, hale nui, lumi ho'okipa, me kēia nei paha. Ka lauhala, piha. Ka lumi 'āina, me kēlā. Puni ka lauhala.* Maybe *ho'okāhi manawa, ka mahina, 'ekolu mākou, wili moena, lawe a ma'ema'e ka hale.*

KM: *'Ae.*

MA: *Kēia manawa, moena li'ili'i wale no ma'ō a mane'i.*

KM: *'Ae. Mamua, nui ka hana?*

MA: Yes.

KM: *Pehea, i kou wā li'ili'i, hele paha a 'ohi…he loulu paha? Ua ulana loulu?*

MA: *Hele mākou ki'i, but a'ole wau i maopopo ka hana 'ana. Maopopo wau ka hana 'ana o ka lauhala ke'oke'o. A maopopo wau ka hana 'ohe.*

KM: *Ka 'ohe?*

MA: *'Ohe.*

KM: *Ua 'ili 'oe i ka 'ohe?*

MA: *Hele ki'i ka 'ohe. Lo'a nā 'ohe 'ano like 'ole e?*

KM: *'Ae.*

MA: *Hele a 'ohi i ka 'ohe Hawai'i. Inā hele a 'ohi i ka 'ohe Kepanī, pōkole loa ka puna.*

KM: *'Ae.*

MA: *Ka 'ohe Hawai'i, lō'ihi ka puna.*

KM: *'Ae, so kēlā 'ano…*

MA: *Lō'ihi ka puna.* So *hele 'oe ki'i kēlā, ho'i mai 'oe ho'omākaukau, kupa a kaula'i. A hiki iā 'oe ke…'ano ke'oke'o.*

KM: *He'aha ka mea 'au i ulana ai me ka 'ohe?*

MA: *Kāu mea mamake ai. A hele 'oe ki'i mai'a, ka 'iwa.*

KM: *'Ae.* so the thing to make designs?

MA: Yes, yes. Most times, this ohe is only for trimming.

KM: So the design, *pāwehe*?

MA: *'Ae, like me ka lauhala ke'oke'o.*

KM: And you use the fern also?

MA: *'Iwa*, just like… [thinking]

KM: *'Ekaha*?

MA: *'Ekaha* is too short, just like used for small decorations. But *'ekaha*, you can *nalo pāpale*, any kind. You go *kuahiwi*.

KM: So the *'iwa* is different then?

MA: Yes.

KM: *He mea kanu Hawai'i*?

MA: Yes, *li'ili'i, me kēia nei paha,* but *lō'ihi*. Something like those reeds in the swamp.

KM: Oh like *makaloa*?

MA: Yes, *makaloa.* My brother used to go…I don't know where, but he used to come home with *makaloa.* And my grandmother used to weave that.

KM: In Kaupō?

MA: Yes. But this *'iwa* is same thing, up the mountain. [*'Iwa*, the *Asplenium horidum*; also called *alae*.]

KM: So *ai kuahivi*?

MA: Yes. When my father-in-law used to work at Olinda, he used to bring it from Olinda. So this guy, Nalapohaku, he said he knows of a place up Waihe'e, where they get that. So I guess different places have it.

KM: How about this side? The *kāpuna, ulana lauhala*?

MA: Hardly any.

KM: I wonder if too *pulu* this side?

MA: I don't know. My husband's aunty did. A few people did. I think the old people did, but these young people, no.

KM: Hmm.

MA: You know, *hele i ke kula, pau ho'i mai, a'ole mamake.*

KM: Hmm. . . [counter 41:17]

MA: [Discussion regarding younger generation who have left the land for years, then return, and bring about changes. (counter 42:50)]

KM: *. . .Kākā*, when you were young here, were people talking story about certain places? Or were people still going up to the mountains in these areas here Pi'ina'au, up to Hau'oliwahine *paha*, or Kikokiko? Places where they would gather *'ōpae.* Or did people go gather *'awa*?

MA: I don't know if they went for *'awa*. What I knew of *'awa* was when my boy worked with this guy on the electric line, and they hear about it. So as they went up the ridges like that, they saw, so they brought some home. I tell, "What's

that?" "Oh, that's *'awa* root." I tell 'um, "You take it home, don't leave at my house." [chuckling]

KM: So when you were young, you don't remember any of those…?

MA: The people went individually, they never went make known.

KM: They didn't advertise, *ho'olaha*?

[Discusses gathering *'ōpae, 'o'opu,* and changes in stream resources; and collection of *pūhi* and other near shore fishes. Introduced prawns had significant impact on the native stream fish.]

MA: Yeah. When I first came here, I drove. So when my mother-in-law wanted to make *'ōpae, mamake hele*, because the men folks, they work. So *lawe wau a hele mākou* by the arboretum, what ever they call that.

KM: Is that Kaumahina?

MA: No, no, down here.

KM: Oh the Ke'anae Arboretum.

MA: Yes.

KM: Pi'ina'au, the road goes up there, right?

MA: Yes, that used to be the road over there. So we would go there, I took them up there, they go make *'ōpae*. And we went to the other side of Kaumahina… [thinking]

KM: Wahinepe'e?

MA: No, before Wahinepe'e… [thinking] The next *kahawai* next to Wahinepe'e… thinking] Ha'ipua'ena, *makai* of the *alanui*.

KM: Oh, Ha'ipua'ena.

MA: I used to take them, and they knew that stop over there, and they go down the *pali*, and over there on top of the waterfall, oh, they make *'ōpae* come up, *puka* by the road. So I drop them over there and I go up by the road, wait.

KM: Hmm. And they *kā'e'e* [gestures using a scoop net]?

MA: Yeah, they get *'upena*. They go up there, get enough for eat for a week or so.

KM: Hmm. What did they make their *'upena* out of, still *olonā*?

MA: No, they go buy net from the store.

KM: Hmm, cotton.

MA: Had that regular *'upena*, yeah. Only thing, you make the thing [gestures net hoop].

KM: The *'apo*, stick hoop.

MA: Yeah, and they make the bag [chuckling].

KM: Interesting. So these are the *'ōpae kahawai*? [begin track 2]

MA: Yes. Then afterwards, they put in these prawns, all *pau.* No can go catch *'ōpae*.

KM: Do you remember when the prawns were coming in?

MA: I think after the war time, yeah.

KM: So after the war?

MA: Yes.

KM: So before the war time, you could go for the *'ōpae, a nui ka 'ōpae*?

MA: You can go anytime. *'Ōpae, 'o'opu*, any kind. Now you go for *'o'opu*, the prawn take your hook, *pa'a* under the stone. You no get nothing!

KM: So you folks went after *'o'opu* also?

MA: Yes.

KM: What kind of *'o'opu*?

MA: They get different kind, but they like the white kind. *Nākea, nāpili*, and something else, I don't remember. But my father tell us that's snake, so we don't like that [shaking her head].

KM: [chuckling]

MA: Even when we go fishing. We catch *pūhi*, them, they make the…I forget the name. Some, they *lāwalu. Pūhi paka*, they dry. But I don't eat that kind of thing [chuckling]. My mother used to like that. And my brothers used to catch *pūhi* for go *palu 'ulua*.

KM: *'Ae.*

MA: They never bring home, but when they tell they throw away the *pūhi*, my mother said, "Why don't you bring the *pūhi* home." But my father look, "that's snake." So when I came over here, I eat anything, but I never ate *pūhi*.

And I used to go fishing, and I'd see this lady put her hand like this. [Gestures holding the palm of her hand up with the finger extended and space between them – a native method of catching young eels.] And the *pūhi* all come up. *Pūhi 'inikiniki* they call that.

KM: Yes, so they come between the fingers and they squeeze them?

MA: Yes. They put *'ōpiʻihi* or *hāʻuke'uke* in the palm, over here. And the *pūhi*, they come to eat.

KM: So the *pūhi* come in between the fingers like that, and then when you get the hand full…?

MA: You squeeze 'um. [shaking her head] *Weliweli*!

KM: [chuckling] But these are little *pūhi*?

MA: Yes, small ones [gestures a few inches long]. In fact, the kids used to come to school. It's *mo'a* (cooked), and they hold it like this [gestures holding it above her mouth, and dropping it in to eat]. Ahhh [shaking her head]!

KM: So you not *'ono* for that eh?

MA: [shaking her head] My father always said, "Snake."

KM: *Kākā*, how did you folks, the *'ohana* …the *'ōpae, 'ai maka wale nō*?

MA: No, *kupa.*

KM: How did they prepare them?

MA: They washed it, *pau*, and then they put water and salt, and boiled it. And then *ho'omalo'o.* Then the raw one of course, they cleaned, and the big kind, they *hemo* the *po'o.*

KM: *'Ae, no ka mea lo'a kēlā laina eh, ka lepo.*

MA: And sharp.

KM: Yes. And how about the *'o'opu*? *'Ai maka* or *kupa*?

MA: *Lāwalu*. They wrap in the ti-leaf and cook. *Weliweli*!

KM: But you don't eat that [chuckling]?

MA: When my younger boy was home, then I go hook *'o'opu*. I would go to Honomanū. Down here [gesturing to the *muliwai* at Ke'anae], you only hook *'o'opu*. But if I go to Honomanū, and can hook *āhole* too. So I can eat the *āhole*, and he can eat the *'o'opu*.

KM: Hmm.

MA: Now they tell me, "you not going to hook *'o'opu?*" I say, "Myron's not home, I don't go. Because if I hook *'o'opu*, I don't like to throw away, because I know he would eat it."

KM: Hmm. *Ua 'ōlelo mai kekāhi kāpuna, kēlā 'o'opu, 'ano like me ka mo'o e. So a'ole ho'iho'i i ka 'ai 'ana.*

MA: Uh-hmm. As long as it's slimy, it makes me think of a snake.

KM: Hmm. Were there stories that were being spoken about certain places. Like you know, people talk about *heiau* or *ilina.* Were there things that were pointed out to you when you were younger, on this *'āina* here?

MA: Well, they talk *heiau*, but my mother always told us to "Leave the *heiau* alone. How you worship in your church, the old people worshipped in the *heiau*." We used to walk to school, over one mile, and the best sweet guava is on the *heiau*, or the best sweet mango is on the *heiau.*

KM: [chuckling]

[*Heiau, ilina* and old sites should be respected and left alone.]

MA: "*No hea mai kēia kuawa*?" "Down by the *heiau*." "*Lālama aku nei, kiloi pōhaku…*" We can go pick up all kinds, but we cannot throw stone, and we must not go play on the *heiau*. So when I came *kupuna* [in the schools], they wanted me to teach the children about *heiau.* I said, "I cannot, I don't know." "How come you don't know?" "My mother told us to leave the *heiau* alone. Just like how you worship in your church, the old people worshipped on the *heiau*." So we never went. If we went, we stayed on the edge, "*Wahi pule kēia nei, wahi hiamoe*

kēlā…" So we never go play on the *heiau*. There were several *heiau* from the school to our house. but we never go on the *heiau*. So people ask me about the *heiau*, I say "I cannot tell you because my mother always told us to stay away from those places.

KM: *Waiho mālie.*

MA: Yes.

KM: Did you folks go *mauka, kuahiwi*, Pi'ina'au like that, up here?

MA: With my husband, I used to go. We go catch *'ōpae* and all that kind. That's why I know where John Plunkett lived or where the plantation guys lived.

KM: Yes. What did your *kāne* do?

MA: He used to work on the road, County.

KM: Oh cantonier like.

MA: His father was a cantonier. Those days, only one guy works. But my husband was with a group. In fact, he died as an operator, tractor operator. Those days they had machines. He was the first tractor operator, or whatever those machines were that they had.

KM: Yes. So your *kāne* didn't work for EMI?

MA: No, no, he worked for the County. I think from CC Camp, then the road. His folks were good friends with Harold Rice, and Harold Rice was a big shot, those days. So they got good jobs.

KM: Hmm. Yes, he was like in the Territorial Legislature.

MA: Yeah. So when they had PWA and all that kind, he worked, and Harold Rice sent him home. . .

KM: This is so good, thank you.

MA: *Pololoi paha, a'ole paha*? But that's what I know.

KM: Yes, this is your *mo'olelo*, what you know.

MA: Other people, may be they look, "Oh *ho'opunipuni*!"

KM/OM: No.

MA: I'm only telling what I know. If I don't know, I say "I don't know."

KM: Yes. You know, do you remember if there was a big earthquake, *'ōla'i*, out here in '38 or something?

MA: [thinking] It was in '37.

KM: Okay. Was there a *kai hō'e'e*, tidal wave?

MA: That one was April fools, '46.

KM: Okay, and *ua hula paha kekāhi po'e i kai nei*?

MA: Yes, they found our two people. But in Hāna, they're still some missing that they haven't found till today.

KM: Hmm.

MA: That Ducen family, down at Hāmoa. This one over here, right down here, the old man… The lady had gone to church in the morning. You know some times you get up in the morning, and you go to church. On the way home, she heard this crackling, and she jumped on the porch of this house, and then she saw the bushes and the house going. Then she saw the old man. He was deaf, so he didn't know. They found him under the roof of the house.

KM: Hmm. What was his name, do you remember?

MA: Walter Huddy, *'ohana* to this Roback. I think his wife was a Roback or some kind of relative. The other one was a Tau'ā lady, Helen. Kanamu Tau'ā's wife.

KM: Yes, Kanamu's wife.

MA: They lived down there. Now she ran, with her baby, she ran from the tidal wave, not knowing what a tidal wave was. And when the wave receded, she went home to get the baby clothes. She left the baby with someone and went home, and got caught in the next wave.

KM: *'Auwē*!

MA: She got hurt, and they got her, rushed her to the hospital and she died that evening. So we had the services for these two people that evening.

KM: Hmm. Did you folks go down to the church at Ke'anae? Was that the church of the families, or you didn't go to that church. [begin track 3]

MA: We were at the Catholic Church, St. Gabriel.

KM: Hmm. . .

MA: [Brief discussion of things taught in the schools as a part of the *Kupuna* program.]

KM: . . .Did you folks go up to gather *lā'au*, or *limu wai* in the *kuahiwi*? Some times they say that the *limu wai* were used for medicines. Did you folks ever…?

MA: I never did learn medicines like that. At home when we grew up, my mother used to…if you had a very bad cold, she would get *'ihi* and sweet potato. Raw, they used to grate that. Though I don't know how they prepared it. But she said, "this is only for us. *A'ole wala'au i kekāhi po'e*."

KM: *'Ae*.

MA: Then if you went and get, "*Hele 'oe ki'i, 'elima, 'ehiku…*" It was an odd number. You go get something and bring home, and they would prepare it. And whatever my mother did for us, she tell "*A'ale wala'au i kekāhi po'e*." So when people said, "Did you folks ever use Hawaiian medicine?" I said "no." And whatever we used, was for our own selves, we were not to tell other people.

My grandmother tell, "*Hele ki'i…*" Sometimes my grandmother would tell *lehu*. You know the *lehu* from when you cook outside?

KM: *'Ae*.

MA: Go get the *lehu* from the *kapuahi*. For what? If you get nail poke or something and you soak inside this. There was no more road for go to the doctor. There were a lot of things they did.

KM: Those were the kinds of medicines they used.

MA: My mother said, "This is for you, not for other people." So now like when they talk. I knew Ka'alakea well, we grew up together, we knew his parents, and I admire him for what he did.

KM: Yes.

MA: David Ka'alakea. But my mother said, "What she learned was for her own use. We don't go try to heal other people."

KM: Hmm. I think some of that had to do with…*mahope, 'ohumu kekāhi po'e, a lo'a ka piliki'a*.

MA: Uh-hmm.

KM: So *mai hele 'oe a hana kēlā mau mea*.

MA: All I remember was odd number. You go five or seven.

KM: Yes, *piha ke kualima*.

MA: Yes. So I know that, go get the sweet potato; *'ihi*, the four leaf clover kind. How they did it, I don't know. "*Ki'i ka lau 'ihi, o hele ki'i ka mea…*" So many, you know. But how they did it, I don't know. I know that they grate the raw potato, and it was for bad cold or something.

KM: *'Ae*. I've heard that the *'ihi* will help loosen up the flem.

MA: And they no more road for go to the doctor.

KM: And *kēlā 'āina, Kaupō me Kahikinui, 'āina mamao loa, wao nahele nō ho'i*.

MA: Yes.

KM: So isolated.

MA: I like the privacy. If the roads were better, I don't mind moving out there. But my sister is having much trouble with the generator, what you going do, yeah?

KM: Hmm. And this sister is younger than you?

MA: Younger than me.

KM: She must be close to 80?

MA: Seventy-nine.

KM: Oh yes. Does she have *'ohana* with her?

MA: Yes. . .

[Discusses *huaka'i pō* (night marchers), *pō Kāne* (dark nights of the moon), and planting by moon phases.]

KM: *Kūkū*, speaking of *huaka'i* (going on excursions), did you folks ever hear stories anywhere out here, *lo'a ka huaka'i pō*?

MA: I never hear over here, but Kaupō, I heard that kind of thing, and my father said "Don't talk." You hear sweet music. You know, sometimes we stay night time, and then nobody home. My mother is cooking by the oil stove, we're sitting down, and we hear this music. You cannot say it's *'ukulele* or guitar. It's so sweet. Mama said "*A'ale wala'au, a'ale wala'au*." And then *pau*. Then the next day she said, "*Ho'olohe mai nei ka huaka'i*." Or sometimes my father is sitting on the front porch and when we come outside. As soon as they make the hand like that [raises hand to indicate stop whatever you're doing], we know it's something spooky, so we shut up. And you hear them tell, "*A pō Kāne i ka pō nei …*" [chuckling] See there is a *heiau* not too far from our house. And they said "if you make noise, the thing stop." So I don't know. But that's what they said. So if we hear, we shut up. We listen, we don't even talk to one another. We try to make out what kind of instrument, you cannot figure out.

KM: Hmm. *Mea kūpaianaha! Ua 'ōlelo 'oe "pō Kāne." Pehea, i ka wā mamua, ua kanu paha kou makua, ai 'ole ka 'ohana o kāu kāne; ua kanu lākou i kekāhi pō, he mahina maika'i paha*?

MA: Well like my mother, *mea kanu pua, mahealani. Nunui ka pua*.

KM: Hmm.

MA: And then like potato, certain moons. Certain things get certain moon. *I'a* (fish) get certain moon.

KM: Yes.

MA: Yes, they had…they *mahi'ai* and everything, *a'ale kanu*. It comes this day, *pau. Kēia pō, mea hele kanu*. So banana had different moon. And I know to plant sweet potato was a different moon. And I know when my mother planted… "*Mahealani kēia*." She go plant the flowers. Yes, they had different moons for different things.

KM: Hmm. That's what I hear. Even certain times to go *'ohi 'ōpae, hīhīwai paha*?

MA: Yes.

KM: You know, the *hīhīwai*, did they always cook that, never eat it raw?

MA: I always see them cook it, I never heard them talk about eating it raw.

KM: So not like *'ōpihi*?

MA: Yeah, *'ōpihi*, you eat raw, and the *he'e*, they slice it up, whatever with the *'ōpihi*.

KM: And were you folks planting taro yourselves? You and your *kāne mā*?

MA: Yes, in Honomanū they had taro patch (*lo'i*), and then when we came up here, we didn't have taro patch, but my neighbor had. They used to have a *poi* shop before. They had leased this land. So when they closed the *poi* shop, they let me use the land, and there were some other people further up here that had plenty taro land. She said, "You like this taro land, you use it. As long as you keep it clean, you don't have to pay." My children grew up working the taro patch.

KM: Hmm, *lo'i kalo*?

MA: *Lo'i*, yes.

KM: *Ma Honomanū*?

MA: Down here. Honomanū we had, but I had babies that time, and I never went to the taro patch (*lo'i*). My in-laws, my husband and them worked. Until we came up here, long afterwards. Then this lady told me, "You like this six taro patches?" Down over here at Ke'anae [gesturing down to the flats]. So then I had about 12 taro patches.

KM: Wow! What kinds of taro were you growing?

MA: All different kinds, but the said *moi* was the best taro, but it takes long to *'ō'ō*.

KM: *'Ae*.

MA: Twelve months like that. We had other kinds, but the *poi* was not too good. Had *ha'akea, piko, lehua*, and get different kinds of names. The *moi* took twelve to fourteen months to *'ō'ō*. That was good taro. Then I pulled taro, at least five bags every week. Maybe one or two months I stop, no more taro. But I went five bags every week, pull taro.

KM: And this was 80 pound bag kind?

MA: Well, first was 100 pound, then came 85 pounds. Before was 100 pounds.

KM: Hoo! And was it for you folks, home use, or you sent to the *poi* shop?

MA: We'd send…had one guy pick up from the different people and take to the *poi* shop. Some went to Wailuku and some went to Honolulu. And we made our own *poi* too, and I used to send to my folks at Kaupō, *poi* every week by the mail carrier.

KM: And when you made your *poi*, were you still pounding, or was it by machine?

MA: No, we had a grinder.

KM: Who's *poi* shop was by here?

MA: Ching Store.

KM: Were they pure *Pākē* or were they part Hawaiian?

MA: They were pure Chinese, that was part of the Soon family. But they had people work for them. So they had Ching Store, and they had the *poi* shop. The store ran that post office too. They also had a theater.

KM: Oh, so it was a big place then?

MA: Until the husband died and the lady closed down her theater. Now, no more, only *mo'opuna* living over there now.

KM: When did the *poi* shop, factory close down?

MA: Long ago. By then, everybody was making their own *poi*.

KM: Do you think it was after the war, before the war, or 1960s?

MA: I think before that.

KM: But after World War II *paha*?

MA: Maybe, I'm not sure now. But I know the theater was going… Until the CC Camp closed, then everything closed. See it was a prison, and after the prison closed, it became a CC Camp for these young boys.

KM: Oh, so right out there?

MA: Yeah, right where the YMCA is now.

KM: Well CC Camp went out around the time that the war broke out [December 1941]. Then became the Engineer Corps.

MA: Yeah, something like that. So right now, it's the YMCA.

KM: And was the prison before?

MA: Yes, it first started out as a prison. That's how they got the people to come here and work on the road.

KM: Yes, Colburn and Ben Tau'ā, Onaona's *'ohana*, were overseeing the road work.

MA: Yes. I knew the people that were staying up there, Roberts, *'ohana* with Richardson and Bell. All those people together.

KM: Hmm.

MA: That place is old. They fix it up every now and then.

KM: Yes, now it looks so different. [pauses] *Mahalo*, this is wonderful!

MA: *Pololoi paha, a'ole paha* [chuckling].

KM: Oh no, you said, you can only share the things that you know. If you don't know, you're not going to tell.

MA: Yeah [chuckling]. Yeah, I said "I don't know what that man wants to know, but I'm not going to lie to him." If other people listen, and they think I'm lying, that's what I heard.

KM: Yes. . . *Mahalo nui iā 'oe i kou wehe 'ana i kēia mo'olelo. Ua 'ike 'oe i kēia mau mea mamua. O mākou, nā keiki, a'ole maopopo*. We weren't there, at least you saw some of these things. . . [personal discussions in track 4 not transcribed]

Mahalo nui iā 'oe i kou aloha a lokomaika'i.

MA: Same to you. *Hele mai niele. Inā a'ale niele, a'ale puka mai kēia 'ano mau mo'olelo*, you know.

KM: *'Ae*. . . [end of interview transcript]

Helen (Helena) Akiona-Nākānelua
***Oral History Interview - April 26, 2001*[9]**
(notes of April 10th and November 8th 2001); Ko'olau Region (Wailua-Ke'anae Vicinity) with Kepā and Onaona Maly

Kupuna Helen (Helena) Akiona-Nākānelua (KPA Photo No. 1472)

Kupuna Helen Akiona-Nākānelua was born on O'ahu, in 1911. Shortly after her birth she was given, in the Hawaiian custom of *lawe hānai* (adoption) to her maternal grandparents to be raised. She was raised at Lākini, Wailua nui, on ancestral land which had been handed down to her grandmother, Helena Kealohanui (Kaiha'a) Akiona, from her *kupuna* Kaiha'a. Kaiha'a was a recipient of *Kuleana* land in the *Māhele 'Āina* of 1848 (L.C.A.w. 3472, at Pauwalu), and also the owner of at least two Royal Patent Grant lands; one at Pauwalu (Grant No. 2549, from 1859), and the other at Lākini (Grant No. 3177, from 1877).

Kupuna Nākānelua is an extraordinary community historian. Over her 90 years, she has known many of the native families of the Wailua-Ke'anae region, and as in the custom of her *kūpuna*, she is a keeper of genealogies and family relations. Her recollections of the practices of families; places of residency; and stewardship and use of lands, waters and marine resources, is clear; and her interview is a significant contribution to the history of her community.

Kupuna Nākānelua has worked in the *lo'i kalo* all her life, and with her *mo'opuna*, Kyle Nākānelua, she continues to tend the family lands. Her family is sustained by the land and waters which flow from the mountains to the sea. She expresses a great sense of responsibility to the natural resources of the land which her *kūpuna* entrusted to her. *Kupuna* has been active in matters of Native Hawaiian Water Rights, and has participated in many programs seeking to address restoration of the natural water systems of the Ko'olau region.

[9] Pekelo Day (son of the late Apolonia Day, a long-time friend and associate of Kupuna Nākānelua), Janet Kiakona-Akau, Garret Hew, and Jackie Honoka'upu assisted in making arrangements for the interview with Kupuna Nākānelua.

During the interview Kupuna Nākānelua shared significant accounts pertaining to native traditions (how place names were given); native customs and practices; and historic residency and land and water use in the Koʻolau region. These narratives include, but are not limited to the following accounts:

Summary of Topic	***Page***
Every *kahawai* – stream valley had water flowing, land was cared for and vegetation did not block up flow areas. Also describes travel along *mauka* roads.	260
Discusses how Chinese came to reside in area; planting of rice; and Wailua land was formerly all *loʻi kalo* – planted in taro.	268
Describes *ʻauwai* – formerly families all came together and worked, digging *ʻauwai* (ditches) and maintaining system. When regularly maintained, the water flowed; now because of overgrowth, the *ʻauwai* get blocked up. During her youth, the *kula* (field lands) were all cleared, you could see great distances.	270
Discusses branching and sharing of *ʻauwai* waters; also references treatment of *kūpapaʻu* (burials), to be respected.	273
Discusses the historic residences – *kuleana* and homesteads; attachment of families to the land (generations of residency); effort of State to move families from land and their refusal to be moved; and old routes of access in relation to the present-day roads.	273
Discusses the nature of the land when she was young; the cultivation of taro; and making *poi*; and the place name, Lā-kini.	276
Discusses use of water in family setting – areas kept clean and different types of water uses kept separated.	277
Discusses trails and access, and occurrences of *huakaʻi pō* (night marchers). Knows of two *heiau* in the Pauwalu vicinity, above the school.	279
Discusses family *ilina* (burials) at Lākini, and on Puʻu ʻIlilua, at a neighboring parcel. *Ilina* should be respected and protected.	281
Describes Wailua – meaning of place name. Every *kahawai* had water flowing; used to catch various *ʻoʻopu* and *ʻōpae*; also gathered *pohole* (fern), *ʻāweoweo* (mountain *līʻau*) and other mountain resources.	287
Learned from her grandmother that families lived both *makai* and *mauka*, and they exchanged goods with one another.	287
Water flow has diminished in her life time; streams were never dry before. Now, only during big rain, when the ditches are full, does EMI throw out the water so that it flows *makai*. Wants every *kahawai* to have water flowing again.	289
Does not think that a new Water Permit (License) should be issued. *Kupuna* Kaihaʻa wanted Water Rights of the native families at Wailua protected in the 1800s.	290
Names varieties of *kalo* that they planted when she was young, and describes management of the *loʻi kalo* and *ʻauwai* systems.	293
Families started using fertilizers and chemicals by the late 1940s. Prior to that the old people would let the land rest, and use mulch to build up nutrients. Now the planting system is so intense that the land does not support good growth without chemicals.	295
Discussing the *heiau* at Pauwalu; place names of various lands in the Koʻolau vicinity; and travel and collection of resources.	298
Collected *hīhīwai* from Lalaʻau-Piʻinaʻau Streams and vicinity; saw *huakaʻi pō* in forest. Also collected or "made *ʻōpae*" at Halekiʻi.	300
ʻOhe, ʻekaha, and other plants gathered from forests for weaving… *Maiʻa ʻele'ele* and *ʻiwa* also collected up in the mountain; the old people took care of the *maiʻa ʻele'ele* because it was highly valued.	305
Water is very important in Hawaiian culture. Also heard of *moʻo* – guardians of the waters; knows of one that had been seen by elder family members in the stream at ʻŌhiʻa.	307
Hīhīwai supplemented meat in diet; uncles also hunted (with permission from EMI), for wild pigs in the mountain.	308
ʻŌpae are not like before because the water doesn't flow in the streams. She and other native residents want water returned to all the streams.	309
Because of the changes to the streams and landscape, she doesn't want EMI to be granted the permit again.	311
Care for the land, and its significance as an inheritance of the family—passed from generation to generation is very important to *kupuna* Nākānelua.	314

The interview was conducted in Hawaiian and English, and the narratives are given verbatim. Kupuna Nākānelua gave her personal release of the interview to Maly on November 8, 2001.

Interview Transcript

KM: …We're talking story, it's the 26th of April and we're at the home of *kākū* Helen…

HN: Nākānelua, Akiona – Nākānelua.

KM: *ʻAe. Mahalo nui i kou hoʻokipa ʻana mai. Holo ʻoe, ua wehe ʻoe i ka moʻolelo e pili ʻana i ka wai me ka ʻāina.*

HN: Yeah.

[Every *kahawai* – stream valley had water flowing, land was cared for and vegetation did not block up flow areas. Also describes travel along *mauka* roads.]

KM: Please *kākū*, you were saying "every *kahawai* before…?"

HN: Every *kahawai* had, and the land was not *piha* with the bushes and guavas all that. Because *hiki iā ʻoe ke nānā i ke kula*.

KM: *ʻAe, ʻahuwale ka ʻāina*?

HN: *ʻAe*. You know behind the school used to be our *alanui* for cut short through Palauhulu, then go up Piʻinaʻau Road to catch that horse back road from Plunkett.

KM: *ʻAe*, Plunkett Spring. *O Plunkett, kekāhi kupuna a kaʻu wahine, John Plunkett mā. Pili me Akau a me Kiakona mā.*

OM: Kaiapa.

HN: Oh!

KM: So Plunkett Spring, so you folks would go up Piʻinaʻau?

HN: We would go up to the road in Piʻinaʻau instead of going into his place, there's a road to go over that trail we pass that Kaʻakeke.

KM: Ahh!

HN: We call that *kahawai* Kaʻakeke. That's that *kahawai* coming down, and Kikokiko is down. Robert's uncle, Alfred Alu used to *kanu lēkō*, watercress over there.

KM: Watercress, oh.

HN: Alu's wife…

KM: Hannah?

HN: That's the oldest… No wait that's Harry's wife, this is the youngest brother, Alfred. There were three brothers that's Eddie and Harry, by the first marriage of their mother. When their mother went *make* that's when the father went marry again and they got some more children with the second wife, but they all half.

So that's our *alanui* going. And we used to cross behind the school, we go over the *kula* because *ahuwale*, cross Palauhulu go down the road and then join that Piʻinaʻau road.

KM: And up to Kaʻakeke?

HN: Kaʻakeke. The Plunketts go this way, and we take the Akeke Road. That's where we used to go to Hāna on horseback. I was young at that time. Then we go to Kopiliʻula. That's where we stopped there in the cave and wait for Hāna (family) come pick us up. We had somebody pick us up to go to Hāna and catch the steamer from there to go to Honolulu. But then, when we had the boat come here once a month, after they come from Hāna, Kaupō and all that. That's why I like to visit the Kīpahulu one. I asked someone, because I was about seven and a half years when my grandmother used to travel there and we came back there. The boat stays way outside we come on the sailboat. They have engineer, I don't know who was, and we have a trough. I don't know how big it is. They used to put all the *kamaliʻi* first while the parents stay out and then they hoist and it's kind of far from down below to go up Kīpahulu you know. That's why I like to see that.

KM: I think Mokulau, the landing by the church?

HN: Yeah, go down the church. I asked somebody, and they said you can go visit. So one day I'd like to go over there visit because I'll be ninety soon. And I'd like to see how the place look like. We used to get scared you know. Then when we don't go there, they had the boat come here to Keʻanae they stay out. There's a rock there where the boats stay out *Maunakea*, *Kilauea*, I rode them.

KM: *ʻAe*.

HN: We came on a sailboat, and came in. At that time the Keʻanae pier was not fixed right. Mr. Roback, the old man Roback was the engineer. And over there they had warehouses, and then People's Store that belonged to the Irrigation Company. There's a store there.

KM: People's Store?

HN: Yes. And AhChang Store, there were two stores there. They had one store here below the school too, AhChang came later on. Prior to AhChang was another *Pākē*, I forgot the name now [it was Hu Wai].

KM: Not Ching?

HN: No. Ching was way behind, Ching got it from his father-in-law Soong. If you know where the intersection come into Keʻanae, the peninsula and go?

KM: Yes.

HN: There's a bridge there.

KM: *ʻAe*.

HN: If you going back now, you going to meet the bridge first. On the left hand side you can see a platform ground like, going up, that's where the old post office was.

At the time his daughter, who used to be Maggie Soon, was not married but Kinson Ching was courting her that time. Kinson Ching used to come here. And she was my first teacher here. She's not a regular teacher, but I guess the Baldwin's put…no more teacher, so they put her there. She was my first teacher here. She taught for a while. Then she got married, and then my second teacher came was Roselyn Haia. William Haia's sister.

KM: William Haia's sister?

HN: She married Ben Akana, she was my teacher here. She didn't last long here, I think she taught about a year. I don't quite remember. You know she was teaching here she was kind of suspended, because the kids there, *kolohe*. Nobody own 'em up so the *kumu* make us put the *lima* like that [holds hand out] and hit every one on the knuckles. So some parents got angry, they say, "why do you do that?" "Because the other kid does not admit, they all got punished." So, she no longer went teach here. Then my next teacher came, was Mr. and Mrs. William Bishop, that was my third teacher. Than my fourth teacher was Janet's mother [Janet Kiakona Akau]. That was in the '20s, Mary Cockett. She had three children by first marriage two daughters and one son. One of her granddaughter's, daughter got married to an attorney. We went to the wedding, that's where I saw Janet. Janet said, "Aunty Helen, what you doing here?" I say, "What are you doing here?" [chuckling] At that time her girlfriend was staying below that Gima's apartment because my grandson just came to be a fireman. He was the youngest fireman here he stayed there, he was not married. She came she lived below and they were friends. When I told her, "What you doing here?" she said, "Oh, I came for her wedding." And I said, "What you doing here?" She said, "Oh, that's my blood, my mother's daughter, daughter." I think one was Maile, one was Sweetheart I think, I don't know the boy's name, but she was Mary Cockett at that time. When she began teaching over here Keʻanae was always giving concerts and she was

one of the leaders down the Protestant Hall at that time not this new hall now. Was the old hall. George Ewaliko was still living. We used to go down there and when I came back from Honolulu during the summer and I got married and I came back and I introduced her at the concert. I said, "This is my husband." He met so he asked my husband, "Who he was and from where he was?" I forget how now she went tell it was her mother through his mother she said *ʻohana kākou*. I said, "What? What a small world!"

KM: That was aunty Mary Cockett?

HN: That was aunty Mary Cockett.

KM: Aunty Mary is aunty Janet's mama?

HN: Mama, married to that Kiakona, David Kiakona.

KM: Kiakona, yes that's correct. That's where Onaona's *pili* comes in. Kiakona's wife was Caroline Hubbell. Caroline Hubbell's first husband was Kaiapa and that's Onaona's, *kākū*. So how aunty Violet, you were saying before…

HN: Yeah.

KM: Her grandmother is Violet Kaiapa Pomroy.

OM: Her papa was Sam Kaiapa

HN: But Pomroy is her last name?

OM: Yes.

HN: That's why I get mixed up when they told me Kepā, I said, "Gee, your sister Violet I never remember her by Kepā."

KM: No, no Pomroy.

HN: That's where the *pilikia* of the Hawaiians. All the *ʻāina* I find that out because they had problems. They take either the first name, the last name or they cut short the name, all *huīna* in the deed.

KM: Right. Like you were just mentioning earlier the name you said, Kawehiokalani or something like that [Hawaiian name is corrected below]. You said the name supposed to be Cano. C-a-n-o?

HN: Yeah, C-a-n-o.

KM: Spanish?

HN: Yeah, he is.

KM: Cano but the name when change to…?

HN: He came here he married a pure Hawaiian and why he think they come from royal, because the mother, his mother was the kind just like for the *aliʻi wahine* that time. Some kind of lady-in-waiting. That's how he began to say that he has that royal blood. . . His daughter, that's the oldest daughter who married my uncle told me, "Helen my last name is Cano, Kawohionalani Cano." But after that we only take Kawohionalani, and some only take Kawohi... Grandfather was from

Spain, Spanish, C-a-n-o. The name Kawohionalani, was his Hawaiian name because he worked for those ladies-in-waiting. So they began to call that name. . .

KM: So *hoihoi*, yeah.

HN: I get her picture. She went back to teaching and she married my uncle. Then somehow, because I was student here, and Mary Cockett came here to teach, she found out that some relative of mine married the teacher that she once knew, when they were teaching. She asked me she said, "Helen, I understand, do you know who is Alice Cano married to Moses Akiona?" I said, "That's my uncle." And she tell me, "Is she working? I said, "No." She said, "Okay, you write to her and you tell her refer back to me and I'll recommend her." And that's how my aunty came back again. She taught at Honokōhau (Maui), because teachers couldn't be in the city right away, so she had to go way down the country.

KM: Country, so Honokōhau side?

HN: Honokōhau, that's Lāhaina side. After she was *pau* there she went to Honolulu, way down way down Halemano, that's Pearl City side. She taught there so many years before they could come further up. Her last school I think was the on Kamehameha IV Road, Fern School, I think so. . .

That's why all the *pilikia* of the Hawaiian *ʻāina*. Because when I had my problem from my great tūtū's here, that's the problem I had. But good thing I understand Hawaiian with my grandmother because she speaks fluent. But then with us English, you have to have a word because we don't know the Hawaiian words for that so I have to give an example. If I have my aunty how would I call that and all that because they never had the word for aunty.

KM: *Makuahine ʻohana*?

HN: *Makuahine*, that's what he said. I said, "How can *makuahine* because I understand *makuahine* is the mother. She said, "*Aʻale loʻa hua ʻōlelo no kēlā*." And that's why they said "*na ka mua, na ka hope*." They know the older one was there and you see.

KM: *ʻAe*.

HN: [Referring to a point earlier in our conversation – prior to recording the interview – when she described going to Honolulu and taking Mandarin in order to be able to speak with her Chinese grandfather.] That's how. So I felt well, if my grandfather cannot understand Mandarin, no use I take. I only waste my time and I took one year of that.

KM/OM: [chuckling]

HN: Because he comes from remote areas whereas that language is in the city like that.

KM: Yes, yes.

HN: So since he doesn't understand I told my *tūtū wahine*, we call 'em Apo. I said, "I going take *ʻōlelo Hawaiʻi*, the Hawaiian language. She said, "*Maikaʻi kēlā, take. Hiki iā kāua ke walaʻau*." That's how I learned to talk Hawaiian. I have another brother but he passed away he owned the Waimānalo…Mel's Market. That's my brother, he just died recently.

OM: Oh!

HN: We're the only two who could speak very good Hawaiian. In fact when his customers come he greet them in Hawaiian, he talks to them in Hawaiian. He just died recently, it's going to make one year in August. His store, he sold it over to his sister-in-law, they made a deal. . .

In Waimānalo, he bought the whole place there for his family. He put 'em, Akiona all his children have *'āina.* And he got *mo'opuna*. One married the Chang from Hāna. . .

KM: . . .*Kūkū* when we met the other week, you were sharing these stories from when you were young. What year were you born?

[Discusses her background and land tenure of family – including *kupuna* Kaiha'a, who was a *Māhele* Award recipient at Wailua; and subsequently purchased Royal Patent Grant No. 3177, in the *'ili* of Lākini.]

HN: I was born in 1911. I was born in Honolulu, September 17, 1911, at Kukui Lane up in Nu'uanu. My father did not value girls. I had two brothers before me, I'm the first girl. He didn't want have anything to do with the girls. So my mother was supposed to give me to one *'ohana* on Moloka'i. Her mother said, "*A'ale hiki ia'u ke mālama i kāu keiki? Inā mālama wau iā 'oe me kou po'e keikānane, a'ale 'oe mamake ia'u…*" Well I guess my mother didn't want to impose on her because you know like the early Hawaiians said, "*Hana 'oe nui 'ino ke keiki, mālama. A'ale ho'iho'i mai iā mākou!*"

KM: *'Ae*.

HN: When my grandmother said that well I guess my mother felt at ease because my grandmother offered. She really knows, because her husband doesn't want the girl so she had to give her to somebody for support. So that's how my grandma *hānai* me.

KM: What was mama's name?

HN: My mama's name was Eunice Lilinoe.

KM: Lilinoe?

HN: Yeah. Her last name was Akiona. We became Akiona in 1922. Because when my mother died in 1920, childbirth; my two brothers were attending St. Louis College at River Street. My father had asked them, he wants to take them back to China for a visit. So my uncle agreed with my grandma, "Okay for only *hoi*oholo." That *hoi*oholo went a long time. . .

KM: . . .You know, from your little time, like you said, your mama *hānau* you, then you came home with your *kūkū*?

HN: Right, I was about not even a month old, my *tūtū* brought me back. And up there that house on the highway? [see map on next page]

KM: At Lākini?

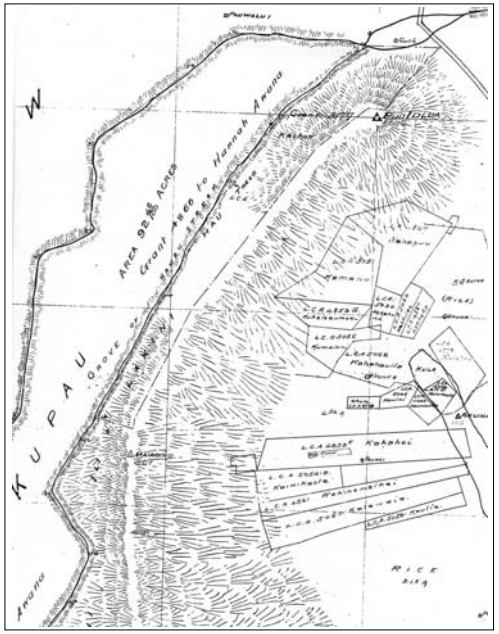

Figure 4. 'Ili of Lākini, Wailua nui (portion of Register Map No. 1760; S.M. Kanakanui, 1896)

HN: Yeah. The house was on the roadway, old style house you know that *lānai puni*. You know the old way of building.

KM: *'Ae*.

HN: That's where we lived, she raised me there.

KM: What was kūkū's name?

HN: Helena Kealohanui.

KM: Kealohanui. *A male 'oia i ka Pākē*?

HN: *Male Pākē piha*. Quan Sing Akiona. *Ka 'āina, mai tūtū, mai kona kupuna kāne mai. Kaiha'a*.

KM: *'Oia ke kumu o kēlā 'āina*?

HN: *'Ae*. You see *Kaiha'a, a'ole 'ālelo ku'u tūtū* if that's the last name, middle name. I have one grandson now (Guy DeSilva on Lāna'i), he's going on my genealogy. Whereas this grandson who is the fire captain at the airport he's going on the grandfather's side. Now this grandson of mine, the fireman on Lāna'i, he went and looked around in the Archives and all the kind, and then he calls me. I said, "Well, according to what I was told by my *tūtū* only three of them." And those were the three surviving ones, I guess. I remember my grandmother said she had a child but died. According to my grandson there were more, but only three survived. He went in there and looked, and it corresponded with what I said. When he told me three more, I said I never heard. Then he told me from where they say who their heirs was, I said "now I find out where this Kamali came, where this Alo'i Apo came, through their mother." Now I know how they came. Because in our family picture I know that's my grandma's cousins but I didn't know how. But through this genealogy of my grandson, I never know how important it is to ask my grandmother what and what, how they came and all the kind.

Through this grandson of mine, he's got a big book he said, "Grandma, I'll bring," he's coming in June because he got to take physical every… [thinking] I don't know how often. So he said "grandma, I'll bring you and show you."

KM: Good. You know the name Kaiha'a, in the *Māhele* in 1848…

HN: His last name was Ka'inapau, because my grandson went send me that.

KM: You know, *i ka noi 'āina, ka palapala 'āina i ka Māhele, 1848…*

HN: Yeah.

KM: *…ua kākau inoa, "Kaihaa."*

HN: *'Ae*.

KM: *'Oia ka inoa i ka Māhele*.

HN: Yeah, Kaihaa. Because I think *'ekolu lākou*. Kaiha'a had three daughters that survived, they were Kamaka, Kawaha, and Ka'oia'i'o. My *tūtū*, Helena Kealohanui, was Ka'oia'i'o's daughter, and I'm named for her. . .

[*Kupuna* Nākākanelua shared detailed documentation pertaining to her *'ohana*, and referenced original land deeds which had been handed down to her from her

grandmother Helena; and which she in turn has entrusted to her *mo'opuna*, Kyle Nākānelua.]

. . .If I'm not mistaken, another old man was from my *kūkū* Kaiha'a's time, he (or his son) used to stay here, his was a policeman before, Kahakauwila.

KM: *'Ae*, I've see the name Kahakauwila in the *Māhele* records.

HN: Kahakauwila, he was a *maka'i* before and my *tūtū* said "He was a very strict *maka'i*." That's the father of this man who went take this Hawaiian Homes below here. They call him Kahakauwila li'ili'i, that's the junior in other words.

KM: Yeah, interesting yeah.

HN: Him and I think there's one more in Ke'anae I not sure if it's Napiha'a… [thinking] We used to call Napi'ā [as pronounced]. But according to the paper they say Napiha'a, but I remember my *tūtū* saying Napi'ā. But I'm not sure on that part.

KM: You see all of these people are all the old *po'e kahiko* for here.

HN: *'Ae*.

KM: Your *'ohana* has been on this *'āina* in Wailua for generations?

HN: Oh, yes!

KM: Generations. How did the *Pākē* side come to be out here?

HN: The *Pākē* side came in, they were laborers from China came for the plantation.

KM: Were they doing the ditch work in the 1870s?

HN: No, I think he never do the ditch work, I never hear him tell me ditch work. They were on the plantation.

KM: I see. Plantation, Hāna or?

HN: Outside, they were outside.

KM: Like Huelo, Ha'ikū?

[Discusses how Chinese came to reside in area; planting of rice; and Wailua land was formerly all *lo'i kalo* – planted in taro.]

HN: Yeah, someplace outside there. Because he said when their contract was over that's when the rest of the Pākēs, some wanted to go on their own, they never like go on. There was only one *Pākē* here Cheong Chong. John Chong that's their oldest son he used to stay Ha'ikū, but I don't know if he…no I don't think he went work for Irrigation Company. He had a couple children. He built a big house, just like a dormitory like and he imported all these laborers from China. He's responsible for their behavior and everything. They get a place there, and somebody is staying there because they all *make*, and the mo'opunas and all. They have a platform, they have a dormitory there so all the Pākēs stay there and he take care of them. If anything go wrong he's responsible. They have the place where they make their own *laisi* [rice], a platform. They have their horses because the *'āina* over here before was only *kalo*.

KM: This *'āina*?

HN: Yeah.

KM: Wailua, this land here?

HN: Wailua.

KM: How about Kupau?

HN: Kūpa'u [as pronounced] well, [thinking] Kūpa'u was owned by Anthony Tam's father (Apo Li'ili'i), I don't know what they have there.

KM: Okay, so you no go Kūpa'u much?

HN: I go Kūpa'u, but to know more about the history I don't know because he has a son, Anthony Tam he married to… [thinking] His sister married to the Chars, Yen Char the photographer, that's one of the brothers-in-law. That's the oldest sister Alice. He had another young sister Mary, married to the brother of her sister's first husband.

KM: Here in Wailua in your time all *lo'i kalo*?

HN: Had *lo'i kalo*. And then when the Pākēs came in they *kanu laisi*. So the Cheong Chongs and the Young Ims, they used to call 'em I-M. They were the first growers here.

KM: So they began planting rice?

HN: They began planting rice.

KM: Where did they ship the rice out to?

HN: I don't know where.

KM: They went ship 'em, yeah?

HN: Yeah.

KM: Not just for local?

HN: No, it was more to send out. That's how they used to harvest, bring it there with the horse, *hehihehi* all that *laisi* on top that. We call 'em *papa'a holu* that platform there.

KM: *Papa'a holu*?

HN: Yeah. That's what they call that platform where they have the horses go back and forth. I no can understand how they make the horses like that with the dirty feet stepping on the rice, how they step with that. In other words there were two rice mills here. The Chongs was the biggest one, because he have that pounder. The one that separates, in fact it's still there but part of it is broken.

KM: Down on the flats here?

HN: The flat, you go the end of the road you turn up, that house there. You don't go above that because that's private. But that house right there just above the house. If you ask the people that's renting the house from the Chongs, there is that old pounder there.

KM: Amazing!

[Describes *'auwai* – formerly families all came together and worked, digging *'auwai* (ditches) and maintaining system. When regularly maintained, the water flowed; now because of overgrowth, the *'auwai* get blocked up. During her youth, the *kula* (field lands) were all cleared, you could see great distances.]

HN: And the water came from this *'auwai* during that time the olden people all *mahi'ai* they all *'alu like*.

KM: *'Ae*, *kōkua*.

HN: When they said one time make the ditch, everybody go *kōkua*.

KM: That's how was yeah, even to *ho'oma'ema'e*?

HN: Right.

KM: Everyone *kōkua*.

HN: Today, it's not like that you have the hardest time. We have the guy who *ho'āla* the committee, who says we go. And some of them don't like him so they won't respond. When they like certain people they respond. Like right now we're having some people ask, because the old-timers are gone already, *make*. I'm the only *wahine* that goes there! Every time cut the ditch. I don't go there as spectator look. The reason why I go there is because all *Kaleponi* grass. They don't upkeep 'em every month. They keep 'em four, five, six years and because the *ulu kuawa*, the *hau* and *Kaleponi* grass, no more water.

KM: *Mamua* you said *'ahuwale*?

HN: *'Ahuwale*!

KM: But, because everyone took care on a daily, regular basis?

HN: That's right. From my place you can see the *kula* all behind the school, the school not as it is today. In fact all this *'āina* here [gesturing *makai* of her], I could see.

KM: Out to the *lae kahakai*?

HN: I cannot see the coastline, but I can see the ocean.

KM: You can see over?

HN: *'Ae*. Even when we were at the school. At the school we can see the steamer coming from Hāna, coming into Ke'anae. And we look forward to that steamer day, all the kids get excited go down there, look at the steamer come in.

KM: [begin Track 2] So before…*mamua, o nā 'ohana a pau, 'alu like lākou, kōkua kekāhi, kekāhi*.

HN: *'Ae*.

KM: *Inā hana 'auwai, holo…*

HN: That's right, everybody. *'Ae*!

KM: *'Oia ka maika'i o ka ola 'ana, o ka 'ohana e*?

HN: *A'ole i kēia manawa. Ka wā hou kēia, inā a'ole wau mamake iā 'oe, a'ole wau hoihoi, a'ole wau hele kōkua.* So we have problem now because now the *'auwai pa'a pū i ka hau* and all that kind *Kaleponi* grass. The last time they went cut, was about two years ago, I always go. The reason why I go is because *maka'u wau, mahope 'oki lākou i ka mau'u Kaleponi*, they throw (the *'ōpala*) right near. And when the big water come after the rain, all came down, and twice it did like that.

KM: Flood?

HN: Right. And I clean up, the first experience it flooded one area so I don't want that to happen.

KM: Do you remember what year about?

HN: I don't remember what year.

KM: Your *kāne ua hala*?

HN: *A'ole* my *kāne* was *ola*, we was one of them.

KM: *I ka makahiki 'oia i hala ai*?

HN: Yes. That was in the '30s or '40s.

KM: Oh!

HN: We cut *'auwai* about four or five times.

KM: Oh, I see.

HN: My husband died June 10, 1991, and I give up the farm. He retired in '73, from the County. I took over that business until '89 because his health was failing.

KM: Your *'āina* at Lākini?

HN: Right.

KM: How many *lo'i kalo* do you keep up there? You folks kept up there?

HN: I kept all there. When I had my cousins children, he had a *poi* shop here and he went bankrupt… *Wala'au me ka waha, hana me ka lima*, that's two different things. Hard job, the hands.

KM: *Pololei 'oe. Ōlelo mai nā kūpuna, "Maika'i ka hana a ka lima, 'ono no ka 'ai a ka waha."*

HN: That's right, yeah. . . So and I was taking care all that land, in fact I lived there with my grandparents. I lived there since 1922, I was raised by her, but when I went to school in 1924 I went to Honolulu. I stayed in Honolulu.

KM: Oh, that was that time that Onaona's *tūtū* Violet was…?

HN: Yes, in the twenties in the middle twenties.

KM: Kapahulu, Waikiki School?

HN: That's when Janet's mother was teaching. She was my last teacher when I left here. Because *a'ole lo'a ka papa 'elima, papa 'eono*.

KM: *Ia ne'i*?

HN: No more. That's why I went Honolulu, I went Kalihiwaena. I went 1924, I graduated in 1927. They had the teachers cottage there. Now, go back to the *po'e wā kahiko*, clean the *'auwai*. *Kēia wā hele mākou, a'ale like nā mana'o. Hukihuki, a'ale makemake, a'ale lākou lo'a* time. But then the committee told them ahead of time, "*Hele kākou, 'alu like*." But nobody come. During that time before these committees came in we had the Youngs, *inā a'ole 'oe hele*, you supposed to pay somebody to come cut your share.

KM: That's good!

HN: But over here they don't do that.

KM: *Mamua, he luna hana? Like me ke konohiki paha, ka mea i alaka'i, kuhikuhi*?

HN: Well, I know my *tūtū* Kaiha'a is one of them.

KM: Kaiha'a…

HN: *Nāna ho'āla mai, 'alu like kākou*, clean up.

KM: *Kahea 'oia, "hele mai…"*

HN: *'Ae*, everybody go. Everybody go.

KM: The *'auwai* from down here, go all the way. How far *mauka*?

HN: Gee [thinking] …To my place, it's from Kūpa'u, it's pretty long to the spring. But then to go this way, to go out and meet these *kahawai*, then you get these two bridges. I don't know how far.

KM: *Lō'ihi* though, more than a mile yeah?

HN: No, no more.

KM: No more one mile?

HN: No more one mile.

KM: Close?

HN: Close.

KM: Did this *'auwai* of yours have a name that you ever heard *kākā mā* call or anything?

HN: No.

KM: That's the old *'auwai* they would always..?

HN: Then the old *'auwai* come. You know the last bridge when you come here, going to Hāna?

KM: Yes.

HN: That bridge there that water passes back of the well, you know behind of the well because that's Hawaiian Homes *'auwai*. From there come to where this *Na Moku* cleaned, and where they're planting taro.

KM: Now, up there?

HN: Yes.

KM: Has a name on that place that you remember?

HN: [thinking] I don't remember.

KM: Okay, that's good.

[Discusses branching and sharing of *'auwai* waters; also references treatment of *kūpapa'u* – burials.]

HN: Then you come on that flat, it's clean now because it's swampy. Ever since they went clean they had fill up from the road all the time it's better. Than that water comes…the church had *'auwai, punawai*. Everybody had *punawai* for wash clothes. The *'auwai* come and come to your place you build a pond. It comes down my place here, but before I had taken here, someone else had taken the *'ohana* of my neighbor below. They had their *'auwai* here and they made their *punawai* right in the back. And at the same time they have *'ohana* went *make* they went bury there. I never know until I went take the Hawaiian Homes in 1933. Then my grandmother said "*A'ole 'oe kapulu*." I said, "Why?" She said "*Po'e kūpapa'u kēlā*."

KM: Hmm. *Ai ma waho, mahope o…*?

HN: It's right in my property. And because it's so many years they all go, a huge mango tree is on top. When I found out that, well, I don't throw my rubbish there, I clean. In fact when I clean there, because it's my property I always clean. and when I go on top I always say "*kala mai*." Because my *tūtū* always said "*Inā 'a'e e 'oe. Kūpapa'u, nanunanu ka waha*," you don't mean that. Even over here I always tell people, when you cross somebody else's grave, because not uniform in the way they were buried in, you say, "Excuse me." Because you don't want anybody go over you like that. My *tūtū* always said that.

We get that *punawai* there and then the lady who chose here you don't know who them, that's John Akuna's mother-in-law. She build a grass house here. Behind have a fee simple land owned by this lady, some relative.

KM: There's a *kuleana* lot?

HN: Yes, on the middle.

KM: *'Ae, kākā*, I have the Register Map of Wailua and I have this packet, I left you one packet the other week. This is all maps again, for you old maps, 1870s like that.

HN: *Mahalo*.

[Discusses the historic residences – *kuleana* and homesteads; attachment of families to the land (generations of residency); effort of State to move families from land and their refusal to be moved; and old routes of access in relation to the present-day roads.]

KM: Here, Wailua Homestead let me just pull out, I hope I get…

HN: That was John…I don't know who his parents, but he got it from Mills.

KM: This is Register Map…let me pull this out.

HN: In fact, the foundation of the *hale mau'u* is still there.

KM: [opening map] This is Register Map 2234, here's the Catholic church here see this *kuleana* [LCA 4853-G:2]

HN: Yes.

KM: It's Kuhelemoku.

HN: That's right. But then, I think that person must have turned it over to some heirs because Mills has it now.

KM: *'Ae*. We see that Kuhelemoku, *'oia ka mea loa'a ke kuleana ma ka Māhele, 1848*.

HN: Oh!

KM: That's why. So this, *'oia ke kumu o kēia 'āina, Kuhelemoku*. And here's your house right here. This is your *'āina*, Lot 15, I think.

HN: Yeah. If you come by this *alanui* below here, if you look straight behind, because that lady Akuna said, she "got the land from Mills." Because they came here one time with the surveyor. That lady takes care of this guy who owns that land, I think nine-something point acres, I forget. How many over there say?

KM: The little *Māhele* parcel here [looking at map], it doesn't say how big. But it is *'Āpana* 2. See he had another *'āpana* somewhere else. LCA 4853-G. *Mamua, ke kuleana, ua lo'a lākou i kekāhi wahi, he pā hale…*

HN: *'Ae*.

KM: *…a lo'a, he 'āpana 'āina, he lo'i kalo…*

HN: *Like pū me kēia*, all this here. *Kēia ka pā hale. Ka lo'i*, I think is Kawā [as pronounced], up there. Far, not near the house, it's away from the house. Every homestead lot has. So that lady had. They still have the *kahua hale, hale mau'u*, and this lady who…because they don't sell. *A'ale kū'ai* till now. So when we had Mrs. Day, Peter's mama.

KM: *'Ae, Apolonia*.

HN: Yeah. She said she would give up the presidency of our *hui*, the Wailua-Ke'anae Hawaiian Homestead…something Trust Fund. But she was told to put out the Trust Fund because it was not a Trust. So she said, she's going to continue to stay as President because what she like is the *'āina*. How many times they wanted to get outsiders to come in here in this *'āina*, but she fought it. And then we had Shaw who was one time the agent, he held it back. "Don't sell the land, don't listen to anybody leave it for the people here give them the first chance."

KM: *'Ae, no nā kama'āina*.

HN: No sell the land. Then when came Haake, Haake found out from Jimmy Shaw, where and where the land. So one time this… [thinking] who now came over. [thinking] Was it the State? I think it was the State. They wanted to exchange this land here, for Kaupō.

KM: Oh, my!

HN: And then Mrs. Day and all us, we never like.

KM: Of course!

HN: We told those guys, "Why should we go there, because our descendants and we were raised here, taro lands. Kaupō is dry land, arid land they only can raise potato. We no like!"

KM: Why would you go out to there?

HN: All these *'āina* was all bull-dozed, no more guava bushes. Now, the nerve they get to put us there to Kaupō, when the land over here all clean. Never had this *alanui* over here, we requested to get that *alanui*.

KM: This little one here or the other one?

HN: Yes, this little one here to go inside. Otherwise, we got to go by the well go over there to the Chinese graveyard [gesturing *mauka* to an area a little below the present-day highway].

[*Kupuna* Nākānelua also noted that some graves were impacted when the road went in, as well; she thinks that the Kekumu family may have some graves in the vicinity.]

KM: When you look at this map here again, what you see is only now this map is 1903, It shows at least the plan for your main road come in front of the house. Had a little bit of an *alanui* but not one all the way back here like this?

HN: Yeah, never. All this *po'e 'āina* over here never have *alanui*, only *waha*.

KM: So *alahele*, little paths.

HN: Yes. You discuss with the neighbor.

KM: Their access?

HN: That's why they always say, get *alanui*. I said, "They never did have *alanui*, it's just between you and my neighbor, we agree to make it."

KM: *'Ae*, like, an agreement.

HN: Yeah, it's a pathway like. There was no more road. That's why when they came in they want to choose the Hawaiian Homes, they demanded a pathway. I said, "None, whatsoever, there was no road on the map for anybody go in the back here. No more road, it's only *waha* or you *kākā* with your neighbor how you agree, I put one *alanui* here."

KM: Yeah. Maybe *mamua loa*, the *kupuna* in the *Māhele* before time, you know. They have their little *alahele*.

HN: *'Ae*.

KM: That's the old kind where you know you go from one *'āpana* to another *'āpana* like that.

HN: That's right and most of them were here before we bought this homestead land.

KM: Yes.

HN: That's how we go to the beach. We go to the *'āina*, we go in somebody else's land because had *alahele*. We know that's our road. That's how we go to the

beach. That's why I said now, wasn't like this you stay here you can see the ocean but you cannot see the coastline.

KM: Because *pā pali*?

[Discusses the nature of the land when she was young; the cultivation of taro; and making *poi*; and the place name, Lā-kini.]

HN: *'Ae*. We used to go here. In fact, all around here, all this *'āina* here, never have bushes. *Hau* all clear, even up my grandparents place no *hau* there. You can see the *kula* outside.

KM: Lākini that's one old name?

HN: Well, that's the name my grandfather gave for this land.

KM: Does it have…*pehea ka mana'o Lākini*?

HN: Well, that's what my mo'opunas ask me, I said, "I never ask my *tūtū* and all that." To my interpretation, I say, "gee, because it came from generation, I feel it's the land of generations. Lā-kini [as pronounced] *Lā* is day, and *kini*, that's for many in numbers.

KM: Multitudes.

HN: That's right. That was my interpretation, I gave to my *mo'opuna* I said, "I think that's the name our greats went give, Lākini during that time." That's how that name *pa'a* there.

KM: From your young days, you *ho'olohe ka mo'olelo, hana ka lima*?

HN: I hear my grandmother say. In fact, I have eight in my family. Out of the eight only five lived with my grandparents. I was the only one that was closest to my grandmother, can speak Hawaiian, we do everything Hawaiian. Of course, my grandfather talk pigeon, we all talk pigeon. He understands a little, but we cannot speak. My grandmother was everything in Hawaiian. Right in the back we get our *kalo*, we *huki*, we *huki*, we cook, we make our own *poi*. We never have grinder that time.

KM: *Ku'i, pōhaku*?

HN: *Kui, pōhaku*. And the *papa*, my uncle used to make out of mango tree *papa ku'i 'ai*. He make big size, small size and my last one went rot out just before my husband died no can save. I had my grandson's friend, I don't know if you know Sam Ka'ai...

KM: Yes.

HN: So Kyle happened to mentioned it to him, and he made one. I told my grandson I just wanted one small one, but he made one big one for a grown up. I said, Granny I can't do that.

KM: [chuckles]

HN: So, anyway when he had that board I said, "Granny, you keep that. Only grandma home, I don't need that, I won't pound *poi* for only one." Because he was curious he took the grandfather's stone and my other cousin took the other stone. Because

when I moved here, the four bedroom house still had everything there. We had a four bedroom house.

KM: Lākini?

HN: Right. Separate dining room, outhouse and all of that, *'au'au* all outside. *Kahawai* we wash down. That's how we used to do.

KM: So I imagine, what you just said, *kahawai*, you wash down. The *wai*, water, is an important thing?

[Discusses uses of water in family setting – areas kept clean and different types of water uses kept separated.]

HN: That's right. At that time the *po'e* over here, below us never have *kauhale* where they have to get water, they take the water from the rain with the barrel. That's how we used to catch ours too, we never consider the *kahawai* water but, if we know where we wash, we not going take the water there. We go above.

KM: That's right, uses of water at certain places?

HN: That's right. Our washing place is separate our bathing, well our bathing, we have a bath house outside of us. Where we put everything that we eat or whatever else, we don't *huikau* with our washing. My grandma said you *ho'oka'awale* that. The *mea 'ai no ka waha*, got to be *ma'ema'e*. "*A'ole huikau me ka mea lepo…*" And all that kind. I still remember, that's how we used to do. But most of the time, people used to have barrels and catch all their water. That's only emergency now! The other water comes from the *kahawai*.

KM: *'Ae. Ua hele paha 'oukou, halihali wai*?

HN: *'Ae. Hele mākou ki'i ka wai mai ke kahawai. Mamake 'oe holoi i ka hale* and all that kind. *A'ale mākou lawe ka wai mai ka ua mai. Mālama* for...unless *a'ole loa'a wai*, then we go upper place where *ma'ema'e, a'ole kapulu 'ia.* Get our drinking water.

KM: You would go up further to gather?

HN: Right.

KM: This is during *wā malo'o* time, no more rain?

HN: Yes, no more rain. Get *pāpa'a lā*. That's how it was.

KM: *'Ae*. Were there other *'ohana* up by you folks at Lākini too, or not?

HN: No, only my *tūtū* was. My grandmother, my mother had a place that's Hui land (at Pauwalu).

KM: Hui land?

HN: Irrigation Company has that too, back of the school.

KM: Behind?

HN: They have Pauwalu *mauka*, Pauwalu *makai*.

KM: *'Ae*.

HN: We're on the *mauka*. In fact, the old road was not where the new road is.

KM: That's right, it was…*ai mauka*?

HN: *Mauka loa*. And that's why when my mother's house was built in the paper it says *mauka* the *alanui*. But when I go the latest map in here it shows my place below the *alanui*. This present *alanui* I say, no during that time my mother had, her place is above, it's the old road. In other words if you came just past up the school, you know where the Mormon Church?

KM: Is it on the same side as the school?

HN: Same side as the school. You know when you come from the school there's a driveway going up?

KM: Yes, yes.

HN: Come past that driveway you see a van, you saw a van there?

KM: *'Ae*.

HN: Right next is the Mormon Church.

KM: Okay.

HN: Now what was I going to say.

KM: Where mama's house and the road before, *alanui* was more up.

HN: Yes. From where that van is where you see before, that's where the *alanui* went up. And that's where my mother's house was. Below the road. Because the *alanui* went that way, whereas the school now on the latest map my mother's house is below. I said, "No, my mother's house was above. The Ke'anae School was not there." Used to be lower Ke'anae.

KM: *Makai ma ka papa*?

HN: Yes.

KM: Oh!

HN: That's where my uncle them went school, George Ewaliko, Apela Aiu was the first teacher here. They were all there. Mary Ann Pahukoa, she was Mary Ann something before… [thinking] What was her name now? She went marry Pahukoa. That's where they used to go to school. Then later on years, I don't know when that's when they brought the school where it is right now.

KM: They went switch because the school came more big and so they had to push up *mauka*?

HN: I guess so, because during that time only the older one's that time were only few. That's why all *huitau*! But that's where the road used to go. In other words when we had the road go, if you came by the well. You know where uncle Harry's stand is right now?

KM: Yes, yes.

HN: That's *alanui kahiko*. We come on the main highway there's one there going up then you can go Pi'ina'au. There's this one coming here. It crosses by uncle Harry, there's the old road there.

KM: *'Ae*, the old *alanui kahiko*?

HN: That's right. . . In fact he got the land from Robert, the half-brother.

KM: Pu'u?

HN: Yes. . . Oliver Mitchell, Dorothy Kahananui, that's the brother. Oliver is his father, Harry Mitchell. Pu'u was the second husband. The Pu'u's are from Huelo. . . [begin Track 3]

KM: It's amazing how you remember all of these *'ohana*! And these places like this.

HN: Well, that's why my grandson is very happy at least he can find out. When he brings me the name I say, "Granny wait I've heard of that name, Apo telling me. Go back again tell me where they came from, and I heard these people." He goes back and research and what he says grandma "yes, in here." I said, "yes, you see."

So that's the old road goes down there through uncle Harry's, go further below they used to have a cable go over. A cable bridge, the foundation is still there but the bridge over, no more.

KM: Went down to the flats? Or the *kahawai*?

HN: No, no, no up on the *alanui*.

KM: Up on the *alanui*?

[Discusses trails and access, and occurrences of *huaka'i pō* (night marchers). Knows of two *heiau* in the Pauwalu vicinity, above the school.]

HN: In other words where the well is, is the taro patch (*lo'i*), there that cable bridge came across to that land and from that land it came up from the well and continued here. Continue, go up the *pali*, go down, go Wailuaiki, go down. That's where the old road was.

KM: Amazing!

HN: You know in the night my grandma always say, "*A'ole 'oe hele i ka pō…*" When *Pō* [thinking]

KM: *Kāne*?

HN: Yeah. Because *ka huaka'i kēlā o ka po'e hele*. And I said, "What happen?" She say, "*Inā hele 'oe, a'ole 'oe 'ohana*…you don't have any relatives in that *huaka'i*, it going affect you."

KM: *A, ua lohe 'oe i kēlā mo'olelo*?

HN: I *lohe* that.

KM: *Mamua, ma na alanui kahiko, he po'e huaka'i*?

HN: *'Ae*.

KM: *Pō Kāne*?

HN: Yes, that's why my *tūtū wahine* always say, "*A'ale 'oe hele i ka pō. Inā hele 'oe, a'ale 'oe pakele, inā a'ole 'oe 'ohana*." I say, "Why?" "Because, *ke hele mai kēia po'e huaka'i…*" You not supposed to block them and all that kind. And I said, "How do they know if you coming?" "I guess they get that smell, they know somebody is coming." I remember that.

KM: *Ua lohe paha 'oe i ka leo, ai 'ole ke kani 'ana o kekāhi mea*?

HN: *A'ole. Ka'u mea wale nō i lohe ai i ku'u wā li'ili'i.* You know in the back of the school there was a teacher's cottage by there. *Po'e noho ma laila*. They were the first people that went down to the first Hawaiian Homes in Waimānalo. In fact there was one house here at the intersection where they have a pink house. There were two guys that lived there before they went to Honolulu; the first Hawaiian Homesteaders in Waimānalo. That's near the park or something like that.

KM: Yes, yes.

HN: The first Hawaiian Homes, some people still there.

KM: Hmm. *Pehea, mahope o ke kula, he heiau paha ko laila*?

HN: Yes, *mahope o ka* cottage was a *heiau. Ko'u hale ma kekāhi 'ao'ao. Mawaena o ko'u hale, ka hale o ku'u mama me kēlā* cottage…

KM: *O Pauwalu kēlā 'āina*?

HN: Pauwalu *mauka,* that's what they call that. Below the road as far as Harry Mitchell, that *māhele* go up *mauka* and *makai*. So they're *makai* and that's *mauka*. Okay over there had *heiau* back of the school. That I heard, only once though I heard. What I heard was the drum.

KM: *Kani ka pahu*?

HN: *'Ae*. There were teachers that were staying there and they hear the noise, they don't know so they ask somebody who was there. They say that was one *heiau* there. Okay, where this side you came before the Mormon Church. You go up that road because that's the road we used to go up, go up this side. There is a small *heiau*, but a small one. I just don't know just where about now because *pa'a i ka hau*, all covered with the *hau*. That used to be our road to come from my mother's place, we cut short from my mother's place, my uncle used to be right above. We continue that road come over the *kula* if you come this first bridge there's a flat there. We used to cross from the *kahawai* go over to come into Lākini that's our cut short road.

KM: I see, so behind way, is real easy?

HN: Yeah. We always *mālama* our *alanui* we keep clean so that we can come. Because they never have this road here. There was only a trail.

KM: In the 1920s only when they started the road?

HN: Yes, yes. There was only a trail. In other words from that angle there, goes up by the side of the cliff go up. That belongs to us.

KM: Up on the side is yours?

HN: Yes, belongs to us.

KM: Is that still Lākini?

HN: Yes, still Lākini. But then near now below the bridge my grandfather sold to two people. One is to Sam Kuoha, I think was three acres and then one to Cooper, Joe Cooper. He's from Makawao. He had a son, used to be an overseer.

Someone just told me, a *haole* bought 'em. And I think the *haole* wanted to make a house there on the side of the cliff because on top that *pu'u*, Pu'u Ililua, in our area has a relative's grave. My grandmother's nephew (Henry Kamali'i).

KM: *Kanu 'ia*?

[Discusses family *ilina* (burials) at Lākini, and on Pu'u 'Ililua, at a neighboring parcel. *Ilina* should be respected and protected.]

HN: The *wahine kanu 'ia* there. She was teacher here but I wasn't that time.

KM: Not born yet?

HN: Was born, but a youngster. I remember seeing her.

KM: Before your time?

HN: I forget, she was *hapa haole* because the heirs came one time here. Three years ago. Last year he came, he live on the mainland but he come back every year his mother is from Moloka'i. One time he come here we were in Ke'anae at the Farmer's Market, and then one of my God children brought me home and we saw this guy at the well. We stopped and asked, "Are you in trouble, do you need help?" He said, "No," he just came from this house, that's my neighbor, Carmichaels. That's the Ka'auamo. He just came from there and he had asked her if she know of anybody there. She said, "No, I don't know I'm a younger generation. The lady that is right below, went down to the market, you wait for her." The coincidence, we met when we came there and we ask if you need *kōkua.* That's when he said, "Yes," and I said, "Who are you looking for and what are you looking for?" He said, "I have *'ohana* here, went *kanu 'ia* here when *make*." I said, "'*O wai kou inoa*?" "Kamali." I said, "That's where I come in." I said, "What about Kamali?" He said, "The wife is *'ohana* to me." I said, "Was the wife one *kumu kula* here? Kind of big *hapa haole wahine* like?" He said, "Yeah." I said, "That's my uncles wife they call her Lizzie." She wanted to be on the *pu'u*, she went very top on the *pu'u*, Pu'u Ililua From my mother's place in the back, the *puuwai*, we wash, we can see her from there, her graveyard. Because old Hawaiians they like way up, they like look down.

KM: *'Ae. Nānā 'āina*?

HN: There's also at least two more *'ohana* up there on the *pu'u*, a little below, and facing this side. Peleli'i Ho'okano *wahine*, was buried there—they're *pili* to the *'ohana* that had the *'āina* down below, where the Rockefeller house is now, and the Kekumu family graves are lower, towards the road.

KM: It's so important to record this kind of information, so that problems can be avoided. What do you think, how should the *ilina* be treated…

HN: *Waiho mālie*, no bother them. Even my *tūtū* who owned the land. That's why now I told my grandson if the State cut the land again I'm going to tell them "I don't

think you folks should." Because something tells me my *kākū* is right there on the *pu'u*.

KM: By Kamali them?

HN: No, no, no Lākini.

KM: Lākini *pu'u*.

HN: As you going now, before you get to the gate to go up to the house...Because I can see all the stones just like how they make, set. I said, something tells me if I going outside there… So I think you folks better not go. I know there's a grave in the back there, the owners of the land.

KM: Your *kākū mā*?

[Discusses her connection to *Māhele* Awardee, Kaiha'a.]

HN: That's my *kākū mā*. Now my grandmother's grandparent is Kaiha'a.

KM: *'Ae*.

HN: My grandmother had my mother. Then my mother had us, we're about the fifth generation.

KM: Your papa's name wasn't Akiona then?

HN: No, the Akiona, I was *hānai*.

KM: You were *hānai* by mama's side. So the Ching…

HN: Actually should be Ching.

KM: Okay, so Akiona was mama's direct line?

HN: Right.

KM: Okay, so that's how you folks came back *pili* here.

HN: Well, not through the *Pākē* because he's pure Chinese.

KM: No, I understand through Kaiha'a, Kealohanui *mā* like that?

HN: Kaiha'a's granddaughter is my grandmother who is Kealohanui.

KM: Okay.

HN: That's how we got there.

KM: I see. So we were just talking about, get *'ohana kanu 'ia ai ma Lākini…*

HN: Yes, that's the owners of the land. And my uncle had two twins the kind *pa'apū, kanu 'ia* over there.

KM: You know basically, where the place is, you think?

HN: Well, my grandma says it's in the behind there and my uncle says was near the pear tree. I say, "No, uncle something tells me it's over there. Where those *pōhaku ho'onohonoho 'ia*."

KM: Is it a little bit of a *pu'u*?

HN: The place now from my uncle's place, go up to like the hill. Overlook down. My uncle built his house down on the flat, this is up and we further up on the flat end. I used to get, and I still get scared.

KM: It's so important that these places…

HN: That's why my grandson wants me to go back there. I said, "No Granny, you go get plenty people come, I scared." I'm scared you know.

KM: *Pule mua.*

HN: Even when I go to the graveyard, I run.

KM: You know *kūkū, inā a'ole 'oe i a'o i nā mo'opuna… E loli 'ana ka manawa, a loa'a kekāhi po'e hou. Pono iā 'oe e a'o i nā mo'opuna.*

HN: I get scared and that's why I tell the priest I get scared. Why I scared is at nine years old, I'm young yet, I don't know those things. Where my mother's house is I would say about… [thinking] ten minutes walk to get to my uncle's… He married one of the Ekela daughters, Fanny Kaikoku. One of their daughters was Violet Akoi, Sam (Akoi) AhLing's wife

KM: *'Ae*, Akoi.

HN: Ahling's first wife was my uncle's first wife's daughter, with a Pākē.

KM: Sam?

HN: Sam. His wife had *Pākē* father with Ekela's daughter, Kaikoku. One is Violet that's Sam's wife, and she had a brother William Māhoe, but he died. That's why Sam's wife call all his children *'ohana*…Her mother is Kaikokū. This one here, Awapuhi's grandmother is Kapeka. Kaikokū was the oldest. And that's Sam Akoi's, AhLing's wife's mother.

KM: So when you were nine years old something happened?

HN: Yes. Our house in back of the school, his house I would say about ten minutes walk.

KM: Still in Pauwalu or…?

HN: Pauwalu facing up, he's further up. We have to go to his place to go and cross the *kahawai* to get here, because we always upkeep. Anyway, one morning I woke up because our dining room is outside, you got to walk down the stairway and go. I open the door I face up. Now I'm nine years old, I don't know anything about that. And during those days we used to call that…I hear my *tūtū* call "*Lole Pukiki*." Means they get those tight out-fitted neck and top pleats and all over here, long sleeve, and all the kind. I seen her playing in white, I told my grandmother, "*Hele mai Apo*." My grandfather was wondering what I was calling, I said, "*Apo, kēlā ki'i a'u e 'ike mai, kohu mea o kākū Kaikokū*." "*Ai hea*?" But no show to anybody only went show me. My grandmother said, "*Hō'ike'ike ka na'aupō*." Which I don't know. It's true, I don't know.

Anyway, I described to her with the outfit and that's the kind clothes that I tell they wear. Her hair, her face is there but fade, this part here is faded. See at that time, she was at the hospital at Pālama...When I saw that, so my grandmother said, "*Hele kākou e ho'oponopono*." And this man is Sam Ahling's brother-in-law (Ka'ailua). Bordner, who used to teach at Nāhiku, before her husband was Akiu, AhLing's *'ohana*.

KM: Akiu *mā* like that?

HN: Yeah. So we went, and because I understand Hawaiian the man told me "*Wehe mai 'oe i ka puke*." They do only by prayers but I don't know why they tell us we go *kahuna*. That's just like *ho'oponopono* that my *tūtū* called that. When I went open the book he read the verse from the book and he told my grandma, "'*Ae pololei kēlā mea a kēlā mo'opuna hō'ike ai. Na'aupō, pololo'i kēlā. No ka mea ka wahine a kāu keiki, iloko ka hale ma'i, ke kumu 'oia i 'ike 'ole ai ka mea o luna…*" [gesturing to her face] He said, "Almost going die! *Kēia mau lā aku, lohe 'ana 'oe i ka mea hou*." Which we did! I think was two, three days after. He was called by the *hale ma'i*, go there. He did go down to Honolulu. But you see I forgot to ask him, because when they went fix that place again, I forget to ask my uncle, did you keep track what they did with her? Because from my understanding when they died, they went put them by the cave over there. I think they must have *pāpali* over there by that place, that old *hale ma'i*.

KM: You mean Lanakila *ma O'ahu*?

HN: Yeah, by that old *hale ma'i*, on the side they went put 'em in the cave. I ask my uncle "you never keep track what happened?" "No can cause they made one park over there and very different. I go there I no recognize where the place was. There's a lot of houses there." I remember that place very well they used to have *lo'i kalo* over there. Now, you no find that, you don't find that. So, I never find out. So, when this man said "'*Ae, kēia mau lā, lohe 'ana 'oe i ka mea hou. Ua hala!*" That's why this face, I cannot see.

But her outfit plain. I described her. From that, that's why I get scared anything Hawaiian. There was another incident I had same thing too and I said, "Why does it happen, show me?" Whenever anybody tell me, even the priest tells me he say, "Helen you don't have no more faith." I said, "Father I have all my faith in God but I say, just so I don't know how that thing is strong in my mind. Father, I guess you have to have a little touch of Hawaiian." Because I cannot refuse, I have my Hawaiian in me, I got to claim some of that heritage from my ancestors. I said, "Although, I don't take all because my grandmother never used to do all what her parents did, but I have to observe some of that." Because it affects to today's generation yet.

KM: Yes, *a 'oia ke kumu huikau kekāhi*.

HN: That's why the priest say, "How you know?" I said, "Because it did happen and it happened to my family." I have to say, "I got to believe, I don't care what you say, I got to." I say, "Father, I have to, I cannot disown I have no more Hawaiian, that's my culture there. I say, I got to."

KM: *Pololei 'oe. He Hawai'i 'oe.*

HN: So from that time I always tell people, no at this age when I have seen those things we went *ho'oponopono,* he said, "Oh, you go *kahuna*." I said, "That's not *kahuna*, that's what they call today *ho'oponopono*." You go there somebody *wehewehe* to you what they see. I said, "That's not *kahuna*."

KM: *'Ae. A i ka wā kahiko, nui no nā 'ano kahuna. He kahuna maika'i, kahuna ho'ōla…*

HN: *'Ae*. According to what my *tūtū* said, "*Ka po'e wā kahiko, mamua, a'ole hiki iā 'oe ke 'ōlelo inā hānau mai 'oe keiki*, 'handsome.'" *A'ole hiki iā 'oe ke 'ōlelo, "O, u'i maoli no kēia kaikamahine…*" I said "*Pehea ka wala'au 'ana?*" "'*Ōlelo mai 'oe, 'pupuka*.'" I say, "Why you say *pupuka*?" She said, "If you say handsome, they going to die."

KM: *He lili paha, 'ohumu kekāhi.*

HN: Yeah. . . Another thing my grandmother tell me "You go Moloka'i, *nui 'ino no ka po'e 'anā'anā*.".

KM: *'Ae "Pule o'o."*

HN: I think still yet some more yet maybe not as much but that island is noted for that... I believe there is some more yet because I was told there are.

KM: *'Ae. . .*

[Track 4]

[begin Track 5] . . .*Kūkū, i ka pule aku nei, ua 'ōlelo mai 'oe, mamua i kou wā li'ili'i, nui ka hana. Ua hele 'oe i ke ala 'ana mai o ka lā, hele i ka hana.*

HN: That's right, yeah. My grandmother not too bad, *kupuna wahine*. It's my grandfather, the *Pākē* he said, "You no *hanahana*, you no *kaukau, poho laisi*. Akung, *a'ale mamake hana. Inā wau a'ole hana, iā wai e hānai 'oe*." Which is right my grandmother is the happy-go-lucky type.

KM: [chuckles]

HN: She never worry, although she made sure that the kids had an education and all the kind. But really for take responsibility in fact for cooking. She cooked very seldom 'cause she said as long I get my *poi*, my *i'a, lawa. . .*

Group: [discusses family relationships of Kaiapa, Hubbell, Tau'ā, Kiakona, Plunkett, and Pomroy *mā*.]

KM: [begin Track 6] . . .I'm so amazed at how many of the *'ohana* you know, you've kept… *'Oia ke 'ano o nā kūpuna*.

[Notes that the Hawaiian language is being changed in schools today.]

HN: That's right. In fact I'm the only one. . . My four uncles did not know all the *'ohana*, and they asked how I learned? I said, "You know why I know, because I *niele* our grandmother." Being Hawaiian I hear her talk Hawaiian, I don't understand I said "*kou 'ōlelo*, what does it mean?" Me, I went *niele*. I'm not sorry, and I'm not sorry I took Hawaiian that's the way I came to know better. I'm not sorry. And now my children, I educate them all Catholic school. When their kids came up, they all go to Kamehameha School. Now they go there they took up Hawaiian they get interest in Hawaiian. Now the *kamali'i* come home talk she said, "No, that's not the way to say the words," so she calls by phone.

A'ale, a'ale, a'ale! I said, "Good, spend money on the phone, you fellas no make any effort…." Because the kids come home and tell "No, that's not the way I hear and all that." Because *ke au hou kēia manawa*, some they speak, it's not like how we spoke.

KM: *'Oko'a.*

HN: Yes.

KM: *Hana 'ana lākou i kekāhi 'ōlelo hou.*

HN: Yeah, that's right. That's why I said if they making the *'ōlelo hou kēia manawa* they should publish another book.

KM: That's right.

HN: Don't mix it up with our old one, because we are all from a generation to that time. You make a new one so we know it was during your time.

KM: Here's the *mea hou*.

HN: That's right. Because if you mix up that, you going to change the Hawaiian. There's going to be no more original Hawaiian. *Nalowale*, no more.

OM: Yes.

KM: And that's why too, to do these kinds of things, this history like this to talk, to recollect. Like your waters here *kākū* I saw that you were on a video with aunty Day *mā* and stuff. About the waters, yeah?

HN: That's why I don't want them to put me on TV and all the kind, even in the newspaper. And on one tape when *kupuna* Day was, she he came with I think…who the name of that man?

KM: Puhipau?

HN: Yeah. His father is not Hawaiian but he took his Hawaiian name he said.

KM: The mama was Puhipau from Kona Hema.

HN: He said, he never take his father's name he took his mother's name.

KM: Yes.

HN: I think, I don't know if that was his wife or his girlfriend she come with him.

KM: Joan Lander.

HN: Oh, that's how I met them, through Apolonia.

KM: You see when you were talking about the water we know that like here Wailua, just Wailua does that have a meaning? Get *wai* inside it?

HN: *Lua* got to be two.

KM: *'Ae*.

[Describes Wailua – meaning of place name. Every *kahawai* had water flowing; used to catch various *'o'opu* and *'ōpae*; also gathered *pohole* (fern), *'āweoweo* (mountain *lā'au*) and other mountain resources.]

HN: There's two Wailua. Wailuaiki and Wailua. This one here is Wailua, you go across [gesturing towards Hāna], Wailuaiki.

KM: So Wailuanui, Wailuaiki?

HN: Right, that's right.

KM: This *'āina* here, must have been a place of waters before?

HN: That's right, it's got to be. Because before we have plenty water. Every *kahawai* full, we used to go catch goldfish, *'o'opu*. And we look forward to that because my grandmother like that. When she say "'*Ono mai nei nō ho'i kēia i'a haole…*" Because they used to eat the goldfish they call it *i'a haole* and *'o'opu* for *pūlehu, lāwalu*. That's our break so we go out swim at the same time so we dive all these kahawais going up.

KM: Into the *kahawai, hele i ke kuahiwi*?

HN: *'Ae*.

KM: And what, *'o'opu nākea*?

HN: *Nākea, owau*, that's the big head kind. *Nāpili*. Hawaiians eat the *nāpili*. My grandmother eat the *nāpili*, you come home *kaula'i*.

KM: And how you go up *kahawai i ke kuahiwi*?

HN: Nobody's *kahawai*, we go up that time you can see everybody. There's no way you can get somebody going to fool around because *'ahuwale*!

KM: Yeah. All of the *'ohana* would go up gather. And *'ōpae* like that?

HN: Right. Get the *hō'i'o* they call *pohole*.

KM: *Pohole, 'ae*.

HN: They go up there to get that. The *'āweoweo* that's the mountain *lā'au*.

KM: *'Āweoweo, ulu nahelehele*…grows wild in the mountain?

HN: Right, grows better in the mountain, I brought it home for plant. Itchy, itchy.

KM: No can. But the *'āweoweo, mauka*?

HN: Good, because it's cool, *kuahiwi*.

[Learned from her grandmother that families lived both *makai* and *mauka*, and they exchanged goods with one another.]

KM: Way *mauka*. I wonder if before did you hear if there were families that stayed up in the mountain and lived? Or did they live mostly here and then go *mauka-makai* when they needed?

HN: I know my grandmother said they usually *makai* and *mauka* but she never tell me how many because she used to tell me the *mauka* exchanged for what *makai* get, *makai* get exchange for what *mauka* get.

KM: *A kuapo*.

HN: There must be some Hawaiians.

KM: You go *hele lawai'a* and what things down here? *Ua'ala paha…*

HN: Yes.

KM: *Kuapo paha me ka po'e o uka?*

HN: Yes, yes.

KM: *He mai'a paha, 'ano kalo…*

HN: *Pu'a*.

KM: *Pua'a. Mamua loa, ua hele paha nā kāpuna, 'ohi olonā, mai i uka paha*?

HN: I think they did but not during my grandmother's time. Her parents time.

KM: Kaiha'a, I heard in that generation some of them they claimed, "I have *olonā* in the *kuahiwi mauka loa*…"

HN: That's right. That's why my grandson, where the place we cleared the *hau* on our property, he's planting some of that.

KM: *Maika'i.*

HN: Because he got it from somebody. I cleaned the land and I tell him *kanu*, I no like *mahi'ai* for nothing.

KM: Yes, yes.

HN: Sometimes I like for my section, he takes it and I don't have any place. So now I have two sections. I said, "Don't you take that, I like plant dry land taro, we no like pick up *lā'au* from the wet land."

KM: Ah, so you *kanu* both *lo'i kalo* and dry land?

HN: Dry land more hard job. Dry land I make more for *lā'au.* The kind *lā'au,* I eat most the time with my dry land is *ha'akea* the white stem.

KM: The *ha'akea.*

HN: They eat any kind *lā'au*, but I was always brought up with *ha'akea* or the *'āweoweo*, the mountain one. Later on as we stay, we see all kinds Chinese taro we try, is good. Now get the Tahitian *lā'au* I make 'em, it's just as good.

KM: Oh yeah, oh.

HN: I think it cooks faster than any other *lā'au.*

KM: Yes, that's what I heard because the *mane'o, a'ole lo'a*?

HN: No more. One of my friend gave it to me and when my aunty saw, she said, "Oh, you eating the kind *ape*." I said, "No, that's not *ape*," and I went a friends house and I ate it, she cooked it with the chicken. I would cook it separately because you don't know how it tastes. She, she went cook it with her chicken because she said she went eat from a friends place, never itchy so she did it that way. When I first started mine, I made it separate because I was afraid the chicken going get all *mane'o* with… But it did good, it did good. I rather have that then other kind, cooks faster.

KM: These are the things that you folks would do before from young time?

HN: That's right.

KM: You go up *kuahiwi*. You said before all of the streams had water that you remember?

HN: Every one, every one.

[Water flow has diminished in her lifetime, streams were never dry before. Now, only during big rain, when the ditches are full, does EMI throw out the water so that it flows *makai*. Wants every *kahawai* to have water flowing again.]

KM: Do you think in your *mana'o*, in your life experience, ninety years coming up now. Has there been a change in the water on this land? And are the ditches a part of that change or…?

HN: Yes, plenty because we don't have the water any more. The only time we have the water is when big water and then they throw it out. Otherwise there's hardly any water. That's why the people here are asking that we want every *kahawai* get water like before. Never dry, never, never, never, never!

KM: Before never dry?

HN: Never dry! During my time, when I was very young, never had time…in fact had more water.

KM: Now it comes dry?

HN: Comes dry, most of the rivers no more! And that's why they say, Irrigation Company said, "No more water." They complaining, but they building more houses. Where they getting water from Hanawī and that's why the people no want them take the water here.

KM: I see, so the water is used for building more houses out Kula?

HN: Right, Kula and over the central part. Where do they get the water from? It's got to come from here, East Maui. Honomanū [as pronounced] and all that, water all inside never one…

KM: Never *malo'o*?

HN: These streams here, never *malo'o* we used to go swim in the kind *kawa* they call 'em the kind deep place. We call 'em *kawa*.

KM: *'Ae, lele kawa.*

HN: *Lele kawa*, that's what we used to do. Never, never, never was, never was. That's why whenever they talk about…you know no more water but they building more house the golf course getting more water. Where they getting the water from? It's from here.

[Does not think that a new Water License should be issued. *Kupuna* Kaiha'a wanted Water Rights of the native families at Wailua protected in the 1800s.]

That's how when my neighbor said, "When OHA called them and said, oh the Irrigation Company never get that, was rejected and they said every year."

KM: Yeah, Revocable Permit.

HN: We're afraid now because if they get the control of the water we probably going to have to pay for the water and that's why we said, "Why should we pay for water, when the water comes from our *'āina*?"

KM: *Kūkū*, that's an important point, cause earlier when we were talking before we started our *mo'olelo*. You shared that your own *kūkū* or someone that they had said this water…?

HN: …Goes to the people.

KM: Goes to the people. He never sell the right?

HN: No, no sell the rights.

KM: On your *kuleana*?

HN: That's my great grandfather. But you see, when we went, we wanted to take over so maybe we can get something. They said, "no we have no right because we were not the original owner."

KM: I see. Is this your *Pākē* grandfather?

HN: No, the Hawaiian. Great grandfather Kaiha'a.

KM: Kaiha'a, okay so that's right because Kaiha'a goes back into the time when Baldwin *mā* and Spreckels them were starting their ditches?

HN: Right, yes.

KM: He never sold his rights?

HN: No.

KM: Because he wanted the water to…?

HN: To go to his people.

KM: Down *makai*?

HN: Right.

KM: On the Wailua like this the flats?

HN: That's right.

[Recalls the names of several *ili* – small land divisions – in the large Wailua *ahupua'a*.]

KM: Is there a name for this area on the flats at Wailua or did they just call it Wailua?

HN: Well, Wailua is the name of the whole place, but in between this *'āina*, they get *pahu'a*, they get different names.

KM: *Pahu'a*, that's like a flat areas?

HN: Right. It's up that way and they get Palolena is over that way.

KM: Palolena [an old *'ili* name].

HN: They get all the different names that's on the other side of the river now. When you go up, on the other side of Waikani Falls.

KM: Waikani?

HN: Yeah. *Waikani, no ka mea, kani ka wai*?

HN: Yes, noisy water. On the other side is what they call Palolena. They all have names there, and some I don't remember.

KM: It's so amazing because these names…every place name must tell us a story.

HN: Right.

KM: About something before.

HN: That's right. Because I never see much during my time. But prior to my time my *tūtū* said, and I seen it in pictures. There were grass houses here and there hardly any, I think wooden house would only be about two or three. I think one of them is that rice… Cheong Chong, the one who import all the Chinese. Otherwise the rest were all grass.

KM: That's amazing cause even like behind here you said the *kuleana* behind. Even when you were young still had grass house or was *pau*?

HN: No, *pau* already. But the foundation and everything my grandmother tell me.

KM: *Lo'a kahua hale*?

HN: Yes. Even the second owner who took here the *kahua hale* is right behind. The *punawai* is still behind there but since no more water I don't allow any water, cause I don't want water come in the land. The walk they get from that *punawai* to go behind the *kuleana*, they build the kind stone wall. They walk on top they don't want their feet dirty, it's still there.

KM: That's right so you can walk right there.

HN: It's still there.

KM: It goes to an *'auwai* that comes down?

HN: No, the *'auwai* is not in the way, the *'auwai* is past the *hale*. The house is here.

KM: Wow!

HN: It's still there. So when people come I show them. I say "this is part of the wall, I never take 'em all out." It's still there and I plant things there. Somebody is leasing, because they don't sell anymore from Hawaiian Homes. And Hawaiian Homes…wait first the State had 'em and then the State when turn over to OHA, I think. And then OHA…

KM: This was a few years ago when that deal came up, the trade?

HN: No, cannot sell now, you can lease and all that.

KM: The nine-hundred and ninety-nine year one too?

HN: That's us.

KM: That's you folks? When did you…did your *kūkū* have this *'āina* first?

HN: No.

KM: You and your *kāne* got this?

HN: Yeah, was in the '30s.

KM: Thirties you got this. A nine-hundred and ninety-nine year lease?

HN: In 1930, yes.

KM: You eventually bought your lease?

HN: After.

KM: In the '40s or something?

HN: Yes, that's when all the people here, most bought.

KM: Were given the opportunity?

HN: *Kupuna* Hū'eu and a couple over here, and I think the Land Agent at that time was not Foster Robinson. [thinking] I think was Aki Tong, when we had all the chance to buy it. And then for those, that's ten years old (lease), we had that option.

KM: That's right when you had it for ten years then you could buy?

HN: Right. There was some they couldn't buy because they never had money. They no have job but later on they bought but their price came higher. Mine was high, so I wrote down; Ashdown was in there at that time.

KM: Yes, Ashdown.

HN: I wrote down to her, "Why is it my place is all rugged and all that. My place cost more than all the other people had flat land." I'm the only one that had rotten one.

KM: Cause you get *pāpali*, little slope.

HN: That's right and all rocks all *papa*. She said, "Well, that's the assessment they gave." I had to accept it.

KM: You worked hard, like you said, all your life.

HN: That's why I never open a driveway because it cost too much money all rugged place. I made one because I had two cars. I'm living there so when my husband died I sold it, and then I bought another car, cannot drive, so I sold it. When I went Honolulu after my husband died I bought one because I cannot drive, but I have somebody to drive me.

KM: All your life you never *kalaiwa ka'a*?

HN: Never. I like to, that's why I bought a standard because everybody said you can learn standard. How can I learn when I'm a scarecrow till today.

OM/KM: [chuckling] . . .

KM: . . .So what you share is your personal experience, your *mana'o* yeah?

HN: That's right.

KM: What you know.

HN: That's right, my *tūtū* said, "*Inā a'ole māakaka 'oe i ka mana'o, a'ole 'oe maopopo, a'ole 'oe wala'au.*"

KM: *'Ae, mahalo.*

HN: Cause *pilikia ka hope, a'ole kēlā ka pololei, kou wala'au 'ia iā lākou. Pilikia 'ana lākou.*

KM: *Pololei 'oe*. [begin Track 7]

HN: . . .The Mitchell's place is Keonenalu [written "Keononalu" in the *Māhele* descriptions]. And you see the hill from my place, Lākini, during that time had no more *hau* and rock. The girls, all the young girls come with the ti leaf slide down.

KM: *Hōlua*?

HN: *Hōlua, 'ae. . .*

KM: *. . .Kūkū*, you went *kanu* all your life?

HN: Oh, yes.

[Names varieties of *kalo* that they planted when she was young, and describes management of the *lo'i kalo* and *'auwai* systems.]

KM: What kinds of *kalo* did you *kanu*? You said *ha'akea*?

HN: We had *ha'akea*, we had *piko*, we had *piko 'ele'ele* and one more kind, *mōkohi*. That's the only kind we started.

KM: *Mōkohi*?

HN: *Mōkohi* is just like *lehua*.

KM: *'Ae.*

HN: Only the plant is stunted.

KM: Dwarfed?

HN: Yeah. Just like the kind *lū'au* they sell at the market, what the name now [thinking]. They sell at the market before in Honolulu, I forget now the name.

KM: But *mōkohi*?

HN: *Mōkohi* is what we call it. But Waipi'o, they don't call it *mōkohi*, my husband said they get one other name. But we call it *mōkohi*. That's the stunted one.

KM: So those are the kinds of *kalo* you had?

HN: That's the kind we had.

KM: When you planted your fields did you flood it with water right at the beginning?

HN: No, no, no. To open up a land, to first open land that time we don't have no tiller, no nothing. We have to *kīnō*, dig, turn it over. Then after we turn over, let little bit go water, because we got to set the bank because the dirt still hard.

KM: *Kuāuna*?

HN: *Kuāuna, ho'onoho kuāuna.*

KM: *'Ae.*

HN: After we set all the bank then we get the hoe, some people use *kipikua*, but we use hoe, *kipikua* was more heavy. We break 'em up in chunks then we flood 'em with water. Then we leave 'em maybe about couple weeks or a month then we go back soften the rest of the other lumps that never come. Then we let 'em stand for one month or until we get *pulapula* to plant.

KM: *'Ae*, With the water flooded or…?

HN: With the water flooded you got to flood 'em so it's soft. Because of all new dirt.

KM: *Hehihehi paha kekāhi*?

HN: *A'ale* only *kimo*. See when we go over there we try to break up the rest with the hoe. Then the only thing we do with the final, is after everything is smashed is to go over with your hands pick up whatever rubbish or whatever is not good and pick it off.

KM: So you go one month then you let it sit?

HN: We let it sit. Because *palupalu ka lepo*.

KM: *'Ae, 'ae.*

HN: Then you start level up we have a level thing to *kē*, they call *'em kē* when you level the soil.

KM: Just like a stick kind?

HN: Yeah, a stick just like a hoe. Yeah the hoe, big, long.

KM: You *kē*?

HN: You *kē* back and forth. So that you see the level, so that the water can be distributed evenly. Then you wait and when ready for you to plant you lessen the water. When you plant you kind of make it dry because that's the new plant going in, or it will be all *palahū*.

KM: *'Ae*. Then you dry it out for a few weeks *paha* or until you know when the root going come?

HN: No, no. After we plant the *huli* I would say about a couple weeks, then we let go little water and let the plant come up. During that time we never did use fertilizer. Then when we began using fertilizer when we have about two or three leaves then we feed the first shoot. We used to throw Triple-16. That's to bring the mother plant up. Then we put the 20-20 to *hānai* the *keiki*. We put about four applications, three of the sixteen every three months, and then four of the four- ten-sixteen to make the *'ohā* all come up. It takes about twelve, fourteen months depending what kind taro.

KM: Yes.

HN: Like *moi* that's the best kind, you can leave till sixteen months no *palahū*. Like *ha'akea* and the other one you got to plant 'em. *Lehua* is worse you cannot leave 'em twelve.

KM: Nine months *paha*?

Lo'i Kalo and 'Auwai at Lākini (KPA Photo No. 2199)

[Families started using fertilizers and chemicals by the late 1940s. Prior to that the old people would let the land rest, and use mulch to build up nutrients. Now the planting system is so intense that the land does not support good growth without chemicals.]

HN: Yes. All depends if *i'o*. Because now the soil, the richness of the soil is all gone. That's why they using the fertilizer.

KM: Yes. *Mamua* when did you folks have to start using fertilizer, you think about? After the war?

HN: Oh yes, years after.

KM: Sixties?

HN: No before the sixties. I would say about the forties, that's when we had lawn mower, pesticides and of course when we had the pesticide, we have to take a certain kind. We got to take, we cannot just apply it. But then, the early Hawaiians don't believe in that.

KM: No, and see that's the thing I understand and is this what you did. Did the *kūpuna*, when you *kanu* before, then when you *huki*, you *ho'omaha ka 'āina*?

HN: That's right, all the rubbish you leave there.

KM: And the *kīpulu* all go inside?

HN: That's right.

KM: It comes back in.

HN: The Hawaiians say "*Pahulu ka lepo*." The richness all gone.

KM: *'Ae, pololei 'oe*.

HN: My grandson now after so many planting, I said, "Well, the richness of the soil is no more." So all the *'ōpala* he step 'um all down, and it's producing for him.

KM: It does yeah, so the *kūpuna* never need all those fertilizers or things like that.

HN: Apolonia Day's father was the only man never did use fertilizer. But then when he no use fertilizer the taro is small.

KM: Now they *'imi kalā*, so they want it to be big?

HN: Yeah. You see the *poi* shops now these days make complaint because the taro is small. I say, "When we first sold our taro the man said he don't care what it is so long the weight is there because we get paid for the weight." When I first pulled my taro when that picture was taken, I was paid dollar half for hundred pound sack. Hundred pounds! Then came later, three dollars a bag, hundred pounds! And that's hard job, and when you have a far place to carry to the roadside. Oh, I never forget that!

KM: Kill fight *nō ho'i*.

HN: But, we continued.

KM: You had to 'cause that was your only source of income?

HN: That's right. And I had to start doing because I was raising children. My husband didn't get any…I had to do it whether I like it or not.

KM: A dollar fifty for a hundred pounds?

HN: Hundred pounds. Then came up three dollars at least now it's better you get 'em forty dollars, forty dollars a bag. That's eighty pounds, it came in the '70s when our taro agent started. First he wrote to his *poi* shop, and he told 'em that his farmers are getting old they don't have the strength why don't you lower the rate. That's why they lowered and then the rest followed. They gave eighty pounds is the actual weight you allowed two pounds extra for dryness, because it takes here some people get twenty bags to pull, ten bags to pull. You know before they take to the pier.

KM: That's right kind of start to *emi* a little bit.

HN: That's right so you allow that weight so most people they water their taro always damp. That's how we used to be. We pay actually eighty pounds. The last I left there was only about thirty dollars, now it's forty, but my grandson was getting

from the neighbor sixty dollars. And you know nowadays the *poi* shop is so choosy. Because so much taro, they choosy. They demand all the big ones. I tell them, "You don't expect the taro every year to be big even though you use fertilizer because the soil is not rich."

KM: That's right.

HN: And we forcing with this fertilizer to grow, and that's why we notice the taro when they say the taro smell funny, either you pull when the taro is not ready for harvest too young or too much fertilizer. Because you can taste that chemical.

KM: See that's where, then we poisoning ourselves too.

HN: That's right. See like how *kula* farmers used to say put inside, put inside later on they say no put because it's harmful to the health. After they did damage already how can you turn over, it's part of you there already.

KM: Times changed very much.

HN: That's right.

KM: Because I know when the *kūpuna*…when your childhood time like that, if you folks would plant you'd rotate your *lo'i* like that?

HN: Yes.

KM: *Ho'omaha* one side.

HN: Right.

KM: Did you even rotate the planting so that you could have *kalo* almost all year round?

HN: During that time nobody did that, it was later when the taro was in demand that's when people never give chance to rotate. They plant 'em right after another. When we were young kids, no. Now, you have to plant because you cannot meet the demand. Some work, you know.

KM: It is. That's why we look now, I look at this *pahu'a* down here Wailua. There's not plenty of taro now.

HN: You know why, the *kamali'i*, the children of today their parents were brought up hard times, even though when they were staying with their parents. Their parents were not concerned about their kids. If I go have good time, that's alright. I let my kids run, then they begin to wonder why their kids go astray. 'Cause if mom and dad can do that why should I go work, I can go *holoholo* and all that. . . [Track 8]

KM: [begin Track 9] . . . You know it's amazing in these things that you've seen, what you've experienced. Like we said, you said, 90 years old in September.

HN: That's right.

KM: *Mahalo*!

HN: I have to thank the good Lord.

[Discussing the *heiau* at Pauwalu; place names of various lands in the Ko'olau vicinity; and travel and collection of resources.]

KM: Oh yes! May I ask you *kākā* when you were young did your *kākā* them like you know you've mentioned like at Pauwalu uka behind the school get *heiau*. Did you hear what kind of *heiau*?

HN: No. Only what I heard was the drum, the *pahu*.

KM: And then you said had a littler one more *mauka*?

HN: More this side where the well, that road where the van is, has there. I don't know much about that. I never heard anything from there, but I know there is one there. But all covered with *hau*.

KM: Pauwalu is an interesting name.

HN: Pauwalu means…*walu* means eight; *pau*, "I ate eight." Eight people died. That's why they call 'em Pauwalu.

KM: *Pehea, ai 'ia na kekāhi manō paha*?

HN: I think so. Maybe that's why. That's only what I was told like that, but we don't know the truth.

KM: It's amazing because these place names like you said Lākini…

HN: Yeah.

KM: You go up Pi'ina'au, you go to Ka'akeke like that.

HN: Just like Nu'a'ailua, they call it that, Nu'a'ailua. We used to say Honomanū [as pronounced]. We used Honomanū, but it should be Honomanu because part of the section is down this side, and *moku*.

KM: And get *manu* on top?

HN: Birds there now.

KM: Nesting there?

HN: I know there were two eagles. I don't know, I asked *kupuna* Hū'eu if the eagles still there. He said, "He doesn't know." There were two there, you know?

KM: Hmm. *Mamua paha, he home, he hono no ka ua'u, 'iwa paha*, the native birds.

HN: Had *'iwa*, but I don't know. But I think had plenty birds though.

KM: Yeah, must be.

HN: Had plenty birds that's why they named it like that.

KM: You said before too, you would have to walk up the trail go up mountain like that?

HN: Oh, yes.

KM: You went?

HN: We did. *Hele wāwae*!

KM: *Lō'ihi*.

HN: We had horse, but we seldom go on the horse. If we go I ride with my grandma because my brothers don't want to go. At that time the *kula* is all clean.

KM: From here or from your home?

HN: Back of the school.

KM: Back of the school.

HN: That's where I was living, go up that *kula*.

KM: Mama's place, you go up there?

HN: Right.

KM: Hit Pi'ina'au, come up…?

HN: Below Ka'akeke.

KM: Ka'akeke.

HN: We come down by this Ching's Pond. Never used to be the road for go Pi'ina'au there. The old road was by the arboretum. Because the County did not want to bring the bridge. That's why they went bring by Ching's Pond go actually the road is the other side.

KM: The arboretum side, is there a place name for that area that you remember? Or is it just Ke'anae.

HN: No, there is a name… [thinking] But I don't know the name. There must be a name. That's how no more road for go there at Pi'ina'au, they have to take Ching's Pond.

KM: Then the road went all the way up into the mountain and then you came down you said, Kopili'ula?

HN: Kopili'ula, we got to go on the horse. From there now, we start our *kahawai* go this way. Wherever we stop, Wailuaiki, we stop put the horse and my grandma go call. That's *mauka* side, we have to have permission. We used to have John Plunkett, ask him permission.

KM: Because he was sort of the overseer for the EMI?

HN: Right, right. I remember going as far as Kopili'ula, and at that time Kopili'ula Bridge was, I think being repaired. All the ditch men where there, they was working. Because as we descend down on horse to go up there. When we saw all those people underneath my grandma said "*ho'i kāua*." We got on the horse and came back again.

KM: Oh, no came home again! *Maka'u*?

HN: Because *maka'u* eh. Only two females and all men, that's all Japanese and their camp was up Amalu, Amalu Camp.

KM: Yes, Amalu Camp.

HN: That's where their camp was.

KM: Amazing yeah, what a hard time!. . .

[Collected *hīhīwai* from Lala'au-Pi'ina'au Streams and vicinity; saw *huaka'i pō* in forest. Also collected or "made *'ōpae*" at Haleki'i.]

HN: . . .What I hear from my *tūtū*, and it did happen some places like where Ching's Pond is. You come way up, because there's a *kawa* [leaping place] there, and on top, that's Palauhulu to go across to go Pi'ina'au. That I know, I went with my grandma we go get water shell (*hīhīwai*) in the night from where Ching's Pond is. The name should be Lala'au, not Ching's Pond. But because Ching Store was right above they call 'em Ching's Pond.

KM: Lala'au?

HN: Lala'au. We go from there, we follow night time, *hīhīwai* because they *'e'e*.

KM: *'Ae 'e'e mai*.

HN: You go up about two turns and on top that is the flat from the other side of that. That's where I saw one, first thing I got so scared. I told my grandma, "Oh, there's lights on the *pali*." My *tūtū* always said, "*Hele kāua, a'ole 'oe wala'au*." Because they say the echo of the voice, you calling, somebody answer, you think and you going follow.

KM: That's right.

HN: I saw the light, I was so scared. I keep calling my grandma, come because I see the light is so bright, look like coming down from the cliff, and I get scared. In fact I always tell my grandma, "I scared the *kepalō*," even till today, old lady [chuckling]. I cannot go outside, I always scared. My grandson wants me to go look my great-grandparents graves up there, Lākini. I said, "You bring plenty people, because only us two, I cannot. I going run, I going leave only you, I'm scared." Even over here when I stay here at the graveyard. I had hard time adjusting here, because this land was all with guava. I had to hand cut, no power saw, no nothing. I cut what I can and when my husband come back he cut what he could. Got to put a house.

KM: *'Ae*. Amazing!

HN: I work hard, boy.

KM: You folks went up and you *kahea* to your grandmother?

HN: Yeah.

KM: Cause, you saw that *kukui*.

HN: That's right and my grandma say, "*kulikuli 'oe*."

KM: [chuckling]

HN: I keep pointing, "*Aia kēlā kukui, mālamalama*." But she said, "you don't say anything, you don't point and all that." I get so dammed scared, I don't want. I tell my grandma "*ho'i kāua*!" So my grandma grabs her stuff we go to the next area, more above, thinking that we going escape. As we went more up, we almost came to Kūpa'u, there that thing came there again. I told my grandma "*Ho'i kāua, Apo*." To me it's a bad sign because it showed there, the light is so bright. I told my grandmother, "*kepalō*!" My grandma said, "*kulikuli*." And that thing bugging me

because the light shining my eyes, I tell my grandma, "Go home, it's shining." And my grandmother look, she said, "*A'ale wala'au*." I said, "*Pehea kēlā mea, Apo?*" She no tell me, she tell me "*kulikuli*." So when she tell me that I'm suspicious, there's something. I get scared.

There was one time we went, another one, had the same thing again by Haleki'i. You see when she used to go make *'ōpae* we take a five gallon can, the kind cracker can.

KM: Yes, yes.

HN: I take a mat, I take salt, and I gather little wood. My grandma go way behind we call it "*kau*," to go get the *'ōpae*. When she full her bag, depending how big some people, my grandma had big sack you know. I told my grandma, "Why do you make it that because heavy when it's almost full." But she liked it that way. When she get her *'a'aniu*, we call 'em, full her bag, then we come where I am, the *'ōpae* is clean already.

KM: Yes, yes.

HN: She salt 'em, we cook 'em right there because I have the wood and I get a mat and I spread that on a mat.

KM: Spread out?

HN: Then she goes back down and makes some more. When she comes up with the second lot, I gather up the first lot and I'm going separate that. Because she used to sell in Honolulu to Otani's Market. Extra living because my grandfather didn't earn much.

KM: She would go up *'ohi 'ōpae* like that *kā'e'e*? The kind net?

HN: No, *hulihuli* stone. The only time she go *kā'e'e* like that when big water, that's the best time to go because the *'ōpae* all on the side.

KM: All come in so you can scoop it in the net?

HN: Yes.

KM: How was, did she use a net or…?

HN: Net.

KM: What kind *olonā* or cotton already?

HN: No, it's the kind made out of *'aho*.

KM: The kind *'aho*, so old kind *'aho*?

HN: Yeah.

KM: Oh!

[Still gathers enough *'ōpae* for her to eat at home, from her *kahawai* at Lākini.]

HN: In fact I still, I get two *upena* now, that I used.

KM: *Maika'i*.

HN: And I have a small one. Every now and then, when I like eat *'ōpae*, because the *kahawai* too far, and all covered with *hau*. So I go my place Lākini. I go in the little ponds and all that kind just for me to eat.

KM: And you still find enough so you can eat?

HN: Yeah.

KM: What a blessing.

HN: I bring home, when I *'ono*, I go make.

KM: Yeah, like I look at some of these *kahawai* now I figure you know no more water the *'o'opu* can't live, the *'ōpae*, no more *hihīwai*.

HN: No. That's why, that's why.

KM: Only the place where the water *kahe mau, kahe mau*.

HN: That's right, that's right. Only the Ke'anae one, the Ching's Pond one. Go up there, can get *hihīwai*.

KM: And Ching Pond you said was?

HN: Lala'au.

KM: Lala'au, oh beautiful. So important, place names. That's one thing I was noticing every one of these little valley's like this, I think it would be so good if people could put the names back, so you could remember.

HN: That's right.

KM: Here you come Wailuanui, Wailuaiki or Lala'au.

HN: That's right. You see where that Chong's Hotdog Stand?

KM: Yes, I saw it.

HN: That's Waianu they call it.

KM: Waianu, oh beautiful!

HN: They call that Waianu. And then come down by Hū'eu's house go back of him go down they call 'em Kilo.

KM: Kilo, oh beautiful!

HN: They have all different names.

KM: And every name tells a story.

HN: Above the Redos. Above there they get one *kahawai* you go on top the flat they call that… [thinking] Waika'ūlili. Looks like it's the water something of the *'ūlili* according to the name.

KM: Oh, yes.

HN: Only one time I remember that thing went overflow and the people couldn't pass they had church service. They had to come back here and sleep at the Parrish Hall because the bridge was off, that's the only time. That's the road I used to go from

Lākini, we come there come over the pasture land, behind the school come down and then come down where that Redo *lēkō* patch is; come down that road and there's a road that's going up by where Crozier's daughter has a residence.

KM: Yes, yes.

HN: We used to take that road there go down, keep on going till we come Waiakuna. That's the end part that's the *kawa* [leaping place] of Lala'au because when you get to that kawa then you have to climb up to get Haleki'i and Palauhulu where we take the road to go up.

KM: Haleki'i and then Palauhulu?

HN: Palauhulu.

KM: That's how you go up there Pi'ina'au, Ka'akeke like that?

HN: Right, right. When big water we have to take the Ke'anae Road, but no more water that's our cut-short because we live right by the school just take the horse and go from there. I remember that.

KM: *'Ae*.

HN: I used to go with my grandmother cause my brothers don't want to go. Of course, when we go there we don't cook the *'ōpae* there cause we going on the road whereas this *kahawai* we have place for spread. When we go there she just *kau* the *'a'aniu* and she put in the bag we have bushel that time, little bushel from flour and she put sometimes four *'a'aniu*. That's four of those bags then we come back. Maybe two days after she wants to go again maybe for more orders we go.

KM: *'Ae*. Do you remember what your *kākū*…like you said *kalo* one hundred pound bag, dollar fifty…do you remember how much the *'ōpae* was sold for, about?

HN: Gee, I forget how much.

KM: I know this was long time ago, you were a child.

HN: Yeah, I forget how much. I would say I was in my tens, eleven.

[There were *lauhala* weavers in the area; *hala* gathered in locations near shore. Also describes house of elder weaver, formerly near the old *paena wa'a* – canoe landing. Leads into detailed discussion on weaving materials and practices of her grandmother.]

KM: Did anyone gather, and were there any weavers before? People *ulana lauhala*?

HN: Oh, yes. There was one lady at the end. That house, Rockefeller I think, bought that house. The Ho'okano house. At the end of this road the last house there on the cliff.

KM: Yes just below, is that the *paena wa'a* down there, down that side?

HN: Yeah, that's where all the canoes land.

KM: Yeah.

HN: That little cliff there used to extend out but because the waves would wash on top, that cliff is washed out. On the side of the house, where the first guy build the house

it's eroded because high sea, if no more that *ulu hau*, that house is going down one day. That's why I say, I wouldn't buy that place even for ten dollars. I would rather them go outside and buy. Because that place is all eroded.

KM: Did people sell *lauhala* for make extra money too, and did they weave *loulu*?

HN: Most people here, when they did, they made it for themselves.

KM: Home.

HN: They go to one another who doesn't know how to make they *a'o* the other, that's how they learn how to make. Like this lady who lived at the end of there she was Mrs. Ho'okano. Boy, that's the first house that I see…and Mary Kamaela told me in Kaupō had one person they do that. This lady where the Rockefeller built the house, her Hawaiian bed… (and my grandma have the bed too), you know have that post up and all that kind?

KM: Uh-hmm.

HN: Everything in *lauhala*. Weave all *lauhala*, everything she had in her house *lauhala*.

KM: She weaved the *moena* for the floor, the bed?

HN: Yes, *moena* what they call that double sided…what they call, there's a name for that.

KM: *Pālua, moena pālua*.

HN: Yeah, and get one more name. Because you can use two sides.

KM: Yes, both sides very nice.

HN: Very good weaver. And then there's another one a younger generation she weaves, that one, and there's another one. But they all died already.

KM: You folks didn't weave to much though cause you?

HN: My grandma did, she told me for learn, I said ahh! [shaking her head]. *Haole* style, they no like *lauhala* they like rugs and all that kind. So my grandmother said, "*Hiki mei 'ana ka wā, ho'i hou 'ana kēia po'e moena…*" [shaking her head] And it's true.

KM: *'Ae* [chuckles]. It's true yeah?

HN: Yeah.

KM: These *kūpuna, 'ike pāpālua lākou*.

HN: "*Ho'i hou mai 'ana*," and it did come. . .

KM: [begin Track 10] . . .So before some people would gather *lauhala* and *ulana*?

HN: Yes, they even *kua*, the kind green kind they put 'em over coal.

KM: Yes.

HN: My grandmother used to make, she used to make it here for us. And *kua lauhala* comes white almost like the kind Panama hat.

KM: Yes.

HN: Strong you know.

KM: They say too, *loulu* like that.

HN: Yeah, *loulu*.

KM: Beautiful.

['*Ōhe, 'ekaha*, and other plants gathered from forests for weaving… *Mai'a 'ele'ele* and *'iwa* also collected up in the mountain; the old people took care of the *mai'a 'ele'ele* because it was highly valued.]

HN: And *'ohe*, but hard work though. *'Ekaha*, we got to get from mountain, come home. They call the *kukae*, you got to scrape 'em and all from the end. Like the *kua lauhala* you put it over charcoal. But then my grandma go get *'ohe*. *'Ohe* is much harder because you get the *'ohe* as soon as you scrape *pau*, you got to dip 'em in the water. Otherwise, it turns red it's not coming white 'cause that thing have that coloring, you have to soak 'em in the water because otherwise it gets…

KM: Was it just plain water or they put *pa'akai* in?

HN: No, no. We sit by the *'auwai*, my grandma and this lady used to sit. Every time they make, when they make, they dump 'em right there.

KM: *He 'ohe maoli*?

HN: Real bamboo.

KM: *'Ano lō'ihi ka puna*?

HN: Yes. Hard job you know. And the *'ekaha*, they call that the *kukae*. The English word they call for that I don't know what.

KM: Bast.

HN: Like a membrane or something like that. That's good my grandma taught me how to weave that with this other lady. The coconut make good Panama hat it's tough. And the *lauhala kua* is a plain green there is another kind they call *lauhala Kinipaki*, that's yellowish white with green.

KM: Yes.

HN: That is not as hard as the real green one. The real green one, after you strip, you got to put 'em on the coal right away, because that kind of *ho'oma'ema'e* the leaf, after you cut, then you *kaula'i*. Then after *kaula'i* for so long, takes good sunny days, then you got to come back. Hard work you know you got to take the thorns. I told my grandma, "Hard job, I no like." Then, when that thing after couple days or maybe weeks, real *malo'o*, then you have to roll it up, roll 'em up I said, "Why you have to do that?" They call 'em "*kuka'a*."

KM: *'Ae*.

HN: She got to make that. And afterwards she get that all enough she makes a big ring depend how big the *kuka'a* she like. She tie inside the end and now when she get this leaves now, she tie to roll 'um back, she have to make now to fit if she made a big one she got to make one big one to fit that put 'em till it comes very tight in

the center. They get big *kuka'a* they get small *kuka'a*. I used to do that with my grandma.

KM: Your *lauhala* came from the lowland area here or did you go?

HN: They go by the *kahakai*.

KM: Yeah, better down here.

HN: Because soft. We had one coming off the school, because the school land, and I had one *tūtū*… In other words, they went move the trees because somebody else took on the next mark where the *alanui* going up, they call that *lauhala Kinipaki* that's another strong one. That's that yellow-white, yellow-green.

KM: That's an introduced one yeah I think?

HN: Yeah, I think so because that's just as good as the *lauhala kua*. Makes strong Panama hat like.

KM: Were there other things that you folks would go up to the mountain for?

HN: I know I went for the *'ekaha*, the *mai'a 'ele'ele*. My grandma…you see, during that time they have the *mai'a 'ele'ele*. If people know they have to take care. Because if they don't take care it won't produce good one. Some people they know where you go and they go *maha'oi*, go get and they not taking care. During those times weavers, they find it so important and they like, they all go *maka'ala*.

KM: They always take care.

HN: They always take care. After they died the trees all died off, no more.

KM: *Nalowale*. And that *mai'a 'ele'ele* for make the design yeah?

HN: That's right. And the *'ekaha*, and they have the *'iwa* you know kind of brown, kind of rust color like that they did that for trimming.

KM: *'Ae*. Beautiful.

HN: Yes.

KM: Those things you folks would go up for?

HN: Yes. And then my grandma would come back sometime just weave. If she doesn't weave it with the *'ohe* the bamboo, you know they usually weave just like strips, and afterwards they run 'em over the machine.

KM: That's right, machine sew so it's the bands like. Nice that style hat too! Your grandmother made that too?

HN: Yes.

KM: The bands?

HN: Yeah.

KM: And then you just sew circle, circle round like that.

HN: And then they make the kind bands for your hat just like napkin rings. You get the *mai'a 'ele'ele*, the *'ekaha*, what designs you like.

KM: Beautiful.

HN: But ever since that, I never bothered no more for weaving. I do handwork instead crochet and knit once in a while. I do that only in my spare time like night time.

KM: You made these? [looking at crochet work in home]

HN: I did, all my hand work I did.

KM: Beautiful!

OM: So nice!

HN: To keep me busy in the evening. . . [begin Track 11 to end of CD]

[CD # 2 – begin Track 3]

[Water is very important in Hawaiian culture. Also heard of *mo'o* – guardians of the waters; knows of one that had been seen by elder family members in the stream at ʻŌhiʻa.]

KM: . . . *Kākū*, coming back to working the land like this. What is your *mana'o* then about the water? Water is so important for you folks here.

HN: Yes.

KM: *Mamua, ua lohe paha ʻoe i kekāhi moʻolelo e pili ʻana ka wai, "wai o ke ola, wai ola?"* They say, the water is life yeah?

HN: That's right, you have to have water.

KM: Did you hear stories about that?

HN: No.

KM: Did they have *mo'o* before in any of these places?

HN: Oh yes, I hear my *tūtū* say, there are certain places I know my *tūtū* tell me it's a *mo'o* certain times they show and all that.

KM: They the guardians like, for the ponds?

HN: I don't know. In other words where the Redo's make a turn, Sarah Crozier goes up. You make that turn as you begin coming this way now my uncle fell down over there had accident. There's one *mo'o* in there. They come out a certain time. More below in the center if you come from the other side you got to go down. And if you come this side from the school, you go down that place you go down because this man used to stay there and the Robacks where they stay now. They used to come near the *kahawai* and wash, that's below that where that *mo'o* come. Every time this is not *mo'o* now, mermaid.

KM: *Kananaka*, mermaid yeah?

HN: Yes. You have to cross over this *kahawai* and then watch below. Certain times she comes out and she sits on that rock combing her hair.

KM: Is there a name to that place?

HN: They call 'em ʻŌhiʻa because that's spring water that over there ʻŌhiʻa. My grandma used to tell, but I never see.

KM: Before they treated the water kind of, you no go *kapulu* the *wai*.

HN: That's right and you know if you go anyplace… My grandma always say, "If you go anyplace you see the water very still, no more nothing in the water, no talk, turn around go home." I say "what's that, *kepalō*?" She said, that's a sign over there, don't go further.

KM: *Ai no paha ka moʻo*?

HN: I think so, *mo'o* inside, so you don't go. And sometimes you go, you hear them calling and then you think somebody calling, you answer. That voice keep calling me he said you don't answer, don't follow.

[Describes one trip to the Wailuaiki – Paʻakoa vicinity to go fishing; notes that there is a *mo'o* pond there.]

I know, once I went with my friend… Oh I never go there again, and only me and her went. On our way we went down the first man met us, *"Hele ʻana ʻolua i hea?"* That's hard luck already when they ask.

KM: [chuckling]

HN: *"Hele holoholo."* We never even reach part of it or even quarter way. Then we reach another place, then we hear, *"Hele ʻana kēia poʻe wahine i hea?" "O holoholo kai."* We had to climb up that mountain we got to come Wailuaiki. After we come Wailuaiki we go over on the flat, they call that Paʻakoa, that's past Wailuaiki on the main road. As we went on the flat and they have cattle, people like go lease land for cows. They get some wild cows too. It's a long flat we go before you descend down that hill now when we went down the hill it's fine. This lady went in the front and I went in the back. I tell her, as we were going down, everything so quiet I said, "No talk! *Aʻole walaʻau!*" And she talk so loud. You know, my *tūtū* said, *"Ina hele ʻoe i ka wahi mehameha*, no talk." Because somebody going answer you and you think it's somebody. She never listen, when we went descend we got way down the *kahawai*, I look at the *wai*, not the kind even the kind just like crickets, they go with the *ʻōpae*. We don't see one inside the water, so still. So I told Sui Lim, *"hoʻi kāua*." "Why?" I said, "You no can see the water so still, no more even the kind crickets that go with the *ʻōpae*?"

The water's so still. "You no see the water, so still no more one *ʻōpae*, no more that kind thing inside with the *ʻōpae*. We go home." And she talk loud, I said, "shut up no talk!" My skin begins to get goosey already, I said, "Eh, my *tūtū* said "When *ʻōkalakala ka ʻili*, no continue. From there turn around." She never like come home. I tell, "You no like come home, I going home." Now, when she talk, I said, "No talk loud, because I know that's one *mo'o* pond above that, probably that's why the water was clear. I told her, "No talk loud bumby we hear." She tell me, "What's that?" I said, "Go home," I never tell her, I said, "Go home." When we came up the hill, it's kind of steep from our side, I go get 'em because I'm still scared, and she take her time.

KM: You got to go back up on top Paʻakoa?

HN: Yeah. Kind of high, you know and take a long while to go. From that time I never go there again.

KM: Were you a teenager at that time?

HN: I was a mother already.

KM: A mother already, oh.

HN: I had my six kids already, they almost out of school. . .

KM: So there were *kapu* kind of things that were associated with the waters?

HN: Oh, yes.

KM: Even going to…like you said, *kākū* said, *"Inā hele ʻoe i kāhi mehameha…"*.

HN: *"Aʻole walaʻau!"*

KM: Even in the open forest or like that?

HN: Yes, you no talk. . .

[Regularly traveled the streams to gather *hīhīwai* and other stream fish.]

KM: [begin Track 4] . . .So you folks *ma'a mau hele ʻohi hīhīwai* like that?

HN: Oh yes, we never miss that *hīhīwai*.

KM: In the night, *hāhā pōʻele…*?

HN: That's better time for get.

KM: Yeah, that's what they say *ʻeʻe mai*.

HN: Yeah. You go in the day time you get hard time. Sometimes you get 'em alright. But other times you get *luhi*, go all the way to Nāhiku and all that.

KM: When you folks gathered the *hīhīwai*, did you always cook it or did they *ʻai maka* that?

HN: Some people eat raw, not much, some people they eat raw and they salt. I never tried. Most people they cook it and some people cook it half cooked, I don't want mine half cooked I want *mo'a pono*. When we make that, we make lot of gravy because we like the gravy [chuckling].

KM: *ʻOno*?

[*Hīhīwai* supplemented meat in diet; uncles also hunted (with permission from EMI), for wild pigs in the mountain.]

HN: We used to do that every time because that's our extra…because there was no more meat, we have cows but only when you kill your cow you have meat. We had pork because we raised our own pigs, or my uncle them go mountain bring back and we raise the pig.

KM: They go up hunt?

HN: Raise the pig and then come just like home kind.

KM: They went hunting mountain for *puʻa* sometime?

HN: Oh, yes, yes they always go.

KM: How they *ki pū* or they trap?

HN: *Pū*, but of course they got to get pass they got to give their stool and all the kind.

KM: Oh, for EMI?

HN: Yeah.

KM: Because of the water?

HN: Yes. They got to take their stool for go inside. They had to.

[Gathered *ʻōpae* in EMI Ditch Tunnels.]

Now go back to the *ʻōpae*, when I first went I went in the tunnel. We had permission. But I never asked John (Plunkett) or my grandma. Where they went come out, but I remember walking across the water dry, because they have to know whether you're in there or not.

KM: Yes.

HN: We used to go with the small little light you got to rub it. That's the small little *kukui* we hold. My grandma, she go over there 'cause when you go in the tunnel they close the water, they no like go full force. The *ʻōpae* is all on the side. Only my grandma do is just put that inside.

KM: On the side, on the walls?

HN: Yes.

KM: Amazing!

HN: Put 'em in the net.

KM: All the *ʻōpae*, *ʻōpae maoli*, the nice native *ʻōpae*?

HN: Yes, yes.

KM: Now they introduced things like this snail, or they introduced the prawns like that…*ʻai ʻia ka ʻōpae*, I understand, the prawns yeah?

HN: I don't know.

[*ʻŌpae* are not like before because the water doesn't flow in the streams. She and other native residents want water returned to all the streams.]

KM: You don't know. Now, get *ʻōpae* like before?

HN: No.

KM: How come?

HN: If you get, you got to go far. No more water.

KM: That's why.

HN: They got to go far. They go up Kopiliʻula, they go Nāhiku, Hanawī. Over here if they go, the water is very small and all covered with the *hau*, they got to crawl in the *hau*.

KM: Yes.

HN: That's why cannot. The people here don't want, they want the water to come back to every stream.

KM: Is that your *mana'o*?

HN: That's right.

KM: You think that they should…do they release all the water or do they let more flow out and still take some? What do you think?

HN: Well… [thinking] they take some depending how much "some" they take. That's what they said they take some, but they've been taking more. That's why the *kahawai* all *malo'o*.

KM: And now when *wā malo'o*, like how this drought has come too...

[Because of the changes to the streams and landscape, she doesn't want EMI to get the permit again.]

HN: You can go see the *kahawai*, all no more water, got the moss and everything crawling across. We don't want that and that's why we feel we're against it. And that's why we don't want Irrigation Company to get that permit again. Because we feel that if they going to get, they going to have the control. They going to give us what they want to give, and they going to do what they want and we don't want that. We don't want. And that's why she told me that they supposed to have this year again because EMI was rejected, they never give. "Helen this is every year stuff, so we got to try control again."

KM: Revocable permit?

HN: Yes. We no like, 'cause their one person came "Where do you want the water to go?" This lady said, "Oh, only certain place…no." My neighbor told me so she went to the meeting cause I didn't go. She said, "We want every *kahawai* here back to it's normal way. And I don't mean the kind small water. It's real water that covers too, you don't see the bare where before the water flow there and it's far below the mark. We don't want that because no *ʻōpae* and *ʻoʻopu* can live in.

KM: Hmm. You're going to be interested, you know when you mentioned Haia, William Haia like that?

HN: Uh-hmm.

KM: The sister was Roselyn.

HN: Roselyn Haia, then she became Akana.

KM: Well, there's a young man now, working at Native Hawaiian Legal Corporation who is representing *Na Moku*. His name is Moses Haia. His *kākū* was Moses Haia, he's going to come be your attorney with Native Hawaiian Legal Corporation.

HN: The Native Hawaiian, they always call me.

KM: Moses, just three weeks ago now, started. So interesting because here's Haia, he's a Haia boy from his *kupuna*.

HN: Who's son is he?

KM: Moses and…

HN: I know William Haia his wife is from Lāhaina. What was her maiden name [thinking].

KM: That's right, not Kahāʻulelio or something?

HN: I don't know. She had a sister who was the nurse who became Mrs. Awana. And I know William and his wife. . .

KM: [begin track 5] . . .Hmm. So this is your *mana'o* though, that the water, the stream should be restored?

HN: Right, every one. Because years back, even before I was born, I know they had water. Because when I was born, as a young child, and I grew up teenager, always the *kahawai*…In fact we go to the *kahawai* and wash.

KM: Uh-hmm. This is interesting because you see when you were young, like we were with uncle Jimmy Hūʻeu.

HN: Yeah.

KM: Before the forest was more Hawaiian, native forest. Healthier.

HN: That's right, that's right.

KM: The healthy native Hawaiian forest catches the water, it stays on the land. The exotic, the alien plants, like all the banyan and all the guava and stuff. The water runs off fast.

HN: Oh, they don't hold water.

[Has observed differences in forest and rainfall.]

KM: They don't hold water. Have you noticed in your lifetime, do you think that the rainfall has changed also?

HN: Yes, I think so.

KM: Less rain or more rain now?

HN: Well there's time we get more rain and there's time we *malo'o* for almost a year.

KM: Long time dry?

HN: Drought, yes.

KM: One time big rain?

HN: Dry and one time big rain, stop and we get most of the time dry.

KM: Wasn't like that when you were young?

HN: No.

KM: Before the rain *ma'a mau*?

HN: Always water and always overflowing.

KM: The river?

HN: The river is always filled.

KM: Even the ditches must have been flowing and there's water overflowing?

HN: Yes, yes.

KM: Now, something's happened to the land. And you look at all of this, you look at the guava, this plant they call *clidemia*.

HN: That's right.

KM: These things, the land changed so maybe that's a part of why the water is out of balance too?

HN: You see…well, I believe so. Because the roots like the *hau*. You see they clean the *'auwai* for go down the roots are all there, they absorb all the water. Now like the *hau* across from my Lākini, that's State Land. Now, my neighbor told me the State was…I think they should, because I'm not going over there clean. But their stuff is coming over my land.

KM: That's right.

HN: Now if they not going over there clean what's going to happen to the people here. We going be all flooded because the State neglected their cleaning.

KM: Well, that was a thing you said too, 'cause if you only clean but then you leave all the *'ōpala* there, block up.

HN: Yeah.

KM: You going flood too?

HN: Yeah. That's why I always *maka'ala* when I cut my land up there. But I said, even though you carry it far away, it's act of God, nature. If he wants to take it down, he'll take your house and everything.

KM: *Inā makemake ke Akua i ho'oma'ema'e ka 'āina, e ho'oma'ema'e nō*!

HN: That's right, that's right. He can *ho'onele* you if he like. That's his right.

KM: *'Ae*.

HN: That, I would excuse, that's from above. We cannot over do him and tell, why you do that. Other than that, normally if not that kind, that's why I want them to carry far. Because only once in a while when that thing come outrageous like that. If the rest of the time not like that, you cannot let them throw near because they going crawl right in the *'auwai*. Going make you lot of work. I warned them this last time because, I had cleaned. I told my grandson, "Granny not going to clean that, you no even clean, because you busy working. Now, it comes stuck all in the *hau, Kaleponi* grass and grandma is old I have to take back all these big things and push 'em out and forcing and all the kind. I might fall and get hurt."

KM: Yeah.

[Care for the land, and its significance as an inheritance of the family — passed from generation to generation is very important to *kupuna* Nākānelua.]

HN: So every time I go cut ditch with them I see they *ho'opololei*. I say, "No, please cut that side. If you folks only cut here not going take long, it's going to come over. You cut 'em completely over." Because I say, "I cut it." I cut mine not with a cane knife I cut mine with a grass knife, I wrecked how many times. Because I cannot hold the cane knife because the handle too long and I'm not that strong. With the knife it's closer to me to hold, that's how I cut. What I cannot cut then I just…my grandson look at me. He see me struggling, I keep cutting no can cut. He leaves what he's doing and he go get the power saw then when he comes that kind of relieves me.

When I do something, I want to do it to finish. My grandma said, "*Hana kapulu 'oia 'ana no ka luahi*." I said, I don't want to do that. And I said, "Grandma is old, why I helping you to keep the land because my *tūtū* said, was handed down to her, *mālama the 'āina*."

KM: Yes, yes.

HN: *Mālama i ka 'āina.*

KM: *Mālama i ka 'āina.*

HN: *'Ae*.

KM: *Kēia kupuna wahine, keiki a Kaiha'a, ka mea lo'a ka 'āina*?

HN: For me.

KM: Yeah.

HN: And then go to my grandson now.

KM: From you, your *kūkū* Kealohanui?

HN: Yeah.

KM: Her *kūkū*, Kaiha'a?

HN: Yeah.

KM: Those are the first people of the land.

HN: Yeah, yes.

KM: Generations?

HN: Yes.

KM: So important, you stayed on the land, you stayed on it?

HN: Yeah, that's right. I stayed with my grandmother, after I came back with her because my grandfather went China since '32.

KM: Oh. He went China?

HN: He went China for the first time.

KM: Did he come back?

HN: Yeah. He went China when he was 96, first visit. He stayed there six months and came back, he never went back China.

KM: He said in case he died in China he was to be buried there. But I said "Akung we cannot afford to go to China and all that kind, cost too much." He came back safely and that was his last trip. He died when he was 99, I think. . .

KM: This uncle was your mama's brother? The uncle who was taking care of your grandfather?

HN: Yes, that's the contractor, Moses Akiona? In the boys, that's the second oldest, my mother is the only daughter, she's the oldest. Then comes this other one, Samson. He took over the contract South Lāhaina Tunnel Road and all that. He took that over. And then comes that uncle of mine.

KM: So your uncles them, all born on the land?

HN: Oh yes, yes, that place there. In that old Hawaiian style house, and that house is right on the road.

KM: Where is the road now?

HN: Yes. Because it was no road, it was trail. When the County came in about '27, that's when they went cut off that.

KM: Your gate going into your *'āina* where the road, where get *kalo* now, the road was just a trail, so the house was down?

HN: Right, on the trail the house. When the County wanted to make a road that's when they compensated my grandparents and that's where the *alanui* go.

KM: The *kuleana* was right around there?

HN: Right. From the intersection down here that little angle that's where our boundary begins.

KM: We've pulled out all of your kūkū's original *Māhele* Award and for all of the lands here. We're going to bring that all together so you can see. It's very interesting you know they say "This is my claim and I got this land from the time of so and so." You know, very interesting…

HN: Even so, I see in the paper, I read in the paper plenty people been get that way back their generation. They claiming, and they not getting anything they overcome. That's not right…

KM: I know. There were also plenty of *Māhele* claims never award too, even in 1848. Plenty *'ohana* never get.

HN: But they stay on the *'āina*?

KM: No, some then they go move somewhere else some.

HN: Oh.

KM: Very interesting, but *kekāhi manawa, kaumaha ka pu'uwai, kaumaha ka no'ono'o*.

HN: Yeah.

KM: *Akā, 'ike 'ana wau iā 'oe a me kekāhi kūpuna e a'e, maopopo wau, 'oukou nā mea i 'a'apo, maopopo, hana i ka mea pono…*

HN: That's right. I always tell all my grandchildren because of my grandmother's words, and I know that *'āina* was handed down to us, we should appreciate. If we were to buy the land of today I don't think we can afford.

KM: *'Ae*.

HN: Even to build a house we got to struggle like hell to get loan. That was handed down, and like how my grandmother said, "*Ka 'āina, hā'awi 'ia na ke Akua*." You fellas should be thankful. . . [begin Track 6] You never going find one old lady like me, still going there work like how I work.

KM: Yes. . . You are unique, a unique woman.

HN: I told my grandson, "Because I always think of the word and I cannot keep still as long I can move, I'm doing it. That's why, my doctor say, That's the best part, I keep myself moving. . .

KM: *'Ae. . .Kākū, i kou wā li'ili'i ua lohe paha 'oe i kou kupuna hā'awi i ka pule, ai 'ole i ka 'oli*?

HN: Well, my grandmother who went *hānai* me, no *'oli*. But you see, when I was small, I was a sickly child. Even up to eighteen years old, I had hard time. So they go to any kind. Had *Pākē* medicine, give *Pākē* herbs, never do nothing. One time I don't know to who she went to they get some kind medicine, *kahea*.

KM: *Lā'au kahea*?

HN: Yeah. I hear her *kahea* and you got to go before the sun go, and you got to lie down facing over there and *kahea*. I tell her, "Why do you do that?" She said, "I got to ask him for help me for you."

KM: And what *ua ola*?

HN: Yeah. So, that's why I tell them, that's how the priest tell me, I say, "No father, I cannot deny all my Hawaiian culture. I said, You said it's foolish when they worship idols." I said "There are still some people that are practicing today that the thing is still powerful." And I said, "It happened to me and I can prove two incidents when I was young." I don't know anything of the culture and all the kind. But it did happen to me and I can say it did happen, I no care who tell me the priest or what. I tell, "No, it happened."

KM: No, you saw.

HN: I saw. That's why I say, my grandmother say, "Because the vision doesn't show to anybody, they show who they want." And it just happened as my grandmother said, they show to a person who have no knowledge about it. But recognize what they saw." What I saw and I describe. I no care who tell me, I say, "No, I had it. I had it at that age, I no can deny that." Sometimes I go overboard, I scared *kepalō* and all the kind." I run and all, *pule, pule*.

KM: *Pule mau.*

HN: I scared like hell, boy. . .

KM: *Kūkū, mahalo nui i kou wehe 'ana i kēia mau mo'olelo.*

HN: That's why Hū'eu tells me… Like Ke'anae, I know some things of Ke'anae, but he knows most of Ke'anae. But I know a lot of people at Ke'anae who died. Usually they refer to him and they refer to me, and I still remember. I can tell, and I can describe who they are and I can tell just where they lived. . .

KM: Yes. By the way, was there a special song for this place that you folks ever heard, that the families would sing for Wailua or Ke'anae?

HN: Well, they had one Ke'anae and I think…I'm pretty sure was Alice Johnson. Because she taught here one year in Ke'anae School. She taught that song Ke'anae. It's a real nice one. And there was only one lady sing here and that was Ke'anae she went compose. That's Alice Johnson because when she began teaching here, she composed that.

KM: No more song for your *'āina* here that you remember hearing?

HN: No.

KM: I know you folks only *hana nui*, so you no go *pā'ani pila*?

HN: We never had the chance play *'ukulele* period! [chuckling]

KM: Only *hana nui*.

HN: We no can sit down. During our days we never have the chance.

KM: No one *hula* down here?

HN: Nobody during our time. But only the old *mākua*, the *kūpuna* they call that *hula ku'i*.

KM: *'Ae, hula ku'i*.

HN: The *hula ku'i* and the *hula* are different. You know those *hula ku'i* you know when they dance they pull their little skirts. I still remember you know.

KM: Oh, some of the *kākū* would *hula ku'i*?

HN: Yes, I see.

KM: Oh, how beautiful!

HN: They pull their little skirts up you know. Today, modern kind they don't do that.

KM: Do you remember who the *hula ku'i* women were here?

HN: Gee, I don't remember their names… [thinking] I don't remember.

KM: Yeah, you were young.

HN: Yeah.

KM: How interesting.

HN: Even riding skirts, ride on horse. What they call that?

KM: *Pā'ū*?

HN: I had my mother's one, I don't know what I did. And one of her clothes on top I know I gave to one of my daughters and she went down Ala Moana, she went get first prize for that. And I told her, "Old fashioned throw away." She said, "No mom, I going take it down," and she got first prize for it.

KM: *Maika'i*.

HN: I think I still have it.

KM: Wonderful!

HN: Even my brothers in China, the kind *Pākē* pants, *alualu* pants. I get one I think, you know. So big you got to know how to turn around and put. When my grandson asked, he's coming in May. Got a lot of albums he's going to check through, I said I got some of that in fact I made copies. Because I say, "I never *make* yet, I like get my own. I still like keep my own copy." Every time when my grandchildren or what, my grand-daughters my great grand-sons… [pointing to a photo] That is my niece now she going graduate this year from Maryknoll, her mother is a teacher. The father work Post Office. . .

KM: What we'll do then, we're going to bring this *mo'olelo* back that we've talked today.

HN: Alright.

KM: *Mahalo, kākū*… [end of interview]

Beatrice Pualani Kepani Kekahuna
Oral History Interview – April 27, 2001[10]
Honopou Vicinity – Hāmākua Loa, Maui; with Kepā Maly (Jackie Honoka'upu and Onaona Maly)

Beatrice Pualani Kepani-Kekahuna (Lowrie Ditch in background) (KPA Photo No. 1479)

Beatrice Pualani Kepani-Kekahuna was born in 1932, and raised on ancestral family land in Honopou, a portion of which she still resides on to the present time. Her genealogy ties her to several traditional residents of Honopou and neighboring lands in Hāmākua Loa (Piohia recipient of – Grant No. 1081; and Kepani, recipient of Grant No. 3101, are her ancestors). Aunty Beatrice Kekahuna notes that her family was sustained by the resources of the land and ocean, and she was raised working the *lo'i kalo* and *'auwai* on her family lands.

In her interview, she describes residency and land use, and the changes in water flow observed during her life-time in Honopou and vicinity. She reports that there has been a significant change in the landscape, water flow has diminished and the streams no longer support the life that she once knew. In the 1970s, the changes—including disappearance of stream life, the warming of stream waters, and damage to *kalo* grown in the *lo'i* (as a result of increased water temperatures and diminished water flow), became alarmingly noticeable to her and her family. In the 1980s, Aunty Beatrice Kekahuna sought out and gained representation of the Native Hawaiian Legal Corporation, to address native tenant water rights and other issues pertaining to stream eco-system health. Specific points she raised during the interview include, but are not limited to:

Summary of Selected Topics	***Page***
Family raised taro on land; she worked *lo'i* as a child and in her adult years, but now there is not enough water in streams to irrigate the family's *lo'i kalo*.	324
Taro lands irrigated from Honopou Stream by a system of *'auwai*. Water flowed through the *'auwai-lo'i* system and was then returned to the main stream.	325
Describes trail that ran from *mauka* to *makai* at Honopou Bay; families also fished along the shore.	328
Collected *hīhīwai* and *'ōpae* from streams; now, there are none, because the water is dirty, and doesn't have the volume of flow like previously.	329
Has also observed fishery resources dwindle; in part because people from outside the *ahupua'a* come in and take.	330
Discusses collection of *hīhīwai*, *'ōpae* and *'o'opu* in vicinity of family land; also gathered *pa'akai* (salt) from the shore side, and used it for drying fish and other uses.	332
Land sustained and gave life to the families; they also cultivated various dry land crops on *'āina*.	333
River flow has changed in her life time. It was the practice of her elders, and she still continues today, to *pule* (pray) when going to work the land. She observed, "When you're on the *'āina*, you still have to *pule*."	335
Feels that water flow in the streams needs to be restored. While she and *'ohana* still plant taro, there is not enough water. Also, because the water flow has been diminished, the water that does come down is warm. The water is heated by the sun heating the rocks, this in turn causes the taro to rot.	336
Even in her parents time, there were problems with the amount of water flow; father them used to sometimes go and break open the EMI water gates to increase flow.	338
Warmth of water also affects the *'ōpae*, *'o'opu*, *hīhīwai*; they can't survive in the streams now.	339
The land and water are important to the Hawaiian families.	347
Discussing practices and values of the old people – always *pule*, before going on the land or gathering things. She still instructs her children and *mo'opuna* in those practices.	348
Knows of a *mo'o* – water guardian – at Ho'olawa.	349
Has great *aloha* for the land; feels it would be good for the water to be restored to the streams.	353

On November 7, 2001, Mrs. Kekahuna participated in a follow up interview with her cousin, Marjorie Kaleialoha-Wallett (they were also joined by their daughters – Wanda Vierra and Lyn Scott). She gave her personal release of both interviews to Maly on November 20, 2001.

Interview Transcript

KM: *Aloha mai*.

BK: *Aloha*.

KM: *Mahalo*, it's April 27th, 2001, just about 9:50 a.m. and we're here in Haiku?

BK: Haiku.

KM: *Mamua*, did they say *Haiku ai'ole Ha'ikū*?

BK: Ha'ikū.

KM: Ha'ikū, *'ae*. That's another thing changing in our history eh?

BK: Yes.

KM: *Loli, loli ka pu'ana*. How you pronounce, Ha'ikū, Haiku, you know all of these. And it's important, these names, so beautiful.

BK: It is.

KM: *Kākū*, may I please ask you your full name and your date of birth?

BK: Beatrice Pualani Kepani Kekahuna.

KM: Ah…your name Kepani, is a well known name and you'll love it in these *mo'olelo* from the *kuleana 'āina* that we see. So you *male* Kekahuna?

BK: *'Ae*.

KM: Ah, when were you born?

BK: June 3rd in '32.

KM: Ah, 1932. Where were you *hānau*?

BK: Hāna.

KM: In Hāna, oh.

BK: Hāna Hospital.

KM: *Kala mai* just for a moment [car starts – recorder off; begin Track 2]…so you *hānau* in Hāna?

BK: Hāna.

KM: How did you come to be *hānau* over there, papa *mā* were living that side?

BK: No… [thinking] I was a difficult child, I guess., I was the last and my mother was having problems. My dad drove my mom over there. We had…the roads were narrow then.

KM: Yes, yes.

BK: We had a Model A so my dad took my mom there.

KM: Where was home then, where was daddy and mommy living?

BK: At Honopou.

KM: At Honopou, what a long drive. So it was more easy to go to Hāna then come this side?

BK: Well, the district, I think they go according to the district.

KM: *'Ae*, I see, oh. You *hānau* in 1932?

BK: Uh-hmm.

KM: Mama folks were living at Honopou?

BK: Honopou.

KM: And that's because Kepani, had *'āina*?

BK: Kepani, yeah.

KM: Kekahuna too *paha*? Or were there elsewhere?

BK: No, not there, they were elsewhere. My husband got from Kaupō.

KM: *'Oia*? So he's that side of the *'ohana*, Kekahuna?

BK: Yeah.

KM: You know it's interesting, cause I have heard that Kekahuna with the Alapa'i tie, they actually tie back to Hawai'i Island also.

BK: Yeah, yeah.

KM: And so it's interesting how they and Kaupō, Kahikinui close to Hawai'i so they communicate back and forth so….oh. Who was your mama?

BK: My mama was Juliana Martha Koko.

KM: Koko, oh that's Hāna people though?

BK: Hāna.

KM: I see so that's her *pili* to Hāna side.

BK: Right. . . And my grandfather was Kepani. My grandmother was Pi'i'ōhia [recorded in historical land records as "Piohia"].

KM: Pi'i'ōhia?

BK: Uh-hmm.

KM: Oh, wow! Were they?

BK: Yeah, my grandmother owns the estate there, the Kepani Estate. She owned that and she's married to and my granddad also owns property there. So after my granddad died, my grandmother took over and most of the property she sold it.

KM: Ahh.

BK: Or she gave it away, whatever.

KM: Was it within the family or was it to the company or?

BK: The family and I think some big business people.

KM: Hmm. Cause I know that I have seen Kepani's *inoa* in some of the records where it comes in through what is now EMI, yeah?

BK: Yeah, yeah EMI got something to do, yeah.

KM: I see. What was the work of your papa or of your *kākū mā*? They lived on the land?

BK: Yeah, they did live on the land. My granddad, he was a cowboy, he was a rancher he raised cows.

KM: Oh, for his own, or did he work one of…the Grove Ranch or Haleakalā?

BK: No on his own, and he sold some cows down at the landing, that's where they used to pick them up.

KM: At which landing?

BK: Honopou.

KM: Honopou, so on the *lae kahakai* had a place where the *moku* could *kū* like that?

BK: Uh-hmm, yeah.

KM: Oh. They would ship *pipi* out like that?

BK: Yes.

KM: Did the *'ohana* have big land then, Kepani?

BK: Oh, yeah. I think their lands was from the mountain to the ocean.

KM: I think in 1848, Kepani had *kuleana*, you know they get *pā hale*, *lo'i* like that and then later Kepani got a Grant from Kamehameha III, I think also.

BK: Yeah.

KM: The bigger Grant land like that. Honopou is in here [looking at map] I just want to see. This is Kepa'a, the map isn't enough detail, I'll try, let me just see one other map.

BK: This is the one, more here [looking at map] Hāmākua Loa.

KM: Okay, we get rid of this map. [opening map in background] That's HTS 1011… *mahalo*.

BK: More around here.

KM: *'Ae*, here's Honopou, if I, let me take a look at the names cause the writing is small right now, let me look real quickly here. We turn it this way so you can see. This is Honopou, here's Kapahu *'ohana*, one Grant, Ka'ō'ō.

BK: Uh-hmm.

KM: Nakaikua'ana, Pa'aluhi, Kahalelā'au, Ka'awa, Poiuhana. I'm just trying to see…Pu'ukoa, here's a Grant coming up to here. James Fern it says over here too, Wilhelm, Inihia…

BK: Yes.

KM: Oh, here's Kepani *ma'ane'i* here's Kepani right on the boundary between Halehaku and…

BK: And this one over here.

KM: *'Ae* Pi'i'ōhia, oh that's your *kākū*?

BK: Yeah.

KM: Oh I see okay. So we have Inihia, and I understand Inihia was a *kahu* also, is that right of one of the churches?

BK: Yeah.

KM: Kaulanapueo *paha*?

BK: Yeah.

KM: I think so, in there. Here's a Grant to your *kākū* Kepani, then the Grant to maybe your grandmother's father *paha* or something?

BK: Yeah, right.

KM: Oh, 1081 and 3101 are the numbers. You know somewhere in here too, I believe there are *kuleana*. You folks are were the stream Honopou, comes right down?

BK: Uh-hmm.

KM: And comes through along side these *'āina*. Did your *kākū* also keep *kalo*?

BK: Yeah.

KM: They did.

[Family raised taro on land; she worked *lo'i* as a child and in her adult years, but now there is not enough water in streams to irrigate the family's *lo'i kalo*.]

BK: Yeah, we raised taro.

KM: Did you work the *lo'i* yourself?

BK: Oh, yes.

KM: You still do?

BK: Hmm.

KM: Not now?

BK: Not enough water.

KM: Not enough water, oh. When you were young?

BK: Oh, yes, carry the bags taro, yes.

KM: Were your *lo'i* down along some of these old *'āina* yet?

BK: Yeah, in here [pointing to vicinity of Grant 1081].

KM: In Kepani's side like that, along the side? Near the Halehaku side?

BK: No, no. More on the Honopou.

KM: Honopou, along the stream though?

BK: Yeah.

KM: Yes, cause you can see the *'āina* come in through here? Oh, and look here's this big one too. Here see this is Kepani, *'Āpana* 1. That's why, here it is right here. Kepani *'Āpana* 2, that's the other parcel and the stream cuts right through it. Your *lo'i kalo* were all in here then?

BK: Yeah.

KM: How many *lo'i* did *kākū mā* keep about, do you think?

[10] Jackie Honoka'upu, assisted Maly in making arrangements for this interview, and also sat in with her cousin, during the interview.

BK: Oh… [thinking], they had about twenty-five.

KM: Wow! And all irrigated kind, no more dry land, the *māla'ai* kind?

BK: No.

KM: All irrigated. Do you remember what kinds of taro, the *'ohana* cultivated like that?

BK: All kinds, but mostly it was *lehua*, my dad likes the *lehua*.

KM: Hmm.

BK: We raised *lehua* and *moi*, that was the most taro we had.

KM: Yes. Were your taro's for both home use and did they *kū'ai*, they sold like that?

BK: Yeah, *kū'ai*, uh-hmm.

KM: Were there *poi* factories…was there a *poi* mill down by you folks?

BK: No, it was down in Wailuku.

KM: Is that the one Aloha?

BK: Aloha, yeah.

KM: Oh, still yet.

BK: Uh-hmm.

KM: Now out of curiosity, was it a Hawaiian family or Kepanī family, that ran the *poi* mill?

BK: Kepanī [chuckling].

KM: Kepanī, yeah no, oh good yeah, they saw the interest in that.

BK: Yeah, where we used to live we had most of our neighbors were Okinawa, Japanese.

KM: Oh yeah, oh. The Hawaiian families many of them, *pau*, *ha'alele ka 'āina*?

BK: Yeah.

KM: But you folks have stayed on the *'āina*?

BK: Still there as long as we can [chuckles].

[Taro lands irrigated from Honopou Stream by a system of *'auwai*. Water flowed through the *'auwai-lo'i* system and was then returned to the main stream.]

KM: Your system, so the stream Honopou was the main stream come down into there?

BK: Yeah.

KM: Did you folks make *'auwai* and to irrigate?

BK: Yeah.

KM: You did. Were these you think from your kūkū's time and before or did you upkeep?

BK: I think that was done under our [thinking] our ditches (*'auwai*) were made by my dad. Anyway, he was raised there when he was a little boy. He got married and he took care of that, the irrigation.

KM: Yes, yes.

BK: Going into the property and down to the *lo'i*.

KM: *'Ae*, and from your water, did it go through your *lo'i* and then connect back to other *lo'i* or to the stream?

BK: It goes into the stream.

KM: Back to the stream again. That was an important thing, I understand.

BK: Yeah.

KM: For the old people.

BK: Yeah.

KM: When they take water it irrigates your field but then they *ho'iho'i i ke kahawai* yeah, return it like that?

BK: Yes.

KM: *'Oia ka mea ma'amau*, I think, that's how they did it?

BK: Yeah.

KM: Hmm. So, maybe about twenty-five *lo'i*?

BK: There's twenty-five down there and we had three up at the house.

KM: Three by your house?

BK: Yeah.

KM: Your house, in relationship to the *lo'i*, was the house up on an elevation a little higher above or further away?

BK: Further away.

KM: Further away, oh.

BK: The ditch, the stream goes you know the stream comes down like that.

KM: Uh-hmm.

BK: And then my dad made a little ditch go this way, our property is right in the center and then the water runs around the property in the *kahawai*.

KM: *'Ae*.

BK: And my dad made it run…

KM: *'Ae*, right through.

BK: Down the other way, yeah it goes down to the rest of the taro patches.

KM: Wonderful, yeah. So, the house is kind of center in above?

BK: Yeah, it is.

KM: The stream is on the side, the *'auwai* comes along… Would that be on the Hāmākua Loa side or Hāna side?

BK: Between the Hāmākua Loa and Huelo, Ho'olawa.

KM: *'Ae*, Ho'olawa. Is it Ho'o or Hōlawa?

BK: Ho'olawa.

KM: Oh, we see some now the map they drop…

BK: Yeah, like Ho'okipa, Hokipa.

KM: *'Ae*, yeah funny, plenty names all mess up. And you know you change a name, sometime *pilikia* too.

BK: Oh a lot of pilikias, even families.

KM: Yes, wow this is amazing! Were there other families living, other old-time Hawaiian families still with you folks?

BK: Yeah, now it's the young generation now.

KM: When you were a child who were some of the Hawaiian families that might have been around you?

BK: There were… [thinking] the Rosa's.

JH: Kaleialoha.

BK: Kaleialoha.

KM: Kaleialoha?

BK: Yeah.

KM: Rosa is your *'ohana* is that right under the Kepani?

BK: Joe.

KM: Joe?

BK: Yeah [chuckling].

KM: Okay. Kaleialoha?

BK: Kaleialoha that's on my dad's side, Kepani their mom was Kepani.

KM: Was Inihia still living down there or? I know the old man *ua hala*, the *kahu*, I think.

BK: Yeah, they were long gone.

KM: On your grandma's family with like Pi'i'ōhi'a, *pau* she was kind of the last one or was there still *'ohana* down there?

BK: When I was a little girl there was, I had an uncle [thinking] she married Smythe.

KM: Oh, Smythe.

BK: She married Smythe, when Kepani died she married Smythe so there was, they had one child there, Eliza.

KM: Smythe?

BK: Smythe, yeah.

KM: Yes, yes we've heard her name.

BK: And there are more Smythe's.

KM: Hmm. You'd mentioned that with your *kahawai* and the *lo'i kalo* as they came down into here. There was a landing at Honopou?

BK: Yeah, right here.

KM: *'Ae*, and so your *kākū* would, in fact it's amazing when we look at this *'āina* Kepani comes right on to the bay, yeah?

BK: Yeah.

[Describes trail that ran from *mauka* to *makai* at Honopou Bay; families also fished along the shore.]

KM: Was there public access…was there a trail through your *'āina* or how did they go over to the bay?

BK: There was a trail.

KM: Was there also another road or something so that other people, did other people go down to the landing also?

BK: Yeah, that they would come from Ho'olawa.

KM: Ah, Ho'olawa, across?

BK: Yeah.

KM: Hmm.

JH: Is that where the graveyard is too?

BK: Yeah, just above the landing.

JH: Yeah, I remember going down there with Albert and then go down to the landing to go fishing.

KM: Oh. You folks…I realize you *kanu kalo*, that's a big work all the time too. Did you folks go *holoholo kahakai*? *Lawai'a*?

BK: A lot, a lot.

KM: Around Honopou and other areas?

BK: Right around there.

KM: What kinds of fishing did you do?

BK: All kinds, *manini*… [thinking] had all kinds.

JH: *Po'opa'a*.

KM: *Po'opa'a*.

BK: *Enenue*, *hinālea*.

KM: *Hinālea*, *enenue*.

BK: *Moi*.

KM: *Moi*. You know where the stream at Honopou comes in near the *kahakai*. Was there a little *muliwai* an estuary, like a pond behind?

BK: Yeah.

KM: Did anyone keep *awa* or *moi*?

BK: No.

KM: Mullet, no more?

BK: No, they were too rocky.

KM: Oh, too rocky, so it wasn't *one* like that?

BK: No.

KM: You know like when you look even at Ke'anae, you look at where the *muliwai* just behind, still it's black *one*, sand and rocks like that but that ponds up behind it. The one at Honopou not too much like that?

BK: No.

KM: Cause it's more open I think, to the ocean.

BK: Yeah, and more rocks, no sand. Even at the landing there were no sand.

KM: Did you ever see a ship come in at the landing?

BK: No, I didn't have the time [chuckles]. They didn't wait for me [laughing].

KM: Was *pau* already?

BK: Yeah.

KM: I understand in the old days, those ship days were the like *Humuula*…well that wasn't that old, you were alive *Humuula* already. You know with the *Hawaii*, the *Bee* like that, they would come in you know like that, *Maunakea* and what, take people.

BK: They were gone.

KM: Yeah, was *pau* already. Were there *limu* and things that you would gather along the shore also?

BK: Oh, yeah.

KM: How is it today?

[Collected *hīhīwai* and *'ōpae* from streams; now, there are none, because the water is dirty, and doesn't have the volume of flow like previously.]

BK: And we had *hīhīwai* and *'ōpae*.

KM: Even low, down this low?

BK: Yeah, they would come way down.

KM: Wow!

BK: We used to have those.

KM: The small *'ōpae kahawai*?

BK: Yeah, uh-hmm.

KM: And *hīhīwai* still near the ocean?

BK: We had, yeah, we had a lot of them.

JH: Now, no more.

BK: Now, no more.

KM: No more, how come?

BK: Probably the water is dirty.

KM: Is it different, is the water in the stream, different today?

BK: Different, different, different, a lot of difference! I would say a lot of difference.

KM: Yeah, well you've seen it, you've seen the change right?

JH: And less water goes down.

KM: In this vicinity, were there *limu* that you folks would gather along the *kahakai* also?

JH: Uh-hmm.

BK: Yeah.

KM: Has the fish and *limu* and things changed also within the *kahakai*?

BK: Yes, now days, now, yeah.

KM: Now, not like before?

BK: No.

KM: What kinds of *limu* do you think you folks could gather before?

BK: Oh, [thinking] a lot.

KM: All kinds.

BK: Name 'em.

KM: *Kohu paha*?

BK: Yeah.

KM: Not *lipoa* this side, or had?

BK: They didn't have, now I think now we have.

KM: Oh yeah?

[Has also observed fishery resources dwindle; in part because people from outside the *ahupua'a* come in and take.]

BK: Yeah, but people down there, they go diving from elsewhere and destroy.

KM: Yes, now that's an interesting thing.

BK: They just yank it off.

KM: Yeah, *huki pau*!

BK: Yeah.

KM: Before when you were a child… Now of course and things have changed greatly even by the time you were *hānau*, 1932. But when they talk about this, before the families that would live at Honopou they were the ones who fished that place.

BK: Yeah, yes.

KM: If *malihini* came, could they just go in and take what they wanted?

BK: Well, they used to go a lot of times, and then [chuckles] my dad put a stop to it.

KM: Yes.

BK: It wasn't because of the ocean, it was because of people getting hurt.

KM: Oh.

BK: He didn't want to be responsible for anything that happens in there. If family would come, we'd let them go down.

KM: In the old days they'd say you had to ask first, if you weren't from this *'āina*.

BK: Yeah.

KM: You would come *noi mua*.

BK: Yes.

KM: Did sometimes if *'ohana* or *malihini* came and they asked, did they give, bring in *ho'okupu* you know a little gift back?

BK: Yeah, they always give. My dad would always let them if they go up to him or go down to the house he'd let them go. And they would bring fish you know and he'd look at them and he said "you came for fish, you take it home."

KM: Oh yeah.

BK: I want fish, I can go get my own.

KM: Oh, but nice when at least they try *hā'awi aloha*.

BK: They do, and the next time they come they buy something and they give it to him, and that he cannot turn away cause they bought it.

KM: It's almost like a *konohiki* kind of relationship.

BK: Yeah.

KM: And I understand that Kepani was an important family here, almost you know kind of *konohiki* like, I think I read. That they oversee some of the *'āina* like that, do you…?

BK: Yeah.

[Discusses collection of *hihiwai*, *'ōpae* and *'o'opu* in vicinity of family land; also gathered *pa'akai* (salt) from the shore side, and used it for drying fish and other uses.]

KM: Did you folks used to come more into the *mauka*, into the stream at all to gather *'ōpae* or anything?

BK: No, actually it was right around there.

KM: Right around your *'āina* here?

BK: Yeah, it's right around there.

KM: Wow, that's amazing!

BK: We didn't have to go far.

KM: And that's an important thing because the water flowed the *hihiwai*, the *'ōpae*. How about *o'opu*? *'O'opu* went up stream?

BK: Yeah, they would go up and down stream, we would fish for *'o'opu* early in the morning when the sun rise, we catch them in the sand sleeping.

KM: Yes, yes.

BK: [chuckles] We never used to hook it you know, we used to pick it [gestures with hand]. They sleeping and we pick it and we put it in the *pākini*, let the mud out.

KM: *'Ae*, oh.

BK: We had goldfishes too.

KM: Oh, yeah?

BK: Yeah.

KM: You go *'ohi 'o'opu*, you eat the *o'opu* like that, how? *'O'opu*, how you *'ai maka* or you *lāwalu paha*?

BK: *Lāwalu*, dry.

KM: Where did you folks get your salt from by your time?

BK: Down at the beach.

KM: Down at the beach. You would still go, certain times when seasonally, was there a time when there was a little drier in your youth?

BK: Uh-hmm.

KM: There was. So was that summerish time or…?

BK: Summer, was mostly summer.

KM: You folks could go gather enough in the *kāheka*, yeah?

BK: Yeah.

KM: The small natural pools like that.

BK: That's where we used to get our salt.

KM: You *'ohi pa'akai* too then you *kaula'i* your *i'a*?

BK: In the *moi li'i* season, we used to go catch *moi li'i* with common pin, safety pin.

KM: Yes, amazing! [chuckling] You use safety pin and what bait *nō ho'i*?

BK: Yeah, bait.

KM: What kind bait?

BK: Sometimes worm.

KM: No *'ōpae*, nothing?

BK: No.

KM: Just the worm *lawa*.

BK: We just hook it with… My mom used to always tell us, use your bag, the *'ōpihi* bag. We tie the *'ōpihi* bag. So all you do is you hook it and you open your bag, you drop it and shake it and drop it and throw it down.

KM: Amazing!

BK: We didn't have scoop net at that time. We could scoop you know, they were all in.

KM: Near to where the stream mouth opens out to the ocean or along that?

BK: Right on the side of the mouth.

KM: Amazing, yeah! [begin Track 3]

BK: Used to have a lot of fun.

OM: Memories.

[Land sustained and gave life to the families; they also cultivated various dry land crops on *'āina*.]

KM: Must have been. All of these things, the land sustained you, it gave you life?

BK: Yes it did, it did.

KM: Your taro, you can eat, you sell some.

BK: Uh-hmm.

KM: You fish like that?

BK: Yeah.

KM: Did you folks have dry land area that you plant sweet potatoes or *mai'a* like that?

BK: Yeah, yes.

KM: Around that same area, or did you have *'āina* come *mauka* too?

BK: No, right around there, most of them, they growing the plants, the vegetables, whatever. Whatever seeds people would give my dad, he'd take it home and he'd plant it. And from that seed he make some more seeds and keep going.

KM: Yeah. *'Uala* some?

BK: *'Uala*.

KM: *Pāla'ai paha* pumpkin like that or no?

BK: Yeah.

KM: A little bit.

BK: Yeah, squash.

KM: You folks had sugar, did you have any Hawaiian sugarcanes?

BK: We had, we still have.

KM: You have, oh.

BK: I still kept some.

KM: What kinds, do you remember?

BK: I don't know the name of it but it's black.

KM: The black with a little purple?

BK: Yeah.

KM: The leaf, is it the one the leaf come purple also? Did you hear the name "*uahiapele*"?

BK: No.

KM: Okay. Some of those native canes are beautiful though, yeah?

BK: Yeah. Some of the canes were green and white.

KM: *'Ae*.

BK: We had those but…

KM: *Kō-kea* or *'āinakea* ?

BK: I don't know somebody came, somebody must have taken it. At that time we were hardly home. After my dad died nobody was on the property.

KM: *Makai*?

BK: Yeah. We found that some things were gone, so some of the family went there.

KM: *Aloha*.

BK: There was another cane that was kind of reddish, rusty color, now I have only two.

KM: Oh. Well good though some you get, a couple at least of the old one's from your *kākā mā*.

BK: Yeah, I'd like to have them. And then when the great-grandchildren go in there and they eat it [smiling].

KM: You also grew vegetables, I guess things that you?

BK: Yeah.

KM: That *'ohana* could eat like that. I think it was really interesting you said "before you folks really never needed to go to far *mauka* along the *kahawai* to get *'ōpae* or *o'opu* anything." The water flowed enough…?

BK: Yeah.

KM: …that you had it down there?

BK: Yeah, they're even in the taro patch. And we had, I don't know today, we used to call it during those days *'ōpae 'oeha'a*.

KM: *'Ae*.

BK: We used to have those, now…

KM: No more?

BK: Now it's prawns.

KM: *'Ae*, that's right, well see that's some of the *pilikia* because they bring in this prawns and more aggressive fish and things like this.

BK: Yeah.

KM: Even the fish, they compete with the *'o'opu*..

BK: Uh-hmm.

KM: The *'o'opu* no can survive.

BK: No.

KM: The prawns come in the *'ōpae 'oeha'a* like that, even the small *'ōpae kahawai*.

BK: Yeah.

[River flow has changed in her life time. It was the practice of her elders, and she still continues today, to *pule* (pray) when going to work the land. She observed, "When you're on the *'āina*, you still have to *pule*."]

KM: Eaten up by these introductions. So change. In your life time you have seen that this river, Honopou does not flow the way it used to?

BK: No.

KM: Less, *emi* now?

BK: Less.

KM: Did you ever hear your *kākū* or your papa them, you know many of the *'ohana*, they believe you know *ola ka 'āina*, the land is alive you *pule mua*, you ask before you go into the *'auwai* or to the *lo'i*. You heard those kinds of things?

BK: I've heard it, I've done it.

KM: Even you, you practice this. When you go out, if you going to open a *lo'i* you *pule mua*?

BK: Uh-hmm.

KM: That's what *tūtū* taught you?

BK: Yeah.

KM: It's so important yeah?

BK: Even living the *'āina*. Going back to the *'āina*, when you on the *'āina* you still have to *pule*.

KM: *'Ae*, very important. Did your *kākū mā*, did anyone still *'oli*, *kahea* in the old style chant?

BK: Never heard that.

KM: You never heard?

BK: No. My grandma died, when I was born my grandma died.

KM: Oh. Did I hear…and *kala mai* if I ask something inappropriate, *hui kala mai ia'u*, did I think that I heard that maybe one of your *kākū* under Kepani was *lā'au kahea*? Did healing like that?

BK: [thinking] I don't know.

KM: Okay.

BK: But I know, on the Pi'i 'ōhi'a side, they had, there was a minister.

KM: Was your folks church, were you Kalawina or you Kakōlika?

BK: Kalawina.

KM: You folks went to?

BK: We used to go to church in Huelo.

KM: Huelo, so Kaulanapueo?

BK: Kaulanapueo.

KM: Ah. Who was the *kahu* when you were young?

BK: Daisy Kalaupā [chuckling].

KM: Kalaupā?

BK: Kalaupā.

[Feels that water flow in the streams needs to be restored. While she and *'ohana* still plant taro, there is not enough water. Also, because the water flow has been diminished, the water that does come down is warm. The water is heated by the sun heating the rocks, this in turn causes the taro to rot.]

KM: Hmm. Do you have some thoughts you know about, what do you think about the water flow in the streams? And if…What would, in the best of worlds, if you had a choice what would you like to see happen with the water flow in these streams?

BK: I like to have more water.

KM: More water?

BK: Yeah. Now with all the people that's on the rest of the property, we having less of water.

KM: You still have *'ohana*, there's still *'ohana* down and you are *makai*? You get *'āina*, you still keep *'āina makai*?

BK: Yeah.

KM: Now the *'ohana* kind of *ho'onui*, big?

BK: Yeah, mine. I'm down there, my cousins is down there, the Kaleialoha?

KM: *'Ae*.

JH: Aunty Girlie.

BK: Yeah.

KM: Are they growing taro?

BK: Ah, the water barely makes it.

KM: Oh I see, so no 'nough water?

BK: When you plant the taro, even we have water but it's not enough. I can say it's not enough, I should know.

KM: Uh-hmm.

BK: I tried anyway and what happens is *palahū* the *kalo*.

KM: *'Ae*, *pololei*.

BK: Because of the heat and all the way from up, way up and the water coming down through the *kahawai*, it's open, the sun gets it.

KM: Yes.

BK: By the time it gets down to the *lo'i*, it's hot.

KM: *Māhana* already?

BK: Yes.

KM: That's true because even if they still flowing, allowing some water to flow from the ditches, when it hits the *kahawai* if it's all *pōhaku* cause that's how they are yeah?

BK: Yeah, all *pōhaku*.

KM: The *pōhaku* get warm in the sun?

BK: Yeah.

KM: It's going to warm the water, by the time it comes to you, not cool enough?

BK: No.

KM: And also, the water too warm?

BK: It used to be cold.

KM: Hmm, but more water *paha*?

BK: Well, they diverted the water. Remember, by the pond, yeah. They closed that where they used to let the water go, the water was cool coming from Ke'anae

way, was cool. And then the water used to flow down into the stream but then they closed that up. Now we have water coming directly from the mountain so by the time it gets down to Honopou it's very warm.

[Even in her parents time, there were problems with the amount of water flow; father them used to sometimes go and break open the EMI water gates to increase flow.]

KM: Hmm. I was up with Garret, where Honopou right below the highway where has the diversion or the ditch yeah?

BK: Yeah.

KM: Ha'ikū Ditch?

BK: Yeah.

JH: Ha'ikū Ditch.

KM: The pipes come out like that?

BK: Uh-hmm.

KM: Before wasn't the pipes?

BK: No.

KM: Oh.

BK: There wasn't any pipe, but just before where you see the pipe coming up?

KM: Yeah.

BK: Just above.

KM: Above and get the *puka*?

BK: Yeah.

KM: And get one gate?

BK: Yeah.

KM: Were you the one who used to go to open that gate sometime? Bang 'em or something?

BK: My dad.

KM: Oh, was your dad.

BK: He used to bust it [chuckling].

Group: [chuckling]

KM: Because no more enough water?

Old Water Gate for Honopou Residents – Ha'ikū Ditch (KPA Photo No. 1375)

BK: Yeah.

KM: Even then, in your dad's time, he felt no more enough water?

BK: Yeah.

[Warmth of water also affects the *'ōpae*, *'o'opu*, *hīhīwai*; they can't survive in the streams now.]

KM: You know one of the interesting things too, when you talk about the temperature so now even though get water, if it's not cool enough the *kalo* no can grow. But you know what, the *'ōpae*, *'o'opu*, *hīhīwai*?

BK: Won't live.

KM: Cannot.

BK: Yeah.

KM: Now if you go to gather, *nele*, no more. *Aloha nō*!

BK: Even we used to have *'o'opu* and *nāpili*. Now, I don't see the nāpilis, no more.

KM: Yeah.

BK: That's the one that has sucks on.

KM: Suction cup?

BK: Yeah [chuckles].

KM: And it can *pi'i* up the water…

BK: Up the fall.

KM: Waterfall, just like.

BK: Yeah.

KM: Just like eating *he'e nō ho'i* [laughing]

BK: Yeah.

KM: *'O'opu nāpili*, yeah. *Aloha*. Things have changed then?

BK: Great changes! [begin Track 4]

[Has seen significant changes in mountain landscape as well, during her lifetime.]

KM: Just in your life time? You *hānau* 1932, so you coming seventy coming up now?

BK: Yeah.

KM: In seventy years change?

BK: A lot!

KM: Do you think, and this is a bigger thing. Do you think, you know when you look at the *'āina* now, on the mountain, upslope above you folks Honopou, *mauka*. Has the forest area you think even changed some?

BK: Yeah.

KM: Has?

BK: Yeah.

KM: Now, not as much or more alien or foreign things?

BK: More alien.

KM: Alien stuff?

BK: Yeah.

KM: Before, did you go you see the *ulu 'ōhi'a*, *koa paha* on some areas?

BK: Now.

KM: No more?

BK: No more.

KM: Eucalyptus plenty, I see the banyan starting to grow wild.

BK: Eucalyptus we have. Things have overgrown, even where I live, didn't have all those trees with the birds and what not.

KM: Yes. That's an interesting thing too, because when you say things have overgrown… Before, would still come *nāhelehele* if you no take care. Everyone have to *lōkāhi*, work together?

BK: No but we could see, from one hill top to the other, could see clear across, there were no trees. Now it's all blocking, trees there, so it's… [shaking her head]

KM: Yeah, change.

BK: We used to go on the hillside, used to play around there, we used to look across the road, the Honopou Road coming down. We used to see a car or something, people coming down and we used to yell down at the house, "Mom, somebody's coming." And she said, "What?" and then we tell her, "*Malihini, malihini* mom, *malihini*" [chuckles].

KM: [chuckling] Yeah, oh. Before did you hear or was it still that way in your youth. You know before when had to have sort of *'ohana* or people within a community, the *kauhale* come together to clear the *'auwai* or to clean. Did families still work together to help clean up, *ho'oma'ema'e* the *'āina* like that at all or was it mostly *'ohana* by your time?

BK: By my time was *'ohana*.

KM: *'Ohana*, individual. Papa took care his *'auwai* and stuff like that?

BK: Yeah.

KM: Did the people, if more *mauka* though, they got to take care their own?

BK: Yeah. He would go up there, that was my dad he would go up behind and if they didn't clean it, he would clean it.

KM: Oh yeah, because he understood how important.

BK: He needed the water.

KM: That's right. That's an interesting thing, I did see the *puka* where the pipes now at Honopou, where crosses Ha'ikū Ditch like that.

BK: Uh-hmm.

KM: You can see the *puka* and get the, I guess the gate.

BK: That's the gate, that's the gate [chuckles].

KM: He would, before days you could control that and increase the flow of water?

BK: Yeah.

KM: Or decrease as you needed?

BK: Yeah.

KM: Now, it's set at just those two pipes?

BK: Yeah.

KM: *A'ale lawa ka wai*?

BK: *A'ale lawa*.

KM: Quite amazing though. Were you folks *pili* to some of the other… Your husband you said, Kaupō?

BK: Yeah.

KM: There are Kekahuna out this side too?

BK: Yeah.

KM: Different or same?

BK: [thinking] Same, somehow, same.

KM: Kind of *pili*. I see that name, Kekahuna in several lands and like you said over in Māliko, the Alapa'is, Kekahuna. You know, you come out even into Ke'anae like that. Kekahuna, there must have been plenty of people by that name.

BK: Plenty, that family was…

KM: Big.

JH: It was their family, the real name was Kekahunanui.

KM: *'Ae*.

JH: Then they dropped, drop, drop until finally came Kekahuna.

[Describes family's present and past work on *lo'i kalo*; types of taro planted and fields rotated.]

KM: Hmm, very interesting. Have you worked, grown taro most of your life also?

BK: My dad did.

KM: Do you still have *lo'i* now or it's too hard?

BK: We have *lo'i*.

KM: A little bit for your own *'ohana* only?

BK: Yeah.

KM: Just for family?

BK: Yeah.

KM: You no can sell now, no more enough?

BK: No. We used that for the *lā'au*, the leaf.

KM: Yes. Are you still growing the *lehua* type?

BK: No more.

KM: What are you growing now?

BK: Whatever I can get my hands on [chuckling].

KM: Some is *Pākē paha*?

BK: Yeah, and they have another one, Ke'anae have a lot of 'em.

KM: *Ha'akea*?

JH: *Ha'akea*.

BK: *Ha'akea*, yeah.

KM: You growing the *ha'akea*?

BK: Yeah, I think they're easier to grow now.

KM: *'Ae*.

BK: They can grow dry too.

KM: Yeah, that's right. Even *lehua* like that, and what you said too, if you want the *moi* or the *kāi-'ala* like that, some long time for mature yeah?

BK: Yeah.

KM: You need more short time kind?

BK: Yeah.

KM: Before, when your papa was, you talked about these twenty-five *lo'i* like that. Did he plant it kind of in cycles, sometimes one was…

BK: He does.

KM: Yeah, so one may be left to rest?

BK: Yeah.

KM: Another one plant, a little later another one. Smart yeah?

BK: [chuckles] He had his timing, it was all there. And the running of the water, sharing of the water from one patch to the other he had real good timing. He didn't have to go make another *'auwai* to go into there, it was from one *lo'i* to another *lo'i*.

KM: Natural?

BK: Yeah.

KM: Step by step.

BK: Yeah.

KM: I understand that in your papa's time like that when you were a child and the *kūpuna, mamua loa* that when they would let the *lo'i* rest, the ground would stay *momona*, rich?

BK: Uh-hmm, yeah.

KM: Now, I hear they plant one, boom, boom, boom and what the *'āina* no can support?

BK: No.

KM: Is the taro even the size of the corm, the root different?

BK: Oh, yeah.

KM: Different from when you were, how big kind *kalo mamua loa*?

BK: Oh, yes.

KM: Now what come *emi*.

BK: *Emi*.

KM: So the ground no more enough nutrients. That's what they say though, when you go in your *lo'i kalo* or your *'āina* when you clean, you put back inside.

BK: Put back.

KM: Now they put chemicals inside and what *ma'i paha*?

BK: Sure. I'm glad Ke'anae have the cool water.

KM: Yes.

BK: They have the lo'i's over there, I'm glad. I like to go there now.

KM: Yeah, it's so beautiful.

BK: Yeah.

KM: When you see that *lau kapalili*, just so beautiful the *kalo* how the leaf flutters [gestures with hand].

BK: I get hypnotized looking at it.

[Knows of a *heiau* near the family *'āina*.]

KM: *'Ae*, beautiful. May I ask, did you ever hear a story about a place name or like what Honopou might be or? Or was there a *heiau*, even before days, some days the *kūpuna* get special place where they'd go, they offer for the ground to be rich or the fish to be good like that. Did you ever?

BK: Yeah, I know a place. Some people from the mainland bought it.

KM: *'Auwē*!

BK: [chuckles] Yeah, *'auwē*!

KM: Down below here, Honopou side or…?

BK: Yeah, Honopou and it's just around our property.

KM: Here's Kepani *ma'ane'i*.

BK: Yeah.

KM: Is it on the ocean side down one of these sides down here you think, or?

BK: No, it's more this way.

KM: Oh.

BK: It's around here.

KM: Along this ledge area. By your *tūtū* Pi'i'ōhi'a's place?

BK: Yeah, it's close. That's where, after they work in the taro patches and they gather, they get together, mostly weekends. They have their family and they go that place and they do whatever.

KM: *'Ae, ho'omaika'i*, give thanks or what, like that.

BK: They eat all together and they sleep, the next day they go back to their homes.

KM: Oh, interesting. Still yet in your papa's time like that?

BK: Yeah. Even I think, over there, somewhere in there. I don't really know. But I think I have an idea where, what it is. Before, after my dad died, there was, my nephew and his wife, you know Freitas, David Freitas?

JH: Uh-hmm.

BK: They were living at the house, and another one of my niece was living below in my sister's house, where the Kaleialoha's live. They used to come and tell us there's a dog. To me the place was *kapu*, because right there where we have the *lo'i*, the family, the older one's used to after they get through pulling taro and all of that they used to go in the water and wash themselves off. That's where they used to have lunch, dinner, whatever. They used to eat and drink, that was their…I guess that was their place.

KM: *'Ae*, yeah.

BK: If you didn't keep it right, then they get angry and somehow it works.

KM: Uh-hmm, that's right, *mana*.

BK: Yeah.

KM: Those *po'e kūpuna, nui ka mana*.

BK: Yeah. And then where we have our house now, my niece and her husband used to live there and they used to see this big, big black dog. Was right next the house and stop where they have to keep the porch, the back porch of the house. They used to get scared, I only heard that.

JH: Because they *hana 'ino*?

BK: Yeah.

KM: No take care.

BK: I think they were trying to scare them too, warn them.

KM: Yeah. *Mālama ka 'āina.*

BK: Yeah. When my husband and I moved in there was one evening we got through working and cleaning around. We had dinner and we were going to take a bath so I asked him you going to come and eat with me and take a bath? He said, "No, you go ahead, I'll come later." I said, "Okay," so I went to take a bath. After taking a bath, I went in the house and told him, "It's your turn." He said, "Okay." I started to clear the sink and everything, clean up before we go to bed. And then he went to the back door and he stopped. I heard him, he stopped. He said, "Hey mom." I said, "Yeah," and I waited for his answer, but he didn't say anything. So I walked out. I walked out to the back porch and he was there standing and I looked at him, he said, "You come with me to the bathroom," I said, "Sure, let's go." But, already I could feel. I tell him, "Go," he said, "No, you go." I said, "Okay," so after taking a bath we went into the house, we didn't say anything. He didn't say anything, he knows about it, he understands cause he's not from there.

KM: *'Ae*.

BK: The next day, he and I talked, he said you know why I seen that dog? I said, "why?" He said, "because I'm a *malihini* to this place, this is your property, this is your land, this is your place, your family."

KM: *'Ae*.

BK: "I'm not from here, I don't think they like me here." I said, "No, it will be alright," I said, "You'll see, it will be alright." I used to see my dad you know, sometimes things don't go right you know he goes out the house and I hear him talking.

KM: Talking story?

BK: Yeah, talking. That's why, I told my husband, "That's okay, things will be alright." The next evening, he had gone to bed before I went to bed, so I went outside and I told them, I was talking. I found myself talking to them. I said, "This is my property, this is my land." I said "Please, I think I'm doing the right thing and that man that is in the house is my husband, I cannot send him away." I said, "He's supposed to be with me." I said "Please, don't do this to me."

KM: *'Ae*.

BK: So after that, no more.

KM: *'Ae*. You know sometimes it's a matter of acknowledging yeah and just you know, if we mistake, *kala mai*.

BK: Yeah. Every time when something goes wrong, I was saying, "If I did wrong, I'm sorry."

KM: Yeah. That's interesting because you know sometimes the *kūpuna*, your *po'e kūpuna* the *kahiko* people. They sometimes even *kanu* right by the *'āina*.

BK: Yeah.

KM: And it's important to take care of those places?

BK: Yeah.

KM: No can just any kind on top them, right?

BK: Well, that's what I did, I asked my dad. I asked him, "Papa, did you, is there any grave in the yard, somebody, a baby buried?" He said, "No," he said "they all up at the cemetery."

KM: Up above?

BK: They have a cemetery up.

KM: The landing up above?

BK: Yeah, just above the landing, we have a cemetery there. That's where all the families are buried and that's where most, all of my sisters and my brothers were buried, there.

KM: You folks still…?

BK: I take care of it.

KM: You take care of there?

BK: Because nobody takes care of it.

KM: Oh!

BK: We have families you know...Because my dad used to do that, yeah.

KM: He instilled that value, you still *mālama, aloha*?

BK: Yeah. Sometimes we get so disgusted because the family don't help, but then, I always told my children, "No, we take care of this."

KM: Yeah, have to.

BK: Yeah, we should take care of this. I say, "we take care of the land, we take care of everything," I said, "things will be fine."

KM: That's right.

BK: I said, "let the rest take care of themselves," you know.

KM: That's right cause you can only be responsible for what you can do.

BK: Yes.

KM: You do the best you can.

BK: Yeah, that's how I feel.

KM: *'Ae*. Your *kāne, ua hala*?

BK: Uh-hmm.

KM: Did he go home down there, did you *kanu* him down on the *'āina*?

BK: Yeah, I did.

KM: That's important, nice when your family can still keep that place there. Was there a church there, or was it just the cemetery?

BK: No, just the cemetery.

KM: For the *'ohana* of Honopou like that and Ho'olawa *paha*?

BK: Yeah.

[The land and water are important to the Hawaiian families.]

KM: Oh, very interesting, wonderful to talk stories like this. The *kūpuna* they say the *'āina* so important, yeah?

BK: It is.

KM: The *wai*?

BK: Oh, yes, life.

KM: You take care the *kai*, that's right the *wai* is life. Thank you so much for sharing your *mana'o* and we're going to transcribe this bring it home to you. I need to get your mailing address. . .

KM: . . .*Mahalo* and Wanda's last name?

BK: Vierra.

KM: Where did you go to school, when you were young?

BK: Huelo.

KM: The little school now, but no more?

BK: No more.

KM: *Pau*? When did the school close, do you remember?

BK: [thinking] No.

KM: The school went up to fourth or fifth grade or more?

BK: Eighth.

KM: Eighth grade, oh.

JH: I think was in, Albert went to that school. Andrew went to that school, Bobby's year maybe when he started going to school it was Hai'kū my brother-in-law.

KM: Hmm.

JH: That was what…

BK: It was still going on in '52, I remember that because I was pregnant, and May Day Mrs. Watson came. She called on me and she said, she wanted me to teach the kids *hula* for May Day. With my big stomach… [chuckling]

KM: You *hula*?

BK: I do.

KM: Who did you learn *hula* from?

BK: Myself.

KM: You taught yourself, so inspired *nō ho'i*, yeah.

BK: Yeah.

KM: Oh, wonderful! No *kākū* still danced *hula* or anything down with you folks before when you were young?

BK: Oh yeah, I think most of the neighbors [chuckles], my mom.

KM: You just saw and…

BK: My mom and dad used to play *ukulele*, they used to sing.

KM: Was there a song that you folks had for this place or for this region that you loved?

BK: Not that I know of.

KM: Not that you know of. It's so amazing sometimes you hear, in fact I hear your *'ohana* wrote a song. Uncle Jimmy Hū'eu was saying…I think one of the Akius. [speaking to Jackie] Maybe one of your uncles or somebody, wrote a song about, and I don't remember…but the words were about Ke'anae and the famous water in the flume.

JH: Yeah.

KM: He sang it, he knows the melody, I got a little bit of it, we got to try get your *'ohana*.

JH: [chuckling]

KM: But you don't recall a song for the Honopou or Hāmākua?

BK: No.

KM: Nice Hawaiian music though, yeah.

BK: Maybe, one day the grandkids will come up with it.

KM: Yeah. So you still have some *'āina* down on this lower land here?

BK: Yes.

KM: Good, good. A little bit *kalo* down here, for you still yet for home, family use?

BK: Yeah.

KM: If had more water you could do more?

BK: Yeah, we could do more. Then I can get the grandkids in there, they want to do it but I'm always telling them there's not enough water, there's not enough water. [begin Track 5]

[Discussing practices and values of the old people – always *pule*, before going on the land or gathering things. She still instructs her children and *mo'opuna* in those practices.]

KM: One of the things just before we started the recording, we did talk about this thing about we need to re-instill some of these values and stories into our children because sometimes it's easy to just take, take, take. You got to give back to the land and water, yeah?

BK: Uh-hmm.

KM: That's what you said was...

BK: Yes.

KM: …very important. Before the *kāpuna* I don't think they just *hehi* anywhere, go do anything you know, you always *pule*, *noi mua*.

BK: That's what I was telling my children, even my grandchildren before you folks go to the beach, you folks come here you know they come to the house. "Grandma, we going to the beach," I said, "remember there's an important person who watches over us, ask him, and go. And if you see that something is not right, don't go, come back."

KM: *Ae*.

JH: Ethics, makes a difference.

BK: Yeah.

OM: *'Ae*.

KM: It does, doesn't it. You know it's amazing and it's so logical you know. If you just a little bit *ha'aha'a*…

BK: Yeah.

KM: …humble yourself, respect. Did you ever hear if there used to be stories of a *mo'o* in the ponds or stream along here?

[Knows of a *mo'o* – water guardian – at Ho'olawa.]

BK: *Wahine mo'o*, yeah.

KM: *'Ae*.

BK: We have, there is a pond in Ho'olawa Stream, we used to call it when we were little kids, *wahine mo'o*. My dad said there was two women down there, they showed him themselves, yeah they showed him.

KM: Ho'olawa the stream come in down here?

BK: Yeah, right there.

KM: See, *ma'ane'i* right here so it comes down and it's actually on the other side of Kepani's *'āina* too coming into.

BK: Yes, just across.

KM: Yeah, oh.

BK: My cousins, my uncle and aunty used to live across.

KM: I see.

BK: They were, she married Yamamoto. She was my grandmother's daughter, she was the Smythe.

KM: Oh, Juliet?

BK: Yeah, Juliet. Smythe, Yamamoto…

JH: What was other name, she have another name?

BK: Who, aunty Juliet?

JH: The Yamamoto's, who's Abbie?

BK: That's the daughter.

KM: Okay. So these *mo'o*, these *wahine mo'o* were they guardians of the waters or ponds like that, did you hear?

BK: Yeah, they belonged there.

KM: They belonged there. I wonder if you take water too, you affect those things maybe?

BK: I believe so because my father used to tell us about them. And he used to tell us, go down there and swim and we used to be afraid you know.

KM: Uh-hmm.

BK: Go down there and swim. So how we started to go there we was little kids. Through my dad, he took us swimming because we were frightened, we were young. There's a cave in the pond.

KM: Was there a certain time though he said if you see the water a certain way or something, you no go in or?

BK: Yeah. But then, as the years went by we was getting older and he told us, "don't think about what you heard." He said, "don't think."

KM: *Wā mamua e*?

BK: Yeah. Just say if you going swimming, just say, "Can I go swimming?" And if I go swimming or if I made a mistake, "I'm sorry."

KM: *'Ae*.

BK: "Forgive me."

KM: *'Ae*.

BK: "Please let me swim." That's how we used to go you know [chuckles].

KM: Yeah. It's so simple.

BK: We used to go to the Yamamoto's, to Abbie them's, we used to whistle from one side to another, whistle and they used to whistle back. That was our signal to go swimming [chuckling].

KM: So a little gully, ravine like and the river inside?

BK: Yeah.

KM: You guys, you *hui* together down in the *kahawai*, how nice.

BK: Yeah. And sometimes we used to walk up to Dog Pond, to the beach.

JH: Oh, my!

BK: That was fun, oh!

KM: You called it Dog Pond?

BK: Yeah, there was a pond they called it Dog Pond, I don't know why.

KM: Is it on Honopou?

BK: No, no in Kailua.

KM: Oh, in Kailua.

BK: We used to walk all the way there.

KM: You're kidding, you would walk all the way to Kailua?

BK: Yeah.

KM: Oh my goodness *nō ho'i*!

OM: Oh, Kailua!

KM: That's why you strong and I look your *kino, ikaika kēia manawa*.

BK: We used to go along the shoreline.

JH: You know how much *palī* along there?

KM: Yeah, along the shore, all the way to Kailua, and here's Kailua. That pond, when you go into Kailua you know where Tatayama used to live?

BK: Uh-hmm.

JH: Right past.

KM: Just past there on the *kahawai*, right down there?

JH: Yeah.

KM: Oh, my goodness!

BK: Down in the *hau*.

KM: *'Ae*. And what that pond more *'ono* then other ponds [chuckling]?

BK: Well, that time we had to taste the ponds [chuckling].

Group: [laughing]

KM: More water that side back then?

BK: Cooler water.

KM: Cooler water, oh. You know why, I think when you start coming out this side the forest particularly when you were young was better, come down.

BK: Yeah the forest. The forests were deeper, you know.

KM: Yes, that's right because when you start to *ahuwale ka 'āina*, the water warms up like you said and now hard, if you only put a little bit of water on the hot rocks the rocks going warm 'em up.

BK: Yeah, warm it up.

KM: Oh, that's amazing! Long walk, so you could walk along the shore there, the cliffs like that?

BK: Yeah.

KM: Was there pasture up above in some areas?

BK: Yeah, that's why I say during those days didn't have trees you could see clear across. The grass were short, like somebody had mowed it, all over.

KM: Yes.

BK: But now, cannot.

KM: That's amazing! *Mahalo nui*.

BK: Some of my children I took them up to the mountain, we have another property up in the mountain.

JH: Lupi.

KM: Where is Lupi on here?

JH: Twin Falls.

KM: Oh Twin Falls.

BK: Just above Twin Falls.

KM: Yes, Twin Falls, here's Honopou right here. Is Lehua Dang's *mo'opuna* or someone is…?

JH: Yeah, Harold, Florence Harold.

KM: That's that area, Twin Fall, that's Lupi?

JH: Further up, *mauka*.

KM: You folks had *'āina*?

BK: Yeah.

JH: *Mauka* of the highway.

KM: Uh-hmm.

BK: We had a small portion over there.

KM: I see there's a Grant lot here too. I was just trying to see, this map is 1915. I was just trying to look and see, even here you know this must be the old *alanui*. Here's the Huelo School lot now and the road comes more above because the school lot is right *makai* of the road?

JH: Uh-hmm.

KM: That's Huelo School there so this must be…hmm.

BK: Is this the old road?

KM: Maybe that's the old road here, 1915.

BK: [thinking] I think so.

[Has great *aloha* for the land; feels it would be good for the water to be restored to the land.]

KM: Now, you *nui ke aloha i ka 'āina*?

BK: *'Ae*.

KM: In your *mana'o*, though as you said before would be good if the water could, some of the water could be restored so that the streams have some life again or?

BK: Yeah.

KM: If the water flows, *ola ka 'āina*?

BK: In Ho'olawa there's no taro patches, no lo'i's in the stream. Only Honopou.

KM: Is that because, do families still live there or the families gone and they left because no water or?

BK: From the very beginning they didn't have *lo'i*.

KM: I see.

BK: As far as I can remember didn't have.

KM: Hmm. Yeah. It's a big thing you know, to try and figure out how can you come to a balance today. Because there's all of this history of water use and gathering the waters from the mountain, coming out to here. Somehow, I don't know if there's a balance so that they can, the streams can have some life and you know. Do they still…

BK: It's hard.

KM: It's hard, yeah.

[Someone with the University came and conducted tests in her *'āina* (part of a regional study); measuring water temperature. She never heard back from them.]

BK: It's hard. At one time I had University of Hawai'i people use the property for some water testing.

KM: Oh.

BK: They were testing the heat and all the weather, and how warm the *lo'i* was.

KM: Do you remember about what year that was?

BK: Was recent.

KM: Fairly recent, do you recognize the name Mike Kido?

BK: [thinking] No.

KM: I'm curious, you think it was '99, '98, '97, 2000? Did you get the study?

BK: It was in, I think it was [thinking] started in about '95, 1997.

KM: Okay. Did you ever get a copy of the study, what their findings were?

BK: No.

KM: No, I'll try and find you a copy. . . [arrangements to copy the document for Mrs. Kekahuna were made with Moses Haia, Esquire.]

BK: It was done by [thinking] what is his name? His last name was Penn, David Penn.

JH: Yeah, he came to us also, EMI also. He went to Ke'anae people also, he put his machinery in the *kalo*.

BK: Yeah.

KM: Did you folks ever see the study that you recall?

JH: I'm not sure. But if we did, then Garret would know where it is.

KM: I'll try and see if I can find the study because it would be interesting because the *mana'o* that you're sharing is your personal *'ike* because of your knowledge of the land. You've see how it was when you were a child, and you see now. It would be very interesting to see if the study indicated that warmth levels or things you know were indeed… Very interesting cause to me, who more to know the land than those who live it on a daily basis, like you folks.

BK: Yeah, I believe so.

KM: *Mahalo nui*, *kākū* I appreciate so much your sharing.

BK: Thanks, I think you kind of gave me something too.

KM: *Mahalo*.

BK: I'm kind of learning something.

KM: You'll enjoy these maps, and it's so nice you know you see little things like this. And what I will do is, as I said, I'll pull out the *Māhele* records so you can see what your *kāpuna nui mā* were saying about when they got their *'āina*. Particularly the *Māhele*, very interesting they recorded, "*He pā hale ko'u, he lo'i kalo, he wahi olonā, paha…*" By the way, did your *kākū*, were there places where they were still getting *'awa* or anything like that in your time or papa them?

BK: I don't know. [chuckling]

Group: [laughing]

BK: I don't think they wanted us to know [chuckling].

KM: They never like you know.

JH: Probably had a plant.

KM: "*Kākū, he'aha kēlā 'ano lā'au? A kalikuli 'oe*!" [chuckling]

BK: Yeah, *hele ma kāhi a'e*!

KM: *'Ae*, so funny. Well good, *mahalo nui*. . . [end of interview]

See also interview of November 7, 2001 with Marjorie Kaleialoha-Wallett (with Lyn Scott), and Beatrice Kepani-Kekahuna (with Wanda Vierra).

Florence Lehualani Seulan Dang-Harold
Oral History Interview – May 24, 2001 (with Kepā Maly)
Huelo Vicinity – Hāmākua Loa, Maui

Florence Lehualani Seulan Dang-Harold was born in 1928, at Pu'u Nēnē. She is descended from several families who have resided in Hāmākua Poko and Hāmākua Loa for generations. She still maintains some parcels of land which were handed down to her from her *kūpuna*, and she feels a strong sense of commitment to the land, and *aloha* to her ancestors, who also worked the land and made it possible for her and her descendants to have their own *'āina*.

During the interview, Mrs. Harold described residency and land use, and changes in water flow observed during her life-time in the Ho'olawa-Pu'uomaile vicinity. She noted that she has had difficulty with water issues. But she feels fortunate to have many of the papers her grandparents and mother had, which document historic agreements allowing her access to water, and ensuring the continued use of the family's *lo'i kalo* and other interests which rely on access to water. During the interview, Mrs. Harold shared copies of some documents with Maly, including a partition map, genealogical records, and land-history sheets.

Even with the documentation, Mrs. Harold, observed that she is considering an alternative to the on-going water difficulties with EMI Company. She has investigated the possibility of drilling her own well, but as she reflects on it, she wonders if there should be a sharing of costs for such an undertaking.

Specific comments pertaining to residency and water matters, raised during the interview by Mrs. Harold include, but are not limited to:

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Florence Lehualani Seulan Dang-Harold gave her personal release of the interview to Maly on November 8, 2001.

KM: It's May 24th, 2001 it's just about 10:40 a.m., we're here in Makawao. Will you please share your name and date of birth?

LD: Florence Lehualani Seulan Dang-Harold.

KM: You *hānau* when?

LD: September 19th, 1928.

KM: Where were you born?

LD: Pu'u Nēnē, Maui in the hospital.

KM: *'Ae*. Where was the *'ohana* living then when you were born?

LD: I think they were living out… [thinking] Pu'u Nēnē, I believe.

KM: Who were your parents?

LD: My parents were Puna Kiakona Dang, my father was Lawrence Y. Dang.

KM: Puna Kiakona, is that the primary name we would trace back to get into your connection to these *'āina* here?

LD: Yeah.

KM: You've shared with me already some of the *Māhele* award information to Kapahu [Grant 1260] them. Is that your *kūpuna* or…?

LD: I don't know, all I know is I just got the information.

KM: Those are *'āina* that you folks had?

LD: That's where it all came from. I just gathered it, and how I got into this is that as I got older and I had my children here. We came back from New York, we lived there for twelve years. My children were born there. I didn't want to raise them in the sidewalks of New York, and so finally I came back. But as time went on the kids were getting bigger we couldn't stay with my parents, so my mother had this property then that was supposed to come to my sister and I. I went to do research on it and when I did research on it, that's how I became interested in all of this stuff.

KM: Where is that *'āina* that your mother had?

LD: Huelo, right out here that's the one, EMI.

KM: Okay. It was at Huelo, now you know where the school house was before?

LD: Yeah, my mother was a teacher there.

KM: Your mama was the teacher?

LD: I even have pictures of her and the school kids.

KM: Wow! Was the *'āina* near the school or further the *makai*?

LD: No, above the school two hills over. We all judge everything by which hill do you live on, everybody had their own hill.

KM: Yes. Were you going Hāna side or?

LD: Wailuku.

KM: Wailuku side. Is that still the *ahupua'a* of Huelo?

LD: Uh-hmm.

KM: In the maps that I gave you, there's this wonderful packet. It'll show the 1870s. [sound of map] It's a real beautiful map that shows the *'āina* around Huelo. I have the material that you shared with me from your genealogy.

LD: You know what I might do with that map just get a plastic frame over instead of laminating it.

KM: Uh-hmm. I just want to find the map for Huelo.

LD: I thought my grandmother's history was too awesome to be so verbal you really have to read it.

KM: *Mahalo*, thank you for sharing that.

LD: You'll get the vibrations from it.

KM: Yes. This is Register Map 862 it was surveyed, the final map was 1881. It sort of shows the Huelo Plantation lands.

LD: Okay.

KM: Here's Huelo, you come over here's Honokalā like that. I'm just trying to get an idea. [pointing out locations on map]

LD: Where's my property, this is the sea…it's probably here. Right here is the road block, this is the sea…

KM: This is the cove here.

LD: Which one?

KM: This comes down into Huelo. Here's Mokupapa right here, here's the old mill.

LD: I'm on this side.

KM: Okay. Here's Huelo, the school lot must be right up around, this is the road here. Must be right around in here. You know what it does it only shows, I didn't know this until you were talking about it. What it shows are sort of their field areas.

LD: Where's that?

KM: Here's the stream…

LD-H: [looking at maps]

LD: [begin Track 2 – brings out a 1927 EMI/Smythe family partition map] This is the EMI map. Isn't that pretty?

KM: Wow!

LD: Let me see.

KM: It's amazing that you've kept and held on to all of these.

LD: My grandmother, I wasn't the one. My grandmother and my grandfather [Ellen and Charles Kiakona].

KM: What was grandmother's name?

[Discusses genealogy; family lands; and Partition / Exchanges with EMI (1927).]

LD: Ellen Smythe Kiakona. My grandmother married a Kiakona.

KM: Kiakona, she was a Smythe then. Was that Eliza or?

LD: No, Ellen. You're going to see it on the genealogy.

KM: On the genealogy, okay.

LD: That genealogy is…you know.

KM: Here's Mokupapa right here.

LD: That's the one I'm looking for. I want to see this particular… [looking for location of parcel on map]

KM: There's Mokupapa. Is this it here? No, that says Manuel Freitas.

LD: Wait [looking at a portion of a map she got from the EMI collection]. Here is my property, concrete marker, here's the sea.

KM: There's the ocean.

LD: Here, here. This is what I'm looking for, this is my property. Right across.

KM: Where is this map from?

LD: EMI.

KM: Here's the LCA, okay let me see which LCA number it is. It says to Pohina, LCA 8459, I think.

LD: Yeah, this is mine. It comes above here and here goes right across here, and comes up. What was I trying to tell you…oh, what I wanted to see on here, lets see where that part is on this map.

KM: It should be.

LD: Here.

KM: There's Mokupapa so it should be right there. This mark here is that point right there.

LD: This one?

KM: This one right here, this little one right here.

LD: The stream, the waterfall?

KM: Yeah.

LD: I see it right here.

KM: That's where it is, yes.

LD: Here's my point, see that?

KM: Okay.

LD: What I'm trying to do, I'm trying to sell this piece of land. This is the top of the ridge that goes down comes up in here. It's really not all valleys, it's flat. I have one like this, I can show.

KM: Yes, you do it's in your packet.

LD: What do they call that, the one with the layers, drawing like this? They call it [thinking] I'll think of it…

KM: Okay. Now I know where you are.

LD: I'm going to mark, do you want me to mark it?

KM: I can figure it out, I see this point right here. Your grandmother…

LD: …and grandfather.

KM: They were?

LD: My grandmother was a Smythe, her father was a Smythe and her mother was an Emmsley. The Emmsleys owned a land in Kailua.

KM: Yes, I've heard the name.

[While Partition / Exchange took place (1927), the family was granted Water Rights in perpetuity.]

LD: Where all the water is, it was only a small portion. EMI comes along probably in their talk or whatever and tells them to sell their place. They'll give 'em five, six times bigger piece than that. Even if they said no, I'm sure they would have figured out some way to bulldoze my grandparents into selling it. Besides it wasn't only my grandmother it was the whole family at the time. What they did they turned over lots of land to all the members of the family in exchange for that. Providing that they got Water Rights free. I can go and get Water Rights up the mountain.

KM: This is the Kailua side *'āina*?

LD: Yeah, that's where it started.

KM: For you folks, the understanding was, that the families that have land there—that have old family *'āina* there—have the rights to water?

LD: The people who owned that original piece of land, wherever they were given land it had to have water on it. It didn't have to be in Kailua, that's why we were in Huelo.

KM: Okay.

[Observes that one of the problems with access to water in the present day is that so many outsiders have come in, and tapped into the original water sources – thus, the draw is greater than the amount needed by the *kama'āina* families.]

LD: What has gone wrong is that there's so many outsiders coming in and they tap and the original people don't have that water.

[Families were self sufficient, living off of the land, when she was young.]

KM: Were you folks growing taro when you were young?

LD: Oh, yeah definitely.

KM: Where were you growing taro?

LD: Right in the valley.

KM: Right in the area you were showing me the *'āina*. It's really sort of Mokupapa-Huelo? How many *lo'i* did you folks keep?

LD: I don't know, my grandmother did, I was small. All the valley area that we had the water, we didn't have to go and pump water. You have the water coming down and of course you have gravity flow and so that was used to water all the patches we had.

KM: *'Ae*. Was this water coming from a stream feeding into *'auwai*? The channels so that it could go into the *lo'i*? Or was it coming right off the stream.

LD: No, no. There was a stream coming down naturally, then they went ahead and diverted it to go into different *lo'i*.

KM: Mostly taro you folks had?

LD: Yeah. We had sweet potato, we had chickens, eggs everything. We were self contained, in fact every Sunday we had chicken stew.

KM: When you were growing taro, were you selling also or was it primarily family?

LD: Nobody sold. We got enough right there to feed your own family even milk from the cows.

KM: And you said fish too. You folks would go out *holoholo*?

LD: Oh yeah, if you look at it we're right by the ocean.

KM: Right on the ocean.

[EMI blocked water – taking it into the ditch system, and her grandmother went up and busted the wall so that the water would flow *makai*.]

LD: When EMI came in, the guys from the mainland came in, they just blocked it off. My grandmother had to go up there and bust the wall.

KM: For real?

LD: Yeah, because they figured she was Hawaiian, she doesn't know any better. That's when Phil Scott and all of them were over there.

KM: There began to be some *pilikia* with the families getting water?

LD: They became very domineering, thinking they had the power. Which is today, look what's happening. So, you know what I'm going to do? Like I told Garret, I said, "You know what, forget about your water, you can keep it. I'm going to dig a well." By the time I get through, you know, it's so much bull shit! First I got to have permission here, permission there, go up the hill, and then people you rent to won't let me pass through. What is this?"

KM: Particularly on the *kuleana* lands, the native tenants like you said were granted water.

LD: Yeah, try and get it now.

KM: They were granted access. You couldn't land-lock someone, they had access.

LD: Uh-hmm. Like when I sold Honopou, I was landlocked by other Hawaiians but, fortunately I had enough evidence to show that a trail was used to go to this certain area at my place, and I won it in court. That's how come I sold it. And the thing is that I started to tell you, when I started tracing back all this history, after I had gone to Bureau of Conveyances I came home I said, "look mother, look what I found, King Kamehameha's signature." She said "Oh wait, I have something to show you." So she went in the bedroom got it out of her closet, gave me this tin can. There were all the originals of what I was looking at but, the thing is what it did for me, was I got so used to reading these papers. I became a part of it, I could feel the Hawaiians walking across my head for months. You read it and you read it and all of a sudden they sort of communicate with you because that's where they were and somebody brings them back to life when they start thinking about them. You know what I'm saying?

KM: Yeah. You speak their name or as you said you think about them.

LD: No, I don't…reading it, but because it's in your thought, once it's in your head it comes alive again. I probably bought the whole mob in Huelo back.

[Discusses genealogy, and lineal descent from Piohia line of Honopou; recalls elder members of Kepani family and their stewardship of the Honopou Stream and *kalo* lands.]

KM: Your grandmother's mother I think *mo'okū'auhau* that was the Caroline and Wong Soon?

LD: That's under my grandpa's.

KM: Oh, your grandpa's.

LD: Now remember this, we were more Tahitian from that side, very little Hawaiian on the Kiakona (side); Chinese and Tahitian mostly. My grandmother's side came…Chinese, Tahitian there was some Hawaiian.

KM: Yes, there was.

LD: Only when Wong Buck Ching came and married the princess Nu'uanu who was Piohia, the chief's daughter.

KM: Oh, that's from down?

LD: Honopou.

KM: Oh, yes.

LD: They got stories for that. You're going to read it and it's, they'll come alive in your mind.

KM: Piohia ties with Kepani also, is that correct?

LD: Yes, that's what is said.

KM: Okay.

LD: . . .Good thing I had an education because I got my easement. The Kepanis, there's Jimmy, Jonah and there's Henry, three of them. They helped me so much when I had my farm in Honopou. They were really nice, the Kepani family, that was one part. Then there's the Kaleialoha. Kaleialoha comes under the Kepani line. There was old man Kepani, he did so many neat things down there with the stream and they clean taro patches (*lo'i*), and how he caught the rubbish from the water coming down. His stream went right to the kitchen so he could wash his dishes, the water kept going.

[Water does not flow in Honopou today, like it did when she was young. EMI has cut off the flow.]

KM: Wow! Does the water flow today down there like it did when you were young?

LD: No. EMI cut it off. But I'm not going to fight with them because that's not my hobby. I don't have the energy to do that.

KM: It is consuming but it's also a little bit *minamina*. If the water should flow.

LD: *Minamina* if everybody…what should and what shouldn't be in this world are two different things.

KM: You're right.

LD: You're going to get a change of heads like one guy is gone and you get somebody else. Then you have to start all over again telling them the history and all of this and that that's happened. By the time you get through you'll be about another ten years older and they're still not listening.

KM: Sure, and then you just get them and then someone else comes?

LD: Yeah.

KM: May I ask, earlier you had shared that there was a time when someone from the company came and told you, "We going cut off the water."

LD: Yeah Scott, but he and I are good friends now.

KM: Good friends, yeah. But, you had to prove to him… Can you tell me a little bit what happened?

LD: Yeah, he just told me, "Don't touch the pipes" he's "going to call the police." I said, "Just do it!" He says, "well, let's talk about it." I said, "sure," that's when he came down. I said, "read this," he said, "oh, you're right."

KM: You had the family documentation that showed the right to water?

LD: Yeah.

KM: Some of that's what you've shared here with me in these documents.

LD: Yeah. I don't have the original deeds, the next time you come up.

KM: You showed him the material?

LD: Oh yeah, his mouth dropped open.

KM: It was easy for them out of ignorance to just say, "Oh we going cut this, or we do, you know."

LD: I said, "just try!" And then afterwards I said, "Remember I just got through living in your homeland for twelve years in New York, where there's an ample amount of Jewish people and the Irish, so therefore they have taught me so much on how to stand up to this, if I have the facts. Now, what?" "Okay, you can have the water!"

[It's important for families to research and have the facts, about their land and Water Rights when pursuing claims.]

KM: And that was an important thing what you just said, "if I have the facts."

LD: I did.

KM: And what you were saying, you got to have the attitude.

LD: Oh, yeah otherwise it's not any good.

KM: You also need to know, have the facts you said yeah? Do your research.

LD: Yeah. He started it, I wouldn't have been that way at all. Besides I was in school in Boston, Massachusetts. I have a little bit of conservatism, a little bit of the moxie [chuckling]. And you combine it all together, then I wear my slippers and my jeans and big aloha shirts. This was back in the '50s, you weren't even born. I walk over there and they look, it didn't bother me you know why? If I didn't like it I could get my ticket and come home on a piece of land that is bigger than those people would ever have.

KM: That's right.

LD: And this is all paid for. They even fight to stay on the streets, so I didn't throw that in their face. I just had developed a bigger understanding, I said, "Oh poor thing these people really have nothing behind them to give them any security." I never threw that in their face.

KM: When we were talking on the phone you had shared with me this idea…you had said something about how important it is when you have land, the feeling. What does the land mean to you? You said it connected you.

[Her grandparents instilled in her a great love for the land. It nurtured them, and connects them to place. She observed, "You take care of the land, the land will take care of you."]

LD: Yeah, you know what, how I feel about the land. Those documents my grandmother saved. I read how she went to court and I looked at all that. I remember my grandfather and grandmother would go in the room every night

they open up the can and look at their land (records). Just like them counting money I guess.

There was a great love for the land, you know why? You can go out there put a seed in the ground it will start. People with little yards don't know that. When my grandmother died and my mother gave me the land, and after my mother died and more I got what it means. I looked at it…but I've done things long before my mother died. I had that land and the kids went away, go out by myself. "Okay, mom here what we going to do with you?" You look around and darn I got a message in my head. The land will take care of you, don't worry about things. You take care of the land, the land will take care of you.

KM: *'Ae*.

LD: That is what it's all about.

KM: That's very Hawaiian, the whole attitude. *Mālama ka 'āina*, and the land takes care of you.

LD: It'll take care of you. Even the shrimps, we used to have a lot of shrimps in the stream. Of course now, with all the hippie people… Well that's okay things change even, Rome fell. Greece fell everybody fell. The idea is there's another alternative…dig a well. Let's see somebody go down there, mess that up [chuckles]. That's my Hawaiian attitude. It's not Hawaiian, Hawaiian how you hear them talk, "Oh this, this and that." Mine is a practical approach.

KM: Uh-hmm. In a way there's some ingenuity to it, though if an obstacle comes before you, you not going to say, "*pohō* waste time," you going find out how to get around it.

LD: Yeah. You know I think that's where my grandmother and my grandfather…I thank them mostly for that. My grandmother folks for getting in there and for doing it. My grandfather, Kiakona side, can sit on the rocking chair on the porch and talk all day. But, you know who's going to put him to work, my grandma.

KM: Grandfathers Kiakona's full name?

LD: Charles Kiakona, you going to see it in there.

KM: I'll see it in there. Now, you and Walla Pomroy are…?

LD: Through Caroline Kaiapa.

KM: Yes.

LD: See the daughter.

KM: Violet Kaiapa, yes.

LD: Aunty Violet.

KM: Yes, I actually found their *mo'okū'auhau*.

LD: How did it work out?

KM: How it worked out is the first husband was Sam Kaiapa…and I can get it for you.

LD: Who's the first?

KM: Caroline Hubbell, who was Hawaiian, Tahitian, Haole.

LD: Yeah, I told you yeah.

KM: Yeah, you told me.

LD: Caroline Hubbell, then she married, Wong Soon?

KM: Her first husband was Sam Kaiapa, he died.

LD: Oh.

KM: And that's where Violet…

LD: Okay. Violet, right?

KM: Yes.

LD: And then Caroline Hubbell married Wong Soon.

KM: *'Ae*.

LD: And that's where all the Kiakona come in.

KM: Now aunty Hannah, I mentioned to you that I've spoken to aunty in Hilo.

LD: How is she?

KM: She's eighty-five, smoking like a smoke stack and [chuckles] a live wire. She's okay.

LD: They were very bossy that side. We never liked it when papa's family came down because they gave advice. And they didn't like mama because she always looked like she just came out of the taro patch. They thought papa deserved somebody better because he graduated from Kamehameha he was an engineer up at the sugar mill and papa was over there you know. Papa was very smart, papa was very good, but he had diabetes.

KM: What aunty Hannah had shared and this was just an idea cause you were talking about Kiakona, how much they value. You know aunty Hannah said it was her understanding from her mama them. Kiakona is the Hawaiian word for Deacon.

LD: Yes, it is.

KM: Because the pure *Pākē* marries his Hawaiian-Tahitian-Haole wife, they were in the church, I think at Huelo.

LD: Yeah, that's how they changed it.

KM: He became a Deacon of the church and finally because he was so strong in the church they just called him Kiakona. They said, "who's kids those?" "Kiakona's children."

LD: He was a court interpreter. He used to go to the courts mostly, that's why it is. Actually Hannah and everybody's name should be Wong.

KM: You're right. They went *'oki* that Wong made it Kiakona.

LD: Yeah, and now there's Kekonas all over the place, and they think Kiakona and Kekona are the same, I said "no."

KM: No, different people.

LD: I said, "there's no real beginning of a Kiakona, it was put there in the middle where it blended the Chinese and the Tahitian with the…

KM: Hawaiian *hapa*?

LD: Yeah.

KM: Real interesting. This is your *mo'okū'auhau*. We were coming up Kaupakulua Road, road not to long ago and we saw a little street that said Kaiapa Place.

LD: That's over there, right near here.

KM: Yeas. We were wondering if at one time…where did aunty Violet them stay?

LD: I don't know.

KM: Where was your great-grandmother Caroline?

LD: Over here, right here. Pe'ahi. That's Kaupakulua.

KM: Maybe that's the connection.

LD: Yes. I even see this from the hill up here.

KM: Pi'iholo, Kauhikoa?

LD: I have the map for that where the house was.

KM: Wonderful.

LD: You want to see that to?

KM: Later that would be good.

[begin track 3] Another important thing that you were sharing with me that as a child you would gather *'ōpae*?

[Land cared for the family. They grew what they needed; collected *'ōpae* and *hīhīwai*; and fished the ocean. They regularly harvested their taro and made *poi*. Respect of the land was important, and a way of life.]

LD: I never did. I'm the first grand-daughter of the whole family, I don't have to do anything.

KM: [chuckling] They *mālama 'oe*?

LD: My grandmother always protected me. If they'd pick on me, she'd get after them. I'm the first born, heck I got the special treatment.

KM: But the family you said, they gathered *'ōpae*, did they get *hīhīwai* from the streams?

LD: Oh, yeah. All you know is at night there's food on the table. All you know is that when you get up in the morning there's a lot of noise. The big *pākini* and all the stuff that's going in the big can, there's maybe three big cans. All you know is you smell the taro, something boiling, the taro, they get out the board and they start pounding the *poi*.

KM: You folks day, pound the *poi*, everything? Was it once a week?

LD: I don't know all I know is every time I looked, we always had homemade butter. Papa used to shake it in the bottle.

KM: Amazing! You go ocean, *lawai'a*?

LD: Oh, yeah.

KM: They go fishing in the stream, and get water for taro. As you said you took care of the land, it takes care of you.

LD: It takes care of you. If you respect the land it will take care of you. When I say take care I don't mean just go over there and water things. You respect that.

KM: Yes. You know I've heard some *kūpuna* just like what you're saying, you *aloha*, respect, care for, love it.

LD: Yeah.

KM: Can't be the kind just on the tip of the tongue.

LD: No, I would go broke taking care of that land a lot of times. All my paycheck went to it. You need to get equipment, you think you're raising a kid with a piece of land. You go and spend it on a tractor, you get your green machine, you get this, a truck and before you know it instead of buying dresses or going traveling, what are you doing buying a stupid machine so you can push the trees down so they don't take over the land and all that.

KM: It's very interesting though even in your grandmother's time she was having some sort of disagreement, it sounds like with the water. Water was the key, right no more water hard, right?

LD: Yeah, but I'm not even going to make any comments about that, that's change of the times. Because when you come down to it, you know everything happens for a reason. If God wanted you to go up the mountains to get the water, I would have been there. But he's telling me, there it is right below you, it's cleaner. You cannot use your ego trip all the time.

KM: That's really interesting so you're going to go ahead and do a well?

LD: Yeah, I'm going to do what I want to do anyway.

KM: Yeah, good.

LD: What I'm going to do when I get more, I need your phone number at home. You got a card?

KM: Yes.

LD: What is your full name. . .? [recorder off – inquires about the oral history study.]

KM: [begin Track 4] . . .EMI let the Water License lapse.

[Discusses problems with water flow, and observes that too many new people are being granted water, thus impacting the *kama'āina* Water Rights.]

LD: You read that big piece of blue paper [referring to the 1927 EMI/Smythe family Partition Map and Deeds]. In there, they made a commitment, grandfather clause…never mind this new United States Constitution thing. In there is what it says. If they don't start respecting those little things and be more discreet, use some discretion in allowing all these new guys coming in and giving them Water Rights up there.

KM: That's really a part of the *pilikia*. You said earlier, there's plenty new guys, *malihini*, coming in; and if they get water the water doesn't continue to flow *makai*.

LD: Yeah, that's right. And they're blaming it on us, we cannot live according to what that says. You read that paper, because no way in there it says, "Oh, feel sorry for so and so coming from Nebraska, let him have some water too."

KM: That's right.

LD: I don't know what to do about it, maybe it's being selfish. But something's wrong someplace. And now I got to spend $38,000.00 to dig a well. Now how about EMI giving us that money, and then can go spread their cheer with who ever they want to play politics. You know what I'm trying to say?

KM: That's an interesting thing, who has the first right?

LD: We do. I feel that whoever can apply, they will go ahead and give us the water. If they want to make a big well over in…well I don't know whether that's good because pretty soon there won't be water in the ground either.

KM: *'Ae*.

LD: Maybe we should just be quiet.

KM: This is one of the big *pilikia* now too, because you know you look and I went up with uncle Jimmy Hū'eu we went into the mountain lands along the ditches. And I tell you, he said from when he was young, the *'ōhi'a*, the *koa*, the *'ie'ie* was thick. That kind of forest keeps the water in. When we went up now he hadn't been up for twenty-five years, he was *pā'iwa*, he said…

LD: Where's the trees?

KM: It's so different, that's right. Where were the trees?

LD: Where's the beef?

KM: Everything gone. And you know you lose that overstory, you lose that ground cover…

LD: You know what's happening? All the people raising pot in the mountain. Many think it's a minor thing. I'm being an old grouch, the tracks up there and everything. The hunters running through there, of course the pigs do ravish it.

KM: But there's a way to do things, a way to have a balance I guess. You said earlier it's not like you're trying to live in the past, you're progressing forward right?

LD: Yeah.

KM: You know, balance.

LD: Before you go to that meeting you read that paper.

KM: I will, definitely.

LD: I think that's the first commitment they made, when they took our land for a particular reason. I don't know what its going to say in that. All I saw was a bunch of words, why read it, it's all done but I just wanted…one day when I have time, I'll read it.

KM: I will make the copies.

LD: You know what…you got to go find a blueprint place.

KM: I believe, when I went to Kinko's a few years ago here they had the machine so we could copy maps. If cannot I can do it in Hilo and I can Fed Ex or packet it right back to you.

LD: Oh yeah, you can. The thing is to get it to the meeting to show them, see if Kinko's can make a reduced copy. . . [begin Tracks 5-7]

KM: I'll make you an extra copy of the map and papers.

LD: Thank you. When I go to meet them, I come in with my ammunition.

KM: [chuckling] That's right you come in with your *palapala*, they get theirs and you have yours, which is theirs too because they signed it right?

LD: Yes. I said to them, "What do you think, I'm stupid?" [chuckles]

KM: They do all the time.

LD: Let's see….blueprint. . . [looking in phone book for address of copy place]

You know what, I come from a whole family of school teachers, the Kiakona clan.

KM: Even aunty Violet right?

LD: Yeah and my mother. I need to… But you got to hear this story. I come from a whole line of school teachers, I guess you can tell by the way I'm doing stuff or talking. Very articulate and emphasis and this and that. My mother says you should be a teacher, I said, I don't want to be, they all old maids and they grouchy and they bossy, so I didn't. I went to dance *hula*, I did this, I did that.

KM: Is that while you were in the mainland, you danced *hula*?

LD: No, I went to school and then the *hula* was secondary. At the age of fifty-two, the kids graduated, I got tired of faming. I went back to school, the University of Hawaii they didn't want me because they said I'm maybe too old. I went to see the admissions guy. He knew me when I went to the University. So he let me in, he said "Let's see if you can keep up your grades up." I went he let me in, I went for nursing I didn't like it because first of all we came to the final thing my teacher said, "get over there and give this person an injection" I said, "I'm not ready." "You do it" I said, "I don't want to." She says, "why?" "I don't want to be the poor person over there with an idiot like me not knowing how to poke 'em and get feeling hurt." She says, "if you don't do it, I'm going to flunk you." I said, "do it" and so she did. I figure okay and besides I have been working hospital, you know, volunteer.

KM: Yes. . .

LD: . . .I said, "okay, I'm going to fix you, I'm going to be a teacher. I'm going to teach these kids how to not go into the hospital when they grow up" I told her that. She got really angry at me. I'm 52 or 53, I went back to school and I graduated and I got a job when I was 60 years old. I was smart, I wasn't going to the town ones I went to where all the Homestead areas are, where they need some idiot like me, going to challenge the kids, the families. But I had fun.

KM: What school did you go to?

LD: Pope Elementary.

KM: Oh, Waimānalo.

LD: That's the one. I wanted to go to Wai'anae but that was kind of far, so it was Waimānalo.

KM: What year did you start?

LD: I forget, in '89 I think. What happened was, when I got there every child had Hawaiian that was my whole glory, oh this is what I wanted [slaps hands]! I closed the door and I said to them, I said, "You know what, I just graduated that's what you get when you don't go to school. Look how long it took me to graduate."[chuckling] They looked at me. "You want to see my diploma, look." "That long you stayed in school?" I said "Yeah, 'cause I didn't listen when I was in the fourth grade, that's the one you're in right now" [chuckling]. After that, oh and I said to them, "Look, I went to school on purpose so I could come here and be here with you today. And you know when you go to school and you're fifty something years old, that's kind of hard. You got to have about five tape recorders so you don't miss anything because your ears like you guys don't hear very much. You get older its worse" [chuckling]. They're over there, they didn't know whether they have a nut for a teacher or what. I said, "I want you to know that I'm very happy that you're my students. This is why I came to school as a teacher, I also want you to know that everybody in this world has problems. When you come in here every morning and we close the door let your family have their problems. We're going to have our own family in this room and we're going to learn how not to have problems. Forget about all the fights, forget about the problems, we not going have any of that," and that's how I started.

KM: Nice. You really gave them kind of a refuge, a place to know that there's another way.

LD: That's what teaching is all about, no matter what ethnic group you're from. That's what a teacher should do. . .

KM: [begin Track 8] . . . May I ask, when you were growing up was there a favorite song of this land or anything that you remember? Nothing that described whether it was Honopou or Huelo that you recall?

LD: No, we always sang the church songs. Every night we had devotion.

KM: You folks were at what church, Kaulanapueo?

LD: No, we went to any kind church. Kaulanapueo was our relative's church.

KM: Was that Kiakona *mā*?

LD: No, what was his name…Akau. Akau, yeah Jeanette is a Kiakona they're cousins both of them are related to me come to think of it yeah, Akau… [phone rings – end of interview]

Helen Pualani Range-Wilhelm
with Robert & Harvey Wilhelm, and Jackie & Albert Honoka'upu
Oral History Interview – May 26, 2001 (with Kepā Maly)
Hāmākua Loa Region, Maui

Kupuna Helen Pualani Range Wilhelm was born at Pāpa'a'ea in 1914. Her mother was pure Hawaiian, a descendant of native families who had resided in the Hāmākua Loa region (on lands between the Pe'ahi and Pāpa'a'ea) for many generations, and her father came to Hawai'i from Germany. Kupuna Wilhelm has resided in the Kailua vicinity most all of her life, and her husband, Robert Wilhelm worked for EMI Company at one time. Together, she and her husband, and subsequently her own children as well as her nephews and nieces, regularly traveled the streams and near shore fisheries. During the interview, Kupuna Wilhelm, her husband, son, nephew and niece share recollections of family relationships and life upon the land. They note that in their life times, the weather has changed (the rain no longer falls as it did), the streams have receded, and stream fisheries have diminished.

The following observations are among those discussed by Kupuna Wilhelm and family during the interview:

Summary of Selected Topics	***Page***
Discusses family background, and land exchanges with EMI Company.	373
Relatives maintained family lands – residence, *lo'i kalo* and *'auwai* – at Pāpa'a'ea; family *ilina* are still situated at Pāpa'a'ea, *makai* of the highway.	377
Fifty and more years ago, there was more rain, and the water flow in the streams was greater.	383

Arrangements for the interview and final release of the transcript were coordinated by Jackie Honoka'upu. Kupuna Wilhelm and family members granted release of the interview to Maly, on November 13, 2001.

Interview Transcript

KM: [discussing maps in packet for family, and locational references on interview maps] …This is from right at the boundary from Makapu'u, 'Ula'ino from Kea'a, all the way up here to Pa'akea, Puakea. This is a nice area. Now, Joe is your brother?

HR-W: My younger brother.

KM: Your younger brother. Were you born here or were you born outside?

HR-W: And I have one sister in Honolulu, there's only three of us.

KM: Hmm, *maika'i*. Were you born here, were you born the other side?

HR-W: This is my mother's property. My father's property is one mile back, Pāpa'a'ea.

HW: Where were you born? You were born at Kailua, or you were born, Pāpa'a'ea?

HR-W: Born, Pāpa'a'ea.

KM: Up the hill?

HW: Up the hill and down.

KM: And back down, oh.

HR-W: I think we were all born over there, Pāpa'a'ea. But we no more birth certificate [chuckles].

KM: *Kākū*, what is your full name?

HR-W: Helen Pualani Range-Wilhelm.

KM: Pualani? Beautiful.

HR-W: Supposed to be Runge, R-u-n-g-e, but come over here they Americanize.

KM: When were you *hānau*, what year?

HR-W: May 14th, 1914.

KM: *O, pōmaika'i nō*!

HR-W: But I'm not supposed to tell [chuckling]. Secret.

Group: [chuckling]

HW: I never know. She just made eighty-seven.

HR-W: Born 1914.

KM: Beautiful! Uncle Jimmy Hū'eu was born the same year as you.

HR-W: My oldest daughter born 1935, then '36, '37, '38.

HW: Don't tell 'em my age [chuckling].

JH: Too late!

Group: [laughing]

HR-W: But he only look like fourteen eh.

JH: Yeah.

KM: Who was your mama? What was your mother's name?

[Discusses family background, and land exchanges with EMI Company.]

HR-W: My mama, Hattie Honoka'upu. That was her maiden name.

KM: Beautiful.

HR-W: Her grandpa was Albert's great grandpa. Honoka'upu, my mama's maiden name.

KM: Who was your papa, your father?

HR-W: My father, Runge.

KM: He came from Germany?

HR-W: Germany, direct. My papa and his [indicating her husband, Robert Wilhelm] great grandpa came together from Germany. But the town, I forgot, but direct from Germany.

KM: What was your father's first name?

HR-W: August.

KM: August Runge.

HR-W: Runge, but he came here, they make American, Range. He's German, he wasn't born here, was born in Germany. His great-grandpa born Germany, the two came together.

KM: Wilhelm and Range came together?

HR-W: Yes. They told me, he and I family. Our papa's came together from Germany.

KM: Interesting, and both married Hawaiian women? Wilhelm and Range?

HR-W: My mama, was the fourth marriage.

KM: Oh. So your papa had married before?

HR-W: Yeah, was married before.

KM: All Hawaiian women? You get plenty cousins?

HR-W: My papa's fourth marriage, my mama's first time.

KM: When you were growing up were your *tūtū* still alive? Your *kāpuna*, Honoka'upu were still alive?

HR-W: Way down the other side, Honopou.

KM: Honopou.

HR-W: Yeah, she's not from here, from Honopou. Twin Falls, down.

KM: *'Ae*. Who were they, what was tūtūs name, do you remember?

HR-W: I don't know [thinking].

JH: What is grandma's name, your grandma?

HR-W: Jack.

JH: Jack Honoka'upu is the grandfather.

HR-W: On my mother side, Jack, right.

KM: Honopou. Does that tie with Piohia or Kepani family or somebody?

HR-W: I don't know.

JH: Piohia?

HR-W: Grandpa's family.

HW: Before that. Who's your family on the Honoka'upu side?

HR-W: I don't know all the family, but some are Holokai, Honoka'upu, 'Aiwohi [thinking] Ho'omalu, Pa'iaho'omalu.

KM: Pa'iaho'omalu?

HR-W: Yeah.

JH: Yeah.

KM: Holokai also.

HR-W: The main grandpa was Kealoha Ho'omalu.

KM: Beautiful name.

HR-W: The Ho'omalu is her father's side.

KM: Ho'omalu on your grandfather, Honoka'upu?

HR-W: Yeah. Eight brothers, one died at Kalaupapa, Moloka'i.

KM: Did he die, before you were born?

HR-W: Died before I was born.

JH: Which one died? What's his name that died at Kalaupapa?

HR-W: That was Jack, I think was Jack Honoka'upu.

JH: Not your grandpa?

HR-W: Not my grandpa.

JH: Get one more other Jack?

HR-W: Get two Jacks.

JH: Okay, two Jacks.

KM: No wonder, *huikau*.

HW: We learn something, yeah [chuckling].

HR-W: My grandpa was Jack, and had the one that was at Kalaupapa, Jack.

AH: That's why they say get one Honoka'upu buried in Kalaupapa.

JH: That's the one. Okay.

KM: *Mahalo*.

HR-W: We don't have all the records of that. [speaking to Jackie] Do you have records of all that?

JH: I have some, but not that. Now I know.

HW: When we go Kalaupapa, they said we might have the grave over there.

KM: This uncle got *ma'i Pākē* then and had to go Kalaupapa?

HR-W: I don't know all the records, the black and white [chuckling].

KM: Yeah, but that's how your *tūtū*, talk story?

HR-W: Yeah. You got to put down before no more. But I no more paper.

JH: That's okay, at least you heard.

KM: *Tūtū*, when you were young…

HR-W: That's why we like to find out from the place that keep the records.

KM: Maybe we could find.

JH: Jack.

KM: Jack Honoka'upu. *Tūtū*, when you were young, what did you do? Did you grow taro, work *māla'ai*, you folks go *lawai'a*?

HR-W: Oh yeah.

KM: You work. Your place, out Pāpa'a'ea?

HR-W: My papa's place. My mama's place over here, that's my papa's place.

KM: Mama's place was here?

HR-W: Yeah. Mama's place was Pe'ahi, before you hit Kākipi, Pe'ahi.

KM: *'Ae*.

HR-W: Exchange with EMI. So this land was EMI.

KM: I see, yes.

HR-W: But her real property was Pe'ahi.

KM: Why did they switch land?

HR-W: I don't know.

HW: She owned another property over here. *Tūtū* had one property here, then she exchanged with EMI and got all her land over here. She had over here, next door and up here, three places.

JH: Where uncle Joe lives.

KM: Yes, across.

JH: That was all theirs.

HW: All up here too, that was tūtū's property.

JH: Oh!

HW: He gave it, a dollar and love.

HR-W: Hattie is her namesake, named after her. Grandpa Kalani, was uncle for my mama. My mother's mama died when she was young. She was bought up by different family that's why.

KM: *Hānai, lawe hānai*.

HR-W: Her own family then she went up there.

KM: Under the Wilhelm, who is the Hawaiian woman? Who is Wilhelm, your great-grandfather?

HW: Fernandez.

KM: Fernandez. She was part-Hawaiian?

HW: Part-Hawaiian, Hawaiian, Chinese.

KM: What was her area?

HW: Kula.

KM: Kula.

HW: Hmm.

[Relatives maintained family lands – residence, *lo'i kalo* and *'auwai* – at Pāpa'a'ea; family *iliina* are still situated at Pāpa'a'ea, *makai* of the highway.]

KM: *Tūtū*, did you folks grow taro when you were young? Was it dry-land or did you have irrigated, *lo'i kalo*? *Lo'i*?

HR-W: My papa lived one mile from here. Pāpa'a'ea.

KM: Had all *'auwai*, taro land?

HR-W: Three acres and a place for the house.

KM: You folks grew taro to take care of your family? Was *lo'i kalo*? Dry land taro?

HR-W: That place all for my papa's third wife, we don't come in over there.

KM: Oh.

HW: We have all the information here on the Wilhelm side [opens a genealogical book].

KM: Did the *'ohana* in Pāpa'a'ea have taro land?

HW: They had taro in Pāpa'a'ea?

HR-W: That land went to Otto Wili's last wife's children.

HW: Had a taro patch?

HR-W: Only graves. Taro patch was way down, but he don't own no taro patch. Taro patch belonged to one of the wives, Akina family. We don't have any share down there, Akina.

HW: There was a taro patch. . .

HR-W: My father married four times so we don't come in over there. This is my mother's property, not my father.

JH: What did they grow behind here?

HW: It was nothing. We were bought up next door here, and had cows, chicken.

HR-W: That one (*mauka*) is her own property. This one is exchanged with EMI. Pe'ahi, Holokai Road to Kākipi, exchange for this place. Papa Joe's place up there, all that exchanged. Had five acres at Honokalā, two sisters come in over there.

JH: Honokalā?

HR-W: My two sisters come in, one adopted sister, five acres over there, Honokalā you pass Twin Falls, then you come down.

KM: *Makai* road.

HR-W: Up side and down side. That's exchange with EMI, her land is Pe'ahi.

KM: The Pe'ahi land must have gone to sugar?

JH: The Pe'ahi land?

HR-W: This is exchange land.

HW: EMI took all the choice land.

JH: How come EMI went exchange, why?

HR-W: My mother's father married two or three times. The last wife had a daughter named Imi. So Imi is half of the property and my mother's share was half of the property. So this was my mother's share, of over here.

JH: Yeah, but why they change? Why give EMI?

HR-W: She wanted to be near her home, because she already had that home.

JH: Ahh.

HR-W: So this home exchanged up there and up aunty Hattie's, three, all exchange. Her old property was over there that's why she wanted EMI exchange, bring home. That's why EMI.

JH: So Imi and your mama are sisters?

HR-W: Imi, that's her niece [chuckling]. Imi's father is my mother's half brother. She is entitled to the property. Holokai is also family, my mother's side but she doesn't come in the property only she's family. The property is all Pe'ahi side. This property belonged to EMI, mama gave Pe'ahi to EMI. So EMI gave this place.

JH: EMI property, over there how many acres? Over here is how many acres?

HR-W: Over here, somebody else owned, was Hawaiian.

JH: Piho or Kauha'a according to the grant map [HTS Plat 1011].

KM: Piho?

HR-W: Yeah. My mother exchanged this place where uncle Joe live up at aunty Hattie, that's all exchange for Pe'ahi.

HW: Covers one acre, up here is one acre.

JH: Was it just like even exchange?

HR-W: The reason she brought the property, she and Imi…Imi's father and her are half brother and sister, half of the property went to Imi and half to her. She didn't want… Pe'ahi Road, get the road to Pe'ahi to Kākipi.

JH: What is Emi's last name?

HR-W: [thinking]

JH: Kuailani, is that the one?

HR-W: Kuailani.

JH: Because Honoka'upu is the original name, her father.

HR-W: Her father is Honoka'upu. She is my mama's own niece. Her father and my mama are brother and sister.

JH: Who was her father?

HR-W: Her mother is Louisiana and the papa was. . . [thinking] supposed to be Honoka'upu. . . Imi married to Kuailani. . . . . .I don't know all the names. My mother never used to talk about those things. We hear from somebody else.

HW: You were asking about my grandpa, what he did out here?

KM: Yes.

HW: He was working for the EMI. They had a dairy up here in Pāpa'a'ea.

KM: Yeah, right on top by the mango trees, Norfolk pine. There was a big dairy out there, Pogues.

HR-W: Yeah he worked for EMI. He buried over there, Pāpa'a'ea

JH: Where did he work before?

HR-W: EMI, he was there all the time till he died.

HW: Doing what?

HR-W: Yard man.

JH: Had dairy over there before?

HR-W: Yes, but he was demoted.

JH: Oh, at the dairy?

HR-W: . . .Just like they demote him.

HW: What did he do there?

HR-W: He was yard man, but I don't know something went wrong.

HW: He take care the dairy too? Had dairy over there, had goats and cows, dairy?

HR-W: At that time was the Pogues…I don't know what went wrong.

KM: Yeah, was a dairy. You said grandpa Gus is buried up there? On top or down? On their *'āina*.

HW: In fact it's their property over there.

KM: Still is. Good.

HR-W: Those days, there was so much flirting, flirting, bosses and the workers [chuckling]

Group: [chuckling]

HR-W: I'm not ashamed to say that. I have one sister, half sister from flirting. The boss's son, go pick up the girls.

JH: Oops!

HR-W: [laughing].

KM: They call that "*kao lele pā*" (fence jumping goat) *nō ho'i*!

Group: [chuckling]

HW: Jump fence, that's right.

HR-W: I'm not ashamed. I was educated in a Christian school, went to church every Sunday, Mauna'olu Seminary I was there eight years.

KM: Wonderful!

HR-W: Come out Christian.

HW: She remembers those things eh.

JH: She remember. . . [begin Tract 2]

KM: Did you go into the streams, gather fish, *'ōpae* like that?

JH: . . .When you was young you guys went make *'ōpae* for eat and go fish?

HR-W: Yeah.

JH: That's how you eat? How did you gather your food?

HR-W: Oh no, at home, we had only *haole* food. My daddy was pure German.

KM: Hmm. Were you allowed to speak Hawaiian when you were young? Could you speak Hawaiian?

HR-W: I understand Hawaiian but I cannot speak. We had a grandma, and when we had to talk, it's Hawaiian. She was like my mama's adopted mama, but she was half colored. We have to talk Hawaiian to her, she doesn't know English.

JH: Who's that?

HR-W: My *tūtū*.

JH: What her name?

HR-W: Mariah Kini. Her husband was Korean. She comes from a family up Makawao, the Pana family. My mother's mother died when she was young, so this *Pōpolo* grandma brought her up.

HW: Dark Portuguese kind.

JH: You spoke Hawaiian to her. How did you learn how to eat fish? You eat fish, you eat *'ōpae*. How, your mama taught you?

HR-W: Oh yes. I cook for her, everybody cook for her, *pūlehu* and things like that.

JH: Who go get the *'ōpae* and *'o'opu*?

KM: You went to go get *'o'o'pu*?

HR-W: *'O'opu*, yeah.

KM: You went to get *'o'opu*?

HR-W: We hardly did, but after we got married, then we did. I was away at school, Mauna'olu, yeah.

HW: What about the *'ōpae*, you went catch *'ōpae*, *'o'opu* you do that?

HR-W: Only sometimes, not every time. . .

KM: Where did you go, you go up mountain, gather *'ōpae*?

HR-W: Long time, no go.

KM: How the water, plenty water in the streams.

HR-W: Nobody to go with.

HW: When you were little long time ago, you used to go?

HR-W: Yeah.

KM: Where did you go?

HR-W: Young time we no eat too much Hawaiian food all *haole* food. *Haole* food, not Hawaiian food.

JH: That's what she said, steak.

Group: [chuckling]

JH: Where did you guys go Nā'ili'ilihāele? You go pick *'ōpae* at Nā'ili'ilihāele?

HR-W: Down there.

JH: And where else? You guys used to go 'O'opuola side too?

HR-W: Some times.

HW: Where we lay the net, that big bay?

JH: Maka'iwa.

HR-W: We don't live on Hawaiian food, we live on German food, *haole* food. My dad is German, we don't eat too much Hawaiian. We had cows. My daddy raised cows, we had lot of meat. You had to salt the meat we didn't have any ice box.

KM: Where did your salt come from? Did you buy the salt or did you make salt?

HR-W: Buy the salt, we never did our own, no. Buy. My daddy is pure German, my mother pure Hawaiian. . .

KM: Honoka'upu family has another name also?

JH: Mo'ikeha.

HR-W: My grandpa and her husband's grandpa, brothers.

JH: So before papa had the name…Mo'ikeha is papa's…

HR-W: Supposed to be Mo'ikeha Honoka'upu. They put Mo'ikeha.

JH: And Jack Honoka'upu…So Jack and Mo'ikeha were brothers?

HR-W: Yeah, the single name, they use that for the front name. And the back name…

JH: They dropped.

HR-W: Yeah. Just like the Chinese, the Chinese like that.

KM: So one took Mo'ikeha, one took Honoka'upu?

HR-W: Yeah.

KM: Plenty families like that.

HR-W: My father's name was R-u-n-g-e, but they come over here, Americanized, R-a-n-g-e. More like the way they do my daddy didn't have pass when he came, he sneak in. But over here wanted to help him, use him as a laborer to work.

JH: And then married Hawaiian so he could stay.

HR-W: Yeah. . . He married three times, the first no marry. That's Pacheco, I get half sister.

HW: Mary Pacheco.

JH: Oh, that's her sister?

HR-W: She's my half sister. She's buried down there. My half sister, her Hawaiian side is Tau'ā. Papa told me, they're Tau'ā. . . That's what happened. And I have one sister in Honolulu, my half sister. Her father is one of the bosses.

KM: Pogue?

HR-W: Yeah. . . We lived one mile from here, Pāpa'a'ea, The boss live above us. They had a dairy, raise cows. Boss's son comes down, and now I get half sister [chuckling].

Group: [chuckling] . . . [begin Track 3]

KM: . . .Maybe a little bit about the water, has she seen changes in the water or in the streams like that or…?

JH: Streams, when you were young until today, the stream no more too much water come down or still the same?

HR-W: I don't know.

RW: Less.

JH: Uncle, from before when you guys was younger till now is it less water coming down the stream or the same amounts?

RW: Less.

KM: Did you used to work up *mauka* too?

RW: Yeah.

KM: You did. You worked for EMI for a while?

JH: Yes.

KM: What are the feelings of the family, your family parents time like that. What did they think about the changes in the water, in the streams? That was life, it was okay, or were there problems getting water for them to have taro to get *'o'opu* or stuff like that?

RW: It was kind of hard.

JH: Because never have that much water coming down. Uncle, where were you raised?

RW: Kahului.

JH: Kahului. And then when you got married to aunty you moved to Kailua?

RW: Yeah.

HW: He was born and raised in Kahului.

[Fifty and more years ago, there was more rain, and the water flow in the streams was greater.]

AH: Harvey and I, we're more or less born over here and raised over here. We know before had more rain than we have now.

HW: Yeah.

AH: You remember? Used to rain everyday in Kailua.

HW: Everyday, a lot of water.

JH: It's not so much…

HW: Had more water.

KM: That's the thing then, so from…Now you're fifty-five?

AH: I'm sixty now. I'm sixty this year.

KM: Okay. You're sixty, from when you guys were young…more rain?

AH: More rain.

HW: More water.

AH: I remember when people used to ask me, "Where you live?" I said, "Kailua." "Wow, that place rain everyday!" Yeah, rain everyday over there, but not anymore. Get less rain now than they had before.

KM: Before, if they were taking the same amount of water sixty years ago, or a hundred years ago had more rain…

AH: Yeah.

KM: …so there was more water flowing. Now, less rain, and because… You know when we talk with *kupuna* Jimmy Hū'eu, Helen Nākānelua, and Mina Atai them, they all say "before the water used to come down in the streams all the way. Now the water stop at the ditch."

AH: No more water.

JH: Right. Because less rain, but they taking same amount.

KM: Yes.

JH: That's what happened.

KM: That's where some of the *pilikia* has come about.

AH: That's why now a lot of the streams are dry.

JH: Because Albert, my father-in-law guys had taro patch (*lo'i*) down Hanawana. They used to have taro patch down there.

AH: EMI took all the water. See they have a ditch *mauka* and a ditch down here. What they lose from up there they take it down…

KM: There's one ditch still below here?

JH: Oh yes. Right into my place.

KM: What ditch is this one below?

AH: Lowrie Ditch.

KM: Lowrie Ditch is right below?

AH: And there's another one at the bottom, Ha'ikū Ditch. Right between these two houses right here the easement for Lowrie Ditch goes.

KM: Underneath, tunnel.

JH: And we fenced, we made it so that… There's a thirty foot tunnel underneath.

KM: Wow!

JH: Right by my gate as you go in.

HW: And the stream is on the side.

KM: Does the stream have water?

JH: Not all the time.

AH: Very little. That water goes down, and goes into the ditch.

KM: When you folks were young, could you go into that stream?

HW: Yeah, we used to swim all the time.

AH: We go.

KM: Had *'ōpae* or stuff in that stream before that you remember?

AH: No, not much.

KM: Not that much, *mauka* no *hihiwai*, *'o'opu* come up?

AH: No.

Group: [inaudible – two conversations]

KM: [begin Track 4] . . .So the weather has changed?

AH: Yeah.

KM: When we went *mauka* with uncle Jimmy, he said the forest too, really changed.

AH: Yeah.

Group: [inaudible - multiple conversations]

KM: [begin Track 6] . . . Nice to talk story with you. . .

[discussion with Albert Honoka'upu and Harvey Wilhelm]

KM: So it's really Nā'ili'ilihāele?

AH: Yeah, yeah, the guys go "Nanihali."

KM: You know, there's an Akina family out Maka'iwa side?

HW: Yeah, I know of that family.

KM: They live on O'ahu now, (Arlene and Charmin Akina), their *tūtū* used to have *'āina* out here at Maka'iwa.

HW: Yeah, right, Akina family. I met the family. When I met her, I mentioned to her that we used to go fishing out there.

KM: You folks?

HW: Yeah.

KM: And the stream flowed all the way down?

HW: Had a lot of *'o'opu* in that stream. The big pond right into the ocean.

KM: What kind of *'o'opu* you folks used to go get?

HW: *Nākea.*

KM: And how about the *nōpili*, you folks?

AH: Yeah, get the sucker cup too.

HW: Yeah. I haven't seen *'o'opu* for years, I don't know if it's still around. Nobody go down here?

KM: How about out here, you folks would go along the ocean. Were there good places to get *'ōpihi* or certain fisheries where you would go?

AH: Oh yeah. There's a trail that we go down. Now they building houses right on the trail.

KM: Oh well, no can sleep night time maybe.

Group: [chuckling]. . .

KM: You'll enjoy when you look at these packets of maps. I got these old maps from Honolulu. . . What you guys were talking earlier, this is so important. If you think back and some of what we were hearing yesterday, it's true. "Just because we did it seventy-five years ago or a hundred years ago. You don't continue to do the same…"

JH: Right, but they expect that.

KM: You have to reevaluate.

JH: Right. In a way I do not blame them because they don't understand that it's not just the water, it's the weather.

KM: That's right, the forest everything. Less rain, the forest goes back, and then if you have, maybe too much pigs and all the alien plants come in. The forest dies back, and you know it's amazing. 'cause you look at the native forest, you get the mosses, the ferns underneath the water stays in the ground. No more fern, moss the water runs away.

JH: Yeah.

KM: You know, changing. So the use has to change also, then.

JH: Right. I agree.

AH: I think it's going to change.

KM: Has to, has to. You know but that was the style. You know the haoles it was, if it was a wet land they called it a waste land you had to reclaim it, reclamation you know. If it was flowing to the ocean, "ah, waste the water."

JH: Yeah.

KM: But they didn't realize the life, the families on the stream you get water flowing the fish grow, you have all of this life, the taros, everything. Everything changed. Nice to meet you, thank you so much.

HR-W: Thank you for coming.

HW: A lot of stories.

KM: It's important. *Mahalo*. This is good for the family… [end of interview]

Marjorie Kaleialoha-Wallett
Beatrice Kepani-Kekahuna (with Lyn Scott and Wanda Vierra)
Oral History
Interview
November 7, 2001
– with Kepā Maly

Marjorie Kaleialoha-Wallett and Beatrice Kepani-Kekahuna (front row, left to right); Lyn Scott and Wanda Vierra (back row, left to right). (KPA Photo No. 2187)

Cousins, Marjorie Kaleialoha-Wallett and Beatrice Kepani-Kekahuna, are direct descendants of the Kepani and Piohia lines. Their *'ohana* have owned lands at Honopou since the 1850s, and their residency pre-dates the establishment of fee-simple property rights in the Hawaiian Kingdom, in 1848 (for further details, see the April 27th interview with Beatrice Kepani-Kekahuna).

Mrs. Wallett was born at Honokahua, Maui in 1932. Her mother was Mariah Kaehukai Lokana (Kepani), and her father was John Kali'a Kaleialoha. The Kepani line ties Mrs. Wallett to the Honopou lands, and her father Kaleialoha, was a native resident of Pa'uwela (as Mrs. Wallett heard it pronounced).

During the interview, Mrs. Wallett, provides readers with an overview of her personal relationship and experiences on the land of Honopou, and the family's reliance upon the water systems. After the initial introductions, Beatrice Kekahuna, joins her cousin and together, they describe their experiences on the land, with the waters, and describe the changes they have observed in their life times. Daughters, Lyn Scott (Marjorie Wallett) and Wanda Vierra (Beatrice Kekahuna), also joined their mothers and shared their experiences on the land and their thoughts on the future of land and water use.

Comments and thoughts raised during the interview include, but are not limited to the following points:

Summary of Selected Topics ***Page***

Discussing *lo'i kalo*, land use and stream flow in the late 1930s-1940s; families in the area all worked together, and helped one another in the *lo'i*, and maintaining the *'auwai* and *kahawai*. 392

Water does not flow with the same volume as it did in the 1930s-1950s; the water is also warmer, and this has affected the health of the *kalo*, and caused river life (for example: *'o'opu* and *'ōpae*) to disappear. 393

Significant changes in water flow and occurrence of *'o'opu, 'ōpae,* and *hīhīwai*, began to occur in the 1950s. By the 1970s, the water flow was so diminished, that the *kalo* would rot in the field because of a lack of water circulation and increased temperatures. 398

Family feels that the break in the natural flow cycle, including periodic flooding when the ditch system cannot handle the water volume, has led to increased erosion of the stream bed. The deeper stream bed, coupled with the diminished water flow, has caused water to drop below the entrances of the *'auwai*. 400

Like her cousin, Marjorie Wallett would like to see more water returned to the stream system. Lyn Scott and family discuss problems with the new proposal by EMI to make one more pipe in the Honopou Stream and "throw another 100,000 gallons of water into the stream." …Family also sees the increased demand (by new residents – those without native tenants rights) for water from the already diminished stream flow, as a significant problem (including those associated with health factors); also notes that present uses and taking of water from the stream is not in line with native traditions and practices. 405

Arrangements for the follow up interview with Mrs. Kekahuna and her cousin, Marjorie Kaleialoha-Wallett, were coordinated through Wanda Vierra, and in consultation with Moses Haia, Esquire (Native Hawaiian Legal Corporation), who is one of their attorney's in the water case. Release of the interview transcript by Mrs. Kekahuna, Mrs. Wallett, and family was granted to Maly on November 20, 2001.

Interview Transcript

[Discussing family background, and recollections of family lands and practices when she was a youth.]

KM: Okay. It's just about eleven o'clock, November 7th, 2001. What *'āina* are we in now, about here. Is this Pauwela or?

LS: This here, Ha'ikū.

MW: Yes, Ha'ikū.

KM: We're in Ha'ikū. Okay. May I please just ask, we're talking story as we've been doing this morning. Your cousin with Beatrice Kekahuna and we just talking story with the *'ohana* about your recollections, growing up and the things that you folks did as children. And how the land and waters are different today from when you were young.

Aunty, may I please just ask for your full name and your date of birth?

MW: My name is Marjorie Kaleialoha-Wallett.

KM: Wallett?

MW: Wallett.

KM: And it's W-a-l-l-e-t? Is that correct?

MW: T-t.

KM: T-t, thank you, okay. You *hānau* when?

MW: March 28, 1932.

KM: Oh, you folks (Beatrice Kekahuna) almost same.

MW: Same year.

KM: Oh, okay. Where were you *hānau*?

MW: [thinking] Honokahua.

KM: Honokahua. How come you were born at Honokahua?

MW: My dad was working for the Baldwins as a mechanic.

KM: I see.

MW: I think it was called Baldwin Packers.

KM: That's correct Baldwin Packers and they had that *'āina* out Honokahua and various areas along there.

MW: Yeah.

KM: So your dad was mechanic. What were they doing out there, do you remember?

MW: Planting pineapples.

KM: Pineapples.

MW: Sugar cane and there were things in the forest, but we couldn't go up there, you know.

KM: What was papa's name?

MW: John Kali 'a Kaleialoha.

KM: Where was he from?

MW: He was from Pa'uwela.

KM: Pauwela?

MW: Pa'uwela.

KM: Pa'uwela?

MW: Yeah.

KM: And that's how you say it then, Pa'uwela.

MW: Pa'uwela.

KM: Not Pauwela? Okay, *e kala mai* I going just wait for the car... [car started in vicinity, recorder off and then back on] …Aunty, that was an important thing you just mentioned. Your recollection is that the *'āina*, the *ahupua'a* where your papa is from is Pa'uwela?

MW: Pa'uwela.

KM: Not Pauwela? That's what you remember. Papa was *hānau* out there?

MW: Yeah.

KM: Okay. And mama was who, who was your mama?

MW: Mariah [thinking]… What was mama's middle name?

LS: Kaehukai.

MW: Yeah, Kaehukai Lokana.

KM: Lokana. But Lokana is Kepani?

MW: Kepani [chuckles].

KM: So they go by two names some. Lokana, some by Kepani.

BK: Kepani.

MW: Yeah. That's what her maiden name was, she went by Lokana.

KM: Lokana.

MW: Yeah.

KM: Oh, okay. Where was mama *hānau*? Do you know?

MW: [thinking] They have a name for that place at Honopou.

BK: Hāmākua Loa, that one?

MW: No.

BK: Where the house was, grandma's house was?

MW: Yeah, they had a name for it. I can't…

BK: Do you remember the name, Lyn?

LS: [shakes head, no.]

MW: I only remember that was Honopou, the whole place.

KM: The whole *ahupua'a* is Honopou.

MW: Yeah.

KM: But it was Honopou. Was this down on the Kepani *'āina* you showed me on the map before, where the house was?

MW: Yeah, yeah.

BK: Yeah, yeah tūtū's house.

KM: The upper one though, the upper parcel?

MW: Yeah.

KM: There were two or three different *'āina*.

MW: Uh-hmm.

BK: She wasn't born over there. She was born by Joe Rosa's place.

BK: Oh, then that would be [thinking]…

MW: Well it's Honopou.

BK: Kahauiki?

MW: No. They also had family…do you know where the bunch of trees are? As you come up Joe Rosa's, and you make that turn inside, they had a camp.

BK: Oh, that's where.

MW: They had houses I know over there.

BK: Yeah. That's where they had that [thinking] is that a monument they have over there. A church or something was there.

MW: I know got a lot of graveyards.

LS: A church up there where the grounds are?

BK: Yeah, that was…I know.

LS: It's on the map.

BK: I know that has it's own place.

KM: Not the old Honokalā Church that used to be?

MW: No.

KM: Okay.

MW: Honokalā was… [gestures, over]

KM: Over?

MW: Yeah.

LS: Way far down the other side.

KM: Okay.

MW: They used to have plantation.

BK: Yeah.

MW: On…

BK: On the top?

MW: No.

KM: The old Huelo Plantation.

MW/BK: Yeah.

KM: That was *makai* and then the wharf was down below.

BK: Yeah.

KM: By your folks side.

MW: They used to have one below Aunty Julia.

BK: Yeah, that's the one he's talking about.

KM: And that old map that I was showing you, the Huelo Plantation Map, I think it's Register Map 862. It's in your packets here.

MW: Yeah, I think so.

KM: Yeah, okay so you *hānau* though, out Honokahua?

MW: Yeah.

[Discussing *lo'i kalo*, land use and stream flow in the late 1930s-1940s; families in the area all worked together, and helped one another in the *lo'i*, and maintaining the *'auwai* and *kahawai*.]

KM: You folks, from what you were talking earlier with your cousin. You folks would always come back over country though, this side.

MW: Yes, but we never stayed.

KM: But you would visit right?

MW: Yeah, we would come and visit.

KM: Weekends?

MW: Weekend, but I never stayed. . . [chuckles] My father would say, "I'd stay outside and sleep in the car with my kids [chuckling]. They're not even going in that house!" My mom would say, "oh, shut up" [chuckling].

KM: Ah, well.

MW: My grandma was a very strict person. . .

KM: . . .You folks, what did these *kākū mā* do. Did they live off of the land down there. Like your cousin describes with her papa them. What did they do? And were there *lo'i kalo* then, by your house?

MW: Yeah. Everybody around the neighborhood came and worked in the taro patch.

KM: One family's taro patch or was it all community?

MW: Well, it was the family but the whole community. If they had to pull taro or clean the patch, if you were home, you'd come there and help.

KM: So, everyone *kōkua*, they would help one another?

MW/BK: Yeah.

KM: And then when someone else had their *lo'i kalo*, or their *māla'ai* or something, they would go *kōkua* one another like that.

MW: Yeah, that's how they would do it.

KM: Around your home, or your kūkū's area?

MW: Yeah.

KM: There were *lo'i kalo* then?

MW: Yes.

KM: And they were all filled with water at various times? Were there *'auwai* that ran through there also, or was it right off of the *kahawai*?

MW: Yeah, they had a ditch.

KM: A ditch, the *'auwai*?

MW: Yeah, coming down to the…coming through her place [Beatrice's] and then coming down to the taro patches.

KM: Okay. Now, where your *'āina* is at Honopou, today when we look at this *'āina* how does it look compared to when you were a child?

MW: [thinking] How does it look like… [thinking]?

KM: You know, are there still *lo'i kalo* that you can irrigate down there. Is the water still flowing through your place? Is the land cleaned or…?

[Water does not flow with the same volume as it did in the 1930s-1950s; the water is also warmer, and this has affected the health of the *kalo*, and caused river life (for example: *'o'opu* and *'ōpae*) to disappear.]

MW: No, the land is not clean [chuckles]. But, there's not enough water.

KM: Not enough water.

MW: The water, you know usually if you have taro the water has to be cold.

KM: I see.

MW: You know. But all the water now that's coming down it's warm, it's not good for the taro.

KM: When you were young, the stream, the *kahawai*, like Honopou Stream flowed all of the time?

MW: All the time.

KM: No problem?

MW: No problem.

KM: And what, the water strong, good flow?

MW: Yes, good flow.

KM: The water was cool then when you were young?

MW: Yes.

KM: Filled the patches, the *lo'i*?

MW: Right.

KM: And the taro grew strong, good?

MW: Right.

KM: About how many *lo'i* do you think the *'ohana* had around that were worked?

MW: [thinking] Good grief… [thinking] I think about in the thirties.

KM: For real?

MW: Yeah.

KM: Do you remember the kinds of taro that your *'ohana* grew?

MW: No.

KM: No.

MW: I only know there were red and green.

KM: Red and green?

MW: Purple.

KM: So?

MW: The stem.

KM: The stem.

MW: Yeah.

KM: Some type of *mana* or *ha'akea*, *piko*?

MW: The name of it, I can't remember.

KM: You can't remember. Were you folks, when you would come here, did you stay one night or did you come early morning and leave the same day?

MW: Leave the same day.

KM: Papa didn't want you folks staying out there?

MW: Yeah.

KM: Were you growing taro out in your *'āina* at where daddy was working out at Honokahua?

MW: No.

KM: No.

MW: It was a camp.

KM: How far *mauka* were you out there, or were you near the *lae kahakai*?

MW: [thinking] We were walking distance.

KM: Of the shore?

MW: To the shore, yeah.

KM: Interesting.

MW: Now, there's a hotel there.

KM: *'Ae*.

MW: I don't know what they call it.

LS: Ritz Carlton.

KM: Carlton, Ritz.

MW: Yeah. That's where I was born.

LS: Two houses down from the hotel.

MW: Yeah.

KM: When you were young, coming in the day time out there, did you go out into the *lo'i kalo* with the *'ohana*?

MW: No.

KM: Watch?

MW: Just watch. [chuckles]

LS: No, you went in and worked the taro patch, you cut uncle's toe off.

MW: No, no. [chuckling]

Group: [laughing]

KM: Is this uncle Kele or…?

LS: No, her brother.

MW: Well, when we were living out there.

KM: When was…out Honopou?

MW: In Honopou.

KM: When was this?

MW: Oh, this was in the [thinking]…

LS: Do you remember how old you were, mom?

MW: Seven.

LS: You were seven.

KM: This was 1940-ish.

MW: Yeah, just before the war.

KM: Just before the war.

MW: Yeah.

KM: Okay.

MW: We moved back because my dad…my mom wanted to go back and grow taro.

KM: Yes.

MW: So my dad quit his job and then we all moved back there.

KM: Okay. So, from when you were seven, if you *hānau* 1932 by the time you were around seven years old, 1939, 1940 you did move back to Honopou.

MW: Yeah.

KM: You lived on the *'āina* that you folks have now?

MW: No, no. In, when the war started we moved out here.

KM: Oh.

MW: To Ha'ikū. We have a home down there.

KM: Yes, okay.

LS: Right here.

MW: Across the road.

KM: You folks still would go take care of…mama's want, was to go back?

MW: Right.

KM: Work the *lo'i kalo*? Okay. How many *lo'i kalo* were you folks working when you were young.

MW: I don't know.

KM: Quite a bit though, do you think?

MW: Too much.

Group: [laughing]

KM: Too much, hard work right? So, you folks had water flowing enough to grow taro; and were you doing taro for family use and to sell for livelihood?

MW: Just family.

KM: Just family.

MW: Family.

KM: Okay. To sustain and care for your family?

MW: Right.

KM: Okay.

MW: Then later on then my mom sold to the markets, taro.

KM: Yes.

MW: To the market in Wailuku.

KM: Wailuku.

MW: And vegetables and stuff like that.

KM: They had, were the vegetables also down on that *'āina*?

MW: Yeah.

KM: You folks had some *lo'i kalo*? Some place where they make *māla*, you know the gardens like that, vegetables and stuff.

MW: Right.

KM: When you were young going out there, did you go into the *kahawai*, out into the stream like that?

MW: Yes.

KM: Did you folks get *'o'opu*?

MW: Yeah.

KM: *Hihiwai* like that or…?

MW: Yeah.

KM: Even *makai*, near the shore down there?

MW: No we couldn't go down to the beach.

KM: But in the vicinity, it's the *makai* lands.

MW: Yeah. By the pond you know in front of the house. We could go, that was our limit because we had to go with an older person.

KM: Yes. If you compare today to that time, if you wanted to go get *'o'opu* from the same place today, where you used to go. Get *'o'opu*? Can you still find?

MW: [shakes head, no]

KM: How come? And I'm sorry, you said no or yes?

MW: No.

KM: No, you no can?

LS: Remember he's recording, you have to talk.

MW: The water is warm and less.

KM: Less, today than before.

MW: Than before.

KM: When did that start to happen do you think. When is the last time you could have gone to get *'o'opu* or *hihiwai*, or something down that place that you remember?

MW: [thinking] I think like in like the late '40s.

KM: In the late '40s.

MW: Yeah.

KM: [asking Beatrice Kekahuna] Aunty, does that sound similar to your recollection? The last time maybe that you folks could go get *'o'opu, hihiwai*…near the family homestead.

MW: No, no that's me.

KM: That's you.

MW: Like the late '40s.

KM: In the late '40s.

MW: Because in the '50s I was gone.

KM: You were gone, okay. Still had, when do you think… You said that when you were young you could get *'o'opu* like that?

MW: Yes.

KM: Now, you no can find any, right? Because the water is less and too warm?

MW: Yes.

[Significant changes in water flow and occurrence of *'o'opu, 'ōpae,* and *hihiwai,* began to occur in the 1950s. By the 1970s, the water flow was so diminished, that the *kalo* would rot in the field because of a lack of water circulation and increased temperatures.]

KM: Okay. When did that happen, do you have an idea of when that happened that now you can't find anymore?

MW: [thinking]

KM: Or was it just a gradual thing and you didn't really keep track of it?

MW: I don't think it was a gradual thing, I think it was abruptly cut.

BK: Actually in the '50s.

KM: In the '50s?

BK: In the '40s, we still had.

KM: Okay. See, that's important…

BK: Gradually, when she was gone, it went down.

KM: *Emi* [receding] everything went down and down, okay. [pauses] Well, I'll jump into this and you know please when you recall something that we should [talk about]. What would you say is the reason that the stream, the water flow, and that the land is different today then when you folks were young. How come?

MW: How come?

KM: How come? How come no more water now from when you were young?

MW: [thinking] I guess they diverting it, I don't know. [chuckling]

KM: Okay, okay. Obviously they were diverting water before you were *hānau* because they had ditches yeah. The ditches started in the 1870s. So other things…has the land, have the rains, has the weather changed also do you think?

MW: It has.

KM: It has, from when you were young? Aunty [Beatrice], you said that too, in your recollection, you described that.

BK: [nods head, yes]

MW: Not changing the subject but there's another ditch, right.

BK: Compared to that time, those years, the water was there we had a lot of water but gradually they were shutting off a couple of places, you know EMI. And the flow, the water flow wasn't coming right, they diverted some of the water. So in the '70s I think, that's when you could see that the water was gone, not much water. Already in the '70s the taro started to get rotten, *palahū*.

KM: Oh, so by the '70s you folks were having a hard time to grow taro?

BK: Yeah, because by that time my dad was sick but he still planted, so we have to go in there. I used to live here, and we have to go in there help him pull taro. By then his taro started to get rotten.

KM: For real?

BK: Yes. And then in the '80s…was in the '70s he died during the '70s, so after he died it was worse. It's like today, now.

KM: Okay. Your *'āina*, aunty Beatrice and your *'āina* Aunty Marjorie are different *'āina*?

BK/MW: Same.

KM: Same place?

MW: Yeah.

KM: Okay. Same, same *lo'i* so the experience is the same.

MW/BK: Yeah.

KM: There was something interesting that you, and I'm sorry sister, your name?

LS: Lyn.

KM: Lyn and you are?

LS: I'm her [Marjorie Wallett's] daughter.

KM: Do you carry Wallett or?

LS: No, Scott.

KM: Scott, okay. Had one famous Scott. Who was that Scott, Phil Scott them, that's EMI guys no that's not…so you're not…

LS: No.

KM: [chuckles] Okay. One of the things that's interesting about, you had brought up when we were talking earlier is that, where before the water flowed higher and it flowed naturally into or with the *'auwai* into your *lo'i* system. Now you said that even the cut in the stream, the *kahawai* is deeper right?

MW: The water, when we take water and go into our little *'auwai*, if you let the water go to a certain extent, depending on the water…how much water coming, then the *kahawai* don't have water.

KM: So, the flow of volume is less?

BK: Less.

MW: Yes.

[Family feels that the break in the natural flow cycle, including periodic flooding when the ditch system cannot handle the water volume, has led to increased erosion of the stream bed. The deeper stream bed, coupled with the diminished water flow, has caused water to drop below the entrances of the *'auwai*.]

KM: But, one of the interesting things that you were talking that's what I was leading to, and you had brought up. That now, sometimes they let water flow, big volume.

MW: Yeah, like now.

KM: Okay. And what happens to the stream, it gets?

MW: They have their water, they're happy, they have their water.

KM: But, you were talking about erosion is the problem.

LS: It causes erosion.

MW: Yeah.

KM: Because the flow isn't the natural cycle kind of things, so the stream bed is getting cut deeper. Is that right?

MW: Yes.

KM: So, now even where you had *'auwai* or where the *kahawai* would flow and feed the *lo'i* it can't because it's cut deeper?

MW: Yeah, because of that big water rush, so it hits the side takes the rocks away.

KM: Okay.

MW: So that's why the water gets low, the bed.

[Increased erosion, as a result of periodic releasing of strong flows from the ditch system has led to siltation and damage to the *papa* (reef system), and near shore fisheries.]

KM: The stream bed is lower. What's the out, what happens cause you were saying then, if you go out onto the *papa*, you know, down to the *kahakai*.

MW: Yes.

KM: What's happened to the *papa* then as this erosion has occurred? Has the *papa* changed?

MW: Oh yes. It's been taken out with erosion.

LS: Drastic.

KM: So, all that…Lyn, you had said, siltation, right?

LS: Yes.

KM: So, your *limu* changed, the *papa*, the reef itself is changed. No more *limu* what happens to your fish?

MW: Don't have the kind of *limu* used to have.

BK: Yeah.

MW: We used to have a lot of different kind limus, I remember that.

KM: Yeah.

BK: Used to go with my mom or my dad or by ourselves you know we used to go pick up.

KM: Yeah. This is a very important thing because you know even like when we were at that [BLNR] hearing on May 25th, as you had said some guy mentioned and we said the haoles look at it like, "Oh, if the water flows from the mountain to the ocean, they call that waste." Right?

BK: Yes.

KM: You folks didn't think that was waste did you?

BK: No, no.

KM: That was the natural cycle.

BK/MW: Yes.

KM: The water from the mountain you get even fish in the sea, right. All the *limu*, the nutrients.

BK: Right.

KM: Everything comes.

MW: Right.

KM: But now, it's changed, is that right?

BK: Because in the seventies, by the seventies we didn't have there's no *moi li'i* yeah we used to go hook 'em, I remember we used to hook *moi li'i*.

KM: Yes, you described that earlier.

BK: When it came to the seventies no *moi li'i*, it was the water.

KM: That's right, see they are like herbivores, they go out like, they eat the *limu* and things like that right.

BK.MW: Yes.

KM: So if the siltation comes down, the *papa* is covered over, the *limu* doesn't grow like it did, the fish can't come in, right?

BK/MW: Uh-hmm.

KM: Even *'o'opu*, now before when you were young you could go get *'o'opu* now, no more water, no more the *limu*, or too hot you said?

BK: Yes.

KM: Too warm.

MW: Too warm the water.

KM: Yeah.

BK: Because the water is so, there is so little water that the water warm.

LS: Sometimes we don't even get water.

KM: There are two…you were describing earlier, if we go down Honopou there's the weir, the cement thing and the ditch where they catch the water take it down. And there's two pipes is that right?

Group: Yes.

KM: Now, so, is that enough water for you folks, those two pipes.

Hai'kū Ditch Intake, Honopou Stream, April 9, 2001 (two pipes drawing water from stream basin for family use); Flow estimated at 200,000 per 24 hour cycle (no rain in preceding day). (KPA Photo No. 1374)

BK: No.

KM: No.

LS: And it's warm water, from the top is warm not cold water from the bottom.

KM: I see.

MW: Further up the stream we were able to get colder water.

BK: Because our water used to come out from the ditch.

KM: That's right.

BK: We had, they had a little *puka* going.

KM: There's a *puka* yeah?

BK: Yeah.

KM: And get one metal gate or something?

BK: Yeah.

KM: Is that the one your folks *kākā* used to go, or your dad them…?

BK: Yeah, my dad used to bust it up.

KM: Bust 'em up, how come they would bust it up.

Group: [laughing]

BK: Because didn't have enough water, they shut the water, and didn't have enough so…

KM: And that comes out of the tunnel and if they open the gate the water could return to the stream. [see page 338; KPA Photo No. 1375]

BK: Yeah.

KM: And it would flow with greater volume.

BK: Yeah, and that time we had cold water. The water was really cold because it's coming all the way from the ditch.

KM: Yes.

BK: And in the tunnel, whereas now we having it straight from the mountain and it's wide open.

KM: Ahh. But see, if it came straight from the mountain in natural flow it would still be good.

BK: Yeah.

KM: But, now the flow is diminished, the water is warming up, so what you get through the pipes is warm?

LS: It's actually not mountain water.

KM: That's right.

LS: It's actually only from one stream between the two diversions.

KM: Oh.

BK: Yeah.

LS: They are diverting the water, so we're not actually getting mountain water, we're getting spring water. So when everything dries up in times of drought, which it has been a drought in the last five years.

KM: That's right.

LS: That's why we don't have our normal 'o'opus. You know, we've spoken with Skippy Hao and we don't have the cold enough water for that.

KM: Yeah.

LS: So these newer introduced species come in and we've got all of those.

KM: That's right, and they consume everything yeah?

LS: Everything.

KM: And so the native species, the *'o'opu*, the *'ōpae kala'ole* or what like that, can't survive with that kind of competition.

LS: Right. Even with the little baby clams, now you see clam shells.

KM: Oh, for real.

MW: Yeah.

BK: We didn't have those, now we have those.

KM: Oh.

BK: And it's sitting under the dirt, if you go and [gestures fanning away the dirt] …

KM: Yes, yes.

BK: They just pop out.

MW: Yes.

KM: Hmm. So it's changed dramatically from when you folks were young.

MW: Dramatically.

KM: You could live off of and sustain yourselves on the land when you were children?

BK/MW: Yes.

KM: Now, it's not like that. I mean I guess if you wanted to grow foreign vegetables and stuff, or some kind of stuff you could but to live in the style that you or your *kūpuna* did, with *kalo* on the land like that, you cannot?

MW: No.

LS: Now they get spam.

Group: [laughing]

KM: But you see that's the *pilikia* right.

LS: That's it.

KM: What does the spam give you?

LS: Nothing.

KM: Poison really you know, no good in the long run. You know look at our diet, our families yeah, *ma'i*. Plenty *ma'i*. If you only eat out of the can, no good.

BK: Yeah, it's way better, when straight from the land.

LS: They call it "progress."

KM: So they call it right. What would you like to see? Aunty [Beatrice], you had shared your *mana'o*.

[Like her cousin, Marjorie Wallett would like to see more water returned to the stream system. Lyn Scott and family discuss problems with the new proposal by EMI to make one more pipe in the Honopou Stream and "throw another 100,000 gallons of water into the stream."

Family sees the increased demand (by new residents – those without native tenants rights) for water from the already diminished stream flow, as a significant problem (including those associated with health factors); also notes that present uses and taking of water from the stream is not in line with native traditions and practices.]

MW: I'd like to see more water, oh please.

KM: [speaking to Lyn] And you had said they'd been talking evidently and there's a proposal that, "Oh they're going throw…" How much water is supposed to be going out of those pipes now?

LS: Two hundred thousand gallons a day.

KM: Two hundred thousand gallons a day, that's not enough water though.

LS: No.

KM: How many families by the way are living down there and need to use…

MW: Oh boy!

KM: Let's start with the native families. How many native families, *kama'āina* families should be living there and using that water?

LS: There are so few *kama'āina*, there's only us and the Crozier's up the road.

KM: Okay, and that's it?

MW: Uh-hmm.

LS: Yes, *kama'āina*.

KM: Everybody else are *malihini*?

LS: They are selling their properties, and are advertising that "you aren't on the grid, but you can take water from the stream." But not really telling them that "they should apply with the Water Commission, or that the water itself can be contaminated with leptospirosis because of the poor flow." Which makes our plight even harder, because not only are we two miles down the stream where we loose a lot through evaporation, but also because other people would like to be using that water also.

KM: So, in between the highway today and where you folks are… You folks are *makai* nearer the shore?

MW: Yeah, about two miles.

KM: About two miles below. In between you and the road all this *'āina* is being sold to *malihini*…

Group: Uh-hmm.

KM: …who are being told they have the right to take water also.

MW: Yes.

KM: And that's an interesting thing…

LS: And they're misinformed.

KM: That's right they are because I believe that under the Kuleana Act, and in the Grant Act of the Kingdom those who were the original grantees or the Māhele Awardees had the right to water, the right to access, the trails, and to the collection of things that would sustain them on the land, but not other people from outside. Right?

BK: That's right.

KM: And so, now if you had, lets say between you, the road, lets say there were fifteen families when you were young. Let's say [for this discussion] I don't know if that's a right number, but today if you get fifty families using that same water, you get what, nothing?

Group: Yeah.

KM: Now there's a proposal maybe that they're talking about, "Oh well, we'll throw another hundred…" So the Ditch Company (EMI) is saying now that they're proposing to throw another hundred thousand gallons in?

LS: They're installing a third pipe and saying that that should suffice us even through times of drought when it gets dry. But if they're going to give us a third pipe from the top of the pond, when the pond goes low three pipes aren't going to get anything out of nothing.

KM: It's interesting because in the few times that I've been out there, I've been out there like you said in the drought period where you can see trickle, only a trickle of water out of the two pipes. In fact only one pipe had water. When get plenty water it's ooshing out right but just what you said when it drops down if there's not rain for maybe a week or something, hardly no more water.

LS: That's right.

KM: So that's an important point. The pipe can't come out of the top, it's got to be down right or an opening down so that the water is always coming out. Three hundred thousand gallons of water, is that enough if you get…

LS: No.

KM: It's because there are still so many people taking water out that don't have…

LS: Right. And it's still not enough of a flow to keep the water cool and keep the stream first. Maybe years ago, there were only fifteen families on the river.

KM: Yes.

LS: But those fifteen families would take the water and give it back.

KM: That's right.

LS: Now the fifty families that move in take the water but they don't give the water back to the stream.

KM: That's right.

LS: They take it they store it in their tanks you know when their tanks go low they fill it back up and nothing goes back into the streams.

KM: And this, aunty Beatrice and aunty Marjorie, this is what you see then?

BK/MW: Yes.

KM: Too many people now taking water?

MW: Yes. Like with us, the water comes into the house and goes back into the river.

KM: That's right, and that's the old style right. When you work *'auwai*, and they just like you said the *'ohana* they would come together. Everyone would work together but they draw the water out it irrigates the field or it takes care of the home needs, but then the stream was replenished because the *'auwai* would take it down.

MW: Right.

KM: Okay, that's the old style.

BK: And that was an every day affair, the water was not stopped. The water, it goes to her place comes from the *'auwai* just up where I live.

KM: *'Ae*, yes.

BK: The water goes down there, used to take care of those taro patches down there where all the *lo'i* are.

KM: *'Ae*.

BK: And yet the water would go back into the stream, never stop.

LS: That's the sad part too, because now that we have very little water, and when we take water now the part of the stream that is surrounding our properties doesn't get any water so our own ponds don't have water because we need it for our own domestic use. And then it goes back to the stream after us [chuckles] too neighbors so… It's one or the other thing. Do we want water in our stream or do we want water for our homes. Right now we do use the water domestically.

KM: Yeah.

LS: And which is a crime too because with *leptospirosis* in there you would think they would think that health wise they would want to give us better water that we bathe in and wash our dishes in and irrigate in.

KM: That's a time bomb waiting to…

LS: Exactly.

KM: If the *'ohana* are bathing in this water…and that's how simple it could be, you go outside you scratch yourself, and come home *'au'au*, if the water doesn't have a substantial flow.

BK: You going have infection.

LS: It becomes contaminated.

KM: *Ma'i*. Are you folks living down there? You're living down there now is that right.

BK: Yeah, we are, all of us.

KM: You're living down there now too?

MW: Yes.

KM: Hmm. [pauses] It's an interesting thing, the environment has changed, the weather patterns have changed.

BK: Yeah, they changed.

KM: Less water, more people have moved in from away, taking more water.

LS: More people come to use the ponds too.

KM: That's right, oh for real.

LS: That also brings up the water temperature. We're in the guide books there's more than just one pond that people come swimming in.

KM: Oh, yes I saw that. There are certain areas they gave these cute little names they give this Sweetheart Pond or something like that right?

LS: Right.

KM: Down there, and you go…so that's all that Honopou Stream that comes down to you folks?

Group: Uh-hmm.

LS: And there's more people that live up above the highway too, that live on Honopou Stream.

KM: That's right. Is it hard to get down to your folks place?

LS: No. Getting too easy as a matter of fact more people come.

Group: [laughing]

KM: Yeah.

LS: Even the dog catcher come.

KM: *'Auwē*!

BK: And the policeman comes.

WV: Fire truck not yet, but they watch us from the hill.

KM: So, aunty Marjorie to you, like your cousin you want to see more water flow through the stream here?

MW: Exactly.

KM: When we were talking you know we'd mentioned like you know this water and that water is life.

MW: Life!

KM: No water, hard to live.

MW: Yeah, that's our life.

KM: Yeah, *wai o ke ola.* [thinking] Are there things, is there some other stuff that we should try to talk about?

LS: Mind drew a blank for a little bit [chuckles].

KM: But you know I think we've covered some basic points that at least demonstrate the change that has occurred. And it's good that you can bounce around and think about when it was. That's important also.

LS: There's at least a couple acres, taro patch land, *lo'i* are still there. Right now nothing's really in them. We just have tiny gardens and things.

KM: These are your folks *'āina*?

LS: Yes.

KM: Who are the *'ohana* that would be…in your mind if you think about it of the *kama'āina* families. Who would be growing taro down there if there was more water?

LS: Us.

KM: You folks.

BK: Us and the people above us.

LS: Yeah, the Magliatos.

KM: Okay.

LS: Who also has a double edged sword because she's a Rosa they have property, they grow taro, but he works for EMI.

KM: Yes.

LS: And he was told that if your wife speaks up, "you may loose your job."

KM: *'Auwē*!

LS: That's what I heard. It's only hearsay.

BK: That's what happened to Jackie.

LS: Aunty Jackie Honoka'upu?

BK: She works for EMI and her husband works for EMI so there's some things she got to watch out. I know that.

LS: She'd like to, but she's got to make a living, she got to eat, she got to feed her kids, her grandchildren. She has mortgages and… It's not that easy.

KM: I think this is good though, you know, we talked. As I said we're gathering together some of these *mo'olelo* so we can demonstrate in a formal way how the land was used, how it's changed and what you would like to see to try and *ho'ōla hou*, to give it life again.

WV: I remember seeing these humongous taro leaves. Looking out into the *lo'i* all you see is the big huge taro leaf. You don't see the body but you see the leaf [chuckling].

Group: [chuckling – agreeing]

KM: It's so beautiful isn't it, *kapalili*, how it just quivers.

BK: Yeah.

LS: And when it rains.

WV: I used to sit on the side and watch my grandfather.

BK: My brothers were naughty, and when my father would come home from work, he'd go around and look, and some of his lumbers were cut. They were making four wheel carts, soon as they hear my dad….zoom, they were gone. Where were they, in the *lo'i*.

KM: [chuckles] Hiding?

BK: Under the taro [chuckling].

KM: Oh amazing.

LS: Hiding under the leaf, aunty?

BK: Yeah. And you know they get in there, they jump. Because if they walking in, directly in… the mud.

KM: He can see.

BK: Yeah. They would jump as far as they can and stay there. The leaves were so huge, the leaves were so huge [gestures – growing overhead].

Group: [chuckling]

KM: That's an interesting thing too because you mentioned earlier, because now there's been some rain yeah…?

BK: We used to have that kind *pūpū lo'i* too.

KM: You did, the *pūpū lo'i*.

BK: We lived, I know I lived on it.

KM: Yeah. Did you hear the name *pūpū lololo kahawai*?

BK: No.

KM: But you called it *pūpū lo'i*?

BK: Yeah. Because they were in the *lo'i*.

KM: That's right. There's a, you talk about how beautiful it is to see the *lau kalo*, the *lū'au* how it would quiver in the wind like that, or the rain in the *piko* like that. [Aunty Beatrice] You mentioned how beautiful…you loved to hear today, because the rain is flowing the *kahawai* is going and you…what, nice to hear the sound?

BK: Oh yes, yes!

KM: Yes, beautiful to hear the streams?

BK: Some people from out here when they go in there and they sleep, they cannot sleep.

LS: Too quiet.

BK: They're afraid that the water going wash them away, you know.

KM: Nice to hear the stream now because the rain has been coming some yeah?

BK: Yes it is. I always go down the *kahawai* and just sit and just watch the water.

KM: *Nānea.*

BK: And when the water is low I want to just cry. Where's the water? Because the water is so low.

KM: Yeah.

BK: But you can see the water drop, you know.

KM: You can?

BK: Yeah. You watch the water on the rock.

KM: Even in a days, a few hours time I guess when the rain is *pau*, the sun comes out, it starts to dry. You can actually see?

BK: Can see.

KM: Within a couple of hours I guess, that the water line where it was now, lower?

BK: Yes.

KM: Wow, that's amazing!

LS: You can imagine them kind of slowly turning the wheels, closing the gate till the water goes.

KM: It's all automated, plenty of it is automated.

LS: Some of it is automated how they can tell, gauge the water.

KM: Yeah, that's right.

LS: A lot of it still they have to go out there and change it.

KM: Yeah. I think Honopou section has one…

LS: Yeah, it has a house there, it's a gauge house.

KM: Yeah. That's interesting too.

LS: Because they still have to come out and manually flop those gates down.

KM: Amazing!

LS: Until somebody goes over there and steals their solar panels.

Group: [laughing]

KM: That's what I heard, so no can work.

LS: Twice up there, wasn't us. But it was twice.

BK: Two times.

LS: It wasn't the *kama'āina* that did it either [chuckling].

WV: Always the first one's to blame.

LS: That's right.

BK: Because we notice you go up the road, you come down the road you look and it's there. Go up the road, you go for weeks you look again, it's not there.

KM: Oh someone get electricity now.

Group: [laughing]

BK: On EMI.

KM: Can watch TV at least, I guess.

LS: No microwave.

KM: *Mahalo*! May I get, what's the best mailing address and if I can get a phone number.

LS: Sure, I'll write that down for you.

KM: *Mahalo*, thank you. . . [end of interview]

Joseph C. Rosa, Jr.
(with Nālani Rosa-Magliato)
East Maui Oral History
Interview
(Waipi'o-Honopou
Vicinity, Hāmākua Loa,)
November 8, 2001
with Kepā Maly

Joseph C. Rosa Jr. (KPA Photo No. 2193)

Kupuna Joseph C. Rosa, Jr. was born at Hōlawa in 1916. His mother was pure Hawaiian and tied to native families of the Halehaku vicinity. Kupuna Rosa's father was pure Puerto Rican, but he settled into Hawaiian life in the Huelo area as a *paniolo*, and maintained herds of cattle on lands of the former Huelo Sugar Plantation (the lands situated *makai* of the old Highway). The elder Mr. Rosa and his wife purchased a portion of the Honopou lands of the Kepani Royal Patent Grant, and Kupuna Rosa's earliest recollections include journeys from Hōlawa to Honopou, where the family kept a small home, and about 12 *lo'i kalo*.

Kupuna Rosa is a gifted and animated story teller, with good recollection of places, practices, and events that have occurred on the land and in the stream conditions over the last 80-plus years. During the interview, he was joined by his daughter, Nālani Magliato, who with her husband and family still work the *lo'i kalo* and lands which Kupuna Rosa describes in the interview.

The interview was conducted in Hawaiian and English, and the narratives are given verbatim. Kupuna Joseph C. Rosa, Jr., granted his personal release of interview record to Maly on November 19, 2001.

In this interview, Kupuna Rosa describes historic residency, and native practices and customs associated with land and water use in the Waipi'o-Honopou vicinity. His recollections and observations include, but are not limited to the following points:

Summary of Selected Topics ***Page***

The *kula* lands of the Waipi'o-Honopou vicinity, below the old road to Hāna (formerly a part of the old Huelo Plantation), were used for grazing cattle; irrigated taro lands were situated near the *kahawai*. 416

Family raised *kalo*; the stream of Honopou flowed everyday from the uplands to the sea. The water was (and remains) of great importance to the families of the land; it gave them their lives and livelihood. 419

Describes the nature of the *lo'i*, *'auwai*, and kinds of *kalo* raised by the family from the 1920s; and access to the land. 421

'Auwai and *lo'i* (including *kuāuna* –pond walls) are basically the same ones that were on the lands from the old days. Describes the dimensions of the *'auwai*, its relationship to the *kahawai* (stream), and operation of the system… Recalled that in ca. 1929-1930, there was a severe storm, that cut the stream bed lower than the *'auwai*; as a result, his father made a dam pond which caught water to throw into the *'auwai*. Though rebuilt, the same *kūmano* (dam) is used by the family to this day. 422

He has taught his children about the land, *lo'i*, *'auwai*, and *kahawai*; his daughter Nālani and her *'ohana* continue to work the land as he did from his youth… The *lo'i* were planted in cycles, and the land allowed to rest; mulching was also used to enrich the land. During his youth all of the families worked together, and the product of that labor, whether from land or the ocean was shared among the families. 424

There was an abundance of *'ōpae*, *hīhīwai*, and *'o'opu* in the Honopou Stream during his youth, and through Nālani's youth (found even the vicinity of their *lo'i*). 426

When he was young some of the *pa'akai* (salt) used by his family was still made by native families of the Kīhei side, and traded for goods from the Hāmākua side. 426

It is his observation that the water flowing in the *kahawai* is the same today as when he was young; he and Nālani both note that people above them use the water in ways that are damaging to the system (putting soaps and oils into the water, through their various uses). Nālani notes that the water is not as cold as it was, because of changes in the flow volume and source, and this is problematic for taro growers. 428

'Alaea gathered for medicinal purposes from the *'ili* of Kāpala'alaea, in Halehaku. 432

Describes customs associated with gathering *limu*, fish, and other resources – one took carefully, respectfully, and with prayer; taking only what was needed. 433

While the water still flows, more could be used. The stream landscape has changed as well, and some families cannot get the water from the same areas they used to. When he was young, the families all worked the *kahawai*, to maintain the *kūmano* (dams), overgrowth, and keep the flow steady. 435

Lo'i and *kuāuna* on their land, are from the old days – built before Kupuna Rosa's time; family always maintains them. It is the way of life. Periodic flooding of streams when EMI throws water out of the ditches, causes erosion and damages the *lo'i*. 437

Discusses the practice and belief that if you "Care for the land, the land will care for you." *Wai* (water) is of great importance and value for the people and the land – "*Wai o ke ola*!" (Water is life!) 439

Describes life on the land – and fishing when he was a youth; traveled with his mother, and fished various locations along the coast. The land and ocean, and their hard work sustained them; they bought only a few items, and mostly fed themselves by their own work and care of the land. 440

Interview Transcript

KM: It's November 8th, 2001 and the time is just about ten fifteen. *Kūkū, mahalo nui i ko ho'okipa ia'u, a hau'oli kēia hui hou 'ana.*

JR: *Mahalo nui iā 'oe, kou hele mai 'ana.*

KM: *Mahalo. A me Nālani.*

JR: Uh-hmm.

KM: *E kolekole 'ana kāua e pili 'ana kou wā li'il'ii, kou mana'o o ka 'āina, ka mea au i hana ai. Nā mea like 'ole.* And *kūkū, e kala mai ia'u. Maopopo 'oe, 'ano hemehema wau ma ka 'ōlelo,* but *hiki iā kāua… Inā makemake 'oe e kama'ilio Hawai'i, Hawai'i. Haole, haole.*

JR: *Kāhi manawa nō ho'i, kama'ilio Hawai'i, kāhi manawa no, kama'ilio haole.*

KM: *Mahalo. Kūkū, 'o wai kou inoa piha, a makahiki a me ka lā 'oe i hānau ai?*

JR: *Ko'u inoa o Joseph Clifford Rosa, Junior. Ka makahiki ka'u i hānau ai, 'umi kumaiwa-'umi kumaōno. Ka makahiki kēlā, Apelila 'umi-kumaōno, ka lā o ku'u hānau 'ana.*

KM: *'Ae. Kou makahiki, o* nineteen?

JR: Nineteen-sixteen.

KM: *Aloha no, mahalo ke Akua. I hea 'oe i hānau ai?*

JR: *Hānau 'ia wau i Huelo, Hōlawa.*

KM: *'Ae. Makai?*

JR: *Makai.*

KM: Okay, we're looking at a couple of maps here *Tūtū,* this map is from 1881, Number 862 [Huelo Plantation Map], showing the Huelo, Honokalā, Honopou area. Now earlier, you were describing this area and *tūta* was just pointing out. What area about do you think you were born, if this is the old mill.

JR: I was just above the old mill.

KM: Ahh.

JR: Just above the old mill.

KM: Who's *'āina* was that?

JR: At that time, as I remember, where the mill was located, it belonged to Charlie Kiakona.

KM: Kiakona, *'ae.*

JR: Yeah, Charlie Kiakona. He was the owner of that property to my knowledge. I was born just above the area where the mill is. Say maybe about a quarter-mile above, that way.

KM: Okay. So the old road…and you said even this road, you kind of recognized yeah?

JR: I do, yeah I remember.

KM: So you were *hānau*…it's really Honokala or is it…?

JR: No, not Honokalā [as pronounced], Hōlawa.

KM: Hōlawa, okay.

JR: Honokalā was I think a little bit further up.

KM: Up, okay. Good, good. Who was your father and your mother? Who were your parents?

JR: My father was Joe C. Rosa. My mother was Kame'e 'Aula.

KM: Kame'e 'Aula?

JR: Kame'e 'Aula. My grandfather was 'Ukiki 'Aula, he originated from Moloka'i.

KM: *'Oia*? And your papa?

JR: My father came from Puerto Rico.

KM: Oh, I see. *He hapa Hawai'i 'oe*?

JR: Yes, *hapa.*

KM: *Ma ka 'ao'ao o kou makuakāne, a'ale?*

JR: *A'ale, he Pokoliko. He paniolo 'oia.*

KM: *O paniolo!*

JR: *Hānau ai 'oia i Pokoliko.*

KM: Hmm. *I hea 'oia i paniolo ai?*

[The *kula* lands of the Waipi'o-Honopou vicinity, below the old road to Hāna (formerly a part of the old Huelo Plantation), were used for grazing cattle; irrigated taro lands were situated near the *kahawai.*]

JR: *Kona makuakāne me makuahine, he paniolo.*

KM: *'Ae, i hea? Haleakala Ranch, o makai nei?*

JR: No, no [points to lands of Waipi'o-Honopou vicinity on Register map 862].

KM: Oh down here. *Ua alualu a hānai pipi lākou ma kēia 'ao'ao makai?*

JR: Yes. *Ma ka 'ao'ao o Honopou, Huelo, Waipi'o.*

KM: *'Ae*. So on the *kula* lands below the old road?

JR: Below the old road, that's it, below the Hāna Highway.

KM: *'Ae*. And mama was 'Aula?

JR: Yes.

KM: *No Moloka'i 'oia?*

JR: No, *ku'u kupuna, Ukiki Aula, no Molokai. Ku'u makuahine, hānau 'oia i Halehaku.*

KM: *'Ae.*

JR: *Ka makuahine o Pahu…* [thinking] *poina au ka inoa…'auwē nō ho'i e! Pahunui ka makuahine.*

KM: Hmm. *Kama'āina lākou no kēlā 'āina, Halehaku?*

JR: Yeah, *Halehaku no kēlā wā. Lākou i noho ai i Halehaku. Hānau ku'u makuahine i kēlā 'āina o Halehaku.*

KM: *'Ae. A he kama'āina 'oe…and kēia manawa loa 'āina Honopou. Pehea 'oe loa kēlā 'āina, he 'āina kupuna?*

JR: *Na ko'u makuakāne i kū'ai kēlā 'āina, no kekāhi wahine i noho ai i Honolulu.* [thinking] *Poina au i kēlā inoa.* [thinking] *Kū'ai 'oia i kēlā 'āina, a nāna nō i hā'awi mai kēlā 'āina ia'u.*

KM: *Maika'i!*

JR: *A hā'awi au kēlā 'āina i ku'u kaikamahine.*

KM: *O Nālani.*

JR: *Nālani.*

KM: And Nālani your last name?

NM: Naihe-Magliato.

KM: Magliato. But also Naihe?

NM: Naihe of Hāna.

KM: Hmm.

NM: My dad.

KM: Okay. [speaking to Kupuna Rosa] So the sugar was *pau* when you were young?

JR: Yes, it was *pau*.

KM: *Pau* already.

JR: Was *pau* already but the relics were there, the ruins were there.

KM: Yes, yes. You had mentioned that much of this *'āina* in your recollection from when you were young all the way even to Hanawī there was sugar in various locations.

JR: Sugar, sugar all the way.

KM: In those days, was that sugar irrigated or was the natural weather enough?

JR: I believe it was a natural weather. The sugar was harvested and the ships came in from off the Honopou Bay.

KM: *'Ae.*

NM: The harbor, this is the… [pointing to location on Register Map 862]

KM: Here's Honopou and there's the old landing here.

JR: Yeah.

KM: That would be below your folks *'āina* right?

JR: Right, below and that's where the sugar was loaded on to the ships. The big ship was anchored out here [pointing to outer bay on map].

KM: *'Ae.*

JR: And according to my mom and dad the smaller ships came in, there was a boom there, I remember the boom in the concrete over there [pointing to area of wharf]. And it was loaded on to the smaller boats, and the boats take it out to the mother ship.

KM: Hmm. But in your childhood that was *pau* already?

JR: Yes, it was gone when I got there, only the boom was there.

KM: You heard, and you saw the boom like that?

JR: Yeah. I saw the boom, I saw the boilers that was there.

KM: Very interesting how things changed over the generations also.

JR: Very much.

KM: Land use like that. Were there still Hawaiian families living down in this area then, when you were young?

JR: There were hardly any families, most of the time they lived in the area where there's a little valley. You know where they can plant something, have some water.

KM: Yes.

JR: The Kepanis, the Lokanas.

NM: You could count them on your fingers.

KM: Kepani, Lokana?

JR: Lokana, the Smythes.

KM: *'Ae*. Was Smythe and Kiakona *pili*?

JR: *Pili, pili.* The Smythe lady was the mother of the Kiakona girls.

KM: *'Ae*, okay. When you met my wife when we met in… [April 24th 2001]

JR: Kailua.

KM: Yes, in April at Kailua, you remember my wife was Pomroy girl, the Kaiapa side, yeah?

JR: Yeah.

KM: Kaiapa, Kiakona.

JR: Kiakona.

KM: Wong Soong them, they all *pili.* Hubbell, Plunkett, Tau'ā.

JR: Plunkett and Tau'ā, all.

KM: You remember those *'ohana*?

JR: I do, I do. The Plunketts, I remember them well, and Pomroy I remember her well.

KM: Violet?

JR: Yeah Violet, she was a school teacher.

KM: Yes.

JR: I remember her well.

KM: At Huelo?

JR: At Huelo and then at Pe'ahi.

KM: Pe'ahi. Yes, yes.

JR: I remember all that.

KM: Wonderful. [pauses] So, the *'ohana* that were down here as you mentioned Lokana, Kepani. Your genealogy then—I understand when you said Aula them—your genealogy isn't actually direct to Kepani is that correct?

JR: No, its side.

KM: By the side and *kū'ai ka 'āina mai kekāhi*?

JR: *A 'oia.*

KM: I see, okay. So your *'āina* when we were looking at this Register Map 862 and then HTS Map 1011, it shows the *'āina* and I'm sorry I'll turn this around so it's on the right side. This harbor, now remember we said here's Piohia's *'āina*?

JR: Uh-hmm.

KM: Let me just get where I am. Piohia is right over here, okay. Kepani get *'āina* right up above here.

JR: Right, right.

[Family raised *kalo*; the stream of Honopou flowed everyday from the uplands to the sea. The water was (and remains) of great importance to the families of the land; it gave them their lives and livelihood.]

KM: Is that where you folks have taro land?

JR: Yeah, across.

KM: Across, okay.

JR: The *kahawai*, Kepani is one side and we are on the other side.

KM: And that *kahawai* is Honopou?

JR: Honopou.

KM: Okay. *Kūkū i kou wā li'ili'i, ka wai, kahe mai uka a i kahakai?*

JR: *Mai i uka, kahe i kahakai.*

KM: *Kahe mau ka wai?*

JR: *Kahe mau ka wai i nā la a pau.*

KM: *I nā la a pau.*

JR: Yes.

KM: *Mea nui kēlā?*

JR: *Mea nui kēlā wai, no ka mea, 'oia no ka mea no ka lo'i kalo.*

KM: *'Ae, no ka lo'i kalo. Mamua, i kou wā li'ili'i, kanu kalo? Mau lo'i kalo a 'oukou?*

JR: *Ko mākou mea 'ai 'ia! Ka lo'i kalo, kanu mākou ke kalo. Ku'i mākou i ke kalo hana i ka poi. 'Oia no ko mākou mea 'ai.*

KM: *'Ae, ko 'oukou ola.*

JR: *Ko kākou ola ana.*

KM: *'Ae. A i ku'u komo ana mai i loko o kou hale, iho ana ka ua. Ua 'ōlelo 'oe, "Ka ua, he mea no ke ola, wai ola."*

JR: *Ka mea ola. "Uwē ka lani, ola ka honua."*

KM: *'Ae, na'auao. Na'auao nā kupuna.*

JR: Uh-hmm.

KM: "*Uwē ka lani, ho'ōla ka honua.*"

JR: *A 'oia!*

KM: So *mea nui ka wai iā 'oukou?*

JR: *Mea nui ka wai. Ina malo'o ka 'āina, a'ole 'oe hiki ke kanu i nā mea 'ai.*

KM: *'Ae, pololei 'oe.* Now, *e kala mai ia'u, nanu huole ana wau…*

JR: Alright.

KM: When you folks lived down here then, did you have a house down by your *lo'i*?

JR: Yes. we had a little house.

KM: You did, okay. You folks would go down there, your whole living, your food source came from this land?

JR: From the land.

KM: And the water flowed all the time?

JR: All the time.

NM: Fish in the pond, the taro, the vegetables everything was, "Live off the land."

JR: See (when I was growing up), we had a home on Hōlawa side and we come there for the weekend, work in the taro patch, the *po'e kamali'i*. Mama and daddy would come during the week.

KM: I see.

[Describes the nature of the *lo'i*, *'auwai*, and kinds of *kalo* raised by the family from the 1920s; and access to the land.]

JR: During the weekend we'd come over there and live there in our little house. Then after Sunday evening, we'd go back home.

KM: *'Ae*. How did you folks travel, you walk feet or…?

JR: Walk and horses. We had horses, we had mules, we had donkeys.

KM: So, there were designated *alahele* like that?

JR: *Alahele, ala li'ili'i.*

KM: *'Ae, ala li'ili'i.*

JR: From Hōlawa we come across, come to the Hōlawa Stream and then up on the hill and down the other side.

KM: Yes, yes wonderful. Now, *kūkū* and because Nālani had just mentioned when that stream was flowing so you had water for your *lo'i*. About how many *lo'i* do you think you had?

JR: We had… [thinking]

NM: At that time all, it was about a dozen all together.

JR: [thinking] We had one, two, three, four, five, six, seven, eight, nine, about a dozen.

KM: Okay.

JR: One dozen.

KM: Now your *lo'i*, what types of taro were you planting?

JR: We planted…at the beginning we planted all different kinds of *huli*, we planted all different kinds. Then my father concentrated on *moi*. We planted a lot of *moi*. Of course we had some other kinds, *papapueo*, *pala'i'i*, *papapueo*, and then *'āhāpua'a*, *mana*.

KM: *'Ōhā…?*

JR: *'Ōhāpua'a*, that's the *mana*. *'Ōhāpua'a*, that's what we used to call 'em. Maybe there are other people who call them other names.

KM: *Hoihoi loa!*

JR: Then we had the *pala'i'i* and *kāī* which is the hard taro to pound.

KM: Yes *'ūlika*?

JR: *'Ūlika*, that's hard to pound, most time you pound it, if you kind of lazy, you going *pūpu'u ka 'ai* [chuckling]!

KM: [chuckles] Yes.

JR: We…at the later part, we planted *lehua*.

KM: *'Ae.*

JR: That's what is going now, *lehua.*

KM: And some of those *kalo* were longer growing periods yeah?

JR: Yeah.

KM: The *lehua*?

JR: Shorter.

KM: Shorter so it was…?

NM: Nine to twelve months.

KM: Yes.

JR: And what you call the other one the white taro now.

NM: *Moi*?

JR: No *moi* is the…

KM: *Ha'akea*?

JR: *Ha'akea*, that's the shorter one. The taro is a little more soft, not as firm. But the *lū'au* and *hāhā* is terrific. Beautiful, good *lū'au* and *hāhā*, *piko* and *ha'akea*. That's what we planted.

KM: Yes. Did you…were these all old *lo'i* or did you have to build up *kuāuna* again like that?

JR: No, the *lo'i* were there.

KM: Were there, yes.

[*'Auwai* and *lo'i* (including *kuāuna* –pond walls) are basically the same ones that were on the lands from the old days. Describes the dimensions of the *'auwai*, its relationship to the *kahawai* (stream), and operation of the system.

Recalled that in ca. 1929-1930, there was a severe storm, that cut the stream bed lower than the *'auwai*; as a result, his father made a dam pond which caught water to throw into the *'auwai*. Though rebuilt, the same *kūmano* (dam) is used by the family to this day.]

JR: And the *auwai* was there, only we improved it little bit here and there. But the main *auwai* was there all the time and that was done before our time. Far before our time.

KM: Yes, *mamua loa*. Now the *'auwai* it connects with Honopou Stream?

JR: With Honopou Stream.

KM: *Mauka* of you folks, or off to the side?

JR: [thinking] *Mauka*, *mauka*.

KM: *Mauka* yeah. The *'auwai* when you were young about how wide was the *'auwai*?

JR: You mean the *kahawai* or the *'auwai*?

KM: *Auwai*.

JR: The *'auwai*. The *'auwai* was about three feet.

KM: Three feet. And the depth?

JR: The depth maybe about two feet.

KM: Okay. And did you folks have *kūmano* or gates like that that you've?

JR: Only one gate.

NM: Had a dam.

JR: Just one gate just below our dam.

KM: I see.

JR: During the rainy period…

NM: We could control the water.

JR: …the stream runs, so much water so we have that little gate there to throw off.

KM: Too control?

JR: To control the water flow. And then during the very heavy rain we closed it up so it would throw the water away .

KM: Yes, so it would stay down the stream?

JR: Yeah.

KM: Now, and *kala mai* I'm just thinking of some important things that we should know about. Your *'auwai*, from the *kahawai* to your *lo'i* about how long. You said it was maybe three feet wide, maybe two feet deep. About how long was the run?

JR: Well, I tell you the run is, right now, it's about, from the *kahawai* to the first patch?

KM: Yes.

JR: It's about 300 feet. [thinking] I think about 300 feet.

KM: Yes.

JR: You see that *kahawai* was so good that we never needed to do anything to have the water come into the ditch (*'auwai*); from the *kahawai* to the ditch. But we had a storm some years back when I was maybe about thirteen, fourteen years old [ca. 1929-1930]. We had a big storm and the water came down so strong. It dug that river down so deep, and water couldn't get up to our ditch. So my dad went there day in and day out, and built a dam. Rock after rock after rock…

NM: Is it down below the pond?

JR: No…our dam.

NM: Oh, the upper section.

JR: He built that up rock by rock.

KM: This dam is in Honopou Stream?

JR: Right now.

NM: Yeah.

KM: Yes, And so he built that up to have the water *ho'opiha kēlā…*

JR: *Ho'opihapiha, a laila, kahe i loko o ka 'auwai.*

KM: *'Ae, i loko o ka 'auwai. He 'ekolu hanele kapua'i paha, mai ke kahawai a i ka lo'i mua?*

JR: *A 'oia!*

KM: *A hol o kēia wai i loko o ka 'auwai, ho'opiha i ka lo'i?*

JR: Uh-hmm.

KM: *Ho'opiha i ka lo'i e ae?*

JR: Uh-hmm.

KM: All the way down, all of your…even today, your *lo'i*?

JR: Yeah.

KM: And then what, does the *'auwai hoi paha ka wai i loko o ke kahawai?*

JR: Yeah, yeah.

KM: From below?

JR: Yeah. *A hui hou i loko o ke kahawai.*

KM: *'Oia ka mea ma'amau a nā Hawaiī? Halihali ka wai, lawe ka wai mai ke kahawai, a hoi hou…?*

JR: *Hoi hou i loko o ke kahawai.*

KM: *'Oia ka mea ma'amau?*

JR: *A 'oia, 'oia ka mea ma'amau.*

[He has taught his children about the land, *lo'i*, *'auwai*, and *kahawai*; his daughter Nālani and her *'ohana* continue to work the land as he did from his youth.

The *lo'i* were planted in cycles, and the land allowed to rest; mulching is also used to enrich the land. During his youth all of the families worked together, and the product of that labor, whether from land or the ocean was shared among the families.]

KM: *Na'auao nā kupuna i ka hana, a ua ao 'oe i kou po'e keiki?*

JR: *O, ua ao wau. Kāhi nei, me kona kāne, kana 'ohana keiki, keiki kāne, hiki iāia, ke kanu i ka 'ai.*

KM: *Maika'i! I kou kanu ana o ka 'ai, ma mua a paha i kēia manawa, ua wae paha 'oe i kekāhi lo'i a kanu i kekāhi manawa? Ho'omaha kekāhi and hana hoi kekāhi?*

JR: *A 'oia!*

KM: So you folks did, *ho'omaha ka 'āina?*

JR: Yeah. *Ho'omaha ka 'āina. No ka mea a'ole hiki iā mākou ke 'ai pau loa. No ka mea, pōpō ana ka 'ai!*

KM: *'Ae, popopo ana!*

JR: *Kanu kekāhi a ho'omaha kekāhi.*

KM: *'Ae. A he mea nui kēlā no ka 'āina. No ka mea, inā e ho'omaha ka 'āina, hiki iāia ke ho'omomona hou e?*

JR: *A 'oia!*

KM: *Ua kipulu, mulch paha oukou i loko…?*

JR: *'Ae. Ulu ka honohono, ulu nā me nahelehele a pau, a ho'ohuli hou, hiki 'oe ke kanu hou.*

KM: *'Ae.*

JR: *Nui loa kēlā 'ai no ko mākou 'ohana, akā, mau 'ohana kēlā i loko, noho nei i ko kākou wahi, a'ole 'ai. Kena mai lākou huki 'ai a kākou, ho'iho'i no lākou, 'ai la.*

KM: *I kou wā li'ili'i?*

JR: Yes.

KM: So *launa pū nā 'ohana?*

JR: *Launa pū!*

KM: *Pehea kou mana'o, i kēlā mau la, inā hana ana kekāhi 'ohana, kōkua nā 'ohana a pau?*

JR: *Laulima! Laulima ka hana ana.*

KM: *'Oia!*

JR: *Kanu lākou i ka 'uala, laulima mākou. Ho'omaema'e kēlā 'āina, kanu mākou i ka 'uala, laulima.*

KM: *Hana 'auwai, kōkua?*

JR: *Kōkua i nā mea a pau, laulima.*

KM: *Mea nui kēlā. I kēia manawa, pehea laulima lākou?*

JR: *Mea, Kepani, hele mai 'oia lawai'a i ka pō i luna o ka canoe. Lākou kā'ili i'a. Lo'a ka i'a, ka 'āweoweo…* [chuckles] *Nui ka 'āweoweo, hoi mai* [gestures giving out fish to each individual] *Eia kāu, eia kāu, eia kāu, hā'awi i nā mea a pau.*

KM: *Māhele 'ia ka i'a.*

JR: *Māhele pono, māhele pono, 'ae. Ku'u makuakāne, inā pepehi 'oia i ka pipi, māhele nō. 'Oki'oki ka pipi, no kēia 'ohana, no kēlā 'ohana kēia, 'ai like mākou.*

KM: Hmm, *maika'i kēlā 'ano noho 'ana.*

JR: *Maika'i kēlā mau lā.*

KM: *Pehea, o ka 'āweoweo paha, ka i'a o Honopou?*

JR: *'Āweoweo, 'ū'ū, nā 'ano like 'ole.*

KM: *'Ae.*

JR: *I ka lā, a'ole hiki 'oe ke lo'a ka 'ū'ū. I ka pō.*

[There was an abundance of *'ōpae*, *hīhīwai*, and *'o'opu* in the Honopou Stream during his youth, and through Nālani's youth (found even the vicinity of their *lo'i*).]

KM: *'Ae. Pehea, ma loko o ke kahawai…* Now Nālani said even you folks have a pond below, or near. Were there fish *'o'opu paha*, *'ōpae* in the streams like that?

NM: Lots. Goldfish, fresh water *'ōpihi*.

KM: The *hīhīwai*, yes.

JR: When I was growing up that *kahawai* had a lot of *hīhīwai* and lot of *'ōpae*.

KM: *'Ōpae kahawai*?

JR: *'Ōpae kahawai*.

NM: And big one's.

KM: *'Ōpae kala'ole* kind.

JR: *'Ōpae kahawai me ka 'ōpae 'oeha'a.*

KM: *A, 'oeha'a.*

JR: *Kāhi manawa, hele wau me ku'u makuahine, ke upena 'ōpae, hele māua, ka 'ōpae.* [gestures scooping up *'ōpae* with net, and placing them in a bag.] *Ka 'ōpae a māhuahua ka 'ōpae, ho'iho'i i kauhale a kōpī a miko. Mea 'ai nō mākou.*

KM: Hmm. *No hea mai ko 'oukou pa'akai?*

[When he was young some of the *pa'akai* (salt) used by his family was still made by native families of the Kīhei side, and traded for goods from the Hāmākua side.]

JR: *O kū'ai mākou kēlā pa'akai, a kāhi manawa, hele mai kēia po'e mai Kīhei mai, a kālewa 'ana lākou i ka pa'akai. Kālewa ana i ka pa'akai.*

KM: *'Ae, no ka mea ma kēia 'ao'ao…*

JR: *A'ole hiki.*

KM: *A, wai e?*

JR: *Nui ka wai, ua, a'ole hiki ke pa'a ke kai.*

KM: *'Ae. Kālewa ka po'e mai Kīhei?*

JR: *Poe mai Kīhei, a no lākou ka pa'akai maika'i. Komo i loko o ka eke hulululu, eke kukae nalo.*

KM: *'Ae.*

JR: *Kā'ai mākou kēlā.*

KM: *A kuapo oukou?*

JR: *Kuapo. Ai pa'a paha, poi paha.*

KM: Hmm. *Kuapo no ka pa'akai, me nā mea o kēlā 'ao'ao?*

JR: *Na mea o Kihei. A'ole lākou lo'a ka lo'i kalo.* Yeah.

KM: Hmm. *Maika'i kēlā 'ano nohona e?*

JR: Yeah, *maika'i, maika'i. Hele lākou kau iluna o ka lio, kālewa mai kēlā pa'akai.*

KM: *Mai Kihei mai?*

JR: *Mai Kihei mai.*

KM: *O lā'ihi.*

JR: *Hele mai i ko mākou hale, hiamoe. Kakahiaka nui, ho'i lākou.*

KM: *'Ae.* And *kākū, ua hele 'oe 'ohi 'ōpae, ka 'ōpae, hīhīwai, 'o'opu paha?*

JR: *'O'opu.*

KM: *Mai ke kahawai?*

JR: *Mai kēlā kahawai a hele i uka. Nunui ka 'o'opu* [gestures 12 inches long]. *'O'opu nākea.*

KM: Oh, one foot kind, almost?

JR: Oh yes.

NM: Yes.

JR: *Nākea, nui a hewahewa. Kāhi manawa hele mākou, hāhā wale no* [gestures catching them in his hand].

NM: The prawns, the biggest one twenty-three inches. Remember we took pictures. five-gallon buckets in no time.

JR: *Hīhīwai, i ka pō, hele mākou i ka pō.*

KM: *Hāhā hīhīwai!*

JR: *Hāhā ka hīhīwai. Nui ka hīhīwai. I'a haole,* goldfish, *nā mea 'ula'ula, mea ke'oke'o, me kalakoa, nui. Hele mākou me ka 'ohe. Ka wā mākou 'u'uku, paeāea mākou, ho'iho'i mai me kēlā i'a haole, o 'o'opu. Ho'omaika'i mai ko'u makuahine i kēlā 'o'opu me kēlā i'a haole, komo iloko o ka lā'i, lāwalu. Mea 'ai no mākou.*

KM: *Kēlā i'a kula,* the gold fish, *'ono*?

JR: *Ono*!

KM: *Ano like me ka 'o'opu paha?*

JR: *Like me ka 'o'opu. No ka mea hoi 'oe i kauhale, kopi 'oe a miko, a pau ka waliwali. a kūkulu 'oe loko o ka wai a manalo, ka wā komo 'oe i loko o ka lā'i a lāwalu 'oe.*

KM: *Pehea, ka 'o'opu, moa* all the time or *'ai maka kekāhi*?

JR: *A'ole mākou...kekāhi 'ohana, i noho 'ai i Waipi'o. Ka makuahine, kēlā i'a haole, me ka 'o'opu, 'ai maka 'ia. Ma ko'u hale, a'ole.*

KM: Hmm. *Ho'oma'ema'e, kōpī, a lāwalu?*

JR: Yeah, *ho'oma'ema'e, kōpī, a lomilomi 'oe a pau ka waliwali, kūkulu 'oe i loko o ka wai, a nā mananalo, a komo i ka lā'i a lāwalu. Mea 'ono kēlā!*

KM: Hmm.

JR: *Ka 'ōpae o kēia manawa, a'ohe 'ōpae o laila. Pau ka 'ōpae. No ka mea, lawe mai kēia po'e haole,* bull frogs *a kēia 'ōpae lolo nei, 'ōpae nui. 'Ai kēlā 'ōpae i ko mākou hīhīwai, i'a haole, 'o'opu.*

KM: *Pau*?

JR: *Pau wale no! A'ole i'a haole i kēia manawa.*

KM: So *nā i'a haole a me nā i'a maoli, pau i ka 'ai 'ia?*

JR: *Pau!*

KM: *I ke kahawai?*

JR: *I ke kahawai!*

[It is his observation that the water flowing in the *kahawai* is the same today as when he was young; he and Nālani both note that people above them use the water in ways that are damaging to the system (putting soaps and oils into the water, through their various uses). Nālani notes that the water is not as cold as it was, because of changes in the flow volume and source, and this is problematic for taro growers.]

KM: *Pehea, ka wai o kēia manawa, like me ka wai o mamua?*

JR: *Like no. Ua like no a like.*

KM: *'Oia?*

JR: Yeah.

KM: *Loa ka wai i loko o ke kahawai? Kākū, namu haole ana wau.* The water today is…?

JR: Is as it was.

KM: Even when you were young?

JR: Right.

KM: Oh.

NM: The flow or the temperature?

JR: The only thing right now, the people who have some residences, that live above us, they do the laundry in the *kahawai* you know, and who knows what.

NM: You can see the oil in the taro patch (*lo'i*), you can smell the soap.

JR: So we don't drink it anymore.

NM: Yeah.

JR: I used to drink it, just take the taro leaf, cut off the taro leaf wrap it around and make a cup.

KM: *Apu*?

NM: Yeah.

JR: Drink.

KM: Now, when you were young did anyone ever get sick drinking that water?

JR: Nobody, we were all healthy.

NM: No.

KM: How about, you know now they go in, get *kāki'o* and all kind *pilikia.*

JR: *Kaki'o* yeah *kaki'o.*

KM: When you were young?

JR: No more.

KM: No more *ma'i* like that.

JR: *A'ale ma'i. Ho'okāpulu lākou i ke kahawai i kēia manawa.*

KM: And I'm sorry now, I want to be clear on this. So, Honopou Stream, yeah?

JR: Yeah.

KM: The water that flows today is like, the flow is what you remember?

JR: The flow.

NM: Dad, have you been there lately? Have you seen the last six months dad? You know we used to have at least a foot and a half. Dad, now we have two inches of water.

JR: Well, that's…

NM: And we still dig up by the dam for the thing to go through, the water is warm, it's not like how it used to. The taro used to grow big because the temperature was cold and there was a constant flow, but because of all the dams and the pools that people dam up, the water doesn't go back and they put things in.

JR: The water should flow at all times.

KM: It should flow yes, and when it's cool water the *kalo*, good?

NM: Yeah.

JR: Very good.

KM: If the water comes warm or the flow slows down?

NM: It like stunts it.

JR: Yeah.

KM: In fact you can see it even in the sugar fields.

NM: We have pictures of huge taros compared to now.

JR: You need good circulation.

KM: Yes, yes. But, you think that the bullfrog and maybe some of these *'ōpae haole paha* yeah.

NM: And the king fisher what you call them?

JR: The *auku'u*, that been there many years.

KM: The *auku'u* is native, but the white ones, not.

NM: When you see only the head, the shrimp gone.

JR: No problem, *auku'u* only eat what's left over, no problem.

NM/KM: [chuckling]

JR: But I tell you the frog, when I was a little boy we used to go out at night and get the big one.

KM: Yeah.

JR: We *kaha* the *ōpū*. The *i'a haole* all inside the *ōpū*, that's why we know, the bullfrog ate the goldfish.

KM: Wow, so you'd see 'em inside.

JR: Inside. We were young kid I was about maybe ten, twelve, fifteen years old. Get the bullfrog skin 'em up and we *pūlehu* that bugga.

KM: *Pūlehu.*

JR: You couldn't bring 'em home.

KM: [chuckles]

JR: Because mother would not allow that frog in the house. Down at the *kahawai* we'd make a fire, we *pūlehu* that, take a little salt down you know, nobody see.

KM: *'Ono*?

JR: *'Ono.*

NM: Tastes like chicken.

JR: At that time you know kids, everything *'ono.*

NM: I would not eat it until I was like… Then, oh good… (then they tell me) "you ate frog!" Never again [chuckling].

JR: You couldn't bring 'em home but down the *kahawai* we ate 'em.

KM: Was good.

JR: Then we cut up the *ōpū*, get *'ōpae* and get goldfish inside the *ōpū*, so we know that frog was eating our goldfish.

KM: It's interesting though because you see then, there are changes that have occurred in the land. It's not like how it was when you were young.

JR: Very true, very true.

KM: I think this story that you're sharing, this history about before everyone used… The word you used was *laulima*, everyone came together to help.

JR: Everyone.

KM: One family is doing something, everyone helps.

NM: *Kōkua,* everybody, now no more.

JR: From our *kahawai*, Honopou to Hōlawa. Family living in Hōlawa we go there *kōkua* too. Mostly was potato.

KM: *'Uala* or…?

JR: *'Uala.*

KM: What types of *'uala* were you folks…?

JR: Well, dam if I know, today there's some yellow or purple whatever it is. Those what we had were all white. No purple and no yellow.

KM: I hear some names like *huamoa.*

JR: Yeah, there was *huamoa.*

KM: And *hi'iaka paha.*

JR: Yeah, plenty all different Hawaiian names.

KM: All different kind. How about did you folks raise some Hawaiian *kō* also, the native sugar canes?

JR: Yeah, we had the red ones, of course *uahiapele*, and we had *kenikeni*, we had *kō kea. Kō kea* was the best one we liked.

KM: Oh yeah.

JR: Yeah, *palupalu* you can break 'em everything broke off. Nice, *'ono*, juicy. And we had some more…

NM: Their toothbrush [chuckling].

JR: *Pilimai*, I think we had some *pilimai* and some *pua'ole.*

KM: *'Ae.*

JR: Some cane that grows, and no bloom.

KM: No *pua,* no blossom. Oh, interesting.

JR: We had all that kind of cane, planted all on our land. And we had…we used to cut the cane up and we lie down and chew 'em and the juices come out while we was lying down.

KM: [chuckles]

JR: *'Ono, 'ono, 'ono.*

KM: *'Ono.*

JR: Yeah. That was our candy.

KM: Did your mama them, did some of them use it for *lā'au* at all?

JR: *Ke 'aha*, oh yeah. I know mama used to take some I don't know what type it was, but she used to take I think was the [thinking] not the *kō kea* but I think was the I forgot… [thinking]

KM: *Uahiapele*?

JR: I think it was the *uahiapele.*

KM: Do you remember the name *manu lele*?

JR: *Manu lele, manu lele*, yes.

KM: *Manu lele*, that's the reddish and the striped?

JR: Right, the striped one.

KM: Yeah, okay.

JR: *Manu lele* and that *uahiapele*, mama used to pound 'em and make the juices and that was for medication.

KM: That's right when they *'apu.*

[*'Alaea* gathered for medicinal purposes from the *'ili* of Kāpala'alaea, in Halehaku.]

JR: *'Apu, 'apu.* Because my brother had asthma, and mother used to make *'apu* with the *lepo 'alaea.*

KM: *No hea mai ka 'alaea*?

JR: No Huelo no, *Kāpala'alaea.*

KM: *Kāpala'alaea. He 'āina kēlā.*

JR: *Hele ku'u makuahine 'eli'eli i ka lepo a ho'i i kauhale.*

KM: Interesting. And there's this old place name called Kāpala'alaea.

JR: Yeah, Kāpala'alaea.

KM: *A 'oia ke kumu o ka 'alaea?*

JR: *'Oia ke kumu o ka 'alaea.*

KM: And *kāpala* is to dab [gestures with fingers].

JR: Yeah to make red.

KM: That's right yeah [chuckles].

JR: Mother used to take it home and she used to get the *imu* stone and then get it nice and hot and she would put a pot over that rock and with the coconut oil which she puts into it. I remember the coconut oil, *lepo 'alaea* and the cane juice.

KM: *Wai kō*?

JR: *Wai kō* and then she mix 'em up, let it cool off that's what she give my brother.

KM: *A pehea kou* brother?

JR: *Maika'i nō!. Ho'okāhi pule, pau.*

[Describes customs associated with gathering *limu*, fish, and other resources – one took carefully, respectfully, and with prayer; taking only what was needed.]

KM: Oh, *maika'i*. You know were there, you were talking also about out in the ocean the fish and things like that and then in the *kahawai*. You know there are *limu kai* and *limu kahawai*.

JR: *Limu 'ele'ele*.

KM: *'Ae*. Did you folks *'ohi* kinds of *limu* from the stream before?

JR: No, no.

KM: Not even for medicine?

JR: The only one we *'ohi* is down by the *muliwai*, way down. That's where we get the *limu 'ele'ele*.

KM: *'Ano lō'ihi, like me ka lauoho?*

JR: *Lō'ihi. Wahi o ka wai ho'ohui me ke kai. 'Oia ka limu 'ele'ele.*

KM: So you folks would gather *limu 'ele'ele*?

JR: *Limu 'ele'ele*.

KM: Were there other *limu* out along the *lae kahakai* too?

JR: Oh yeah, all different kind yeah.

KM: And still yet today?

JR: Till today.

NM: Yes.

JR: All different kind *limu*. Only *manauea* no was out there, *manauea* we never had.

KM: That's different…

JR: Yeah, different area.

KM: Needs *one* like that too, nice out on the *papa*.

JR: *One*, needs a lot of *one*. The other kind *limu* we had most all of them. *Limu kohu*, plenty. All by the *kahawai*, you know where the *kahawai* come down to the ocean?

KM: Yes.

JR: The *limu kohu* grow over there you look 'em [gestures with hand], it goes back and forth, swaying.

KM: *Lahilahi*, beautiful!

JR: But, *ho'i mai ka nalu*, all *moku*.

KM: But that's how then *ulu hou*.

JR: *Ulu hou! Kēlā 'ano limu, 'ako 'oe, a'ole 'oe 'oki. 'Ako, 'ako.*

KM: *'Oia ka mea ma'amau. Ka 'oki, ai'ole huki…*

JR: *Pau, pau, pau! 'Ako.*

KM: *A pono iā 'oe e a'o i kou po'e mo'opuna.*

JR: Yeah.

KM: *No ka mea, i kēia mau lā hele kekāhi kanaka, 'ohi a nui, 'ohi hewa nō ho'i!*

JR: Yeah.

KM: *Pau ka pono, a'ole lo'a ka 'ōpihi, ka wana, limu, ka i'a, pau!*

JR: *Pau. Mai ka 'u'uku a ka mea nui, lawe a pau.*

KM: *I kou wā li'ili'i…?*

JR: *Aole, lawa no kēia* [gestures, enough to fill his cupped hands]. *Ku'u makuahine hele no ku'i 'ōpihi, piha ka 'eke, lawa no 'ia. Ho'iho'i 'oia, 'oki, 'ihi, kohe no a pau, ho'omikomiko 'ai no. Ko mākou mea 'ai.*

KM: *Pehea, i kēlā mau lā li'ili'i, ua lohe paha 'oe i kou makuahine, ai 'ole kekāhi kupuna… Ua noi mua lākou mamua o ka 'ohi 'ana?*

JR: *Mamua o ka 'ohi 'ana. Mai 'oe 'ai nā mea 'oe…i 'ōpihi, ka 'oukou 'ohi 'ana i ka 'ōpihi. Ka wā 'oukou ku'i 'ana i ka 'ōpihi, a'ole 'oe 'ai i ka 'ōpihi. Mamua o kou hele 'ana, 'oe no'ono'o no 'oe ke Akua, no ke kia'i mai iā 'oukou ka wā 'oukou e ku'i ai kēia 'ōpihi.*

KM: Hmm, *'oia ka mea nui.*

JR: *Hālawai 'oia, hele lāko.*

KM: *Pehea kou ho'i 'ana i ka lo'i, pule paha lākou?*

JR: *Pule, 'oia no mamua o ke kanu 'ana o ka 'ai. No'ono'o 'oe i ke Akua, e ho'oulu mai i kēia mea 'ai.*

KM: *'Ae, a ulu ka 'ai*?

JR: *Ulu ka 'ai*, yeah.

NM: Maybe next time when the weather is better I'll take you down to the taro patches.

KM: Would be good.

NM: You can see for yourself.

KM: Would be wonderful.

NM: It's beautiful down there.

JR: Before my parents do anything, they always stop and say a few words before them, they do it.

KM: And you carry that on?

JR: I carry that on.

KM: And Nālani, do you folks think like how daddy was saying that you always you *mahalo*.

NM: No matter where you go you take, you always give something back.

JR: *Nāna no i kia'i mai iā 'oe, a pau. Inā a'ole kia'i 'ana 'oe, pilikia 'ana 'oe.*

KM: *'Ae.*

JR: *Ulia!*

KM: *'Ae, ulia. 'Oia ka pilikia o ko mākou keiki i kēia mau lā, a'ole lākou i ho'omana'o.*

JR: *Ho'omana'o.*

KM: *Ola nā mea a pau. Inā poina…*

JR: *Pilikia 'ana 'oe.*

KM: Hmm. *Hau'oli kēia hui 'ana.*

JR: Yeah, *mea maika'i, nā 'oukou e mamake e noi ai mai ia'u.*

KM: *Mahalo!* Well, may we just on one thing further too, and thank you I realize we're just scratching the surface, but it's so deep the things, these *mo'olelo*. Do you think that… You folks are still growing taro. Now Nālani, and your *kāne* (husband), your *kāne* is *haole*, come from the mainland right, or something?

NM: Oh yes.

KM: But he loves…he works the land with you folks.

JR: He's there whenever he can.

NM: He had to prove to him that he could do it otherwise we wouldn't have gotten it.

JR: And her son, planting the taro too.

NM: Now, my children I teach them what I've learned.

[While the water still flows, more could be used. The stream landscape has changed as well, and some families cannot get the water from the same areas they used to. When he was young, the families all worked the *kahawai*, to maintain the *kūmano* (dams), overgrowth, and keep the flow steady.]

KM: So Nālani, do you have enough water today?

NM: I can't complain we have water, we could use more, but we do have water. We do have water.

KM: Yes. As long as you take care. Now this was very interesting though you said you were about maybe thirteen, fourteen years old so this is maybe 1929, 1930 had this big *'ino*, the *kahawai* changed?

JR: Yes.

KM: What you folks did was you build *kūmano*?

JR: *Kūmano*.

KM: So you make the dam?

JR: You make a dam, yeah.

KM: You folks, your father went stone by stone?

JR: Stone by stone.

NM: The whole wall, I'll show you next time.

KM: I'd love to see it.

JR: Stone by stone, and you know the Kepanis had their water source further up from us.

KM: Yes.

JR: They can't no more because that *kahawai* went deeper.

NM: There's not enough for them to…

JR: Now the land is up and the river is down.

KM: Even if they were to build one *kūmano*, one dam, no can?

JR: Yeah, hard, hard.

NM: Even the underground spring water used to flow and it's not.

KM: So drying up?

NM: It's close yeah.

JR: With a little drought will hinder all that.

KM: Yes, that's right.

NM: And three years ago we had a big storm that took all our taro everything right through.

KM: *'Auwē*!

NM: All that dam, *Tūtū* man all gone we had to start all over again.

KM: Now see, this is an interesting thing, today when has storm if it's spread far out… Before did you folks take care of the *kahawai* even further up above the river place. To open up?

JR: All, all, always.

KM: Always. So, you folks as a family and as neighbors?

JR: And the *'ohana*. Everybody.

NM: Everybody would come help us when they need help all of us go help.

JR: Some times a tree falls into the river, we cut it up with the axe. No more chain saw. We carry all that out put 'em all on the side, leave the waterway clear.

KM: That's right. And when you do that, when get big water it doesn't build up and wash everything out.

JR: It doesn't, no it just clear out the way.

KM: That's an important thing, you know.

NM: The water now when they have big water you could walk in front the wall and walk it. Up 'Iao and in other one's you have a second to get out and leave everything because that water rushes down, there's a difference between up there and that side.

KM: So when you clean the river, you take care — *mālama ka 'āina, a mālama ka 'āina iā 'oe*.

[*Lo'i* and *kuāuna* on their land, are from the old days – built before Kupuna Rosa's time; family always maintains them. It is the way of life. Periodic flooding of streams when EMI throws water out of the ditches, causes erosion and damages the *lo'i*.]

JR: *Mālama, a 'oia!* You see another problem is when we have a lot of rain, East Maui Irrigation releases all the water from way up, they don't put 'em in… the reservoirs are all full.

KM: No more reservoir enough, right?

JR: The reservoirs are full, they let the water come down and then all that water from wherever it is comes down to that one river and…

NM: It goes over the bridge and you're stuck.

KM: And that's a problem.

JR: That's a problem.

KM: Because they are not allowing the flow, there's not a continuous…

JR: Flow.

KM: Yes. And so suddenly you release one big water, it's going to roar down.

JR: If they take care of that portion, send that water down to the plantation reservoirs all over maybe it's better but they let it go down. They call it in water meter here, the readings here, open that ditch, open that one, close that one water all…

KM: That's *pilikia*.

JR: That's a *pilikia*.

KM: And then kind of kill fight yeah, if you go you make your *kuāuna*…

JR: The *kuāuna*, that's the main thing.

KM: And then if all of that is washed out, oh!

JR: For you, *hana nui kēlā!*

KM: Your *kuāuna*, are they *pōhaku* inside or *lepo*?

JR: *Pōhaku* with *lepo*.

KM: *Pōhaku me lepo, 'ae*.

JR: *Pōhaku* with *lepo*.

KM: These *po'e lo'i, kuāuna, nā ka po'e kahiko*?

JR: *'Ae ka po'e kahiko i hana ai, a mākou, ho'oponopono i nā wā a pau. Kāhi i hiolo, a ho'oponopono hou.*

KM: *I nā wā a pau e?*

JR: *I nā wā a pau!*

KM: *Mea nui, a'ole hiki iā 'oe ke molowā?*

JR: *Aole hiki. Inā ike 'oe ka pilikia, ka wā kēlā 'oe e hana ai.*

[Discusses places names – laments that he did not hear traditions regarding the giving of place names.]

KM: *'Ae. Mea nui. Ua lohe paha 'oe i kekāhi mo'olelo e pili 'ana ka inoa o kēia 'āina, Honopou? He 'aha ke mana'o, maopopo?*

JR: Hono-pou, *Hono* means little bay. Hono-pou, *ku mau*…I know it's a bay that stands upright.

KM: *'Ae, pou.*

JR: Yeah.

KM: *Pehea, i kou wā li'ili'i, ua kolekole paha, ha'i mo'olelo kou kupuna i ka mo'olelo?*

JR: *A'ole au i lohe kēlā.*

KM: *Like me Honokalā?*

JR: *'Ae Honokalā* [as pronounced].

KM: But *kēia Kāpala'alaea, ke kumu, ka* source *nō ho'i o ka 'alaea?*

JR: *'Ae.*

KM: So now we know the meaning of the name. But like Huelo. *Ka huelo o 'aha, nō ho'i?*

JR: [chuckling – shaking his head] *Huelo, a'ole au maopopo kēlā. Ka mana'o o kēlā inoa, Huelo.*

KM: *Ka inoa o kēlā Ekalesia ma Huelo, o…?*

JR: *Kaulana-pueo.*

KM: *'Ae, mea huelo pueo paha? Aole maopopo?*

JR: *Kaulana paha kēlā owl, kēlā pueo.*

KM: *'Ae. But a'ole 'oe i lohe?*

JR: *Aole wau i lohe ka wehewehe 'ana.*

KM: [pauses] *Kākū, mahalo nui iā 'oe i kou wehe 'ana i kēia mau mo'olelo. Maika'i!*

[Gives permission to include his recollections in the study being prepared.]

JR: *Hiki no iā 'oe ke ho'okomo i loko o ka puke, maika'i.*

KM: *Mahalo. Mea nui kēia no ka ho'omau 'ana o ka mea ma'amau a 'oukou, nā Hawai'i.*

JR: Yes.

[Discusses the practice and belief that if you "Care for the land, the land will care for you." *Wai* (water) is of great importance and value for the people and the land – "*Wai o ke ola!*" (Water is life!)]

KM: *Mālama i ka 'āina…*

JR: *Na ka 'āina i mālama iā 'oe.*

KM: *'Ae. A he mea nui ka wai, wai o ke ola?*

JR: *Wai o ke ola. Wai, waiwai nui! Wai, nā mea a pau, ka wai, waiwai no kēlā!*

KM: *'Ae, lo'a ka wai, ola!*

JR: *Wai ola, wai o ke ola!*

KM: *Mahalo nui, hau'oli kēia.*

JR: *'Ae.*

KM: Hmm. These maps here, go all the way from Nāhiku, all of Ko'olau come out to the Hāmākua Poko section. You'll enjoy some of these you going see the…

JR: When I have time I'll sit down and I'll go over.

KM: What I'll do is, this transcript, I'm going to take it home, I'll transcribe it and I'm going to send it back to you. . . Again, like we said, this is to bring some of these *kama'āina* recollections forward so that we can insure that people understand how you work the land and what you folks did and how it's important.

[When he was young, the *kula* lands of the Waipi'o-Honopou vicinity were all clear of vegetation – a remnant of the early plantation and ranching activities.]

JR: You know back then when we started this side, there were times that we needed wood to *ho'ā imu*, to cook our taro and stuff like that. There was no wood around.

KM: For real?

JR: Yeah, because pineapple was all over, they cut down all the guavas they plowed here they plowed there, no more trees. We used to go down the *kahakai* with our animals put the wood into the *'eke huluhulu*.

KM: *'Ae*, driftwood like.

JR: Yeah. Go down the *kahawai*, Hōlawa pick all the driftwood. *Ho'okomo iloko o ka 'eke huluhulu, kau i luna o ke kēkake. Kēkake me kēlā noho āmana* [gestures – crossing his fingers]. See, the donkeys we had the *noho āmana*, the wooden saddles, *noho āmana*. On the mule, then we load it up our *'eke huluhulu* with the wood on top, on the *kēkake* and with the *hoki*. Then *ho'iho'i i kauhale, ho'ā imu.*

KM: So all *makai* of the highway out in that *'āina* where you folks are, was all open land?

JR: All open land today it's nothing but *nahelehele*, all big trees and that berries you know.

KM: Yes and it's all *malihini* stuff not old Hawaiian stuff.

JR: No, no.

NM: [has to leave, says goodbye]

KM: *Mahalo…* That's what you folks had to do because there was no wood for you folks.

[Describes life on the land – and fishing when he was a youth; traveled with his mother, and fished various locations along the coast. The land and ocean, and their hard work sustained them; they bought only a few items, and mostly fed themselves by their own work and care of the land.]

JR: No, no wood, it was all chopped down, the growers planted all the…

KM: Was that from the highway down?

JR: From the highway down.

KM: Were there still *pipi* all out on that *'āina*?

JR: *Pipi*, my dad had a lot of cattle, plenty cattle. We never used to buy meat all we did was buy sugar. *Pipi*, then we get the taro, we get the fish, sometime we get plenty fish, we *kaula'i*. And then get the meat and we used to keep our pigs, we had lot of pigs. Not that much, but for the house use, the *kale 'ai*, you know from the taro?

KM: *'Ae.*

JR: That's for the pig. And then we cook the *honohono*, and we put the tallow, fat from our steers that we kill. *Ho'ohui me ka honohono*, and we feed our pigs. And the taro, some of the taro *popo*, that goes for the pigs. And we planted a lot of *he'i*, papayas. I had papaya trees there that *kukapaila* then we feed the ducks, we had ducks inside the pen, all put in the pen. Cannot let 'em go into the taro patch, all in the pen. With the roofing iron as a fence, no had wire, the chicken fence [chuckling].

KM: No had wire. Had *piula* though [chuckles].

JR: Then we take the *he'i*, we feed the ducks. The ducks were so good, fat from just eating the *honohono* and the what you call the *kale 'ai*. While we were cooking our taro for the *poi*, mother usually had one *kini winihā* square can used to be for kerosene. They put the *haka* underneath, steamed that duck in there. When the duck *mo'a, helele'i ka iwi!* [chuckling]

KM: [chuckling]

JR: Then we eat that for our lunch with our *poi*.

KM: *Kou po'e pua'a, ai ma ka pā holoholoma, ai'ole ma ke kula wale no?*

JR: No, *ka pua, i loko o ka pā pua'a.*

KM: Hmm.

JR: *A'ole hiki no ke ho'oku'u, no ka mea nui no ka 'ilio.*

KM: *Pehea, mamua, 'ai paha ka 'ilio?* [chuckling]

JR: [chuckling] *A'ole mākou 'ai. Ku'u makuakāne, a'ole 'oia 'ai i ka i'a maka.*

KM: *O, aloha!*

JR: *A'ole 'oia hiki ke 'ai i ka 'ake. Na mākou wale no ka mea 'ai 'ake. Ka i'a wale no 'oia i 'ai, he 'ō'io. 'Ō'io, 'oia ka 'ono 'oia. Na mea 'oko'a, a'ole 'oia mamake ai.*

KM: *Ka 'ō'io, mai kahakai i Honopou?*

JR: *Kahakai, Honopou.*

KM: So *nui ka 'ō'io, me ka moi paha?*

JR: *Ka moi, nui ka moi. Ka 'ō'io ma ka wahi one, one kēlā wahi, hele 'oe pākākā, dunk. Pākākā. Ka moi, kēlā i'a noho ma ka wahi nalu.*

KM: *'Ae.*

JR: *Ka 'ama'ama.*

KM: *Pehea ka 'ama'ama, i loko o ka muliwai?*

JR: *Ka muliwai. Nui ka pua 'ama. Kāhi manawa, nānā 'oe, nui a hewahewa.*

KM: *'Oia,* so *he muliwai pili me kahakai?*

JR: *He muliwai ma Honopou. Nui! Moi li'i. Hele ana ka moi li'i, nui a hewahewa! Ki'i mākou me ka 'upena.*

KM: *'Ae.*

JR: *Kāhi manawa me ka paeāea, me ka 'upena, ka mea maika'i.*

KM: Hmm.

JR: *A ka 'ōhua, mai Hāwini…mane'i mai o Hāwini, he wahi ka inoa o Pōpōhilo. He kāheka nui, nui kāheka.*

[*Kēia wahi 'o Hāwini, aia makai o Honokalā.*]

KM: *'Oia?*

JR: *Kēlā wahi, nana 'oe i ke kahakai, uwē kahakai. Nānā 'oe e, mea aku ku'u makuahine, ke hānau ai ka manini. Kōko'olau, Kōko'olau, 'oia ka inoa o kēlā, nui ka uwē a ke kahakai. Nānā 'oe 'ele'ele a nui ka 'ino. A mavaena…*

KM: *He hō'ailona kēlā?*

JR: *Hō'ailona.*

KM: *A maopopo mai 'ea mai ka 'ōhua?*

JR: *'Ea mai ka 'ōhua. 'Ea mai ka 'ōhua, hele māua, o wau me ku'u makuahine, i ka wana'ao, hele i ka wana'ao.*

KM: *'Ae, mamua o ka puka 'ana o ka lā?*

JR: *Mamua o ka puka 'ana o ka lā. Malalo mai o ke kāheka, lo'a he 'eke.*

KM: *'Eke, 'ano waliwali e?*

JR: *'Ae. Nui no ka 'ōhua i loko laila. Hele māua me ka 'upena, au'a i ka 'upena, pa'a kēlā mea. Komo maloko o ke kukaenalo. 'Ekolu paha, lawa.*

KM: Hmm.

JR: *Ka 'ōhua, mea 'ono kēlā.*

KM: Hmm, *a ho'i i ka hale a kōpī?*

JR: *Kōpī 'oe, a ho'omalo'o no 'oe.* Gee, *'ai 'oe kēlā, mea maika'i. Yeah. Ka pa'akai wale no, hele a 'oia, miko loa.*

KM: *'Ae. Mau makahiki, a'ole 'ai i ka 'ōhua, e?*

JR: Yeah. *Kāhi manawa ho'iho'i mai, lāwalu. Lāwalu 'oe i kēlā 'ōhua. O nui ka 'ono!*

KM: *O ka 'ōhua, he pua manini e?*

JR: *Pua manini kēlā. Manini, a kāhi manawa he pua no ka mamamo.*

KM: *'Oia?*

JR: *Nui, mamamo me ka manini. Yeah, ko mākou mea 'ai no 'ia. Hele ku'u makuahine, ku'i 'ōpihi, a kāhi manawa lo'a ka he'e pali, a ho'i i kauhale.*

KM: *'Ae, he'e pali, he he'e 'ano li'ili'i?*

JR: *'Ae, li'ili'i, mea paha, 'umi tumahā, 'ehā* ounces, yeah.

KM: *'Ae.*

JR: Not even half a pound. Yeah, *ho'i mākou, kōpī kēlā mea, a ka 'ala'ala nō ho'i, maika'i!*

KM: Hmm. *Maika'i ka ola 'ana mai ka 'āina me ke kai.*

JR: Yes. *Kāhi manawa hele mākou i ka ho'ālapō. I ka pō hele mākou, ka pūhi me ka 'ula. Pa'a kau, pūhi uhā a maika'i kēlā.*

KM: *'Ae, ua lohe wau.*

JR: *Pūhi uhā, ka 'ula.*

KM: *Kāmākoi, kēlā 'ano…?*

JR: Yeah, *kāmākoi. Ho'iho'i i kauhale, maika'i kēlā mea a pau! Pau ka wali, pau ka huuna, kaula'i 'oe, kupa 'oe, 'ōlani nō ho'i i ka kapuahi.*

KM: *'Ae.*

JR: Yeah.

KM: Oh, *mahalo, mahalo nui iā 'oe!*

JR: *Ko mākou ano noho 'ana. Noho 'oe a kua'āina. Ka mea kū'ai wale nō, kō pa'a, pa'akai, aila kupa, a hiki iā 'oe ke palai ka palaoa* [chuckling].

KM: *A nā mea a'e, na 'oukou i lo'a mai ka 'āina?*

JR: Yeah. *Poi, ka i'a, ka pipi, lawa no! Nui ka pipi kāula, nui!*

KM: *'Ae, i kou wā 'ōpio, i kou ulu 'ana, he'aha kāu hana? Lo'a 'oe i 'ōpio*, teenager, *a lo'a 'oe, he makua, he'aha kāu hana?*

JR: *Wā 'u'uku, pau au i ke kula a hele au i Kahului, 'imi au i ka na'auao. Kamanā ka hana. Ka hale kula kamanā. Puka au mai kēlā hale kula kamanā, ataila hele au i*

ka hana me ka po'e Kepanī. Poe Kepanī wale no ka po'e kamanā. Kāhi no po'e haole. . . Mahope lo'a wau ka hana Kālana. . .

KM: *Ua kūkulu hale 'oe?*

JR: *'Ae, a na'u no i kūkulu i kēia hale.*

KM: *O, maika'i!* So *'oia kāu hana? Kāu hana mawaho, a kāu hana ma ka 'āina…?*

JR: *Kanu no nā mea 'ai, ola.*

KM: *'Ae. . . A kāu wahine, no hea mai 'oia?*

JR: *He haole*, Burns. *Kona makuakāne, hele mai* Norway. *Hele mai 'oia i ne'i nei a male 'oia i ka wahine Pukiki, a hānau ai ku'u wahine.*

KM: *O, maika'i. A 'ehia mau keiki?*

JR: *'Elima a'u keiki. 'Ehā kaikamahine, ho'okāhi keikikāne.*

KM: *'Ae. . . Mahalo nui!*

JR: *Mahalo iā 'oe, kou hele mai 'ana.*

KM: *Maika'i kou mo'olelo. . .* I'll take it home to Hilo and get it typed out, and return it to you. And then we're going to bring it all together in this *mo'olelo* for this *'āina*. For the lands all the way Ko'olau to here.

JR: Alright that's fine.

KM: *Mahalo*, thank you so much!

JR: You're very welcome, you're very welcome.

KM: Wonderful! . . . [end of interview]

BOARD OF LAND AND NATURAL RESOURCES HEARING MAY 25, 2001 WATER LICENSE APPLICATION EAST MAUI IRRIGATION COMPANY

Transcript of Hearing (Selected Speakers)
(recorded and transcribed by Kumu Pono Associates)

The following transcript is a verbatim record of: (1) Statements by members and representatives of the Board of Land and Natural Resources and Alexander & Baldwin/East Maui Irrigation Company, regarding ditch history, the Water License Application, and the review agency process ; and (2) Testimonies from the public—with particular emphasis on Native Hawaiian tenants of affected lands—and others who did not support the application, or who raised questions and concerns regarding the nature and extent of the License.

(Note: xx and sp? used to indicate uncertain name or spelling.)

[CD # 1 of 2]

GC-A: [Chairman, Gilbert Coloma-Agaron] Let me just say how we're going to proceed. Mr. Uchida will make a presentation… We'll come back and the applicant can make a presentation. We'll take questions, then we'll open it up for comments from the public.

DU: [staff, Dean Uchida] . . .Thank you Board Members, good morning. Item B-5 is a request for a discussion of a long term disposition of the water licenses and issuance of an interim revocable permit since it is still A & B and East Maui Irrigation Company. These are for four watershed areas on Maui. If the board will recall this has been an ongoing process. Back in 1985 when all of the leases expired the Department went forward and tried to get a third year water license sold at public auction. Since 1985 we've been putting these licenses on a month to month permit and renewed annually.

The reason for the delay has been several fold, the Water Code was passed, there was some litigation involving the environmental requirements for the licenses that are being sold. There was a contested case hearing request made also. Trying to untangle all those issues caused us to continue issuing month to month revocable permits on an annual basis. Last year the Board had asked its staff to take several specific steps in trying to bring this to some kind of resolution. Today's action again is to discuss some of the long term issues, procedural issues, as well as issue some interim permits once the process has started. A & B has submitted a request earlier this month, I think May 14th was the day of the letter, requesting the long term lease and also the interim revocable permits while the lease is in process. That was one of the specific questions that was asked last year. Also, the Board had asked that the former Chair Person who is a member of the Board again, sit with some of the community members and discuss some of the long term issues and possibly address some of the specific issues to Community Groups and Special Interest Groups in the area. The other thing that the Board asked specifically was for some briefing on the appraisal process in determining what both the permit rents and the long term dispositioning might be. And fourth was to start working on the Watershed Management Plan for the area. The Watershed Management Plan we understand, has been prepared back

in '93 with the East Maui Watershed Partnership Group. Finally, we are trying to start a dialogue with the Department of Hawaiian Homelands which is one of the consultations that are required under the Statue 171-58.

Basically with A & B making their long term request we are processing the lease. There is going to be a 343 requirement, so A & B will be required to prepare the necessary environmental document, whether it be an EA or an EIS. At which point we would consult with the other agency's including Hawaiian Homelands and bring it back to the Board with somewhat of a lease package that would authorize the sale of the lease at public auction. That issue is now before the Board today, but the disposition process is subject to discussion. I think the applicant has by letter indicated their desire for long-term lease and also the interim revocable permits. We've attached their specific request in the submittal. I think it is Exhibit F; the May 14th letter from Alexander & Baldwin.

Based on that the staff is prepared to recommend that the Board authorize the issuance of a revocable permits for the four watersheds listed subject to the eleven issues that we have listed here. With that I would be happy to answer any questions that the board members might have. [begin Track 2]

GC-A: Questions?

LMc: [BLNR Member, Lynn McCrory] I need to get clear on… The reason we're not looking at issuing a long term lease at this point is because we need further consultation that DHHL?

DU: The process usually is, the Board doesn't get involved in the decision on the long term lease until all the different procedural, different process has been completed which includes the EA/EIS process. Similarly when someone requests for sale of a lease of State land at public auction, when we come to the Board we've already had the 343 compliance, we've had agency's comments, we've had pretty much draft terms and conditions of the lease. We have pre-qualifications of the perspective bidders. And then the Board would look at that and either approve or deny the request to move for that sale of lease at public auction. At this point today, we don't even have the Environmental Document so it is premature for the Board under its normal process to take any action on a request for the long-term disposition at this point.

LMc: An EIS is going to take how long?

DU: For a project of this size, it's going to take some time. I don't know exactly how long it might take.

LMc: We could be three years?

DU: Hopefully not that long.

LMc: What you're suggesting to us is that we would issue a one year revocable permit and we would probably be back in with another one year revocable permit after that if the EIS is not completed.

DU: Correct, but if the EIS is completed we may be back sooner with the request to sell the lease at public auction.

LMc: How will the EIS be completed? How will the State do that?

DU: We would act as the agency making a decision on the prep-notice and acceptability of the document. The applicant, A & B in this case, would actually prepare the EIS subject to our approval. There's a standard process you go through in the 343 – OEQC public disclosure, getting public comments from everybody in the community. Agency comments, it's all together through the EIS process. We would be the accepting authority on the EIS.

LMc: We have done direct leases before and I'm not clear on why we are looking at a Public Auction versus a Direct Lease?

DU: Good question. There's only certain types of uses and entities that are eligible for Direct Leases. Other Government Agencies get direct leases, Non-Profits get direct leases. And there are certain provisions in the statutes for specific user types that get Direct Leases. None of those qualify in this case. Our only recourse is to go through lease at public auction.

LMc: Okay, thank you.

KIn: [BLNR member, Kathryn Inouye] I'd just like to clarify and someone correct me if I'm mistaken. The item that's before us today is simply a discussion on the long-term disposition. There's no action to be taking regarding long-term disposition?

DU: That's correct.

KIn: And A & B has issued a request to the State for a long-term lease?

DU: That's correct.

KIn: Again, there is no action that's going to be processed by the Board. Pending satisfaction of Chapter 343, the EIS process. And that allows for public comment throughout that entire process?

DU: That's correct.

KIn: After the EIS is accepted, if it is accepted, it is then presented to the Board for long term disposition?

DU: Correct. The EIS is just one component of what needs to be done.

KIn: Right. And that includes the Interim in-stream standards?

DU: The Water Commissions' involvement may or may not be done or completed prior to the Board taking action. If it's not completed one of the things we're working with the Commission on is to have the lease contain language that would allow for us to proceed with the sale subject to compliance with the Commissions' rules and statutes.

KIn: Okay. So as I understand the item before us today is simply to provide an annual interim revocable permit so there is no lapse in maintenance of the system?

DU: That's correct.

KIn: Thank you.

LMc: One more question? Would you be looking at anyone who will be bidding on this process as being responsible for preparation at EIS and Public Auction?

DU: You mean if it's not the applicant that's doing the EIS right now? Our position right now is the applicant would be doing the EIS, and we would just go forward with the lease at Public Auction and not have any kind of requirement. Unless of course someone was proposing to do something that wasn't covered by the EIS. Then they would need a separate requirement for compliance. But if we're going by what is applied for A& B in this case would prepare the EIS. And we would sell the lease in Public Auction for the uses that are allowed/covered by the EIS.

LMc: At the point of the Public Auction after A & B had gone through preparing the EIS, there could be someone else who could come in and then bid on it?

DU: Could be.

LMc: [chuckles] What are we talking about at the cost for an EIS?

DU: I'm not sure how much an EIS for this project would cost.

LMc: I bet it's got commas.

Group: [laughing]

DU: Probably.

LMc: Lots of zeros and two commas is my guess.

DU: Probably more.

LMc: Three commas? No, not three, I couldn't believe. Two commas and a period. Let's just take that down a bit, and say that the EIS costs them $10.00. Is there any way, should they not get the bid, there would be a way for them to recover this money?

DU: That question has come up, I don't think at this point we are looking at using that process. To reimburse the applicant for the cost of the EIS would be…

LMc: Could that be part of the condition at the Public Auction?

DU: It could be if the Board so chooses. I think staff has concerns about conditioning a sale of a lease with that requirement.

LMc: Concerns are?

DU: The documentation on the cost…there's no control over what the cost might be so we might get situations where people are spending money without any type of reasonable checks and balances. Is it fair to pass on those costs to any prospective bidder?

LMc: Could it be that someone actually bid on it and went over that amount…? Never mind… Okay. That's quite a leap of faith for A&B to…

DU: That's our standard process, that we use. Granted the Board does not consider projects of this magnitude all the time, but the process has been adhered to in the past.

LMc: Okay, thank you.

GC-A: Further questions?

FH: Dean, just one more, for my brain to kind of get it sorted out. This business with the commas through me. What we will be voting on today after all the discussion is four separate permits. Three to EMI for those three areas as listed in the recommendation and the A & B for the Nahiku License. Four separate, one year revocable applications. Is that correct?

DU: Four separate permits. Right.

GC-A: Any further questions? If not…We'll take a break. I think there was an interest in going into executive session as well…

LMc: There is a phrasing in here where the Attorney General has been reviewing the issue, the compliance with 343 as it relates to Water Leases and the Attorney General is going to report on that to the Board. So I'll move to go into executive session. . .

BLNR: [begin track 3 — breaks for executive session]

DU: [begin track 4] . . .We don't normally do an EA document when it is a continued use. In this case, because of the court situation, the court has also ordered that we do comply with 343. So that's why we've moved forward with an EA/EIS process.

GC-A: Any other questions? If not, is there a representative of the Applicant here?

MC: [begin Track 5] Thank you Mr. Chair, members of the board. My name is Meredith Ching and I'm a vice-president of Alexander & Baldwin. With me today are Steve Holiday, vice-president of Alexander & Baldwin and General Manager of Hawaiian Commercial and Sugar Company, and Garrett Hew, Vice-President of East Maui Irrigation Company or EMI who builds, operates and maintains the East Maui water system that is HC&S's life-line.

You've seen us before, we have come before this body annually in the past fifteen years asking for revocable permits for the right to continue to collect waters from the State's East Maui lands. This water remains essential to HC&S's future liability. This year we are before you asking not only for the annual permit but also requesting that the Board authorize the issuance of a long-term thirty year lease for these East Maui waters.

Why are we asking for a long-term lease now? HC&S is operating in a markedly different and increasingly challenging business environment. In order to have a long-term future we believe that we must diversify away from being in the commodity sugar business and insulate ourselves from the vagrancies of the commodity sugar price. Increasing efficiencies, backed by investment in new equipment and technology have gotten us through the past few decades where others have not. However, HC&S is now faced with a need to make a different kind of investment. Investments in new strategic but related ventures. Investments which by their very nature are large and carry more risk. Yet the basis for these ventures will remain in agriculture and water will remain a basic essential for our business. However, without long-term certainty about adequate and reliable

supplies of water, HC&S cannot even begin to plan to have a long-term future and that's why we're seeking a lease.

What we are asking for this morning is limited, you do not need to approve the final form of lease, you do not need to approve the upset price, you do not need to award the lease. All we ask is for you to approve the sale of a lease at Public Auction of the entire watershed with the basic conditions noted in our request.

Three of the most important positions are:

1) All bidders be required to prepare an Environmental Impact Statement for their proposed use;

2) Water must continue to be supplied to the Maui Board of Water Supply; and

3) The lease will be issued subject to any in-stream flow standards established in the future.

We believe these conditions fairly address the concerns that this Board, staff and other concerned groups have raised in the past.

To put our request in perspective however, it may be useful to cover a little background on the East Maui waters in the EMI Ditch System. Let me call your attention to this map of the East Maui Watershed.

[pointing out reference point on map] Just to orient you a little bit. This side is *mauka*, this is the ocean, that's toward Hāna and this is in the direction of Kahului. What this map shows is the entire length of the ditch system from its eastern most point in Nāhiku to Kamole weir, where the County of Maui takes water for Upcountry Maui and the rest of the water goes into HC&S's irrigation system and to Maui Pineapple Company. The total length of ditch is seventy-four miles and that's the blue area of the ditches. As you can see there are multiple ditches ending up in essentially four parallel ditches as you get closer to the plantation.

The total volume of water in this system ranges from a maximum capacity of 450-million gallons per day during a storm, to 10-million gallons per day in a drought. The State of Hawai'i owns all of the land that's shown in yellow. EMI and A & B own all the land showing in green and orange. As you can see the water flows into the ditch off of State land, off of A & B land, and sometimes off of both and co-mingling in the ditch. Approximately seventy-percent of the water we harvest from East Maui comes from State land and thirty percent from our own land, which highlights why this lease is so important to us.

You will also note from the map that the State and EMI owns much of the land that is down stream from the ditch. The EMI ditch system includes fifty miles of tunnel and twenty-four miles open ditch along with 388 intakes. The system is eighteen times the size of Waiāhole ditch in terms of capacity, and three times its length. Additionally, it winds its way through mountain and terrain that makes the Waiāhole system look almost flat in comparison.

We have eighteen full-time employees who's sole responsibility is to maintain the Ditch System. Most of them with long-time experience. EMI's annual maintenance budget is over a million and a half dollars. Maintaining the ditch is a

twenty-four hours a day job. Water flows at all times of the day, problems can occur twenty-four hours a day. It takes investment, time and experience to keep this entire system working optimally and it would not be practical to have more than one entity maintain the system. This is one unit that is needed in its entirety to continue to provide adequate supplies of water to HC&S, to Maui Pineapple Company and to the Maui Board of Water Supply for its upcountry residents, farmers and ranchers.

EMI began using the State's East Maui Waters sub, one-hundred and twenty-three years ago. When in 1878, the Commissioners of the Crown Lands issued the first lease for the East Maui Watershed, coinciding with the expansion of sugar operations in Maui Central plain. It was a thirty year lease similar to the one we request today. Allowing the plantation to have a long-term reliable source of water. Following expiration of that lease the Government continued to issue a successive long-term agreement for this water. The last long-term agreement issued by the State had a term of twenty-four years that ended in 1986.

After 1940, the Territory no longer automatically issued the lease by negotiations directly to A & B. The water lease or license instead was put up for Public Auction just as it is today. The key that enabled the Territory to take the lease to Public Auction was an agreement it reached with EMI in 1938. That 1938 Agreement is still valid and will affect anything you decide to do with the watershed today, whether you decide to issue a lease or not. Whether that lease is to EMI or to someone else. Since 1986 the State has issued only one year revocable permits, while this has worked adequately for us to continue our sugar operations. As I mentioned before, it is not a satisfactory solution from a long range planning standpoint and in light of the challenge that's facing HC&S today.

Let me talk a little about HC&S today. HC&S currently supports over 1,000 employees and 2,500 retirees with an annual payroll for Maui in excess of 30-million dollars. Each year HC&S buys more than 49-million dollars in goods and services from local vendors. Last year HC&S paid more than 5.6-million dollars in taxes to the State. HC&S keeps 37,000 acres of central Maui in lush, green, income-producing landscape. Some call this "open space." Some think that is vital to the Maui Tourism Industry. In addition HC&S is a good neighbor providing in-kind services and contributions to various community organizations and causes. HC&S also provides 8% of electricity distributed by Maui Electric Company; produced from clean, renewable resources such as hydro-power and bagass. HC&S would not be here if not for the water collected in the rivers by the East Maui Irrigation system from the East Maui Watershed.

And as mentioned previously, many other community members benefit from this water as well. EMI ditch is also the major source of water for twenty-thousand upcountry residents, farmers and ranchers; the Kula Ag-Park and Maui Pineapple Company's upcountry fields.

Let me take this opportunity to clarify however, that this East Maui water does not go to Kīhei, Wailea'a and Mākena that has been repeatedly asserted.

It is no secret that HC&S uses a lot of water but we use it wisely and we take care of the resource that produces the water. EMI has long been involved in Watershed

Management activities and is today an active partner in the East Maui Watershed Partnership. Providing money and manpower to the joint effort to protect what is widely recognized as a very healthy watershed eco-system, although fragile. Part of the Partnerships' efforts involves encouragement of hunting in the area to control feral goats and pigs.

EMI maintains the over 62 miles of roads and 50 miles of trails that make the area accessible for public hunting; as well as other watershed management activities, such as fencing, monitoring and invasive species eradication. We do this because we have a business interest in the watershed and because we believe in taking care of the resource on which we are so dependant. While HC&S uses large amounts of water from East Maui it has been estimated that we only divert about 15 % of the total annual rainfall in the area. And HC&S uses this water wisely, it does not waste water. We've invested in excess of 35-million dollars to install drip irrigation throughout one hundred percent of the plantation to insure water is used efficiently. We have invested in three hydro-power plants to use the water in the ditches to make clean energy before again using the water for irrigating the fields. Still another form of reuse we practice is the recycling of our mill water which after processing the crops is filtered and applied back to the field in irrigation.

We do so because water is precious to us and in short supply. On average HC&S is a water-short plantation. Many believe that with all the water we use there must be excess, this is not true. While there are days of high rainfall when we do not need water from East Maui there are many more days when we are short of water on the plantation.

With that background let me now address our specific requests. First the request that all bidders be required to prepare an EIS for their proposed use. Since 1986 there has been a question whether an EIS was necessary for this lease. Concerned parties have repeatedly advocated than an EIS be done so that issues could be brought out and openly discussed. The condition that we are proposing should address their desires as well as clear up any questions regarding the past litigation. And it should be uniformly applied to all bidders. As the proposed uses of the lease may differ as well their respective environmental impact.

We are willing to proceed with an EIS which by all estimates will not be a minor undertaking. It will be difficult for us to justify the significant expenditure if the BLNR has not authorized issuance of a lease with a sufficiently long term. The lease also needs to recognize that the dependence of Upcountry Maui residents requirements on the East Maui water. As we have mentioned the EMI ditch is the main source of water for the Board of Water Supply in Upcountry Maui and there simply are no replacements sources for this water at this time. The Board does have a long term plan to drill more wells in East Maui however that plan is currently held up by litigation. The community must be provided for, and water must continue to be supplied to the Board of Water Supply.

Lastly, regarding the studying of in-stream-flow standards we recognize that in-stream-flow standards will be set for this East Maui streams. The statutory process for this has long been in place. We are in no way seeking to be exempt from this process, however we are advocating that the lease process proceed independently.

That the lease contain language addressing what happens once the Commission on Water Resource Management does set in-stream flow standards. A task they are diligently trying to proceed with.

To summarize, the action we are now requesting the Board to take is outlined on the last page of our May 14th letter to you. We ask you to approve today, issuance of a lease of the entire watershed subject to various conditions that will be satisfied over the next year or so or included in the lease form itself.

We estimate that it will take at least twelve months to prepare the Environmental Impact Statement. It will also take some time to develop the appropriate language for the lease and to obtain an appraisal to establish the upset bid amount.

Therefore we have included in our request a separate request for a full approval of a new one year revocable permit to allow the water to continue to be collected and provided to current users pending the sale of a lease.

We would like to take this opportunity to thank you the Board Members and everyone here in the room for your patience in listening to this presentation this morning. We thought it was important in light of the seriousness of a long-term lease. Our main message to you is simply that HC&S needs the water from the State lease to stay in business. This water lease is for agriculture use on our part. Further, these East Maui waters and the EMI system serve broader community needs. Many on Maui depend on this water directly and indirectly. Please support us in our effort to remain agriculture on Maui and to continue to be a good neighbor.

On behalf of Steve, Garret and the rest of the HC&S, EMI employees here this morning we ask you to approve our request. We'll be happy to answer any questions you might have. [begin Track 6]

GC-A: Questions? …

LMc: Meredith you indicated that you believe that any one of the bidders for Public Auction should file an EIS. You indicated that the reasoning for that was there would be other users who would have other areas that would change what's written in the EIS. What other users would there be for this?

MC: There could be people who partition for some of the water to perhaps to leave it in the stream for biota reasons or environmental reasons and the impacts of that action would be very different from the impacts of the proposed use we have. Which is why we think that there would need to be a separate EIS's done.

LMc: The money question. Estimate of the cost of an EIS, do you have a range?

MC: We gotten proposals and one of the proposals goes up as high as two million dollars.

LMc: Hoo! Is there a low? [chuckling]

MC: I think the lowest we've current, this is verbally whereas the two-million is in writing. The lowest verbal quote we've heard is half a million.

LMc: Okay, thank you.

GC-A: This is just to follow up you suggest that you would need an EIS or some sort of Chapter 343 compliance just to restore water to a stream?

MC: I didn't mean to suggest that, I think Commissioner McCrory was just asking what other kind of uses there could be. Another example might be someone who just wants to use one stream or two streams as opposed to all the streams that we use.

GC-A: I could see that if the use of the water was for some sort of commercial enterprise which is a very different kind of use than what you have right now. But just to return water to a stream, I'm not… Well, I guess that's an issue that we will have to…that will have to be resolved.

MC: That may have been a poor choice of examples but I think that's part of the whole in-stream standard process that we understand, can take place, will take place. I'm just trying to think of another example of another use.

LMc: Who owns the white land or white areas?

GH: The white areas are privately owned property in the Watershed area. Maybe just to show you where the boundaries are. The ditch, water license area extends from Nāhiku and this is the boundary here Honopou. Anything beyond that point is either privately owned or A & B or EMI owned. Basically the State land ends at the Honopou boundary.

Kln: Meredith, has A & B had a chance to review the staff report and recommendations?

MC: Yes, we have.

Kln: Do you realize that it does not incorporate the request from A & B to authorize the sale of a lease at Public Auction?

MC: Yes we recognize. But, we are asking the Board to consider that action as well.

Kln: I believe that we cannot consider that as an action because that is not what is before us today. Is that correct?

DU: That's correct. That's not a matter on the agenda. On the discussion of long-term lease the only matter that is before the Board…

MC: I think our understanding was that the discussion actually modifies both the discussion and revocable permits as well as the lease so that action was available on either. We understand that what the staff recommendation is. The applicant and the applicant letter is also before you. We thought the request to authorize or start the process, the lease process was also before you.

Kln: As I view this, it's just a discussion and to modify separate actions. The Board can't give any action on it additional discussion of long-term lease today… [inaudible] …the purpose of Chapter 92-xx.

GC-A: I'm still kind of curious on what the Board would be doing with a long-term lease at this point. I don't see how we can authorize it without the information that would come out of the EIS process. I think, I'm not sure that…I'm not quite sure exactly what your request is at this point. The process for an Auction Lease are set

out in the Statutes 171-58. That was outlined yesterday during the briefing. A lot of those items haven't been complied with so it wouldn't even come into a Land Board until a minimal of some of those items are in place. And the staff is willing to bring it to the Board at that time. At this point also, by the time that happens I'm not sure how many of the Board members currently here would be around. I'm not sure that even if this Board right now were inclined to say "we're going to be looking to issue a long-term lease," whether that's not something that could be changed in a couple years.

MC: I think there are two reasons why we brought this request before the board now. One is, that is how the Board proceeded back in 1986, they authorized the issuance of a long-term lease, a thirty year lease then proceeded to do the EA themselves. The second reason that we bought it before the Board is because I think the difference here is you're asking us to do the EIS. And in order for us to do the EIS with that kind of magnitude and investment involved we kind of know need to know what the box is. It's very hard for me to take to management and ask them for two million dollars and they say, "For what, is the Board going to give you a long-term lease or at least put one up for auction?" And I have to say, "I don't know." Not that I know it could be five years, it could be ten years, it could be thirty years. In addition to which to do the EIS you kind of have to know what you're scoping, because the impact of a one-year lease or a five-year lease would be really different from a thirty-year lease in terms of impacts. I guess it's the chicken and the egg.

LMc: And the reason we are asking you to do the EIS is because we don't have the money?

MC: That's my understanding.

LMc: Okay.

GC-A: Any further questions for Mr. Uchida, Board? [begin Track 7 – break]

…Board member Holshuh requests that if you have a copy of what you just read, that could be submitted to staff. Let's start with Ron Sterts [sp?]

RS: Good morning my name is Ron Sterts. I'm wearing various hats today. I'm vice-president of Maui Tomorrow, I'm on the Board of Maui Meadows Neighborhood Association. Most of us citizens living here, and like everybody here I drink the same water we all drink. I've raised a family, my children are all grown. We have concerns about the future of Maui and where the waters going to come from and how it's going to be distributed. In one sense I'm representing the interest of everyone here wearing the red ti-shirts too. Because you all live here too. We all have the same concerns. I'd like not to couch this as any "we versus them," it's really an issue that affects us all. I really would like to depolarize things and not make it H C & S versus the people or the native Hawaiians, or whoever. I want to talk about common issues here. There's been the discussion of the EIS and who should pay for it and the Board has indicated that it can't afford to. The question comes up why can't it afford to. This takes us into the question of appropriate lease value, for the lease, even on the revocable permit basis. As I understand, I've reviewed the documents, under the current proposal A & B would pay a quarter of a cent for a thousand gallons basically for this water. They then resell it…the portion that they resell to the Board of Water

Supply, for between six and twelve cents a thousand gallons. That's about 2500 to 5000 percent increase in profit from that purchase sale.

It suggests to me that there's some room for movement in terms of appraisal of the value of the lease, significantly. There's been request from a community that there be a fair market appraisal of this particular…these particular leasehold interests. And I would like to support that I think that it would be everyone's benefit. Right now the way of the structuring of the law is twenty percent of the value of these leasehold permit goes to OHA and thirty percent goes to DHHL. They're both being prejudiced by an unreasonably low or apparently unreasonably low lease value being assigned to these projects.

I'd like you to encourage, first of all as Trustees of the State and of the Public Trust of Water Supply, you have the right and responsibility to protect the Trust assets and to act reasonably on behalf of the Trustor. In this particular case I'd like to suggest that more appropriate fair market value would benefit the children of DHHL people and benefit OHA. There's a question about competitive bidding for these rights. I'd like to talk about the basic structure of a committee process. Right now and for many, many years the lease hold interest had been broken into four major areas. Nāhiku, Ke'anae, Huelo and Honomanu. So large segments of property. It makes it practically impossible for any individual, riparian rights owner, any taro farmer, to bid on a whole large section. It basically limits the ability of anyone to come in and compete and bid for these because they're so wide spread. I'd like to suggest a possibility that you look at the way in which these lease interests have been broken up in large sections, and break them down to stream watershed areas; into more manageable units so that in fact people who have a direct interest in having water, such as taro farmers, can come and bid for rights to use the water, and have water be placed in their streams. I'd like to suggest, lets just think about this. Because it's not the way things have been done, but I think that…I don't know if we can continue to do things the way they have been done.

I know right now when I drive through East Maui, except when it's a downpour the streambeds are empty. When the tourist drive along the Hāna Highway, there's no waterfalls. The farmers in East Maui are all complaining bitterly that they don't have any water to run their crops. So you say, "Why is that?" Well, a basic science, when it rains, and it comes to the ground, it either runs off or seeps in to the aquifer. If you drill down into the aquifer and take water from just the aquifer, if the rains continue it will continue to replenish the aquifer. On the other hand if you take it from the surface the aquifer remains intact so there's always water for the future and then you take the surface water. But if you take it from the surface and under the ground at the same time you take away all water from being replenished. And so you're guaranteeing that we're dissipating our resources here. And our future generations will not have water to sustain life here. So my suggestion is that there's an overtaxing of our water resources in East Maui right now, and one of the reasons for the Waiāhole decision and placing responsibility on you, the Board to act in a fiduciary way, is to look afresh at these issues and make sure that the native farming rights, the natural stream flows are being protected as your highest priority.

Things have changed since almost the last year. The Waiāhole decision has major impacts on our State and how we manage to get our supplies. And your responsibility as Trustees, that's my view and it's shared by many.

This issue is six times as big as the Waiāhole decision. I think there's twenty-two million gallons coming through the Waiāhole Ditch. You were talking about somewhere near a hundred and sixty million again. So I think we need to all grab on to the magnitude of what we're working with here. . . [begin Track 8]

CC: . . .My Carl Christensen, I'm a staff attorney with the Native Hawaiian Legal Corporation. We represent *Na Moku Aupuni o Ko'olau Hui*, a Native Hawaiian Non-Profit, the people in the Ke'anae area and also several individual native Hawaiians who would be affected by these licenses, and who through us have requested a contested case hearing to challenge the legality of the proposed disposition of the revocable permits and/or subsequently a long-term lease.

I will not repeat in detail the ten page letter that I sent you. I would like to address a couple of the items that have been discussed here. With regard to Chapter 343, clearly it is inappropriate to ask applicants to prepare Chapter 343 documents when the process at least contemplates the possibility that there would be multiple applicants. If you impose a two million dollar up front fee on any perspective applicant you are guaranteeing that there will be only one applicant, first of all. Also, that pre-supposes the structure of the lease that is to be auctioned. It pre-supposes the term, it pre-supposes the units into which this large area is to be subdivided.

The…as it's been discussed, the impacts of a five-year lease are very different from the impacts of a thirty-year lease. A proper EIS should discuss those alternatives. One of the main purposes of an EIS is to discuss alternatives. And to pre-suppose that the sale, if it occurs would be structured in a way that has been the case so far, ignores the possibility of looking at alternatives which may differ substantially from the current process. It's my understanding, and correct me if I'm wrong, that the Board is reluctant to spend the money because you don't have it. Is that correct or incorrect?

BLNR: [inaudible reply]

CC: Because our office sued fifteen years ago, raising a question of "should an EIS be done?" This is not a question that has just come up. I myself have written numerous letters over the last eight or nine years to the Board raising precisely this issue. This should not be a surprise. The State is the Trustee of a tremendously valuable public asset. The State as Trustee has a duty to plan for the management of that asset. That planning costs money. Instead the State has been leasing this asset out at a rate that is so low that it could not possibly pay for the planning process to manage the asset. That in itself shows how ridiculously low the existing rental rates are.

With regards to whether Chapter 343 applies to the disposition of a short-term revocable permit. It's been, for the last fifteen years, the Boards view that it does not. We disagree with that. First of all Chapter 343 does provide an exemption process. The Board or the Department went to the Environmental Council last

year to amend it's exemption list, specifically to provide for an exemption in the circumstances of this case. The Environmental Council rejected it. DLNR proposed amendments to the exemption list were rejected by the Environmental Council last year. Furthermore, the law and the rules relating to Chapter 343 state that "Even if a project might otherwise be exempt if it takes place in a particularly sensitive environment. It is not subject to an exemption." Thirty-three thousand acres of State land, and a huge amount of State water are sufficiently sensitive in my view, that it is not appropriately exempt from the Chapter 343 process.

Furthermore, the use that is proposed is the right privilege and authority for the development diversion in use for water purposes. Development and diversion are active terms, they do not contemplate the status quo they clearly authorize increased diversions in development of water, which as testified to by one of the people who spoke to you yesterday, is in fact occurring. That EMI is increasing the efficiency of its ability to remove water from East Maui. That by itself shows that this is not simply a continuation of the status quo.

There is a real question under the McBryde case whether or not water can be transported out of watersheds at all in the absence of a water use permit. The Water Code clearly provides that you can obtain the water use permit to transport water out of watersheds. The purpose for that was to allow a process to exist that did not previously exist because of the McBryde case. The State does not have a water use permit, therefore in our opinion, the current transport for any continued transport is unlawful under the Water Code.

With regard to the rental assessment, as has been said earlier the revenues from these lands are subject to an entitlement of 20% for the Office of Hawaiian Affairs, and 30% for the Department of Hawaiian Homelands. The current appraisals before you today says effectively "the sugar and pineapple industries are in trouble, let's keep the same rates that we had before." First of all, there is no showing that the existing rates bare any relationship to economic reality. I question whether anyone could reasonably say that this huge amount of water, if you found it would be available from an alternative source for example for $158,000.00 or whatever is the figure here. It is simply ridiculously low. Furthermore, the appraisal makes no suggestion that there could be any other use for this water other than the current use for sugar. An appraisal that fails to look at alternative uses of the property being appraised is defective. The Board as Trustees has a duty to act in a reasonable manner, and I do not believe that any reasonable Trustee could rely on so clearly defective an appraisal.

The Board apparently believes that by including certain requirements that the lease be subject to in-stream-flows, appurtenant rights, etc. That it is fulfilling its responsibility to protect those rights. I do not believe that that's correct. The Board I believe has a duty to identify the rights that are being protected and to quantify, and to specify the actions that EMI has to take to protect those interests. This is very similar to the issue in the *Ka Pa'akai* Case where the court said that "before the Land Use Commission could allow certain development it had to identify the rights that were to be protected under the permit and include provisions in the permit that would in fact protect those interests."

Here the Board is doing pretty much what it did in the 'Ewa Marina case that our office was involved in several years ago, where by failing to make findings as to the interests that were supposed to be protected, the Board in affect delegating the responsibility for that to the applicant. As to the applicant issue, which I guess goes back to Chapter 343 again, in 1985 it was the Land Board that did the Environmental Assessment. I'm not aware that in any other transaction where there has been a possibility of multiple bidders for a lease or license, or any other permit that the various applicants would be each required to prepare Chapter 343 documents. Again, that effectively eliminates the possibility of any bidders but one. Also by structuring the transaction in the way that is structured, that prevents the possibility of any other bidders. And again I suggest that no reasonable Trustee would manage Trust assets in such a way as to eliminate any possibility of there being more than one bidder for them. Thank you. And I'll answer any questions you may have.

LMc: You indicated that you felt that the appraisal was defective. Suggestions for how an appraisal could be done?

CC: One possibility would be to state in any revocable permit, if such were to be issued, that the rental, set by fair market value, subsequently when you do a real appraisal, be retroactive.

LMc: How would we do a real appraisal? Define, give me something that says again, you think this process is defective. What would be a correct process?

CC: The staff submittal discusses the efforts that the Board will be making in the future to come up with an appraisal prior to the issue of a lease. And that would include contacting experts in appraising water resources. It's going to be a very difficult process for anybody to appraise those assets. But one thing I think a reasonable Trustee would want to know is, as part of the value of the assets are how much would it cost for someone to get water from other sources for example? If the licenses, the lease ultimately was structured in smaller units it might be that there would be other water users on the island who might want to bid on say 10% of the water rather than having it one auction for the whole shebang.

LMc: Are you comfortable with what is being proposed in the staff's submittal? Into looking forward as we look towards the long-term?

CC: I'm not certainly an expert on appraisals. I assume that if the staff submittal says you are looking forward to going with a fair-market value appraisal, that that would in fact be a fair-market value appraisal based on the general professional standards in the appraising business. The current appraisal however, I have difficulty imagining that it would meet those standards. I mentioned earlier I would like to reiterate that our clients have requested the contested case hearing on this matter, and would ask that you like to respond to that.

GC-A: Further questions?

KIn: Yes. And this is with regard to your request for contested case hearing and what's before us today. What's before us today is for issuance of another annual RP. Is that what you are contesting?

CC: That's correct.

GC-A: So you're contesting continuing any transfers right now?

CC: Remember we have been raising this issue for fifteen years. In those fifteen years no one has come to us and said, "let's sit down, let's try and discuss some sort of reasonable allocation of these assets. With some substantial portion of those waters being returned to the streams."

GC-A: So, your answer is yes?

CC: Yes, my answer is yes. We are challenging any further disposition at this time.

KIn: What would you propose being done during the interim? If the RPs are not extended today, what do you propose in terms of continued maintenance of the system?

CC: The law is a very blunt instrument. I can go into court and if I prevail on behalf of my clients we can get an order from the State to stop doing something unlawful. If unlawfulness is found. I cannot ask a judge to make a wise decision as to how to allocate assets in the best manner, whatever that may be. Rather than forcing us into the litigation if the parties wanted to initiate serious discussions looking at a reasonable solution that would certainly be something to look at carefully. But in the legal sense we have made our request, we cannot fail to assert those rights without waving them.

GC-A: Your clients are the same clients that were in the Needham versus Lono [?] case?

CC: Beatrice Kekahuna is one of the plaintiffs in that case the other individuals—if I remember correctly—aren't.

GC-A: . . .You'll be around later if we do have further questions? [begin Track 9]

CC: Yes.

GC-A: Sally Raisbeck [sp.?]

SR: Thank you for coming to Maui and holding this important discussion on Maui where people who are interested can come out. I understand you have received a petition for the contested case and I believe the experts that say that you are required to stop consideration of the leases until that contested case is resolved. I would like to talk about the Public Trust doctrine. I would also like to briefly mention the "Precautionary Principle." I feel strongly that the State should do the EIS on this matter, not the applicant. And I want to talk a little about politics. To start off with the Public Trust Doctrine is that "All water in Hawai'i belongs to the people and is held in a trust for them by the State." We have not yet really comprehended the invocations of that statement. I am a citizen of Hawai'i, that makes me part owner of the water that is generated on the State lands in question here. I'm equally part-owner of any water that is generated on the A & B lands. I am equally part-owner of the water pumped from wells drilled by A & B, or wells drilled by Maui Land & Pine, or by the County or the developer Everett Dowling or the hotels in Waile'a and Mākena and Ka'anapali and Kapalua. I am part-owner of the water used in taro *lo'i* or pumped by ranches be they large or small or pumped in a Kahului resident's back yard or used in private water systems in large sub-divisions. All of that water belongs to the people of Hawaii of whom I am one. Everyone in this room red shirts, blue

shirts, Hawaiians, haoles, everyone owns the water of Hawai'i and the State holds it in trust for us. Trustees are held to a high standard of accountability. They must make every effort to preserve the assets, while meeting the needs of the beneficiaries, and while using the assets for the purposes defined for the Trust. Those purposes are spelled out in the Waiāhole decision by the Supreme Court. As we saw with the Bishop Estate dire consequences can follow when Trustees do not follow Trust guidelines in using the assets that are under their control. I hope that this contested case will work out for all of us exactly what the implications of the Public Trust Doctrine are relative to the proposed thirty-year leases.

I also want to talk about the Precautionary Principle which was another very important aspect of the Waiāhole decision. And people whom I respect have told me that they think this principle, which was strongly supported by the Supreme Court, will have an even greater affect on these leases than the Public Trust Doctrine. Precautionary Principles says "If you don't know, if you don't have scientific proof about whether it's safe to divert water you can't do it." You cannot say as the tobacco companies have said for so many years, "it hasn't been proven that smoking causes cancer." If you don't have reliable scientific studies of in-stream-flow standards that normal streamline will be preserved, you must under the law err on the side of caution. I hope the contested case will work out for all of us what the implications of this principle are for these leases.

Another point, the State has to do, the EIS for these leases, not the applicants. As a part-owner of this water that's being proposed for a lease I object strongly to having a bidder do an EIS. The heart of an Environmental Impact Statement is the consideration of various alternatives, and their environmental, economic and social policy consequences. One of the proponents of a particular course of action will not possibly give a comprehensive or fair presentation of what the real alternatives are to the current situation.

I have an alternative I wish to propose. That the County of Maui be given a license to control the water, not at public auction to determine who has the deepest pockets, but because in a democratic society, the County elected authorities are the one's who are most directly accountable to all the people who's lives are affected by this lease, and also the most directly accountable to the ultimate owners of this water which is me, everybody else in this room, everybody else in the State.

At present, EMI and A & B pay less to the State for this water; about $160,000.00 a year for sixty billion gallons on the average. . .Then the County pays A & B for five percent of the water which is about a hundred seventy-five thousand. Under my proposal the County would control the whole amount, it would provide the water A & B needs for agriculture, in exchange for sufficient money to maintain the watershed. Say it was three million dollars needed to really maintain the watershed. EMI says it's spending one and a half million now, say it was three million. Then the County could pay A & B three million dollars to maintain the watershed and they could charge EMI three million dollars. EMI and A & B would not be out any money except the hundred seventy-five thousand the County is now paying for their 5% of the water.

If…I don't know just this morning I heard that public authority don't have to do an EIS. Is that correct? Direct leases? Not… Oh it didn't have to go to public auction, that was it. The County could get a direct lease, do an EIS, and the County would have the control over the water. Nobody wants to take sugar water away from A & B, we just don't want to see them get a thirty-year lease so that then they are free to develop their lands for residential development. Which in the past has meant houses that ordinary people on Maui can't even afford.

So this way the County would get it's water free and it would have control of water it needs for domestic use. I think the other alternative that Mr. Christensen mentioned where the lease units are broken up into smaller units. I think that needs to be explored in an EIS. And the economic, social and environmental consequences of that need to be considered. A & B is not going to do an EIS that will consider those.

And if you will forgive me and I hope you won't feel affronted if I say that water is also politics. And yesterday Senator Jeffers of Vermont showed us all how extremely important the balance of power is, in politics. One lone man changing sides through control of the U.S. Senate from one party to the other with all the power of committee chairmanships and setting the agenda for the senate.

Yesterday a friend of mine, Nikil Ananda [sp?] testified to you, that he, as a resident who lives on a dry stream in East Maui, a stream that is diverted above his property. You may not know that in the election last year Nikil Ananda, who has been the voice of the Maui Green Party for many years, and who is recognized everywhere on Maui as a strong environmentalist, got 25% of the general election vote when his opponent was a popular democrat, chairman of the Maui Planning Commission, Bob Carroll, won the seat. Does this say environmentalist cannot win an election on Maui, not on their own they can't. But if you consider that in this County last election Republicans got 33% of the vote…or George Bush I should say, and old line Democrats lost some council seats with 42% of the vote. That means the environmental vote that 25% is the balance of power in elections. And that means something to the politicians in Maui.

I think you need to explore with you attorneys all the legal questions that have been raised. And I strongly feel that this water belongs to the people and the current situation is most unfair. Thank you very much.

GC-A: Any questions? Mark Andrews. [begin Track 10]

MA: . . .I'm Mark Andrews, a resident of Kula, I've been there for over fifty [?] years and at all times my water has come off the Upper Kula Line, which is the East Maui Watershed. I have farmed in the past and currently run a small nursery for non-profit purposes. It is important to me that the water continue to flow. I support East Maui Irrigation's management of that water and the continued leasing of the resource to them. In the future when you're considering longer term leases, I think this is also very important to consider due to the need for more and more investment in the resource. To me that's the most important thing, it's not really who's getting the water, it's how we invest in that resource. It's been declining, it needs help, and we need to always insure that we are providing the proper funding and activities there to insure that resource will always be there, and hopefully in the long

run increase it's output of water. So that more and more of these conflicting uses can be resolved. Thank you.

EW: . . *Aloha*, my name is Elaine Wender I'm former chair of the Hāna Advisory Committee to the Maui Planning Commission, I'm speaking today of course as an individual. I own and occupy land in Ke'anae bordered by Waiokamilo Stream and if Garrett can help me I can show you where [GH goes to map points out location]. Right here. I haven't seen this before, what does the green [coloring on map] signify?

GH: EMI owned lands.

EW: Okay. My land and a lot of other lands there which are green would lead you to believe that EMI owns those lands entirely. That's not true most of those lands, much of those lands EMI owns, are what are called Hui lands. We have an unusual situation in the Ke'anae area where lands were never partitioned. And for instance, the parcel I am on 151 acres which was purchased from the kingdom in 1859, and has never been sub-divided. Come down through descendant's sale to hundreds of owners now. EMI does claim ownership interest in that parcel but so do many, many other people, and I'm one of them. I've been involved in water issues in Ke'anae for the past twenty years. I do want to thank you, as others have for having this meeting on Maui. Usually we don't get the opportunity as consequently it's held on another island. And also to thank you for yesterday's workshop. The feeling that I have today is that this is the end of an old cycle and the beginning of a new one. I certainly hope that that is true.

My personal knowledge of the issues related to the issues goes back to 1981 when the Ke'anae-Wailuanui Community Association, an organization which no longer exists first petitioned this Board to intervene on the applications for leases. The Board denied the request that year and a few years later other individuals petitioned to intervene on the lease application were again denied and at that point a law-suit was filed. In 1986 the First Circuit Court ruled in favor of the petitioners and instructed the Board to allow intervention. The State initially appealed but later withdrew it's appeal, and the Board published notice of the contested case in October of 1986.

Many other affected persons including myself filed to become parties even though the notice gave us only a few days to file papers. I was formally accepted of the party and attended a pre-hearing conference and the contested case was scheduled for November 12th, 1986. On November 7th, 1986 I was sent notice by Mr. Ono, who was then the chair of the Board, that the contested case had been postponed to allow for scientific studies of the water requirements of taro. That was the last communication I received. [chuckling in background] Fifteen years have past.

This contested case is still pending it seems to have disappeared from your file. Your staff submittal mentions the other lawsuit on the EIS that is a separate matter but it does not…or at least I did not see any mention of the pending contested case. Mr. Uchida did briefly mention it this morning. You cannot proceed without some solution of the still pending contested case. Which certainly I would think could be merged with the new request. But you've already got it on the record, and already have parties who have been accepted to be part of that.

The staff report does refer to the McBryde decision but it ignores it's holdings. McBryde is still good law, and under it, this Board has no authority to authorize a transfer of water across *ahupua'a* boundaries. Ignoring the needs of downstream users appurtenant and riparian water rights. Also despite lip service to the Waiāhole decision, your staff report reflects no understanding of it's application. The Trust option demands that an EIS be done before you consider dispersions, and that those Trust responsibilities be fulfilled.

East Maui presents a unique situation. No where else in Hawai'i does such an extensive ditch and tunnel system exist. Stretching from Nāhiku near Hāna to upcountry and central Maui. Every single stream which crosses the system is completely dewatered at the ditch except when we have big water and the ditch can't handle the flow. Unfortunately, EMI has very little storage so it can hardly take advantage of these times. Over 100 streams with over 388 points of diversion are affected. If you tour the ditch, which I hope you will with community representatives not just with EMI, you'll see beautiful waterfalls falling into the ditch and below the ditch what you will see is no flow at all. Nothing! EMI talks about taking 15% of the rainfall but they are taking 100% of all the water at the point where the ditch intersects the stream. There is nothing below the ditch.

Now in Ke'anae and Wailua we are very fortunate. We have springs which arise downstream of the ditch and it is these springs which irrigate the taro patches and provide water for other uses. But the flow is not sufficient and the streams are sometimes too warm or completely dry. I'm the end user on Waiokamilo Stream, I have my own water pipe line to provide domestic and irrigation waters. I had to run pipes 3,000 feet to get to a spot where I can be sure that I'll get water. This year after sixteen years in the same spot I had to move my intake further upstream so that it would work. In only four of the past seventeen years when I've been monitoring the stream, has the stream run continuously all year round. That is to say from below the ditch where the springs arise, down to the ocean. The other thirteen years had interrupted flows with many dry days. And thus, my riparian water rights have not been honored.

As you know the endemic stream species which are gathered in our community need continuous fresh water to complete their life cycle. Often this does not exist because the stream water which feeds our springs is taken. The often too warm water which is in the streams provides breeding grounds for the apple snails, a terrible pest for taro. The EMI system removes as you've heard over sixty billion gallons a year from East Maui, the largest private water delivery system in the U.S. Ninety-five percent of this water goes to sugar cane. Fifteen years ago A & B completed diversion to drip-irrigation as they testified this morning all other 37,000 acres of cane are now in drip. That saves them by their own acknowledgement approximately one-third of their water needs, and yet still they take every single drop. I would like for you to imagine just for a moment what East Maui would look like if the streams flowed free. And then try to imagine the company coming in there and trying, asking you to build the system to now exist. You would never let it happen. It's only because it's existed for so long that you're numb to the devastation that it creates.

The procedure which you presented to us in yesterday's workshop lacks logic. Before you even consider granting month to month permits you should have complete information before you. If you have a legal authority to grant these permits, which I actually doubt, you should first have in-stream-flow standards set. Then an EIS should be completed by the State. as it is the State that's proposing the leases. It makes no sense at all to allow the purchase of the lease first with the necessity, as Mr. Uchida had mentioned yesterday, but I didn't catch it today, of a buy-back clause in the lease so that if, as he stated, it turns out that it's not economically feasible after the in-stream-flow standards are set, that the purchaser of the lease can then renege on the lease. That's a backwards way of doing things.

Further, I need to know what the in-stream-flow standards will be before I or my neighbors decide whether or not we want or need to bid on the lease. Any permits should be on a stream by stream basis so that such purchase, if its necessary would be possible.

We've been waiting a long time for justice. In just the time that I've been involved a whole generation has passed. I was a young woman when I started getting involved in this now I have gray hair. Two of our former presidents of the Ke'anae-Wailuanui Community Association, who fought so hard for water rights, one of whom was a party to the Needham case he mentioned, Uncle Harry Mitchell, and Ruth Hansen, their dead. Other former Board Members Harry Mitchell, Jr., Harry Pahukoa Jr., aunty Sarah Ka'auamo, they've also passed on. I am wondering if I will see in-stream restoration in my lifetime.

Lastly, I've been asked by Gladys Kanoa who's off island today to read a brief testimony. Gladys and her husband are full-time farmers, their *'ohana* farms about five and a half acres of taro in Ke'anae and Wailua, and Kūpa'u. They are also the biggest taro growers in Ke'anae and this is her brief testimony.

[reads statement of Gladys Kanoa]

To The Board of Land and Natural Resources, re: Renewal, East Maui Water Lands. As a taro farmer in Ke'anae-Wailua nui, Kūpa'u valley for twenty-two years I'm familiar with the water needs of taro farmers and subsistence gatherers. During those twenty-two years I have testified and have questioned at many public hearings and conferences, that much of the time, the farmers do not have enough water to grow healthy taro, and why can't EMI share the diverted water for this purpose. Never did I hear a willingness on EMI's part to even consider this. We are in a cycle of increasing drought periods. The river behind our house in Ke'anae has been dry 90% this year. Before this year it would go dry once every five years or so for a week or two. Now I am concerned that we won't have any water in the future for growing taro. How can this be? For over seven hundred years there was water to grow taro in Ke'anae. Today there is not enough to grow healthy taro. Instead of continuing the inequity of allowing EMI to divert every drop of water off these East Maui mountains it is time for you to be accountable to the people that live here and restore the water to the streams. Thank you…

KIn: Your name again?

EW: Elaine Wender. [clapping]

GC-A: James Chester… [begin Track 11]

JC: . . .I'm James Chester. I'm sitting back here listening to what a lot of people have to say. What I hear is it all boils down to money. I hear them talking about they want those streams to flow, hear other guys saying water for tomorrow. Well, let's think about this, the streams are flowing, where is that water going when it goes to the taro patches, where does it end up? It ends up in the ocean. That's wasted water. HC & S, they use their water to go in the mill and they re-run it back out there. . . I guess that's about it, you should consider renewing this long-term lease because…or the yearly one. In the future take this into consideration. H C & S and agriculture have their own problems. . . Let's think about Maui tomorrow. . .

GC-A: We don't want to turn this into a clap-fest, as people come up. And we'd like to give everybody the courtesy of listening to what they have to say. We would appreciate that you don't applaud. . . Moses Haia [begin Track 12]

MH: . . .My name is Moses Haia, and I'm a staff attorney with the Native Hawaiian Legal Corporation. I appear before you today on behalf of our clients Beatrice Kepani Kekahuna, Marjorie Wallett, Elizabeth Lapenia, and *Na Moku Aupuni o Ko'olau Hui*, a Native Hawaiian non-profit organization committed to the enhancement, preservation and protection of the quality of life, and *'āina* for the Hawaiian descendants and/or tenants *ahupua'a* Ke'anae-Wailuanui.

For my clients this is all about the preservation of a way of life. Beatrice Kekahuna and Marjorie Wallett, the *kūpuna* of Honopou both of whom are full-blooded Hawaiians. Each of them have ownership interest in parcels of land adjacent to Honopou stream. Honopou stream is within the Huelo License area. Before Honopou stream flow reaches Beatrice and Marjorie's land, it's diverted by at least three ditches, and maybe four, Waiola [Wailoa] Ditch, the New Hāmākua Ditch, the Lowrie Ditch, and the Ha'ikū Ditch. As a result, absent ditch overflow due to heavy rain, the stream flow just above their parcels is non-existent. Since these parcels show evidence of taro *lo'i* we've been researching whether or not they are inherent of appurtenant rights. Our preliminary research suggests that, that is the case. It is those appurtenant rights do in fact attach to each of these parcels, Honopou stream diversions work a continuous abridgement and denial of these rights to those lands. Beatrice and Marjorie and their families do not now grow taro on their lands because they cannot due to the lack of sufficient stream flow in Honopou Stream. Elizabeth Lapenia is three-quarters Hawaiian. She has an ownership interest in a parcel of land adjacent to the Hanehoi, Pū'olua, also known as Huelo streams. Both are within the Huelo License area above Elizabeth's parcel. Hanehoi Steam flow is diverted by possibly four ditches, the same ones that I mentioned above.

The stream flow in Pū'olua or Huelo is taken at the Lowrie Ditch and Ha'ikū ditches. Again as a result, except for overflow, the stream flow directly above Elizabeth's parcel is essentially non-existent. Approximately two-thirds of this parcel is taro *lo'i*. appurtenant water-rights may also attach. If so, that right has been abridged by the ditch diversions. But for the seriously diminishing stream flow in Hanehoi and Pū'olua, taro would also be planted and growing in these *lo'i* that remain evident on the parcel.

Na Moku o Puni o Ko'olau Hui has as its members Hawaiian residents of the *ahupua'a* of Ke'anae-Wailuanui. This *ahupua'a* encompasses the Nāhiku, Ke'anae and Honomanu License areas. Many of its members hold interests in *kuleana* parcels with attached of appurtenant water rights. The stream flow that once fed *lo'i* on these parcels with cold clean water is now diverted by Ko'olau Ditch. The loss of stream flow has resulted in a rise in water temperature at most *lo'i*. These circumstances have made it nearly impossible for those taro farmers in the area to continue to grow taro. Beatrice, Marjorie, Elizabeth and *Na Moku* have retained the Native Hawaiian Legal Corporation to assert their property's appurtenant rights to water for taro farming.

I wanted to address one of the issues I believe that is before you, and that's whether or not a provision in a lease of this water… Attempting to take care of any and all traditional and customary rights, any inner mid-stream-flow-standards may subsequently be made by the Water Commission, is a…and an affirmation and protection of these rights through that process. Our argument is that the appurtenant rights, the State has an affirmative duty to protect. An affirmative duty suggests action rather than…and we also would argue that you do not let somebody else, for instance EMI take charge or care of those rights.

That's all I would want to say with respect to appurtenant rights. As tenants of their respective *ahupua'a* our clients also enjoy other constitutionally protected rights. The exercise of which requires sufficient stream flow. These rights include but are by no means limited to taro cultivation and gathering. Sadly, the stream flow necessary for the proper exercise of these rights is precluded by the stream diversions.

As part of its effort to protect these rights the Native Hawaiian Legal Corporation yesterday, on behalf of its clients filed with the State Commissioner and Water Resource Management petitions to amend the interim in-stream-flow standards of twenty-three streams within the four water licensed areas. The Native Hawaiian Legal Corporation will also…and I believe that Mr. Christiansen provided our basis for these pursuits. Will pursue all other appropriate administrative and judicial remedies available to protect our clients interests.

I thank you for the opportunity to testify, I also wanted to make one other point. We have written testimony from some of our clients from Ke'anae-Wailuanui, who were unable to attend this meeting. I will be submitting that to the staff. Thank you. Any questions?

GC-A: Some of the issues you raise are going to be involved in the proposed contested case and some of the other issues will be in your petition for the Water Commissioner?

MH: That's correct. With respect to the appurtenant water rights and traditional and customary practices. We're presently in the process of obtaining all documentation and evidence of those rights and practices.

GC-A: Any other questions? Make sure that those copies are submitted to staff. . . [begin Track 13]

CB: . . .My name is Charlie Belalon [sp?]. I'm a twenty-two year law enforcement and regulator veteran, a veteran of the U.S. Coastguard, five years as a police officer, twel ve years as a DOCARE-DLNR officer. At present, five years coastal zone inspector for the County of Maui. More importantly I sit here before you as a descendant of more than two-hundred years of taro farmers from the Wailuanui, Ke'anae and Hāna areas, under the name of Kekumu. I plead for you to listen to my story of myself. In 1998 while walking my daughter to the altar, I was hospitalized before the reception and taken to Queen's Hospital, for I had taken ill. During my six weeks of treatment, I was told that I had contracted *milodisplacia* [sp?], a form of leukemia, and told that if I didn't have a arrow transplant and chemo, I would die in six months. During that time, I received word for the Center for Disease Control in Atlanta that I had contracted leptospirosis. . . It's from the *'iole*, the rat, the *shishi* in the water. I went get that real bad was one of the worst cases in the State.

My sickness was not cancer. During the analysis it was found that due to my favorite past time activities hunting, fishing and gathering. I had contracted leptospirosis from one of the many Maui streams that was not flowing at it's usual capacity. Although happy to learn that I had no cancer, I became intent to have those responsible for informing the public of our fresh water hazard to post signs warning the public about the risk, nothing happened.

By law streams have been potentially imposing health hazards are required to be posted. Look at Hilo, look at Honolulu. I hereby request to go on record that if the A & B conglomerates are granted the water rights against our native rights, I ask that it be duly noted that they be responsible for posting every stream affected by leptospirosis, which is required by law. So we know. Besides the degradation of culture and lifestyle and cultural rights the serious health concerns for diverting our streams dry, to a point that rats infest the dry river banks and poison our stagnant ponds. I am not proud to beg for my lifestyle, or my right to access cultural lands for my generations have sustained our families. I beg not to allow the total depletion of fresh water resources to those who use it for development. But also beg that you think not my humbleness for weakness. What ever happens during the interim EIS process what happens to the water flow? Does it flow, do they keep it until the EIS is revised? They diverted it already. That's the problem. They taking it, it's taken. They went take before they went ask. Make A & B…this is the important part and I know the brothers in the red shirts you guys know, make A & B utilize the commercial contaminated wells in central Maui first. We get choke water, we sitting on one lake…all those waters underneath those wells are contaminated from them. So why they take country water? Go clean the water up, all the wells in central Maui before you guys deplete the Maui, Ko'olau portions of Maui, and take those waters. Thank you! [clapping]

GC-A: Questions? Francis Torres [sp?].

FT: [HC & S Federal Credit Union — supports application]

GC-A: . . .Questions. . . Note, we have fifty-four people signed up. We have a request for a contested case already. We would appreciate when you come up here that you try not to repeat what other people have already said. . . Tarrol Bensol [?]

TB: . . . [Executive Director of the Maui Hotel Association – support application].

GC-A: Questions. Cheryl Manley. [begin track 14] We have a letter from the Office of Hawaiian Affairs in you files.

CM: There should be sufficient copies for all of you. *Aloha* again Board Members. The Office of Hawaiian Affairs is opposed to the Board of Land and Natural Resources issuing separate water permits to EMI and A&B. OHA has both a representative and individual interest that would be significantly affected by this Board action. Under the State Constitution OHA is charged with a responsibility to represent the interest of Hawaiians and to better the conditions of Hawaiian lands. OHA also is the designated recipient of the constitutional mandated pro-rata share of the proceeds from the public land trust. OHA objects to the approval of these water permits for the following three reasons.

First of all, DLNR has an affirmative duty to protect traditional and customary native Hawaiian rights and practices. In *Ka Pa'akai* versus Land Use Commission the Supreme Court rule that Article 12 Section 7 on the Hawai'i Constitution places an affirmative duty on the State and its agencies to preserve and protect TnC Hawaiian Rights.

The court provided an analytical framework to insure protection of Hawaiian customary, traditional practices, and prescribed a process by which these rights must be accommodated. In order for the Board to make a meaningful and informed decision on the pending application the Board must analyze the traditional and customary practices which are dependent on the water flowing in these streams.

The Board must utilize the criteria provided by the Supreme Court and make specific findings and conclusions warranted by the evidence. As of yet this analysis has not been done, and to proceed without it is a clear violation of State law. The only provision to protect Hawaiian Rights is the staffs recommendation that the permit include a condition that the State reserves the right to withdraw water for constitutional protected water rights and the Department of Hawaiian Homelands.

A conditional approval is not sufficient. Reserving the right to withdraw water does not discharge State's duty to apply the necessary criteria to weigh the evidence and use it to conclusion. Nor does it adequately protect native Hawaiian rights and practices.

The second reason is, assuming, for the sake of argument, that this permit could be deemed to protect Hawaiian Rights, BLNR must ensure that Hawaiians receive fair compensation for the use of these Public Trust Lands. The State has the fiduciary obligation to require full compensation for the use of these lands. To accept anything less constitutes a serious breach of the State's Fiduciary duty to Native Hawaiians. In the instant matter OHA and DHHL are entitled to 20 and 30% of the rent.

It is our understanding that the rents for these four permits have not increased a penny over the last six years. According to DLNR's staff appraiser the applicant, in physical year 1999 to 2000 paid about $5.06 per million gallons of water. That

is compared with the $763.26 per million gallons per water that ADC users can expect to pay for Waiāhole Ditch water. The current appraisal set forth for the Board's consideration do not provide a detailed formula for determining the fair-market value of these permits. In the absence of such essential information, the BLNR's plan to move forward can only be deemed an arbitrary and capricious decision which the facts do not support.

Our third reason, which has already been addressed here, is BLNR should adhere to the mandate set forth in Chapter 343 and Chapter 171. The only thing that we would add to the discussion on Chapter 343 is that the subject property is within the conservation district and State law is clear that environmental assessment must be prepared for land located within a conservation district. So that would be our only addition to that discussion. And as no environmental review was completed to date we do not believe that action is warranted on this issue.

We have three points under Chapter 171, it's included in our letter. Just to summarize our first point is that we object to the continued use of the one year permits to effectively grant long-term use. Our second objection is regarding DLNR's obligation to notify DHHL of its intent to renew any lease of water rights, and also DLNR's responsibility to consult with DHHL, to jointly develop a reservation of water rights. In our review of the staff report we do not see indication that it's notification and consultation have occurred. Nor the permit quantify the amount of water to reserve for DHHL. That's a significant point for us. The third point under Chapter 171 is the Watershed Management Plan, which staff report indicates a preliminary plan has been completed. The plan does not meet the standard of completion mandated by law, nor does the staff report indicate that the plan is capable of being implemented.

So for all of these reasons OHA objects to any action on this at this time and we believe that the Board must apply the law and perform the required analysis.

GC-A: Questions? Thank you. [end CD # 1 – begin CD # 2]

[?]: [Ornales ?] . . .After consultation among our members, I'm here to speak in support of the request of the East Maui Irrigation Company. . . [begin Track 2]

SW: . . .My name is Stephanie Whalen, I'm the president, director of the Hawai'i Agriculture Research Center, a non-profit organization to promote and maintain the agriculture in the State. . . [begin Track 3] . . .Precautionary Principle is a very nice sounding phrase, however, if you are requiring scientific proof to prove a negative, it doesn't happen. And that basically what was presented earlier, and I just wanted to bring that up. We are a scientific organization, and that bothered me. It really is how you implement a precautionary principle, and you cannot prove a negative. And that's what we are trying to say, when you say "Prove it doesn't cause any harm." You can't prove that. . . [begin Track 4]

CM: . . .My name is *kahu* Charles Uluwehi Maxwell, and I am a life-long *kanaka maoli* from Maui. I would like to, in the future, for you to be aware Mr. Chairman, that whenever you talk about water, it's a very sacred object for Hawaiians. And we should have done the right protocol by praying and ask the Lord to protect us as we go through this. But it's halfway through now. Before I begin my testimony I would like to compliment your decision to have this meeting on Maui. But protest

the fact that this meeting is being held at this hall where workers are dependent on HC & S for their livelihood and have no choice but to come out in droves to support giving water to their company for thirty years. This meeting should have been held in Pā'ia Community Center or Ha'ikū where the source of this water comes from, or even from Ke'anae and it would be easier for the people from East Maui to attend. Let the record show though that I am in full support of the sugar plantation and pineapple fields, and we all know that the sugar industry is a dinosaurs. I am a chronic asthmatic yet, I support cane burning because if we did not have cane there would be development in its place.

[referencing historical papers, e.g., N.B. Emerson 1965]

There is an ancient chant that I'd like to tell you about the importance water. And it goes…it's translated to say —

"Where flows the water of Kāne?

This is deep in the ground, in the gushing spring.

The duct of Kāne and Loa, Kanaloa.

A well-spring of water to gush.

A water of magic power.

The water of life.

Life! O give us life!

The word for *wai*, the Hawaiian meaning means rich. To describe a rich person is "*kanaka waiwai*." Even today, he who controls the water, controls the richest resource of the land.

Water has always been central in Hawaiian thought and ritual. As much mystical as essential. Hawaiians revered water, protected it, preserved it. Strict rules regulated its use, and kapu prevented its abuse. Each *ahupua'a* had its own system of *'auwai* that diverted water from the stream to the fields and clearings.

The *Konohiki* laid out the path of the *'auwai* and diggers worked from the destination upwards towards the stream. Each *ali'i* provided men according to the number of cultivators on each land. Water was distributed according to the number of men who built and worked on the *'auwai*. No *'auwai* was permitted to take more water than continued to flow down stream, below the dam. It was usually less, for there were those living below the stream drawing water from it. Their right had to be regarded. Dams was made up of loose rock and clods controlled the flow of the water. The height of the dam controlled the flow. If a dam drew too much water, water right holders down stream were permitted to knock it down. If it were subsequently rebuilt, down stream delegates were required to be present to see that a due proportion of the water was left in the stream.

Water rights were primarily for *lo'i kalo* (taro cultivation). Potato patches, bananas or sugar cane had no recognized claim on a water right. The cultivation these, regarded as dry land crops, was invariably during the rainy season, except in the Ko'olau or wet districts.

In ancient time, problems with the supply of water and its fair distribution were rare. Land was held in trust for all who were willing to work for it. Water was available for all who worked to get it. Water problems arose only after individuals could own land. And with the private ownership came the notion of private water rights.

The most ambitious water project was the Waiāhole Ditch. It is safe to say that ancient Hawaiians did not have the means to dig the tunnel. But if they had, they certainly would have done a better job of allocating its water. The same holds true on the outer islands where similar systems were constructed.

As *kanaka maoli*, our rights are recognized to gather by law, but this rights cannot be practiced because there is no water in the stream and therefore we cannot gather. For many years, we have been deprived of this rights. For many years, the water has been taken away, making our ability to plant taro, our staple food impossible to do. Because the users of this diverted water have been paying pennies per gallon, the Office of Hawaiian Affairs and the Hawaiian Homes Commission have been short changed in receiving the revenues they would deserve.

My suggestion to this committee is to lease the water to EMI and HC & S, yearly like you've been doing and adjust the price to fit modern times. Insert a caveat in the lease that if the sugar industry folds the lease automatically expires. Do we go back to ancient times and break down the dams that are stopping the water from flowing to the *lo'i* and to the streams as it was intended? Times have changed, this is a new millennium the information age no more secret deals in the back room. We as a people of Hawai'i are full partners at the table. Get used to it. *Mahalo*!

GC-A: Questions? . . . Mark Sheehan. . . [begin track 5]

MS: . . .Thank you for coming to Maui. I don't know who picked this venue, but I want to object to it, to the fact that it's the ILWU Hall . I appreciate that fact that so many ILWU members can come out in force. But I think, it has had an affect on the hearings here. Next time you might consider. . .the Pā'ia Community Center or some place closer to the affected areas in east Maui.

I'm always amazed that the Board of Land and Natural Resources some how does not have the resources to deal with the tasks that it is responsible for. I don't know if you can give me an explanation, but I would like to know why it is you don't have the money to conduct the Environmental Impact Statement? Can anybody explain this to me and everybody else here? Do you not go to the legislature and to the Governor?

GC-A: Mr. Sheehan, the Department has one percent of the State's budget, and that's spread across all the departments. . . We have gone to Legislature for additional funding, we haven't been that successful, compared to the other priorities in the State. . . We compete against education and other things. . . That's just the way it is. If you have other comments please.

MS: I do have other comments. . . Maybe there is some basis in which you can borrow money from State funds and do the Environmental Impact Statement, I believe that is your responsibility. And then the successful applicant at the auction can

reimburse you for the expense of the EIS. . . [discusses Waiāhole Supreme Court Decision and Precautionary Principle raised earlier] . . .[reading] This is from the Supreme Court's Decision:

> Where scientific is preliminary, and not yet conclusive regarding the management of fresh water resources, which are a part of the public trust, it is prudent without precautionary principles in protecting the resource. That is where there are present or potential threats of serious damage, lack of full scientific certainty should not be a basis for postponing effective measures to prevent environmental degradations. Precautionary principle appears in diverse forms throughout the field of environmental law. . .

I'm reading further from the text.

> . . .And as with any general principle, its meaning was according to the situation, could only develop over time. . .Questions involving the environment are particularly called to uncertainty, yet the statutes and common sense demand regulatory action to prevent harm. Even if the regulator is less than certain that harm is otherwise inevitable. . .

What they suggest here is that it is very important to determine the extent to which the damage to the affected areas, culturally, socially, environmentally, is. And without in-stream gauges. Without careful assessment of the impacts in these areas, and we have no idea of what the extent of it is. It is my belief that there is enough water, if the applicants would come to the table and to negotiate with the other users. There is enough water to allow for the uses of those who live along those streams and for EMI and HC & S' requirements. There is also laid out in that document, what the duties of the State as a Trustee of the State Water Resource Trust are. Which is to take the initiative to plan appropriate in-stream flows. I don't know what the relationship between the Board is and the Commission on Water Resource Management, but they have yet in ten years to have established any permanent in-stream-flows standards. And they seem to be rather than being a watch dog, a political lap dog for developers in terms of plans. They have not really taken their responsibility seriously. That's a serious concern for us.

Further more, your responsibilities are to ensure that all Trust purposes are protected to the extent feasible, and you are advised to preserve the rights of present and future generations in the waters of the State. I don't see how granting these leases, particularly long-term leases, allows you the opportunity to plan for present and future uses.

And then finally, when ruling on water, use applicants among the various recommendations, you are advised to determine any possible harm to the water body, and all alternatives available to reduce or eliminate that harm.

Consider the Cumulative impact of proposed and existing diversion, and I wonder how that will be done? But think that should be done in an Environmental Impact Statement. And you are directed to grant no vested rights to use water, to the detriment of the Public Trust Purposes.

And finally, the water use applicant's duties says that the absence of practical mitigating measures, including the use of alternative water… They are required to justify their proposed uses. How do you determine whether there are alternative sources in the water that the applicant used, besides the cheap water that they get as a result of these leases being awarded. Thank you

GC-A: Questions. . . Doug Sheehan?

DS: My name is Doug Sheehan. . . [resident of Upcountry –supports application] [begin track 6]

AL: [Anders Lyons – TNC] . . .And water quality, through the use of reasonable management practices. The hundred thousand acre East Maui Watershed is one of the most pristine native forest in the State. As a result is also the State's most productive watershed supplying sixty billion gallons of water to Maui annually. The continued participation of A & B in these programs however, depends on the continuing existence in operation, of A & B and its various components.

A & B has many components on the island of Maui all of which are necessary for the success and survival of the whole operation. EMI supplies the water which makes it possible for A C & S to grow sugar cane in central Maui. And in the process delivers water to upcountry farmers, ranchers and residents. A & B has supported and been an essential partner in alien species control efforts, erosion control, protecting forest cover, watershed monitoring, and other watershed protection efforts for decades. The on-going support that participation of A & B in East Maui's Watershed protection efforts are critical to the health and long term viability of the East Maui Watershed. A & B has been a committed partner and steward of the East Maui Watershed, and their efforts providing major contributions to the Maui community and its environment. We strongly urge you to consider the track record of watershed protection by A & B in consideration of this application. Thank you. . .

GC-A: Questions? . . .

GS: My name is Glenn Shepard, I'm a retired geologist, I'm also a member of the Maui County Watershed Advisory Committee, I'm also a stockholder in A & B. . . I hope that they will listen to a few suggestions. I'd hate like hell to see those sugar fields go. This would be terrible. I don't think they have to go. . . They are under welfare, they get a subsidy from the federal government every year for their sugar. . .sugar is not a profitable product. . . I cannot see a continuance of a contract for thirty years. These are different times than when they made those contracts years ago. And we've got to flex with the changes. . . If you have to go to that particular point of an EA or an EIS, for gosh sakes don't let them do it. Have somebody else do it. . . Having A & B do an Environmental Impact is just a little too cozy. . . Get report put out by USGS on East Maui Water. . .

GC-A: . . .James Tanaka. . .

JT: . . .If not for the Hawaiians I would not be here today [urges return of water to streams]. [begin track 7]

ES: [Elliot Crash] . . .Our part of Upcountry Kula is subject to seasonal dry spells also known as droughts. Water is an issue of an enormous importance to our residents, to our farmers. In fact in our upcountry plan water is given premier importance and in our Kula Community Association policy statement on water, we specify that agriculture and Hawaiian Homelands should have first priority for water. We recognize as many speakers before me have that our water is coming from the system that EMI is keeping up. We all appreciate the green central valley when we look down the mountain from where we live. . . [begin Track 8]

VN: [Vema Nahulu] . . .As you can see we are very, very grateful that the meeting is here instead of on us having to take the plane to another island to voice our concerns. I applaud the speakers who have so eloquently spoken today, for the necessity for keeping it at one year renewals instead of the long term. Since it's very questionable as to what's going to happen to the sugar cane industry… [begin Track 9]

MC: [Miranda Camp – Sierra Club] . . .And even before our group had promoted all policies that promote restoration and healthy stream-flow to enhance the habitat for native stream life, and for traditional use by native Hawaiians. We're deeply concerned about the proposed long term leases and their effect on Maui's future. Article 2, Section 7 of the Hawai'i State Constitution it describes that the State as the Trustee of all public resources. We ask the Board to truly examine whether their acting as responsible Trustees. In both granting the short-term leases and considering the option of long-term leases as has been said before. We think that these leases are being granted without specifically enforcing priorities as the public trust.

These priorities are traditional Hawaiian practices such as agriculture and gathering. Determining and maintaining in-stream-flow standards, promoting native stream life and domestic use by communities where these streams flow. There are several other reasons against awarding long-term leases. In the phrasing of the permits the words, the right, privilege and authority for the development, diversion and use of water are used. This development could also cover the drilling of additional wells in East Maui. And that would further affect the entire aquifer. There's no provision to prevent this at this time. There's also no overseeing agency that determines how much water the applicants actually use or need. So if there is a surplus of water will the remainder be used to make possible housing developments rather than agriculture. There's no specific provision in the wording of the leases that the water must be used for agriculture.

There is at least one pending court case as we've heard and we feel like these legal issues should be resolved before any long-term decisions are made. In conclusion, the Sierra Club Maui group is opposed to granting of any long-term leases to the East Maui water by the State as long as these issues are unresolved. Thank you…

GC-A: Questions? Are you saying that the public trust doctrine limits consideration domestic use only to the community's where streams flow?

MC: …No, where the streams flow, those communities should seem to have first rights.

GC-A: Are you saying that's what the Waiähole decision says?

MC: No. I didn't mention Waiähole decision. . .

GC-A: Thank you. Jeffrey Parker.

JP: . . .My name is Jeffrey Parker, I'm a farmer, my farm is situated in one of the subject lease areas. The Huelo area. I've been farming there since 1974, and a resident since 1969. I'm also a member of the Maui County Farm Bureau and briefly served on its Legislative Committee. [opposed to application]

GC-A: . . . Ed Wendt, followed by, Beatrice Kekahuna. . . [begin Track 10]

EW: *Aloha*. . . The members of *Na Moku Aupuni o Ko'olau Hui*, consisting of 550 *kanaka maoli* descendents and/or tenants of the Ke'anae-Wailuanui *ahupua'a* request you not to grant any long-term water lease or permits for East Maui at this time. The diversions has caused extreme hardships on the taro farmers and subsistence gatherers and our very existence is being threatened. We believe more scientific data from the East Maui Watershed by USGS and other co-carried agency's should be conducted, stream by stream to determine the affects the diversions have on our fragile environment and our way of life.

The Office of Hawaiian Affair's should be involved since they have a vested interest in part of the Crown Lands in this area. Should you grant a long-term water lease to EMI, HC & S, what devastating affect will this have on our native rights and our fragile environment? Thank you.

GC-A: Questions? Beatrice Kekahuna followed by Marjorie Wallett.

AS: . . .I'm not Beatrice Kekahuna but my name is Arleen Scott [?]. I would like to leave our testimony here for my mother Marjorie Wallett and my aunt Beatrice Kekahuna. We are here to oppose the thirty-year lease. We live on Honopou Stream and we would really like to get our water back. Not just for the stream itself but also for our future right here [indicating her young daughter]. She's been in here, she's in training so if you guys are going to be on this Board for a while she is going to be coming up and speaking for us in the future. Thank you. . . [Track 11 & 12 black – begin Track 13]

LN: [Lucianne Nieh] . . .Like Trudy I serve on the Board of Ha'ikü Community Association. We've been very concerned about water issues in the previous years. I come here today because I actually live in the affected area and what I'd passed out to you is a little picture show. If you look at the pictures there they tell a story. I really want to appreciate that you come to Maui here. And i would also like to invite you if you do come again to hear more about this, that you would come nearer to East Maui, where many of the folks live who are very affected by this. That would really help.

What you see in these pictures are two areas that are affected by these leases one is Waipi'o valley where I live in the community of Huelo and this is Hämäkua Loa an area that gets quite a bit of rain. What you are looking at is pictures of our community water system which is this pipe stuck in a stream. About forty families, over a hundred people and two churches depend on that, that's their

water system. That's a pipe with a piece of screen wrapped around it and then that pipe goes over the stream and eventually comes out and folks have little pipes over, and sometimes they get giardia, especially when the stream levels are really low. That's the only choice we have. We don't have any county water. We have five streams and we have no county water. Some of our streams are not even lucky enough to run.

On the right hand side of that picture is Waipi'o iki stream which is famous for a big water fall it makes. But no more, it really hasn't run very often in the past several years, you see a little pipe stuck in it someone was trying to get some water for their taro patch that's shown in there. They have to water it with a hose and luckily they get some water from the other pipe for their hose. It's a very, very tough situation. The same thing in Wailuanui. Mr. Wendt spoke. You see on one hand there's a beautiful waterfall and that's up above the diversion and in the picture right below it it's below the diversion. No more water comes out. The fields, there's so many *lo'i* there that folks have farmed for generations, but they just had to cut back because there's not enough water to keep them all going. They can . . .each family can only do a few. They just die after all their efforts. I just wanted you to have those pictures to take home because I don't know if you'll have a chance to do a field visit or anything. The story is on the land there.

When I attended the workshop yesterday and heard about all the things under discussion. I really got a sense from the power point that the State is really the Trustee of these resources. The State does believe that the resources deserve protection and deserve the kind of maintenance. What I have to say with all do respect to EMI, who I have a lot of respect for as an organization, cause we all live side by side these are my neighbors, they live in the next building over the folks that work for EMI and they're all good people. But, they don't have the personnel and no one else has the personnel or money to really maintain this watershed the way it really needs to be maintained. The alien species are just getting all over. We're going to see a big change in the next ten or fifteen years.

So I really think that we need to face the reality that right now there is no reliable way of really maintaining the watershed. The East Maui Watershed Partnership is very much concerned. At areas over three-thousand foot elevation, those are very important pristine areas. The lower watershed also gets a tremendous amount of rain and can contribute to the water productivity and it's just kind of going to hell in a hand basket. I go there all the time and I can tell you it has problems.

Nor is there a way to meet the needs of the local community that's very practical right now. People go and beg for water at any kind of hearing and nothing ever happens you've heard some of it today. I'm here representing fifty people in my neighborhood who had to work and can't come down. We just want you to know, it seems like to award thirty-year leases at this point, when we haven't really figured out a program to make this work with one-year leases, is not really right.

Just to look at the long-term, none of us really know what A & B's needs will be in thirty years. We don't know who will own A & B thirty years from now. We don't know what business they will be in, with all due respect for them I'm sure their trying their best to stay in the agricultural business. We don't know the

future and in spite of the fact that water was available to Pioneer Mill and Amfac and so forth, they had to go out of business. It wasn't a matter that they didn't have water they had water but they didn't have enough price to make the business profitable. I think it's not just a matter of if they have less water all the sugar is going to crumble. Sugar is facing dilemmas and we do all need to stick together. I'm with those other speakers.

I think is that one thing we do know is thirty years from now we're going to need a healthy watershed there. And we're going to need a lot further than thirty years because a lot of people depend on this water. The people who live there and the people who get domestic water from the County, and whoever A & B's successors are and whatever their company needs are. I really think that what we want to come away from this meeting with is a sense that the nature of use of this water may be changing. There certainly appear to be new diversions, not new ditches, the ditches are the same. There's little pipes stuck under streams and things like that, these are plastic pipes they were not installed in the 1920s when the ditches were built. These are recent things so I think it is appropriate to do an environmental impact statement because the nature of the system is changing.

I'm not a professional employee up there, that's the way it looks to me as a person who hikes in the watershed. This is not the same system that it was twenty years ago, a hundred years ago, or fifty years ago. I would hope that the mission of this Board as representatives of the State and being the Trustees of public resources is to uphold the priorities of the Public Trust. I heard that the State has had problems with funding. Personally I've sent letters to the Legislature urging a greater proportion of funding be geared towards our natural resources, and unfortunately we're the voices in the wilderness right now. Maybe a crisis needs to happen for us to be heard.

I also wonder I did some research, I found out that in 1976 there was a petition before your successors in this Board asking the Board of Land and Natural Resources — Life of the Land filed theirs — to set higher rates. Now just imagine if the State would have acted upon that there might have been funding for things like environmental impact statement now. There might have been funding to do some stream-flow standard setting because we could have hired the consultant or paid the USGS. It could have changed a lot so we really need to realize we may need another important juncture that way where decisions are being made by this Board to determine whether another twenty-five years from now we're sitting here in the same position saying well, we wish we could have been taking better care of the resource, but we didn't have any money.

We need to find a way to get that money and a realistic appraisal could be one way. You ask Mr. Christiansen how that can happen I might suggest that in recent years Ka'anapali had sold it's private water system. So there are appraisals of what that is worth. They divert several million gallons a day from the west Maui streams. There also are contractual arrangements between the Board of Water Supply of the County and Wailuku Agri-business to buy water. They pay I believe at least twelve cents per thousand gallons or something for that water. There are I think what we call comparable situations to look at that are outside of the scope of just what the staff people from this Board had looked into. It would be my hope

that and I believe many others share that when we leave this room, we leave with a community vision. We leave with an agreement that the East Maui Watershed and its people that depend on it are in need right now. We can come to that conclusion that there is a need there. And that we can also agree that this whole resource and the people who are deserving of the right to practice their lifestyle within the rural watersheds, are deserving of better protection by their Trustee, the State. And that we need to find a way to do this that involves all the stakeholders. I've heard that a lot today and I really agree with that. There are legally mandated needs, and they are not going to be met just by lawsuits or these confrontive actions. We really need to see everyone brought to the table. I hope this agency can have the auspices to ask representatives of A & B, representatives of the Ha'ikü Community Association, or the Häna Community Association, and *Na Moku* and so forth, to sit at the same table and look at what the future holds.

I also think that you need to know that it appears that A & B is able to trade off ditch water credits for development water out of the County system from time to time. For development in the Ha'ikü area. It looks real bad to the public when this happens because the public is waiting in line for water meters and they don't get any, and A & B can get water meters because they can say, well, we'll give you some more ditch water and then you give us the water meters. There really needs to be a fairer system and if the State is the Trustee it should be involved in determining that fairness. I want to thank you very, very much.

I reiterate the fact that no one wants to see sugar cane disappear, but we're taking one company's word for that if they don't get every single drop of water they're getting now their company will disappear. I think we really need to be realistic about looking at the various sources of water that might be available to them and what they may cost, including reclaimed water from the sewage treatment that's nearby their fields. Wells and even putting pipes in the ditches that they use across their land that must have a huge trans-evaporation rate. If that water were piped it could be enough to save, to restore many of the streams in east Maui. Thank you for your time. . .

GC-A: Questions. . .

JK: . . .I'm trying to scratch out my written notes to shorten it I just want you to know that I am also a litigant, and it's been 15 long years. And I don't think that I will be living after another 15 years. . . My name is Joyce Kainoa, I am a land owner in Wailuanui, Ke'anae, Häna, Maui. I also own land in Pelekunu, North Shore Molokai. My residence, my coordinates, longitude/ latitude 21 degrees, 10 minutes, 7 seconds north, by 156 degrees, 15 minutes and forty-five seconds, west. For the record NHLC represents me. So I'll not comment on it but I would like to add for the record clarification that Mr. Murakami is not going to be liable or more responsible for my comments. I am not his client today, I am *kanaka maoli*, a native Hawaiian. I give notice to this Board that February, 2001 the award of the Hague Tribunal validates my national status. I am a Hawaiian National, by descent. That award recognizes Hawai'i as an independent nation. . . [provides brief overview of illegal occupation by United States, and Hawaiian sovereignty] . . .The Board needs to recognize that

the under law of occupation, you are personally liable for decisions that you make that is detrimental to the future of this land.

The Hawaiian Kingdom Government shall be restored in Hawai'i with it's nationals, legislative branches and Kingdom law in the near future. . . Water is power and when you got too much power…the Board has a very kind of uncomfortable position. You have all this people here, all with the red shirts too. This looks like another Molokai hearing too. I will not be intimidated or criticized because this is my opinion. . .

. . .I live in a very remote area on the north-shore of Molokai. There is no roads, I hike eleven hours to get from one side of the island to the other. I'm a fisherman, I'm a farmer and a live a subsistence lifestyle. I fish for my survival. I live in four watershed areas for ten miles down the coast. . .I cooperate with DLNR because they are doing a job, their work. I pay for them to go in there and check out the watershed. I'm privileged to this pristine environment but I also have land in Ke'anae. When I go home to look at those rivers, for ages to watch this marvelous, outrageous I don't know engineering one of the fetes, I call it the eighth, seventh wonders of the world. You should, the Board I advise you to go up into those mountains, walk the land, look at those ditches. It catch every drop of water that's coming out of the mountain. I hear families testifying or farmers who have been planting taro, my family too, and I see that in coming back again over and over again.

You don't want to see me here and I don't want to be here. I want to just go home but I can't, I have a responsibility, I am spiritually connected to the environment. I'm a practitioner and I am responsible for anything that goes wrong. And I want you to take that into consideration. Please have a care. Please!

Like one of the testimonies that someone said earlier, "we have a lot of *aloha*." I don't have *aloha* today. You sit here you live in Hawai'i you go down to every island. We got a problem, water. So I charge you to *mälama* that source. Forget this politics, get involved, because it's your families, your children, your descendents because you still going be living here when Hawai'i becomes…when the Hawaiian Kingdom is restored, you still going live here. We're not chasing anybody out, I am not. You got to coexist with me and take care of the Hawaiians.

I do not have the ability to pack up this room with *kanaka maoli*. I didn't die on Kaho'olawe and I'm still alive here. I am considered many things and I wear many hats. I live in court, and that is not a good place to be. I envy you're your job, and I don't like your job either, because you can't satisfy all of our uses.

So Molokai is in a drought I have a water wheel, I can't run my water wheel…why? Primarily I have to take care of the land. The water is allowed to flow to the ocean. One brother perhaps, I hope I never misquote you, or misunderstand you. There is a balance of nature between the aquatic life in the stream and the ocean. Restore the watershed and you find that we have more rain. The rain comes back, fishermen more fish to fish. Hawaiians can exercise their gathering rights with caution, because they not only taking, there's also giving back.

EMI, I have families who work for EMI, many years, that their brad and butter. And I'm not at war at you, I'm going with the bigger game, the company. Look at your deeds, see how you got the land. I have land, I have my deeds to my land too. Big question, how you got it? I don't want to make enemies, I'm not prejudiced. . . I'm not going to come here 15 years, where my grandchildren say "I did this before. I don't want to do this."

I consider DLNR as the most powerful Department of the State, it controls, regulates and manages all watershed areas, statewide. And all the State lands and all the natural resources above and below. I request the restoration of streams that are part of the four leases. They should be restored, that's the first agenda, and the water flows all the way down to the ocean. That's where you begin because now you can see with your own two eyes whether or not the watershed area is able to produce, more rain or what, they take more water out. We have to share this water whether you like it or not.

We shouldn't be here fighting over water, we not fighting over water. I just saying to you the Board you got a big responsibility, and I going see you when this Kingdom is returned. You not going like what going happen. . .what I say to you it is also I'm accountable for it.

Next I request the collection of *hihïwai*, *'o'opu* and *kala'ole*, mountain *'öpae*, indigenous to the stream. I can help you because Molokai still got 'em. I can go collect *hihïwai*, *kala'ole* and *'o'opu* and come here to Maui and all that streams that get restored I put 'em back in the streams, because that is what I do on the north shore of Molokai. Even the shoreline, there's a balance between the two. I have one and a half mile of shoreline, I take my family, I've been living there twenty-two years, I travel by boat and helicopter, I even swim to Kalaupapa. Those coast lines that I face Kalawao is my next door neighbor. I have replenished the ground, they should make it illegal for *'öpihi* to be commercialized, just like *hihïwai*. So, we all can eat then we don't get into a problem like fighting on the ocean because Richard was taking too much.

Next, . . .I don't a meter. I request a meter in the beginning and at the end of the watershed areas that the lease is made. You got to know how much water is going in the river and how much is coming out. Does that make sense? Then we won't be here speculating, guessing how much water that the EMI is taking out. I hear a lot of water but where's the meter? I live in remote, I still haven't gotten my meter and DLNR is looking at me that I live in remote that they give me the meter to put in the river so that they can determine how much water I'm taking out. Well, if this can be applied to me, apply it to those who's going to get the lease. That's fair.

In closing, I oppose the thirty-year lease, forget about the thirty-year. Deal with the one-year. You only can handle one thing at a time, don't take too much you can't chew, you can spit it out. That's why everybody going mad with you, don't be afraid of us including me. I'm your conscience, I'll keep on come coming back over here. . . We must go back to tradition . . .You must take out the politics and say I need your help, to help me and help everybody else, even used but we can accommodate everybody, I willing to die for what I believe. Are you too? I hold

the Board responsible, liable for the decisions that you make that is detrimental to the future of this land of *Hawai'i nei*. Thank you.

GC-A: Questions? Issac Hall. . . [begin Track 15]

IH: . . .My name is Isaac Hall speaking for the Coalition to Protect East Maui Water and Maui Tomorrow. We joined in the petition to intervene and the request for contested case proceedings on legal issues, on the proposed short-term disposition and long-term disposition. And we will be submitting a timely written petition to intervene. I've submitted my letter and will not read it, the points that I've made has been made by others. I won't repeat them. I'd like to leave my text behind, and make some points others did not make.

I'm concerned, and a little bit amazed about how this got on your agenda. One half of the public apparently knew about the meeting well in advance then the other half of the public. I'm in the half of the public that didn't know about it. We heard rumblings in the community that A & B, EMI were organizing for this meeting and then we weren't able to find any documents until about May 18th, when the letter. . .A & B's application was released. Letter dated May 14th. I was amazed I've never been able to file an application with DLNR and get on the agenda two weeks later for anything. There is no public review of their application, no agency review of their application, and within two weeks they were on your agenda.

A & B and EMI were out in the community getting people organized. I want to congratulate all the people that are in opposition to this application because they got themselves together in one week's time, whereas A & B and EMI apparently knew about all this well in advance. . .We did pretty dam well. Good work folks.

I also would like to object to this taking place in the ILWU Hall. It's totally inappropriate to be here where William Kennison is here. Where he recused himself, I think this hall should have recused itself as well.

I'm concerned as well. I didn't appear last year when we had the annual exchange of licenses, but Native Hawaiian Legal Corp did and I did by paper, and we pretty much let the Board know we were going to oppose anymore annual exchanges of licenses. And that if it occurred again the next year we were seriously going to oppose by filing a petition to intervene and by going to court.

And we had talks with then Board Chair Tim Johns — "Look, you've got a year to get ready for this next meeting, why don't you prepare an EIS? And an outside independent appraisal, and study the affected riparian and appurtenant water rights, and also put together stream restoration programs. So when we all come together for what is now this May 25th meeting, we're all going to be in the same place."

Well, what happened? No EIS, no EA, no outside independent appraisal, no document at all prepared by staff, on stream restoration at all. No study of riparian or appurtenant water rights that are affected, and A & B is here with the troops asking for the exchange with absolutely no documents. And we're hear and we're saying, "Look, we gave you a year." We also said, "Work with us during this year." And nobody worked with us during the year. So we have these people

saying, we have…we've been waiting for EMI to let the water down. EMI refuses to let any water down, so we have no choice but to ask for a contested case proceedings to have this water down.

What else happened during the course of this year? Of course, Waiāhole got decided on August 22, 2000 after our last meeting. I'm going to assume that all of you read Waiāhole, and you all know the high Trust responsibility imposed on you. And it's not…When you come to this meeting you already must know what water has to be left in the stream before we can allow any of it to be diverted.

What do we have to leave in the stream for in stream values? What do we have to leave in for riparian users? What do we have to leave in for appurtenant users before allowing any to be diverted? We're not there and that's what's forced these petitions to intervene. If we knew that, at this point and time if A & B or EMI had even bothered to work with these people who have been asking for water for fifteen years. . .

. . .The extent of the dewatering, I can't emphasize how horrific, how terrible, how severe it is. Waiāhole that so disturbed the Hawai'i Supreme Court was about twenty-two million gallons a day. Board member Inouye asked the question the maximum capacity of the ditch is four-hundred million gallons a day but the average is a hundred and sixty. Waiāhole was twenty-two, the average is a hundred and sixty here. We've got streams that are diverted sometimes six times, sometimes four times. So you take a stream in some cases, the worst case, that is totally diverted once then it'll percolate out and get diverted totally again. Six times going down the mountain. And we've got a stream holding the water.

And we've got people living below some of these streams that have zero water in their streams. And it's not as if EMI ever asked them, "Is it okay with you if we close your stream? Do you mind if we take all the water out of your stream before we take it out of the watershed?" They never asked anybody. They never went to court and got a judicial determination that it was okay. . .They simply took the water and said "suffer." And it's not as if we hadn't been doing for the last fifteen years, we've been coming to you folks for the last fifteen years saying "please don't give them these leases unless you make sure that they're conditioned upon giving us the water."

Now we're here saying okay, end of it. No more water going out to HC & S and EMI until we get the amount of water we get first, and you make that determination first before you give them any.

The EA, EIS issue, the staff report says on the short-term disposition there's an exemption. I don't believe that's exempt, and I think that's been argued. I think we were entitled to an EA today, even prior to this short-term disposition. So if you took any action on the short-term disposition today without any EA, that that action would be void because of the lack of an EA. On a long-term disposition just to be really quick, that's an agency action, it's you deciding to dispose of water. You're deciding to do a long-term lease, you're deciding to sign the lease, that's an agency action. Since it's an agency action, you prepare the EIS. It's not a matter of do we have the money, don't we have the money, it's required as a matter of law. It's not a matter that bidders by the law can be the one's that you can delegate

that to them. . .I think it's pretty clear under the law that you have the duty since this is an agency action, to prepare that EIS. And it will be a better EIS if you do it. . .

[Notes he is sorry that "A false battle has been brewing here today…" also references several point raised by supporters during the day.]

. . . You have the duty to require that the water be let down. . .

GC-A: Questions? [begin Track 16]

EL: [Ed Lindsey] . . .We are a part of their family, we all live in the same boat, the middle of the Pacific Ocean. The decisions that you make, it's going to be a tough decision. You got everybody pulling you from different ways. When you make this decision go and walk the valleys. Every valley as you go along the east side, you going to see evidence of Hawaiian places. Taro patches with the *'auwai* system still intact. I'm not saying take the water away from them, I'm not from HC & S, they need the water and the Kama'oma'o plains. Water is needed. HC & S provides an intrinsic infrastructure that goes beyond money. The same thing that Pioneer Mill and Amfac in Lahaina. Now that the infrastructure is gone, no green. Now you have farmers coming in they want to farm. They have to look at the infrastructure, the ditch system. It's in disrepair. The same thing is happening here. We need to maintain the infrastructure.

Now if you are the primary caretakers, the stewards of the water resources, and if you give a long-term lease, what is the natural behavior that is going to occur. If you give anybody a long leash they start to run around and do all kinds of things. So to keep an accountability, you need something where you can come in and say, this is out of line or that is out of line. When you give a long-term lease like that, yes financially it helps them. This is really not a question I feel of agriculture. This is going to go down to a question of development. Lands without water are useless. If you have water to land, and this is what we're finding out on west Maui. You have lots of buyers there but the first question comes up. "You have water for the land?" And if the answer is "No," or if the answer is "unsure." "I don't want to touch it."

Now, we are involved over in west Maui in an effort to green the area back up with native trees and so on, and different kind of agricultural products. This is just directly above Lahaina town and that belongs to Kamehameha Schools. Everybody has a stake in it. We would not like to see anything happen to HC & S. Just as the employees of HC & S would not like to see our brothers and sisters who are trying to raise *lo'i*, get stabbed in the back. We don't want them hurt. If you go down here and ask everybody and say, we don't want anybody hurt. We don't want the people from Ke'anae hurt, no. From Wailuanui hurt, no. Wailuanui, Ke'anae has been filing a case these law cases for their water since the early 1900's, I think 1906 law cases have come up. And every time the poor people who come up and file these cases, they are ignored because we don't have money. Thank goodness that OHA has the 20% from the ceded lands to fund the Native Legal Corp. With the Native Legal Corp being funded everybody is at that same level eye to eye. And the resolution to this problem is, as the song goes, "Let's talk story."

That's what has to be done. You know if you get tangled up in the legal stuff, it's forever. Why can't we just sit down and talk story.

You are important, we are important this whole island is important, let's talk story. Let's not get tangled up in legal. Otherwise you just get upsmanship. Wave after wave comes in of legal entanglement. And nobody really wins, everybody looses. Let's look for solutions, let's identify the problems. As I said, you folks have a tough job to do when you have to listen to everybody. *Mahalo.*

GC-A: Questions. . . Followed by Kristina Hemming and Lisa Kahiamoe.

KIn: . . .We did want to have this issue heard on Maui, our dilemma is that several of us are from off island, and since it's prior to a long weekend, flights are booked and we are about to loose quorum. Can we ask people who are testifying to keep it as concise as possible and if they have written testimony to submit it so we can try to resolve this item today.

NA: [Nikil Ananda (sp. ?)] Is that to the chair or to myself?

KIn: To the audience, everyone.

NA: My name is Nikil Ananda, I am a residence of Huelo, I live on…my property is located on Mokupapa Stream. So for the Board who is not from here on Maui, I point to you where the stream is in Huelo. . . .I do appreciate that you came to Maui. I really appreciate the workshop that we had yesterday, that really bought me up to speed on a lot of issues that I wasn't aware of. . .I also agree that this is an inappropriate place to have this meeting. Should have had it in Ha'ikū or Ke'anae so you could see the area that we're talking about. It's a beautiful hall, but it's just an inappropriate place. So when you sit here you don't feel the same thing. I'm happy that there's not going to be a thirty-year lease, we're all sure of that. That's going to be one step in the right direction. But we are all dependent upon water. Many people have talked today that we are all in this together.

. . .No one wants to see HC & S go out of business and every time I hear these comments it also makes the hair that don't have on the front of my hair stand up. Nobody is talking about that. . .I agree with most of what was said by Isaac, and most of what was said by everybody. Everybody is dependent upon water, we want water.

My property line picture at the end of this table and picture the EMI ditch/dam is right over there where you're sitting Commissioner Inouye. And that ditch is flowing. It's a couple of feet worth of water and it flows a couple of feet worth of water twelve months out of the year. And that's the natural creek, and then the stream flows from that point on is where my property line is and it's drier than this floor, 330 days out of the year. The width of my stream is about half of this room, and it just didn't get there by accident. It got there because naturally, the stream used to flow there.

You asked earlier about having new information. I know I mentioned it yesterday some of you were not here. It was ironic that yesterday on the way to the workshop, I heard on National Public Radio talking about a lake in California. . . A lake was bled dry to bring water into Los Angeles and now their bringing the water back because they realize it was inappropriate. And that's what people who

live on the streams that are dry are saying. I'm not saying to take most of the water from EMI, and to put HC & S out of business. And every time you guys say that you know it's not true. But I'd like to see some water in my stream because that's where its natural where it should be. The allocation of water, a really good point that was brought up earlier today, about gold, and then petroleum and now water.

So you're not going to give the thirty-year lease that's sure it's inappropriate. It's probably inappropriate to give a one-year lease but that might be the mediative agreement that we allow another one-year lease. What's long overdue, when I hear people that had been talking for generations about getting water in Ke'anae and they've lived on that water. I think that is long overdue. . .that the in-stream-flow standards need to be done immediately. The EIS, it's inappropriate for HC & S or EMI to be required to do the Environmental Impact Statement. That's a State requirement. So I would strongly urge you to go back to whoever you need to for your funding and require the Governor, the Legislature to find the funds. The funds are there we all know it's a choice of where we spend the money. An EIS needs to be done, in-stream-flow standards need to be done immediately before any longer term lease. . .

. . .And the water that's being used I wonder if an amendment could be put into any more lease that's given with EMI that the water only goes to agriculture. That's what I hear a lot of you talk about your jobs will be lost, and yet I don't hear you guys coming in front of the Planning Commission and Council and saying "Don't make this develop in Spreckelsville, don't develop someplace else in Ha'ikū because it's ag-land you're taking away our jobs." I never, ever see you guys there testifying next to me when we're talking about we need the agriculture land. . .

I also serve as the Publicity Chair of the Ha'ikū Community Association and earlier the president was here. I do feel that it is important to read some points. Historically the Ha'ikū Community Association has asked the Maui County Water Board to reexamine the current method of apportioning the billions of gallons of surface water which originates on State owned watershed lands. They referred up to the State Commission on Water Resources and to your Board. These waters which are public resources in which are subject to State policies, governing local agricultural use, traditional native Hawaiian agricultural and customary use, have been consigned to a corporate entity under past and current lease procedures. Our members have voiced numerous concerns that local, riparian, agricultural, and traditional Hawaiian rights, to adequate water flows of local streams are not being met. Their only recourse to rectify the situation would be costly lawsuits and now that's where we're at.

Families in our community are accustomed to yearly mandatory water restrictions of our County water supply despite that we live in one of the rainiest populations area of Maui and I would submit that every time I listen to the radio and TV about "today is going to be sunny and hot," and I look out my window and it's pouring in Huelo. Then I know that there is plenty of water on our side of the island. And yes, it needs to be shared, But not at the expense of a stream on my property, which is bone dry.

Additionally there exists a confusing system for allocations of water meters. A & B is successful in procuring new meters for their sub-divisions, Ha'ikū Mauka, Ha'ikū Hill and Ha'ikū Makai, while other families in our community have to wait years. I think that you should be aware of that too. That again when I talk about agricultural development it is occurring in our Ha'ikū region. Citizens of the Ha'ikū area share deep concern about the water for ill-advised developments... So what the Ha'ikū Community Association has asked, is for these recommendations.

That you deny the request for an extension of the East Maui Water Leases. . . Longer term would continue unsuitable policies, while eliminating public scrutiny.

To determine a fair market value for the water withdrawals, commiserate with similar source withdrawals, County and State wide. The legislature has voted down all increases in municipal fee structures that could have funded watershed protection and restoration efforts. The fees need to be based on fair market value...

Bring in reputable outside consultants. Modern computer modeling techniques now make this possible. And instruct the State and local agencies to gather accurate data on stream flow standards of east Maui streams affected by the diversion. Based on these studies complete an independent EIS on the impacts of these stream diversions. . . [begin Track 17]

GC-A: Questions? . . . [end of hearing]

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30, 78, 79, 111, 137

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'Ekaha (Asplenium nidus)
248, 260, 305, 306

Hala (Lauhala -pandanus)
50, 95, 143, 153, 246, 247, 248, 303, 304, 305, 306

Hau (Hibisuus tiliaceus)
28, 29, 149, 183, 184, 187, 240, 270, 271, 276, 280, 288, 293, 298, 302, 304, 310, 313, 351

Hō'i'o (Diplazium arnottii)
11, 44, 46, 89, 90, 129, 130, 287

'Ie'ie (Freysinetia arborea)
71, 73, 74, 85, 95, 96, 100, 107, 112, 368

'Iwa (Asplenium horidum; also called alae)
247, 248, 260, 305, 306

Kalo (Taro)
10, 11, 15, 16, 19, 20, 21, 23, 28, 37, 48, 55, 94, 98, 131, 136, 137, 138, 140, 142, 150, 151, 165, 182, 183, 184, 212, 214, 224, 229, 230, 238, 240, 241, 255, 256, 258, 259, 268, 269, 271, 272, 274, 275, 276, 279, 284, 288, 293, 294, 295, 296, 297, 303, 315, 319, 320, 324, 325, 326, 328, 335, 336, 337, 339, 341, 343, 344, 348, 353, 354, 355, 360, 361, 362, 365, 366, 367, 372, 376, 377, 382, 383, 388, 392, 393, 394, 395, 396, 398, 399, 404, 407, 409, 410, 413, 414, 416, 419, 420, 421, 422, 427, 428, 429, 434, 435, 436, 439, 440, 455, 459, 462, 463, 464, 465, 466, 467, 470, 471, 475, 476, 479, 483

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69, 70, 71, 92, 152

Māmaki (Pipturus)
94, 95, 100, 206

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50

Neneleau (a native Sumach)
143

'Ōhāwai (Lobelia)
88, 91, 92, 95, 100

'Ohe (Native Bamboo)
54, 72, 131, 153, 186, 220, 247, 260, 305, 306, 427

'Ōhi'a Lehua (Metrosideros polymorpha)
28, 95, 107, 155, 340, 368

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114, 136, 143, 147, 170, 171, 184, 218, 220, 249, 288, 301, 354

Pā'ihi ('Ōhi'a hā) (Euginia malaccensis)
28, 107

Pohole (a fern similar to the hō'i'o)
11, 44, 45, 46, 89, 90, 129, 130, 259, 287

'Uala (Sweet Potatoes)
65,135, 202, 253, 254, 255, 275, 288, 333, 360, 425, 431, 470

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243, 329

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152, 176, 328, 329

He'e (octopus)
255, 339, 442

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29, 94, 171, 192, 221, 230, 242, 243, 255, 260, 300, 302, 309, 320, 329, 332, 339, 355, 366, 384, 388, 397, 398, 414, 426, 427, 428, 480

Hināłea (wrasse fish)
328, 329

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20, 152, 230, 243, 287, 427, 428, 430

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20, 73, 172, 253, 433

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146, 441

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11, 12, 19, 20, 21, 29, 39, 54, 60, 61, 94, 170, 221, 230, 249, 250, 251, 259, 287, 302, 311, 320, 332, 335, 339, 380, 382, 384, 385, 388, 393, 397, 398, 401, 403, 404, 414, 426, 427, 428, 480

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'Ōpihi (limpets)
56, 136, 250, 255, 333, 383, 433, 434, 442, 480

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APPENDIX A
RELEASE OF
ORAL HISTORY INTERVIEW RECORDS

INTERVIEW RECORDS AND RELEASE

All participants in the recorded oral history interviews conducted as a part of this study reviewed, and granted permission for release of their interview transcripts in Volume II (above). In requesting permission for release from the interview participants, Maly followed a general release of interview records form (*Figure A-1*). All of the interviewees agreed, and felt that their verbal release was all that was necessary, for release of the interviews. Dates of interviews and release are cited below:

Interviewee ***Date(s) of Interview***	***Date of Release***
James K. Hū'eu Jr. April 11 & 25, and November 6, 2001	November 6, 2001
Stephen Cabral April 23, 2001	November 7, 2001
Mary Evanson April 24, 2001	November 19, 2001
Mina Atai April 24, 2001	November 7, 2001
Helen Näkänelua April 26, 2001	November 8, 2001
Beatrice Kekahuna and Wanda Vierra April 27, 2001 & November 7, 2001	November 20, 2001
Marjorie Kaleialoha Wallett and Lyn Scott November 7, 2001	November 20, 2001
F. Lehua Dang-Harold May 24, 2001	November 8, 2001
Helen Range-Wilhelm with Robert and Harvey Wilhelm; and Jackie & Albert Honoka'upu	November 13, 2001 May 26, 2001
Joseph C. Rosa Jr. and Nalani Rosa-Magliato November 8, 2001	November 18, 2001

Personal Release of Oral History Interview Records
"Wai o ke Ola – He Wahi Mo'olelo no Maui Hikina" an Oral History Study
for the Families and Lands of Hämäkua Poko, Hämäkua Loa and Ko'olau, East Maui

The interview referenced below was conducted by Kepä Maly (*Kumu Pono Associates*), as a part of a cultural assessment study to identify cultural and historical properties, and practices associated with the lands and waters of the Hämäkua Poko, Hämäkua Loa and Ko'olau region on the Island of Maui. The study was conducted at the request of East Maui Irrigation Company (EMI Co.), as a part of a State Land Use planning process. The study is meant to provide readers with traditional and historical background information which may be helpful in planning for site and resource preservation, interpretation, and in formulating land use actions (with particular interest in water flow and its relationship to land use practices).

Date of Interview(s):_____.

Handwritten notes made on:_____.

I, _____, participated in the above referenced oral history interview with Kepä Maly. I have reviewed and made corrections to the interview records, and hereby give permission to Kepä Maly to include the released interview transcript in the archival/oral historical study he is preparing (KPA Report MaHikina59). This permission is granted, subject to any restrictions listed below:

(**a**) The released interview transcript(s) and/or quotes from the interview(s) may be included as a part of the final report on historic and cultural sites and practices in the Maui Hikina study area.

Yes or no: _____

(**b**) Copies of the interview transcript (including maps and photographs – subject to restrictions) may be made available to appropriate review agencies as a part of the historic preservation review process.

Yes or no: _____

(**c**) The released interview records may be housed in library and/or historical society (museum) collections for review by the general public.

Yes or no: _____

(**d**) The released interview records may be referenced by Kepä Maly for scholarly publication.

Yes or no: _____

(**e**) Restrictions:

_____ (Interviewee)

Address: _____

_____

_____ Date of Release

_____
Kepä Maly (Interviewer)
Kumu Pono Associates
554 Keonaona St.
Hilo, Hawai'i 96720

Figure A-1. Personal Release of Oral History Interview Records Form

DECLARATION

Name Solomon KAAUAMO Sr.

Address KEANAE

Age 68

1. I/My family □ lives on and/or □ grows kalo on property I/we own adjacent to WAIOKAMILO/WAIUANUI Stream(s).
2. I/My family owns property adjacent to an 'auwai system connected to WAIOKAMILO Stream(s).
3. I/My family gather(s)/would gather and/or fish/would fish for (check all that apply):

□ `o`opu in WAIUANUI Stream(s).

□ hihiwai in PALAUHULU Stream(s).

□ `opae in WAIUA IKI Stream(s).

□ haha in HANAWI Stream(s).

□ pulu in ~~Pa~~ KAPAULA Stream(s).

□ leko in PAAKEA Stream(s).

□ pohole near HONOMANU/NUAAILUA Stream(s).

□ aholehole in the nearshore waters below WAILUAIKI Stream(s).

□ mullet in the nearshore waters below WAIOHUE Stream(s).

□ other (please specify): MOI, OIO, ENENU in or around All of the above streams mentioned Stream(s) but are unable to do so because there is insufficient water. (Describe problem in your own words):

All of the Fish and Subsistance from the streams requires some water presently theres no water in all of these streams

4. I/My family would grow or increase current acreage by Maintain Current Acreage and increase when water becomes Available acres of kalo irrigated by water from from WAIOKAMILO/WAIUANUI Stream(s) but are unable to do so

because there is insufficient water in that stream(s). (Describe problem in your own words):

Not enough water in streams.

5. It would take me/my family More than a year months to begin production of kalo and restore 1 acre acres of lo`i if stream water was restored.
6. The cost of restoring lo`i in _____ Stream(s) would be around _____.
7.

DECLARANT

Solomon Kaauamalu 2-28-10

Signature (Date)

DECLARATION

Name PAUL R Bodnar

Address Po box 611 hana HI 96713

Age (67)

1. I/My family ☐ lives on and/or ☐ grows kalo on property I/we own adjacent to makapipi Stream(s).
2. I/My family owns property adjacent to an ʻauwai system connected to .7 3/4 Ac. Stream(s).
3. I/My family gather(s)/would gather and/or fish/would fish for (check all that apply):

☐ ʻoʻopu in makapipi Stream(s).

☒ hihiwai in " Stream(s).

☐ ʻopae in " Stream(s).

☐ haha in " Stream(s).

☐ pulu in " Stream(s).

☐ leko in " Stream(s).

☐ pohole near " Stream(s).

☐ aholehole in the nearshore waters below _____ Stream(s).

☒ mullet in the nearshore waters below _____ Stream(s).

☐ other (please specify): _____ in or around _____ Stream(s) but are unable to do so because there is insufficient water. (Describe problem in your own words):

_____

_____

_____

_____

_____

4. I/My family would grow or increase current acreage by _____ acres of kalo irrigated by water from _____ Stream(s) but are unable to do so

because there is insufficient water in that stream(s). (Describe problem in your own words):

_____

_____

_____

_____

_____

5. It would take me/my family Undetermined months to begin production of kalo and restore _____acres of lo`i if stream water was restored.
6. The cost of restoring lo`i in _____ Stream(s) would be around _____.
7.

DECLARANT

Paul R Bohman 2-28-10

Signature (Date)

DECLARATION

Name PAUL T. SIMONAI SR.

Address 2848 IWALANI ST., PUKALANI HI 96768

Age 66

1. I/My family □ lives on and/or ☑ grows kalo on property I/we own adjacent to WAIKAMILO Stream(s).
2. I/My family owns property adjacent to an 'auwai system connected to _____ Stream(s).
3. I/My family gather(s)/would gather and/or fish/would fish for (check all that apply):

□ `o`opu in WAIKAMILO Stream(s).

□ hihiwai in _____ Stream(s).

☑ `opae in WAILUAIKI Stream(s).

☑ haha in WAILUAIKI Stream(s).

□ pulu in _____ Stream(s).

☑ leko in WAINU Stream(s).

☑ pohole near HONOMANU Stream(s).

☑ aholehole in the nearshore waters below _____ Stream(s).

☑ mullet in the nearshore waters below WAIKANI Stream(s).

□ other (please specify): _____ in or around _____ Stream(s) but are unable to do so because there is insufficient water. (Describe problem in your own words):

BECAUSE WITH MORE WATER THE STREAMS STAYS COOLER. ~~[illegible]~~ (LESS WATER CREATES BACTERIA IN STREAMS)

4. I/My family would grow or increase current acreage by _____ acres of kalo irrigated by water from ~~WAIKAMILO~~ KULANI _____ Stream(s) but are unable to do so

because there is insufficient water in that stream(s). (Describe problem in your own words):

NICE MAINTAIN until MORE WATER IS AVAILABLE

5. It would take me/my family _____months to begin production of kalo and restore _____acres of lo`i if stream water was restored.
6. The cost of restoring lo`i in _____ Stream(s) would be around _____.
7.

DECLARANT

[signature] 12/28/10

Signature (Date)

He huewai Ola ke kanaka Na Käne.

Man is Käne's living water gourd.

Water is life and Käne is the keeper of water.

I am writing to discuss water diversion in East Maui which affects all inhabitants of Maui. It is an issue of whether we will allow agriculture to survive in our streams by making sure that farmers have access to enough water to grow their crops.

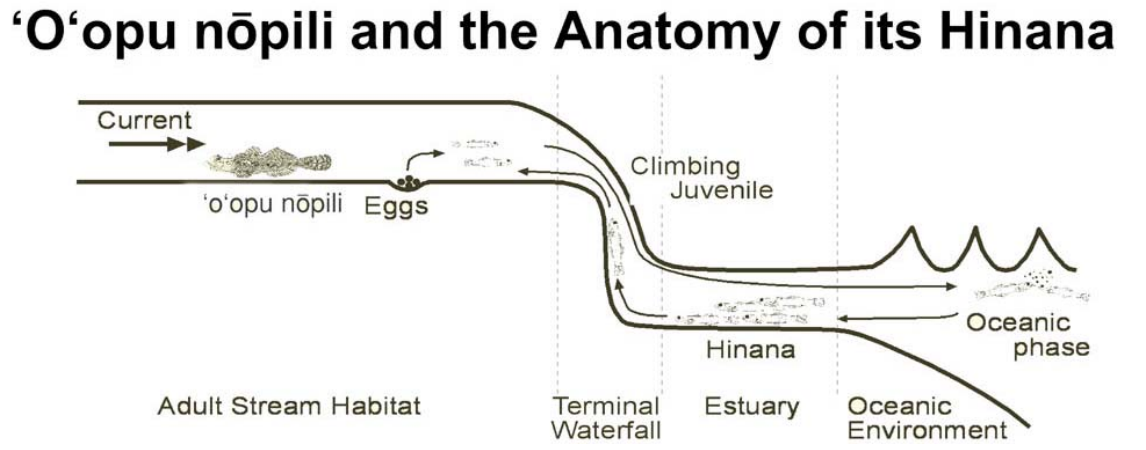
I am writing to talk about the technical and scientific aspects of in-stream flow levels. There are many of you who already know about this. I am here to talk about reaching a reasonable and balanced decision by the Water Commission, and also to say that the decisions that the Commission makes will greatly effect the future of the east side and Maui as a whole. I believe because companies that grow crops should be given some rights to the water because if they stand in the same position as the east maui taro farmers (cultivation of crops) but only with a big name.

Water for agricultural operations should be given the same level of protection as that given to home grown consumption, the protection of traditional and customary Hawaiian rights, and the protection of forest and freshwater stream life to achieve a proper water life balance. I feel that taro farmers should come up with a east Maui farmers board if not already created and come up with a reasonable amount of how much water is actually used daily to cultivate their crops, and bring that number back to the water commission so they can discuss the real amount of water that is needed and that should be let back into the 16 streams that are currently being diverted.

Our state Constitution specifically calls for the conservation and protection of agricultural lands, promotion of different agriculture, and making sure of agricultural self sufficiency. Agriculture depends on water. Agriculture, and the water it needs for growth, is a part of the public trust. Water is a natural resource that is essential for life and when used with care and understanding, is a benefit to the community. Maui has a long history of

depending on water from streams to meet the needs of its population – for growing crops, drinking, and for the preservation of freshwater stream life.

Water that is returned or that stays in streams on Maui is done at the expense of those who depend on this water on a daily basis. Which include Hawaiian Commercial and Sugar Company (HC&S), upcountry farmers in Kula who rely on this water?
This is about whether we will be able to save almost 35,000 acres of produce land on Maui and protect the jobs of more than 800 workers and their families who depend on water for their livelihoods. This matter is about the residents of Maui who must depend on these streams for their drinking water. It is also about providing for in-stream species and habitat life, such as Hihiwai, Oopu, and Opae. Oopu as you know swim down stream to collect food and swim upstream to lay their eggs but if there is no water then how are they supposed to lay their eggs? This life stream is displayed for you in the figure below.



(http://hawaii.gov/dlnr/dar/pubs/Nopili.pdf)

This issue is about Customary Hawaiian rights. “Water rights were primarily for [loʻi], that is, for kalo culture.” Wetland kalo requires a consistent supply of cool, fresh water flowing through the loʻi (wetland kalo patch) to survive and thrive. Consistent mauka to makai flow in streams is also necessary for native stream life to reproduce, including ʻoʻopu, ʻōpae, and hīhīwai (also known as wī), which provided an important food source,

especially during winter months. Ola i ka wai: water is life. Continuous mauka to makai (from the mountains to the ocean) stream flow provided critical fresh water for drinking, supported traditional agriculture and aquaculture, recharged ground water supplies, and sustained productive estuaries and fisheries by both bringing nutrients from the uplands to the sea and providing a travel corridor so that native stream animals could migrate between the streams and ocean and complete their life cycles (water primer). This is a matter that impacts our core value that Hawai‘i should remain a viable agricultural state in the midst of continued urbanization.

I decided to pull aside my grandfather one of the many distinguished kupuna that we have here in Ko’olau to simply ask 3 questions that would help clarify the types of practices actually being done in the streams, if they continue to do these practices and what exact stream do they go to. Stanley Akoi a well known citizen of Ko’olau who grew up in the Keanae peninsula, “Traditional practices that I have done in the streams of East Maui have been catching Opae, Oopu and Hihiwai in the streams. Gathering taro top leaves and harvesting taro for Poi Hawaii’s main source of starch. It has been a living in my family from when we were young kids. We grew up around the Lo’i.” I then ask him if he could name some of the streams that he practiced these cultural events in and he simply said “The stream that we use to go to when we were young was the stream that flows trough chings pond, because it was the only river that we were allowed to go to, Wailuanui was an option only when my dad went with us.” Yet finally the question about practicing it today came up and his nice and short answer was simply “No I don’t practice there things now because I am getting older and I believe that the younger generations should continue.” Later I ran into some other family members and friends and asked the same questions.

Tweet Akoi

1) Oopu Taro Farming
2) Keanae Arboretum and lower Keanae for taro.
3) No because don’t live near by like before.

Tenia Akoi

1) Prawns, Fishing, Swimming

2) Wailuanui for prawns and chings pond for swimming/

3) No she doesn't know why she wouldn't go but knows that if there wasn't this whole issue about water she would try to attempt it again.

Nichole Kalama

1) Oopu, Opae, Hihiwai, Taro, Prawning

2) Makapipi, Wailuanui, and Palauhulu.

3) Would go but for what when only get little baby kind because there is no water for them for reproduce.

Mikela Akoi

1) Prawning, Opae, Watercress, Taro

2) Waiahole and Wailoa.

3) Would but hardly get water so I hardly go.

I believe that decision that is made by the water commission must allow the current users of these streams to continue to receive water in amounts that allow their crops and company to increase and allow enough water for fresh water stream life to survive and for cultural gathering practices shall not be hinder. All of them who were kind enough to answer my questions were all sort of similar they all made it clear that the streams that were mentioned were not going to be practiced in anymore because the whole "Water Issue" people fighting of water is this ever going to be solved. I'd like to thank you for your time.

Mahalo,

Kekoa Nakooka-akoi

6.0 Mar. 23, 2010 - Hawaiian Commercial & Sugar Company

Hawaiian Commercial & Sugar Company (HC&S) provided information on:

1) Attachment A: Daily Water Balance; and
2) Attachment B: Modified Penman Equation.

LINDA LINGLE
GOVERNOR OF HAWAII

LAURA H. THIELEN
CHAIRPERSON

WILLIAM D. BALFOUR, JR.
SUMNER ERDMAN
NEAL S. FUJIWARA
CHIYOME L. FUKINO, M.D.
DONNA FAY K. KIYOSAKI, P.E.
LAWRENCE H. MIIKE, M.D., J.D.

KEN C. KAWAHARA, P.E.
DEPUTY DIRECTOR

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT
P.O. BOX 621
HONOLULU, HAWAII 96809

March 23, 2010

Mr. Christopher Benjamin
Hawaiian Commercial & Sugar Company
P.O. Box 266
Puunene, Hawaii 96784

Dear Mr. Benjamin:

The purpose of this letter is to request additional information that the staff at the Commission on Water Resource Management (Commission) needs concerning the interim instream flow standard (interim IFS) recommendations and adaptive management strategies for 19 east Maui streams presented at the Commission meeting on December 16-17, 2009, in Paia, Maui. This request was discussed at the stakeholder meeting held on March 11, 2010 in Oahu, which HC&S and various other parties attended.

Commission staff asks that information on the daily water balance of drip irrigation fields for a period of one water year selected between years 2004 to 2008. Such data is produced by HC&S' water balance model, and is included in the water balance report that HC&S generates on a daily basis to determine irrigation requirements for each field. Staff is also seeking the actual amount of water applied per day for each irrigated field for the selected water year if not already included in the water balance report.

Upon reviewing this request and available data, please notify the Commission staff and provide an expected submission date no later than April 16, 2010. Data should be presented in an electronic format that the Commission staff can use to conduct direct computations and other necessary analyses. For example, staff would prefer an excel spreadsheet instead of a scanned PDF copy of the data.

Should you have any questions, please contact Dean Uyeno of the Stream Protection and Management Branch at 587-0249, or via email at dean.d.uyeno@hawaii.gov. On behalf of the Commission, I would like to thank you in advance for your cooperation in this matter.

Sincerely,

KEN C. KAWAHARA, P.E.
Deputy Director

KCK:du

April 16, 2010

Mr. Ken C. Kawahara, P.E.
Deputy Director
Commission on Water Resource Management
State of Hawaii
P. O. Box 621
Honolulu, HI 96809

Dear Mr. Kawahara:

We are transmitting herein the additional information requested on HC&S' daily water balance pursuant to your letter dated March 23, 2010 as clarified by subsequent communications with Commission staff. Enclosed please find:

- Attachment A: Daily Water Balance
  We have included daily water balance information for four sample East Maui fields throughout the most recent two successive two-year crop cycles—a cycle with 'normal' water availability and one drought cycle. The sample fields represent each of the East Maui ditch sources (Hamakua, Kauhikoa, Lowrie and Haiku), including two fields (Hamakua and Kauhikoa) that have no access to pump water.

  In that the daily water balance information we have provided is only part of the information taken into account by our field managers when making irrigation decisions for each field, we also have included a description of the full protocol followed.

- Attachment B: Modified Penman Equation
  As requested, we have included the modified Penman equation used by HC&S to determine daily evaporation values

We appreciate the guidance you and your staff provided so that we could best fulfill your data request. We would be happy to meet to provide further explanation, if desired. As discussed previously, we are submitting these data in an Excel spreadsheet for ease of review by CWRM staff, and have also attached the same data in PDF file, the format that should be used when sharing the data with the other parties. Should you wish to have a CD of this transmittal, we would be happy to provide one.

Please do not hesitate to call if you have any questions.

Sincerely,

Christopher J. Benjamin
HC&S General Manager

HAWAIIAN COMMERCIAL & SUGAR COMPANY A DIVISION OF ALEXANDER & BALDWIN, INC.
P.O. BOX 266 PUUNENE, MAUI, HAWAII 96784 TEL 808-877-6978 FAX 808-871-2149

ATTACHMENT A: DAILY WATER BALANCE

Summary:

This attachment includes the requested daily water balance information for four sample East Maui fields throughout two successive two-year crop cycles—a cycle with 'normal' water availability and one drought cycle. The sample fields were selected to represent different East Maui ditch sources—Hamakua (F302), Kauhikoa (F306), Lowrie (F500) and Haiku (F602), including two fields (F302 and F306) that have no access to pump water.

Water balance information, such as that attached, represents just a portion of the factors taken into account by our field managers when making daily irrigation decisions. Actual field observations/tests, consideration of the stage of growth of the crop, other agronomic needs and water availability that day are also taken into account. The typical protocol involves the manager starting the day by updating the water balance database with the results of the previous day, including applied irrigation, rainfall, and miscellaneous notes/comments regarding the field status or condition, and reviewing other updated data. The manager then reviews the water balance information, noting in particular the current soil moisture storage levels, the days off water and rainfall. The manager will also use actual observations and on-the-ground knowledge to validate this data. Even though computers and automated weather stations have improved our ability to make sound agronomic decisions, there is no substitute for field observations and assessments of soil moisture. The most important tool for any field manager is still the shovel.

The manager further considers the non-irrigation water needs of the crop, including pest control, fertilizer applications, and irrigation system maintenance. The stage of growth of the crop can also play a big factor, as crops in the germination stage need to be irrigated at rates that exceed evapotranspiration, with the goal being to keep the soil moisture storage level at 100%. Conversely, during the ripening period, limited irrigation is applied. The field manager then conducts an inventory of available water resources, from surface flows, groundwater pumps (where available), reservoir storage and potential contributions from rainfall, and best prioritizes and schedules available water to meet crop and operational needs. Note that from an operational point of view, once an irrigation decision is implemented, it is difficult to alter that day.

The attached information indicates:

- Irrigation decisions are not made casually. A large amount of information is taken into account before daily water decisions are made. Prioritization of available water resources is made after carefully reviewing individual field requirements, field operation needs, and weather conditions.

- Yields in a crop cycle typified by drought are significantly lower than yields during crop cycles with 'normal' water availability. The following table summarizes yields for the fields included in this submittal. 2007 water availability is characterized as "normal" while 2009 represents drought conditions.

Field	2005-2007 Crop Cycle ("2007 Crop") TSA	2007-2009 Crop Cycle ("2009 Crop") TSA
302-1	13.6	10.1
306-1	11.9	8.1
500-2	11.0	7.3
602-2	12.3	8.5

- Water, both applied irrigation and effective rainfall, over and above that directly consumed by the plant is stored in the soil and used to support the plant when applied irrigation and effective rainfall aren't available or enough to meet the plant needs (see Current % SMS). Soil moisture storage levels are an important factor when making daily irrigation decisions.
- Typically, during the dry season, fields go many consecutive days without water (see 'Comments" column, WS-#) .
- HC&S is typically water-short; at the end of crop cycles, fields typically show water deficits (see totals at end of each crop cycle)—i.e. there were lost opportunities for plant growth/increased sugar yields due to unavailability of water during growth periods in the crop cycle.

Explanation of Data:

An explanation of the data headings follows:

Field:	Field number
Block:	Block number— irrigation system within a field
Plot:	Plot number—smallest unit within a block that can be irrigated separately
Entry Date:	Date data entered, typically early morning
Crop Age:	In months
Hrs Irr:	Hours of applied irrigation
Days Irr:	Number of consecutive days a crop has received applied irrigation and/or effective rain. Note that "S" denotes the start of an irrigation interval (ie. first day irrigation occurs after an interval of no irrigation (Days Off)). Also, not all applied irrigation and effective rainfall shows up as a 'day' in the program—there is a trigger expressed in acre-inches. All applied irrigation is captured, however, in the hours irrigated (Hrs Irr) figure.

Days Off: Number of consecutive days a crop has received no irrigation either through applied irrigation or effective rain. Note that "S" denotes the start of a no-irrigation interval (ie. the first day, after an irrigation interval, that no irrigation occurs).

Note on Days Irr/Days Off: These two data items are not used much by the field managers when making irrigation decisions. The more significant data are the hours irrigated (Hrs Irr) and the number of water-short days, which shows up in the Comments column as "WS - #" and is a value that is calculated by the model.

Adj Evap ac in: Adjusted evapotranspiration need in acre-inches—adjusted for crop age, on a daily basis. Represents water needs of the crop over its life span. HC&S has a network of 13 automated weather stations across the plantation that provide information used to calculate adjusted evapotranspiration; please note that as with all mechanical instruments, there can occasionally be failures of sensors, radios, etc. A default system has been built into the program such that a day of missing data will trigger the use of the previous day's data. After three days of missing data, the program utilizes historical averages.

Act Rain: Actual Rainfall—acre-inches of rain that falls on this particular field, as measured by 41 rainfall gages located throughout the plantation. Note that not all of this 'actual rainfall' can be utilized by the plant—days of very low rainfall do not make it to the root system of the plant, and days of very high rainfall, when SMS levels are at 100%, also cannot be utilized by the plant. While the water balance model does not separately calculate 'effective rainfall', it only takes into account rainfall amounts needed to meet evapotranspiration needs and 'fill' the SMS bucket.This is what we refer to as 'effective rainfall'

Note that the value registered as "actual rainfall" represents precipitation from the previous day, and is used to determine irrigation needs for the recorded day. That is, rain that falls on Day 1 is taken into account in the irrigation decision on Day 2. From an operational point of view, it is practically impossible to adjust/alter irrigation decisions once implementation has begun in response to rain falling on that day.

Adj SMS ac in: Adjusted SMS is the age adjusted values for SMS. This adjustment recognizes that the plant's capacity to use water is directly related to the size of the plant and therefore its age. Smaller plants have smaller root systems and therefore a limited ability to access the actual soil moisture storage and so is shown as a value less than the full SMS. Large plants with full

root growth can access the entire soil profile and so the adjusted soil moisture storage is equal to the SMS value. In the HC&S model, the SMS is adjusted on a daily basis based on crop age until the field reaches full canopy at which time the adjusted SMS equals SMS.

Curr Irr ac in: Current Irrigation—Actual (effective) water applied to the plant measured in acre-inches; equals 80% of gross water needed. Note that this is ditch (stream) plus pump (well) water—we do not have the ability to break this down into ditch and pump water quantities. If you refer, however, to the data we submitted on March 19, 2010 (Appendix G), you will note that there is always pump water used, every month of the year, to supplement ditch flows in order to meet the needs of the East Maui fields.

Deficit ac in: Water deficit measured in acre-inches; represents lost opportunities to irrigate and support plant growth because there is no water available for the plant through SMS (soil moisture), irrigation, or rainfall to replace evapotranspiration. Note that deficits are not calculated/recorded during the ripening period for each crop.

Curr % SMS: Estimate of current SMS levels, made on a daily basis and expressed as a percentage. The denominator is the adjusted SMS, which accounts for particular soil type, and the numerator is the additional water added to the soil through applied water (either through irrigation or effective rainfall, ie. rainfall that actually makes it to the plant) that exceeds evapotranspiration. Note that a deficit ("Deficit ac in") is not registered when water is available to the plant through SMS levels, ie. the HC&S model assumes that water in the soil, as indicated by SMS levels, is used to meet the water needs of the crop.

Comments: These are various explanatory comments about field condition/irrigation needs on any given day. A legend for the codes used is provided as Attachment A-1.

Attachment A-1
Miscellaneous Comment Codes

AC	Age Change
AF	Accidental Fire
BA	Bottleneck Area
BR	Behind Replant
CHL	Chlorine
CP	Check Pressure (Infield)
CRR	Complete Round and Ripen
DR or DRY	Drying
DS	Dry Spot (Ripening Round)
*DS	Dry Spot (Prior to Ripening Rounds)
DV	Flush Drain Valves
F	Fertilizing
FNLRD	Final Round
HAF	Harvest Adjacent Field
HD	Harvest Damage
I	Irrigating
INS	Inspection
LCB	Lesser Cornstalk Borer
LS	Leaching Salt
MT	Motor or Pump Trouble
NP	No Power
OMR	One More Round
PC	Cut Cane Machine
PLT	Planting, Replanting or Germination
RC	Rat Control
RD	Repair Ditch
RDS	Repair to Drip System
RI or RIPE	Ripening
SC	Season Change
SF	Check Sand Filters
SP	Seed Plot
WC	Weed Control
WS	Water Shortage
WS-#	Water Short for # of days
?	User Attention Prompt

ATTACHMENT B
MODIFIED PENMAN FORMULA

There are many variations of the Penman equation, developed to reflect location-specific conditions. As is commonly done by other users, HC&S secured independent meteorological experts to identify the Penman formula that best validated the actual results of evaporation studies conducted in HC&S' fields utilizing 5-inch stainless steel pans. When the Penman Monteith formula proved to be a poor fit, a modified Penman formula, which is attached, was adopted as it validated HC&S' field evapotranspiration data. Note that in practice, HC&S adjusts this calculated rate to account for the age of the field to arrive at an 'adjusted evapotranspiration rate' by field. For example, newly planted fields have large downward adjustments while the fields with full canopy utilize the full calculated evaporation rate.

Calulating ETo (Reference Evapotranspiration)

E = = ETo in mm **=C*(W*S7+(1-W)*(E2-E1)*U)**
= ETo in Inches **=Eto in mm/25.4**

Input Parameters

H = Average RH (%)
H2 = Maximum RH (%)
T1 = Average Air Temperature (°F)
W1 = Wind run (mi/day)*
S = Solar Radiation (Langleys/day)

B = Barometric Pressure
S3 = Extraterrestrial Radiation (mm/day) from Table
R1 = Ratio of Avg. Daytime Wind to Nighttime wind

Extra-terrestrial Radiation (S3) Table
Expressed in equivalent evaporation (mm/day)

Lat	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
20	11.2	12.7	14.4	15.6	16.3	16.4	16.3	15.9	14.8	13.3	11.6	10.7

*Wind Run Miles means: Average Wind Speed = 5 mph
Archive Interval = 30 minutes (0.5 hours)
Wind Run = 5 mph x 0.5 hours = 2.5 miles of wind

Calculations

T2 = = T1 + 273.16 = Avg. Air Temp in °K
E2 = = 6.108*EXP(17.27*T1)/(T1+237.2)) = Sat. Vapor Pressure at T1 (mb)
H1 = = H/100 = RH expressed as a fraction
E1 = = H1*E2 = Avg. Actual Vapor Pressure (mb)
G = = B*0.0006595 = Psychrometric Constant
D = = (E2/T2)*[(6790.4985/T2)-5.02808] = Slope of Sat VP curve at temp T1
W = = D/(D+G) = Weighting function for Temp
S4 = = S/59 = Solar Radiation expressed in equiv. evapo (mm/day)
S5 = = S4*0.75 = Net Solar Radiation expressed in equiv. evapo (mm/day)
S6 = = (1.9835*10^-9*T2^4)*(0.34-0.044*E1^0.5)*(0.1+0.9*(2*S4/S3-0.5)) = Net long wave radiation (mm/day)
S7 = = S5-S6 = Net Radiation expressed as equiv evap (mm/day)
U1 = = (R1*W1)/(43.2*(R1+1) = Mean wind speed between 0700-1900 hours (m/s)
U = = 0.27*(1+(W1/100)) = Wind Function
C = =A0+A1*H2+A2*S4+A3*U1+A4*R1+A5*U1*R1+A6*H2*S4*U1+A7*H2*S4*R1

Constants

A0 = 0.6817006
A1 = 0.0027864
A2 = 0.0181768
A3 = -0.0682501
A4 = 0.0126514
A5 = 0.0097297
A6 = 0.000043025
A7 = -9.2118E-08

F302: Hamakua Ditch

Crop Cycle: 2007-2009 (2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAMK	2009	302	1	1	8/3/07	0.00	12	S	S	0.07326	0	1.6983	0.252	0	10	IPLT
HAMK	2009	302	1	1	8/4/07	0.03	24	2	1	0.05994	0.02	1.6983	0.504	0	37	IPLT
HAMK	2009	302	1	1	8/5/07	0.07	24	3	1	0.09324	0	1.6983	0.504	0	62	IPLT
HAMK	2009	302	1	1	8/6/07	0.10	24	4	1	0.10656	0	1.6983	0.504	0	85	IPLT
HAMK	2009	302	1	1	8/7/07	0.13	24	5	1	0.11322	0	1.6983	0.504	0	100	IPLT
HAMK	2009	302	1	1	8/8/07	0.16	24	6	1	0.07992	0	1.6983	0.504	0	100	IPLT
HAMK	2009	302	1	1	8/9/07	0.20	24	7	1	0.0999	0	1.6983	0.504	0	100	IPLT
HAMK	2009	302	1	1	8/10/07	0.23	24	8	1	0.09324	0	1.6983	0.504	0	100	IPLT
HAMK	2009	302	1	1	8/11/07	0.26	24	9	1	0.0666	0	1.6983	0.504	0	100	IPLT
HAMK	2009	302	1	1	8/12/07	0.30	12	10	1	0.1332	0	1.6983	0.252	0	100	IPLT
HAMK	2009	302	1	1	8/13/07	0.33	0	10	S	0.11322	0.01	1.6983	0	0	93	PLT WC
HAMK	2009	302	1	1	8/14/07	0.36	0	10	2	0.10323	0.03	1.6983	0	0	89	PLT WC
HAMK	2009	302	1	1	8/15/07	0.39	0	10	3	0.04329	0.01	1.6983	0	0	87	PLT WC
HAMK	2009	302	1	1	8/16/07	0.43	0	10	4	0.08991	0	1.6983	0	0	82	IPLT
HAMK	2009	302	1	1	8/17/07	0.46	22	S	4	0.11322	0	1.6983	0.462	0	100	IPLT
HAMK	2009	302	1	1	8/18/07	0.49	24	2	4	0.09324	0	1.6983	0.504	0	100	IPLT
HAMK	2009	302	1	1	8/19/07	0.53	24	3	4	0.12321	0	1.6983	0.504	0	100	IPLT
HAMK	2009	302	1	1	8/20/07	0.56	6	3	S	0.11988	0	1.6983	0.126	0	100	PLT
HAMK	2009	302	1	1	8/21/07	0.59	0	S	1	0.10989	0.2	1.6983	0	0	100	PLT
HAMK	2009	302	1	1	8/22/07	0.63	0	1	S	0.08991	0	1.6983	0	0	94	PLT
HAMK	2009	302	1	1	8/23/07	0.66	0	1	2	0.07659	0	1.6983	0	0	90	PLT
HAMK	2009	302	1	1	8/24/07	0.69	16	S	2	0.05328	0	1.6983	0.336	0	100	IPLT
HAMK	2009	302	1	1	8/25/07	0.72	24	2	2	0.04995	0	1.6983	0.504	0	100	PLT
HAMK	2009	302	1	1	8/26/07	0.76	0	3	2	0.0666	0.2	1.6983	0	0	100	IPLT
HAMK	2009	302	1	1	8/27/07	0.79	22	4	2	0.08991	0	1.6983	0.462	0	100	IPLT F
HAMK	2009	302	1	1	8/28/07	0.82	6	4	S	0.08991	0	1.6983	0.126	0	100	PLT
HAMK	2009	302	1	1	8/29/07	0.86	0	4	2	0.06993	0	1.6983	0	0	95	PLT
HAMK	2009	302	1	1	8/30/07	0.89	0	4	3	0.07659	0	1.6983	0	0	91	PLT
HAMK	2009	302	1	1	8/31/07	0.92	0	4	4	0.05661	0	1.6983	0	0	88	PLT
HAMK	2009	302	1	1	9/1/07	0.95	0	S	4	0.10989	0.2	1.6983	0	0	93	PLT
HAMK	2009	302	1	1	9/2/07	0.99	0	1	S	0.0999	0	1.6983	0	0	87	PLT
HAMK	2009	302	1	1	9/3/07	1.02	0	1	2	0.11322	0	1.6983	0	0	80	IPLT
HAMK	2009	302	1	1	9/4/07	1.05	22	S	2	0.06327	0	1.6983	0.462	0	100	I
HAMK	2009	302	1	1	9/5/07	1.09	24	2	2	0.07326	0	1.6983	0.504	0	100	
HAMK	2009	302	1	1	9/6/07	1.12	0	2	S	0.07992	0	1.6983	0	0	95	
HAMK	2009	302	1	1	9/7/07	1.15	0	2	2	0.0666	0	1.6983	0	0	91	
HAMK	2009	302	1	1	9/8/07	1.18	0	2	3	0.0666	0	1.6983	0	0	87	

F302: Hamakua Ditch

Crop Cycle: 2007-2009 (2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAMK	2009	302	1	1	9/9/07	1.22	0	2	4	0.10323	0.05	1.6983	0	0	84	I
HAMK	2009	302	1	1	9/10/07	1.25	22	S	4	0.08991	0	1.6983	0.462	0	100	I
HAMK	2009	302	1	1	9/11/07	1.28	24	2	4	0.08658	0	1.6983	0.504	0	100	IF
HAMK	2009	302	1	1	9/12/07	1.32	0	2	S	0.10323	0	1.6983	0	0	93	
HAMK	2009	302	1	1	9/13/07	1.35	0	2	2	0.07992	0	1.6983	0	0	89	
HAMK	2009	302	1	1	9/14/07	1.38	0	2	3	0.08325	0	1.6983	0	0	84	
HAMK	2009	302	1	1	9/15/07	1.41	0	2	4	0.04329	0	1.6983	0	0	81	
HAMK	2009	302	1	1	9/16/07	1.45	0	2	5	0.05661	0	1.6983	0	0	78	
HAMK	2009	302	1	1	9/17/07	1.48	0	2	6	0.09324	0	1.6983	0	0	72	?
HAMK	2009	302	1	1	9/18/07	1.51	0	2	7	0.09441	0.16	1.719618	0	0	75	AC?
HAMK	2009	302	1	1	9/19/07	1.55	0	2	8	0.117133	0.02	1.757001	0	0	68	I
HAMK	2009	302	1	1	9/20/07	1.58	22	S	8	0.080923	0	1.794384	0.462	0	88	I
HAMK	2009	302	1	1	9/21/07	1.61	24	2	8	0.064651	0	1.831767	0.504	0	100	IF
HAMK	2009	302	1	1	9/22/07	1.64	6	2	S	0.076965	0	1.86915	0.126	0	100	
HAMK	2009	302	1	1	9/23/07	1.68	0	2	2	0.108411	0	1.906533	0	0	92	
HAMK	2009	302	1	1	9/24/07	1.71	0	2	3	0.087667	0	1.943916	0	0	86	
HAMK	2009	302	1	1	9/25/07	1.74	0	2	4	0.054389	0	1.981299	0	0	81	
HAMK	2009	302	1	1	9/26/07	1.78	0	2	5	0.11083	0.1	2.018682	0	0	79	I
HAMK	2009	302	1	1	9/27/07	1.81	22	S	5	0.068536	0	2.056065	0.462	0	97	I
HAMK	2009	302	1	1	9/28/07	1.84	24	2	5	0.073886	0	2.093448	0.504	0	100	
HAMK	2009	302	1	1	9/29/07	1.88	0	2	S	0.058493	0	2.130831	0	0	95	
HAMK	2009	302	1	1	9/30/07	1.91	0	2	2	0.102034	0.02	2.168214	0	0	90	I
HAMK	2009	302	1	1	10/1/07	1.94	16	S	2	0.099468	0.01	2.205597	0.336	0	99	I
HAMK	2009	302	1	1	10/2/07	1.97	24	2	2	0.114348	0.1	2.24298	0.504	0	100	
HAMK	2009	302	1	1	10/3/07	2.01	0	2	S	0.093897	0.01	2.280363	0	0	94	WC
HAMK	2009	302	1	1	10/4/07	2.04	0	2	2	0.104526	0.02	2.317746	0	0	89	WC
HAMK	2009	302	1	1	10/5/07	2.07	0	2	3	0.124683	0	2.355129	0	0	82	WC
HAMK	2009	302	1	1	10/6/07	2.11	0	2	4	0.11728	0	2.392512	0	0	76	WC
HAMK	2009	302	1	1	10/7/07	2.14	0	S	4	0.142935	0.2	2.429895	0	0	77	I
HAMK	2009	302	1	1	10/8/07	2.17	22	2	4	0.091918	0	2.467278	0.462	0	91	I
HAMK	2009	302	1	1	10/9/07	2.20	24	3	4	0.137511	0.03	2.504661	0.504	0	100	IF
HAMK	2009	302	1	1	10/10/07	2.24	6	3	S	0.134579	0	2.542044	0.126	0	98	
HAMK	2009	302	1	1	10/11/07	2.27	0	3	2	0.1315	0	2.579427	0	0	91	
HAMK	2009	302	1	1	10/12/07	2.30	0	3	3	0.128275	0	2.61681	0	0	85	
HAMK	2009	302	1	1	10/13/07	2.34	0	3	4	0.124903	0	2.654193	0	0	79	
HAMK	2009	302	1	1	10/14/07	2.37	0	3	5	0.126662	0	2.691576	0	0	73	
HAMK	2009	302	1	1	10/15/07	2.40	0	3	6	0.128422	0	2.728959	0	0	68	

F302: Hamakua Ditch

Crop Cycle: 2007-2009 (2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAMK	2009	302	1	1	10/16/07	2.43	0	3	7	0.097636	0	2.766342	0	0	63	
HAMK	2009	302	1	1	10/17/07	2.47	0	3	8	0.082463	0	2.803725	0	0	59	I
HAMK	2009	302	1	1	10/18/07	2.50	22	S	8	0.105845	0	2.841108	0.462	0	71	I
HAMK	2009	302	1	1	10/19/07	2.53	24	2	8	0.112882	0	2.878491	0.504	0	84	I-F
HAMK	2009	302	1	1	10/20/07	2.57	6	2	S	0.108631	0	2.915874	0.126	0	83	
HAMK	2009	302	1	1	10/21/07	2.60	0	2	2	0.104233	0	2.953257	0	0	79	
HAMK	2009	302	1	1	10/22/07	2.63	0	2	3	0.152464	0	2.99064	0	0	73	?
HAMK	2009	302	1	1	10/23/07	2.66	0	2	4	0.142495	0	3.028023	0	0	67	RD?
HAMK	2009	302	1	1	10/24/07	2.70	0	2	5	0.186329	0	3.065406	0	0	60	RD?
HAMK	2009	302	1	1	10/25/07	2.73	0	2	6	0.164265	0.01	3.102789	0	0	54	RD?
HAMK	2009	302	1	1	10/26/07	2.76	0	2	7	0.178559	0	3.140172	0	0	48	
HAMK	2009	302	1	1	10/27/07	2.80	0	2	8	0.168224	0	3.177555	0	0	42	
HAMK	2009	302	1	1	10/28/07	2.83	0	2	9	0.163899	0.12	3.214938	0	0	40	?
HAMK	2009	302	1	1	10/29/07	2.86	0	2	10	0.191313	0.06	3.252321	0	0	36	?
HAMK	2009	302	1	1	10/30/07	2.89	0	2	11	0.219314	0	3.289704	0	0	29	I
HAMK	2009	302	1	1	10/31/07	2.93	16	S	11	0.189187	0	3.327087	0.336	0	33	I
HAMK	2009	302	1	1	11/1/07	2.96	24	2	11	0.073967	0.2	2.514861	0.504	0	69	I
HAMK	2009	302	1	1	11/2/07	2.99	24	3	11	0.08476	0.02	2.542804	0.504	0	85	SCIF
HAMK	2009	302	1	1	11/3/07	3.03	6	3	S	0.07561	0	2.570747	0.126	0	86	
HAMK	2009	302	1	1	11/4/07	3.06	0	3	2	0.035668	0	2.59869	0	0	84	
HAMK	2009	302	1	1	11/5/07	3.09	0	S	2	0.092705	0.6	2.626633	0	0	100	
HAMK	2009	302	1	1	11/6/07	3.13	0	1	S	0.072871	0	2.654576	0	0	96	
HAMK	2009	302	1	1	11/7/07	3.16	0	1	2	0.089417	0	2.682518	0	0	91	
HAMK	2009	302	1	1	11/8/07	3.19	0	1	3	0.06909	0	2.710461	0	0	88	
HAMK	2009	302	1	1	11/9/07	3.22	0	1	4	0.118127	0	2.738404	0	0	83	
HAMK	2009	302	1	1	11/10/07	3.26	0	1	5	0.113908	0	2.766347	0	0	78	
HAMK	2009	302	1	1	11/11/07	3.29	0	1	6	0.104101	0	2.79429	0	0	73	
HAMK	2009	302	1	1	11/12/07	3.32	0	1	7	0.105142	0	2.822233	0	0	69	
HAMK	2009	302	1	1	11/13/07	3.36	0	1	8	0.100594	0	2.850176	0	0	65	
HAMK	2009	302	1	1	11/14/07	3.39	0	1	9	0.095937	0	2.878119	0	0	61	I
HAMK	2009	302	1	1	11/15/07	3.42	16	S	9	0.119661	0	2.906062	0.336	0	67	I
HAMK	2009	302	1	1	11/16/07	3.45	24	2	9	0.103553	0	2.934005	0.504	0	80	IF
HAMK	2009	302	1	1	11/17/07	3.49	6	2	S	0.133578	0	2.961947	0.126	0	79	
HAMK	2009	302	1	1	11/18/07	3.52	0	2	2	0.140701	0	2.98989	0	0	74	
HAMK	2009	302	1	1	11/19/07	3.55	0	2	3	0.130181	0	3.017833	0	0	69	
HAMK	2009	302	1	1	11/20/07	3.59	0	2	4	0.101526	0.15	3.045776	0	0	70	
HAMK	2009	302	1	1	11/21/07	3.62	0	2	5	0.108484	0.05	3.073719	0	0	67	

F302: Hamakua Ditch

Crop Cycle: 2007-2009 (2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAMK	2009	302	1	1	11/22/07	3.65	0	S	5	0.133797	0.9	3.101662	0	0	91	
HAMK	2009	302	1	1	11/23/07	3.68	0	1	S	0.153412	0.12	3.129605	0	0	90	
HAMK	2009	302	1	1	11/24/07	3.72	0	1	2	0.210503	0.07	3.157548	0	0	84	
HAMK	2009	302	1	1	11/25/07	3.75	0	1	3	0.118675	0	3.185491	0	0	80	
HAMK	2009	302	1	1	11/26/07	3.78	0	1	4	0.100814	0	3.213434	0	0	76	
HAMK	2009	302	1	1	11/27/07	3.82	0	1	5	0.108046	0	3.241376	0	0	72	
HAMK	2009	302	1	1	11/28/07	3.85	0	1	6	0.032052	0	3.269319	0	0	70	
HAMK	2009	302	1	1	11/29/07	3.88	0	S	6	0.103444	0.56	3.297262	0	0	84	
HAMK	2009	302	1	1	11/30/07	3.91	0	1	S	0.07824	0	3.325205	0	0	81	
HAMK	2009	302	1	1	12/1/07	3.95	0	1	2	0.105197	0.02	3.353148	0	0	77	
HAMK	2009	302	1	1	12/2/07	3.98	0	1	3	0.145851	0.01	3.381091	0	0	73	
HAMK	2009	302	1	1	12/3/07	4.01	0	S	3	0.093581	1.15	3.409034	0	0	100	
HAMK	2009	302	1	1	12/4/07	4.05	0	2	3	0.303263	1.15	3.436977	0	0	100	
HAMK	2009	302	1	1	12/5/07	4.08	0	2	S	0.11509	0.1	3.46492	0	0	98	
HAMK	2009	302	1	1	12/6/07	4.11	0	S	1	0.05479	4.5	3.492863	0	0	100	
HAMK	2009	302	1	1	12/7/07	4.14	0	2	1	0.082842	0.3	3.520805	0	0	100	
HAMK	2009	302	1	1	12/8/07	4.18	0	3	1	0.076542	1.2	3.548748	0	0	100	
HAMK	2009	302	1	1	12/9/07	4.21	0	3	S	0.084157	0.01	3.576691	0	0	97	
HAMK	2009	302	1	1	12/10/07	4.24	0	3	2	0.070679	0	3.604634	0	0	94	
HAMK	2009	302	1	1	12/11/07	4.28	0	3	3	0.142454	0	3.632577	0	0	89	
HAMK	2009	302	1	1	12/12/07	4.31	0	3	4	0.14355	0	3.66052	0	0	85	
HAMK	2009	302	1	1	12/13/07	4.34	0	3	5	0.09402	0.1	3.688463	0	0	84	
HAMK	2009	302	1	1	12/14/07	4.38	0	S	5	0.102019	0.42	3.716406	0	0	92	
HAMK	2009	302	1	1	12/15/07	4.41	0	2	5	0.11747	0.22	3.744349	0	0	94	
HAMK	2009	302	1	1	12/16/07	4.44	0	3	5	0.118346	0.82	3.772292	0	0	100	
HAMK	2009	302	1	1	12/17/07	4.47	0	4	5	0.126674	0.32	3.800234	0	0	100	
HAMK	2009	302	1	1	12/18/07	4.51	0	4	S	0.157631	0.08	3.828177	0	0	97	
HAMK	2009	302	1	1	12/19/07	4.54	0	4	2	0.136098	0.01	3.85612	0	0	93	
HAMK	2009	302	1	1	12/20/07	4.57	0	4	3	0.114237	0	3.884063	0	0	89	RD
HAMK	2009	302	1	1	12/21/07	4.61	0	4	4	0.12273	0	3.912006	0	0	85	
HAMK	2009	302	1	1	12/22/07	4.64	0	4	5	0.092705	0	3.939949	0	0	82	
HAMK	2009	302	1	1	12/23/07	4.67	0	4	6	0.108923	0	3.967892	0	0	79	
HAMK	2009	302	1	1	12/24/07	4.70	0	4	7	0.10969	0	3.995835	0	0	76	
HAMK	2009	302	1	1	12/25/07	4.74	0	4	8	0.118346	0.03	4.023778	0	0	73	
HAMK	2009	302	1	1	12/26/07	4.77	0	4	9	0.134581	0.01	4.051721	0	0	69	I
HAMK	2009	302	1	1	12/27/07	4.80	22	S	9	0.135509	0.01	4.079663	0.462	0	77	I
HAMK	2009	302	1	1	12/28/07	4.84	24	2	9	0.136437	0.02	4.107606	0.504	0	86	

F302: Hamakua Ditch

Crop Cycle: 2007-2009 (2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAMK	2009	302	1	1	12/29/07	4.87	0	2	S	0.137365	0	4.135549	0	0	82	
HAMK	2009	302	1	1	12/30/07	4.90	0	2	2	0.138293	0	4.163492	0	0	78	
HAMK	2009	302	1	1	12/31/07	4.93	0	2	3	0.139221	0.06	4.191435	0	0	76	
HAMK	2009	302	1	1	1/1/08	4.97	0	S	3	0.04964	0.56	4.219378	0	0	88	
HAMK	2009	302	1	1	1/2/08	5.00	0	1	S	0.135914	0.08	4.247321	0	0	86	I
HAMK	2009	302	1	1	1/3/08	5.03	22	S	1	0.136808	0.16	4.275264	0.462	0	96	I
HAMK	2009	302	1	1	1/4/08	5.07	24	2	1	0.137703	0.01	4.303207	0.504	0	100	
HAMK	2009	302	1	1	1/5/08	5.10	0	2	S	0.138597	0.01	4.33115	0	0	96	
HAMK	2009	302	1	1	1/6/08	5.13	0	2	2	0.139491	0	4.359092	0	0	92	
HAMK	2009	302	1	1	1/7/08	5.16	0	2	3	0.140385	0	4.387035	0	0	88	
HAMK	2009	302	1	1	1/8/08	5.20	0	2	4	0.141279	0	4.414978	0	0	85	
HAMK	2009	302	1	1	1/9/08	5.23	0	2	5	0.142173	0	4.442921	0	0	81	
HAMK	2009	302	1	1	1/10/08	5.26	0	2	6	0.143068	0	4.470864	0	0	77	
HAMK	2009	302	1	1	1/11/08	5.30	0	2	7	0.143962	0	4.498807	0	0	73	
HAMK	2009	302	1	1	1/12/08	5.33	0	2	8	0.144856	0	4.52675	0	0	70	
HAMK	2009	302	1	1	1/13/08	5.36	0	2	9	0.14575	0	4.554693	0	0	66	I
HAMK	2009	302	1	1	1/14/08	5.39	22	S	9	0.146644	0	4.582636	0.462	0	73	I
HAMK	2009	302	1	1	1/15/08	5.43	24	2	9	0.147539	0.03	4.610579	0.504	0	81	IF
HAMK	2009	302	1	1	1/16/08	5.46	6	2	S	0.148433	0.01	4.638521	0.126	0	80	
HAMK	2009	302	1	1	1/17/08	5.49	0	2	2	0.149327	0	4.666464	0	0	76	
HAMK	2009	302	1	1	1/18/08	5.53	0	2	3	0.150221	0	4.694407	0	0	72	
HAMK	2009	302	1	1	1/19/08	5.56	0	2	4	0.151115	0	4.72235	0	0	69	
HAMK	2009	302	1	1	1/20/08	5.59	0	2	5	0.152009	0.08	4.750293	0	0	67	
HAMK	2009	302	1	1	1/21/08	5.63	0	2	6	0.152904	0	4.778236	0	0	63	
HAMK	2009	302	1	1	1/22/08	5.66	0	2	7	0.153798	0	4.806179	0	0	60	
HAMK	2009	302	1	1	1/23/08	5.69	0	2	8	0.123223	0.02	4.834122	0	0	57	I
HAMK	2009	302	1	1	1/24/08	5.72	22	S	8	0.200203	0	4.862065	0.462	0	62	I
HAMK	2009	302	1	1	1/25/08	5.76	24	2	8	0.153412	0	4.890008	0.504	0	69	I
HAMK	2009	302	1	1	1/26/08	5.79	24	3	8	0.173575	0.42	4.91795	0.504	0	84	I
HAMK	2009	302	1	1	1/27/08	5.82	24	4	8	0.164863	0.08	4.945893	0.504	0	92	
HAMK	2009	302	1	1	1/28/08	5.86	0	4	S	0.117031	0.15	4.973836	0	0	92	
HAMK	2009	302	1	1	1/29/08	5.89	0	S	1	0.068652	0.5	5.001779	0	0	100	
HAMK	2009	302	1	1	1/30/08	5.92	0	2	1	0.08876	0.85	5.029722	0	0	100	
HAMK	2009	302	1	1	1/31/08	5.95	0	3	1	0.089253	0.6	5.057665	0	0	100	
HAMK	2009	302	1	1	2/1/08	5.99	0	4	1	0.049859	1	5.085608	0	0	100	
HAMK	2009	302	1	1	2/2/08	6.02	0	5	1	0.06	0.92	5.1	0	0	100	
HAMK	2009	302	1	1	2/3/08	6.05	0	6	1	0.1	0.86	5.1	0	0	100	

F302: Hamakua Ditch

Crop Cycle: 2007-2009 (2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAMK	2009	302	1	1	2/4/08	6.09	0	6	S	0.11	0.15	5.1	0	0	100	
HAMK	2009	302	1	1	2/5/08	6.12	0	6	2	0.08	0	5.1	0	0	98	
HAMK	2009	302	1	1	2/6/08	6.15	0	6	3	0.08	0.02	5.1	0	0	97	
HAMK	2009	302	1	1	2/7/08	6.18	0	6	4	0.12	0	5.1	0	0	94	
HAMK	2009	302	1	1	2/8/08	6.22	0	6	5	0.14	0	5.1	0	0	92	I
HAMK	2009	302	1	1	2/9/08	6.25	22	S	5	0.14	0	5.1	0.462	0	98	I
HAMK	2009	302	1	1	2/10/08	6.28	24	2	5	0.18	0	5.1	0.504	0	100	I
HAMK	2009	302	1	1	2/11/08	6.32	6	2	S	0.14	0	5.1	0.126	0	99	
HAMK	2009	302	1	1	2/12/08	6.35	0	2	2	0.19	0	5.1	0	0	96	
HAMK	2009	302	1	1	2/13/08	6.38	0	2	3	0.16	0	5.1	0	0	92	
HAMK	2009	302	1	1	2/14/08	6.41	0	2	4	0.18	0	5.1	0	0	89	
HAMK	2009	302	1	1	2/15/08	6.45	0	2	5	0.15	0	5.1	0	0	86	
HAMK	2009	302	1	1	2/16/08	6.48	0	2	6	0.17	0	5.1	0	0	83	I
HAMK	2009	302	1	1	2/17/08	6.51	22	S	6	0.14	0	5.1	0.462	0	89	I
HAMK	2009	302	1	1	2/18/08	6.55	24	2	6	0.12	0	5.1	0.504	0	96	
HAMK	2009	302	1	1	2/19/08	6.58	0	2	S	0.2	0	5.1	0	0	92	
HAMK	2009	302	1	1	2/20/08	6.61	0	2	2	0.19	0	5.1	0	0	89	
HAMK	2009	302	1	1	2/21/08	6.64	0	2	3	0.18	0	5.1	0	0	85	
HAMK	2009	302	1	1	2/22/08	6.68	0	2	4	0.18	0	5.1	0	0	82	
HAMK	2009	302	1	1	2/23/08	6.71	0	2	5	0.17	0	5.1	0	0	78	
HAMK	2009	302	1	1	2/24/08	6.74	0	2	6	0.19	0	5.1	0	0	75	
HAMK	2009	302	1	1	2/25/08	6.78	0	2	7	0.11	0.01	5.1	0	0	73	I
HAMK	2009	302	1	1	2/26/08	6.81	22	S	7	0.18	0	5.1	0.462	0	78	
HAMK	2009	302	1	1	2/27/08	6.84	0	1	S	0.15	0	5.1	0	0	75	
HAMK	2009	302	1	1	2/28/08	6.88	0	1	2	0.15	0	5.1	0	0	72	
HAMK	2009	302	1	1	2/29/08	6.91	0	1	3	0.2	0	5.1	0	0	68	
HAMK	2009	302	1	1	3/1/08	6.94	0	1	4	0.18	0	5.1	0	0	65	
HAMK	2009	302	1	1	3/2/08	6.97	0	1	5	0.18	0	5.1	0	0	61	
HAMK	2009	302	1	1	3/3/08	7.01	0	1	6	0.18	0	5.1	0	0	58	
HAMK	2009	302	1	1	3/4/08	7.04	0	1	7	0.2	0	5.1	0	0	54	
HAMK	2009	302	1	1	3/5/08	7.07	0	1	8	0.19	0	5.1	0	0	50	?
HAMK	2009	302	1	1	3/6/08	7.11	0	1	9	0.21	0	5.1	0	0	46	?
HAMK	2009	302	1	1	3/7/08	7.14	0	1	10	0.19	0	5.1	0	0	42	
HAMK	2009	302	1	1	3/8/08	7.17	0	1	11	0.19	0	5.1	0	0	39	
HAMK	2009	302	1	1	3/9/08	7.20	0	1	12	0.17	0	5.1	0	0	35	
HAMK	2009	302	1	1	3/10/08	7.24	0	1	13	0.14	0	5.1	0	0	33	
HAMK	2009	302	1	1	3/11/08	7.27	0	1	14	0.18	0	5.1	0	0	29	

F302: Hamakua Ditch

Crop Cycle: 2007-2009 (2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAMK	2009	302	1	1	3/12/08	7.30	15	S	14	0.19	0	5.1	0.315	0	31	
HAMK	2009	302	1	1	3/13/08	7.34	24	2	14	0.21	0	5.1	0.504	0	37	F?
HAMK	2009	302	1	1	3/14/08	7.37	0	2	S	0.17	0	5.1	0	0	34	
HAMK	2009	302	1	1	3/15/08	7.40	0	2	2	0.24	0	5.1	0	0	29	
HAMK	2009	302	1	1	3/16/08	7.43	0	2	3	0.16	0	5.1	0	0	26	
HAMK	2009	302	1	1	3/17/08	7.47	0	2	4	0.1	0	5.1	0	0	24	I
HAMK	2009	302	1	1	3/18/08	7.50	22	S	4	0.19	0.5	5.1	0.462	0	39	I
HAMK	2009	302	1	1	3/19/08	7.53	24	2	4	0.16	0	5.1	0.504	0	46	
HAMK	2009	302	1	1	3/20/08	7.57	0	2	S	0.13	0	5.1	0	0	43	
HAMK	2009	302	1	1	3/21/08	7.60	0	2	2	0.15	0	5.1	0	0	40	
HAMK	2009	302	1	1	3/22/08	7.63	0	2	3	0.17	0	5.1	0	0	37	
HAMK	2009	302	1	1	3/23/08	7.66	0	2	4	0.24	0	5.1	0	0	32	
HAMK	2009	302	1	1	3/24/08	7.70	0	2	5	0.21	0	5.1	0	0	28	
HAMK	2009	302	1	1	3/25/08	7.73	0	2	6	0.21	0	5.1	0	0	24	
HAMK	2009	302	1	1	3/26/08	7.76	0	2	7	0.2	0	5.1	0	0	20	
HAMK	2009	302	1	1	3/27/08	7.80	0	2	8	0.23	0	5.1	0	0	16	
HAMK	2009	302	1	1	3/28/08	7.83	0	2	9	0.2	0	5.1	0	0	12	
HAMK	2009	302	1	1	3/29/08	7.86	0	2	10	0.29	0	5.1	0	0	6	
HAMK	2009	302	1	1	3/30/08	7.89	0	2	11	0.25	0	5.1	0	0	1	
HAMK	2009	302	1	1	3/31/08	7.93	0	2	12	0.31	0	5.1	0	0.31	0	I
HAMK	2009	302	1	1	4/1/08	7.96	22	S	12	0.31	0	5.1	0.462	0	2	SCI?
HAMK	2009	302	1	1	4/2/08	7.99	5	1	S	0.19	0.01	5.1	0.105	0	1	
HAMK	2009	302	1	1	4/3/08	8.03	0	1	2	0.17	0.07	5.1	0	0.17	0	WS-0
HAMK	2009	302	1	1	4/4/08	8.06	0	1	3	0.23	0.01	5.1	0	0.23	0	WS-1
HAMK	2009	302	1	1	4/5/08	8.09	0	1	4	0.28	0.01	5.1	0	0.28	0	I
HAMK	2009	302	1	1	4/6/08	8.13	0	1	5	0.23	0	5.1	0	0.23	0	I
HAMK	2009	302	1	1	4/7/08	8.16	24	S	5	0.25	0.2	5.1	0.504	0	8	I
HAMK	2009	302	1	1	4/8/08	8.19	24	2	5	0.19	0.03	5.1	0.504	0	15	
HAMK	2009	302	1	1	4/9/08	8.22	0	2	S	0.06	0	5.1	0	0	14	?
HAMK	2009	302	1	1	4/10/08	8.26	0	S	1	0.14	0.66	5.1	0	0	24	
HAMK	2009	302	1	1	4/11/08	8.29	0	1	S	0.17	0	5.1	0	0	21	
HAMK	2009	302	1	1	4/12/08	8.32	0	1	2	0.12	0	5.1	0	0	18	I
HAMK	2009	302	1	1	4/13/08	8.36	24	S	2	0.34	0	5.1	0.504	0	22	
HAMK	2009	302	1	1	4/14/08	8.39	24	2	2	0.24	0	5.1	0.504	0	27	IF
HAMK	2009	302	1	1	4/15/08	8.42	24	3	2	0.21	0	5.1	0.504	0	33	?
HAMK	2009	302	1	1	4/16/08	8.45	0	3	S	0.25	0	5.1	0	0	28	
HAMK	2009	302	1	1	4/17/08	8.49	0	3	2	0.16	0	5.1	0	0	25	

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAMK	2009	302	1	1	4/18/08	8.52	0	3	3	0.17	0	5.1	0	0	21	
HAMK	2009	302	1	1	4/19/08	8.55	0	3	4	0.2	0	5.1	0	0	17	
HAMK	2009	302	1	1	4/20/08	8.59	0	3	5	0.25	0	5.1	0	0	12	
HAMK	2009	302	1	1	4/21/08	8.62	0	3	6	0.27	0	5.1	0	0	7	
HAMK	2009	302	1	1	4/22/08	8.65	0	3	7	0.25	0	5.1	0	0	2	
HAMK	2009	302	1	1	4/23/08	8.68	0	3	8	0.23	0	5.1	0	0.23	0	WS-0
HAMK	2009	302	1	1	4/24/08	8.72	0	3	9	0.17	0	5.1	0	0.17	0	I
HAMK	2009	302	1	1	4/25/08	8.75	22	S	9	0.25	0.04	5.1	0.462	0	4	I
HAMK	2009	302	1	1	4/26/08	8.78	24	2	9	0.24	0	5.1	0.504	0	10	
HAMK	2009	302	1	1	4/27/08	8.82	0	2	S	0.23	0	5.1	0	0	5	
HAMK	2009	302	1	1	4/28/08	8.85	0	2	2	0.2	0	5.1	0	0	1	
HAMK	2009	302	1	1	4/29/08	8.88	0	2	3	0.13	0	5.1	0	0.13	0	WS-0
HAMK	2009	302	1	1	4/30/08	8.91	0	2	4	0.26	0	5.1	0	0.26	0	WS-1
HAMK	2009	302	1	1	5/1/08	8.95	0	2	5	0.29	0	5.1	0	0.29	0	WS-2
HAMK	2009	302	1	1	5/2/08	8.98	0	2	6	0.23	0	5.1	0	0.23	0	WS-3
HAMK	2009	302	1	1	5/3/08	9.01	0	2	7	0.19	0	5.1	0	0.19	0	WS-4
HAMK	2009	302	1	1	5/4/08	9.05	0	2	8	0.2	0	5.1	0	0.2	0	I
HAMK	2009	302	1	1	5/5/08	9.08	4	2	9	0.25	0	5.1	0.084	0.25	0	WS-0
HAMK	2009	302	1	1	5/6/08	9.11	0	2	10	0.21	0	5.1	0	0.21	0	WS-1
HAMK	2009	302	1	1	5/7/08	9.14	0	2	11	0.28	0	5.1	0	0.28	0	I
HAMK	2009	302	1	1	5/8/08	9.18	21	S	11	0.35	0.03	5.1	0.441	0	2	IF
HAMK	2009	302	1	1	5/9/08	9.21	24	2	11	0.32	0.01	5.1	0.504	0	6	?
HAMK	2009	302	1	1	5/10/08	9.24	0	2	S	0.39	0	5.1	0	0.39	0	WS-0
HAMK	2009	302	1	1	5/11/08	9.28	0	2	2	0.34	0.03	5.1	0	0.34	0	WS-1
HAMK	2009	302	1	1	5/12/08	9.31	0	2	3	0.3	0	5.1	0	0.3	0	WS-2
HAMK	2009	302	1	1	5/13/08	9.34	0	2	4	0.19	0	5.1	0	0.19	0	WS-3
HAMK	2009	302	1	1	5/14/08	9.38	0	2	5	0.22	0	5.1	0	0.22	0	WS-4
HAMK	2009	302	1	1	5/15/08	9.41	0	2	6	0.2	0	5.1	0	0.2	0	WS-5
HAMK	2009	302	1	1	5/16/08	9.44	0	2	7	0.15	0	5.1	0	0.15	0	WS-6
HAMK	2009	302	1	1	5/17/08	9.47	0	2	8	0.2	0	5.1	0	0.2	0	WS-7
HAMK	2009	302	1	1	5/18/08	9.51	0	2	9	0.29	0	5.1	0	0.29	0	WS-8
HAMK	2009	302	1	1	5/19/08	9.54	0	2	10	0.36	0	5.1	0	0.36	0	WS-9
HAMK	2009	302	1	1	5/20/08	9.57	0	2	11	0.18	0	5.1	0	0.18	0	WS-10
HAMK	2009	302	1	1	5/21/08	9.61	0	2	12	0.22	0	5.1	0	0.22	0	WS-11
HAMK	2009	302	1	1	5/22/08	9.64	0	2	13	0.14	0	5.1	0	0.14	0	WS-12
HAMK	2009	302	1	1	5/23/08	9.67	0	2	14	0.2845	0	5.1	0	0.2845	0	WS-13
HAMK	2009	302	1	1	5/24/08	9.70	0	2	15	0.22	0	5.1	0	0.22	0	WS-14

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAMK	2009	302	1	1	5/25/08	9.74	0	2	16	0.31	0	5.1	0	0.31	0	WS-15
HAMK	2009	302	1	1	5/26/08	9.77	0	2	17	0.31	0	5.1	0	0.31	0	WS-16
HAMK	2009	302	1	1	5/27/08	9.80	0	2	18	0.23	0	5.1	0	0.23	0	WS-17
HAMK	2009	302	1	1	5/28/08	9.84	0	2	19	0.3	0	5.1	0	0.3	0	WS-18
HAMK	2009	302	1	1	5/29/08	9.87	0	2	20	0.28	0	5.1	0	0.28	0	WS-19
HAMK	2009	302	1	1	5/30/08	9.90	0	2	21	0.4	0	5.1	0	0.4	0	WS-20
HAMK	2009	302	1	1	5/31/08	9.93	0	2	22	0.32	0	5.1	0	0.32	0	WS-21
HAMK	2009	302	1	1	6/1/08	9.97	0	2	23	0.31	0	5.1	0	0.31	0	WS-22
HAMK	2009	302	1	1	6/2/08	10.00	0	2	24	0.34	0	5.1	0	0.34	0	WS-23
HAMK	2009	302	1	1	6/3/08	10.03	0	2	25	0.24	0	5.1	0	0.24	0	WS-24
HAMK	2009	302	1	1	6/4/08	10.07	0	2	26	0.2	0	5.1	0	0.2	0	WS-25
HAMK	2009	302	1	1	6/5/08	10.10	0	2	27	0.35	0.01	5.1	0	0.35	0	WS-26
HAMK	2009	302	1	1	6/6/08	10.13	0	2	28	0.24	0	5.1	0	0.24	0	WS-27
HAMK	2009	302	1	1	6/7/08	10.16	0	2	29	0.28	0	5.1	0	0.28	0	WS-28
HAMK	2009	302	1	1	6/8/08	10.20	0	2	30	0.25	0	5.1	0	0.25	0	WS-29
HAMK	2009	302	1	1	6/9/08	10.23	0	2	31	0.35	0	5.1	0	0.35	0	WS-30
HAMK	2009	302	1	1	6/10/08	10.26	0	2	32	0.34	0	5.1	0	0.34	0	WS-31
HAMK	2009	302	1	1	6/11/08	10.30	0	2	33	0.11	0	5.1	0	0.11	0	WS-32
HAMK	2009	302	1	1	6/12/08	10.33	0	2	34	0.19	0.05	5.1	0	0.19	0	WS-33
HAMK	2009	302	1	1	6/13/08	10.36	0	2	35	0.34	0	5.1	0	0.34	0	WS-34
HAMK	2009	302	1	1	6/14/08	10.39	0	2	36	0.33	0	5.1	0	0.33	0	WS-35
HAMK	2009	302	1	1	6/15/08	10.43	0	2	37	0.26	0	5.1	0	0.26	0	WS-36
HAMK	2009	302	1	1	6/16/08	10.46	0	2	38	0.28	0	5.1	0	0.28	0	WS-37
HAMK	2009	302	1	1	6/17/08	10.49	0	2	39	0.23	0	5.1	0	0.23	0	WS-38
HAMK	2009	302	1	1	6/18/08	10.53	0	2	40	0.27	0	5.1	0	0.27	0	WS-39
HAMK	2009	302	1	1	6/19/08	10.56	0	2	41	0.32	0	5.1	0	0.32	0	WS-40
HAMK	2009	302	1	1	6/20/08	10.59	0	2	42	0.39	0	5.1	0	0.39	0	WS-41
HAMK	2009	302	1	1	6/21/08	10.63	0	2	43	0.33	0	5.1	0	0.33	0	WS-42
HAMK	2009	302	1	1	6/22/08	10.66	0	2	44	0.27	0	5.1	0	0.27	0	WS-43
HAMK	2009	302	1	1	6/23/08	10.69	0	2	45	0.36	0	5.1	0	0.36	0	WS-44
HAMK	2009	302	1	1	6/24/08	10.72	0	2	46	0.38	0	5.1	0	0.38	0	WS-45
HAMK	2009	302	1	1	6/25/08	10.76	0	2	47	0.36	0	5.1	0	0.36	0	WS-46
HAMK	2009	302	1	1	6/26/08	10.79	0	2	48	0.27	0	5.1	0	0.27	0	WS-47
HAMK	2009	302	1	1	6/27/08	10.82	0	2	49	0.14	0	5.1	0	0.14	0	WS-48
HAMK	2009	302	1	1	6/28/08	10.86	0	2	50	0.27	0	5.1	0	0.27	0	WS-49
HAMK	2009	302	1	1	6/29/08	10.89	0	2	51	0.26	0	5.1	0	0.26	0	WS-50
HAMK	2009	302	1	1	6/30/08	10.92	0	2	52	0.29	0	5.1	0	0.29	0	WS-51

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAMK	2009	302	1	1	7/1/08	10.95	0	2	53	0.17	0	5.1	0	0.17	0	WS-52
HAMK	2009	302	1	1	7/2/08	10.99	0	2	54	0.3619	0	5.1	0	0.3619	0	WS-53
HAMK	2009	302	1	1	7/3/08	11.02	0	2	55	0.3	0	5.1	0	0.3	0	WS-54
HAMK	2009	302	1	1	7/4/08	11.05	0	2	56	0.32	0	5.1	0	0.32	0	WS-55
HAMK	2009	302	1	1	7/5/08	11.09	0	2	57	0.23	0	5.1	0	0.23	0	WS-56
HAMK	2009	302	1	1	7/6/08	11.12	0	2	58	0.3619	0	5.1	0	0.3619	0	WS-57
HAMK	2009	302	1	1	7/7/08	11.15	0	2	59	0.3619	0	5.1	0	0.3619	0	WS-58
HAMK	2009	302	1	1	7/8/08	11.18	0	2	60	0.3	0	5.1	0	0.3	0	WS-59
HAMK	2009	302	1	1	7/9/08	11.22	0	2	61	0.3	0	5.1	0	0.3	0	WS-60
HAMK	2009	302	1	1	7/10/08	11.25	0	2	62	0.3619	0.02	5.1	0	0.3619	0	WS-61
HAMK	2009	302	1	1	7/11/08	11.28	0	2	63	0.27	0	5.1	0	0.27	0	WS-62
HAMK	2009	302	1	1	7/12/08	11.32	0	2	64	0.3	0	5.1	0	0.3	0	WS-63
HAMK	2009	302	1	1	7/13/08	11.35	0	2	65	0.25	0	5.1	0	0.25	0	WS-64
HAMK	2009	302	1	1	7/14/08	11.38	0	2	66	0.21	0	5.1	0	0.21	0	WS-65
HAMK	2009	302	1	1	7/15/08	11.41	0	2	67	0.21	0	5.1	0	0.21	0	WS-66
HAMK	2009	302	1	1	7/16/08	11.45	0	2	68	0.21	0	5.1	0	0.21	0	WS-67
HAMK	2009	302	1	1	7/17/08	11.48	0	2	69	0.3619	0	5.1	0	0.3619	0	WS-68
HAMK	2009	302	1	1	7/18/08	11.51	16	S	69	0.3619	0.16	5.1	0.336	0	2	I
HAMK	2009	302	1	1	7/19/08	11.55	24	2	69	0.3619	0.06	5.1	0.504	0	6	IF
HAMK	2009	302	1	1	7/20/08	11.58	24	3	69	0.3619	0.02	5.1	0.504	0	9	I
HAMK	2009	302	1	1	7/21/08	11.61	24	4	69	0.19	0.02	5.1	0.504	0	16	I
HAMK	2009	302	1	1	7/22/08	11.64	24	5	69	0.33	0	5.1	0.504	0	19	I
HAMK	2009	302	1	1	7/23/08	11.68	24	6	69	0.28	0.03	5.1	0.504	0	24	I
HAMK	2009	302	1	1	7/24/08	11.71	6	6	S	0.41	0.03	5.1	0.126	0	19	?
HAMK	2009	302	1	1	7/25/08	11.74	0	6	2	0.37	0	5.1	0	0	12	?
HAMK	2009	302	1	1	7/26/08	11.78	0	6	3	0.31	0	5.1	0	0	6	
HAMK	2009	302	1	1	7/27/08	11.81	0	6	4	0.33	0	5.1	0	0.33	0	WS-0
HAMK	2009	302	1	1	7/28/08	11.84	16	S	4	0.33	0	5.1	0.336	0.33	0	I
HAMK	2009	302	1	1	7/29/08	11.88	24	2	4	0.3619	0.3	5.1	0.504	0	8	I
HAMK	2009	302	1	1	7/30/08	11.91	24	3	4	0.3619	0.02	5.1	0.504	0	11	I
HAMK	2009	302	1	1	7/31/08	11.94	24	4	4	0.23	0	5.1	0.504	0	17	I
HAMK	2009	302	1	1	8/1/08	11.97	24	5	4	0.28	0	5.1	0.504	0	21	I
HAMK	2009	302	1	1	8/2/08	12.01	6	5	S	0.27	0	5.1	0.126	0	18	
HAMK	2009	302	1	1	8/3/08	12.04	0	5	2	0.15	0	5.1	0	0	15	
HAMK	2009	302	1	1	8/4/08	12.07	0	5	3	0.24	0.03	5.1	0	0	11	
HAMK	2009	302	1	1	8/5/08	12.11	0	5	4	0.24	0	5.1	0	0	7	
HAMK	2009	302	1	1	8/6/08	12.14	0	5	5	0.23	0	5.1	0	0	2	I

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAMK	2009	302	1	1	8/7/08	12.17	22	S	5	0.3	0	5.1	0.462	0	5	I
HAMK	2009	302	1	1	8/8/08	12.20	24	2	5	0.26	0	5.1	0.504	0	10	I
HAMK	2009	302	1	1	8/9/08	12.24	24	3	5	0.35	0	5.1	0.504	0	13	I
HAMK	2009	302	1	1	8/10/08	12.27	24	4	5	0.33	0.02	5.1	0.504	0	17	I
HAMK	2009	302	1	1	8/11/08	12.30	24	5	5	0.35	0.08	5.1	0.504	0	22	I
HAMK	2009	302	1	1	8/12/08	12.34	24	6	5	0.35	0	5.1	0.504	0	25	I
HAMK	2009	302	1	1	8/13/08	12.37	6	6	S	0.21	0	5.1	0.126	0	23	I
HAMK	2009	302	1	1	8/14/08	12.40	22	S	1	0.22	0.12	5.1	0.462	0	30	I
HAMK	2009	302	1	1	8/15/08	12.43	24	2	1	0.31	0.01	5.1	0.504	0	34	I
HAMK	2009	302	1	1	8/16/08	12.47	24	3	1	0.32	0	5.1	0.504	0	38	I
HAMK	2009	302	1	1	8/17/08	12.50	24	4	1	0.32	0	5.1	0.504	0	41	I
HAMK	2009	302	1	1	8/18/08	12.53	24	5	1	0.34	0	5.1	0.504	0	44	I
HAMK	2009	302	1	1	8/19/08	12.57	6	5	S	0.28	0	5.1	0.126	0	41	?
HAMK	2009	302	1	1	8/20/08	12.60	0	5	2	0.23	0	5.1	0	0	37	
HAMK	2009	302	1	1	8/21/08	12.63	0	5	3	0.35	0.02	5.1	0	0	30	
HAMK	2009	302	1	1	8/22/08	12.66	0	5	4	0.35	0.01	5.1	0	0	24	
HAMK	2009	302	1	1	8/23/08	12.70	0	5	5	0.34	0.05	5.1	0	0	18	
HAMK	2009	302	1	1	8/24/08	12.73	0	5	6	0.34	0	5.1	0	0	11	I
HAMK	2009	302	1	1	8/25/08	12.76	22	S	6	0.3377	0.02	5.1	0.462	0	14	I
HAMK	2009	302	1	1	8/26/08	12.80	24	2	6	0.3377	0	5.1	0.504	0	17	
HAMK	2009	302	1	1	8/27/08	12.83	0	2	S	0.23	0.14	5.1	0	0	16	
HAMK	2009	302	1	1	8/28/08	12.86	0	2	2	0.36	0	5.1	0	0	9	
HAMK	2009	302	1	1	8/29/08	12.89	0	2	3	0.28	0	5.1	0	0	3	I
HAMK	2009	302	1	1	8/30/08	12.93	24	S	3	0.28	0.04	5.1	0.504	0	8	I
HAMK	2009	302	1	1	8/31/08	12.96	24	2	3	0.3377	0	5.1	0.504	0	12	
HAMK	2009	302	1	1	9/1/08	12.99	0	2	S	0.3033	0	5.1	0	0	6	
HAMK	2009	302	1	1	9/2/08	13.03	0	2	2	0.3033	0.04	5.1	0	0.3033	0	WS-0
HAMK	2009	302	1	1	9/3/08	13.06	0	2	3	0.3033	0	5.1	0	0.3033	0	WS-1
HAMK	2009	302	1	1	9/4/08	13.09	0	2	4	0.32	0	5.1	0	0.32	0	I
HAMK	2009	302	1	1	9/5/08	13.13	22	S	4	0.22	0	5.1	0.462	0	4	I
HAMK	2009	302	1	1	9/6/08	13.16	24	2	4	0.29	0	5.1	0.504	0	8	?
HAMK	2009	302	1	1	9/7/08	13.19	24	3	4	0.31	0	5.1	0.504	0	12	?
HAMK	2009	302	1	1	9/8/08	13.22	0	3	S	0.31	0.14	5.1	0	0	9	
HAMK	2009	302	1	1	9/9/08	13.26	0	3	2	0.31	0	5.1	0	0	3	?RD
HAMK	2009	302	1	1	9/10/08	13.29	0	3	3	0.22	0	5.1	0	0.22	0	WS-0
HAMK	2009	302	1	1	9/11/08	13.32	0	3	4	0.18	0	5.1	0	0.18	0	WS-1
HAMK	2009	302	1	1	9/12/08	13.36	0	3	5	0.23	0	5.1	0	0.23	0	WS-2

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAMK	2009	302	1	1	9/13/08	13.39	0	3	6	0.17	0	5.1	0	0.17	0	WS-3
HAMK	2009	302	1	1	9/14/08	13.42	0	3	7	0.17	0	5.1	0	0.17	0	WS-4
HAMK	2009	302	1	1	9/15/08	13.45	0	3	8	0.26	0	5.1	0	0.26	0	WS-5
HAMK	2009	302	1	1	9/16/08	13.49	0	3	9	0.3	0	5.1	0	0.3	0	WS-6
HAMK	2009	302	1	1	9/17/08	13.52	0	3	10	0.31	0.01	5.1	0	0.31	0	WS-7
HAMK	2009	302	1	1	9/18/08	13.55	0	3	11	0.19	0	5.1	0	0.19	0	WS-8
HAMK	2009	302	1	1	9/19/08	13.59	0	3	12	0.25	0	5.1	0	0.25	0	WS-9
HAMK	2009	302	1	1	9/20/08	13.62	0	3	13	0.25	0	5.1	0	0.25	0	WS-10
HAMK	2009	302	1	1	9/21/08	13.65	0	3	14	0.3033	0	5.1	0	0.3033	0	WS-11
HAMK	2009	302	1	1	9/22/08	13.68	0	3	15	0.29	0	5.1	0	0.29	0	WS-12
HAMK	2009	302	1	1	9/23/08	13.72	0	3	16	0.23	0.02	5.1	0	0.23	0	WS-13
HAMK	2009	302	1	1	9/24/08	13.75	0	3	17	0.17	0.01	5.1	0	0.17	0	WS-14
HAMK	2009	302	1	1	9/25/08	13.78	0	3	18	0.18	0	5.1	0	0.18	0	I
HAMK	2009	302	1	1	9/26/08	13.82	22	S	18	0.17	0	5.1	0.462	0	5	I
HAMK	2009	302	1	1	9/27/08	13.85	24	2	18	0.2	0	5.1	0.504	0	11	I
HAMK	2009	302	1	1	9/28/08	13.88	24	3	18	0.15	0	5.1	0.504	0	18	?
HAMK	2009	302	1	1	9/29/08	13.91	0	3	S	0.24	0	5.1	0	0	13	
HAMK	2009	302	1	1	9/30/08	13.95	16	S	1	0.26	0.03	5.1	0.336	0	16	I
HAMK	2009	302	1	1	10/1/08	13.98	24	2	1	0.29	0	5.1	0.504	0	20	
HAMK	2009	302	1	1	10/2/08	14.01	0	2	S	0.21	0	5.1	0	0	16	
HAMK	2009	302	1	1	10/3/08	14.05	0	2	2	0.27	0	5.1	0	0	10	
HAMK	2009	302	1	1	10/4/08	14.08	0	2	3	0.25	0	5.1	0	0	5	
HAMK	2009	302	1	1	10/5/08	14.11	0	2	4	0.18	0	5.1	0	0	2	
HAMK	2009	302	1	1	10/6/08	14.14	0	2	5	0.17	0	5.1	0	0.17	0	WS-0
HAMK	2009	302	1	1	10/7/08	14.18	0	2	6	0.22	0	5.1	0	0.22	0	WS-1
HAMK	2009	302	1	1	10/8/08	14.21	0	2	7	0.18	0	5.1	0	0.18	0	WS-2
HAMK	2009	302	1	1	10/9/08	14.24	0	2	8	0.22	0	5.1	0	0.22	0	WS-3
HAMK	2009	302	1	1	10/10/08	14.28	0	2	9	0.2	0	5.1	0	0.2	0	WS-4
HAMK	2009	302	1	1	10/11/08	14.31	0	2	10	0.22	0	5.1	0	0.22	0	WS-5
HAMK	2009	302	1	1	10/12/08	14.34	0	2	11	0.2	0	5.1	0	0.2	0	WS-6
HAMK	2009	302	1	1	10/13/08	14.38	0	2	12	0.16	0	5.1	0	0.16	0	WS-7
HAMK	2009	302	1	1	10/14/08	14.41	0	2	13	0.15	0	5.1	0	0.15	0	WS-8
HAMK	2009	302	1	1	10/15/08	14.44	15	S	13	0.15	0.01	5.1	0.315	0	3	I
HAMK	2009	302	1	1	10/16/08	14.47	24	2	13	0.27	0	5.1	0.504	0	8	I
HAMK	2009	302	1	1	10/17/08	14.51	24	3	13	0.28	0	5.1	0.504	0	12	
HAMK	2009	302	1	1	10/18/08	14.54	0	3	S	0.2	0	5.1	0	0	8	
HAMK	2009	302	1	1	10/19/08	14.57	0	3	2	0.22	0.01	5.1	0	0	4	

F302: Hamakua Ditch

Crop Cycle: 2007-2009 (2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAMK	2009	302	1	1	10/20/08	14.61	0	3	3	0.17	0	5.1	0	0	1	
HAMK	2009	302	1	1	10/21/08	14.64	0	3	4	0.17	0	5.1	0	0.17	0	WS-0
HAMK	2009	302	1	1	10/22/08	14.67	0	3	5	0.28	0	5.1	0	0.28	0	WS-1
HAMK	2009	302	1	1	10/23/08	14.70	0	3	6	0.2	0	5.1	0	0.2	0	WS-2
HAMK	2009	302	1	1	10/24/08	14.74	0	3	7	0.19	0	5.1	0	0.19	0	WS-3
HAMK	2009	302	1	1	10/25/08	14.77	0	3	8	0.12	0	5.1	0	0.12	0	WS-4
HAMK	2009	302	1	1	10/26/08	14.80	0	3	9	0.17	0	5.1	0	0.17	0	WS-5
HAMK	2009	302	1	1	10/27/08	14.84	0	3	10	0.16	0	5.1	0	0.16	0	WS-6
HAMK	2009	302	1	1	10/28/08	14.87	0	3	11	0.15	0	5.1	0	0.15	0	WS-7
HAMK	2009	302	1	1	10/29/08	14.90	0	3	12	0.25	0	5.1	0	0.25	0	WS-8
HAMK	2009	302	1	1	10/30/08	14.93	0	3	13	0.2	0	5.1	0	0.2	0	I
HAMK	2009	302	1	1	10/31/08	14.97	22	S	13	0.23	0.01	5.1	0.462	0	4	?
HAMK	2009	302	1	1	11/1/08	15.00	0	1	S	0.2	0	5.1	0	0.2	0	WS-0 SC
HAMK	2009	302	1	1	11/2/08	15.03	0	1	2	0.17	0	5.1	0	0.17	0	WS-1
HAMK	2009	302	1	1	11/3/08	15.07	0	1	3	0.17	0	5.1	0	0.17	0	WS-2
HAMK	2009	302	1	1	11/4/08	15.10	0	1	4	0.12	0	5.1	0	0.12	0	WS-3
HAMK	2009	302	1	1	11/5/08	15.13	0	1	5	0.18	0	5.1	0	0.18	0	WS-4
HAMK	2009	302	1	1	11/6/08	15.16	0	1	6	0.21	0	5.1	0	0.21	0	WS-5
HAMK	2009	302	1	1	11/7/08	15.20	0	1	7	0.17	0	5.1	0	0.17	0	WS-6
HAMK	2009	302	1	1	11/8/08	15.23	0	1	8	0.19	0	5.1	0	0.19	0	WS-7
HAMK	2009	302	1	1	11/9/08	15.26	0	1	9	0.18	0	5.1	0	0.18	0	WS-8
HAMK	2009	302	1	1	11/10/08	15.30	0	1	10	0.17	0	5.1	0	0.17	0	WS-9
HAMK	2009	302	1	1	11/11/08	15.33	0	1	11	0.18	0	5.1	0	0.18	0	WS-10
HAMK	2009	302	1	1	11/12/08	15.36	0	1	12	0.15	0	5.1	0	0.15	0	WS-11
HAMK	2009	302	1	1	11/13/08	15.39	0	1	13	0.16	0	5.1	0	0.16	0	WS-12
HAMK	2009	302	1	1	11/14/08	15.43	0	1	14	0.15	0	5.1	0	0.15	0	WS-13
HAMK	2009	302	1	1	11/15/08	15.46	0	1	15	0.17	0	5.1	0	0.17	0	WS-14
HAMK	2009	302	1	1	11/16/08	15.49	0	1	16	0.14	0	5.1	0	0.14	0	WS-15
HAMK	2009	302	1	1	11/17/08	15.53	0	1	17	0.21	0.06	5.1	0	0.21	0	I
HAMK	2009	302	1	1	11/18/08	15.56	22	S	17	0.1	1.57	5.1	0.462	0	37	I
HAMK	2009	302	1	1	11/19/08	15.59	24	2	17	0.18	0.23	5.1	0.504	0	48	I
HAMK	2009	302	1	1	11/20/08	15.63	24	3	17	0.19	0	5.1	0.504	0	54	I
HAMK	2009	302	1	1	11/21/08	15.66	24	4	17	0.13	0	5.1	0.504	0	62	
HAMK	2009	302	1	1	11/22/08	15.69	0	4	S	0.05	0	5.1	0	0	61	
HAMK	2009	302	1	1	11/23/08	15.72	0	4	2	0.17	0.16	5.1	0	0	61	
HAMK	2009	302	1	1	11/24/08	15.76	0	4	3	0.25	0	5.1	0	0	56	
HAMK	2009	302	1	1	11/25/08	15.79	0	4	4	0.17	0	5.1	0	0	52	

F302: Hamakua Ditch

Crop Cycle: 2007-2009 (2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAMK	2009	302	1	1	11/26/08	15.82	0	4	5	0.14	0	5.1	0	0	50	?
HAMK	2009	302	1	1	11/27/08	15.86	0	4	6	0.19	0	5.1	0	0	46	?
HAMK	2009	302	1	1	11/28/08	15.89	0	4	7	0.16	0	5.1	0	0	43	?
HAMK	2009	302	1	1	11/29/08	15.92	0	4	8	0.13	0	5.1	0	0	40	
HAMK	2009	302	1	1	11/30/08	15.95	0	4	9	0.17	0.09	5.1	0	0	39	
HAMK	2009	302	1	1	12/1/08	15.99	0	4	10	0.16	0	5.1	0	0	35	
HAMK	2009	302	1	1	12/2/08	16.02	0	4	11	0.09	0	5.1	0	0	34	
HAMK	2009	302	1	1	12/3/08	16.05	0	4	12	0.15	0	5.1	0	0	31	
HAMK	2009	302	1	1	12/4/08	16.09	0	4	13	0.14	0	5.1	0	0	28	
HAMK	2009	302	1	1	12/5/08	16.12	0	4	14	0.19	0	5.1	0	0	24	
HAMK	2009	302	1	1	12/6/08	16.15	0	4	15	0.16	0	5.1	0	0	21	
HAMK	2009	302	1	1	12/7/08	16.18	0	4	16	0.14	0	5.1	0	0	18	
HAMK	2009	302	1	1	12/8/08	16.22	0	4	17	0.15	0	5.1	0	0	15	
HAMK	2009	302	1	1	12/9/08	16.25	0	4	18	0.14	0	5.1	0	0	13	
HAMK	2009	302	1	1	12/10/08	16.28	0	4	19	0.12	0	5.1	0	0	10	
HAMK	2009	302	1	1	12/11/08	16.32	0	4	20	0.03	0	5.1	0	0	10	I*DS
HAMK	2009	302	1	1	12/12/08	16.35	6	S	20	0.14	2.5	5.1	0.126	0	59	?
HAMK	2009	302	1	1	12/13/08	16.38	24	2	20	0.11	1.4	5.1	0.504	0	94	
HAMK	2009	302	1	1	12/14/08	16.41	0	3	20	0.08	0.7	5.1	0	0	100	
HAMK	2009	302	1	1	12/15/08	16.45	0	3	S	0.11	0	5.1	0	0	97	
HAMK	2009	302	1	1	12/16/08	16.48	0	3	2	0.14	0	5.1	0	0	95	?
HAMK	2009	302	1	1	12/17/08	16.51	0	3	3	0.15	0	5.1	0	0	92	?
HAMK	2009	302	1	1	12/18/08	16.55	0	3	4	0.14	0	5.1	0	0	89	
HAMK	2009	302	1	1	12/19/08	16.58	0	3	5	0.14	0	5.1	0	0	86	
HAMK	2009	302	1	1	12/20/08	16.61	0	3	6	0.15	0	5.1	0	0	83	
HAMK	2009	302	1	1	12/21/08	16.64	0	3	7	0.16	0	5.1	0	0	80	
HAMK	2009	302	1	1	12/22/08	16.68	0	3	8	0.14	0	5.1	0	0	77	
HAMK	2009	302	1	1	12/23/08	16.71	0	3	9	0.15	0	5.1	0	0	74	
HAMK	2009	302	1	1	12/24/08	16.74	0	3	10	0.13	0.05	5.1	0	0	73	
HAMK	2009	302	1	1	12/25/08	16.78	0	S	10	0.18	0.34	5.1	0	0	76	
HAMK	2009	302	1	1	12/26/08	16.81	24	2	10	0.09	0.35	5.1	0.504	0	91	I
HAMK	2009	302	1	1	12/27/08	16.84	24	3	10	0.13	0.48	5.1	0.504	0	100	I
HAMK	2009	302	1	1	12/28/08	16.88	24	4	10	0.1	0.06	5.1	0.504	0	100	I
HAMK	2009	302	1	1	12/29/08	16.91	24	5	10	0.12	0.26	5.1	0.504	0	100	I
HAMK	2009	302	1	1	12/30/08	16.94	24	6	10	0.06	0.13	5.1	0.504	0	100	I
HAMK	2009	302	1	1	12/31/08	16.97	24	7	10	0.13	0.76	5.1	0.504	0	100	I
HAMK	2009	302	1	1	1/1/09	17.01	24	8	10	0.14	0	5.1	0.504	0	100	I

F302: Hamakua Ditch

Crop Cycle: 2007-2009 (2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAMK	2009	302	1	1	1/2/09	17.04	24	9	10	0.1632	0.08	5.1	0.504	0	100	I
HAMK	2009	302	1	1	1/3/09	17.07	24	10	10	0.1632	0	5.1	0.504	0	100	I
HAMK	2009	302	1	1	1/4/09	17.11	24	11	10	0.13	0	5.1	0.504	0	100	
HAMK	2009	302	1	1	1/5/09	17.14	0	11	S	0.13	0	5.1	0	0	97	
HAMK	2009	302	1	1	1/6/09	17.17	0	11	2	0.16	0	5.1	0	0	94	
HAMK	2009	302	1	1	1/7/09	17.20	0	11	3	0.14	0	5.1	0	0	91	
HAMK	2009	302	1	1	1/8/09	17.24	0	11	4	0.1632	0	5.1	0	0	88	
HAMK	2009	302	1	1	1/9/09	17.27	0	11	5	0.1632	0	5.1	0	0	85	
HAMK	2009	302	1	1	1/10/09	17.30	0	11	6	0.1632	0	5.1	0	0	81	
HAMK	2009	302	1	1	1/11/09	17.34	0	S	6	0.1632	0.22	5.1	0	0	83	
HAMK	2009	302	1	1	1/12/09	17.37	0	1	S	0.1632	0	5.1	0	0	79	
HAMK	2009	302	1	1	1/13/09	17.40	0	1	2	0.1632	0	5.1	0	0	76	
HAMK	2009	302	1	1	1/14/09	17.43	0	1	3	0.1632	0	5.1	0	0	73	
HAMK	2009	302	1	1	1/15/09	17.47	0	1	4	0.1632	0.08	5.1	0		71	RIPE
HAMK	2009	302	1	1	1/16/09	17.50	0	S	4	0.1632	0.2	5.1	0		72	RIPE
HAMK	2009	302	1	1	1/17/09	17.53	0	2	4	0.1632	0.96	5.1	0		88	RIPE
HAMK	2009	302	1	1	1/18/09	17.57	0	2	S	0.1632	0.02	5.1	0		85	RIPE
HAMK	2009	302	1	1	1/19/09	17.60	0	2	2	0.1632	0	5.1	0		82	RIPE
HAMK	2009	302	1	1	1/20/09	17.63	0	2	3	0.1632	0	5.1	0		78	RIPE
HAMK	2009	302	1	1	1/21/09	17.66	0	2	4	0.1632	0	5.1	0		75	RIPE
HAMK	2009	302	1	1	1/22/09	17.70	0	2	5	0.1632	0	5.1	0		72	RIPE
HAMK	2009	302	1	1	1/23/09	17.73	0	2	6	0.1632	0	5.1	0		69	RIPE
HAMK	2009	302	1	1	1/24/09	17.76	0	2	7	0.1632	0	5.1	0		66	RIPE
HAMK	2009	302	1	1	1/25/09	17.80	0	2	8	0.1632	0	5.1	0		62	RIPE
HAMK	2009	302	1	1	1/26/09	17.83	0	2	9	0.1632	0	5.1	0		59	RIPE
HAMK	2009	302	1	1	1/27/09	17.86	0	S	9	0.1632	0.5	5.1	0		66	RIPE
HAMK	2009	302	1	1	1/28/09	17.89	0	2	9	0.1632	0.85	5.1	0		79	RIPE
HAMK	2009	302	1	1	1/29/09	17.93	0	3	9	0.1632	0.28	5.1	0		82	RIPE
HAMK	2009	302	1	1	1/30/09	17.96	0	3	S	0.1632	0	5.1	0		78	RIPE
HAMK	2009	302	1	1	1/31/09	17.99	0	3	2	0.1632	0	5.1	0		75	RIPE
HAMK	2009	302	1	1	2/1/09	18.03	0	3	3	0.1864	0	5.1	0		72	RIPE
HAMK	2009	302	1	1	2/2/09	18.06	0	3	4	0.1864	0	5.1	0		68	RIPE
HAMK	2009	302	1	1	2/3/09	18.09	0	S	4	0.1864	0.26	5.1	0		69	RIPE
HAMK	2009	302	1	1	2/4/09	18.13	0	1	S	0.12	0	5.1	0		67	RIPE
HAMK	2009	302	1	1	2/5/09	18.16	0	1	2	0.12	0	5.1	0		65	RIPE
HAMK	2009	302	1	1	2/6/09	18.19	0	1	3	0.12	0	5.1	0		62	RIPE
HAMK	2009	302	1	1	2/7/09	18.22	0	1	4	0.16	0	5.1	0		59	RIPE

F302: Hamakua Ditch

Crop Cycle: 2007-2009 (2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAMK	2009	302	1	1	2/8/09	18.26	0	1	5	0.17	0	5.1	0		56	RIPE
HAMK	2009	302	1	1	2/9/09	18.29	0	1	6	0.19	0	5.1	0		52	RIPE
HAMK	2009	302	1	1	2/10/09	18.32	0	1	7	0.16	0	5.1	0		49	RIPE
HAMK	2009	302	1	1	2/11/09	18.36	0	1	8	0.15	0	5.1	0		46	RIPE
HAMK	2009	302	1	1	2/12/09	18.39	0	1	9	0.17	0.1	5.1	0		45	RIPE
HAMK	2009	302	1	1	2/13/09	18.42	0	1	10	0.27	0	5.1	0		39	RIPE
HAMK	2009	302	1	1	2/14/09	18.45	0	1	11	0.27	0.03	5.1	0		35	RIPE
HAMK	2009	302	1	1	2/15/09	18.49	0	1	12	0.1864	0.05	5.1	0		32	RIPE
HAMK	2009	302	1	1	2/16/09	18.52	0	1	13	0.1864	0	5.1	0		28	RIPE
HAMK	2009	302	1	1	2/17/09	18.55	0	1	14	0.1864	0	5.1	0		25	RIPE
HAMK	2009	302	1	1	2/18/09	18.59	0	1	15	0.1864	0	5.1	0		21	RIPE
HAMK	2009	302	1	1	2/19/09	18.62	0	1	16	0.1864	0.04	5.1	0		18	RIPE
HAMK	2009	302	1	1	2/20/09	18.65	0	1	17	0.1864	0.15	5.1	0		17	RIPE
HAMK	2009	302	1	1	2/21/09	18.68	0	1	18	0.1864	0.15	5.1	0		17	RIPE
HAMK	2009	302	1	1	2/22/09	18.72	0	1	19	0.1864	0	5.1	0		13	RIPE
HAMK	2009	302	1	1	2/23/09	18.75	0	1	20	0.1864	0	5.1	0		9	RIPE
HAMK	2009	302	1	1	2/24/09	18.78	0	1	21	0.1864	0	5.1	0		6	RIPE
HAMK	2009	302	1	1	2/25/09	18.82	0	1	22	0.1864	0.09	5.1	0		4	RIPE
HAMK	2009	302	1	1	2/26/09	18.85	0	1	23	0.1864	0.06	5.1	0		1	RIPE
HAMK	2009	302	1	1	2/27/09	18.88	0	1	24	0.2	0	5.1	0		0	RIPE
HAMK	2009	302	1	1	2/28/09	18.91	0	1	25	0.17	0.05	5.1	0		0	RIPE
HAMK	2009	302	1	1	3/1/09	18.95	0	1	26	0.22	0.06	5.1	0		0	RIPE
HAMK	2009	302	1	1	3/2/09	18.98	0	1	27	0.19	0.1	5.1	0		0	RIPE
HAMK	2009	302	1	1	3/3/09	19.01	0	S	27	0.19	0.2	5.1	0		0	IFNLRD
HAMK	2009	302	1	1	3/4/09	19.05	22	2	27	0.2094	0.01	5.1	0.462		5	IFNLRD
HAMK	2009	302	1	1	3/5/09	19.08	24	3	27	0.2094	0	5.1	0.504		11	IFNLRD
HAMK	2009	302	1	1	3/6/09	19.11	24	4	27	0.2094	0	5.1	0.504		16	IFNLRD
HAMK	2009	302	1	1	3/7/09	19.14	0	5	27	0.2094	0.24	5.1	0		17	DRY
HAMK	2009	302	1	1	3/8/09	19.18	0	6	27	0.2094	0.2	5.1	0		17	DRY
HAMK	2009	302	1	1	3/9/09	19.21	0	6	S	0.2094	0.1	5.1	0		15	DRY
HAMK	2009	302	1	1	3/10/09	19.24	0	6	2	0.2094	0.05	5.1	0		12	DRY
HAMK	2009	302	1	1	3/11/09	19.28	0	6	3	0.2094	0	5.1	0		7	DRY
HAMK	2009	302	1	1	3/12/09	19.31	0	S	3	0.2094	0.25	5.1	0		8	DRY
HAMK	2009	302	1	1	3/13/09	19.34	0	2	3	0.2094	0.89	5.1	0		22	DRY
HAMK	2009	302	1	1	3/14/09	19.38	0	2	S	0.2094	0	5.1	0		17	DRY
HAMK	2009	302	1	1	3/15/09	19.41	0	S	1	0.2094	0.4	5.1	0		21	DRY
HAMK	2009	302	1	1	3/16/09	19.44	0	2	1	0.2094	0.92	5.1	0		35	DRY

F302: Hamakua Ditch

Crop Cycle: 2007-2009 (2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAMK	2009	302	1	1	3/17/09	19.47	0	2	S	0.2094	0	5.1	0		31	DRY
HAMK	2009	302	1	1	3/18/09	19.51	0	2	2	0.2094	0.14	5.1	0		30	DRY
HAMK	2009	302	1	1	3/19/09	19.54	0	2	3	0.2094	0	5.1	0		26	DRY
HAMK	2009	302	1	1	3/20/09	19.57	0	2	4	0.2094	0.03	5.1	0		22	DRY
HAMK	2009	302	1	1	3/21/09	19.61	0	2	5	0.2094	0	5.1	0		18	DRY
HAMK	2009	302	1	1	3/22/09	19.64	0	2	6	0.2094	0	5.1	0		14	DRY
HAMK	2009	302	1	1	3/23/09	19.67	0	2	7	0.2094	0	5.1	0		10	DRY
HAMK	2009	302	1	1	3/24/09	19.70	0	2	8	0.2094	0	5.1	0		6	DRY
HAMK	2009	302	1	1	3/25/09	19.74	0	2	9	0.2094	0	5.1	0		2	DRY
HAMK	2009	302	1	1	3/26/09	19.77	0	2	10	0.2094	0	5.1	0		0	DRY
HAMK	2009	302	1	1	3/27/09	19.80	0	2	11	0.2094	0	5.1	0		0	DRY
HAMK	2009	302	1	1	3/28/09	19.84	0	2	12	0.2094	0	5.1	0		0	DRY
HAMK	2009	302	1	1	3/29/09	19.87	0	2	13	0.2094	0	5.1	0		0	DRY
HAMK	2009	302	1	1	3/30/09	19.90	0	2	14	0.2094	0.01	5.1	0		0	DRY
HAMK	2009	302	1	1	3/31/09	19.93	0	2	15	0.2094	0	5.1	0		0	DRY
HAMK	2009	302	1	1	4/1/09	19.97	0	2	16	0.19	0.01	5.1	0		0	DRY
HAMK	2009	302	1	1	4/2/09	20.00	0	2	17	0.29	0	5.1	0		0	DRY
HAMK	2009	302	1	1	4/3/09	20.03	0	2	18	0.29	0.03	5.1	0		0	DRY
HAMK	2009	302	1	1	4/4/09	20.07	0	2	19	0.2453	0	5.1	0		0	DRY
HAMK	2009	302	1	1	4/5/09	20.10	0	2	20	0.2453	0.01	5.1	0		0	DRY
HAMK	2009	302	1	1	4/6/09	20.13	0	2	21	0.2453	0	5.1	0		0	DRY
HAMK	2009	302	1	1	4/7/09	20.16	0	2	22	0.2453	0	5.1	0		0	DRY
HAMK	2009	302	1	1	4/8/09	20.20	0	2	23	0.2453	0	5.1	0		0	DRY
HAMK	2009	302	1	1	4/9/09	20.23	0	2	24	0.2453	0	5.1	0		0	DRY
HAMK	2009	302	1	1	4/10/09	20.26	0	2	25	0.2453	0.17	5.1	0		0	DRY
HAMK	2009	302	1	1	4/11/09	20.30	0	2	26	0.2453	0.01	5.1	0		0	DRY
HAMK	2009	302	1	1	4/12/09	20.33	0	2	27	0.2453	0	5.1	0		0	DRY
HAMK	2009	302	1	1	4/13/09	20.36	0	2	28	0.2453	0	5.1	0		0	DRY
HAMK	2009	302	1	1	4/14/09	20.39	0	2	29	0.2453	0	5.1	0		0	DRY
HAMK	2009	302	1	1	4/15/09	20.43	0	2	30	0.2453	0	5.1	0		0	DRY
HAMK	2009	302	1	1	4/16/09	20.46	0	2	31	0.2453	0	5.1	0		0	DRY
HAMK	2009	302	1	1	4/17/09	20.49	0	2	32	0.2453	0	5.1	0		0	DRY
HAMK	2009	302	1	1	4/18/09	20.53	0	2	33	0.2453	0	5.1	0		0	DRY
HAMK	2009	302	1	1	4/19/09	20.56	0	2	34	0.2453	0	5.1	0		0	DRY
HAMK	2009	302	1	1	4/20/09	20.59	0	2	35	0.2453	0	5.1	0		0	DRY
HAMK	2009	302	1	1	4/21/09	20.63	0	S	35	0.2453	0.24	5.1	0		0	DRY
HAMK	2009	302	1	1	4/22/09	20.66	0	1	S	0.2453	0.03	5.1	0		0	DRY

F302: Hamakua Ditch

Crop Cycle: 2007-2009 (2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAMK	2009	302	1	1	4/23/09	20.69	0	1	2	0.2453	0	5.1	0		0	DRY
HAMK	2009	302	1	1	4/24/09	20.72	0	1	3	0.2453	0.16	5.1	0		0	DRY
HAMK	2009	302	1	1	4/25/09	20.76	0	1	4	0.2453	0.02	5.1	0		0	DRY
HAMK	2009	302	1	1	4/26/09	20.79	0	1	5	0.2453	0	5.1	0		0	DRY
HAMK	2009	302	1	1	4/27/09	20.82	0	1	6	0.2453	0	5.1	0		0	DRY
HAMK	2009	302	1	1	4/28/09	20.86	0	1	7	0.2453	0	5.1	0		0	DRY
HAMK	2009	302	1	1	4/29/09	20.89	0	1	8	0.2453	0	5.1	0		0	DRY
HAMK	2009	302	1	1	4/30/09	20.92	0	1	9	0.2453	0.15	5.1	0		0	DRY
HAMK	2009	302	1	1	5/1/09	20.95	0	1	10	0.2845	0.01	5.1	0		0	DRY
HAMK	2009	302	1	1	5/2/09	20.99	0	1	11	0.2845	0	5.1	0		0	DRY
HAMK	2009	302	1	1	5/3/09	21.02	0	1	12	0.2845	0	5.1	0		0	DRY
HAMK	2009	302	1	1	5/4/09	21.05	0	1	13	0.2845	0	5.1	0		0	DRY
HAMK	2009	302	1	1	5/5/09	21.09	0	1	14	0.2845	0	5.1	0		0	DRY
HAMK	2009	302	1	1	5/6/09	21.12	0	1	15	0.2845	0	5.1	0		0	DRY
HAMK	2009	302	1	1	5/7/09	21.15	0	1	16	0.2845	0	5.1	0		0	DRY
HAMK	2009	302	1	1	5/8/09	21.18	0	1	17	0.2845	0	5.1	0		0	DRY
HAMK	2009	302	1	1	5/9/09	21.22	0	1	18	0.2845	0	5.1	0		0	DRY
HAMK	2009	302	1	1	5/10/09	21.25	0	1	19	0.2845	0	5.1	0		0	DRY
HAMK	2009	302	1	1	5/11/09	21.28	0	1	20	0.2845	0	5.1	0		0	DRY
HAMK	2009	302	1	1	5/12/09	21.32	0	1	21	0.2845	0	5.1	0		0	DRY
HAMK	2009	302	1	1	5/13/09	21.35	0	1	22	0.2845	0	5.1	0		0	DRY
HAMK	2009	302	1	1	5/14/09	21.38	0	1	23	0.2845	0	5.1	0		0	DRY
HAMK	2009	302	1	1	5/15/09	21.41	0	1	24	0.2845	0	5.1	0		0	DRY
HAMK	2009	302	1	1	5/16/09	21.45	0	1	25	0.2845	0	5.1	0		0	DRY
HAMK	2009	302	1	1	5/17/09	21.48	0	1	26	0.2845	0	5.1	0		0	DRY
HAMK	2009	302	1	1	5/18/09	21.51	0	1	27	0.2845	0	5.1	0		0	DRY
HAMK	2009	302	1	1	5/19/09	21.55	0	1	28	0.2845	0.05	5.1	0		0	DRY
HAMK	2009	302	1	1	5/20/09	21.58	0	1	29	0.2845	0	5.1	0		0	DRY
HAMK	2009	302	1	1	5/21/09	21.61	0	1	30	0.2845	0.01	5.1	0		0	DRY
HAMK	2009	302	1	1	5/22/09	21.64	0	1	31	0.2845	0	5.1	0		0	DRY
HAMK	2009	302	1	1	5/23/09	21.68	0	1	32	0.2845	0	5.1	0		0	DRY
HAMK	2009	302	1	1	5/24/09	21.71	0	1	33	0.2845	0	5.1	0		0	DRY
HAMK	2009	302	1	1	5/25/09	21.74	0	1	34	0.2845	0	5.1	0		0	DRY
HAMK	2009	302	1	1	5/26/09	21.78	0	1	35	0.2845	0	5.1	0		0	DRY
HAMK	2009	302	1	1	5/27/09	21.81	0	1	36	0.2845	0	5.1	0		0	DRY
HAMK	2009	302	1	1	5/28/09	21.84	0	1	37	0.2845	0.14	5.1	0		0	DRY
HAMK	2009	302	1	1	5/29/09	21.88	0	1	38	0.2845	0.14	5.1	0		0	DRY

F302: Hamakua Ditch

Crop Cycle: 2007-2009 (2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAMK	2009	302	1	1	5/30/09	21.91	0	1	39	0.2845	0	5.1	0		0	DRY
HAMK	2009	302	1	1	5/31/09	21.94	0	1	40	0.2845	0	5.1	0		0	DRY
HAMK	2009	302	1	1	6/1/09	21.97	0	1	41	0.3423	0	5.1	0		0	DRY
HAMK	2009	302	1	1	6/2/09	22.01	0	1	42	0.3423	0	5.1	0		0	DRY
HAMK	2009	302	1	1	6/3/09	22.04	0	1	43	0.3423	0	5.1	0		0	DRY
HAMK	2009	302	1	1	6/4/09	22.07	0	1	44	0.3423	0	5.1	0		0	DRY
HAMK	2009	302	1	1	6/5/09	22.11	0	1	45	0.3423	0	5.1	0		0	DRY
HAMK	2009	302	1	1	6/6/09	22.14	0	1	46	0.3423	0	5.1	0		0	DRY
HAMK	2009	302	1	1	6/7/09	22.17	0	1	47	0.3423	0	5.1	0		0	DRY
HAMK	2009	302	1	1	6/8/09	22.20	0	1	48	0.3423	0	5.1	0		0	DRY
HAMK	2009	302	1	1	6/9/09	22.24	0	1	49	0.3423	0	5.1	0		0	END
										130.7391	42.54*		59.22	34.7439		

**** Actual Rainfall total not fully useable by the plant as irrigation. Please see cover memo for explanation of "Effective Rainfall"***

F302: Hamakua Ditch

Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAMK	2007	302	1	1	8/19/05	0.00	0	S	S	0.08991	0	1.6983	0	0	0	IPLT
HAMK	2007	302	1	1	8/20/05	0.03	0	1	2	0.09657	0	1.6983	0	0	0	IPLT
HAMK	2007	302	1	1	8/21/05	0.07	0	1	3	0.09324	0	1.6983	0	0	0	IPLT
HAMK	2007	302	1	1	8/22/05	0.10	12	S	3	0.08991	0	1.6983	0.252	0	9	IPLT
HAMK	2007	302	1	1	8/23/05	0.13	12	2	3	0.08325	0	1.6983	0.252	0	19	IPLT
HAMK	2007	302	1	1	8/24/05	0.16	23	3	3	0.09324	0	1.6983	0.483	0	42	IPLT
HAMK	2007	302	1	1	8/25/05	0.20	24	4	3	0.08658	0	1.6983	0.504	0	67	IPLT
HAMK	2007	302	1	1	8/26/05	0.23	24	5	3	0.08325	0	1.6983	0.504	0	91	IPLT
HAMK	2007	302	1	1	8/27/05	0.26	24	6	3	0.07992	0	1.6983	0.504	0	100	IPLT
HAMK	2007	302	1	1	8/28/05	0.30	24	7	3	0.06993	0	1.6983	0.504	0	100	IPLT
HAMK	2007	302	1	1	8/29/05	0.33	24	8	3	0.05328	0	1.6983	0.504	0	100	IPLT
HAMK	2007	302	1	1	8/30/05	0.36	24	9	3	0.08658	0	1.6983	0.504	0	100	IPLT
HAMK	2007	302	1	1	8/31/05	0.39	24	10	3	0.09657	0	1.6983	0.504	0	100	IPLT
HAMK	2007	302	1	1	9/1/05	0.43	20	11	3	0.09657	0	1.6983	0.42	0	100	IPLT
HAMK	2007	302	1	1	9/2/05	0.46	24	12	3	0.09324	0	1.6983	0.504	0	100	IPLT
HAMK	2007	302	1	1	9/3/05	0.49	24	13	3	0.08991	0	1.6983	0.504	0	100	IPLT
HAMK	2007	302	1	1	9/4/05	0.53	24	14	3	0.0999	0	1.6983	0.504	0	100	IPLT
HAMK	2007	302	1	1	9/5/05	0.56	24	15	3	0.08991	0	1.6983	0.504	0	100	IPLT
HAMK	2007	302	1	1	9/6/05	0.59	24	16	3	0.08325	0	1.6983	0.504	0	100	IPLT
HAMK	2007	302	1	1	9/7/05	0.63	24	17	3	0.07659	0.01	1.6983	0.504	0	100	IPLT
HAMK	2007	302	1	1	9/8/05	0.66	24	18	3	0.08991	0	1.6983	0.504	0	100	IPLT
HAMK	2007	302	1	1	9/9/05	0.69	24	19	3	0.08991	0	1.6983	0.504	0	100	PLT WC
HAMK	2007	302	1	1	9/10/05	0.72	0	19	S	0.09657	0	1.6983	0	0	94	PLT WC
HAMK	2007	302	1	1	9/11/05	0.76	0	19	2	0.09657	0	1.6983	0	0	88	PLT WC
HAMK	2007	302	1	1	9/12/05	0.79	0	19	3	0.08325	0	1.6983	0	0	83	PLT WC
HAMK	2007	302	1	1	9/13/05	0.82	0	19	4	0.07326	0	1.6983	0	0	79	PLT WC
HAMK	2007	302	1	1	9/14/05	0.86	0	19	5	0.06327	0.06	1.6983	0	0	79	IPLT
HAMK	2007	302	1	1	9/15/05	0.89	22	S	5	0.05661	1.83	1.6983	0.462	0	100	IPLT
HAMK	2007	302	1	1	9/16/05	0.92	6	1	S	0.05328	0	1.6983	0.126	0	100	PLT
HAMK	2007	302	1	1	9/17/05	0.95	0	1	2	0.08325	0	1.6983	0	0	95	PLT
HAMK	2007	302	1	1	9/18/05	0.99	0	1	3	0.06993	0	1.6983	0	0	90	PLT
HAMK	2007	302	1	1	9/19/05	1.02	0	1	4	0.07992	0	1.6983	0	0	86	PLT
HAMK	2007	302	1	1	9/20/05	1.05	0	1	5	0.07992	0	1.6983	0	0	81	IPLT
HAMK	2007	302	1	1	9/21/05	1.09	22	S	5	0.07659	0	1.6983	0.462	0	100	IPLT
HAMK	2007	302	1	1	9/22/05	1.12	24	2	5	0.05661	0	1.6983	0.504	0	100	PLT
HAMK	2007	302	1	1	9/23/05	1.15	0	2	S	0.05328	0	1.6983	0	0	96	

F302: Hamakua Ditch

Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAMK	2007	302	1	1	9/24/05	1.18	0	2	2	0.06993	0	1.6983	0	0	92	
HAMK	2007	302	1	1	9/25/05	1.22	0	2	3	0.07659	0	1.6983	0	0	88	I
HAMK	2007	302	1	1	9/26/05	1.25	22	S	3	0.07992	0	1.6983	0.462	0	100	IPLT
HAMK	2007	302	1	1	9/27/05	1.28	24	2	3	0.08325	0	1.6983	0.504	0	100	IPLT F
HAMK	2007	302	1	1	9/28/05	1.32	6	2	S	0.08325	0	1.6983	0.126	0	100	
HAMK	2007	302	1	1	9/29/05	1.35	0	2	2	0.0666	0.06	1.6983	0	0	99	
HAMK	2007	302	1	1	9/30/05	1.38	0	2	3	0.05661	0.15	1.6983	0	0	100	
HAMK	2007	302	1	1	10/1/05	1.41	0	S	3	0.05328	0.3	1.6983	0	0	100	
HAMK	2007	302	1	1	10/2/05	1.45	0	1	S	0.06327	0	1.6983	0	0	96	I
HAMK	2007	302	1	1	10/3/05	1.48	22	S	1	0.04662	0	1.6983	0.462	0	100	IPLT
HAMK	2007	302	1	1	10/4/05	1.51	24	2	1	0.07418	0	1.719618	0.504	0	100	AC
HAMK	2007	302	1	1	10/5/05	1.55	0	2	S	0.075792	0	1.757001	0	0	93	
HAMK	2007	302	1	1	10/6/05	1.58	0	2	2	0.056294	0.07	1.794384	0	0	92	
HAMK	2007	302	1	1	10/7/05	1.61	0	2	3	0.057467	0.17	1.831767	0	0	96	
HAMK	2007	302	1	1	10/8/05	1.64	0	2	4	0.093054	0.02	1.86915	0	0	90	I
HAMK	2007	302	1	1	10/9/05	1.68	22	S	4	0.094915	0	1.906533	0.462	0	100	I
HAMK	2007	302	1	1	10/10/05	1.71	24	2	4	0.096777	0	1.943916	0.504	0	100	IPLT
HAMK	2007	302	1	1	10/11/05	1.74	24	3	4	0.098638	0	1.981299	0.504	0	100	IF
HAMK	2007	302	1	1	10/12/05	1.78	6	3	S	0.100499	0.08	2.018682	0.126	0	100	
HAMK	2007	302	1	1	10/13/05	1.81	0	S	1	0.10236	0.22	2.056065	0	0	100	
HAMK	2007	302	1	1	10/14/05	1.84	0	1	S	0.104221	0	2.093448	0	0	93	
HAMK	2007	302	1	1	10/15/05	1.88	0	1	2	0.106082	0	2.130831	0	0	86	PLT
HAMK	2007	302	1	1	10/16/05	1.91	0	1	3	0.107943	0	2.168214	0	0	80	PLT
HAMK	2007	302	1	1	10/17/05	1.94	0	1	4	0.109804	0	2.205597	0	0	73	
HAMK	2007	302	1	1	10/18/05	1.97	0	1	5	0.111665	0	2.24298	0	0	67	I
HAMK	2007	302	1	1	10/19/05	2.01	22	S	5	0.113526	0	2.280363	0.462	0	81	I
HAMK	2007	302	1	1	10/20/05	2.04	20	2	5	0.115387	0	2.317746	0.42	0	93	
HAMK	2007	302	1	1	10/21/05	2.07	0	2	S	0.117248	0	2.355129	0	0	87	
HAMK	2007	302	1	1	10/22/05	2.11	0	2	2	0.11911	0.1	2.392512	0	0	84	
HAMK	2007	302	1	1	10/23/05	2.14	0	S	2	0.120971	1.1	2.429895	0	0	100	
HAMK	2007	302	1	1	10/24/05	2.17	0	2	2	0.122832	0.38	2.467278	0	0	100	
HAMK	2007	302	1	1	10/25/05	2.20	0	2	S	0.124693	0	2.504661	0	0	93	
HAMK	2007	302	1	1	10/26/05	2.24	0	2	2	0.126554	0	2.542044	0	0	87	
HAMK	2007	302	1	1	10/27/05	2.27	0	2	3	0.128415	0	2.579427	0	0	80	I
HAMK	2007	302	1	1	10/28/05	2.30	22	S	3	0.130276	0.01	2.61681	0.462	0	92	I
HAMK	2007	302	1	1	10/29/05	2.34	24	2	3	0.132137	0.01	2.654193	0.504	0	100	IF

F302: Hamakua Ditch

Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAMK	2007	302	1	1	10/30/05	2.37	6	2	S	0.133998	0	2.691576	0.126	0	98	WC
HAMK	2007	302	1	1	10/31/05	2.40	0	2	2	0.135859	0	2.728959	0	0	91	WC
HAMK	2007	302	1	1	11/1/05	2.43	0	2	3	0.082427	0	2.067775	0	0	100	WC
HAMK	2007	302	1	1	11/2/05	2.47	0	2	4	0.083541	0.05	2.095718	0	0	97	SCWC
HAMK	2007	302	1	1	11/3/05	2.50	0	2	5	0.084655	0.02	2.12366	0	0	92	I
HAMK	2007	302	1	1	11/4/05	2.53	20	S	5	0.085769	0	2.151603	0.42	0	100	I
HAMK	2007	302	1	1	11/5/05	2.57	24	2	5	0.086883	0	2.179546	0.504	0	100	
HAMK	2007	302	1	1	11/6/05	2.60	0	2	S	0.087997	0	2.207489	0	0	94	
HAMK	2007	302	1	1	11/7/05	2.63	0	2	2	0.08911	0	2.235432	0	0	89	
HAMK	2007	302	1	1	11/8/05	2.66	0	S	2	0.090224	0.25	2.263375	0	0	95	I
HAMK	2007	302	1	1	11/9/05	2.70	22	2	2	0.091338	0.05	2.291318	0.462	0	100	I
HAMK	2007	302	1	1	11/10/05	2.73	24	3	2	0.092452	0	2.319261	0.504	0	100	
HAMK	2007	302	1	1	11/11/05	2.76	0	3	S	0.093566	0	2.347204	0	0	94	
HAMK	2007	302	1	1	11/12/05	2.80	0	3	2	0.09468	0	2.375147	0	0	89	
HAMK	2007	302	1	1	11/13/05	2.83	0	3	3	0.065967	0	2.403089	0	0	85	
HAMK	2007	302	1	1	11/14/05	2.86	16	S	3	0.066734	0	2.431032	0.336	0	96	I
HAMK	2007	302	1	1	11/15/05	2.89	24	2	3	0.086787	0.02	2.458975	0.504	0	100	
HAMK	2007	302	1	1	11/16/05	2.93	0	2	S	0.09265	0	2.486918	0	0	95	
HAMK	2007	302	1	1	11/17/05	2.96	0	2	2	0.08876	0	2.514861	0	0	90	
HAMK	2007	302	1	1	11/18/05	2.99	0	2	3	0.049859	0	2.542804	0	0	87	
HAMK	2007	302	1	1	11/19/05	3.03	0	2	4	0.085692	0	2.570747	0	0	83	I
HAMK	2007	302	1	1	11/20/05	3.06	22	S	4	0.091718	0	2.59869	0.462	0	96	I
HAMK	2007	302	1	1	11/21/05	3.09	24	2	4	0.066953	0	2.626633	0.504	0	100	
HAMK	2007	302	1	1	11/22/05	3.13	0	2	S	0.057256	0	2.654576	0	0	96	
HAMK	2007	302	1	1	11/23/05	3.16	0	2	2	0.052598	0	2.682518	0	0	93	
HAMK	2007	302	1	1	11/24/05	3.19	0	S	2	0.053146	0.22	2.710461	0	0	99	
HAMK	2007	302	1	1	11/25/05	3.22	0	1	S	0.10916	0	2.738404	0	0	94	
HAMK	2007	302	1	1	11/26/05	3.26	0	1	2	0.086787	0	2.766347	0	0	89	
HAMK	2007	302	1	1	11/27/05	3.29	0	1	3	0.043832	0.02	2.79429	0	0	88	
HAMK	2007	302	1	1	11/28/05	3.32	0	S	3	0.083007	0.72	2.822233	0	0	100	
HAMK	2007	302	1	1	11/29/05	3.36	0	1	S	0.100594	0	2.850176	0	0	95	
HAMK	2007	302	1	1	11/30/05	3.39	0	1	2	0.090294	0	2.878119	0	0	91	
HAMK	2007	302	1	1	12/1/05	3.42	0	1	3	0.056982	0	2.906062	0	0	88	
HAMK	2007	302	1	1	12/2/05	3.45	0	1	4	0.074788	0	2.934005	0	0	85	
HAMK	2007	302	1	1	12/3/05	3.49	0	1	5	0.075501	0	2.961947	0	0	81	
HAMK	2007	302	1	1	12/4/05	3.52	0	1	6	0.058625	0	2.98989	0	0	79	

F302: Hamakua Ditch

Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAMK	2007	302	1	1	12/5/05	3.55	0	1	7	0.100594	0.02	3.017833	0	0	75	RD
HAMK	2007	302	1	1	12/6/05	3.59	0	1	8	0.095554	0	3.045776	0	0	71	RD
HAMK	2007	302	1	1	12/7/05	3.62	0	1	9	0.102457	0	3.073719	0	0	67	RD
HAMK	2007	302	1	1	12/8/05	3.65	0	1	10	0.097307	0.02	3.101662	0	0	64	RD
HAMK	2007	302	1	1	12/9/05	3.68	0	1	11	0.098184	0	3.129605	0	0	61	I
HAMK	2007	302	1	1	12/10/05	3.72	22	S	11	0.09906	0.12	3.157548	0.462	0	75	I
HAMK	2007	302	1	1	12/11/05	3.75	24	2	11	0.105808	0.2	3.185491	0.504	0	93	
HAMK	2007	302	1	1	12/12/05	3.78	0	2	S	0.106736	0.12	3.213434	0	0	93	
HAMK	2007	302	1	1	12/13/05	3.82	0	2	2	0.209736	0	3.241376	0	0	86	IF
HAMK	2007	302	1	1	12/14/05	3.85	22	S	2	0.121798	0	3.269319	0.462	0	95	
HAMK	2007	302	1	1	12/15/05	3.88	0	1	S	0.090513	0	3.297262	0	0	92	
HAMK	2007	302	1	1	12/16/05	3.91	0	1	2	0.09128	0	3.325205	0	0	88	
HAMK	2007	302	1	1	12/17/05	3.95	0	1	3	0.111377	0	3.353148	0	0	84	
HAMK	2007	302	1	1	12/18/05	3.98	0	1	4	0.112305	0	3.381091	0	0	80	
HAMK	2007	302	1	1	12/19/05	4.01	0	1	5	0.113233	0	3.409034	0	0	76	
HAMK	2007	302	1	1	12/20/05	4.05	0	1	6	0.114162	0	3.436977	0	0	72	
HAMK	2007	302	1	1	12/21/05	4.08	16	S	6	0.11509	0	3.46492	0.336	0	78	I
HAMK	2007	302	1	1	12/22/05	4.11	24	2	6	0.116018	0	3.492863	0.504	0	89	IF
HAMK	2007	302	1	1	12/23/05	4.14	6	2	S	0.116946	0	3.520805	0.126	0	88	
HAMK	2007	302	1	1	12/24/05	4.18	0	2	2	0.117874	0	3.548748	0	0	84	
HAMK	2007	302	1	1	12/25/05	4.21	0	2	3	0.118802	0	3.576691	0	0	80	
HAMK	2007	302	1	1	12/26/05	4.24	0	2	4	0.11973	0	3.604634	0	0	76	
HAMK	2007	302	1	1	12/27/05	4.28	0	2	5	0.120659	0	3.632577	0	0	72	
HAMK	2007	302	1	1	12/28/05	4.31	0	2	6	0.121587	0	3.66052	0	0	68	
HAMK	2007	302	1	1	12/29/05	4.34	0	2	7	0.122515	0	3.688463	0	0	65	
HAMK	2007	302	1	1	12/30/05	4.38	0	2	8	0.123443	0	3.716406	0	0	61	
HAMK	2007	302	1	1	12/31/05	4.41	0	2	9	0.124371	0	3.744349	0	0	57	
HAMK	2007	302	1	1	1/1/06	4.44	0	2	10	0.11095	0	3.772292	0	0	54	
HAMK	2007	302	1	1	1/2/06	4.47	0	2	11	0.121608	0	3.800234	0	0	50	
HAMK	2007	302	1	1	1/3/06	4.51	0	2	12	0.122502	0	3.828177	0	0	46	
HAMK	2007	302	1	1	1/4/06	4.54	0	2	13	0.123396	0	3.85612	0	0	43	
HAMK	2007	302	1	1	1/5/06	4.57	0	S	13	0.12429	0.2	3.884063	0	0	45	
HAMK	2007	302	1	1	1/6/06	4.61	0	1	S	0.125184	0.08	3.912006	0	0	43	
HAMK	2007	302	1	1	1/7/06	4.64	0	1	2	0.126078	0	3.939949	0	0	40	
HAMK	2007	302	1	1	1/8/06	4.67	0	1	3	0.126973	0	3.967892	0	0	36	I
HAMK	2007	302	1	1	1/9/06	4.70	16	S	3	0.10969	0	3.995835	0.336	0	41	I

F302: Hamakua Ditch

Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAMK	2007	302	1	1	1/10/06	4.74	24	2	3	0.149905	0.02	4.023778	0.504	0	50	
HAMK	2007	302	1	1	1/11/06	4.77	0	2	S	0.119168	0	4.051721	0	0	47	
HAMK	2007	302	1	1	1/12/06	4.80	0	2	2	0.151987	0.18	4.079663	0	0	48	
HAMK	2007	302	1	1	1/13/06	4.84	16	S	2	0.104704	0	4.107606	0.336	0	53	I
HAMK	2007	302	1	1	1/14/06	4.87	24	2	2	0.121634	0	4.135549	0.504	0	62	I
HAMK	2007	302	1	1	1/15/06	4.90	24	3	2	0.130619	0	4.163492	0.504	0	70	I
HAMK	2007	302	1	1	1/16/06	4.93	24	4	2	0.123278	0	4.191435	0.504	0	79	
HAMK	2007	302	1	1	1/17/06	4.97	0	4	S	0.091006	0.07	4.219378	0	0	78	
HAMK	2007	302	1	1	1/18/06	5.00	0	4	2	0.133249	0	4.247321	0	0	74	
HAMK	2007	302	1	1	1/19/06	5.03	0	4	3	0.11736	0	4.275264	0	0	71	
HAMK	2007	302	1	1	1/20/06	5.07	0	4	4	0.135003	0	4.303207	0	0	67	
HAMK	2007	302	1	1	1/21/06	5.10	0	4	5	0.118894	0	4.33115	0	0	64	
HAMK	2007	302	1	1	1/22/06	5.13	0	4	6	0.136756	0	4.359092	0	0	61	
HAMK	2007	302	1	1	1/23/06	5.16	0	4	7	0.103224	0	4.387035	0	0	58	
HAMK	2007	302	1	1	1/24/06	5.20	0	4	8	0.077911	0.05	4.414978	0	0	57	
HAMK	2007	302	1	1	1/25/06	5.23	0	S	8	0.078404	0.38	4.442921	0	0	63	I
HAMK	2007	302	1	1	1/26/06	5.26	22	2	8	0.070131	0.12	4.470864	0.462	0	74	I
HAMK	2007	302	1	1	1/27/06	5.30	24	3	8	0.097033	0.14	4.498807	0.504	0	86	IF
HAMK	2007	302	1	1	1/28/06	5.33	6	3	S	0.124264	0	4.52675	0.126	0	86	
HAMK	2007	302	1	1	1/29/06	5.36	0	3	2	0.133962	0	4.554693	0	0	82	
HAMK	2007	302	1	1	1/30/06	5.39	0	3	3	0.134783	0	4.582636	0	0	79	
HAMK	2007	302	1	1	1/31/06	5.43	0	3	4	0.126565	0	4.610579	0	0	75	
HAMK	2007	302	1	1	2/1/06	5.46	0	3	5	0.145522	0	4.638521	0	0	72	
HAMK	2007	302	1	1	2/2/06	5.49	0	3	6	0.137249	0	4.666464	0	0	68	
HAMK	2007	302	1	1	2/3/06	5.53	0	S	6	0.092047	0.34	4.694407	0	0	73	
HAMK	2007	302	1	1	2/4/06	5.56	0	2	6	0.157412	0.52	4.72235	0	0	81	
HAMK	2007	302	1	1	2/5/06	5.59	0	2	S	0.223543	0	4.750293	0	0	75	
HAMK	2007	302	1	1	2/6/06	5.63	0	2	2	0.196751	0	4.778236	0	0	71	I
HAMK	2007	302	1	1	2/7/06	5.66	22	S	2	0.131934	0	4.806179	0.462	0	77	IF
HAMK	2007	302	1	1	2/8/06	5.69	24	2	2	0.085308	0	4.834122	0.504	0	86	
HAMK	2007	302	1	1	2/9/06	5.72	0	2	S	0.171602	0.08	4.862065	0	0	83	
HAMK	2007	302	1	1	2/10/06	5.76	0	2	2	0.191765	0.05	4.890008	0	0	80	
HAMK	2007	302	1	1	2/11/06	5.79	0	2	3	0.135003	0	4.91795	0	0	77	I
HAMK	2007	302	1	1	2/12/06	5.82	22	S	3	0.13577	0	4.945893	0.462	0	83	I
HAMK	2007	302	1	1	2/13/06	5.86	24	2	3	0.126784	0.02	4.973836	0.504	0	90	
HAMK	2007	302	1	1	2/14/06	5.89	0	3	3	0.137304	0.35	5.001779	0	0	94	

F302: Hamakua Ditch

Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAMK	2007	302	1	1	2/15/06	5.92	0	4	3	0.098622	0.35	5.029722	0	0	98	
HAMK	2007	302	1	1	2/16/06	5.95	0	4	S	0.128921	0.03	5.057665	0	0	96	I
HAMK	2007	302	1	1	2/17/06	5.99	22	S	1	0.089746	0	5.085608	0.462	0	100	
HAMK	2007	302	1	1	2/18/06	6.02	0	2	1	0.11	0.26	5.1	0	0	100	
HAMK	2007	302	1	1	2/19/06	6.05	0	2	S	0.08	0	5.1	0	0	98	
HAMK	2007	302	1	1	2/20/06	6.09	0	2	2	0.14	0	5.1	0	0	95	
HAMK	2007	302	1	1	2/21/06	6.12	0	2	3	0.1	0	5.1	0	0	93	I
HAMK	2007	302	1	1	2/22/06	6.15	22	S	3	0.19	0	5.1	0.462	0	99	I
HAMK	2007	302	1	1	2/23/06	6.18	24	2	3	0.2	0.26	5.1	0.504	0	100	
HAMK	2007	302	1	1	2/24/06	6.22	0	2	S	0.16	0	5.1	0	0	96	
HAMK	2007	302	1	1	2/25/06	6.25	0	2	2	0.19	0	5.1	0	0	93	
HAMK	2007	302	1	1	2/26/06	6.28	0	2	3	0.19	0	5.1	0	0	89	
HAMK	2007	302	1	1	2/27/06	6.32	16	S	3	0.2	0.05	5.1	0.336	0	93	I
HAMK	2007	302	1	1	2/28/06	6.35	24	2	3	0.17	0	5.1	0.504	0	99	
HAMK	2007	302	1	1	3/1/06	6.38	0	2	S	0.12	0	5.1	0	0	97	
HAMK	2007	302	1	1	3/2/06	6.41	0	2	2	0.17	0	5.1	0	0	93	I
HAMK	2007	302	1	1	3/3/06	6.45	16	S	2	0.16	0	5.1	0.336	0	97	IF
HAMK	2007	302	1	1	3/4/06	6.48	24	2	2	0.16	0	5.1	0.504	0	100	IF
HAMK	2007	302	1	1	3/5/06	6.51	5	2	S	0.23	0.1	5.1	0.105	0	99	
HAMK	2007	302	1	1	3/6/06	6.55	0	2	2	0.22	0	5.1	0	0	95	
HAMK	2007	302	1	1	3/7/06	6.58	0	2	3	0.17	0	5.1	0	0	91	I
HAMK	2007	302	1	1	3/8/06	6.61	16	S	3	0.19	0	5.1	0.336	0	94	I
HAMK	2007	302	1	1	3/9/06	6.64	24	2	3	0.11	0	5.1	0.504	0	100	IF
HAMK	2007	302	1	1	3/10/06	6.68	6	2	S	0.16	0	5.1	0.126	0	99	
HAMK	2007	302	1	1	3/11/06	6.71	0	2	2	0.17	0	5.1	0	0	96	
HAMK	2007	302	1	1	3/12/06	6.74	0	2	3	0.19	0	5.1	0	0	92	
HAMK	2007	302	1	1	3/13/06	6.78	16	S	3	0.13	0	5.1	0.336	0	96	I
HAMK	2007	302	1	1	3/14/06	6.81	24	2	3	0.13	0	5.1	0.504	0	100	
HAMK	2007	302	1	1	3/15/06	6.84	0	2	S	0.08	0	5.1	0	0	98	
HAMK	2007	302	1	1	3/16/06	6.88	0	2	2	0.13	0.03	5.1	0	0	96	I
HAMK	2007	302	1	1	3/17/06	6.91	22	S	2	0.19	0	5.1	0.462	0	100	I
HAMK	2007	302	1	1	3/18/06	6.94	6	1	S	0.16	0	5.1	0.126	0	99	
HAMK	2007	302	1	1	3/19/06	6.97	0	S	1	0.06	0.65	5.1	0	0	100	
HAMK	2007	302	1	1	3/20/06	7.01	0	2	1	0.2	1.65	5.1	0	0	100	
HAMK	2007	302	1	1	3/21/06	7.04	0	2	S	0.15	0.03	5.1	0	0	97	
HAMK	2007	302	1	1	3/22/06	7.07	0	2	2	0.11	0	5.1	0	0	95	

F302: Hamakua Ditch

Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAMK	2007	302	1	1	3/23/06	7.11	0	2	3	0.18	0	5.1	0	0	91	
HAMK	2007	302	1	1	3/24/06	7.14	0	S	3	0.22	0.3	5.1	0	0	93	
HAMK	2007	302	1	1	3/25/06	7.17	0	1	S	0.1	0.08	5.1	0	0	93	
HAMK	2007	302	1	1	3/26/06	7.20	0	1	2	0.07	0.08	5.1	0	0	93	
HAMK	2007	302	1	1	3/27/06	7.24	0	S	2	0.08	0.8	5.1	0	0	100	
HAMK	2007	302	1	1	3/28/06	7.27	0	2	2	0.1	0.32	5.1	0	0	100	
HAMK	2007	302	1	1	3/29/06	7.30	0	3	2	0.08	1.45	5.1	0	0	100	
HAMK	2007	302	1	1	3/30/06	7.34	0	4	2	0.08	2.5	5.1	0	0	100	
HAMK	2007	302	1	1	3/31/06	7.37	0	4	S	0.12	0	5.1	0	0	97	
HAMK	2007	302	1	1	4/1/06	7.40	0	4	2	0.16	0.07	5.1	0	0	95	
HAMK	2007	302	1	1	4/2/06	7.43	0	4	3	0.19	0.06	5.1	0	0	93	SC
HAMK	2007	302	1	1	4/3/06	7.47	0	4	4	0.22	0	5.1	0	0	89	
HAMK	2007	302	1	1	4/4/06	7.50	0	4	5	0.2	0	5.1	0	0	85	I
HAMK	2007	302	1	1	4/5/06	7.53	22	S	5	0.3	0	5.1	0.462	0	88	I
HAMK	2007	302	1	1	4/6/06	7.57	24	2	5	0.23	0	5.1	0.504	0	93	IF
HAMK	2007	302	1	1	4/7/06	7.60	6	3	5	0.27	0.24	5.1	0.126	0	95	
HAMK	2007	302	1	1	4/8/06	7.63	0	3	S	0.29	0.05	5.1	0	0	90	
HAMK	2007	302	1	1	4/9/06	7.66	0	3	2	0.21	0	5.1	0	0	86	
HAMK	2007	302	1	1	4/10/06	7.70	0	3	3	0.21	0.06	5.1	0	0	83	I
HAMK	2007	302	1	1	4/11/06	7.73	22	S	3	0.27	0.06	5.1	0.462	0	88	I
HAMK	2007	302	1	1	4/12/06	7.76	24	2	3	0.16	0.02	5.1	0.504	0	95	
HAMK	2007	302	1	1	4/13/06	7.80	0	2	S	0.31	0.1	5.1	0	0	91	I
HAMK	2007	302	1	1	4/14/06	7.83	22	S	1	0.31	0	5.1	0.462	0	94	I
HAMK	2007	302	1	1	4/15/06	7.86	0	1	S	0.24	0	5.1	0	0	90	
HAMK	2007	302	1	1	4/16/06	7.89	0	1	2	0.26	0.01	5.1	0	0	85	
HAMK	2007	302	1	1	4/17/06	7.93	0	1	3	0.28	0.01	5.1	0	0	79	I
HAMK	2007	302	1	1	4/18/06	7.96	22	S	3	0.25	0.02	5.1	0.462	0	84	I
HAMK	2007	302	1	1	4/19/06	7.99	24	2	3	0.29	0.1	5.1	0.504	0	90	I
HAMK	2007	302	1	1	4/20/06	8.03	24	3	3	0.25	0.02	5.1	0.504	0	95	IF
HAMK	2007	302	1	1	4/21/06	8.06	6	3	S	0.25	0.06	5.1	0.126	0	94	
HAMK	2007	302	1	1	4/22/06	8.09	0	3	2	0.27	0	5.1	0	0	89	
HAMK	2007	302	1	1	4/23/06	8.13	0	3	3	0.31	0.05	5.1	0	0	84	I
HAMK	2007	302	1	1	4/24/06	8.16	22	S	3	0.22	0	5.1	0.462	0	88	I
HAMK	2007	302	1	1	4/25/06	8.19	24	2	3	0.13	0	5.1	0.504	0	96	
HAMK	2007	302	1	1	4/26/06	8.22	0	2	S	0.19	0	5.1	0	0	92	
HAMK	2007	302	1	1	4/27/06	8.26	0	2	2	0.2	0	5.1	0	0	88	I

F302: Hamakua Ditch

Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAMK	2007	302	1	1	4/28/06	8.29	22	S	2	0.2	0	5.1	0.462	0	93	I
HAMK	2007	302	1	1	4/29/06	8.32	24	2	2	0.16	0	5.1	0.504	0	100	I
HAMK	2007	302	1	1	4/30/06	8.36	24	3	2	0.18	0	5.1	0.504	0	100	
HAMK	2007	302	1	1	5/1/06	8.39	0	3	S	0.18	0.08	5.1	0	0	98	
HAMK	2007	302	1	1	5/2/06	8.42	0	3	2	0.23	0	5.1	0	0	93	I
HAMK	2007	302	1	1	5/3/06	8.45	22	S	2	0.28	0	5.1	0.462	0	97	IF
HAMK	2007	302	1	1	5/4/06	8.49	6	1	S	0.24	0	5.1	0.126	0	94	
HAMK	2007	302	1	1	5/5/06	8.52	0	S	1	0.17	0.62	5.1	0	0	100	
HAMK	2007	302	1	1	5/6/06	8.55	0	2	1	0.1	0.44	5.1	0	0	100	
HAMK	2007	302	1	1	5/7/06	8.59	0	3	1	0.27	0.46	5.1	0	0	100	
HAMK	2007	302	1	1	5/8/06	8.62	0	3	S	0.31	0.1	5.1	0	0	95	I
HAMK	2007	302	1	1	5/9/06	8.65	22	S	1	0.33	0	5.1	0.462	0	98	I
HAMK	2007	302	1	1	5/10/06	8.68	24	2	1	0.36	0	5.1	0.504	0	100	I
HAMK	2007	302	1	1	5/11/06	8.72	24	3	1	0.36	0	5.1	0.504	0	100	I
HAMK	2007	302	1	1	5/12/06	8.75	24	4	1	0.2845	0	5.1	0.504	0	100	
HAMK	2007	302	1	1	5/13/06	8.78	0	4	S	0.2845	0	5.1	0	0	94	
HAMK	2007	302	1	1	5/14/06	8.82	0	4	2	0.2845	0.02	5.1	0	0	89	
HAMK	2007	302	1	1	5/15/06	8.85	16	S	2	0.2845	0.5	5.1	0.336	0	100	I
HAMK	2007	302	1	1	5/16/06	8.88	24	2	2	0.2845	0	5.1	0.504	0	100	
HAMK	2007	302	1	1	5/17/06	8.91	0	2	S	0.2845	0	5.1	0	0	94	
HAMK	2007	302	1	1	5/18/06	8.95	0	S	1	0.2845	0.4	5.1	0	0	96	
HAMK	2007	302	1	1	5/19/06	8.98	16	2	1	0.2845	0.02	5.1	0.336	0	98	I
HAMK	2007	302	1	1	5/20/06	9.01	24	3	1	0.2845	0	5.1	0.504	0	100	I
HAMK	2007	302	1	1	5/21/06	9.05	24	4	1	0.2845	0	5.1	0.504	0	100	I
HAMK	2007	302	1	1	5/22/06	9.08	6	4	S	0.2845	0.04	5.1	0.126	0	97	IF
HAMK	2007	302	1	1	5/23/06	9.11	5	4	2	0.2845	0	5.1	0.105	0	94	
HAMK	2007	302	1	1	5/24/06	9.14	0	4	3	0.2845	0	5.1	0	0	88	
HAMK	2007	302	1	1	5/25/06	9.18	0	4	4	0.2845	0	5.1	0	0	83	
HAMK	2007	302	1	1	5/26/06	9.21	0	4	5	0.2845	0	5.1	0	0	77	
HAMK	2007	302	1	1	5/27/06	9.24	0	4	6	0.2845	0	5.1	0	0	71	
HAMK	2007	302	1	1	5/28/06	9.28	0	4	7	0.2845	0	5.1	0	0	66	I
HAMK	2007	302	1	1	5/29/06	9.31	22	S	7	0.2845	0	5.1	0.462	0	69	I
HAMK	2007	302	1	1	5/30/06	9.34	24	2	7	0.2845	0	5.1	0.504	0	74	
HAMK	2007	302	1	1	5/31/06	9.38	0	2	S	0.2845	0	5.1	0	0	68	
HAMK	2007	302	1	1	6/1/06	9.41	0	2	2	0.3423	0	5.1	0	0	61	
HAMK	2007	302	1	1	6/2/06	9.44	0	2	3	0.3423	0	5.1	0	0	55	

F302: Hamakua Ditch

Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAMK	2007	302	1	1	6/3/06	9.47	0	2	4	0.3423	0	5.1	0	0	48	I
HAMK	2007	302	1	1	6/4/06	9.51	22	S	4	0.3423	0	5.1	0.462	0	50	I
HAMK	2007	302	1	1	6/5/06	9.54	24	2	4	0.3423	0	5.1	0.504	0	53	
HAMK	2007	302	1	1	6/6/06	9.57	0	2	S	0.3423	0	5.1	0	0	47	
HAMK	2007	302	1	1	6/7/06	9.61	0	2	2	0.3423	0	5.1	0	0	40	?
HAMK	2007	302	1	1	6/8/06	9.64	0	2	3	0.26	0	5.1	0	0	35	
HAMK	2007	302	1	1	6/9/06	9.67	0	2	4	0.27	0	5.1	0	0	30	
HAMK	2007	302	1	1	6/10/06	9.70	0	2	5	0.2	0	5.1	0	0	26	
HAMK	2007	302	1	1	6/11/06	9.74	0	2	6	0.2	0	5.1	0	0	22	I
HAMK	2007	302	1	1	6/12/06	9.77	22	S	6	0.2	0	5.1	0.462	0	27	I
HAMK	2007	302	1	1	6/13/06	9.80	24	2	6	0.25	0	5.1	0.504	0	32	I
HAMK	2007	302	1	1	6/14/06	9.84	6	2	S	0.37	0	5.1	0.126	0	27	
HAMK	2007	302	1	1	6/15/06	9.87	0	2	2	0.25	0.01	5.1	0	0	22	
HAMK	2007	302	1	1	6/16/06	9.90	0	2	3	0.34	0.05	5.1	0	0	17	
HAMK	2007	302	1	1	6/17/06	9.93	0	2	4	0.34	0	5.1	0	0	10	I
HAMK	2007	302	1	1	6/18/06	9.97	22	S	4	0.3423	0	5.1	0.462	0	12	I
HAMK	2007	302	1	1	6/19/06	10.00	24	2	4	0.3	0	5.1	0.504	0	16	
HAMK	2007	302	1	1	6/20/06	10.03	0	2	S	0.29	0	5.1	0	0	11	
HAMK	2007	302	1	1	6/21/06	10.07	15	S	1	0.36	0	5.1	0.315	0	10	I
HAMK	2007	302	1	1	6/22/06	10.10	24	2	1	0.36	0	5.1	0.504	0	13	I
HAMK	2007	302	1	1	6/23/06	10.13	24	3	1	0.28	0	5.1	0.504	0	17	I
HAMK	2007	302	1	1	6/24/06	10.16	24	4	1	0.3	0	5.1	0.504	0	21	?
HAMK	2007	302	1	1	6/25/06	10.20	0	4	S	0.15	0	5.1	0	0	18	
HAMK	2007	302	1	1	6/26/06	10.23	0	4	2	0.22	0	5.1	0	0	14	
HAMK	2007	302	1	1	6/27/06	10.26	0	4	3	0.27	0	5.1	0	0	8	
HAMK	2007	302	1	1	6/28/06	10.30	0	4	4	0.35	0	5.1	0	0	2	
HAMK	2007	302	1	1	6/29/06	10.33	0	4	5	0.35	0	5.1	0	0.35	0	WS-0
HAMK	2007	302	1	1	6/30/06	10.36	0	4	6	0.35	0	5.1	0	0.35	0	WS-1
HAMK	2007	302	1	1	7/1/06	10.39	0	4	7	0.3619	0	5.1	0	0.3619	0	WS-2
HAMK	2007	302	1	1	7/2/06	10.43	0	4	8	0.3619	0	5.1	0	0.3619	0	WS-3
HAMK	2007	302	1	1	7/3/06	10.46	0	4	9	0.35	0	5.1	0	0.35	0	WS-4
HAMK	2007	302	1	1	7/4/06	10.49	0	4	10	0.35	0	5.1	0	0.35	0	WS-5
HAMK	2007	302	1	1	7/5/06	10.53	0	4	11	0.3619	0	5.1	0	0.3619	0	WS-6
HAMK	2007	302	1	1	7/6/06	10.56	0	4	12	0.3619	0	5.1	0	0.3619	0	WS-7
HAMK	2007	302	1	1	7/7/06	10.59	0	4	13	0.28	0	5.1	0	0.28	0	I
HAMK	2007	302	1	1	7/8/06	10.63	22	S	13	0.28	0	5.1	0.462	0	3	I

F302: Hamakua Ditch

Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAMK	2007	302	1	1	7/9/06	10.66	24	2	13	0.3619	0.02	5.1	0.504	0	6	I
HAMK	2007	302	1	1	7/10/06	10.69	24	3	13	0.3619	0.05	5.1	0.504	0	10	I
HAMK	2007	302	1	1	7/11/06	10.72	24	4	13	0.36	0.07	5.1	0.504	0	14	I
HAMK	2007	302	1	1	7/12/06	10.76	24	5	13	0.36	0	5.1	0.504	0	17	
HAMK	2007	302	1	1	7/13/06	10.79	0	5	S	0.3619	0	5.1	0	0	10	
HAMK	2007	302	1	1	7/14/06	10.82	0	5	2	0.3619	0	5.1	0	0	3	
HAMK	2007	302	1	1	7/15/06	10.86	0	5	3	0.34	0	5.1	0	0.34	0	WS-0
HAMK	2007	302	1	1	7/16/06	10.89	0	5	4	0.34	0	5.1	0	0.34	0	I
HAMK	2007	302	1	1	7/17/06	10.92	22	S	4	0.3619	0	5.1	0.462	0	1	I
HAMK	2007	302	1	1	7/18/06	10.95	24	2	4	0.3619	0	5.1	0.504	0	4	
HAMK	2007	302	1	1	7/19/06	10.99	0	2	S	0.22	0	5.1	0	0.22	0	WS-0
HAMK	2007	302	1	1	7/20/06	11.02	0	2	2	0.22	0.08	5.1	0	0.22	0	WS-1
HAMK	2007	302	1	1	7/21/06	11.05	0	2	3	0.3619	0	5.1	0	0.3619	0	WS-2
HAMK	2007	302	1	1	7/22/06	11.09	0	2	4	0.3619	0	5.1	0	0.3619	0	WS-3
HAMK	2007	302	1	1	7/23/06	11.12	0	2	5	0.26	0	5.1	0	0.26	0	WS-4
HAMK	2007	302	1	1	7/24/06	11.15	0	2	6	0.26	0	5.1	0	0.26	0	WS-5
HAMK	2007	302	1	1	7/25/06	11.18	0	2	7	0.3619	0	5.1	0	0.3619	0	WS-6
HAMK	2007	302	1	1	7/26/06	11.22	0	2	8	0.3619	0	5.1	0	0.3619	0	WS-7
HAMK	2007	302	1	1	7/27/06	11.25	0	2	9	0.38	0	5.1	0	0.38	0	WS-8
HAMK	2007	302	1	1	7/28/06	11.28	16	S	9	0.38	0	5.1	0.336	0.38	0	I
HAMK	2007	302	1	1	7/29/06	11.32	24	2	9	0.3619	0.01	5.1	0.504	0	2	I
HAMK	2007	302	1	1	7/30/06	11.35	5	2	S	0.3619	0	5.1	0.105	0.3619	0	WS-0
HAMK	2007	302	1	1	7/31/06	11.38	0	2	2	0.3619	0	5.1	0	0.3619	0	I
HAMK	2007	302	1	1	8/1/06	11.41	22	S	2	0.17	0	5.1	0.462	0	5	I
HAMK	2007	302	1	1	8/2/06	11.45	6	1	S	0.28	0	5.1	0.126	0	2	
HAMK	2007	302	1	1	8/3/06	11.48	0	1	2	0.35	0	5.1	0	0.35	0	WS-0
HAMK	2007	302	1	1	8/4/06	11.51	0	1	3	0.38	0	5.1	0	0.38	0	WS-1
HAMK	2007	302	1	1	8/5/06	11.55	0	1	4	0.27	0	5.1	0	0.27	0	WS-2
HAMK	2007	302	1	1	8/6/06	11.58	0	1	5	0.22	0.02	5.1	0	0.22	0	I
HAMK	2007	302	1	1	8/7/06	11.61	24	S	5	0.3	0	5.1	0.504	0	4	I
HAMK	2007	302	1	1	8/8/06	11.64	24	2	5	0.26	0	5.1	0.504	0	8	I
HAMK	2007	302	1	1	8/9/06	11.68	24	3	5	0.35	0	5.1	0.504	0	11	I
HAMK	2007	302	1	1	8/10/06	11.71	24	4	5	0.33	0	5.1	0.504	0	15	
HAMK	2007	302	1	1	8/11/06	11.74	0	4	S	0.35	0	5.1	0	0	8	
HAMK	2007	302	1	1	8/12/06	11.78	0	4	2	0.29	0	5.1	0	0	2	
HAMK	2007	302	1	1	8/13/06	11.81	0	4	3	0.28	0	5.1	0	0.28	0	WS-0

F302: Hamakua Ditch

Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAMK	2007	302	1	1	8/14/06	11.84	0	4	4	0.22	0	5.1	0	0.22	0	I
HAMK	2007	302	1	1	8/15/06	11.88	5	4	5	0.17	0	5.1	0.105	0.17	0	WS-0
HAMK	2007	302	1	1	8/16/06	11.91	0	4	6	0.27	0.04	5.1	0	0.27	0	WS-1
HAMK	2007	302	1	1	8/17/06	11.94	0	4	7	0.31	0	5.1	0	0.31	0	WS-2
HAMK	2007	302	1	1	8/18/06	11.97	0	4	8	0.31	0.02	5.1	0	0.31	0	I
HAMK	2007	302	1	1	8/19/06	12.01	22	S	8	0.26	0	5.1	0.462	0	3	I
HAMK	2007	302	1	1	8/20/06	12.04	24	2	8	0.25	0	5.1	0.504	0	8	I
HAMK	2007	302	1	1	8/21/06	12.07	24	3	8	0.31	0	5.1	0.504	0	12	
HAMK	2007	302	1	1	8/22/06	12.11	0	3	S	0.28	0	5.1	0	0	7	
HAMK	2007	302	1	1	8/23/06	12.14	0	3	2	0.23	0	5.1	0	0	2	
HAMK	2007	302	1	1	8/24/06	12.17	0	3	3	0.2	0	5.1	0	0.2	0	WS-0
HAMK	2007	302	1	1	8/25/06	12.20	0	3	4	0.17	0	5.1	0	0.17	0	WS-1
HAMK	2007	302	1	1	8/26/06	12.24	0	3	5	0.19	0	5.1	0	0.19	0	WS-2
HAMK	2007	302	1	1	8/27/06	12.27	0	3	6	0.17	0	5.1	0	0.17	0	WS-3
HAMK	2007	302	1	1	8/28/06	12.30	0	3	7	0.18	0	5.1	0	0.18	0	WS-4
HAMK	2007	302	1	1	8/29/06	12.34	0	3	8	0.3	0	5.1	0	0.3	0	I
HAMK	2007	302	1	1	8/30/06	12.37	22	S	8	0.35	0	5.1	0.462	0	2	I
HAMK	2007	302	1	1	8/31/06	12.40	24	2	8	0.31	0	5.1	0.504	0	6	
HAMK	2007	302	1	1	9/1/06	12.43	0	2	S	0.33	0	5.1	0	0.33	0	WS-0
HAMK	2007	302	1	1	9/2/06	12.47	0	2	2	0.29	0	5.1	0	0.29	0	WS-1
HAMK	2007	302	1	1	9/3/06	12.50	0	2	3	0.26	0	5.1	0	0.26	0	WS-2
HAMK	2007	302	1	1	9/4/06	12.53	0	2	4	0.2	0	5.1	0	0.2	0	WS-3
HAMK	2007	302	1	1	9/5/06	12.57	0	2	5	0.19	0	5.1	0	0.19	0	WS-4
HAMK	2007	302	1	1	9/6/06	12.60	0	2	6	0.12	0	5.1	0	0.12	0	WS-5
HAMK	2007	302	1	1	9/7/06	12.63	0	2	7	0.22	0.04	5.1	0	0.22	0	WS-6
HAMK	2007	302	1	1	9/8/06	12.66	0	2	8	0.25	0	5.1	0	0.25	0	I
HAMK	2007	302	1	1	9/9/06	12.70	0	2	9	0.33	0.1	5.1	0	0.33	0	I
HAMK	2007	302	1	1	9/10/06	12.73	22	S	9	0.22	0	5.1	0.462	0	4	I
HAMK	2007	302	1	1	9/11/06	12.76	24	2	9	0.26	0	5.1	0.504	0	9	
HAMK	2007	302	1	1	9/12/06	12.80	0	2	S	0.24	0	5.1	0	0	4	
HAMK	2007	302	1	1	9/13/06	12.83	0	2	2	0.22	0	5.1	0	0.22	0	WS-0
HAMK	2007	302	1	1	9/14/06	12.86	0	2	3	0.21	0	5.1	0	0.21	0	WS-1
HAMK	2007	302	1	1	9/15/06	12.89	0	2	4	0.16	0	5.1	0	0.16	0	WS-2
HAMK	2007	302	1	1	9/16/06	12.93	0	2	5	0.16	0	5.1	0	0.16	0	WS-3
HAMK	2007	302	1	1	9/17/06	12.96	0	2	6	0.3033	0	5.1	0	0.3033	0	WS-4
HAMK	2007	302	1	1	9/18/06	12.99	0	2	7	0.3033	0	5.1	0	0.3033	0	WS-5

F302: Hamakua Ditch

Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAMK	2007	302	1	1	9/19/06	13.03	0	2	8	0.3033	0	5.1	0	0.3033	0	WS-6
HAMK	2007	302	1	1	9/20/06	13.06	0	2	9	0.28	0	5.1	0	0.28	0	I
HAMK	2007	302	1	1	9/21/06	13.09	22	S	9	0.29	0	5.1	0.462	0	3	I
HAMK	2007	302	1	1	9/22/06	13.13	24	2	9	0.25	0	5.1	0.504	0	8	
HAMK	2007	302	1	1	9/23/06	13.16	0	2	S	0.29	0	5.1	0	0	2	
HAMK	2007	302	1	1	9/24/06	13.19	0	2	2	0.19	0	5.1	0	0.19	0	WS-0
HAMK	2007	302	1	1	9/25/06	13.22	0	2	3	0.14	0.05	5.1	0	0.14	0	WS-1
HAMK	2007	302	1	1	9/26/06	13.26	0	2	4	0.11	0	5.1	0	0.11	0	WS-2
HAMK	2007	302	1	1	9/27/06	13.29	0	2	5	0.19	0	5.1	0	0.19	0	I
HAMK	2007	302	1	1	9/28/06	13.32	16	S	5	0.24	0	5.1	0.336	0	1	I
HAMK	2007	302	1	1	9/29/06	13.36	24	2	5	0.26	0	5.1	0.504	0	6	I
HAMK	2007	302	1	1	9/30/06	13.39	24	3	5	0.23	0	5.1	0.504	0	12	I
HAMK	2007	302	1	1	10/1/06	13.42	24	4	5	0.14	0	5.1	0.504	0	19	I
HAMK	2007	302	1	1	10/2/06	13.45	24	5	5	0.13	0	5.1	0.504	0	26	
HAMK	2007	302	1	1	10/3/06	13.49	0	5	S	0.22	0	5.1	0	0	22	
HAMK	2007	302	1	1	10/4/06	13.52	0	5	2	0.23	0	5.1	0	0	17	
HAMK	2007	302	1	1	10/5/06	13.55	0	5	3	0.19	0	5.1	0	0	13	
HAMK	2007	302	1	1	10/6/06	13.59	0	5	4	0.2	0	5.1	0	0	10	I
HAMK	2007	302	1	1	10/7/06	13.62	16	S	4	0.17	0	5.1	0.336	0	13	I
HAMK	2007	302	1	1	10/8/06	13.65	20	2	4	0.2	0	5.1	0.42	0	17	
HAMK	2007	302	1	1	10/9/06	13.68	0	2	S	0.17	0	5.1	0	0	14	
HAMK	2007	302	1	1	10/10/06	13.72	0	2	2	0.19	0	5.1	0	0	10	
HAMK	2007	302	1	1	10/11/06	13.75	0	2	3	0.16	0	5.1	0	0	7	
HAMK	2007	302	1	1	10/12/06	13.78	0	2	4	0.18	0	5.1	0	0	3	
HAMK	2007	302	1	1	10/13/06	13.82	0	2	5	0.17	0	5.1	0	0.17	0	WS-0
HAMK	2007	302	1	1	10/14/06	13.85	0	2	6	0.17	0	5.1	0	0.17	0	WS-1
HAMK	2007	302	1	1	10/15/06	13.88	0	2	7	0.2	0	5.1	0	0.2	0	I
HAMK	2007	302	1	1	10/16/06	13.91	22	S	7	0.05	0	5.1	0.462	0	8	I
HAMK	2007	302	1	1	10/17/06	13.95	24	2	7	0.05	3.04	5.1	0.504	0	76	I
HAMK	2007	302	1	1	10/18/06	13.98	24	3	7	0.2539	0	5.1	0.504	0	81	
HAMK	2007	302	1	1	10/19/06	14.01	0	3	S	0.2539	0	5.1	0	0	76	
HAMK	2007	302	1	1	10/20/06	14.05	0	S	1	0.2539	0.3	5.1	0	0	77	I
HAMK	2007	302	1	1	10/21/06	14.08	22	2	1	0.2539	0.02	5.1	0.462	0	81	I
HAMK	2007	302	1	1	10/22/06	14.11	24	3	1	0.2539	0.08	5.1	0.504	0	88	
HAMK	2007	302	1	1	10/23/06	14.14	0	3	S	0.2539	0	5.1	0	0	83	I
HAMK	2007	302	1	1	10/24/06	14.18	22	S	1	0.2539	0	5.1	0.462	0	87	

F302: Hamakua Ditch

Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAMK	2007	302	1	1	10/25/06	14.21	0	1	S	0.2539	0	5.1	0	0	82	
HAMK	2007	302	1	1	10/26/06	14.24	0	1	2	0.21	0	5.1	0	0	78	
HAMK	2007	302	1	1	10/27/06	14.28	16	S	2	0.19	0	5.1	0.336	0	81	I
HAMK	2007	302	1	1	10/28/06	14.31	24	2	2	0.23	0	5.1	0.504	0	86	
HAMK	2007	302	1	1	10/29/06	14.34	0	2	S	0.24	0	5.1	0	0	81	
HAMK	2007	302	1	1	10/30/06	14.38	0	2	2	0.16	0	5.1	0	0	78	
HAMK	2007	302	1	1	10/31/06	14.41	0	2	3	0.18	0	5.1	0	0	75	
HAMK	2007	302	1	1	11/1/06	14.44	0	2	4	0.18	0	5.1	0	0	71	
HAMK	2007	302	1	1	11/2/06	14.47	0	S	4	0.2033	0.2	5.1	0	0	71	SCI
HAMK	2007	302	1	1	11/3/06	14.51	22	2	4	0.2033	3.2	5.1	0.462	0	100	
HAMK	2007	302	1	1	11/4/06	14.54	0	2	S	0.2033	0.02	5.1	0	0	96	
HAMK	2007	302	1	1	11/5/06	14.57	0	2	2	0.2033	0	5.1	0	0	92	
HAMK	2007	302	1	1	11/6/06	14.61	0	2	3	0.12	0	5.1	0	0	90	
HAMK	2007	302	1	1	11/7/06	14.64	0	2	4	0.12	0	5.1	0	0	87	
HAMK	2007	302	1	1	11/8/06	14.67	0	2	5	0.2033	0.02	5.1	0	0	84	
HAMK	2007	302	1	1	11/9/06	14.70	0	2	6	0.13	0	5.1	0	0	81	
HAMK	2007	302	1	1	11/10/06	14.74	0	2	7	0.13	0	5.1	0	0	79	I
HAMK	2007	302	1	1	11/11/06	14.77	22	S	7	0.18	0	5.1	0.462	0	84	I
HAMK	2007	302	1	1	11/12/06	14.80	24	2	7	0.16	0	5.1	0.504	0	91	
HAMK	2007	302	1	1	11/13/06	14.84	0	2	S	0.16	0	5.1	0	0	88	
HAMK	2007	302	1	1	11/14/06	14.87	0	2	2	0.08	0	5.1	0	0	86	
HAMK	2007	302	1	1	11/15/06	14.90	0	2	3	0.15	0	5.1	0	0	83	
HAMK	2007	302	1	1	11/16/06	14.93	0	2	4	0.14	0	5.1	0	0	80	
HAMK	2007	302	1	1	11/17/06	14.97	0	2	5	0.18	0	5.1	0	0	77	
HAMK	2007	302	1	1	11/18/06	15.00	0	2	6	0.18	0	5.1	0	0	73	
HAMK	2007	302	1	1	11/19/06	15.03	0	2	7	0.19	0	5.1	0	0	70	
HAMK	2007	302	1	1	11/20/06	15.07	0	2	8	0.19	0	5.1	0	0	66	
HAMK	2007	302	1	1	11/21/06	15.10	0	2	9	0.18	0	5.1	0	0	62	
HAMK	2007	302	1	1	11/22/06	15.13	0	2	10	0.14	0	5.1	0	0	60	
HAMK	2007	302	1	1	11/23/06	15.16	0	S	10	0.15	0.26	5.1	0	0	62	
HAMK	2007	302	1	1	11/24/06	15.20	0	1	S	0.14	0	5.1	0	0	59	
HAMK	2007	302	1	1	11/25/06	15.23	0	1	2	0.12	0	5.1	0	0	57	
HAMK	2007	302	1	1	11/26/06	15.26	0	1	3	0.15	0	5.1	0	0	54	?
HAMK	2007	302	1	1	11/27/06	15.30	0	1	4	0.13	0.14	5.1	0	0	54	
HAMK	2007	302	1	1	11/28/06	15.33	0	1	5	0.14	0.02	5.1	0	0	52	
HAMK	2007	302	1	1	11/29/06	15.36	0	1	6	0.1	0	5.1	0	0	50	I

F302: Hamakua Ditch

Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAMK	2007	302	1	1	11/30/06	15.39	22	S	6	0.08	0.6	5.1	0.462	0	69	I
HAMK	2007	302	1	1	12/1/06	15.43	24	2	6	0.13	0.2	5.1	0.504	0	80	I
HAMK	2007	302	1	1	12/2/06	15.46	0	2	S	0.05	0.05	5.1	0	0	80	
HAMK	2007	302	1	1	12/3/06	15.49	0	S	1	0.05	5.25	5.1	0	0	100	
HAMK	2007	302	1	1	12/4/06	15.53	0	1	S	0.1694	0.03	5.1	0	0	97	
HAMK	2007	302	1	1	12/5/06	15.56	0	1	2	0.1694	0	5.1	0	0	93	
HAMK	2007	302	1	1	12/6/06	15.59	0	1	3	0.13	0	5.1	0	0	91	
HAMK	2007	302	1	1	12/7/06	15.63	0	1	4	0.16	0.06	5.1	0	0	89	
HAMK	2007	302	1	1	12/8/06	15.66	0	1	5	0.24	0.03	5.1	0	0	85	
HAMK	2007	302	1	1	12/9/06	15.69	0	1	6	0.17	0	5.1	0	0	81	
HAMK	2007	302	1	1	12/10/06	15.72	0	1	7	0.16	0	5.1	0	0	78	
HAMK	2007	302	1	1	12/11/06	15.76	0	1	8	0.16	0	5.1	0	0	75	
HAMK	2007	302	1	1	12/12/06	15.79	0	1	9	0.14	0	5.1	0	0	72	
HAMK	2007	302	1	1	12/13/06	15.82	0	1	10	0.15	0	5.1	0	0	70	
HAMK	2007	302	1	1	12/14/06	15.86	0	1	11	0.15	0	5.1	0	0	67	
HAMK	2007	302	1	1	12/15/06	15.89	0	1	12	0.21	0	5.1	0	0	62	
HAMK	2007	302	1	1	12/16/06	15.92	0	1	13	0.16	0.08	5.1	0	0	61	
HAMK	2007	302	1	1	12/17/06	15.95	0	1	14	0.17	0.05	5.1	0	0	59	I
HAMK	2007	302	1	1	12/18/06	15.99	22	S	14	0.19	0	5.1	0.462	0	64	I
HAMK	2007	302	1	1	12/19/06	16.02	24	2	14	0.19	0	5.1	0.504	0	70	
HAMK	2007	302	1	1	12/20/06	16.05	0	2	S	0.16	0	5.1	0	0	67	
HAMK	2007	302	1	1	12/21/06	16.09	0	2	2	0.14	0	5.1	0	0	64	
HAMK	2007	302	1	1	12/22/06	16.12	0	2	3	0.12	0	5.1	0	0	62	
HAMK	2007	302	1	1	12/23/06	16.15	0	2	4	0.16	0	5.1	0	0	59	
HAMK	2007	302	1	1	12/24/06	16.18	0	2	5	0.14	0	5.1	0	0	56	
HAMK	2007	302	1	1	12/25/06	16.22	0	2	6	0.12	0	5.1	0	0	54	
HAMK	2007	302	1	1	12/26/06	16.25	0	2	7	0.15	0.05	5.1	0	0	52	
HAMK	2007	302	1	1	12/27/06	16.28	0	2	8	0.16	0	5.1	0	0	48	
HAMK	2007	302	1	1	12/28/06	16.32	0	2	9	0.11	0	5.1	0	0	46	
HAMK	2007	302	1	1	12/29/06	16.35	0	S	9	0.13	0.45	5.1	0	0	53	
HAMK	2007	302	1	1	12/30/06	16.38	0	1	S	0.17	0	5.1	0	0	49	
HAMK	2007	302	1	1	12/31/06	16.41	0	1	2	0.15	0	5.1	0	0	46	
HAMK	2007	302	1	1	1/1/07	16.45	0	1	3	0.15	0	5.1	0	0	43	?
HAMK	2007	302	1	1	1/2/07	16.48	0	1	4	0.11	0.08	5.1	0	0	43	
HAMK	2007	302	1	1	1/3/07	16.51	0	1	5	0.19	0	5.1	0	0	39	
HAMK	2007	302	1	1	1/4/07	16.55	0	1	6	0.14	0	5.1	0	0	36	

F302: Hamakua Ditch

Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAMK	2007	302	1	1	1/5/07	16.58	0	1	7	0.14	0	5.1	0	0	34	I
HAMK	2007	302	1	1	1/6/07	16.61	22	S	7	0.15	0	5.1	0.462	0	40	I
HAMK	2007	302	1	1	1/7/07	16.64	24	2	7	0.09	0	5.1	0.504	0	48	I
HAMK	2007	302	1	1	1/8/07	16.68	24	3	7	0.08	0.02	5.1	0.504	0	57	I
HAMK	2007	302	1	1	1/9/07	16.71	24	4	7	0.12	0	5.1	0.504	0	64	
HAMK	2007	302	1	1	1/10/07	16.74	0	4	S	0.1	0.04	5.1	0	0	63	
HAMK	2007	302	1	1	1/11/07	16.78	0	4	2	0.13	0	5.1	0	0	60	
HAMK	2007	302	1	1	1/12/07	16.81	0	4	3	0.16	0	5.1	0	0	57	
HAMK	2007	302	1	1	1/13/07	16.84	0	4	4	0.2	0	5.1	0	0	53	I
HAMK	2007	302	1	1	1/14/07	16.88	22	S	4	0.15	0	5.1	0.462	0	59	
HAMK	2007	302	1	1	1/15/07	16.91	0	1	S	0.15	0	5.1	0	0	56	I
HAMK	2007	302	1	1	1/16/07	16.94	22	S	1	0.15	0	5.1	0.462	0	63	
HAMK	2007	302	1	1	1/17/07	16.97	0	1	S	0.16	0	5.1	0	0	59	
HAMK	2007	302	1	1	1/18/07	17.01	0	1	2	0.2	0	5.1	0	0	55	
HAMK	2007	302	1	1	1/19/07	17.04	16	S	2	0.19	0	5.1	0.336	0	58	I
HAMK	2007	302	1	1	1/20/07	17.07	24	2	2	0.15	0	5.1	0.504	0	65	I
HAMK	2007	302	1	1	1/21/07	17.11	24	3	2	0.14	0	5.1	0.504	0	72	
HAMK	2007	302	1	1	1/22/07	17.14	0	3	S	0.14	0	5.1	0	0	70	
HAMK	2007	302	1	1	1/23/07	17.17	0	3	2	0.19	0	5.1	0	0	66	
HAMK	2007	302	1	1	1/24/07	17.20	0	3	3	0.17	0	5.1	0	0	63	
HAMK	2007	302	1	1	1/25/07	17.24	0	3	4	0.18	0	5.1	0	0	59	
HAMK	2007	302	1	1	1/26/07	17.27	0	3	5	0.19	0	5.1	0	0	55	
HAMK	2007	302	1	1	1/27/07	17.30	0	3	6	0.17	0	5.1	0	0	52	
HAMK	2007	302	1	1	1/28/07	17.34	0	3	7	0.2	0	5.1	0	0	48	
HAMK	2007	302	1	1	1/29/07	17.37	0	3	8	0.16	0	5.1	0	0	45	?
HAMK	2007	302	1	1	1/30/07	17.40	0	S	8	0.1632	0.39	5.1	0	0	49	
HAMK	2007	302	1	1	1/31/07	17.43	0	1	S	0.18	0	5.1	0	0	46	
HAMK	2007	302	1	1	2/1/07	17.47	0	S	1	0.11	0.7	5.1	0	0	57	
HAMK	2007	302	1	1	2/2/07	17.50	0	2	1	0.15	0.5	5.1	0	0	64	
HAMK	2007	302	1	1	2/3/07	17.53	0	2	S	0.18	0	5.1	0	0	61	
HAMK	2007	302	1	1	2/4/07	17.57	0	2	2	0.16	0	5.1	0	0	58	
HAMK	2007	302	1	1	2/5/07	17.60	0	2	3	0.16	0	5.1	0	0	55	
HAMK	2007	302	1	1	2/6/07	17.63	0	2	4	0.18	0	5.1	0	0	51	
HAMK	2007	302	1	1	2/7/07	17.66	0	2	5	0.19	0	5.1	0	0	47	
HAMK	2007	302	1	1	2/8/07	17.70	0	S	5	0.1	0.55	5.1	0	0	56	
HAMK	2007	302	1	1	2/9/07	17.73	0	1	S	0.16	0.02	5.1	0	0	53	

F302: Hamakua Ditch

Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAMK	2007	302	1	1	2/10/07	17.76	0	1	2	0.19	0.02	5.1	0	0	50	I
HAMK	2007	302	1	1	2/11/07	17.80	22	S	2	0.22	0.05	5.1	0.462	0	56	I
HAMK	2007	302	1	1	2/12/07	17.83	24	2	2	0.22	0	5.1	0.504	0	61	
HAMK	2007	302	1	1	2/13/07	17.86	0	2	S	0.18	0	5.1	0	0	58	
HAMK	2007	302	1	1	2/14/07	17.89	0	2	2	0.17	0	5.1	0	0	54	?
HAMK	2007	302	1	1	2/15/07	17.93	0	2	3	0.14	0	5.1	0	0	52	
HAMK	2007	302	1	1	2/16/07	17.96	0	2	4	0.14	0.04	5.1	0	0	50	I
HAMK	2007	302	1	1	2/17/07	17.99	22	S	4	0.24	0.6	5.1	0.462	0	66	I
HAMK	2007	302	1	1	2/18/07	18.03	24	2	4	0.24	0.14	5.1	0.504	0	74	I
HAMK	2007	302	1	1	2/19/07	18.06	24	3	4	0.28	0.05	5.1	0.504	0	79	I
HAMK	2007	302	1	1	2/20/07	18.09	24	4	4	0.26	0.01	5.1	0.504	0	84	I
HAMK	2007	302	1	1	2/21/07	18.13	6	4	S	0.24	0.02	5.1	0.126	0	82	
HAMK	2007	302	1	1	2/22/07	18.16	0	4	2	0.19	0	5.1	0	0	79	
HAMK	2007	302	1	1	2/23/07	18.19	0	4	3	0.15	0	5.1	0	0	76	I
HAMK	2007	302	1	1	2/24/07	18.22	22	S	3	0.16	0.12	5.1	0.462	0	84	
HAMK	2007	302	1	1	2/25/07	18.26	0	1	S	0.18	0	5.1	0	0	80	
HAMK	2007	302	1	1	2/26/07	18.29	0	1	2	0.17	0	5.1	0	0	77	I
HAMK	2007	302	1	1	2/27/07	18.32	22	S	2	0.17	0	5.1	0.462	0	83	I
HAMK	2007	302	1	1	2/28/07	18.36	24	2	2	0.21	0	5.1	0.504	0	89	I
HAMK	2007	302	1	1	3/1/07	18.39	5	2	S	0.24	0	5.1	0.105		86	RIPE
HAMK	2007	302	1	1	3/2/07	18.42	0	2	2	0.18	0	5.1	0		82	RIPE
HAMK	2007	302	1	1	3/3/07	18.45	0	2	3	0.18	0	5.1	0		79	RIPE
HAMK	2007	302	1	1	3/4/07	18.49	0	2	4	0.15	0.02	5.1	0		76	RIPE
HAMK	2007	302	1	1	3/5/07	18.52	0	2	5	0.21	0.01	5.1	0		72	RIPE
HAMK	2007	302	1	1	3/6/07	18.55	0	2	6	0.19	0	5.1	0		69	RIPE
HAMK	2007	302	1	1	3/7/07	18.59	0	2	7	0.17	0	5.1	0		65	RIPE
HAMK	2007	302	1	1	3/8/07	18.62	0	2	8	0.18	0	5.1	0		62	RIPE
HAMK	2007	302	1	1	3/9/07	18.65	0	2	9	0.25	0	5.1	0		57	RIPE
HAMK	2007	302	1	1	3/10/07	18.68	0	S	9	0.09	0.6	5.1	0		67	RIPE
HAMK	2007	302	1	1	3/11/07	18.72	0	2	9	0.16	0.4	5.1	0		72	RIPE
HAMK	2007	302	1	1	3/12/07	18.75	0	2	S	0.14	0	5.1	0		69	RIPE
HAMK	2007	302	1	1	3/13/07	18.78	0	2	2	0.07	0	5.1	0		67	RIPE
HAMK	2007	302	1	1	3/14/07	18.82	0	2	3	0.1	0.15	5.1	0		68	RIPE
HAMK	2007	302	1	1	3/15/07	18.85	0	S	3	0.16	0.96	5.1	0		84	RIPE
HAMK	2007	302	1	1	3/16/07	18.88	0	2	3	0.21	0.28	5.1	0		85	RIPE
HAMK	2007	302	1	1	3/17/07	18.91	0	2	S	0.3	0.1	5.1	0		82	RIPE

F302: Hamakua Ditch

Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAMK	2007	302	1	1	3/18/07	18.95	0	S	1	0.19	0.9	5.1	0		95	RIPE
HAMK	2007	302	1	1	3/19/07	18.98	0	2	1	0.32	0.8	5.1	0		100	RIPE
HAMK	2007	302	1	1	3/20/07	19.01	0	3	1	0.24	0.24	5.1	0		100	RIPE
HAMK	2007	302	1	1	3/21/07	19.05	0	3	S	0.29	0.03	5.1	0		94	RIPE
HAMK	2007	302	1	1	3/22/07	19.08	0	3	2	0.2	0	5.1	0		90	RIPE
HAMK	2007	302	1	1	3/23/07	19.11	0	3	3	0.2	0	5.1	0		87	RIPE
HAMK	2007	302	1	1	3/24/07	19.14	0	3	4	0.29	0	5.1	0		81	RIPE
HAMK	2007	302	1	1	3/25/07	19.18	0	3	5	0.31	0	5.1	0		75	RIPE
HAMK	2007	302	1	1	3/26/07	19.21	0	3	6	0.16	0.01	5.1	0		72	RIPE
HAMK	2007	302	1	1	3/27/07	19.24	0	3	7	0.18	0	5.1	0		68	RIPE
HAMK	2007	302	1	1	3/28/07	19.28	0	3	8	0.21	0	5.1	0		64	RIPE
HAMK	2007	302	1	1	3/29/07	19.31	0	3	9	0.17	0	5.1	0		61	RIPE
HAMK	2007	302	1	1	3/30/07	19.34	0	3	10	0.2	0.05	5.1	0		58	RIPE
HAMK	2007	302	1	1	3/31/07	19.38	0	3	11	0.23	0	5.1	0		53	RIPE
HAMK	2007	302	1	1	4/1/07	19.41	0	3	12	0.19	0	5.1	0		50	RIPE
HAMK	2007	302	1	1	4/2/07	19.44	0	S	12	0.21	0.3	5.1	0		51	RIPE
HAMK	2007	302	1	1	4/3/07	19.47	0	1	S	0.28	0	5.1	0		46	RIPE
HAMK	2007	302	1	1	4/4/07	19.51	0	1	2	0.23	0	5.1	0		41	RIPE
HAMK	2007	302	1	1	4/5/07	19.54	0	1	3	0.26	0	5.1	0		36	RIPE
HAMK	2007	302	1	1	4/6/07	19.57	0	1	4	0.2	0	5.1	0		32	RIPE
HAMK	2007	302	1	1	4/7/07	19.61	0	1	5	0.27	0	5.1	0		27	RIPE
HAMK	2007	302	1	1	4/8/07	19.64	0	1	6	0.17	0	5.1	0		24	RIPE
HAMK	2007	302	1	1	4/9/07	19.67	0	1	7	0.14	0	5.1	0		21	RIPE
HAMK	2007	302	1	1	4/10/07	19.70	0	1	8	0.2	0	5.1	0		17	RIPE
HAMK	2007	302	1	1	4/11/07	19.74	0	1	9	0.2	0	5.1	0		13	RIPE
HAMK	2007	302	1	1	4/12/07	19.77	0	1	10	0.15	0	5.1	0		10	RIPE
HAMK	2007	302	1	1	4/13/07	19.80	0	1	11	0.21	0	5.1	0		6	RIPE
HAMK	2007	302	1	1	4/14/07	19.84	0	1	12	0.28	0	5.1	0		1	RIPE
HAMK	2007	302	1	1	4/15/07	19.87	0	1	13	0.29	0	5.1	0		0	RIPE
HAMK	2007	302	1	1	4/16/07	19.90	0	1	14	0.34	0.02	5.1	0		0	RIPE
HAMK	2007	302	1	1	4/17/07	19.93	0	1	15	0.31	0.1	5.1	0		0	RIPE
HAMK	2007	302	1	1	4/18/07	19.97	0	1	16	0.29	0	5.1	0		0	IOMR
HAMK	2007	302	1	1	4/19/07	20.00	22	S	16	0.35	0.03	5.1	0.462		2	IOMR
HAMK	2007	302	1	1	4/20/07	20.03	24	2	16	0.31	0	5.1	0.504		6	IOMR
HAMK	2007	302	1	1	4/21/07	20.07	24	3	16	0.34	0.08	5.1	0.504		11	IOMR
HAMK	2007	302	1	1	4/22/07	20.10	24	4	16	0.34	0	5.1	0.504		14	RIPE

F302: Hamakua Ditch

Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAMK	2007	302	1	1	4/23/07	20.13	0	4	S	0.24	0.03	5.1	0		10	RIPE
HAMK	2007	302	1	1	4/24/07	20.16	0	S	1	0.32	0.34	5.1	0		10	RIPE
HAMK	2007	302	1	1	4/25/07	20.20	0	1	S	0.35	0.1	5.1	0		5	RIPE
HAMK	2007	302	1	1	4/26/07	20.23	0	1	2	0.29	0	5.1	0		0	RIPE
HAMK	2007	302	1	1	4/27/07	20.26	0	1	3	0.31	0	5.1	0		0	RIPE
HAMK	2007	302	1	1	4/28/07	20.30	0	1	4	0.32	0.02	5.1	0		0	RIPE
HAMK	2007	302	1	1	4/29/07	20.33	0	1	5	0.34	0.02	5.1	0		0	RIPE
HAMK	2007	302	1	1	4/30/07	20.36	0	1	6	0.28	0.03	5.1	0		0	RIPE
HAMK	2007	302	1	1	5/1/07	20.39	0	1	7	0.34	0	5.1	0		0	RIPE
HAMK	2007	302	1	1	5/2/07	20.43	0	1	8	0.23	0	5.1	0		0	RIPE
HAMK	2007	302	1	1	5/3/07	20.46	0	1	9	0.25	0	5.1	0		0	RIPE
HAMK	2007	302	1	1	5/4/07	20.49	0	1	10	0.22	0	5.1	0		0	RIPE
HAMK	2007	302	1	1	5/5/07	20.53	0	1	11	0.19	0	5.1	0		0	RIPE
HAMK	2007	302	1	1	5/6/07	20.56	0	1	12	0.27	0	5.1	0		0	RIPE
HAMK	2007	302	1	1	5/7/07	20.59	0	1	13	0.34	0	5.1	0		0	RIPE
HAMK	2007	302	1	1	5/8/07	20.63	0	1	14	0.38	0	5.1	0		0	RIPE
HAMK	2007	302	1	1	5/9/07	20.66	0	1	15	0.34	0	5.1	0		0	RIPE
HAMK	2007	302	1	1	5/10/07	20.69	0	1	16	0.33	0.01	5.1	0		0	RIPE
HAMK	2007	302	1	1	5/11/07	20.72	0	1	17	0.21	0.03	5.1	0		0	IFNLRD
HAMK	2007	302	1	1	5/12/07	20.76	22	S	17	0.17	0	5.1	0.462		5	IFNLRD
HAMK	2007	302	1	1	5/13/07	20.79	24	2	17	0.17	0	5.1	0.504		12	IFNLRD
HAMK	2007	302	1	1	5/14/07	20.82	24	3	17	0.2	0	5.1	0.504		18	DRY
HAMK	2007	302	1	1	5/15/07	20.86	0	3	S	0.23	0	5.1	0		13	DRY
HAMK	2007	302	1	1	5/16/07	20.89	0	3	2	0.28	0	5.1	0		8	DRY
HAMK	2007	302	1	1	5/17/07	20.92	0	3	3	0.25	0	5.1	0		3	DRY
HAMK	2007	302	1	1	5/18/07	20.95	0	3	4	0.16	0	5.1	0		0	DRY
HAMK	2007	302	1	1	5/19/07	20.99	0	3	5	0.23	0	5.1	0		0	DRY
HAMK	2007	302	1	1	5/20/07	21.02	0	3	6	0.24	0	5.1	0		0	DRY
HAMK	2007	302	1	1	5/21/07	21.05	0	3	7	0.19	0	5.1	0		0	DRY
HAMK	2007	302	1	1	5/22/07	21.09	0	3	8	0.26	0	5.1	0		0	DRY
HAMK	2007	302	1	1	5/23/07	21.12	0	3	9	0.27	0	5.1	0		0	DRY
HAMK	2007	302	1	1	5/24/07	21.15	0	3	10	0.3	0	5.1	0		0	DRY
HAMK	2007	302	1	1	5/25/07	21.18	0	3	11	0.34	0	5.1	0		0	DRY
HAMK	2007	302	1	1	5/26/07	21.22	0	3	12	0.38	0	5.1	0		0	DRY
HAMK	2007	302	1	1	5/27/07	21.25	0	3	13	0.31	0	5.1	0		0	DRY
HAMK	2007	302	1	1	5/28/07	21.28	0	3	14	0.27	0	5.1	0		0	DRY

F302: Hamakua Ditch

Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAMK	2007	302	1	1	5/29/07	21.32	0	3	15	0.32	0	5.1	0		0	DRY
HAMK	2007	302	1	1	5/30/07	21.35	0	3	16	0.26	0	5.1	0		0	DRY
HAMK	2007	302	1	1	5/31/07	21.38	0	3	17	0.23	0	5.1	0		0	DRY
HAMK	2007	302	1	1	6/1/07	21.41	0	3	18	0.24	0	5.1	0		0	DRY
HAMK	2007	302	1	1	6/2/07	21.45	0	3	19	0.23	0	5.1	0		0	DRY
HAMK	2007	302	1	1	6/3/07	21.48	0	3	20	0.33	0	5.1	0		0	DRY
HAMK	2007	302	1	1	6/4/07	21.51	0	3	21	0.31	0	5.1	0		0	DRY
HAMK	2007	302	1	1	6/5/07	21.55	0	3	22	0.18	0	5.1	0		0	DRY
HAMK	2007	302	1	1	6/6/07	21.58	0	3	23	0.21	0	5.1	0		0	DRY
HAMK	2007	302	1	1	6/7/07	21.61	0	3	24	0.29	0	5.1	0		0	DRY
HAMK	2007	302	1	1	6/8/07	21.64	0	3	25	0.19	0	5.1	0		0	DRY
HAMK	2007	302	1	1	6/9/07	21.68	0	3	26	0.21	0.02	5.1	0		0	DRY
HAMK	2007	302	1	1	6/10/07	21.71	0	3	27	0.28	0	5.1	0		0	DRY
HAMK	2007	302	1	1	6/11/07	21.74	0	3	28	0.28	0	5.1	0		0	DRY
HAMK	2007	302	1	1	6/12/07	21.78	0	3	29	0.27	0	5.1	0		0	DRY
HAMK	2007	302	1	1	6/13/07	21.81	0	3	30	0.26	0	5.1	0		0	DRY
HAMK	2007	302	1	1	6/14/07	21.84	0	3	31	0.15	0	5.1	0		0	DRY
HAMK	2007	302	1	1	6/15/07	21.88	0	3	32	0.27	0	5.1	0		0	DRY
HAMK	2007	302	1	1	6/16/07	21.91	0	3	33	0.25	0	5.1	0		0	DRY
HAMK	2007	302	1	1	6/17/07	21.94	0	3	34	0.19	0	5.1	0		0	DRY
HAMK	2007	302	1	1	6/18/07	21.97	0	3	35	0.24	0	5.1	0		0	DRY
HAMK	2007	302	1	1	6/19/07	22.01	0	3	36	0.32	0	5.1	0		0	DRY
HAMK	2007	302	1	1	6/20/07	22.04	0	3	37	0.26	0	5.1	0		0	DRY
HAMK	2007	302	1	1	6/21/07	22.07	0	3	38	0.29	0	5.1	0		0	DRY
HAMK	2007	302	1	1	6/22/07	22.11	0	3	39	0.3	0	5.1	0		0	DRY
HAMK	2007	302	1	1	6/23/07	22.14	0	3	40	0.34	0	5.1	0		0	DRY
HAMK	2007	302	1	1	6/24/07	22.17	0	3	41	0.36	0	5.1	0		0	DRY
HAMK	2007	302	1	1	6/25/07	22.20	0	3	42	0.31	0	5.1	0		0	DRY
HAMK	2007	302	1	1	6/26/07	22.24	0	3	43	0.26	0	5.1	0		0	DRY
HAMK	2007	302	1	1	6/27/07	22.27	0	3	44	0.39	0	5.1	0		0	DRY
HAMK	2007	302	1	1	6/28/07	22.30	0	3	45	0.33	0	5.1	0		0	DRY
HAMK	2007	302	1	1	6/29/07	22.34	0	3	46	0.36	0.02	5.1	0		0	DRY
HAMK	2007	302	1	1	6/30/07	22.37	0	3	47	0.34	0	5.1	0		0	DRY
HAMK	2007	302	1	1	7/1/07	22.40	0	3	48	0.34	0	5.1	0		0	DRY
HAMK	2007	302	1	1	7/2/07	22.43	0	3	49	0.24	0	5.1	0		0	DRY
HAMK	2007	302	1	1	7/3/07	22.47	0	3	50	0.23	0	5.1	0		0	DRY

F302: Hamakua Ditch

Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAMK	2007	302	1	1	7/4/07	22.50	0	3	51	0.23	0	5.1	0		0	DRY
HAMK	2007	302	1	1	7/5/07	22.53	0	3	52	0.31	0	5.1	0		0	DRY
HAMK	2007	302	1	1	7/6/07	22.57	0	3	53	0.31	0	5.1	0		0	DRY
HAMK	2007	302	1	1	7/7/07	22.60	0	3	54	0.31	0	5.1	0		0	DRY
HAMK	2007	302	1	1	7/8/07	22.63	0	3	55	0.34	0	5.1	0		0	DRY
HAMK	2007	302	1	1	7/9/07	22.66	0	3	56	0.34	0	5.1	0		0	DRY
HAMK	2007	302	1	1	7/10/07	22.70	0	3	57	0.25	0	5.1	0		0	DRY
HAMK	2007	302	1	1	7/11/07	22.73	0	3	58	0.34	0	5.1	0		0	DRY
HAMK	2007	302	1	1	7/12/07	22.76	0	3	59	0.32	0	5.1	0		0	END
										134.4573	45.31*		84.861	16.9889		

**** Actual Rainfall total not fully useable by the plant as irrigation. Please see cover memo for explanation of "Effective Rainfall"***

F306: Kauhikoa Ditch

Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
KAUK	2007	306	1	1	8/24/05	0.00	0	S	S	0.1032	0	1.332	0	0	0	IPLT
KAUK	2007	306	1	1	8/25/05	0.03	0	1	2	0.07992	0	1.332	0	0	0	IPLT
KAUK	2007	306	1	1	8/26/05	0.07	0	1	3	0.07992	0	1.332	0	0	0	IPLT
KAUK	2007	306	1	1	8/27/05	0.10	12	S	3	0.0799	0	1.332	0.324	0	18	IPLT
KAUK	2007	306	1	1	8/28/05	0.13	12	2	3	0.0433	0	1.332	0.324	0	39	IPLT
KAUK	2007	306	1	1	8/29/05	0.16	16	3	3	0.0799	0	1.332	0.432	0	65	IPLT
KAUK	2007	306	1	1	8/30/05	0.20	24	4	3	0.0666	0	1.332	0.648	0	100	IPLT
KAUK	2007	306	1	1	8/31/05	0.23	24	5	3	0.0666	0	1.332	0.648	0	100	IPLT
KAUK	2007	306	1	1	9/1/05	0.26	24	6	3	0.101	0	1.332	0.648	0	100	IPLT
KAUK	2007	306	1	1	9/2/05	0.30	24	7	3	0.101	0	1.332	0.648	0	100	IPLT
KAUK	2007	306	1	1	9/3/05	0.33	24	8	3	0.0733	0	1.332	0.648	0	100	IPLT
KAUK	2007	306	1	1	9/4/05	0.36	24	9	3	0.0733	0	1.332	0.648	0	100	IPLT
KAUK	2007	306	1	1	9/5/05	0.39	24	10	3	0.101	0	1.332	0.648	0	100	IPLT
KAUK	2007	306	1	1	9/6/05	0.43	24	11	3	0.101	0.03	1.332	0.648	0	100	IPLT
KAUK	2007	306	1	1	9/7/05	0.46	24	12	3	0.0966	0.07	1.332	0.648	0	100	IPLT
KAUK	2007	306	1	1	9/8/05	0.49	24	13	3	0.0866	0.02	1.332	0.648	0	100	IPLT
KAUK	2007	306	1	1	9/9/05	0.53	24	14	3	0.0766	0	1.332	0.648	0	100	IPLT
KAUK	2007	306	1	1	9/10/05	0.56	24	15	3	0.0866	0	1.332	0.648	0	100	IPLT
KAUK	2007	306	1	1	9/11/05	0.59	24	16	3	0.1066	0	1.332	0.648	0	100	IPLT
KAUK	2007	306	1	1	9/12/05	0.63	24	17	3	0.0966	0	1.332	0.648	0	100	IPLT
KAUK	2007	306	1	1	9/13/05	0.66	24	18	3	0.0666	0	1.332	0.648	0	100	IPLT
KAUK	2007	306	1	1	9/14/05	0.69	0	18	S	0.0466	0.14	1.332	0	0	100	PLT
KAUK	2007	306	1	1	9/15/05	0.72	0	S	1	0.0566	2.04	1.332	0	0	100	PLT WC
KAUK	2007	306	1	1	9/16/05	0.76	0	1	S	0.0566	0.03	1.332	0	0	98	PLT WC
KAUK	2007	306	1	1	9/17/05	0.79	0	1	2	0.0766	0	1.332	0	0	92	PLT WC
KAUK	2007	306	1	1	9/18/05	0.82	0	1	3	0.0733	0	1.332	0	0	86	PLT WC
KAUK	2007	306	1	1	9/19/05	0.86	0	1	4	0.0733	0	1.332	0	0	81	PLT WC
KAUK	2007	306	1	1	9/20/05	0.89	0	1	5	0.0733	0	1.332	0	0	76	IPLT
KAUK	2007	306	1	1	9/21/05	0.92	22	S	5	0.0866	0	1.332	0.594	0	100	IPLT
KAUK	2007	306	1	1	9/22/05	0.95	24	2	5	0.0666	0	1.332	0.648	0	100	IPLT F
KAUK	2007	306	1	1	9/23/05	0.99	6	2	S	0.0599	0	1.332	0.162	0	100	
KAUK	2007	306	1	1	9/24/05	1.02	0	2	2	0.101	0	1.332	0	0	92	
KAUK	2007	306	1	1	9/25/05	1.05	0	2	3	0.101	0	1.332	0	0	85	
KAUK	2007	306	1	1	9/26/05	1.09	0	2	4	0.0899	0	1.332	0	0	78	IPLT
KAUK	2007	306	1	1	9/27/05	1.12	22	S	4	0.0966	0	1.332	0.594	0	100	IPLT
KAUK	2007	306	1	1	9/28/05	1.15	24	2	4	0.0966	0.04	1.332	0.648	0	100	IF
KAUK	2007	306	1	1	9/29/05	1.18	6	2	S	0.101	0	1.332	0.162	0	100	

F306: Kauhikoa Ditch

Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
KAUK	2007	306	1	1	9/30/05	1.22	0	2	2	0.101	0.08	1.332	0	0	98	
KAUK	2007	306	1	1	10/1/05	1.25	0	S	2	0.0845	0.28	1.332	0	0	100	
KAUK	2007	306	1	1	10/2/05	1.28	0	1	S	0.0845	0	1.332	0	0	94	
KAUK	2007	306	1	1	10/3/05	1.32	0	1	2	0.0845	0	1.332	0	0	87	
KAUK	2007	306	1	1	10/4/05	1.35	0	1	3	0.0845	0	1.332	0	0	81	I
KAUK	2007	306	1	1	10/5/05	1.38	22	S	3	0.0845	0	1.332	0.594	0	100	I
KAUK	2007	306	1	1	10/6/05	1.41	24	2	3	0.0845	0.12	1.332	0.648	0	100	
KAUK	2007	306	1	1	10/7/05	1.45	0	2	S	0.0533	0.14	1.332	0	0	100	
KAUK	2007	306	1	1	10/8/05	1.48	0	2	2	0.0845	0.05	1.332	0	0	97	
KAUK	2007	306	1	1	10/9/05	1.51	0	2	3	0.0856	0	1.3488	0	0	90	ACPLT
KAUK	2007	306	1	1	10/10/05	1.55	0	2	4	0.087471	0	1.378	0	0	81	PLT
KAUK	2007	306	1	1	10/11/05	1.58	0	2	5	0.0893	0.04	1.4072	0	0	76	IPLT
KAUK	2007	306	1	1	10/12/05	1.61	22	S	5	0.0912	0.18	1.4368	0.594	0	100	IPLT
KAUK	2007	306	1	1	10/13/05	1.64	24	2	5	0.0931	0.24	1.466	0.648	0	100	IPLT
KAUK	2007	306	1	1	10/14/05	1.68	6	2	S	0.0949	0	1.4952	0.162	0	100	
KAUK	2007	306	1	1	10/15/05	1.71	0	2	2	0.0968	0	1.5248	0	0	92	PLT
KAUK	2007	306	1	1	10/16/05	1.74	0	2	3	0.0986	0	1.554	0	0	84	PLT
KAUK	2007	306	1	1	10/17/05	1.78	0	2	4	0.100499	0	1.5833	0	0	75	
KAUK	2007	306	1	1	10/18/05	1.81	0	2	5	0.1023	0	1.6124	0	0	68	I
KAUK	2007	306	1	1	10/19/05	1.84	22	S	5	0.1042	0	1.642	0.594	0	97	I
KAUK	2007	306	1	1	10/20/05	1.88	24	2	5	0.1061	0	1.6712	0.648	0	100	
KAUK	2007	306	1	1	10/21/05	1.91	0	2	S	0.1079	0	1.7004	0	0	92	
KAUK	2007	306	1	1	10/22/05	1.94	0	2	2	0.1098	0.15	1.73	0	0	92	
KAUK	2007	306	1	1	10/23/05	1.97	0	S	2	0.1117	0.98	1.7592	0	0	100	
KAUK	2007	306	1	1	10/24/05	2.01	0	2	2	0.1135	0.36	1.7884	0	0	100	
KAUK	2007	306	1	1	10/25/05	2.04	0	2	S	0.1154	0	1.818	0	0	92	
KAUK	2007	306	1	1	10/26/05	2.07	0	2	2	0.1173	0	1.8472	0	0	84	
KAUK	2007	306	1	1	10/27/05	2.11	0	2	3	0.1191	0	1.8764	0	0	76	I
KAUK	2007	306	1	1	10/28/05	2.14	22	S	3	0.121	0.03	1.906	0.594	0	100	I
KAUK	2007	306	1	1	10/29/05	2.17	24	2	3	0.1228	0	1.9352	0.648	0	100	IF
KAUK	2007	306	1	1	10/30/05	2.20	6	2	S	0.1247	0	1.9644	0.162	0	100	
KAUK	2007	306	1	1	10/31/05	2.24	0	2	2	0.1265	0	1.9936	0	0	92	
KAUK	2007	306	1	1	11/1/05	2.27	0	2	3	0.0768	0.02	1.512	0	0	100	
KAUK	2007	306	1	1	11/2/05	2.30	0	2	4	0.078	0.04	1.534	0	0	96	SC
KAUK	2007	306	1	1	11/3/05	2.34	0	2	5	0.0791	0.04	1.556	0	0	92	I
KAUK	2007	306	1	1	11/4/05	2.37	20	S	5	0.0802	0	1.578	0.54	0	100	I
KAUK	2007	306	1	1	11/5/05	2.40	24	2	5	0.0813	0	1.6	0.648	0	100	

F306: Kauhikoa Ditch

Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
KAUK	2007	306	1	1	11/6/05	2.43	0	2	S	0.0824	0	1.6216	0	0	94	
KAUK	2007	306	1	1	11/7/05	2.47	0	2	2	0.0835	0	1.6436	0	0	87	
KAUK	2007	306	1	1	11/8/05	2.50	0	S	2	0.0847	0.2	1.6656	0	0	93	
KAUK	2007	306	1	1	11/9/05	2.53	0	1	S	0.0858	0.05	1.6876	0	0	90	
KAUK	2007	306	1	1	11/10/05	2.57	0	1	2	0.0869	0	1.7096	0	0	84	I
KAUK	2007	306	1	1	11/11/05	2.60	22	S	2	0.088	0	1.7312	0.594	0	100	
KAUK	2007	306	1	1	11/12/05	2.63	0	1	S	0.0891	0	1.7532	0	0	94	
KAUK	2007	306	1	1	11/13/05	2.66	0	1	2	0.0902	0	1.7752	0	0	87	WC
KAUK	2007	306	1	1	11/14/05	2.70	0	1	3	0.0913	0	1.7972	0	0	81	WC
KAUK	2007	306	1	1	11/15/05	2.73	0	1	4	0.0925	0.02	1.8192	0	0	76	IPLT
KAUK	2007	306	1	1	11/16/05	2.76	22	S	4	0.0936	0	1.8408	0.594	0	100	IPLT
KAUK	2007	306	1	1	11/17/05	2.80	24	2	4	0.0947	0	1.8628	0.648	0	100	I
KAUK	2007	306	1	1	11/18/05	2.83	24	3	4	0.0471	0	1.8848	0.648	0	100	I
KAUK	2007	306	1	1	11/19/05	2.86	6	3	S	0.081	0	1.9068	0.162	0	100	
KAUK	2007	306	1	1	11/20/05	2.89	0	3	2	0.082	0	1.9284	0	0	95	
KAUK	2007	306	1	1	11/21/05	2.93	0	3	3	0.0634	0	1.9504	0	0	91	I
KAUK	2007	306	1	1	11/22/05	2.96	22	S	3	0.0542	0	1.9724	0.594	0	100	I
KAUK	2007	306	1	1	11/23/05	2.99	24	2	3	0.0548	0	1.9944	0.648	0	100	
KAUK	2007	306	1	1	11/24/05	3.03	0	3	3	0.0504	0.28	2.0164	0	0	100	
KAUK	2007	306	1	1	11/25/05	3.06	0	3	S	0.1036	0	2.038	0	0	94	
KAUK	2007	306	1	1	11/26/05	3.09	0	3	2	0.1047	0	2.06	0	0	88	
KAUK	2007	306	1	1	11/27/05	3.13	0	3	3	0.1058	0.08	2.082	0	0	86	
KAUK	2007	306	1	1	11/28/05	3.16	0	S	3	0.1069	0.92	2.104	0	0	100	
KAUK	2007	306	1	1	11/29/05	3.19	0	1	S	0.0957	0	2.126	0	0	94	
KAUK	2007	306	1	1	11/30/05	3.22	0	1	2	0.1092	0	2.1476	0	0	88	
KAUK	2007	306	1	1	12/1/05	3.26	0	1	3	0.0542	0	2.1696	0	0	85	I
KAUK	2007	306	1	1	12/2/05	3.29	22	S	3	0.0712	0	2.1916	0.594	0	100	
KAUK	2007	306	1	1	12/3/05	3.32	0	1	S	0.0719	0	2.2136	0	0	96	
KAUK	2007	306	1	1	12/4/05	3.36	0	1	2	0.055886	0	2.235432	0	0	92	
KAUK	2007	306	1	1	12/5/05	3.39	0	1	3	0.095937	0.18	2.257348	0	0	95	
KAUK	2007	306	1	1	12/6/05	3.42	0	1	4	0.091171	0	2.279264	0	0	90	
KAUK	2007	306	1	1	12/7/05	3.45	0	1	5	0.0978	0	2.30118	0	0	85	
KAUK	2007	306	1	1	12/8/05	3.49	0	1	6	0.092924	0.04	2.323096	0	0	82	I
KAUK	2007	306	1	1	12/9/05	3.52	16	S	6	0.0938	0	2.345012	0.432	0	95	I
KAUK	2007	306	1	1	12/10/05	3.55	24	2	6	0.094677	0.26	2.366928	0.648	0	100	
KAUK	2007	306	1	1	12/11/05	3.59	0	2	S	0.101168	0.1	2.388844	0	0	99	
KAUK	2007	306	1	1	12/12/05	3.62	0	2	2	0.102096	0.06	2.41076	0	0	96	

F306: Kauhikoa Ditch

Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
KAUK	2007	306	1	1	12/13/05	3.65	0	2	3	0.200696	0	2.432676	0	0	87	
KAUK	2007	306	1	1	12/14/05	3.68	0	2	4	0.116593	0	2.454592	0	0	81	
KAUK	2007	306	1	1	12/15/05	3.72	0	2	5	0.086678	0	2.476508	0	0	77	
KAUK	2007	306	1	1	12/16/05	3.75	0	2	6	0.087445	0	2.498424	0	0	73	I
KAUK	2007	306	1	1	12/17/05	3.78	22	S	6	0.106736	0	2.52034	0.594	0	92	I
KAUK	2007	306	1	1	12/18/05	3.82	24	2	6	0.107665	0	2.542256	0.648	0	100	
KAUK	2007	306	1	1	12/19/05	3.85	0	2	S	0.108593	0	2.564172	0	0	94	
KAUK	2007	306	1	1	12/20/05	3.88	0	2	2	0.109521	0	2.586088	0	0	89	
KAUK	2007	306	1	1	12/21/05	3.91	0	2	3	0.110449	0	2.608004	0	0	84	RD
KAUK	2007	306	1	1	12/22/05	3.95	0	2	4	0.111377	0	2.62992	0	0	79	RD
KAUK	2007	306	1	1	12/23/05	3.98	0	2	5	0.112305	0	2.651836	0	0	75	
KAUK	2007	306	1	1	12/24/05	4.01	0	2	6	0.113233	0	2.673752	0	0	70	
KAUK	2007	306	1	1	12/25/05	4.05	0	2	7	0.114162	0	2.695668	0	0	65	
KAUK	2007	306	1	1	12/26/05	4.08	0	2	8	0.11509	0	2.717584	0	0	60	
KAUK	2007	306	1	1	12/27/05	4.11	0	2	9	0.116018	0	2.7395	0	0	55	
KAUK	2007	306	1	1	12/28/05	4.14	0	2	10	0.116946	0	2.761416	0	0	51	
KAUK	2007	306	1	1	12/29/05	4.18	0	2	11	0.117874	0	2.783332	0	0	46	
KAUK	2007	306	1	1	12/30/05	4.21	0	2	12	0.118802	0	2.805248	0	0	41	
KAUK	2007	306	1	1	12/31/05	4.24	0	2	13	0.11973	0	2.827164	0	0	37	
KAUK	2007	306	1	1	1/1/06	4.28	0	2	14	0.106841	0	2.84908	0	0	33	
KAUK	2007	306	1	1	1/2/06	4.31	0	2	15	0.117137	0	2.870996	0	0	29	
KAUK	2007	306	1	1	1/3/06	4.34	0	2	16	0.118031	0	2.892912	0	0	24	
KAUK	2007	306	1	1	1/4/06	4.38	0	2	17	0.118925	0	2.914828	0	0	20	
KAUK	2007	306	1	1	1/5/06	4.41	0	2	18	0.119819	0.06	2.936744	0	0	18	
KAUK	2007	306	1	1	1/6/06	4.44	0	2	19	0.120713	0.04	2.95866	0	0	15	I
KAUK	2007	306	1	1	1/7/06	4.47	22	S	19	0.121608	0	2.980576	0.594	0	31	I
KAUK	2007	306	1	1	1/8/06	4.51	24	2	19	0.122502	0	3.002492	0.648	0	48	IF
KAUK	2007	306	1	1	1/9/06	4.54	6	2	S	0.105854	0	3.024408	0.162	0	49	?
KAUK	2007	306	1	1	1/10/06	4.57	0	2	2	0.1447	0.08	3.046324	0	0	47	
KAUK	2007	306	1	1	1/11/06	4.61	0	2	3	0.115059	0	3.06824	0	0	43	
KAUK	2007	306	1	1	1/12/06	4.64	0	S	3	0.146782	0.2	3.090156	0	0	44	
KAUK	2007	306	1	1	1/13/06	4.67	0	1	S	0.101142	0	3.112072	0	0	41	I
KAUK	2007	306	1	1	1/14/06	4.70	22	S	1	0.117525	0	3.133988	0.594	0	56	I
KAUK	2007	306	1	1	1/15/06	4.74	24	2	1	0.126236	0	3.155904	0.648	0	72	IF
KAUK	2007	306	1	1	1/16/06	4.77	24	3	1	0.119168	0	3.17782	0.648	0	88	
KAUK	2007	306	1	1	1/17/06	4.80	0	3	S	0.087993	0.1	3.199736	0	0	88	
KAUK	2007	306	1	1	1/18/06	4.84	0	3	2	0.128866	0	3.221652	0	0	83	

F306: Kauhikoa Ditch

Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
KAUK	2007	306	1	1	1/19/06	4.87	0	3	3	0.113525	0	3.243568	0	0	79	
KAUK	2007	306	1	1	1/20/06	4.90	0	3	4	0.130619	0	3.265484	0	0	75	
KAUK	2007	306	1	1	1/21/06	4.93	0	3	5	0.115059	0	3.2874	0	0	71	
KAUK	2007	306	1	1	1/22/06	4.97	0	3	6	0.132373	0	3.309316	0	0	66	
KAUK	2007	306	1	1	1/23/06	5.00	0	3	7	0.099937	0	3.331232	0	0	63	I
KAUK	2007	306	1	1	1/24/06	5.03	12	S	7	0.075446	0.08	3.353148	0.324	0	72	I
KAUK	2007	306	1	1	1/25/06	5.07	20	2	7	0.059064	0.6	3.375064	0.54	0	100	IF
KAUK	2007	306	1	1	1/26/06	5.10	6	2	S	0.06794	0.1	3.39698	0.162	0	100	
KAUK	2007	306	1	1	1/27/06	5.13	0	2	2	0.09402	0.15	3.418896	0	0	100	
KAUK	2007	306	1	1	1/28/06	5.16	0	2	3	0.120428	0	3.440812	0	0	95	
KAUK	2007	306	1	1	1/29/06	5.20	0	2	4	0.129852	0	3.462728	0	0	91	
KAUK	2007	306	1	1	1/30/06	5.23	0	2	5	0.130674	0	3.484644	0	0	87	
KAUK	2007	306	1	1	1/31/06	5.26	0	2	6	0.12273	0	3.50656	0	0	83	
KAUK	2007	306	1	1	2/1/06	5.30	0	2	7	0.141139	0	3.528476	0	0	78	
KAUK	2007	306	1	1	2/2/06	5.33	0	2	8	0.13314	0	3.550392	0	0	74	
KAUK	2007	306	1	1	2/3/06	5.36	0	S	8	0.089308	0.44	3.572308	0	0	83	
KAUK	2007	306	1	1	2/4/06	5.39	16	2	8	0.152755	0.08	3.594224	0.432	0	93	I
KAUK	2007	306	1	1	2/5/06	5.43	23	3	8	0.216968	0	3.61614	0.621	0	100	
KAUK	2007	306	1	1	2/6/06	5.46	0	3	S	0.190998	0	3.638056	0	0	94	
KAUK	2007	306	1	1	2/7/06	5.49	0	3	2	0.128099	0	3.659972	0	0	90	
KAUK	2007	306	1	1	2/8/06	5.53	0	3	3	0.082842	0	3.681888	0	0	87	
KAUK	2007	306	1	1	2/9/06	5.56	0	3	4	0.166671	0.05	3.703804	0	0	83	I
KAUK	2007	306	1	1	2/10/06	5.59	22	S	4	0.186286	0	3.72572	0.594	0	94	I
KAUK	2007	306	1	1	2/11/06	5.63	24	2	4	0.131167	0	3.747636	0.648	0	100	
KAUK	2007	306	1	1	2/12/06	5.66	0	2	S	0.131934	0	3.769552	0	0	95	
KAUK	2007	306	1	1	2/13/06	5.69	0	2	2	0.123223	0.05	3.791468	0	0	93	
KAUK	2007	306	1	1	2/14/06	5.72	0	S	2	0.133468	0.28	3.813384	0	0	96	
KAUK	2007	306	1	1	2/15/06	5.76	0	2	2	0.095883	0.2	3.8353	0	0	98	
KAUK	2007	306	1	1	2/16/06	5.79	0	2	S	0.12536	0.05	3.857216	0	0	96	
KAUK	2007	306	1	1	2/17/06	5.82	0	2	2	0.08728	0	3.879132	0	0	93	
KAUK	2007	306	1	1	2/18/06	5.86	0	2	3	0.107279	0.18	3.901048	0	0	94	I
KAUK	2007	306	1	1	2/19/06	5.89	22	S	3	0.078459	0	3.922964	0.594	0	100	I
KAUK	2007	306	1	1	2/20/06	5.92	24	2	3	0.138071	0	3.94488	0.648	0	100	I
KAUK	2007	306	1	1	2/21/06	5.95	24	3	3	0.09917	0	3.966796	0.648	0	100	
KAUK	2007	306	1	1	2/22/06	5.99	0	3	S	0.189464	0	3.988712	0	0	94	
KAUK	2007	306	1	1	2/23/06	6.02	0	3	2	0.2	0.14	4	0	0	92	
KAUK	2007	306	1	1	2/24/06	6.05	0	3	3	0.16	0	4	0	0	88	

F306: Kauhikoa Ditch

Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
KAUK	2007	306	1	1	2/25/06	6.09	0	3	4	0.19	0	4	0	0	84	
KAUK	2007	306	1	1	2/26/06	6.12	22	S	4	0.11	0	4	0.594	0	96	I
KAUK	2007	306	1	1	2/27/06	6.15	24	2	4	0.2	0.06	4	0.648	0	100	
KAUK	2007	306	1	1	2/28/06	6.18	0	2	S	0.17	0	4	0	0	95	
KAUK	2007	306	1	1	3/1/06	6.22	0	2	2	0.12	0	4	0	0	92	
KAUK	2007	306	1	1	3/2/06	6.25	0	2	3	0.17	0	4	0	0	88	
KAUK	2007	306	1	1	3/3/06	6.28	0	2	4	0.16	0	4	0	0	84	
KAUK	2007	306	1	1	3/4/06	6.32	16	S	4	0.16	0	4	0.432	0	91	I
KAUK	2007	306	1	1	3/5/06	6.35	24	2	4	0.23	0.12	4	0.648	0	100	I
KAUK	2007	306	1	1	3/6/06	6.38	24	3	4	0.22	0	4	0.648	0	100	
KAUK	2007	306	1	1	3/7/06	6.41	0	3	S	0.17	0	4	0	0	95	
KAUK	2007	306	1	1	3/8/06	6.45	0	3	2	0.19	0	4	0	0	91	
KAUK	2007	306	1	1	3/9/06	6.48	0	3	3	0.11	0	4	0	0	88	
KAUK	2007	306	1	1	3/10/06	6.51	0	3	4	0.16	0	4	0	0	84	
KAUK	2007	306	1	1	3/11/06	6.55	0	3	5	0.17	0	4	0	0	80	I
KAUK	2007	306	1	1	3/12/06	6.58	22	S	5	0.19	0	4	0.594	0	90	I
KAUK	2007	306	1	1	3/13/06	6.61	24	2	5	0.13	0	4	0.648	0	100	IF
KAUK	2007	306	1	1	3/14/06	6.64	0	2	S	0.13	0	4	0	0	96	
KAUK	2007	306	1	1	3/15/06	6.68	0	2	2	0.08	0	4	0	0	94	
KAUK	2007	306	1	1	3/16/06	6.71	0	2	3	0.13	0.03	4	0	0	92	I
KAUK	2007	306	1	1	3/17/06	6.74	22	S	3	0.19	0	4	0.594	0	100	I
KAUK	2007	306	1	1	3/18/06	6.78	24	2	3	0.16	0	4	0.648	0	100	
KAUK	2007	306	1	1	3/19/06	6.81	0	3	3	0.06	0.5	4	0	0	100	
KAUK	2007	306	1	1	3/20/06	6.84	0	4	3	0.2	0.9	4	0	0	100	
KAUK	2007	306	1	1	3/21/06	6.88	0	4	S	0.15	0.02	4	0	0	96	IF
KAUK	2007	306	1	1	3/22/06	6.91	6	4	2	0.11	0	4	0.162	0	98	
KAUK	2007	306	1	1	3/23/06	6.94	0	4	3	0.18	0.03	4	0	0	94	
KAUK	2007	306	1	1	3/24/06	6.97	0	S	3	0.22	0.7	4	0	0	100	
KAUK	2007	306	1	1	3/25/06	7.01	0	1	S	0.1	0.03	4	0	0	98	
KAUK	2007	306	1	1	3/26/06	7.04	0	1	2	0.07	0.08	4	0	0	98	
KAUK	2007	306	1	1	3/27/06	7.07	0	S	2	0.08	0.86	4	0	0	100	
KAUK	2007	306	1	1	3/28/06	7.11	0	2	2	0.1	0.48	4	0	0	100	
KAUK	2007	306	1	1	3/29/06	7.14	0	3	2	0.08	1.45	4	0	0	100	
KAUK	2007	306	1	1	3/30/06	7.17	0	4	2	0.16	2.6	4	0	0	100	
KAUK	2007	306	1	1	3/31/06	7.20	0	4	S	0.12	0	4	0	0	97	
KAUK	2007	306	1	1	4/1/06	7.24	0	4	2	0.16	0.1	4	0	0	95	
KAUK	2007	306	1	1	4/2/06	7.27	0	4	3	0.19	0.08	4	0	0	92	SCI

F306: Kauhikoa Ditch

Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
KAUK	2007	306	1	1	4/3/06	7.30	22	S	3	0.22	0	4	0.594	0	100	IF
KAUK	2007	306	1	1	4/4/06	7.34	5	1	S	0.2	0	4	0.135	0	98	
KAUK	2007	306	1	1	4/5/06	7.37	0	1	2	0.3	0	4	0	0	90	
KAUK	2007	306	1	1	4/6/06	7.40	0	1	3	0.23	0	4	0	0	85	I
KAUK	2007	306	1	1	4/7/06	7.43	16	S	3	0.27	0.18	4	0.432	0	93	I
KAUK	2007	306	1	1	4/8/06	7.47	24	2	3	0.29	0.05	4	0.648	0	100	
KAUK	2007	306	1	1	4/9/06	7.50	0	2	S	0.21	0	4	0	0	94	
KAUK	2007	306	1	1	4/10/06	7.53	0	2	2	0.21	0.04	4	0	0	90	
KAUK	2007	306	1	1	4/11/06	7.57	0	2	3	0.27	0.04	4	0	0	84	
KAUK	2007	306	1	1	4/12/06	7.60	0	2	4	0.16	0.05	4	0	0	82	I
KAUK	2007	306	1	1	4/13/06	7.63	22	S	4	0.31	0.09	4	0.594	0	91	I
KAUK	2007	306	1	1	4/14/06	7.66	24	2	4	0.31	0	4	0.648	0	99	I
KAUK	2007	306	1	1	4/15/06	7.70	24	3	4	0.24	0.05	4	0.648	0	100	
KAUK	2007	306	1	1	4/16/06	7.73	0	3	S	0.26	0.02	4	0	0	94	
KAUK	2007	306	1	1	4/17/06	7.76	0	3	2	0.28	0.02	4	0	0	87	
KAUK	2007	306	1	1	4/18/06	7.80	0	3	3	0.25	0.07	4	0	0	83	I
KAUK	2007	306	1	1	4/19/06	7.83	22	S	3	0.29	0.12	4	0.594	0	93	I
KAUK	2007	306	1	1	4/20/06	7.86	24	2	3	0.25	0.02	4	0.648	0	100	I
KAUK	2007	306	1	1	4/21/06	7.89	24	3	3	0.25	0.1	4	0.648	0	100	I
KAUK	2007	306	1	1	4/22/06	7.93	24	4	3	0.27	0	4	0.648	0	100	IF
KAUK	2007	306	1	1	4/23/06	7.96	6	4	S	0.31	0.05	4	0.162	0	97	
KAUK	2007	306	1	1	4/24/06	7.99	0	4	2	0.22	0	4	0	0	92	HAF HD
KAUK	2007	306	1	1	4/25/06	8.03	0	4	3	0.13	0	4	0	0	88	HAF HD
KAUK	2007	306	1	1	4/26/06	8.06	0	4	4	0.19	0	4	0	0	84	HAF HD
KAUK	2007	306	1	1	4/27/06	8.09	0	4	5	0.2	0	4	0	0	79	HAF HD
KAUK	2007	306	1	1	4/28/06	8.13	0	4	6	0.2	0	4	0	0	74	HAF HD?
KAUK	2007	306	1	1	4/29/06	8.16	0	4	7	0.16	0	4	0	0	70	RDS HD?
KAUK	2007	306	1	1	4/30/06	8.19	0	4	8	0.18	0	4	0	0	65	RDS HD?
KAUK	2007	306	1	1	5/1/06	8.22	0	4	9	0.21	0.18	4	0	0	64	I
KAUK	2007	306	1	1	5/2/06	8.26	15	S	9	0.23	0	4	0.405	0	69	I
KAUK	2007	306	1	1	5/3/06	8.29	21	2	9	0.28	0	4	0.567	0	76	I
KAUK	2007	306	1	1	5/4/06	8.32	24	3	9	0.24	0	4	0.648	0	86	I
KAUK	2007	306	1	1	5/5/06	8.36	20	4	9	0.17	0.85	4	0.54	0	100	I
KAUK	2007	306	1	1	5/6/06	8.39	16	5	9	0.1	0.24	4	0.432	0	100	I
KAUK	2007	306	1	1	5/7/06	8.42	4	6	9	0.27	0.32	4	0.108	0	100	
KAUK	2007	306	1	1	5/8/06	8.45	0	6	S	0.31	0.08	4	0	0	94	IF
KAUK	2007	306	1	1	5/9/06	8.49	6	6	2	0.33	0	4	0.162	0	90	

F306: Kauhikoa Ditch

Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
KAUK	2007	306	1	1	5/10/06	8.52	0	6	3	0.36	0	4	0	0	81	I
KAUK	2007	306	1	1	5/11/06	8.55	22	S	3	0.36	0	4	0.594	0	86	I
KAUK	2007	306	1	1	5/12/06	8.59	24	2	3	0.2845	0	4	0.648	0	95	
KAUK	2007	306	1	1	5/13/06	8.62	0	2	S	0.2845	0	4	0	0	88	
KAUK	2007	306	1	1	5/14/06	8.65	0	2	2	0.2845	0.02	4	0	0	82	
KAUK	2007	306	1	1	5/15/06	8.68	0	S	2	0.2845	0.3	4	0	0	82	I
KAUK	2007	306	1	1	5/16/06	8.72	22	2	2	0.2845	0	4	0.594	0	90	I
KAUK	2007	306	1	1	5/17/06	8.75	24	3	2	0.2845	0	4	0.648	0	99	
KAUK	2007	306	1	1	5/18/06	8.78	0	4	2	0.2845	0.26	4	0	0	98	
KAUK	2007	306	1	1	5/19/06	8.82	0	4	S	0.2845	0	4	0	0	91	I
KAUK	2007	306	1	1	5/20/06	8.85	16	S	1	0.2845	0	4	0.432	0	95	I
KAUK	2007	306	1	1	5/21/06	8.88	24	2	1	0.2845	0.01	4	0.648	0	100	I
KAUK	2007	306	1	1	5/22/06	8.91	24	3	1	0.2845	0.03	4	0.648	0	100	I
KAUK	2007	306	1	1	5/23/06	8.95	24	4	1	0.2845	0	4	0.648	0	100	IF
KAUK	2007	306	1	1	5/24/06	8.98	6	4	S	0.2845	0	4	0.162	0	96	
KAUK	2007	306	1	1	5/25/06	9.01	0	4	2	0.2845	0	4	0	0	89	
KAUK	2007	306	1	1	5/26/06	9.05	0	4	3	0.2845	0	4	0	0	82	
KAUK	2007	306	1	1	5/27/06	9.08	0	4	4	0.2845	0	4	0	0	75	I
KAUK	2007	306	1	1	5/28/06	9.11	22	S	4	0.2845	0	4	0.594	0	83	I
KAUK	2007	306	1	1	5/29/06	9.14	24	2	4	0.2845	0	4	0.648	0	92	I
KAUK	2007	306	1	1	5/30/06	9.18	6	2	S	0.2845	0	4	0.162	0	89	
KAUK	2007	306	1	1	5/31/06	9.21	0	2	2	0.2845	0	4	0	0	82	
KAUK	2007	306	1	1	6/1/06	9.24	0	2	3	0.3423	0	4	0	0	73	
KAUK	2007	306	1	1	6/2/06	9.28	0	2	4	0.3423	0	4	0	0	65	
KAUK	2007	306	1	1	6/3/06	9.31	0	2	5	0.3423	0	4	0	0	56	I
KAUK	2007	306	1	1	6/4/06	9.34	22	S	5	0.3423	0	4	0.594	0	62	I
KAUK	2007	306	1	1	6/5/06	9.38	24	2	5	0.3423	0	4	0.648	0	70	
KAUK	2007	306	1	1	6/6/06	9.41	0	2	S	0.3423	0	4	0	0	61	
KAUK	2007	306	1	1	6/7/06	9.44	0	2	2	0.3423	0	4	0	0	53	I
KAUK	2007	306	1	1	6/8/06	9.47	22	S	2	0.26	0	4	0.594	0	61	I
KAUK	2007	306	1	1	6/9/06	9.51	16	2	2	0.27	0	4	0.432	0	65	
KAUK	2007	306	1	1	6/10/06	9.54	0	2	S	0.2	0	4	0	0	60	
KAUK	2007	306	1	1	6/11/06	9.57	0	2	2	0.2	0	4	0	0	55	
KAUK	2007	306	1	1	6/12/06	9.61	0	2	3	0.2	0	4	0	0	50	
KAUK	2007	306	1	1	6/13/06	9.64	0	2	4	0.25	0	4	0	0	44	
KAUK	2007	306	1	1	6/14/06	9.67	0	2	5	0.37	0.01	4	0	0	35	
KAUK	2007	306	1	1	6/15/06	9.70	0	2	6	0.25	0.01	4	0	0	29	

F306: Kauhikoa Ditch

Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
KAUK	2007	306	1	1	6/16/06	9.74	0	2	7	0.34	0.06	4	0	0	22	
KAUK	2007	306	1	1	6/17/06	9.77	0	2	8	0.34	0	4	0	0	14	I
KAUK	2007	306	1	1	6/18/06	9.80	16	S	8	0.3423	0	4	0.432	0	16	I
KAUK	2007	306	1	1	6/19/06	9.84	24	2	8	0.3	0	4	0.648	0	24	IF
KAUK	2007	306	1	1	6/20/06	9.87	6	2	S	0.29	0	4	0.162	0	21	
KAUK	2007	306	1	1	6/21/06	9.90	0	2	2	0.36	0	4	0	0	12	
KAUK	2007	306	1	1	6/22/06	9.93	0	2	3	0.36	0	4	0	0	3	I
KAUK	2007	306	1	1	6/23/06	9.97	22	S	3	0.28	0	4	0.594	0	11	I
KAUK	2007	306	1	1	6/24/06	10.00	24	2	3	0.3	0	4	0.648	0	20	IF
KAUK	2007	306	1	1	6/25/06	10.03	6	2	S	0.15	0	4	0.162	0	20	
KAUK	2007	306	1	1	6/26/06	10.07	0	2	2	0.22	0	4	0	0	15	
KAUK	2007	306	1	1	6/27/06	10.10	0	2	3	0.27	0	4	0	0	8	
KAUK	2007	306	1	1	6/28/06	10.13	0	2	4	0.35	0	4	0	0.35	0	WS-0
KAUK	2007	306	1	1	6/29/06	10.16	0	2	5	0.35	0	4	0	0.35	0	WS-1
KAUK	2007	306	1	1	6/30/06	10.20	0	2	6	0.35	0	4	0	0.35	0	WS-2
KAUK	2007	306	1	1	7/1/06	10.23	0	2	7	0.3619	0	4	0	0.3619	0	WS-3
KAUK	2007	306	1	1	7/2/06	10.26	0	2	8	0.3619	0	4	0	0.3619	0	WS-4
KAUK	2007	306	1	1	7/3/06	10.30	0	2	9	0.35	0	4	0	0.35	0	WS-5
KAUK	2007	306	1	1	7/4/06	10.33	0	2	10	0.35	0	4	0	0.35	0	WS-6
KAUK	2007	306	1	1	7/5/06	10.36	0	2	11	0.3619	0.05	4	0	0.3619	0	WS-7
KAUK	2007	306	1	1	7/6/06	10.39	0	2	12	0.3619	0	4	0	0.3619	0	WS-8
KAUK	2007	306	1	1	7/7/06	10.43	0	2	13	0.28	0	4	0	0.28	0	I
KAUK	2007	306	1	1	7/8/06	10.46	22	S	13	0.28	0.01	4	0.594	0	8	I
KAUK	2007	306	1	1	7/9/06	10.49	24	2	13	0.3619	0.04	4	0.648	0	16	
KAUK	2007	306	1	1	7/10/06	10.53	0	2	S	0.3619	0.07	4	0	0	8	
KAUK	2007	306	1	1	7/11/06	10.56	0	2	2	0.36	0.07	4	0	0	1	
KAUK	2007	306	1	1	7/12/06	10.59	0	2	3	0.36	0.04	4	0	0.36	0	WS-0
KAUK	2007	306	1	1	7/13/06	10.63	0	2	4	0.3619	0	4	0	0.3619	0	I
KAUK	2007	306	1	1	7/14/06	10.66	16	S	4	0.3619	0	4	0.432	0	1	I
KAUK	2007	306	1	1	7/15/06	10.69	24	2	4	0.34	0	4	0.648	0	9	I
KAUK	2007	306	1	1	7/16/06	10.72	24	3	4	0.34	0.04	4	0.648	0	18	
KAUK	2007	306	1	1	7/17/06	10.76	0	3	S	0.3619	0	4	0	0	9	
KAUK	2007	306	1	1	7/18/06	10.79	0	3	2	0.3619	0	4	0	0.3619	0	WS-0
KAUK	2007	306	1	1	7/19/06	10.82	0	3	3	0.22	0	4	0	0.22	0	WS-1
KAUK	2007	306	1	1	7/20/06	10.86	0	S	3	0.22	0.22	4	0	0.22	0	WS-2
KAUK	2007	306	1	1	7/21/06	10.89	0	1	S	0.3619	0	4	0	0.3619	0	WS-3
KAUK	2007	306	1	1	7/22/06	10.92	0	1	2	0.3619	0	4	0	0.3619	0	WS-4

F306: Kauhikoa Ditch

Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
KAUK	2007	306	1	1	7/23/06	10.95	0	1	3	0.26	0	4	0	0.26	0	WS-5
KAUK	2007	306	1	1	7/24/06	10.99	0	1	4	0.26	0	4	0	0.26	0	WS-6
KAUK	2007	306	1	1	7/25/06	11.02	0	1	5	0.3619	0	4	0	0.3619	0	WS-7
KAUK	2007	306	1	1	7/26/06	11.05	0	1	6	0.3619	0	4	0	0.3619	0	WS-8
KAUK	2007	306	1	1	7/27/06	11.09	0	1	7	0.38	0	4	0	0.38	0	WS-9
KAUK	2007	306	1	1	7/28/06	11.12	0	1	8	0.38	0	4	0	0.38	0	WS-10
KAUK	2007	306	1	1	7/29/06	11.15	0	1	9	0.3619	0.05	4	0	0.3619	0	WS-11
KAUK	2007	306	1	1	7/30/06	11.18	0	1	10	0.3619	0	4	0	0.3619	0	WS-12
KAUK	2007	306	1	1	7/31/06	11.22	0	1	11	0.3619	0	4	0	0.3619	0	WS-13
KAUK	2007	306	1	1	8/1/06	11.25	0	1	12	0.17	0	4	0	0.17	0	I
KAUK	2007	306	1	1	8/2/06	11.28	22	S	12	0.28	0	4	0.594	0	7	I
KAUK	2007	306	1	1	8/3/06	11.32	24	2	12	0.35	0	4	0.648	0	15	I
KAUK	2007	306	1	1	8/4/06	11.35	24	3	12	0.38	0	4	0.648	0	22	
KAUK	2007	306	1	1	8/5/06	11.38	0	3	S	0.27	0	4	0	0	15	
KAUK	2007	306	1	1	8/6/06	11.41	0	3	2	0.22	0.03	4	0	0	10	
KAUK	2007	306	1	1	8/7/06	11.45	0	3	3	0.3	0	4	0	0	3	
KAUK	2007	306	1	1	8/8/06	11.48	0	3	4	0.26	0	4	0	0.26	0	WS-0
KAUK	2007	306	1	1	8/9/06	11.51	0	3	5	0.35	0	4	0	0.35	0	I
KAUK	2007	306	1	1	8/10/06	11.55	22	S	5	0.33	0	4	0.594	0	6	I
KAUK	2007	306	1	1	8/11/06	11.58	24	2	5	0.35	0	4	0.648	0	14	
KAUK	2007	306	1	1	8/12/06	11.61	0	2	S	0.29	0	4	0	0	6	
KAUK	2007	306	1	1	8/13/06	11.64	0	2	2	0.28	0	4	0	0.28	0	WS-0
KAUK	2007	306	1	1	8/14/06	11.68	0	2	3	0.22	0	4	0	0.22	0	WS-1
KAUK	2007	306	1	1	8/15/06	11.71	0	2	4	0.17	0	4	0	0.17	0	WS-2
KAUK	2007	306	1	1	8/16/06	11.74	0	2	5	0.27	0.1	4	0	0.27	0	WS-3
KAUK	2007	306	1	1	8/17/06	11.78	0	2	6	0.31	0	4	0	0.31	0	I
KAUK	2007	306	1	1	8/18/06	11.81	22	S	6	0.31	0.08	4	0.594	0	9	I
KAUK	2007	306	1	1	8/19/06	11.84	24	2	6	0.26	0	4	0.648	0	18	
KAUK	2007	306	1	1	8/20/06	11.88	0	2	S	0.25	0	4	0	0	12	
KAUK	2007	306	1	1	8/21/06	11.91	0	2	2	0.31	0	4	0	0	4	
KAUK	2007	306	1	1	8/22/06	11.94	0	2	3	0.28	0	4	0	0.28	0	WS-0
KAUK	2007	306	1	1	8/23/06	11.97	0	2	4	0.23	0	4	0	0.23	0	WS-1
KAUK	2007	306	1	1	8/24/06	12.01	0	2	5	0.2	0	4	0	0.2	0	WS-2
KAUK	2007	306	1	1	8/25/06	12.04	0	2	6	0.17	0	4	0	0.17	0	WS-3
KAUK	2007	306	1	1	8/26/06	12.07	0	2	7	0.19	0	4	0	0.19	0	WS-4
KAUK	2007	306	1	1	8/27/06	12.11	0	2	8	0.17	0	4	0	0.17	0	WS-5
KAUK	2007	306	1	1	8/28/06	12.14	0	2	9	0.18	0	4	0	0.18	0	WS-6

F306: Kauhikoa Ditch

Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
KAUK	2007	306	1	1	8/29/06	12.17	0	2	10	0.3	0	4	0	0.3	0	WS-7
KAUK	2007	306	1	1	8/30/06	12.20	0	2	11	0.35	0	4	0	0.35	0	WS-8
KAUK	2007	306	1	1	8/31/06	12.24	0	2	12	0.31	0	4	0	0.31	0	WS-9
KAUK	2007	306	1	1	9/1/06	12.27	0	2	13	0.33	0	4	0	0.33	0	WS-10
KAUK	2007	306	1	1	9/2/06	12.30	0	2	14	0.29	0	4	0	0.29	0	WS-12
KAUK	2007	306	1	1	9/3/06	12.34	0	2	15	0.26	0	4	0	0.26	0	WS-13
KAUK	2007	306	1	1	9/4/06	12.37	0	2	16	0.2	0	4	0	0.2	0	WS-14
KAUK	2007	306	1	1	9/5/06	12.40	0	2	17	0.19	0	4	0	0.19	0	I
KAUK	2007	306	1	1	9/6/06	12.43	5	2	18	0.12	0	4	0.135	0.12	0	HAF WS-0
KAUK	2007	306	1	1	9/7/06	12.47	0	2	19	0.22	0	4	0	0.22	0	WS-1
KAUK	2007	306	1	1	9/8/06	12.50	0	2	20	0.25	0	4	0	0.25	0	WS-2
KAUK	2007	306	1	1	9/9/06	12.53	0	2	21	0.33	0.08	4	0	0.33	0	WS-3
KAUK	2007	306	1	1	9/10/06	12.57	0	2	22	0.22	0	4	0	0.22	0	WS-4
KAUK	2007	306	1	1	9/11/06	12.60	0	2	23	0.26	0	4	0	0.26	0	WS-5
KAUK	2007	306	1	1	9/12/06	12.63	0	2	24	0.24	0	4	0	0.24	0	WS-6
KAUK	2007	306	1	1	9/13/06	12.66	0	2	25	0.22	0	4	0	0.22	0	WS-7
KAUK	2007	306	1	1	9/14/06	12.70	0	2	26	0.21	0	4	0	0.21	0	WS-8
KAUK	2007	306	1	1	9/15/06	12.73	0	2	27	0.16	0	4	0	0.16	0	WS-9
KAUK	2007	306	1	1	9/16/06	12.76	0	2	28	0.16	0	4	0	0.16	0	WS-10
KAUK	2007	306	1	1	9/17/06	12.80	0	2	29	0.3033	0	4	0	0.3033	0	WS-11
KAUK	2007	306	1	1	9/18/06	12.83	0	2	30	0.3033	0	4	0	0.3033	0	I
KAUK	2007	306	1	1	9/19/06	12.86	22	S	30	0.3033	0	4	0.594	0	7	I
KAUK	2007	306	1	1	9/20/06	12.89	24	2	30	0.3033	0	4	0.648	0	16	WS
KAUK	2007	306	1	1	9/21/06	12.93	0	2	S	0.3033	0	4	0	0	8	WS
KAUK	2007	306	1	1	9/22/06	12.96	0	2	2	0.25	0	4	0	0	2	WS
KAUK	2007	306	1	1	9/23/06	12.99	0	2	3	0.29	0	4	0	0.29	0	WS-0
KAUK	2007	306	1	1	9/24/06	13.03	0	2	4	0.19	0	4	0	0.19	0	WS-1
KAUK	2007	306	1	1	9/25/06	13.06	0	S	4	0.14	0.2	4	0	0	1	WS
KAUK	2007	306	1	1	9/26/06	13.09	0	1	S	0.11	0.02	4	0	0.11	0	WS-0
KAUK	2007	306	1	1	9/27/06	13.13	0	1	2	0.19	0	4	0	0.19	0	I
KAUK	2007	306	1	1	9/28/06	13.16	22	S	2	0.24	0	4	0.594	0	9	I
KAUK	2007	306	1	1	9/29/06	13.19	24	2	2	0.26	0	4	0.648	0	19	I
KAUK	2007	306	1	1	9/30/06	13.22	24	3	2	0.23	0	4	0.648	0	29	WS
KAUK	2007	306	1	1	10/1/06	13.26	0	3	S	0.14	0	4	0	0	26	WS
KAUK	2007	306	1	1	10/2/06	13.29	0	3	2	0.13	0	4	0	0	22	WS
KAUK	2007	306	1	1	10/3/06	13.32	0	3	3	0.22	0	4	0	0	17	WS
KAUK	2007	306	1	1	10/4/06	13.36	0	3	4	0.23	0	4	0	0	11	WS

F306: Kauhikoa Ditch

Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
KAUK	2007	306	1	1	10/5/06	13.39	0	3	5	0.19	0	4	0	0	6	WS
KAUK	2007	306	1	1	10/6/06	13.42	0	3	6	0.2	0	4	0	0	1	WS
KAUK	2007	306	1	1	10/7/06	13.45	0	3	7	0.17	0	4	0	0.17	0	WS-0
KAUK	2007	306	1	1	10/8/06	13.49	0	3	8	0.2	0	4	0	0.2	0	WS-1
KAUK	2007	306	1	1	10/9/06	13.52	0	3	9	0.17	0	4	0	0.17	0	WS-2
KAUK	2007	306	1	1	10/10/06	13.55	0	3	10	0.19	0	4	0	0.19	0	WS-3
KAUK	2007	306	1	1	10/11/06	13.59	0	3	11	0.16	0	4	0	0.16	0	WS-4
KAUK	2007	306	1	1	10/12/06	13.62	0	3	12	0.18	0	4	0	0.18	0	WS-5
KAUK	2007	306	1	1	10/13/06	13.65	0	3	13	0.17	0	4	0	0.17	0	WS-6
KAUK	2007	306	1	1	10/14/06	13.68	0	3	14	0.17	0	4	0	0.17	0	I
KAUK	2007	306	1	1	10/15/06	13.72	22	S	14	0.2	0	4	0.594	0	10	I
KAUK	2007	306	1	1	10/16/06	13.75	24	2	14	0.05	0.05	4	0.648	0	26	WS
KAUK	2007	306	1	1	10/17/06	13.78	0	3	14	0.05	3.59	4	0	0	100	
KAUK	2007	306	1	1	10/18/06	13.82	0	3	S	0.2539	0	4	0	0	94	
KAUK	2007	306	1	1	10/19/06	13.85	0	3	2	0.2539	0	4	0	0	87	
KAUK	2007	306	1	1	10/20/06	13.88	0	3	3	0.2539	0.15	4	0	0	85	
KAUK	2007	306	1	1	10/21/06	13.91	0	S	3	0.2539	1.1	4	0	0	100	
KAUK	2007	306	1	1	10/22/06	13.95	0	1	S	0.2539	0.12	4	0	0	97	
KAUK	2007	306	1	1	10/23/06	13.98	0	1	2	0.2539	0	4	0	0	90	I
KAUK	2007	306	1	1	10/24/06	14.01	22	S	2	0.2539	0	4	0.594	0	99	I
KAUK	2007	306	1	1	10/25/06	14.05	24	2	2	0.2539	0	4	0.648	0	100	
KAUK	2007	306	1	1	10/26/06	14.08	0	2	S	0.21	0	4	0	0	95	
KAUK	2007	306	1	1	10/27/06	14.11	0	2	2	0.19	0	4	0	0	90	
KAUK	2007	306	1	1	10/28/06	14.14	0	2	3	0.23	0	4	0	0	84	
KAUK	2007	306	1	1	10/29/06	14.18	0	2	4	0.24	0	4	0	0	78	
KAUK	2007	306	1	1	10/30/06	14.21	0	2	5	0.24	0	4	0	0	72	
KAUK	2007	306	1	1	10/31/06	14.24	0	2	6	0.18	0	4	0	0	68	I
KAUK	2007	306	1	1	11/1/06	14.28	22	S	6	0.18	0	4	0.594	0	78	I
KAUK	2007	306	1	1	11/2/06	14.31	5	2	6	0.2033	0.4	4	0.135	0	86	SC
KAUK	2007	306	1	1	11/3/06	14.34	0	3	6	0.2033	3.8	4	0	0	100	
KAUK	2007	306	1	1	11/4/06	14.38	0	3	S	0.2033	0.02	4	0	0	95	I
KAUK	2007	306	1	1	11/5/06	14.41	3	3	2	0.2033	0	4	0.081	0	92	RDS
KAUK	2007	306	1	1	11/6/06	14.44	0	3	3	0.2033	0	4	0	0	87	I
KAUK	2007	306	1	1	11/7/06	14.47	0	3	4	0.12	0	4	0	0	84	RDS
KAUK	2007	306	1	1	11/8/06	14.51	0	3	5	0.2033	0.06	4	0	0	81	RDS
KAUK	2007	306	1	1	11/9/06	14.54	0	3	6	0.2033	0	4	0	0	76	RDS
KAUK	2007	306	1	1	11/10/06	14.57	0	3	7	0.2033	0	4	0	0	71	I

F306: Kauhikoa Ditch

Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
KAUK	2007	306	1	1	11/11/06	14.61	22	S	7	0.2033	0	4	0.594	0	80	I
KAUK	2007	306	1	1	11/12/06	14.64	24	2	7	0.2033	0	4	0.648	0	91	I
KAUK	2007	306	1	1	11/13/06	14.67	6	2	S	0.16	0	4	0.162	0	91	
KAUK	2007	306	1	1	11/14/06	14.70	0	2	2	0.08	0	4	0	0	89	
KAUK	2007	306	1	1	11/15/06	14.74	0	2	3	0.15	0	4	0	0	86	
KAUK	2007	306	1	1	11/16/06	14.77	0	2	4	0.14	0	4	0	0	82	
KAUK	2007	306	1	1	11/17/06	14.80	0	2	5	0.18	0	4	0	0	78	
KAUK	2007	306	1	1	11/18/06	14.84	0	2	6	0.18	0	4	0	0	73	
KAUK	2007	306	1	1	11/19/06	14.87	0	2	7	0.19	0	4	0	0	68	I
KAUK	2007	306	1	1	11/20/06	14.90	22	S	7	0.19	0	4	0.594	0	79	I
KAUK	2007	306	1	1	11/21/06	14.93	24	2	7	0.2033	0	4	0.648	0	90	I
KAUK	2007	306	1	1	11/22/06	14.97	6	2	S	0.14	0	4	0.162	0	90	
KAUK	2007	306	1	1	11/23/06	15.00	0	S	1	0.15	0.2	4	0	0	91	
KAUK	2007	306	1	1	11/24/06	15.03	0	1	S	0.14	0	4	0	0	88	
KAUK	2007	306	1	1	11/25/06	15.07	0	1	2	0.12	0	4	0	0	85	
KAUK	2007	306	1	1	11/26/06	15.10	0	1	3	0.15	0	4	0	0	81	
KAUK	2007	306	1	1	11/27/06	15.13	0	1	4	0.13	0	4	0	0	78	
KAUK	2007	306	1	1	11/28/06	15.16	0	1	5	0.1402	0.01	4	0	0	74	
KAUK	2007	306	1	1	11/29/06	15.20	0	1	6	0.098	0	4	0	0	72	
KAUK	2007	306	1	1	11/30/06	15.23	0	S	6	0.0755	0.56	4	0	0	84	
KAUK	2007	306	1	1	12/1/06	15.26	0	1	S	0.1261	0.14	4	0	0	84	
KAUK	2007	306	1	1	12/2/06	15.30	0	1	2	0.0521	0.05	4	0	0	84	
KAUK	2007	306	1	1	12/3/06	15.33	0	S	2	0.0521	5.5	4	0	0	100	
KAUK	2007	306	1	1	12/4/06	15.36	0	1	S	0.1694	0.03	4	0	0	96	RD
KAUK	2007	306	1	1	12/5/06	15.39	0	1	2	0.1694	0	4	0	0	92	RD
KAUK	2007	306	1	1	12/6/06	15.43	0	1	3	0.1347	0	4	0	0	88	RD
KAUK	2007	306	1	1	12/7/06	15.46	0	1	4	0.1594	0.06	4	0	0	85	RD
KAUK	2007	306	1	1	12/8/06	15.49	0	1	5	0.2386	0	4	0	0	79	RD
KAUK	2007	306	1	1	12/9/06	15.53	16	S	5	0.1681	0	4	0.432	0	85	I
KAUK	2007	306	1	1	12/10/06	15.56	24	2	5	0.1621	0	4	0.648	0	98	I
KAUK	2007	306	1	1	12/11/06	15.59	24	3	5	0.1554	0	4	0.648	0	100	I
KAUK	2007	306	1	1	12/12/06	15.63	21	4	5	0.1435	0	4	0.567	0	100	I
KAUK	2007	306	1	1	12/13/06	15.66	24	5	5	0.1522	0	4	0.648	0	100	I
KAUK	2007	306	1	1	12/14/06	15.69	6	5	S	0.1508	0	4	0.162	0	100	
KAUK	2007	306	1	1	12/15/06	15.72	0	5	2	0.2096	0	4	0	0	94	
KAUK	2007	306	1	1	12/16/06	15.76	0	5	3	0.1609	0.06	4	0	0	92	
KAUK	2007	306	1	1	12/17/06	15.79	0	5	4	0.1699	0.05	4	0	0	89	

F306: Kauhikoa Ditch

Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
KAUK	2007	306	1	1	12/18/06	15.82	0	5	5	0.1862	0	4	0	0	84	
KAUK	2007	306	1	1	12/19/06	15.86	0	5	6	0.171	0	4	0	0	79	RD
KAUK	2007	306	1	1	12/20/06	15.89	0	5	7	0.1578	0	4	0	0	75	RD
KAUK	2007	306	1	1	12/21/06	15.92	0	5	8	0.1367	0	4	0	0	71	RD
KAUK	2007	306	1	1	12/22/06	15.95	0	5	9	0.1206	0	4	0	0	68	
KAUK	2007	306	1	1	12/23/06	15.99	0	5	10	0.1602	0	4	0	0	64	
KAUK	2007	306	1	1	12/24/06	16.02	0	5	11	0.1361	0	4	0	0	60	
KAUK	2007	306	1	1	12/25/06	16.05	0	5	12	0.1238	0	4	0	0	57	
KAUK	2007	306	1	1	12/26/06	16.09	0	5	13	0.1534	0.04	4	0	0	55	
KAUK	2007	306	1	1	12/27/06	16.12	0	5	14	0.1572	0	4	0	0	51	
KAUK	2007	306	1	1	12/28/06	16.15	0	5	15	0.1087	0	4	0	0	48	WS
KAUK	2007	306	1	1	12/29/06	16.18	0	S	15	0.131	0.3	4	0	0	52	
KAUK	2007	306	1	1	12/30/06	16.22	0	1	S	0.168	0	4	0	0	48	WS
KAUK	2007	306	1	1	12/31/06	16.25	0	1	2	0.1473	0	4	0	0	44	WS
KAUK	2007	306	1	1	1/1/07	16.28	0	1	3	0.1473	0	4	0	0	40	?
KAUK	2007	306	1	1	1/2/07	16.32	0	1	4	0.114	0	4	0	0	38	WS
KAUK	2007	306	1	1	1/3/07	16.35	0	1	5	0.1873	0	4	0	0	33	WS
KAUK	2007	306	1	1	1/4/07	16.38	0	1	6	0.1443	0.15	4	0	0	33	WS
KAUK	2007	306	1	1	1/5/07	16.41	0	1	7	0.1392	0	4	0	0	30	WS
KAUK	2007	306	1	1	1/6/07	16.45	0	1	8	0.1501	0	4	0	0	26	I
KAUK	2007	306	1	1	1/7/07	16.48	22	S	8	0.0882	0	4	0.594	0	38	I
KAUK	2007	306	1	1	1/8/07	16.51	24	2	8	0.0762	0	4	0.648	0	53	I
KAUK	2007	306	1	1	1/9/07	16.55	24	3	8	0.1239	0	4	0.648	0	66	
KAUK	2007	306	1	1	1/10/07	16.58	0	3	S	0.0985	0.03	4	0	0	64	
KAUK	2007	306	1	1	1/11/07	16.61	0	3	2	0.1284	0	4	0	0	61	
KAUK	2007	306	1	1	1/12/07	16.64	0	3	3	0.1584	0	4	0	0	57	
KAUK	2007	306	1	1	1/13/07	16.68	0	3	4	0.1964	0	4	0	0	52	
KAUK	2007	306	1	1	1/14/07	16.71	0	3	5	0.1523	0	4	0	0	47	?
KAUK	2007	306	1	1	1/15/07	16.74	0	3	6	0.15	0	4	0	0	44	I
KAUK	2007	306	1	1	1/16/07	16.78	22	S	6	0.15	0.01	4	0.594	0	55	I
KAUK	2007	306	1	1	1/17/07	16.81	24	2	6	0.16	0	4	0.648	0	67	
KAUK	2007	306	1	1	1/18/07	16.84	0	2	S	0.2	0	4	0	0	62	
KAUK	2007	306	1	1	1/19/07	16.88	0	2	2	0.19	0	4	0	0	57	
KAUK	2007	306	1	1	1/20/07	16.91	0	2	3	0.15	0	4	0	0	54	
KAUK	2007	306	1	1	1/21/07	16.94	0	2	4	0.14	0	4	0	0	50	
KAUK	2007	306	1	1	1/22/07	16.97	0	2	5	0.14	0	4	0	0	47	WS
KAUK	2007	306	1	1	1/23/07	17.01	0	2	6	0.19	0	4	0	0	42	WS

F306: Kauhikoa Ditch

Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
KAUK	2007	306	1	1	1/24/07	17.04	0	2	7	0.17	0	4	0	0	38	WS
KAUK	2007	306	1	1	1/25/07	17.07	0	2	8	0.18	0	4	0	0	33	WS
KAUK	2007	306	1	1	1/26/07	17.11	0	2	9	0.19	0	4	0	0	28	WS
KAUK	2007	306	1	1	1/27/07	17.14	0	2	10	0.17	0	4	0	0	24	WS
KAUK	2007	306	1	1	1/28/07	17.17	0	2	11	0.2	0	4	0	0	19	WS
KAUK	2007	306	1	1	1/29/07	17.20	0	2	12	0.2	0	4	0	0	14	WS
KAUK	2007	306	1	1	1/30/07	17.24	0	S	12	0.1632	0.36	4	0	0	19	WS
KAUK	2007	306	1	1	1/31/07	17.27	0	1	S	0.18	0	4	0	0	14	WS
KAUK	2007	306	1	1	2/1/07	17.30	0	S	1	0.11	0.52	4	0	0	25	WS
KAUK	2007	306	1	1	2/2/07	17.34	0	2	1	0.15	0.36	4	0	0	30	WS
KAUK	2007	306	1	1	2/3/07	17.37	0	2	S	0.18	0	4	0	0	26	WS
KAUK	2007	306	1	1	2/4/07	17.40	0	2	2	0.16	0	4	0	0	22	I
KAUK	2007	306	1	1	2/5/07	17.43	22	S	2	0.16	0	4	0.594	0	32	I
KAUK	2007	306	1	1	2/6/07	17.47	6	1	S	0.16	0	4	0.162	0	32	WS
KAUK	2007	306	1	1	2/7/07	17.50	0	1	2	0.19	0	4	0	0	28	WS
KAUK	2007	306	1	1	2/8/07	17.53	0	S	2	0.1	0.45	4	0	0	36	WS
KAUK	2007	306	1	1	2/9/07	17.57	0	1	S	0.1	0.03	4	0	0	35	WS
KAUK	2007	306	1	1	2/10/07	17.60	0	1	2	0.19	0.03	4	0	0	31	WS
KAUK	2007	306	1	1	2/11/07	17.63	0	1	3	0.22	0.08	4	0	0	27	WS
KAUK	2007	306	1	1	2/12/07	17.66	0	1	4	0.22	0	4	0	0	22	WS
KAUK	2007	306	1	1	2/13/07	17.70	0	1	5	0.18	0	4	0	0	17	?
KAUK	2007	306	1	1	2/14/07	17.73	0	1	6	0.17	0	4	0	0	13	?
KAUK	2007	306	1	1	2/15/07	17.76	22	S	6	0.14	0	4	0.594	0	24	I
KAUK	2007	306	1	1	2/16/07	17.80	24	2	6	0.14	0.1	4	0.648	0	39	I
KAUK	2007	306	1	1	2/17/07	17.83	0	3	6	0.24	0.62	4	0	0	49	?
KAUK	2007	306	1	1	2/18/07	17.86	24	4	6	0.24	0.16	4	0.648	0	63	I
KAUK	2007	306	1	1	2/19/07	17.89	24	5	6	0.28	0.03	4	0.648	0	73	I
KAUK	2007	306	1	1	2/20/07	17.93	24	6	6	0.26	0.03	4	0.648	0	84	
KAUK	2007	306	1	1	2/21/07	17.96	0	6	S	0.24	0.06	4	0	0	79	
KAUK	2007	306	1	1	2/22/07	17.99	0	6	2	0.19	0.03	4	0	0	75	
KAUK	2007	306	1	1	2/23/07	18.03	0	6	3	0.15	0	4	0	0	71	
KAUK	2007	306	1	1	2/24/07	18.06	0	S	3	0.16	0.2	4	0	0	72	
KAUK	2007	306	1	1	2/25/07	18.09	0	1	S	0.18	0	4	0	0	68	
KAUK	2007	306	1	1	2/26/07	18.13	0	1	2	0.17	0	4	0	0	64	I
KAUK	2007	306	1	1	2/27/07	18.16	22	S	2	0.17	0	4	0.594	0	74	I
KAUK	2007	306	1	1	2/28/07	18.19	24	2	2	0.21	0	4	0.648	0	85	I
KAUK	2007	306	1	1	3/1/07	18.22	24	3	2	0.24	0	4	0.648		95	RIPE

F306: Kauhikoa Ditch
Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
KAUK	2007	306	1	1	3/2/07	18.26	0	3	S	0.18	0	4	0		91	RIPE
KAUK	2007	306	1	1	3/3/07	18.29	0	3	2	0.18	0	4	0		86	RIPE
KAUK	2007	306	1	1	3/4/07	18.32	0	3	3	0.15	0.04	4	0		84	RIPE
KAUK	2007	306	1	1	3/5/07	18.36	0	3	4	0.21	0	4	0		78	RIPE
KAUK	2007	306	1	1	3/6/07	18.39	0	3	5	0.19	0	4	0		74	RIPE
KAUK	2007	306	1	1	3/7/07	18.42	0	3	6	0.17	0	4	0		69	RIPE
KAUK	2007	306	1	1	3/8/07	18.45	0	3	7	0.18	0	4	0		65	RIPE
KAUK	2007	306	1	1	3/9/07	18.49	0	3	8	0.25	0	4	0		59	RIPE
KAUK	2007	306	1	1	3/10/07	18.52	0	S	8	0.09	0.8	4	0		76	RIPE
KAUK	2007	306	1	1	3/11/07	18.55	0	2	8	0.16	0.3	4	0		80	RIPE
KAUK	2007	306	1	1	3/12/07	18.59	0	2	S	0.14	0	4	0		76	RIPE
KAUK	2007	306	1	1	3/13/07	18.62	0	2	2	0.07	0	4	0		75	RIPE
KAUK	2007	306	1	1	3/14/07	18.65	0	2	3	0.1	0.16	4	0		76	RIPE
KAUK	2007	306	1	1	3/15/07	18.68	0	S	3	0.16	1.1	4	0		100	RIPE
KAUK	2007	306	1	1	3/16/07	18.72	0	2	3	0.21	0.22	4	0		100	RIPE
KAUK	2007	306	1	1	3/17/07	18.75	0	2	S	0.3	0.14	4	0		96	RIPE
KAUK	2007	306	1	1	3/18/07	18.78	0	S	1	0.19	0.66	4	0		100	RIPE
KAUK	2007	306	1	1	3/19/07	18.82	0	2	1	0.32	0.54	4	0		100	RIPE
KAUK	2007	306	1	1	3/20/07	18.85	0	2	S	0.24	0.18	4	0		98	RIPE
KAUK	2007	306	1	1	3/21/07	18.88	0	2	2	0.29	0.03	4	0		92	RIPE
KAUK	2007	306	1	1	3/22/07	18.91	0	2	3	0.2	0	4	0		87	RIPE
KAUK	2007	306	1	1	3/23/07	18.95	0	2	4	0.2	0	4	0		82	RIPE
KAUK	2007	306	1	1	3/24/07	18.98	0	2	5	0.29	0	4	0		75	RIPE
KAUK	2007	306	1	1	3/25/07	19.01	0	2	6	0.31	0	4	0		67	RIPE
KAUK	2007	306	1	1	3/26/07	19.05	0	2	7	0.16	0	4	0		63	RIPE
KAUK	2007	306	1	1	3/27/07	19.08	0	2	8	0.18	0	4	0		58	RIPE
KAUK	2007	306	1	1	3/28/07	19.11	0	2	9	0.21	0	4	0		53	RIPE
KAUK	2007	306	1	1	3/29/07	19.14	0	2	10	0.17	0	4	0		49	RIPE
KAUK	2007	306	1	1	3/30/07	19.18	0	2	11	0.2	0	4	0		44	RIPE
KAUK	2007	306	1	1	3/31/07	19.21	0	2	12	0.23	0	4	0		38	RIPE
KAUK	2007	306	1	1	4/1/07	19.24	0	2	13	0.19	0	4	0		34	RIPE
KAUK	2007	306	1	1	4/2/07	19.28	0	2	14	0.21	0.09	4	0		30	RIPE
KAUK	2007	306	1	1	4/3/07	19.31	0	2	15	0.28	0	4	0		25	IOMR
KAUK	2007	306	1	1	4/4/07	19.34	22	S	15	0.23	0	4	0.594		34	RIPE
KAUK	2007	306	1	1	4/5/07	19.38	0	1	S	0.26	0	4	0		28	RIPE
KAUK	2007	306	1	1	4/6/07	19.41	0	1	2	0.2	0	4	0		23	RIPE
KAUK	2007	306	1	1	4/7/07	19.44	0	1	3	0.27	0	4	0		16	RIPE

F306: Kauhikoa Ditch
Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
KAUK	2007	306	1	1	4/8/07	19.47	0	1	4	0.17	0	4	0		12	RIPE
KAUK	2007	306	1	1	4/9/07	19.51	0	1	5	0.14	0	4	0		9	RIPE
KAUK	2007	306	1	1	4/10/07	19.54	0	1	6	0.2	0	4	0		2	RIPE
KAUK	2007	306	1	1	4/11/07	19.57	0	1	7	0.2	0	4	0		0	RIPE
KAUK	2007	306	1	1	4/12/07	19.61	0	1	8	0.15	0	4	0		0	RIPE
KAUK	2007	306	1	1	4/13/07	19.64	0	1	9	0.21	0	4	0		0	RIPE
KAUK	2007	306	1	1	4/14/07	19.67	0	1	10	0.28	0	4	0		0	RIPE
KAUK	2007	306	1	1	4/15/07	19.70	0	1	11	0.29	0	4	0		0	RIPE
KAUK	2007	306	1	1	4/16/07	19.74	0	1	12	0.34	0.03	4	0		0	RIPE
KAUK	2007	306	1	1	4/17/07	19.77	0	1	13	0.31	0.12	4	0		0	RIPE
KAUK	2007	306	1	1	4/18/07	19.80	0	1	14	0.29	0	4	0		0	RIPE
KAUK	2007	306	1	1	4/19/07	19.84	0	1	15	0.35	0.04	4	0		0	IOMR
KAUK	2007	306	1	1	4/20/07	19.87	22	S	15	0.31	0	4	0.594		7	IOMR
KAUK	2007	306	1	1	4/21/07	19.90	24	2	15	0.34	0.05	4	0.648		16	RIPE
KAUK	2007	306	1	1	4/22/07	19.93	0	2	S	0.34	0.04	4	0		9	RIPE
KAUK	2007	306	1	1	4/23/07	19.97	0	2	2	0.24	0.01	4	0		3	RIPE
KAUK	2007	306	1	1	4/24/07	20.00	0	S	2	0.32	0.4	4	0		5	RIPE
KAUK	2007	306	1	1	4/25/07	20.03	0	1	S	0.35	0	4	0		0	RIPE
KAUK	2007	306	1	1	4/26/07	20.07	0	1	2	0.29	0	4	0		0	RIPE
KAUK	2007	306	1	1	4/27/07	20.10	0	1	3	0.31	0	4	0		0	RIPE
KAUK	2007	306	1	1	4/28/07	20.13	0	1	4	0.32	0.03	4	0		0	RIPE
KAUK	2007	306	1	1	4/29/07	20.16	0	1	5	0.34	0	4	0		0	RIPE
KAUK	2007	306	1	1	4/30/07	20.20	0	1	6	0.28	0.07	4	0		0	RIPE
KAUK	2007	306	1	1	5/1/07	20.23	0	1	7	0.34	0	4	0		0	RIPE
KAUK	2007	306	1	1	5/2/07	20.26	0	1	8	0.2267	0	4	0		0	RIPE
KAUK	2007	306	1	1	5/3/07	20.30	0	1	9	0.246	0	4	0		0	RIPE
KAUK	2007	306	1	1	5/4/07	20.33	0	1	10	0.22	0	4	0		0	RIPE
KAUK	2007	306	1	1	5/5/07	20.36	0	1	11	0.19	0	4	0		0	RIPE
KAUK	2007	306	1	1	5/6/07	20.39	0	1	12	0.27	0	4	0		0	RIPE
KAUK	2007	306	1	1	5/7/07	20.43	0	1	13	0.3396	0	4	0		0	RIPE
KAUK	2007	306	1	1	5/8/07	20.46	0	1	14	0.38	0	4	0		0	RIPE
KAUK	2007	306	1	1	5/9/07	20.49	0	1	15	0.34	0	4	0		0	IFNLRD
KAUK	2007	306	1	1	5/10/07	20.53	22	S	15	0.33	0.08	4	0.594		9	IFNLRD
KAUK	2007	306	1	1	5/11/07	20.56	24	2	15	0.2141	0	4	0.648		17	DRY
KAUK	2007	306	1	1	5/12/07	20.59	0	2	S	0.17	0	4	0		13	DRY
KAUK	2007	306	1	1	5/13/07	20.63	0	2	2	0.17	0	4	0		6	DRY
KAUK	2007	306	1	1	5/14/07	20.66	0	2	3	0.195	0	4	0		0	DRY

F306: Kauhikoa Ditch
Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
KAUK	2007	306	1	1	5/15/07	20.69	0	2	4	0.2265	0	4	0		0	DRY
KAUK	2007	306	1	1	5/16/07	20.72	0	2	5	0.28	0	4	0		0	DRY
KAUK	2007	306	1	1	5/17/07	20.76	0	2	6	0.25	0	4	0		0	DRY
KAUK	2007	306	1	1	5/18/07	20.79	0	2	7	0.16	0	4	0		0	DRY
KAUK	2007	306	1	1	5/19/07	20.82	0	2	8	0.2333	0	4	0		0	DRY
KAUK	2007	306	1	1	5/20/07	20.86	0	2	9	0.24	0	4	0		0	DRY
KAUK	2007	306	1	1	5/21/07	20.89	0	2	10	0.19	0	4	0		0	DRY
KAUK	2007	306	1	1	5/22/07	20.92	0	2	11	0.2597	0	4	0		0	DRY
KAUK	2007	306	1	1	5/23/07	20.95	0	2	12	0.2747	0	4	0		0	DRY
KAUK	2007	306	1	1	5/24/07	20.99	0	2	13	0.3	0	4	0		0	DRY
KAUK	2007	306	1	1	5/25/07	21.02	0	2	14	0.34	0	4	0		0	DRY
KAUK	2007	306	1	1	5/26/07	21.05	0	2	15	0.3825	0	4	0		0	DRY
KAUK	2007	306	1	1	5/27/07	21.09	0	2	16	0.3092	0	4	0		0	DRY
KAUK	2007	306	1	1	5/28/07	21.12	0	2	17	0.27	0	4	0		0	DRY
KAUK	2007	306	1	1	5/29/07	21.15	0	2	18	0.32	0	4	0		0	DRY
KAUK	2007	306	1	1	5/30/07	21.18	0	2	19	0.26	0	4	0		0	DRY
KAUK	2007	306	1	1	5/31/07	21.22	0	2	20	0.23	0	4	0		0	DRY
KAUK	2007	306	1	1	6/1/07	21.25	0	2	21	0.24	0	4	0		0	DRY
KAUK	2007	306	1	1	6/2/07	21.28	0	2	22	0.23	0	4	0		0	DRY
KAUK	2007	306	1	1	6/3/07	21.32	0	2	23	0.33	0	4	0		0	DRY
KAUK	2007	306	1	1	6/4/07	21.35	0	2	24	0.31	0	4	0		0	DRY
KAUK	2007	306	1	1	6/5/07	21.38	0	2	25	0.18	0	4	0		0	DRY
KAUK	2007	306	1	1	6/6/07	21.41	0	2	26	0.21	0	4	0		0	DRY
KAUK	2007	306	1	1	6/7/07	21.45	0	2	27	0.2894	0	4	0		0	DRY
KAUK	2007	306	1	1	6/8/07	21.48	0	2	28	0.186	0.02	4	0		0	DRY
KAUK	2007	306	1	1	6/9/07	21.51	0	2	29	0.21	0.01	4	0		0	DRY
KAUK	2007	306	1	1	6/10/07	21.55	0	2	30	0.28	0	4	0		0	DRY
KAUK	2007	306	1	1	6/11/07	21.58	0	2	31	0.2844	0	4	0		0	DRY
KAUK	2007	306	1	1	6/12/07	21.61	0	2	32	0.2733	0	4	0		0	DRY
KAUK	2007	306	1	1	6/13/07	21.64	0	2	33	0.26	0	4	0		0	DRY
KAUK	2007	306	1	1	6/14/07	21.68	0	2	34	0.15	0	4	0		0	DRY
KAUK	2007	306	1	1	6/15/07	21.71	0	2	35	0.27	0	4	0		0	DRY
KAUK	2007	306	1	1	6/16/07	21.74	0	2	36	0.2491	0	4	0		0	DRY
KAUK	2007	306	1	1	6/17/07	21.78	0	2	37	0.19	0	4	0		0	DRY
KAUK	2007	306	1	1	6/18/07	21.81	0	2	38	0.2355	0	4	0		0	DRY
KAUK	2007	306	1	1	6/19/07	21.84	0	2	39	0.3238	0	4	0		0	DRY
KAUK	2007	306	1	1	6/20/07	21.88	0	2	40	0.2595	0	4	0		0	DRY

F306: Kauhikoa Ditch
Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
KAUK	2007	306	1	1	6/21/07	21.91	0	2	41	0.2906	0	4	0		0	DRY
KAUK	2007	306	1	1	6/22/07	21.94	0	2	42	0.2995	0	4	0		0	DRY
KAUK	2007	306	1	1	6/23/07	21.97	0	2	43	0.34	0	4	0		0	DRY
KAUK	2007	306	1	1	6/24/07	22.01	0	2	44	0.36	0	4	0		0	DRY
KAUK	2007	306	1	1	6/25/07	22.04	0	2	45	0.31	0	4	0		0	DRY
KAUK	2007	306	1	1	6/26/07	22.07	0	2	46	0.2592	0	4	0		0	DRY
KAUK	2007	306	1	1	6/27/07	22.11	0	2	47	0.39	0	4	0		0	DRY
KAUK	2007	306	1	1	6/28/07	22.14	0	2	48	0.33	0	4	0		0	DRY
KAUK	2007	306	1	1	6/29/07	22.17	0	2	49	0.3624	0.01	4	0		0	DRY
KAUK	2007	306	1	1	6/30/07	22.20	0	2	50	0.3449	0	4	0		0	DRY
KAUK	2007	306	1	1	7/1/07	22.24	0	2	51	0.34	0	4	0		0	DRY
KAUK	2007	306	1	1	7/2/07	22.27	0	2	52	0.2446	0	4	0		0	DRY
KAUK	2007	306	1	1	7/3/07	22.30	0	2	53	0.2319	0	4	0		0	DRY
KAUK	2007	306	1	1	7/4/07	22.34	0	2	54	0.2349	0	4	0		0	DRY
KAUK	2007	306	1	1	7/5/07	22.37	0	2	55	0.3131	0	4	0		0	DRY
KAUK	2007	306	1	1	7/6/07	22.40	0	2	56	0.3059	0	4	0		0	DRY
KAUK	2007	306	1	1	7/7/07	22.43	0	2	57	0.3086	0	4	0		0	DRY
KAUK	2007	306	1	1	7/8/07	22.47	0	2	58	0.3447	0	4	0		0	DRY
KAUK	2007	306	1	1	7/9/07	22.50	0	2	59	0.3393	0	4	0		0	END
										133.2626	47.31*		93.474	19.6813		

**** Actual Rainfall total not fully useable by the plant as irrigation. Please see cover memo for explanation of "Effective Rainfall"***

F306: Kauhikoa Ditch
Crop Cycle: 2007-2009(2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
KAUK	2009	306	1	1	9/17/07	0.00	6	S	S	0.09324	0	0.999	0.162	0	6	IPLT
KAUK	2009	306	1	1	9/18/07	0.03	12	S	1	0.09324	0.1	0.999	0.324	0	40	IPLT
KAUK	2009	306	1	1	9/19/07	0.07	22	2	1	0.11322	0.02	0.999	0.594	0	90	IPLT
KAUK	2009	306	1	1	9/20/07	0.10	22	3	1	0.07659	0	0.999	0.594	0	100	IPLT
KAUK	2009	306	1	1	9/21/07	0.13	24	4	1	0.05994	0	0.999	0.648	0	100	IPLT
KAUK	2009	306	1	1	9/22/07	0.16	24	5	1	0.06993	0	0.999	0.648	0	100	PLT WC
KAUK	2009	306	1	1	9/23/07	0.20	0	5	S	0.09657	0	0.999	0	0	90	PLT WC
KAUK	2009	306	1	1	9/24/07	0.23	0	5	2	0.07659	0	0.999	0	0	82	PLT WC
KAUK	2009	306	1	1	9/25/07	0.26	0	5	3	0.04662	0	0.999	0	0	77	PLT WC
KAUK	2009	306	1	1	9/26/07	0.30	0	S	3	0.09324	0.24	0.999	0	0	92	IPLT
KAUK	2009	306	1	1	9/27/07	0.33	22	2	3	0.05661	0	0.999	0.594	0	100	IPLT
KAUK	2009	306	1	1	9/28/07	0.36	24	3	3	0.05994	0	0.999	0.648	0	100	IPLT
KAUK	2009	306	1	1	9/29/07	0.39	24	4	3	0.04662	0	0.999	0.648	0	100	IPLT
KAUK	2009	306	1	1	9/30/07	0.43	24	5	3	0.07992	0	0.999	0.648	0	100	IPLT
KAUK	2009	306	1	1	10/1/07	0.46	24	6	3	0.07659	0.07	0.999	0.648	0	100	IPLT
KAUK	2009	306	1	1	10/2/07	0.49	24	7	3	0.08658	0.12	0.999	0.648	0	100	IPLT
KAUK	2009	306	1	1	10/3/07	0.53	24	8	3	0.06993	0.02	0.999	0.648	0	100	IPLT
KAUK	2009	306	1	1	10/4/07	0.56	24	9	3	0.07659	0.05	0.999	0.648	0	100	IPLT F
KAUK	2009	306	1	1	10/5/07	0.59	24	10	3	0.08991	0	0.999	0.648	0	100	PLT
KAUK	2009	306	1	1	10/6/07	0.63	0	10	S	0.08325	0.01	0.999	0	0	92	PLT
KAUK	2009	306	1	1	10/7/07	0.66	0	S	1	0.0999	0.22	0.999	0	0	100	PLT
KAUK	2009	306	1	1	10/8/07	0.69	0	1	S	0.06327	0.02	0.999	0	0	95	PLT
KAUK	2009	306	1	1	10/9/07	0.72	0	1	2	0.09324	0.04	0.999	0	0	90	IPLT
KAUK	2009	306	1	1	10/10/07	0.76	16	S	2	0.08991	0	0.999	0.432	0	100	IPLT
KAUK	2009	306	1	1	10/11/07	0.79	24	2	2	0.08658	0	0.999	0.648	0	100	IPLT
KAUK	2009	306	1	1	10/12/07	0.82	24	3	2	0.08325	0	0.999	0.648	0	100	I-F
KAUK	2009	306	1	1	10/13/07	0.86	6	3	S	0.07992	0	0.999	0.162	0	100	
KAUK	2009	306	1	1	10/14/07	0.89	0	3	2	0.07992	0	0.999	0	0	92	
KAUK	2009	306	1	1	10/15/07	0.92	0	3	3	0.07992	0.02	0.999	0	0	86	
KAUK	2009	306	1	1	10/16/07	0.95	0	3	4	0.05994	0	0.999	0	0	80	
KAUK	2009	306	1	1	10/17/07	0.99	0	3	5	0.04995	0	0.999	0	0	75	
KAUK	2009	306	1	1	10/18/07	1.02	0	3	6	0.06327	0	0.999	0	0	68	PLT
KAUK	2009	306	1	1	10/19/07	1.05	0	3	7	0.0666	0	0.999	0	0	62	IPLT
KAUK	2009	306	1	1	10/20/07	1.09	22	S	7	0.06327	0	0.999	0.594	0	100	IPLT
KAUK	2009	306	1	1	10/21/07	1.12	24	2	7	0.05994	0	0.999	0.648	0	100	
KAUK	2009	306	1	1	10/22/07	1.15	0	2	S	0.08658	0	0.999	0	0	91	
KAUK	2009	306	1	1	10/23/07	1.18	0	2	2	0.07992	0	0.999	0	0	83	

F306: Kauhikoa Ditch
Crop Cycle: 2007-2009(2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
KAUK	2009	306	1	1	10/24/07	1.22	0	2	3	0.10323	0	0.999	0	0	73	I
KAUK	2009	306	1	1	10/25/07	1.25	22	S	3	0.08991	0.03	0.999	0.594	0	100	I
KAUK	2009	306	1	1	10/26/07	1.28	24	2	3	0.09657	0	0.999	0.648	0	100	IF
KAUK	2009	306	1	1	10/27/07	1.32	6	2	S	0.08991	0.02	0.999	0.162	0	100	
KAUK	2009	306	1	1	10/28/07	1.35	0	S	1	0.08658	0.22	0.999	0	0	100	
KAUK	2009	306	1	1	10/29/07	1.38	0	1	S	0.0999	0.15	0.999	0	0	100	
KAUK	2009	306	1	1	10/30/07	1.41	0	1	2	0.11322	0	0.999	0	0	88	
KAUK	2009	306	1	1	10/31/07	1.45	0	1	3	0.09657	0	0.999	0	0	78	
KAUK	2009	306	1	1	11/1/07	1.48	0	S	3	0.04995	0.2	0.999	0	0	94	
KAUK	2009	306	1	1	11/2/07	1.51	0	1	S	0.05661	0	0.999	0	0	88	SC
KAUK	2009	306	1	1	11/3/07	1.55	0	1	2	0.04995	0	0.999	0	0	83	
KAUK	2009	306	1	1	11/4/07	1.58	0	1	3	0.02331	0	0.999	0	0	81	
KAUK	2009	306	1	1	11/5/07	1.61	0	S	3	0.05994	0.58	0.999	0	0	100	
KAUK	2009	306	1	1	11/6/07	1.64	0	1	S	0.04662	0	0.999	0	0	95	
KAUK	2009	306	1	1	11/7/07	1.68	0	1	2	0.05661	0	0.999	0	0	89	
KAUK	2009	306	1	1	11/8/07	1.71	0	1	3	0.04329	0	0.999	0	0	85	
KAUK	2009	306	1	1	11/9/07	1.74	0	1	4	0.07326	0	0.999	0	0	77	IF
KAUK	2009	306	1	1	11/10/07	1.78	22	S	4	0.06993	0	0.999	0.594	0	100	
KAUK	2009	306	1	1	11/11/07	1.81	0	1	S	0.06327	0	0.999	0	0	93	
KAUK	2009	306	1	1	11/12/07	1.84	0	1	2	0.06327	0	0.999	0	0	87	
KAUK	2009	306	1	1	11/13/07	1.88	0	1	3	0.05994	0	0.999	0	0	81	
KAUK	2009	306	1	1	11/14/07	1.91	0	1	4	0.05661	0	0.999	0	0	75	
KAUK	2009	306	1	1	11/15/07	1.94	0	1	5	0.06993	0	0.999	0	0	68	
KAUK	2009	306	1	1	11/16/07	1.97	0	1	6	0.05994	0	0.999	0	0	62	WC
KAUK	2009	306	1	1	11/17/07	2.01	0	1	7	0.07687	0	1.002657	0	0	54	WC
KAUK	2009	306	1	1	11/18/07	2.04	0	1	8	0.081528	0	1.019094	0	0	45	WC
KAUK	2009	306	1	1	11/19/07	2.07	0	1	9	0.075939	0.01	1.035531	0	0	38	WC
KAUK	2009	306	1	1	11/20/07	2.11	0	S	9	0.059612	0.35	1.051968	0	0	65	WC
KAUK	2009	306	1	1	11/21/07	2.14	0	2	9	0.064104	0.2	1.068405	0	0	77	WC
KAUK	2009	306	1	1	11/22/07	2.17	0	3	9	0.079555	0.48	1.084842	0	0	100	
KAUK	2009	306	1	1	11/23/07	2.20	0	3	S	0.091773	0.1	1.101279	0	0	99	
KAUK	2009	306	1	1	11/24/07	2.24	0	3	2	0.126674	0.06	1.117716	0	0	91	I
KAUK	2009	306	1	1	11/25/07	2.27	20	S	2	0.07183	0	1.134153	0.54	0	100	I
KAUK	2009	306	1	1	11/26/07	2.30	24	2	2	0.061365	0	1.15059	0.648	0	100	
KAUK	2009	306	1	1	11/27/07	2.34	0	2	S	0.066132	0	1.167027	0	0	92	
KAUK	2009	306	1	1	11/28/07	2.37	0	2	2	0.019724	0	1.183464	0	0	89	
KAUK	2009	306	1	1	11/29/07	2.40	0	S	2	0.063995	0.85	1.199901	0	0	100	

F306: Kauhikoa Ditch
Crop Cycle: 2007-2009(2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
KAUK	2009	306	1	1	11/30/07	2.43	0	1	S	0.048654	0	1.216338	0	0	94	
KAUK	2009	306	1	1	12/1/07	2.47	0	1	2	0.065748	0.03	1.232775	0	0	90	
KAUK	2009	306	1	1	12/2/07	2.50	0	1	3	0.091609	0.03	1.249212	0	0	84	
KAUK	2009	306	1	1	12/3/07	2.53	0	S	3	0.059064	0.76	1.265649	0	0	100	
KAUK	2009	306	1	1	12/4/07	2.57	0	2	3	0.192313	0.9	1.282086	0	0	100	
KAUK	2009	306	1	1	12/5/07	2.60	0	2	S	0.073323	0.14	1.298523	0	0	100	
KAUK	2009	306	1	1	12/6/07	2.63	0	S	1	0.035066	2.8	1.31496	0	0	100	
KAUK	2009	306	1	1	12/7/07	2.66	0	1	S	0.053256	0.18	1.331397	0	0	100	
KAUK	2009	306	1	1	12/8/07	2.70	0	S	1	0.049421	1	1.347834	0	0	100	
KAUK	2009	306	1	1	12/9/07	2.73	0	1	S	0.054571	0.01	1.364271	0	0	95	
KAUK	2009	306	1	1	12/10/07	2.76	0	1	2	0.046024	0	1.380708	0	0	91	
KAUK	2009	306	1	1	12/11/07	2.80	0	1	3	0.093143	0	1.397145	0	0	83	
KAUK	2009	306	1	1	12/12/07	2.83	0	1	4	0.094239	0	1.413582	0	0	75	
KAUK	2009	306	1	1	12/13/07	2.86	0	1	5	0.061967	0.14	1.430019	0	0	80	
KAUK	2009	306	1	1	12/14/07	2.89	0	S	5	0.067501	0.42	1.446456	0	0	100	
KAUK	2009	306	1	1	12/15/07	2.93	0	2	5	0.078021	0.36	1.462893	0	0	100	
KAUK	2009	306	1	1	12/16/07	2.96	0	3	5	0.078898	0.42	1.47933	0	0	100	
KAUK	2009	306	1	1	12/17/07	2.99	0	4	5	0.08476	0.46	1.495767	0	0	100	
KAUK	2009	306	1	1	12/18/07	3.03	0	4	S	0.105854	0.08	1.512204	0	0	97	
KAUK	2009	306	1	1	12/19/07	3.06	0	4	2	0.091718	0.02	1.528641	0	0	91	
KAUK	2009	306	1	1	12/20/07	3.09	0	4	3	0.077254	0	1.545078	0	0	85	
KAUK	2009	306	1	1	12/21/07	3.13	0	4	4	0.083281	0.01	1.561515	0	0	79	
KAUK	2009	306	1	1	12/22/07	3.16	0	4	5	0.063118	0	1.577952	0	0	75	I
KAUK	2009	306	1	1	12/23/07	3.19	22	S	5	0.074405	0	1.594389	0.594	0	100	IF
KAUK	2009	306	1	1	12/24/07	3.22	6	1	S	0.075172	0.03	1.610826	0.162	0	100	
KAUK	2009	306	1	1	12/25/07	3.26	0	1	2	0.081363	0.07	1.627263	0	0	98	
KAUK	2009	306	1	1	12/26/07	3.29	0	1	3	0.092814	0.02	1.6437	0	0	92	
KAUK	2009	306	1	1	12/27/07	3.32	0	1	4	0.093742	0.03	1.660137	0	0	88	
KAUK	2009	306	1	1	12/28/07	3.36	0	1	5	0.094671	0.04	1.676574	0	0	83	I
KAUK	2009	306	1	1	12/29/07	3.39	22	S	5	0.095599	0	1.693011	0.594	0	100	I
KAUK	2009	306	1	1	12/30/07	3.42	24	2	5	0.096527	0	1.709448	0.648	0	100	I
KAUK	2009	306	1	1	12/31/07	3.45	22	3	5	0.097455	0.01	1.725885	0.594	0	100	I
KAUK	2009	306	1	1	1/1/08	3.49	6	4	5	0.034846	0.46	1.742322	0.162	0	100	
KAUK	2009	306	1	1	1/2/08	3.52	0	4	S	0.095676	0.16	1.758759	0	0	100	
KAUK	2009	306	1	1	1/3/08	3.55	0	4	2	0.096571	0.18	1.775196	0	0	100	
KAUK	2009	306	1	1	1/4/08	3.59	0	4	3	0.097465	0.02	1.791633	0	0	94	
KAUK	2009	306	1	1	1/5/08	3.62	0	4	4	0.098359	0	1.80807	0	0	88	

F306: Kauhikoa Ditch
Crop Cycle: 2007-2009(2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
KAUK	2009	306	1	1	1/6/08	3.65	0	4	5	0.099253	0	1.824507	0	0	82	
KAUK	2009	306	1	1	1/7/08	3.68	0	4	6	0.100147	0	1.840944	0	0	76	I
KAUK	2009	306	1	1	1/8/08	3.72	22	S	6	0.101042	0	1.857381	0.594	0	100	I
KAUK	2009	306	1	1	1/9/08	3.75	24	2	6	0.101936	0	1.873818	0.648	0	100	
KAUK	2009	306	1	1	1/10/08	3.78	0	2	S	0.10283	0	1.890255	0	0	93	
KAUK	2009	306	1	1	1/11/08	3.82	0	2	2	0.103724	0	1.906692	0	0	87	
KAUK	2009	306	1	1	1/12/08	3.85	0	2	3	0.104618	0	1.923129	0	0	81	
KAUK	2009	306	1	1	1/13/08	3.88	0	2	4	0.105512	0	1.939566	0	0	75	
KAUK	2009	306	1	1	1/14/08	3.91	0	2	5	0.106407	0	1.956003	0	0	69	
KAUK	2009	306	1	1	1/15/08	3.95	0	2	6	0.107301	0.07	1.97244	0	0	66	
KAUK	2009	306	1	1	1/16/08	3.98	0	2	7	0.108195	0	1.988877	0	0	60	I
KAUK	2009	306	1	1	1/17/08	4.01	22	S	7	0.109089	0	2.005314	0.594	0	84	I
KAUK	2009	306	1	1	1/18/08	4.05	24	2	7	0.109983	0	2.021751	0.648	0	100	IF
KAUK	2009	306	1	1	1/19/08	4.08	6	2	S	0.110877	0	2.038188	0.162	0	100	
KAUK	2009	306	1	1	1/20/08	4.11	0	2	2	0.111772	0.1	2.054625	0	0	98	
KAUK	2009	306	1	1	1/21/08	4.14	0	2	3	0.112666	0	2.071062	0	0	92	
KAUK	2009	306	1	1	1/22/08	4.18	0	2	4	0.11356	0	2.087499	0	0	86	
KAUK	2009	306	1	1	1/23/08	4.21	0	2	5	0.091171	0.02	2.103936	0	0	82	
KAUK	2009	306	1	1	1/24/08	4.24	0	2	6	0.148426	0	2.120373	0	0	74	
KAUK	2009	306	1	1	1/25/08	4.28	0	2	7	0.113963	0	2.13681	0	0	68	
KAUK	2009	306	1	1	1/26/08	4.31	0	S	7	0.129195	0.4	2.153247	0	0	80	
KAUK	2009	306	1	1	1/27/08	4.34	0	1	S	0.122949	0.15	2.169684	0	0	81	I
KAUK	2009	306	1	1	1/28/08	4.38	22	S	1	0.087445	0.12	2.186121	0.594	0	100	I
KAUK	2009	306	1	1	1/29/08	4.41	6	2	1	0.051393	0.4	2.202558	0.162	0	100	
KAUK	2009	306	1	1	1/30/08	4.44	0	3	1	0.06657	1.1	2.218995	0	0	100	
KAUK	2009	306	1	1	1/31/08	4.47	0	4	1	0.067063	0.38	2.235432	0	0	100	
KAUK	2009	306	1	1	2/1/08	4.51	0	5	1	0.037531	0.86	2.251869	0	0	100	
KAUK	2009	306	1	1	2/2/08	4.54	0	6	1	0.045366	0.6	2.268306	0	0	100	
KAUK	2009	306	1	1	2/3/08	4.57	0	7	1	0.076158	0.9	2.284743	0	0	100	
KAUK	2009	306	1	1	2/4/08	4.61	0	7	S	0.084377	0.05	2.30118	0	0	97	
KAUK	2009	306	1	1	2/5/08	4.64	0	7	2	0.061803	0.02	2.317617	0	0	95	
KAUK	2009	306	1	1	2/6/08	4.67	0	7	3	0.062241	0.02	2.334054	0	0	92	
KAUK	2009	306	1	1	2/7/08	4.70	0	7	4	0.09402	0	2.350491	0	0	88	
KAUK	2009	306	1	1	2/8/08	4.74	22	S	4	0.110457	0	2.366928	0.594	0	100	
KAUK	2009	306	1	1	2/9/08	4.77	24	2	4	0.111224	0	2.383365	0.648	0	100	I
KAUK	2009	306	1	1	2/10/08	4.80	24	3	4	0.143988	0	2.399802	0.648	0	100	I
KAUK	2009	306	1	1	2/11/08	4.84	0	3	S	0.112758	0	2.416239	0	0	94	

F306: Kauhikoa Ditch
Crop Cycle: 2007-2009(2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
KAUK	2009	306	1	1	2/12/08	4.87	0	3	2	0.154069	0	2.432676	0	0	87	
KAUK	2009	306	1	1	2/13/08	4.90	0	3	3	0.130619	0	2.449113	0	0	81	
KAUK	2009	306	1	1	2/14/08	4.93	0	3	4	0.147933	0	2.46555	0	0	75	
KAUK	2009	306	1	1	2/15/08	4.97	0	3	5	0.124099	0	2.481987	0	0	69	
KAUK	2009	306	1	1	2/16/08	5.00	0	3	6	0.141577	0	2.498424	0	0	63	I
KAUK	2009	306	1	1	2/17/08	5.03	22	S	6	0.11736	0	2.514861	0.594	0	82	I
KAUK	2009	306	1	1	2/18/08	5.07	24	2	6	0.101252	0	2.531298	0.648	0	100	I
KAUK	2009	306	1	1	2/19/08	5.10	24	3	6	0.169849	0	2.547735	0.648	0	100	
KAUK	2009	306	1	1	2/20/08	5.13	0	3	S	0.162398	0	2.564172	0	0	93	
KAUK	2009	306	1	1	2/21/08	5.16	0	3	2	0.154837	0	2.580609	0	0	86	
KAUK	2009	306	1	1	2/22/08	5.20	0	3	3	0.155823	0	2.597046	0	0	79	
KAUK	2009	306	1	1	2/23/08	5.23	0	3	4	0.148097	0	2.613483	0	0	73	
KAUK	2009	306	1	1	2/24/08	5.26	0	3	5	0.166562	0	2.62992	0	0	66	
KAUK	2009	306	1	1	2/25/08	5.30	0	3	6	0.097033	0	2.646357	0	0	62	
KAUK	2009	306	1	1	2/26/08	5.33	0	3	7	0.159768	0	2.662794	0	0	56	
KAUK	2009	306	1	1	2/27/08	5.36	22	S	7	0.133962	0	2.679231	0.594	0	73	I
KAUK	2009	306	1	1	2/28/08	5.39	24	2	7	0.134783	0	2.695668	0.648	0	91	
KAUK	2009	306	1	1	2/29/08	5.43	0	2	S	0.180807	0	2.712105	0	0	84	
KAUK	2009	306	1	1	3/1/08	5.46	0	2	2	0.163713	0	2.728542	0	0	78	
KAUK	2009	306	1	1	3/2/08	5.49	0	2	3	0.164699	0	2.744979	0	0	71	
KAUK	2009	306	1	1	3/3/08	5.53	0	2	4	0.165685	0	2.761416	0	0	65	
KAUK	2009	306	1	1	3/4/08	5.56	0	2	5	0.18519	0	2.777853	0	0	58	
KAUK	2009	306	1	1	3/5/08	5.59	0	2	6	0.176972	0	2.79429	0	0	51	?
KAUK	2009	306	1	1	3/6/08	5.63	0	2	7	0.196751	0	2.810727	0	0	44	?
KAUK	2009	306	1	1	3/7/08	5.66	0	2	8	0.179054	0	2.827164	0	0	37	
KAUK	2009	306	1	1	3/8/08	5.69	0	2	9	0.180095	0	2.843601	0	0	31	I
KAUK	2009	306	1	1	3/9/08	5.72	22	S	9	0.162069	0	2.860038	0.594	0	45	I
KAUK	2009	306	1	1	3/10/08	5.76	24	2	9	0.134236	0	2.876475	0.648	0	63	
KAUK	2009	306	1	1	3/11/08	5.79	0	2	S	0.173575	0	2.892912	0	0	57	
KAUK	2009	306	1	1	3/12/08	5.82	0	2	2	0.184259	0	2.909349	0	0	50	
KAUK	2009	306	1	1	3/13/08	5.86	0	2	3	0.204805	0	2.925786	0	0	43	
KAUK	2009	306	1	1	3/14/08	5.89	0	2	4	0.166726	0	2.942223	0	0	37	
KAUK	2009	306	1	1	3/15/08	5.92	0	2	5	0.236693	0	2.95866	0	0	29	
KAUK	2009	306	1	1	3/16/08	5.95	0	2	6	0.158672	0	2.975097	0	0	23	WC/3RD BROAD
KAUK	2009	306	1	1	3/17/08	5.99	0	2	7	0.099718	0	2.991534	0	0	20	WC/3RD BROADCAST

F306: Kauhikoa Ditch
Crop Cycle: 2007-2009(2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
KAUK	2009	306	1	1	3/18/08	6.02	0	2	8	0.19	0.17	3	0	0	19	WC/3RD BROAD
KAUK	2009	306	1	1	3/19/08	6.05	0	2	9	0.16	0	3	0	0	14	I
KAUK	2009	306	1	1	3/20/08	6.09	22	S	9	0.13	0	3	0.594	0	29	I
KAUK	2009	306	1	1	3/21/08	6.12	24	2	9	0.15	0	3	0.648	0	46	I-F
KAUK	2009	306	1	1	3/22/08	6.15	6	2	S	0.17	0	3	0.162	0	45	
KAUK	2009	306	1	1	3/23/08	6.18	0	2	2	0.24	0	3	0	0	37	
KAUK	2009	306	1	1	3/24/08	6.22	0	2	3	0.21	0	3	0	0	30	
KAUK	2009	306	1	1	3/25/08	6.25	0	2	4	0.21	0	3	0	0	23	
KAUK	2009	306	1	1	3/26/08	6.28	0	2	5	0.2	0	3	0	0	17	
KAUK	2009	306	1	1	3/27/08	6.32	0	2	6	0.23	0	3	0	0	9	
KAUK	2009	306	1	1	3/28/08	6.35	0	2	7	0.2	0	3	0	0	2	
KAUK	2009	306	1	1	3/29/08	6.38	0	2	8	0.29	0	3	0	0.29	0	WS-0
KAUK	2009	306	1	1	3/30/08	6.41	0	2	9	0.25	0	3	0	0.25	0	WS-1
KAUK	2009	306	1	1	3/31/08	6.45	0	2	10	0.31	0	3	0	0.31	0	WS-2
KAUK	2009	306	1	1	4/1/08	6.48	0	2	11	0.31	0	3	0	0.31	0	SCWS-3
KAUK	2009	306	1	1	4/2/08	6.51	0	2	12	0.19	0.02	3	0	0.19	0	WS-4
KAUK	2009	306	1	1	4/3/08	6.55	0	2	13	0.17	0.05	3	0	0.17	0	WS-5
KAUK	2009	306	1	1	4/4/08	6.58	0	2	14	0.23	0.04	3	0	0.23	0	WS-6
KAUK	2009	306	1	1	4/5/08	6.61	0	2	15	0.28	0	3	0	0.28	0	WS-7
KAUK	2009	306	1	1	4/6/08	6.64	0	2	16	0.23	0	3	0	0.23	0	WS-8
KAUK	2009	306	1	1	4/7/08	6.68	0	S	16	0.25	0.3	3	0	0	1	
KAUK	2009	306	1	1	4/8/08	6.71	0	1	S	0.19	0.04	3	0	0.19	0	WS-0
KAUK	2009	306	1	1	4/9/08	6.74	0	1	2	0.06	0	3	0	0.06	0	I
KAUK	2009	306	1	1	4/10/08	6.78	22	S	2	0.14	0.5	3	0.594	0	31	I
KAUK	2009	306	1	1	4/11/08	6.81	24	2	2	0.17	0	3	0.648	0	47	IF
KAUK	2009	306	1	1	4/12/08	6.84	6	2	S	0.12	0	3	0.162	0	49	
KAUK	2009	306	1	1	4/13/08	6.88	0	2	2	0.34	0	3	0	0	37	
KAUK	2009	306	1	1	4/14/08	6.91	0	2	3	0.24	0	3	0	0	29	
KAUK	2009	306	1	1	4/15/08	6.94	0	2	4	0.21	0	3	0	0	22	
KAUK	2009	306	1	1	4/16/08	6.97	0	2	5	0.25	0	3	0	0	14	
KAUK	2009	306	1	1	4/17/08	7.01	0	2	6	0.16	0	3	0	0	9	
KAUK	2009	306	1	1	4/18/08	7.04	0	2	7	0.17	0	3	0	0	3	
KAUK	2009	306	1	1	4/19/08	7.07	0	2	8	0.2	0	3	0	0.2	0	I
KAUK	2009	306	1	1	4/20/08	7.11	22	S	8	0.25	0	3	0.594	0	11	I
KAUK	2009	306	1	1	4/21/08	7.14	24	2	8	0.27	0	3	0.648	0	24	I
KAUK	2009	306	1	1	4/22/08	7.17	24	3	8	0.25	0	3	0.648	0	37	?

F306: Kauhikoa Ditch
Crop Cycle: 2007-2009(2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
KAUK	2009	306	1	1	4/23/08	7.20	0	3	S	0.23	0	3	0	0	29	
KAUK	2009	306	1	1	4/24/08	7.24	0	3	2	0.17	0	3	0	0	24	
KAUK	2009	306	1	1	4/25/08	7.27	0	3	3	0.25	0	3	0	0	15	
KAUK	2009	306	1	1	4/26/08	7.30	0	3	4	0.24	0	3	0	0	7	
KAUK	2009	306	1	1	4/27/08	7.34	0	3	5	0.23	0	3	0	0.23	0	WS-0
KAUK	2009	306	1	1	4/28/08	7.37	0	3	6	0.2	0	3	0	0.2	0	WS-1
KAUK	2009	306	1	1	4/29/08	7.40	0	3	7	0.13	0	3	0	0.13	0	WS-2
KAUK	2009	306	1	1	4/30/08	7.43	0	3	8	0.26	0	3	0	0.26	0	WS-3
KAUK	2009	306	1	1	5/1/08	7.47	0	3	9	0.29	0	3	0	0.29	0	WS-4
KAUK	2009	306	1	1	5/2/08	7.50	0	3	10	0.23	0	3	0	0.23	0	WS-5
KAUK	2009	306	1	1	5/3/08	7.53	0	3	11	0.19	0	3	0	0.19	0	WS-6
KAUK	2009	306	1	1	5/4/08	7.57	0	3	12	0.2	0	3	0	0.2	0	HD WS-7
KAUK	2009	306	1	1	5/5/08	7.60	0	3	13	0.25	0	3	0	0.25	0	HD WS-8
KAUK	2009	306	1	1	5/6/08	7.63	0	3	14	0.21	0	3	0	0.21	0	HD WS-9
KAUK	2009	306	1	1	5/7/08	7.66	0	3	15	0.28	0	3	0	0.28	0	HD WS-10
KAUK	2009	306	1	1	5/8/08	7.70	0	3	16	0.35	0.03	3	0	0.35	0	HD WS-11
KAUK	2009	306	1	1	5/9/08	7.73	0	3	17	0.32	0	3	0	0.32	0	HD WS-12
KAUK	2009	306	1	1	5/10/08	7.76	0	3	18	0.39	0	3	0	0.39	0	WS-13
KAUK	2009	306	1	1	5/11/08	7.80	0	3	19	0.34	0.04	3	0	0.34	0	WS-14
KAUK	2009	306	1	1	5/12/08	7.83	0	3	20	0.3	0	3	0	0.3	0	WS-15
KAUK	2009	306	1	1	5/13/08	7.86	0	3	21	0.19	0	3	0	0.19	0	WS-16
KAUK	2009	306	1	1	5/14/08	7.89	0	3	22	0.22	0	3	0	0.22	0	WS-17
KAUK	2009	306	1	1	5/15/08	7.93	0	3	23	0.2	0	3	0	0.2	0	WS-18
KAUK	2009	306	1	1	5/16/08	7.96	0	3	24	0.15	0	3	0	0.15	0	WS-19
KAUK	2009	306	1	1	5/17/08	7.99	0	3	25	0.2	0	3	0	0.2	0	WS-20
KAUK	2009	306	1	1	5/18/08	8.03	0	3	26	0.29	0	3	0	0.29	0	I
KAUK	2009	306	1	1	5/19/08	8.06	22	S	26	0.36	0	3	0.594	0	7	I
KAUK	2009	306	1	1	5/20/08	8.09	24	2	26	0.18	0	3	0.648	0	23	?
KAUK	2009	306	1	1	5/21/08	8.13	0	2	S	0.22	0	3	0	0	16	
KAUK	2009	306	1	1	5/22/08	8.16	0	2	2	0.14	0	3	0	0	11	
KAUK	2009	306	1	1	5/23/08	8.19	0	2	3	0.2845	0	3	0	0	1	
KAUK	2009	306	1	1	5/24/08	8.22	0	2	4	0.22	0	3	0	0.22	0	WS-0
KAUK	2009	306	1	1	5/25/08	8.26	0	2	5	0.31	0	3	0	0.31	0	WS-1
KAUK	2009	306	1	1	5/26/08	8.29	0	2	6	0.31	0	3	0	0.31	0	WS-2
KAUK	2009	306	1	1	5/27/08	8.32	0	2	7	0.23	0	3	0	0.23	0	WS-3
KAUK	2009	306	1	1	5/28/08	8.36	0	2	8	0.3	0	3	0	0.3	0	WS-4
KAUK	2009	306	1	1	5/29/08	8.39	0	2	9	0.28	0	3	0	0.28	0	WS-5

F306: Kauhikoa Ditch
Crop Cycle: 2007-2009(2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
KAUK	2009	306	1	1	5/30/08	8.42	0	2	10	0.4	0	3	0	0.4	0	WS-6
KAUK	2009	306	1	1	5/31/08	8.45	0	2	11	0.32	0	3	0	0.32	0	WS-7
KAUK	2009	306	1	1	6/1/08	8.49	0	2	12	0.31	0	3	0	0.31	0	WS-8
KAUK	2009	306	1	1	6/2/08	8.52	0	2	13	0.34	0	3	0	0.34	0	WS-9
KAUK	2009	306	1	1	6/3/08	8.55	0	2	14	0.24	0	3	0	0.24	0	WS-10
KAUK	2009	306	1	1	6/4/08	8.59	0	2	15	0.2	0	3	0	0.2	0	WS-11
KAUK	2009	306	1	1	6/5/08	8.62	0	2	16	0.35	0.03	3	0	0.35	0	WS-12
KAUK	2009	306	1	1	6/6/08	8.65	0	2	17	0.24	0	3	0	0.24	0	WS-13
KAUK	2009	306	1	1	6/7/08	8.68	0	2	18	0.28	0	3	0	0.28	0	WS-14
KAUK	2009	306	1	1	6/8/08	8.72	0	2	19	0.25	0	3	0	0.25	0	WS-15
KAUK	2009	306	1	1	6/9/08	8.75	0	2	20	0.35	0	3	0	0.35	0	WS-16
KAUK	2009	306	1	1	6/10/08	8.78	0	2	21	0.34	0	3	0	0.34	0	WS-17
KAUK	2009	306	1	1	6/11/08	8.82	0	2	22	0.11	0	3	0	0.11	0	WS-18
KAUK	2009	306	1	1	6/12/08	8.85	0	2	23	0.19	0	3	0	0.19	0	WS-19
KAUK	2009	306	1	1	6/13/08	8.88	0	2	24	0.34	0	3	0	0.34	0	WS-20
KAUK	2009	306	1	1	6/14/08	8.91	0	2	25	0.33	0	3	0	0.33	0	WS-21
KAUK	2009	306	1	1	6/15/08	8.95	0	2	26	0.26	0	3	0	0.26	0	WS-22
KAUK	2009	306	1	1	6/16/08	8.98	0	2	27	0.28	0	3	0	0.28	0	WS-23
KAUK	2009	306	1	1	6/17/08	9.01	0	2	28	0.23	0	3	0	0.23	0	WS-24
KAUK	2009	306	1	1	6/18/08	9.05	0	2	29	0.27	0	3	0	0.27	0	WS-25
KAUK	2009	306	1	1	6/19/08	9.08	0	2	30	0.32	0	3	0	0.32	0	WS-26
KAUK	2009	306	1	1	6/20/08	9.11	0	2	31	0.39	0	3	0	0.39	0	WS-27
KAUK	2009	306	1	1	6/21/08	9.14	0	2	32	0.33	0	3	0	0.33	0	WS-28
KAUK	2009	306	1	1	6/22/08	9.18	0	2	33	0.27	0	3	0	0.27	0	WS-29
KAUK	2009	306	1	1	6/23/08	9.21	0	2	34	0.36	0	3	0	0.36	0	WS-30
KAUK	2009	306	1	1	6/24/08	9.24	0	2	35	0.38	0	3	0	0.38	0	WS-31
KAUK	2009	306	1	1	6/25/08	9.28	0	2	36	0.36	0	3	0	0.36	0	WS-32
KAUK	2009	306	1	1	6/26/08	9.31	0	2	37	0.27	0	3	0	0.27	0	WS-33
KAUK	2009	306	1	1	6/27/08	9.34	0	2	38	0.14	0	3	0	0.14	0	WS-34
KAUK	2009	306	1	1	6/28/08	9.38	0	2	39	0.27	0	3	0	0.27	0	WS-35
KAUK	2009	306	1	1	6/29/08	9.41	0	2	40	0.26	0	3	0	0.26	0	WS-36
KAUK	2009	306	1	1	6/30/08	9.44	0	2	41	0.29	0	3	0	0.29	0	WS-37
KAUK	2009	306	1	1	7/1/08	9.47	0	2	42	0.17	0	3	0	0.17	0	WS-38
KAUK	2009	306	1	1	7/2/08	9.51	0	2	43	0.3619	0.01	3	0	0.3619	0	WS-39
KAUK	2009	306	1	1	7/3/08	9.54	0	2	44	0.3	0	3	0	0.3	0	WS-40
KAUK	2009	306	1	1	7/4/08	9.57	0	2	45	0.32	0	3	0	0.32	0	WS-41
KAUK	2009	306	1	1	7/5/08	9.61	0	2	46	0.23	0	3	0	0.23	0	WS-42

F306: Kauhikoa Ditch
Crop Cycle: 2007-2009(2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
KAUK	2009	306	1	1	7/6/08	9.64	0	2	47	0.3619	0	3	0	0.3619	0	WS-43
KAUK	2009	306	1	1	7/7/08	9.67	0	2	48	0.3619	0	3	0	0.3619	0	WS-44
KAUK	2009	306	1	1	7/8/08	9.70	0	2	49	0.3	0	3	0	0.3	0	WS-45
KAUK	2009	306	1	1	7/9/08	9.74	0	2	50	0.3	0	3	0	0.3	0	WS-46
KAUK	2009	306	1	1	7/10/08	9.77	0	2	51	0.3619	0.02	3	0	0.3619	0	WS-47
KAUK	2009	306	1	1	7/11/08	9.80	0	2	52	0.27	0	3	0	0.27	0	WS-48
KAUK	2009	306	1	1	7/12/08	9.84	0	2	53	0.3	0	3	0	0.3	0	WS-49
KAUK	2009	306	1	1	7/13/08	9.87	0	2	54	0.25	0	3	0	0.25	0	WS-50
KAUK	2009	306	1	1	7/14/08	9.90	0	2	55	0.21	0	3	0	0.21	0	WS-51
KAUK	2009	306	1	1	7/15/08	9.93	0	2	56	0.21	0	3	0	0.21	0	WS-52
KAUK	2009	306	1	1	7/16/08	9.97	0	2	57	0.21	0	3	0	0.21	0	WS-53
KAUK	2009	306	1	1	7/17/08	10.00	0	2	58	0.3619	0	3	0	0.3619	0	WS-54
KAUK	2009	306	1	1	7/18/08	10.03	0	S	58	0.3619	0.46	3	0	0	3	
KAUK	2009	306	1	1	7/19/08	10.07	0	1	S	0.3619	0.07	3	0	0.3619	0	WS-0
KAUK	2009	306	1	1	7/20/08	10.10	0	1	2	0.3619	0	3	0	0.3619	0	WS-1
KAUK	2009	306	1	1	7/21/08	10.13	0	1	3	0.19	0	3	0	0.19	0	I
KAUK	2009	306	1	1	7/22/08	10.16	22	S	3	0.33	0	3	0.594	0	8	I
KAUK	2009	306	1	1	7/23/08	10.20	24	2	3	0.28	0.05	3	0.648	0	22	I
KAUK	2009	306	1	1	7/24/08	10.23	24	3	3	0.41	0.08	3	0.648	0	33	I
KAUK	2009	306	1	1	7/25/08	10.26	6	3	S	0.37	0	3	0.162	0	26	?
KAUK	2009	306	1	1	7/26/08	10.30	0	3	2	0.31	0	3	0	0	16	
KAUK	2009	306	1	1	7/27/08	10.33	0	3	3	0.33	0	3	0	0	5	?
KAUK	2009	306	1	1	7/28/08	10.36	0	3	4	0.33	0	3	0	0.33	0	WS-0
KAUK	2009	306	1	1	7/29/08	10.39	0	S	4	0.3619	0.42	3	0	0	1	?
KAUK	2009	306	1	1	7/30/08	10.43	0	1	S	0.3619	0.02	3	0	0.3619	0	WS-0
KAUK	2009	306	1	1	7/31/08	10.46	0	1	2	0.23	0	3	0	0.23	0	WS-1
KAUK	2009	306	1	1	8/1/08	10.49	0	1	3	0.28	0	3	0	0.28	0	WS-2
KAUK	2009	306	1	1	8/2/08	10.53	0	1	4	0.27	0	3	0	0.27	0	WS-3
KAUK	2009	306	1	1	8/3/08	10.56	0	1	5	0.15	0	3	0	0.15	0	WS-4
KAUK	2009	306	1	1	8/4/08	10.59	0	1	6	0.24	0.02	3	0	0.24	0	WS-5
KAUK	2009	306	1	1	8/5/08	10.63	0	1	7	0.24	0	3	0	0.24	0	WS-6
KAUK	2009	306	1	1	8/6/08	10.66	0	1	8	0.23	0	3	0	0.23	0	I
KAUK	2009	306	1	1	8/7/08	10.69	21	S	8	0.3	0	3	0.567	0	8	I
KAUK	2009	306	1	1	8/8/08	10.72	24	2	8	0.26	0	3	0.648	0	21	I
KAUK	2009	306	1	1	8/9/08	10.76	24	3	8	0.35	0	3	0.648	0	31	I
KAUK	2009	306	1	1	8/10/08	10.79	24	4	8	0.33	0.04	3	0.648	0	43	I
KAUK	2009	306	1	1	8/11/08	10.82	24	5	8	0.35	0.08	3	0.648	0	56	I

F306: Kauhikoa Ditch
Crop Cycle: 2007-2009(2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
KAUK	2009	306	1	1	8/12/08	10.86	24	6	8	0.35	0.02	3	0.648	0	66	I
KAUK	2009	306	1	1	8/13/08	10.89	6	6	S	0.21	0	3	0.162	0	65	?
KAUK	2009	306	1	1	8/14/08	10.92	0	6	2	0.22	0.08	3	0	0	60	?
KAUK	2009	306	1	1	8/15/08	10.95	0	6	3	0.31	0	3	0	0	50	?
KAUK	2009	306	1	1	8/16/08	10.99	0	6	4	0.32	0	3	0	0	39	
KAUK	2009	306	1	1	8/17/08	11.02	0	6	5	0.32	0	3	0	0	28	?
KAUK	2009	306	1	1	8/18/08	11.05	16	S	5	0.34	0	3	0.432	0	32	I
KAUK	2009	306	1	1	8/19/08	11.09	24	2	5	0.28	0	3	0.648	0	44	IF
KAUK	2009	306	1	1	8/20/08	11.12	24	3	5	0.23	0	3	0.648	0	58	?
KAUK	2009	306	1	1	8/21/08	11.15	0	3	S	0.35	0.02	3	0	0	47	
KAUK	2009	306	1	1	8/22/08	11.18	0	3	2	0.35	0.07	3	0	0	37	
KAUK	2009	306	1	1	8/23/08	11.22	0	3	3	0.34	0.04	3	0	0	27	
KAUK	2009	306	1	1	8/24/08	11.25	0	3	4	0.34	0	3	0	0	16	
KAUK	2009	306	1	1	8/25/08	11.28	0	3	5	0.3377	0.02	3	0	0	5	
KAUK	2009	306	1	1	8/26/08	11.32	0	3	6	0.3377	0	3	0	0.3377	0	WS-0
KAUK	2009	306	1	1	8/27/08	11.35	0	3	7	0.23	0.12	3	0	0.23	0	WS-1
KAUK	2009	306	1	1	8/28/08	11.38	0	3	8	0.36	0	3	0	0.36	0	I
KAUK	2009	306	1	1	8/29/08	11.41	22	S	8	0.28	0	3	0.594	0	10	I
KAUK	2009	306	1	1	8/30/08	11.45	24	2	8	0.28	0	3	0.648	0	22	
KAUK	2009	306	1	1	8/31/08	11.48	0	2	S	0.3377	0.02	3	0	0	12	?RD
KAUK	2009	306	1	1	9/1/08	11.51	0	2	2	0.3033	0	3	0	0	2	RD
KAUK	2009	306	1	1	9/2/08	11.55	0	2	3	0.3033	0.08	3	0	0.3033	0	WS-0
KAUK	2009	306	1	1	9/3/08	11.58	0	2	4	0.3033	0	3	0	0.3033	0	WS-1
KAUK	2009	306	1	1	9/4/08	11.61	0	2	5	0.32	0	3	0	0.32	0	WS-2
KAUK	2009	306	1	1	9/5/08	11.64	0	2	6	0.22	0	3	0	0.22	0	I
KAUK	2009	306	1	1	9/6/08	11.68	22	S	6	0.29	0	3	0.594	0	10	I
KAUK	2009	306	1	1	9/7/08	11.71	24	2	6	0.31	0	3	0.648	0	21	I
KAUK	2009	306	1	1	9/8/08	11.74	24	3	6	0.31	0.1	3	0.648	0	36	?
KAUK	2009	306	1	1	9/9/08	11.78	0	3	S	0.31	0	3	0	0	25	
KAUK	2009	306	1	1	9/10/08	11.81	0	3	2	0.22	0	3	0	0	18	
KAUK	2009	306	1	1	9/11/08	11.84	0	3	3	0.18	0	3	0	0	12	
KAUK	2009	306	1	1	9/12/08	11.88	0	3	4	0.23	0	3	0	0	4	
KAUK	2009	306	1	1	9/13/08	11.91	0	3	5	0.17	0	3	0	0.17	0	WS-0
KAUK	2009	306	1	1	9/14/08	11.94	0	3	6	0.17	0	3	0	0.17	0	WS-1
KAUK	2009	306	1	1	9/15/08	11.97	0	3	7	0.26	0	3	0	0.26	0	WS-2
KAUK	2009	306	1	1	9/16/08	12.01	0	3	8	0.3	0	3	0	0.3	0	WS-3
KAUK	2009	306	1	1	9/17/08	12.04	0	3	9	0.31	0.02	3	0	0.31	0	WS-4

F306: Kauhikoa Ditch
Crop Cycle: 2007-2009(2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
KAUK	2009	306	1	1	9/18/08	12.07	0	3	10	0.19	0	3	0	0.19	0	WS-5
KAUK	2009	306	1	1	9/19/08	12.11	0	3	11	0.25	0	3	0	0.25	0	I
KAUK	2009	306	1	1	9/20/08	12.14	22	S	11	0.25	0	3	0.594	0	11	I
KAUK	2009	306	1	1	9/21/08	12.17	24	2	11	0.3033	0	3	0.648	0	22	?
KAUK	2009	306	1	1	9/22/08	12.20	0	2	S	0.29	0	3	0	0	13	
KAUK	2009	306	1	1	9/23/08	12.24	0	2	2	0.23	0.05	3	0	0	7	
KAUK	2009	306	1	1	9/24/08	12.27	0	2	3	0.17	0	3	0	0	1	
KAUK	2009	306	1	1	9/25/08	12.30	0	2	4	0.18	0	3	0	0.18	0	WS-0
KAUK	2009	306	1	1	9/26/08	12.34	0	2	5	0.17	0	3	0	0.17	0	WS-1
KAUK	2009	306	1	1	9/27/08	12.37	0	2	6	0.2	0	3	0	0.2	0	WS-2
KAUK	2009	306	1	1	9/28/08	12.40	0	2	7	0.15	0	3	0	0.15	0	WS-3
KAUK	2009	306	1	1	9/29/08	12.43	0	2	8	0.24	0	3	0	0.24	0	WS-4
KAUK	2009	306	1	1	9/30/08	12.47	0	2	9	0.26	0.08	3	0	0.26	0	WS-5
KAUK	2009	306	1	1	10/1/08	12.50	0	2	10	0.29	0	3	0	0.29	0	WS-6
KAUK	2009	306	1	1	10/2/08	12.53	0	2	11	0.21	0	3	0	0.21	0	WS-7
KAUK	2009	306	1	1	10/3/08	12.57	0	2	12	0.27	0	3	0	0.27	0	WS-8
KAUK	2009	306	1	1	10/4/08	12.60	0	2	13	0.25	0	3	0	0.25	0	WS-9
KAUK	2009	306	1	1	10/5/08	12.63	0	2	14	0.18	0	3	0	0.18	0	WS-10
KAUK	2009	306	1	1	10/6/08	12.66	0	2	15	0.17	0	3	0	0.17	0	WS-11
KAUK	2009	306	1	1	10/7/08	12.70	0	2	16	0.22	0	3	0	0.22	0	WS-12
KAUK	2009	306	1	1	10/8/08	12.73	0	2	17	0.18	0	3	0	0.18	0	WS-13
KAUK	2009	306	1	1	10/9/08	12.76	0	2	18	0.22	0	3	0	0.22	0	WS-14
KAUK	2009	306	1	1	10/10/08	12.80	0	2	19	0.2	0	3	0	0.2	0	WS-15
KAUK	2009	306	1	1	10/11/08	12.83	0	2	20	0.22	0	3	0	0.22	0	WS-16
KAUK	2009	306	1	1	10/12/08	12.86	0	2	21	0.2	0	3	0	0.2	0	WS-17
KAUK	2009	306	1	1	10/13/08	12.89	0	2	22	0.16	0	3	0	0.16	0	WS-18
KAUK	2009	306	1	1	10/14/08	12.93	0	2	23	0.15	0	3	0	0.15	0	WS-19
KAUK	2009	306	1	1	10/15/08	12.96	0	2	24	0.15	0	3	0	0.15	0	WS-20
KAUK	2009	306	1	1	10/16/08	12.99	0	2	25	0.27	0	3	0	0.27	0	WS-21
KAUK	2009	306	1	1	10/17/08	13.03	0	2	26	0.28	0.01	3	0	0.28	0	WS-22
KAUK	2009	306	1	1	10/18/08	13.06	0	2	27	0.2	0	3	0	0.2	0	WS-23
KAUK	2009	306	1	1	10/19/08	13.09	0	2	28	0.22	0.07	3	0	0.22	0	WS-24
KAUK	2009	306	1	1	10/20/08	13.13	0	2	29	0.17	0	3	0	0.17	0	WS-25
KAUK	2009	306	1	1	10/21/08	13.16	0	2	30	0.17	0	3	0	0.17	0	WS-26
KAUK	2009	306	1	1	10/22/08	13.19	0	2	31	0.28	0	3	0	0.28	0	I
KAUK	2009	306	1	1	10/23/08	13.22	22	S	31	0.2	0	3	0.594	0	13	I
KAUK	2009	306	1	1	10/24/08	13.26	0	1	S	0.19	0	3	0	0	6	I

F306: Kauhikoa Ditch
Crop Cycle: 2007-2009(2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
KAUK	2009	306	1	1	10/25/08	13.29	22	S	1	0.12	0	3	0.594	0	22	I
KAUK	2009	306	1	1	10/26/08	13.32	24	2	1	0.17	0	3	0.648	0	38	?
KAUK	2009	306	1	1	10/27/08	13.36	0	2	S	0.16	0	3	0	0	33	
KAUK	2009	306	1	1	10/28/08	13.39	0	2	2	0.15	0	3	0	0	28	
KAUK	2009	306	1	1	10/29/08	13.42	0	2	3	0.25	0	3	0	0	19	
KAUK	2009	306	1	1	10/30/08	13.45	0	2	4	0.2	0	3	0	0	13	
KAUK	2009	306	1	1	10/31/08	13.49	0	2	5	0.23	0.09	3	0	0	8	
KAUK	2009	306	1	1	11/1/08	13.52	0	2	6	0.2	0	3	0	0	1	SC
KAUK	2009	306	1	1	11/2/08	13.55	0	2	7	0.17	0	3	0	0.17	0	WS-0
KAUK	2009	306	1	1	11/3/08	13.59	0	2	8	0.17	0	3	0	0.17	0	WS-1
KAUK	2009	306	1	1	11/4/08	13.62	0	2	9	0.12	0	3	0	0.12	0	WS-2
KAUK	2009	306	1	1	11/5/08	13.65	0	2	10	0.18	0	3	0	0.18	0	WS-3
KAUK	2009	306	1	1	11/6/08	13.68	0	2	11	0.21	0	3	0	0.21	0	WS-4
KAUK	2009	306	1	1	11/7/08	13.72	0	2	12	0.17	0	3	0	0.17	0	WS-5
KAUK	2009	306	1	1	11/8/08	13.75	0	2	13	0.19	0	3	0	0.19	0	WS-6
KAUK	2009	306	1	1	11/9/08	13.78	0	2	14	0.18	0	3	0	0.18	0	WS-7
KAUK	2009	306	1	1	11/10/08	13.82	0	2	15	0.17	0	3	0	0.17	0	WS-8
KAUK	2009	306	1	1	11/11/08	13.85	0	2	16	0.18	0	3	0	0.18	0	WS-9
KAUK	2009	306	1	1	11/12/08	13.88	0	2	17	0.15	0	3	0	0.15	0	WS-10
KAUK	2009	306	1	1	11/13/08	13.91	0	2	18	0.16	0	3	0	0.16	0	WS-11
KAUK	2009	306	1	1	11/14/08	13.95	0	2	19	0.15	0	3	0	0.15	0	WS-12
KAUK	2009	306	1	1	11/15/08	13.98	0	2	20	0.17	0	3	0	0.17	0	WS-13
KAUK	2009	306	1	1	11/16/08	14.01	0	2	21	0.14	0	3	0	0.14	0	WS-14
KAUK	2009	306	1	1	11/17/08	14.05	0	2	22	0.21	0.01	3	0	0.21	0	WS-15
KAUK	2009	306	1	1	11/18/08	14.08	0	S	22	0.1	0.82	3	0	0	24	I
KAUK	2009	306	1	1	11/19/08	14.11	23	2	22	0.18	0.15	3	0.621	0	43	I
KAUK	2009	306	1	1	11/20/08	14.14	24	3	22	0.19	0	3	0.648	0	58	I
KAUK	2009	306	1	1	11/21/08	14.18	24	4	22	0.13	0	3	0.648	0	76	
KAUK	2009	306	1	1	11/22/08	14.21	0	4	S	0.05	0	3	0	0	74	
KAUK	2009	306	1	1	11/23/08	14.24	0	4	2	0.17	0.16	3	0	0	74	
KAUK	2009	306	1	1	11/24/08	14.28	0	4	3	0.25	0	3	0	0	65	
KAUK	2009	306	1	1	11/25/08	14.31	0	4	4	0.17	0	3	0	0	60	
KAUK	2009	306	1	1	11/26/08	14.34	0	4	5	0.14	0	3	0	0	55	?
KAUK	2009	306	1	1	11/27/08	14.38	0	4	6	0.19	0	3	0	0	49	?
KAUK	2009	306	1	1	11/28/08	14.41	0	4	7	0.16	0	3	0	0	43	?
KAUK	2009	306	1	1	11/29/08	14.44	0	4	8	0.13	0	3	0	0	39	
KAUK	2009	306	1	1	11/30/08	14.47	0	4	9	0.17	0.19	3	0	0	40	

F306: Kauhikoa Ditch
Crop Cycle: 2007-2009(2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
KAUK	2009	306	1	1	12/1/08	14.51	0	4	10	0.16	0	3	0	0	34	
KAUK	2009	306	1	1	12/2/08	14.54	0	4	11	0.09	0.03	3	0	0	32	
KAUK	2009	306	1	1	12/3/08	14.57	0	4	12	0.15	0	3	0	0	27	
KAUK	2009	306	1	1	12/4/08	14.61	0	4	13	0.14	0	3	0	0	23	
KAUK	2009	306	1	1	12/5/08	14.64	0	4	14	0.19	0	3	0	0	16	
KAUK	2009	306	1	1	12/6/08	14.67	0	4	15	0.16	0	3	0	0	11	
KAUK	2009	306	1	1	12/7/08	14.70	0	4	16	0.14	0	3	0	0	6	
KAUK	2009	306	1	1	12/8/08	14.74	0	4	17	0.15	0	3	0	0	1	
KAUK	2009	306	1	1	12/9/08	14.77	0	4	18	0.14	0	3	0	0.14	0	WS-0
KAUK	2009	306	1	1	12/10/08	14.80	0	4	19	0.12	0	3	0	0.12	0	WS-1
KAUK	2009	306	1	1	12/11/08	14.84	0	4	20	0.03	0	3	0	0.03	0	WS-2
KAUK	2009	306	1	1	12/12/08	14.87	0	S	20	0.14	2.35	3	0	0	73	?
KAUK	2009	306	1	1	12/13/08	14.90	0	2	20	0.11	1.2	3	0	0	100	I*DS
KAUK	2009	306	1	1	12/14/08	14.93	22	3	20	0.08	0.48	3	0.594	0	100	I*DS
KAUK	2009	306	1	1	12/15/08	14.97	20	4	20	0.11	0	3	0.54	0	100	I*DS
KAUK	2009	306	1	1	12/16/08	15.00	24	5	20	0.14	0	3	0.648	0	100	
KAUK	2009	306	1	1	12/17/08	15.03	0	5	S	0.15	0	3	0	0	95	
KAUK	2009	306	1	1	12/18/08	15.07	0	5	2	0.14	0	3	0	0	90	
KAUK	2009	306	1	1	12/19/08	15.10	0	5	3	0.14	0	3	0	0	85	
KAUK	2009	306	1	1	12/20/08	15.13	0	5	4	0.15	0	3	0	0	80	
KAUK	2009	306	1	1	12/21/08	15.16	0	5	5	0.16	0	3	0	0	75	
KAUK	2009	306	1	1	12/22/08	15.20	0	5	6	0.14	0	3	0	0	70	
KAUK	2009	306	1	1	12/23/08	15.23	0	5	7	0.15	0	3	0	0	65	
KAUK	2009	306	1	1	12/24/08	15.26	0	5	8	0.13	0.1	3	0	0	64	
KAUK	2009	306	1	1	12/25/08	15.30	0	S	8	0.18	0.42	3	0	0	72	
KAUK	2009	306	1	1	12/26/08	15.33	22	2	8	0.09	0.33	3	0.594	0	100	I
KAUK	2009	306	1	1	12/27/08	15.36	24	3	8	0.13	0.42	3	0.648	0	100	I
KAUK	2009	306	1	1	12/28/08	15.39	24	4	8	0.1	0.05	3	0.648	0	100	I
KAUK	2009	306	1	1	12/29/08	15.43	24	5	8	0.12	0.07	3	0.648	0	100	I
KAUK	2009	306	1	1	12/30/08	15.46	6	5	S	0.06	0.14	3	0.162	0	100	
KAUK	2009	306	1	1	12/31/08	15.49	0	S	1	0.13	0.64	3	0	0	100	
KAUK	2009	306	1	1	1/1/09	15.53	0	1	S	0.1632	0	3	0	0	94	
KAUK	2009	306	1	1	1/2/09	15.56	0	1	2	0.1632	0.04	3	0	0	90	
KAUK	2009	306	1	1	1/3/09	15.59	0	1	3	0.1632	0	3	0	0	85	
KAUK	2009	306	1	1	1/4/09	15.63	0	1	4	0.13	0	3	0	0	80	I
KAUK	2009	306	1	1	1/5/09	15.66	24	S	4	0.13	0	3	0.648	0	97	I
KAUK	2009	306	1	1	1/6/09	15.69	24	2	4	0.16	0	3	0.648	0	100	I

F306: Kauhikoa Ditch
Crop Cycle: 2007-2009(2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
KAUK	2009	306	1	1	1/7/09	15.72	24	3	4	0.16	0	3	0.648	0	100	I
KAUK	2009	306	1	1	1/8/09	15.76	24	4	4	0.1632	0	3	0.648	0	100	
KAUK	2009	306	1	1	1/9/09	15.79	0	4	S	0.1632	0	3	0	0	94	
KAUK	2009	306	1	1	1/10/09	15.82	0	4	2	0.1632	0	3	0	0	89	
KAUK	2009	306	1	1	1/11/09	15.86	0	4	3	0.1632	0.03	3	0	0	84	
KAUK	2009	306	1	1	1/12/09	15.89	0	4	4	0.1632	0	3	0	0	79	
KAUK	2009	306	1	1	1/13/09	15.92	0	4	5	0.1632	0	3	0	0	73	
KAUK	2009	306	1	1	1/14/09	15.95	0	4	6	0.1632	0	3	0	0	68	
KAUK	2009	306	1	1	1/15/09	15.99	0	4	7	0.1632	0.1	3	0	0	66	
KAUK	2009	306	1	1	1/16/09	16.02	0	4	8	0.1632	0.05	3	0	0	62	
KAUK	2009	306	1	1	1/17/09	16.05	22	S	8	0.1632	0.68	3	0.594	0	99	I
KAUK	2009	306	1	1	1/18/09	16.09	24	2	8	0.1632	0.01	3	0.648	0	100	
KAUK	2009	306	1	1	1/19/09	16.12	0	2	S	0.1632	0	3	0	0	94	
KAUK	2009	306	1	1	1/20/09	16.15	0	2	2	0.1632	0	3	0	0	89	
KAUK	2009	306	1	1	1/21/09	16.18	0	2	3	0.1632	0	3	0	0	83	
KAUK	2009	306	1	1	1/22/09	16.22	0	2	4	0.1632	0	3	0	0	78	
KAUK	2009	306	1	1	1/23/09	16.25	0	2	5	0.1632	0	3	0	0	72	
KAUK	2009	306	1	1	1/24/09	16.28	0	2	6	0.1632	0	3	0	0	67	
KAUK	2009	306	1	1	1/25/09	16.32	0	2	7	0.1632	0	3	0	0	61	
KAUK	2009	306	1	1	1/26/09	16.35	0	2	8	0.1632	0	3	0	0	56	
KAUK	2009	306	1	1	1/27/09	16.38	0	S	8	0.1632	0.48	3	0	0	67	
KAUK	2009	306	1	1	1/28/09	16.41	0	2	8	0.1632	1.05	3	0	0	96	I
KAUK	2009	306	1	1	1/29/09	16.45	22	3	8	0.1632	0.39	3	0.594	0	100	
KAUK	2009	306	1	1	1/30/09	16.48	0	3	S	0.1632	0	3	0	0	94	
KAUK	2009	306	1	1	1/31/09	16.51	0	3	2	0.1632	0	3	0	0	89	
KAUK	2009	306	1	1	2/1/09	16.55	0	3	3	0.1864	0	3	0	0	82	
KAUK	2009	306	1	1	2/2/09	16.58	0	3	4	0.1864	0	3	0	0	76	I
KAUK	2009	306	1	1	2/3/09	16.61	24	S	4	0.1864	0.3	3	0.648	0	100	I
KAUK	2009	306	1	1	2/4/09	16.64	24	2	4	0.12	0.14	3	0.648	0	100	I
KAUK	2009	306	1	1	2/5/09	16.68	24	3	4	0.12	0	3	0.648	0	100	I
KAUK	2009	306	1	1	2/6/09	16.71	24	4	4	0.12	0	3	0.648	0	100	
KAUK	2009	306	1	1	2/7/09	16.74	0	4	S	0.16	0	3	0	0	94	
KAUK	2009	306	1	1	2/8/09	16.78	0	4	2	0.17	0	3	0	0	89	
KAUK	2009	306	1	1	2/9/09	16.81	0	4	3	0.19	0	3	0	0	82	
KAUK	2009	306	1	1	2/10/09	16.84	0	4	4	0.16	0	3	0	0	77	
KAUK	2009	306	1	1	2/11/09	16.88	0	4	5	0.15	0	3	0	0	72	
KAUK	2009	306	1	1	2/12/09	16.91	0	S	5	0.17	0.8	3	0		93	RIPE

F306: Kauhikoa Ditch
Crop Cycle: 2007-2009(2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
KAUK	2009	306	1	1	2/13/09	16.94	0	1	S	0.27	0	3	0		84	RIPE
KAUK	2009	306	1	1	2/14/09	16.97	0	1	2	0.27	0.04	3	0		76	RIPE
KAUK	2009	306	1	1	2/15/09	17.01	0	1	3	0.1864	0.09	3	0		73	RIPE
KAUK	2009	306	1	1	2/16/09	17.04	0	1	4	0.1864	0	3	0		67	RIPE
KAUK	2009	306	1	1	2/17/09	17.07	0	1	5	0.1864	0	3	0		61	RIPE
KAUK	2009	306	1	1	2/18/09	17.11	0	1	6	0.1864	0	3	0		54	RIPE
KAUK	2009	306	1	1	2/19/09	17.14	0	1	7	0.1864	0.09	3	0		51	RIPE
KAUK	2009	306	1	1	2/20/09	17.17	0	1	8	0.1864	0.11	3	0		49	RIPE
KAUK	2009	306	1	1	2/21/09	17.20	0	1	9	0.1864	0.09	3	0		45	RIPE
KAUK	2009	306	1	1	2/22/09	17.24	0	1	10	0.1864	0	3	0		39	RIPE
KAUK	2009	306	1	1	2/23/09	17.27	0	1	11	0.1864	0	3	0		33	RIPE
KAUK	2009	306	1	1	2/24/09	17.30	0	1	12	0.1864	0	3	0		27	RIPE
KAUK	2009	306	1	1	2/25/09	17.34	0	1	13	0.1864	0.05	3	0		22	RIPE
KAUK	2009	306	1	1	2/26/09	17.37	0	1	14	0.1864	0.07	3	0		18	RIPE
KAUK	2009	306	1	1	2/27/09	17.40	0	1	15	0.2	0	3	0		12	RIPE
KAUK	2009	306	1	1	2/28/09	17.43	0	1	16	0.17	0.04	3	0		7	RIPE
KAUK	2009	306	1	1	3/1/09	17.47	0	1	17	0.22	0.1	3	0		3	RIPE
KAUK	2009	306	1	1	3/2/09	17.50	0	1	18	0.19	0.11	3	0		1	RIPE
KAUK	2009	306	1	1	3/3/09	17.53	0	S	18	0.19	0.2	3	0		1	RIPE
KAUK	2009	306	1	1	3/4/09	17.57	0	1	S	0.2094	0.03	3	0		0	RIPE
KAUK	2009	306	1	1	3/5/09	17.60	0	1	2	0.2094	0	3	0		0	RIPE
KAUK	2009	306	1	1	3/6/09	17.63	0	1	3	0.2094	0	3	0		0	RIPE
KAUK	2009	306	1	1	3/7/09	17.66	0	S	3	0.2094	0.24	3	0		1	RIPE
KAUK	2009	306	1	1	3/8/09	17.70	0	1	S	0.2094	0.17	3	0		0	RIPE
KAUK	2009	306	1	1	3/9/09	17.73	0	1	2	0.2094	0.09	3	0		0	RIPE
KAUK	2009	306	1	1	3/10/09	17.76	0	1	3	0.2094	0.06	3	0		0	RIPE
KAUK	2009	306	1	1	3/11/09	17.80	0	1	4	0.2094	0	3	0		0	RIPE
KAUK	2009	306	1	1	3/12/09	17.83	0	S	4	0.2094	0.2	3	0		0	RIPE
KAUK	2009	306	1	1	3/13/09	17.86	0	2	4	0.2094	1.21	3	0		33	RIPE
KAUK	2009	306	1	1	3/14/09	17.89	0	2	S	0.2094	0	3	0		26	RIPE
KAUK	2009	306	1	1	3/15/09	17.93	0	2	2	0.2094	0.12	3	0		23	RIPE
KAUK	2009	306	1	1	3/16/09	17.96	0	S	2	0.2094	1.8	3	0		76	RIPE
KAUK	2009	306	1	1	3/17/09	17.99	0	1	S	0.2094	0	3	0		69	RIPE
KAUK	2009	306	1	1	3/18/09	18.03	0	1	2	0.2094	0.1	3	0		65	RIPE
KAUK	2009	306	1	1	3/19/09	18.06	0	1	3	0.2094	0	3	0		58	RIPE
KAUK	2009	306	1	1	3/20/09	18.09	0	1	4	0.2094	0.03	3	0		52	RIPE
KAUK	2009	306	1	1	3/21/09	18.13	0	1	5	0.2094	0	3	0		45	RIPE

F306: Kauhikoa Ditch
Crop Cycle: 2007-2009(2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
KAUK	2009	306	1	1	3/22/09	18.16	0	1	6	0.2094	0	3	0		38	RIPE
KAUK	2009	306	1	1	3/23/09	18.19	0	1	7	0.2094	0	3	0		31	RIPE
KAUK	2009	306	1	1	3/24/09	18.22	0	1	8	0.2094	0	3	0		24	RIPE
KAUK	2009	306	1	1	3/25/09	18.26	0	1	9	0.2094	0	3	0		17	RIPE
KAUK	2009	306	1	1	3/26/09	18.29	0	1	10	0.2094	0	3	0		10	RIPE
KAUK	2009	306	1	1	3/27/09	18.32	0	1	11	0.2094	0	3	0		3	RIPE
KAUK	2009	306	1	1	3/28/09	18.36	0	1	12	0.2094	0	3	0		0	RIPE
KAUK	2009	306	1	1	3/29/09	18.39	0	1	13	0.2094	0	3	0		0	RIPE
KAUK	2009	306	1	1	3/30/09	18.42	0	1	14	0.2094	0.06	3	0		0	RIPE
KAUK	2009	306	1	1	3/31/09	18.45	0	1	15	0.2094	0	3	0		0	RIPE
KAUK	2009	306	1	1	4/1/09	18.49	0	1	16	0.19	0.01	3	0		0	RIPE
KAUK	2009	306	1	1	4/2/09	18.52	0	1	17	0.29	0	3	0		0	RIPE
KAUK	2009	306	1	1	4/3/09	18.55	0	1	18	0.29	0.04	3	0		0	RIPE
KAUK	2009	306	1	1	4/4/09	18.59	0	1	19	0.2453	0	3	0		0	RIPE
KAUK	2009	306	1	1	4/5/09	18.62	0	1	20	0.2453	0.03	3	0		0	RIPE
KAUK	2009	306	1	1	4/6/09	18.65	0	1	21	0.2453	0	3	0		0	RIPE
KAUK	2009	306	1	1	4/7/09	18.68	0	1	22	0.2453	0	3	0		0	RIPE
KAUK	2009	306	1	1	4/8/09	18.72	0	1	23	0.2453	0	3	0		0	RIPE
KAUK	2009	306	1	1	4/9/09	18.75	0	1	24	0.2453	0	3	0		0	RIPE
KAUK	2009	306	1	1	4/10/09	18.78	0	1	25	0.2453	0.17	3	0		0	RIPE
KAUK	2009	306	1	1	4/11/09	18.82	0	1	26	0.2453	0.01	3	0		0	RIPE
KAUK	2009	306	1	1	4/12/09	18.85	0	1	27	0.2453	0	3	0		0	RIPE
KAUK	2009	306	1	1	4/13/09	18.88	0	1	28	0.2453	0	3	0		0	IFNLRD
KAUK	2009	306	1	1	4/14/09	18.91	23	S	28	0.2453	0	3	0.621		12	IFNLRD
KAUK	2009	306	1	1	4/15/09	18.95	24	2	28	0.2453	0	3	0.648		25	IFNLRD
KAUK	2009	306	1	1	4/16/09	18.98	24	3	28	0.2453	0	3	0.648		39	DRY
KAUK	2009	306	1	1	4/17/09	19.01	0	3	S	0.2453	0	3	0		31	DRY
KAUK	2009	306	1	1	4/18/09	19.05	0	3	2	0.2453	0	3	0		23	DRY
KAUK	2009	306	1	1	4/19/09	19.08	0	3	3	0.2453	0	3	0		14	DRY
KAUK	2009	306	1	1	4/20/09	19.11	0	3	4	0.2453	0	3	0		6	DRY
KAUK	2009	306	1	1	4/21/09	19.14	0	S	4	0.2453	0.48	3	0		14	DRY
KAUK	2009	306	1	1	4/22/09	19.18	0	1	S	0.2453	0.03	3	0		7	DRY
KAUK	2009	306	1	1	4/23/09	19.21	0	1	2	0.2453	0	3	0		0	DRY
KAUK	2009	306	1	1	4/24/09	19.24	0	1	3	0.2453	0	3	0		0	DRY
KAUK	2009	306	1	1	4/25/09	19.28	0	1	4	0.2453	0.02	3	0		0	DRY
KAUK	2009	306	1	1	4/26/09	19.31	0	1	5	0.2453	0	3	0		0	DRY
KAUK	2009	306	1	1	4/27/09	19.34	0	1	6	0.2453	0	3	0		0	DRY

F306: Kauhikoa Ditch
Crop Cycle: 2007-2009(2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
KAUK	2009	306	1	1	4/28/09	19.38	0	1	7	0.2453	0	3	0		0	DRY
KAUK	2009	306	1	1	4/29/09	19.41	0	1	8	0.2453	0	3	0		0	DRY
KAUK	2009	306	1	1	4/30/09	19.44	0	1	9	0.2453	0.04	3	0		0	DRY
KAUK	2009	306	1	1	5/1/09	19.47	0	1	10	0.2845	0.05	3	0		0	DRY
KAUK	2009	306	1	1	5/2/09	19.51	0	1	11	0.2845	0	3	0		0	DRY
KAUK	2009	306	1	1	5/3/09	19.54	0	1	12	0.2845	0	3	0		0	DRY
KAUK	2009	306	1	1	5/4/09	19.57	0	1	13	0.2845	0	3	0		0	DRY
KAUK	2009	306	1	1	5/5/09	19.61	0	1	14	0.2845	0	3	0		0	DRY
KAUK	2009	306	1	1	5/6/09	19.64	0	1	15	0.2845	0	3	0		0	DRY
KAUK	2009	306	1	1	5/7/09	19.67	0	1	16	0.2845	0	3	0		0	DRY
KAUK	2009	306	1	1	5/8/09	19.70	0	1	17	0.2845	0	3	0		0	DRY
KAUK	2009	306	1	1	5/9/09	19.74	0	1	18	0.2845	0	3	0		0	DRY
KAUK	2009	306	1	1	5/10/09	19.77	0	1	19	0.2845	0	3	0		0	DRY
KAUK	2009	306	1	1	5/11/09	19.80	0	1	20	0.2845	0	3	0		0	DRY
KAUK	2009	306	1	1	5/12/09	19.84	0	1	21	0.2845	0	3	0		0	DRY
KAUK	2009	306	1	1	5/13/09	19.87	0	1	22	0.2845	0	3	0		0	DRY
KAUK	2009	306	1	1	5/14/09	19.90	0	1	23	0.2845	0	3	0		0	DRY
KAUK	2009	306	1	1	5/15/09	19.93	0	1	24	0.2845	0	3	0		0	DRY
KAUK	2009	306	1	1	5/16/09	19.97	0	1	25	0.2845	0	3	0		0	DRY
KAUK	2009	306	1	1	5/17/09	20.00	0	1	26	0.2845	0	3	0		0	DRY
KAUK	2009	306	1	1	5/18/09	20.03	0	1	27	0.2845	0	3	0		0	DRY
KAUK	2009	306	1	1	5/19/09	20.07	0	1	28	0.2845	0.08	3	0		0	DRY
KAUK	2009	306	1	1	5/20/09	20.10	0	1	29	0.2845	0	3	0		0	DRY
KAUK	2009	306	1	1	5/21/09	20.13	0	1	30	0.2845	0.01	3	0		0	DRY
KAUK	2009	306	1	1	5/22/09	20.16	0	1	31	0.2845	0	3	0		0	DRY
KAUK	2009	306	1	1	5/23/09	20.20	0	1	32	0.2845	0	3	0		0	DRY
KAUK	2009	306	1	1	5/24/09	20.23	0	1	33	0.2845	0	3	0		0	DRY
KAUK	2009	306	1	1	5/25/09	20.26	0	1	34	0.2845	0	3	0		0	DRY
KAUK	2009	306	1	1	5/26/09	20.30	0	1	35	0.2845	0	3	0		0	DRY
KAUK	2009	306	1	1	5/27/09	20.33	0	1	36	0.2845	0	3	0		0	DRY
KAUK	2009	306	1	1	5/28/09	20.36	0	1	37	0.2845	0	3	0		0	DRY
KAUK	2009	306	1	1	5/29/09	20.39	0	1	38	0.2845	0.03	3	0		0	DRY
KAUK	2009	306	1	1	5/30/09	20.43	0	1	39	0.2845	0	3	0		0	DRY
KAUK	2009	306	1	1	5/31/09	20.46	0	1	40	0.2845	0	3	0		0	DRY
KAUK	2009	306	1	1	6/1/09	20.49	0	1	41	0.3423	0	3	0		0	DRY
KAUK	2009	306	1	1	6/2/09	20.53	0	1	42	0.3423	0	3	0		0	DRY
KAUK	2009	306	1	1	6/3/09	20.56	0	1	43	0.3423	0	3	0		0	DRY

F306: Kauhikoa Ditch
Crop Cycle: 2007-2009(2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
KAUK	2009	306	1	1	6/4/09	20.59	0	1	44	0.3423	0	3	0		0	DRY
KAUK	2009	306	1	1	6/5/09	20.63	0	1	45	0.3423	0	3	0		0	DRY
KAUK	2009	306	1	1	6/6/09	20.66	0	1	46	0.3423	0	3	0		0	DRY
KAUK	2009	306	1	1	6/7/09	20.69	0	1	47	0.3423	0	3	0		0	DRY
KAUK	2009	306	1	1	6/8/09	20.72	0	1	48	0.3423	0	3	0		0	DRY
KAUK	2009	306	1	1	6/9/09	20.76	0	1	49	0.3423	0	3	0		0	DRY
KAUK	2009	306	1	1	6/10/09	20.79	0	1	50	0.3423	0	3	0		0	DRY
KAUK	2009	306	1	1	6/11/09	20.82	0	1	51	0.3423	0	3	0		0	DRY
KAUK	2009	306	1	1	6/12/09	20.86	0	1	52	0.3423	0	3	0		0	DRY
KAUK	2009	306	1	1	6/13/09	20.89	0	1	53	0.3423	0	3	0		0	DRY
KAUK	2009	306	1	1	6/14/09	20.92	0	1	54	0.3423	0	3	0		0	END
										122.4023	39.26*		62.721	39.7695		

***** Actual Rainfall total not fully useable by the plant as irrigation. Please see cover memo for explanation of "Effective Rainfall"***

F500: Lowrie Ditch
Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
LOWR	2007	500	2	1	6/28/05	0.00	24	S	S	0.09324	0	1.5318	0.648	0	36	IPLT
LOWR	2007	500	2	1	6/29/05	0.03	20	2	1	0.08991	0	1.5318	0.54	0	65	IPLT
LOWR	2007	500	2	1	6/30/05	0.07	24	3	1	0.09324	0	1.5318	0.648	0	100	IPLT
LOWR	2007	500	2	1	7/1/05	0.10	24	4	1	0.09657	0	1.5318	0.648	0	100	IPLT
LOWR	2007	500	2	1	7/2/05	0.13	24	5	1	0.09657	0.03	1.5318	0.648	0	100	IPLT
LOWR	2007	500	2	1	7/3/05	0.16	24	6	1	0.09657	0	1.5318	0.648	0	100	IPLT
LOWR	2007	500	2	1	7/4/05	0.20	24	7	1	0.09324	0	1.5318	0.648	0	100	IPLT
LOWR	2007	500	2	1	7/5/05	0.23	24	8	1	0.0999	0	1.5318	0.648	0	100	IPLT
LOWR	2007	500	2	1	7/6/05	0.26	24	9	1	0.08991	0	1.5318	0.648	0	100	IPLT
LOWR	2007	500	2	1	7/7/05	0.30	24	10	1	0.09324	0	1.5318	0.648	0	100	IPLT
LOWR	2007	500	2	1	7/8/05	0.33	24	11	1	0.04995	0.2	1.5318	0.648	0	100	IPLT
LOWR	2007	500	2	1	7/9/05	0.36	0	11	S	0.07992	0.17	1.5318	0	0	100	
LOWR	2007	500	2	1	7/10/05	0.39	0	11	2	0.0666	0	1.5318	0	0	95	
LOWR	2007	500	2	1	7/11/05	0.43	0	11	3	0.08991	0.05	1.5318	0	0	93	
LOWR	2007	500	2	1	7/12/05	0.46	0	11	4	0.07326	0.13	1.5318	0	0	96	
LOWR	2007	500	2	1	7/13/05	0.49	0	11	5	0.0999	0.05	1.5318	0	0	93	
LOWR	2007	500	2	1	7/14/05	0.53	0	11	6	0.08658	0	1.5318	0	0	87	
LOWR	2007	500	2	1	7/15/05	0.56	18	S	6	0.0666	0	1.5318	0.486	0	100	
LOWR	2007	500	2	1	7/16/05	0.59	22	2	6	0.09324	0.14	1.5318	0.594	0	100	
LOWR	2007	500	2	1	7/17/05	0.63	0	2	S	0.10989	0	1.5318	0	0	92	
LOWR	2007	500	2	1	7/18/05	0.66	0	2	2	0.08325	0	1.5318	0	0	87	
LOWR	2007	500	2	1	7/19/05	0.69	0	2	3	0.10323	0	1.5318	0	0	80	
LOWR	2007	500	2	1	7/20/05	0.72	0	2	4	0.10989	0.06	1.5318	0	0	77	
LOWR	2007	500	2	1	7/21/05	0.76	24	S	4	0.09657	0	1.5318	0.648	0	100	
LOWR	2007	500	2	1	7/22/05	0.79	24	2	4	0.09324	0	1.5318	0.648	0	100	
LOWR	2007	500	2	1	7/23/05	0.82	24	3	4	0.05994	0	1.5318	0.648	0	100	
LOWR	2007	500	2	1	7/24/05	0.86	5	3	S	0.09657	0	1.5318	0.135	0	100	
LOWR	2007	500	2	1	7/25/05	0.89	0	3	2	0.09324	0	1.5318	0	0	93	
LOWR	2007	500	2	1	7/26/05	0.92	0	3	3	0.10656	0	1.5318	0	0	86	
LOWR	2007	500	2	1	7/27/05	0.95	0	3	4	0.09657	0	1.5318	0	0	80	
LOWR	2007	500	2	1	7/28/05	0.99	0	3	5	0.04329	0	1.5318	0	0	77	
LOWR	2007	500	2	1	7/29/05	1.02	0	3	6	0.08658	0	1.5318	0	0	72	
LOWR	2007	500	2	1	7/30/05	1.05	24	S	6	0.09657	0	1.5318	0.648	0	100	
LOWR	2007	500	2	1	7/31/05	1.09	24	2	6	0.08658	0	1.5318	0.648	0	100	
LOWR	2007	500	2	1	8/1/05	1.12	0	2	S	0.10656	0	1.5318	0	0	93	
LOWR	2007	500	2	1	8/2/05	1.15	0	2	2	0.08325	0	1.5318	0	0	87	
LOWR	2007	500	2	1	8/3/05	1.18	0	2	3	0.10656	0	1.5318	0	0	80	

F500: Lowrie Ditch
Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
LOWR	2007	500	2	1	8/4/05	1.22	0	2	4	0.09324	0	1.5318	0	0	74	
LOWR	2007	500	2	1	8/5/05	1.25	0	2	5	0.09324	0	1.5318	0	0	68	
LOWR	2007	500	2	1	8/6/05	1.28	22	S	5	0.110756	0	1.5318	0.594	0	100	
LOWR	2007	500	2	1	8/7/05	1.32	24	2	5	0.110756	0	1.5318	0.648	0	100	
LOWR	2007	500	2	1	8/8/05	1.35	24	3	5	0.110756	0	1.5318	0.648	0	100	
LOWR	2007	500	2	1	8/9/05	1.38	0	4	5	0.110756	0.53	1.5318	0	0	100	
LOWR	2007	500	2	1	8/10/05	1.41	0	4	S	0.110756	0	1.5318	0	0	92	
LOWR	2007	500	2	1	8/11/05	1.45	0	4	2	0.09324	0	1.5318	0	0	86	
LOWR	2007	500	2	1	8/12/05	1.48	0	4	3	0.07992	0	1.5318	0	0	81	
LOWR	2007	500	2	1	8/13/05	1.51	0	4	4	0.067436	0	1.551028	0	0	76	AC
LOWR	2007	500	2	1	8/14/05	1.55	0	4	5	0.099908	0	1.584746	0	0	68	?
LOWR	2007	500	2	1	8/15/05	1.58	20	S	5	0.10907	0	1.618464	0.54	0	93	
LOWR	2007	500	2	1	8/16/05	1.61	0	1	S	0.100568	0	1.652182	0	0	85	
LOWR	2007	500	2	1	8/17/05	1.64	24	S	1	0.12461	0	1.6859	0.648	0	100	
LOWR	2007	500	2	1	8/18/05	1.68	24	2	1	0.119626	0	1.719618	0.648	0	100	
LOWR	2007	500	2	1	8/19/05	1.71	4	2	S	0.102913	0	1.753336	0.108	0	98	
LOWR	2007	500	2	1	8/20/05	1.74	0	S	1	0.112662	0.25	1.787054	0	0	100	
LOWR	2007	500	2	1	8/21/05	1.78	0	1	S	0.11083	0	1.820772	0	0	92	
LOWR	2007	500	2	1	8/22/05	1.81	0	1	2	0.108851	0	1.85449	0	0	84	
LOWR	2007	500	2	1	8/23/05	1.84	0	1	3	0.10262	0	1.888208	0	0	77	
LOWR	2007	500	2	1	8/24/05	1.88	0	1	4	0.116987	0	1.921926	0	0	70	?
LOWR	2007	500	2	1	8/25/05	1.91	0	1	5	0.110536	0	1.955644	0	0	63	?
LOWR	2007	500	2	1	8/26/05	1.94	24	S	5	0.108118	0	1.989362	0.648	0	89	
LOWR	2007	500	2	1	8/27/05	1.97	24	2	5	0.105552	0	2.02308	0.648	0	100	
LOWR	2007	500	2	1	8/28/05	2.01	0	2	S	0.093897	0	2.056798	0	0	93	
LOWR	2007	500	2	1	8/29/05	2.04	4	2	2	0.072714	0	2.090516	0.108	0	93	
LOWR	2007	500	2	1	8/30/05	2.07	0	2	3	0.120065	0	2.124234	0	0	86	
LOWR	2007	500	2	1	8/31/05	2.11	0	2	4	0.136045	0	2.157952	0	0	79	
LOWR	2007	500	2	1	9/1/05	2.14	0	2	5	0.138171	0	2.19167	0	0	71	?
LOWR	2007	500	2	1	9/2/05	2.17	0	2	6	0.135458	0	2.225388	0	0	64	?
LOWR	2007	500	2	1	9/3/05	2.20	0	2	7	0.1326	0	2.259106	0	0	57	?
LOWR	2007	500	2	1	9/4/05	2.24	0	2	8	0.149532	0	2.292824	0	0	50	?
LOWR	2007	500	2	1	9/5/05	2.27	0	2	9	0.136558	0	2.326542	0	0	43	?
LOWR	2007	500	2	1	9/6/05	2.30	22	S	9	0.128275	0.1	2.36026	0.594	0	67	?
LOWR	2007	500	2	1	9/7/05	2.34	24	2	9	0.119699	0.06	2.393978	0.648	0	90	
LOWR	2007	500	2	1	9/8/05	2.37	24	3	9	0.142495	0.05	2.427696	0.648	0	100	
LOWR	2007	500	2	1	9/9/05	2.40	0	3	S	0.144474	0	2.461414	0	0	92	

F500: Lowrie Ditch
Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
LOWR	2007	500	2	1	9/10/05	2.43	0	3	2	0.157302	0	2.495132	0	0	85	
LOWR	2007	500	2	1	9/11/05	2.47	0	3	3	0.159428	0	2.52885	0	0	77	
LOWR	2007	500	2	1	9/12/05	2.50	0	3	4	0.13927	0.03	2.562568	0	0	72	
LOWR	2007	500	2	1	9/13/05	2.53	0	3	5	0.12417	0.03	2.596286	0	0	67	?
LOWR	2007	500	2	1	9/14/05	2.57	0	3	6	0.108631	0.12	2.630004	0	0	67	?
LOWR	2007	500	2	1	9/15/05	2.60	0	S	6	0.110023	2.5	2.663722	0	0	100	
LOWR	2007	500	2	1	9/16/05	2.63	0	1	S	0.093824	0	2.69744	0	0	95	
LOWR	2007	500	2	1	9/17/05	2.66	0	1	2	0.148433	0	2.731158	0	0	88	
LOWR	2007	500	2	1	9/18/05	2.70	0	1	3	0.126223	0.05	2.764876	0	0	84	
LOWR	2007	500	2	1	9/19/05	2.73	0	1	4	0.146014	0	2.798594	0	0	78	
LOWR	2007	500	2	1	9/20/05	2.76	0	1	5	0.147773	0	2.832312	0	0	72	?
LOWR	2007	500	2	1	9/21/05	2.80	0	1	6	0.143302	0	2.86603	0	0	66	?
LOWR	2007	500	2	1	9/22/05	2.83	0	1	7	0.107165	0	2.899748	0	0	62	?
LOWR	2007	500	2	1	9/23/05	2.86	0	1	8	0.102034	0	2.933466	0	0	57	?
LOWR	2007	500	2	1	9/24/05	2.89	24	S	8	0.135458	0	2.967184	0.648	0	74	?
LOWR	2007	500	2	1	9/25/05	2.93	5	1	S	0.150045	0	3.000902	0.135	0	73	?
LOWR	2007	500	2	1	9/26/05	2.96	0	1	2	0.158328	0	3.03462	0	0	67	?
LOWR	2007	500	2	1	9/27/05	2.99	0	1	3	0.166758	0	3.068338	0	0	60	?
LOWR	2007	500	2	1	9/28/05	3.03	0	1	4	0.16859	0	3.102056	0	0	54	?
LOWR	2007	500	2	1	9/29/05	3.06	0	1	5	0.136338	0	3.135774	0	0	49	?
LOWR	2007	500	2	1	9/30/05	3.09	0	S	5	0.117133	0.26	3.169492	0	0	53	?
LOWR	2007	500	2	1	10/1/05	3.13	22	2	5	0.111416	0.25	3.20321	0.594	0	76	?
LOWR	2007	500	2	1	10/2/05	3.16	24	3	5	0.133699	0	3.236928	0.648	0	91	
LOWR	2007	500	2	1	10/3/05	3.19	24	4	5	0.099541	0	3.270646	0.648	0	100	
LOWR	2007	500	2	1	10/4/05	3.22	24	5	5	0.158035	0	3.304364	0.648	0	100	
LOWR	2007	500	2	1	10/5/05	3.26	20	6	5	0.159647	0.03	3.338082	0.54	0	100	
LOWR	2007	500	2	1	10/6/05	3.29	0	6	S	0.11728	0	3.3718	0	0	95	
LOWR	2007	500	2	1	10/7/05	3.32	0	6	2	0.118453	0.12	3.405518	0	0	94	
LOWR	2007	500	2	1	10/8/05	3.36	0	6	3	0.192223	0	3.439236	0	0	88	
LOWR	2007	500	2	1	10/9/05	3.39	0	6	4	0.194108	0	3.472954	0	0	81	
LOWR	2007	500	2	1	10/10/05	3.42	0	6	5	0.195992	0	3.506672	0	0	75	
LOWR	2007	500	2	1	10/11/05	3.45	0	6	6	0.197877	0.02	3.54039	0	0	69	?
LOWR	2007	500	2	1	10/12/05	3.49	21	S	6	0.199762	0.19	3.574108	0.567	0	84	
LOWR	2007	500	2	1	10/13/05	3.52	24	2	6	0.201646	0.13	3.607826	0.648	0	99	
LOWR	2007	500	2	1	10/14/05	3.55	24	3	6	0.203531	0	3.641544	0.648	0	100	
LOWR	2007	500	2	1	10/15/05	3.59	5	3	S	0.205415	0	3.675262	0.135	0	97	
LOWR	2007	500	2	1	10/16/05	3.62	0	3	2	0.2073	0	3.70898	0	0	90	

F500: Lowrie Ditch
Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
LOWR	2007	500	2	1	10/17/05	3.65	0	3	3	0.209184	0	3.742698	0	0	84	
LOWR	2007	500	2	1	10/18/05	3.68	0	3	4	0.211069	0	3.776416	0	0	77	
LOWR	2007	500	2	1	10/19/05	3.72	0	3	5	0.212953	0	3.810134	0	0	71	
LOWR	2007	500	2	1	10/20/05	3.75	5	3	6	0.214838	0	3.843852	0.135	0	68	?
LOWR	2007	500	2	1	10/21/05	3.78	0	3	7	0.216722	0	3.87757	0	0	62	?
LOWR	2007	500	2	1	10/22/05	3.82	0	3	8	0.218607	0.1	3.911288	0	0	59	?
LOWR	2007	500	2	1	10/23/05	3.85	0	S	8	0.220492	1.25	3.945006	0	0	84	
LOWR	2007	500	2	1	10/24/05	3.88	22	2	8	0.222376	0.22	3.978724	0.594	0	98	
LOWR	2007	500	2	1	10/25/05	3.91	24	3	8	0.224261	0	4.012442	0.648	0	100	
LOWR	2007	500	2	1	10/26/05	3.95	24	4	8	0.226145	0	4.04616	0.648	0	100	
LOWR	2007	500	2	1	10/27/05	3.98	5	4	S	0.22803	0	4.079878	0.135	0	96	
LOWR	2007	500	2	1	10/28/05	4.01	0	4	2	0.229914	0.08	4.113596	0	0	92	
LOWR	2007	500	2	1	10/29/05	4.05	0	4	3	0.231799	0	4.147314	0	0	86	
LOWR	2007	500	2	1	10/30/05	4.08	0	4	4	0.233683	0	4.181032	0	0	79	
LOWR	2007	500	2	1	10/31/05	4.11	0	4	5	0.235568	0	4.21475	0	0	73	
LOWR	2007	500	2	1	11/1/05	4.14	0	4	6	0.142006	0.03	3.175628	0	0	94	
LOWR	2007	500	2	1	11/2/05	4.18	18	S	6	0.143133	0	3.200832	0.486	0	100	SC
LOWR	2007	500	2	1	11/3/05	4.21	24	2	6	0.14426	0	3.226035	0.648	0	100	
LOWR	2007	500	2	1	11/4/05	4.24	0	2	S	0.145387	0	3.251239	0	0	94	
LOWR	2007	500	2	1	11/5/05	4.28	0	2	2	0.146514	0	3.276442	0	0	89	
LOWR	2007	500	2	1	11/6/05	4.31	0	2	3	0.147641	0	3.301645	0	0	84	
LOWR	2007	500	2	1	11/7/05	4.34	0	2	4	0.148768	0.02	3.326849	0	0	79	
LOWR	2007	500	2	1	11/8/05	4.38	16	S	4	0.149895	0.15	3.352052	0.432	0	92	
LOWR	2007	500	2	1	11/9/05	4.41	24	2	4	0.151022	0.05	3.377256	0.648	0	100	
LOWR	2007	500	2	1	11/10/05	4.44	24	3	4	0.152149	0	3.402459	0.648	0	100	
LOWR	2007	500	2	1	11/11/05	4.47	0	3	S	0.153276	0	3.427662	0	0	94	
LOWR	2007	500	2	1	11/12/05	4.51	0	3	2	0.154403	0	3.452866	0	0	89	
LOWR	2007	500	2	1	11/13/05	4.54	16	S	2	0.105854	0	3.478069	0.432	0	98	
LOWR	2007	500	2	1	11/14/05	4.57	24	2	2	0.09139	0	3.503273	0.648	0	100	
LOWR	2007	500	2	1	11/15/05	4.61	24	3	2	0.145741	0	3.528476	0.648	0	100	
LOWR	2007	500	2	1	11/16/05	4.64	0	3	S	0.139057	0	3.553679	0	0	95	
LOWR	2007	500	2	1	11/17/05	4.67	0	3	2	0.124483	0	3.578883	0	0	91	
LOWR	2007	500	2	1	11/18/05	4.70	0	3	3	0.086185	0	3.604086	0	0	88	
LOWR	2007	500	2	1	11/19/05	4.74	0	3	4	0.142016	0	3.62929	0	0	83	
LOWR	2007	500	2	1	11/20/05	4.77	0	3	5	0.119168	0	3.654493	0	0	79	
LOWR	2007	500	2	1	11/21/05	4.80	21	S	5	0.095992	0	3.679696	0.567	0	92	
LOWR	2007	500	2	1	11/22/05	4.84	24	2	5	0.104704	0	3.7049	0.648	0	100	

F500: Lowrie Ditch
Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
LOWR	2007	500	2	1	11/23/05	4.87	5	2	S	0.064871	0	3.730103	0.135	0	100	
LOWR	2007	500	2	1	11/24/05	4.90	0	S	1	0.06531	0.43	3.755307	0	0	100	
LOWR	2007	500	2	1	11/25/05	4.93	0	1	S	0.169055	0	3.78051	0	0	94	
LOWR	2007	500	2	1	11/26/05	4.97	0	1	2	0.115826	0	3.805713	0	0	91	
LOWR	2007	500	2	1	11/27/05	5.00	0	1	3	0.024984	0.12	3.830917	0	0	93	
LOWR	2007	500	2	1	11/28/05	5.03	0	S	3	0.092212	1.1	3.85612	0	0	100	
LOWR	2007	500	2	1	11/29/05	5.07	0	1	S	0.092814	0	3.881324	0	0	96	
LOWR	2007	500	2	1	11/30/05	5.10	0	1	2	0.144372	0	3.906527	0	0	92	
LOWR	2007	500	2	1	12/1/05	5.13	0	1	3	0.145303	0	3.93173	0	0	88	
LOWR	2007	500	2	1	12/2/05	5.16	0	1	4	0.120428	0	3.956934	0	0	84	
LOWR	2007	500	2	1	12/3/05	5.20	0	1	5	0.121195	0	3.982137	0	0	81	
LOWR	2007	500	2	1	12/4/05	5.23	0	1	6	0.148097	0	4.007341	0	0	76	
LOWR	2007	500	2	1	12/5/05	5.26	0	S	6	0.227926	0.29	4.032544	0	0	78	
LOWR	2007	500	2	1	12/6/05	5.30	0	1	S	0.22053	0	4.057747	0	0	72	
LOWR	2007	500	2	1	12/7/05	5.33	0	1	2	0.17752	0	4.082951	0	0	67	
LOWR	2007	500	2	1	12/8/05	5.36	22	S	2	0.214338	0	4.108154	0.594	0	76	
LOWR	2007	500	2	1	12/9/05	5.39	0	1	S	0.269567	0	4.133358	0	0	69	
LOWR	2007	500	2	1	12/10/05	5.43	22	S	1	0.271211	0.25	4.158561	0.594	0	82	
LOWR	2007	500	2	1	12/11/05	5.46	24	2	1	0.263759	0.1	4.183764	0.648	0	93	
LOWR	2007	500	2	1	12/12/05	5.49	24	3	1	0.265348	0.02	4.208968	0.648	0	100	
LOWR	2007	500	2	1	12/13/05	5.53	0	3	S	0.257732	0	4.234171	0	0	93	
LOWR	2007	500	2	1	12/14/05	5.56	0	3	2	0.287045	0	4.259375	0	0	86	
LOWR	2007	500	2	1	12/15/05	5.59	0	3	3	0.186286	0	4.284578	0	0	81	
LOWR	2007	500	2	1	12/16/05	5.63	0	3	4	0.187382	0	4.309781	0	0	76	
LOWR	2007	500	2	1	12/17/05	5.66	20	S	4	0.158981	0	4.334985	0.54	0	84	
LOWR	2007	500	2	1	12/18/05	5.69	24	2	4	0.159905	0	4.360188	0.648	0	95	
LOWR	2007	500	2	1	12/19/05	5.72	24	3	4	0.160829	0	4.385392	0.648	0	100	
LOWR	2007	500	2	1	12/20/05	5.76	0	3	S	0.161754	0	4.410595	0	0	95	
LOWR	2007	500	2	1	12/21/05	5.79	0	3	2	0.162678	0	4.435798	0	0	91	
LOWR	2007	500	2	1	12/22/05	5.82	0	3	3	0.163602	0	4.461002	0	0	87	
LOWR	2007	500	2	1	12/23/05	5.86	0	3	4	0.164527	0	4.486205	0	0	83	
LOWR	2007	500	2	1	12/24/05	5.89	0	3	5	0.165451	0	4.511409	0	0	79	
LOWR	2007	500	2	1	12/25/05	5.92	0	3	6	0.166375	0	4.536612	0	0	74	
LOWR	2007	500	2	1	12/26/05	5.95	0	3	7	0.1673	0	4.561815	0	0	70	
LOWR	2007	500	2	1	12/27/05	5.99	0	3	8	0.149577	0	4.587019	0	0	67	
LOWR	2007	500	2	1	12/28/05	6.02	0	3	9	0.14	0	4.6	0	0	64	
LOWR	2007	500	2	1	12/29/05	6.05	0	3	10	0.13	0	4.6	0	0	61	

F500: Lowrie Ditch
Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
LOWR	2007	500	2	1	12/30/05	6.09	0	3	11	0.12	0	4.6	0	0	58	
LOWR	2007	500	2	1	12/31/05	6.12	0	3	12	0.15	0	4.6	0	0	55	
LOWR	2007	500	2	1	1/1/06	6.15	0	3	13	0.14	0	4.6	0	0	52	?
LOWR	2007	500	2	1	1/2/06	6.18	0	3	14	0.1	0	4.6	0	0	50	?
LOWR	2007	500	2	1	1/3/06	6.22	0	3	15	0.15	0	4.6	0	0	46	?
LOWR	2007	500	2	1	1/4/06	6.25	0	3	16	0.14	0	4.6	0	0	43	?
LOWR	2007	500	2	1	1/5/06	6.28	0	3	17	0.13	0.06	4.6	0	0	42	?
LOWR	2007	500	2	1	1/6/06	6.32	0	3	18	0.17	0.14	4.6	0	0	41	?
LOWR	2007	500	2	1	1/7/06	6.35	0	3	19	0.19	0	4.6	0	0	37	?
LOWR	2007	500	2	1	1/8/06	6.38	0	3	20	0.17	0	4.6	0	0	33	?
LOWR	2007	500	2	1	1/9/06	6.41	0	3	21	0.17	0.02	4.6	0	0	30	?
LOWR	2007	500	2	1	1/10/06	6.45	0	3	22	0.1787	0	4.6	0	0	26	?
LOWR	2007	500	2	1	1/11/06	6.48	0	3	23	0.14	0	4.6	0	0	23	?
LOWR	2007	500	2	1	1/12/06	6.51	21	S	23	0.17	0.17	4.6	0.567	0	35	?
LOWR	2007	500	2	1	1/13/06	6.55	0	1	S	0.16	0	4.6	0	0	32	?
LOWR	2007	500	2	1	1/14/06	6.58	16	S	1	0.19	0	4.6	0.432	0	37	?
LOWR	2007	500	2	1	1/15/06	6.61	24	2	1	0.17	0	4.6	0.648	0	48	?
LOWR	2007	500	2	1	1/16/06	6.64	24	3	1	0.14	0	4.6	0.648	0	59	?
LOWR	2007	500	2	1	1/17/06	6.68	24	4	1	0.15	0.1	4.6	0.648	0	72	
LOWR	2007	500	2	1	1/18/06	6.71	0	4	S	0.19	0	4.6	0	0	68	
LOWR	2007	500	2	1	1/19/06	6.74	0	4	2	0.2	0	4.6	0	0	63	
LOWR	2007	500	2	1	1/20/06	6.78	0	4	3	0.19	0	4.6	0	0	59	?
LOWR	2007	500	2	1	1/21/06	6.81	0	4	4	0.18	0	4.6	0	0	55	?
LOWR	2007	500	2	1	1/22/06	6.84	0	4	5	0.17	0	4.6	0	0	51	?
LOWR	2007	500	2	1	1/23/06	6.88	0	4	6	0.11	0	4.6	0	0	49	?
LOWR	2007	500	2	1	1/24/06	6.91	0	4	7	0.1	0.04	4.6	0	0	48	?
LOWR	2007	500	2	1	1/25/06	6.94	22	S	7	0.11	0.43	4.6	0.594	0	68	
LOWR	2007	500	2	1	1/26/06	6.97	24	2	7	0.13	0.08	4.6	0.648	0	81	
LOWR	2007	500	2	1	1/27/06	7.01	24	3	7	0.18	0.17	4.6	0.648	0	94	
LOWR	2007	500	2	1	1/28/06	7.04	24	4	7	0.2	0	4.6	0.648	0	100	
LOWR	2007	500	2	1	1/29/06	7.07	0	4	S	0.18	0	4.6	0	0	96	
LOWR	2007	500	2	1	1/30/06	7.11	0	4	2	0.17	0	4.6	0	0	92	
LOWR	2007	500	2	1	1/31/06	7.14	0	4	3	0.18	0	4.6	0	0	88	
LOWR	2007	500	2	1	2/1/06	7.17	0	4	4	0.2	0	4.6	0	0	84	
LOWR	2007	500	2	1	2/2/06	7.20	0	4	5	0.17	0	4.6	0	0	80	
LOWR	2007	500	2	1	2/3/06	7.24	0	S	5	0.12	0.55	4.6	0	0	89	
LOWR	2007	500	2	1	2/4/06	7.27	0	1	S	0.18	0.05	4.6	0	0	86	

F500: Lowrie Ditch
Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
LOWR	2007	500	2	1	2/5/06	7.30	21	S	1	0.21	0	4.6	0.567	0	94	
LOWR	2007	500	2	1	2/6/06	7.34	24	2	1	0.22	0	4.6	0.648	0	100	
LOWR	2007	500	2	1	2/7/06	7.37	0	2	S	0.18	0	4.6	0	0	96	
LOWR	2007	500	2	1	2/8/06	7.40	16	S	1	0.13	0	4.6	0.432	0	100	
LOWR	2007	500	2	1	2/9/06	7.43	4	1	S	0.2	0.02	4.6	0.108	0	98	
LOWR	2007	500	2	1	2/10/06	7.47	0	1	2	0.2	0	4.6	0	0	94	
LOWR	2007	500	2	1	2/11/06	7.50	0	1	3	0.17	0	4.6	0	0	90	
LOWR	2007	500	2	1	2/12/06	7.53	0	1	4	0.18	0	4.6	0	0	86	
LOWR	2007	500	2	1	2/13/06	7.57	0	1	5	0.17	0.1	4.6	0	0	84	
LOWR	2007	500	2	1	2/14/06	7.60	0	S	5	0.13	0.3	4.6	0	0	88	
LOWR	2007	500	2	1	2/15/06	7.63	22	2	5	0.14	0.06	4.6	0.594	0	99	
LOWR	2007	500	2	1	2/16/06	7.66	24	3	5	0.16	0	4.6	0.648	0	100	
LOWR	2007	500	2	1	2/17/06	7.70	24	4	5	0.13	0	4.6	0.648	0	100	
LOWR	2007	500	2	1	2/18/06	7.73	0	4	S	0.13	0.15	4.6	0	0	100	
LOWR	2007	500	2	1	2/19/06	7.76	0	4	2	0.09	0	4.6	0	0	98	
LOWR	2007	500	2	1	2/20/06	7.80	0	4	3	0.12	0.17	4.6	0	0	99	
LOWR	2007	500	2	1	2/21/06	7.83	0	4	4	0.11	0	4.6	0	0	96	
LOWR	2007	500	2	1	2/22/06	7.86	0	4	5	0.16	0	4.6	0	0	93	
LOWR	2007	500	2	1	2/23/06	7.89	0	4	6	0.19	0.14	4.6	0	0	92	
LOWR	2007	500	2	1	2/24/06	7.93	0	4	7	0.16	0	4.6	0	0	88	
LOWR	2007	500	2	1	2/25/06	7.96	24	S	7	0.17	0	4.6	0.648	0	99	
LOWR	2007	500	2	1	2/26/06	7.99	24	2	7	0.1	0	4.6	0.648	0	100	
LOWR	2007	500	2	1	2/27/06	8.03	5	2	S	0.21	0.05	4.6	0.135	0	99	
LOWR	2007	500	2	1	2/28/06	8.06	0	2	2	0.2	0	4.6	0	0	95	
LOWR	2007	500	2	1	3/1/06	8.09	0	2	3	0.15	0	4.6	0	0	91	
LOWR	2007	500	2	1	3/2/06	8.13	0	2	4	0.19	0	4.6	0	0	87	
LOWR	2007	500	2	1	3/3/06	8.16	0	2	5	0.22	0	4.6	0	0	82	
LOWR	2007	500	2	1	3/4/06	8.19	20	S	5	0.2	0	4.6	0.54	0	90	
LOWR	2007	500	2	1	3/5/06	8.22	24	2	5	0.23	0	4.6	0.648	0	99	
LOWR	2007	500	2	1	3/6/06	8.26	24	3	5	0.25	0	4.6	0.648	0	100	
LOWR	2007	500	2	1	3/7/06	8.29	4	3	S	0.18	0	4.6	0.108	0	98	
LOWR	2007	500	2	1	3/8/06	8.32	0	3	2	0.24	0	4.6	0	0	93	
LOWR	2007	500	2	1	3/9/06	8.36	0	3	3	0.15	0	4.6	0	0	89	
LOWR	2007	500	2	1	3/10/06	8.39	0	3	4	0.22	0	4.6	0	0	85	
LOWR	2007	500	2	1	3/11/06	8.42	16	S	4	0.24	0	4.6	0.432	0	89	
LOWR	2007	500	2	1	3/12/06	8.45	24	2	4	0.17	0	4.6	0.648	0	99	
LOWR	2007	500	2	1	3/13/06	8.49	24	3	4	0.16	0	4.6	0.648	0	100	

F500: Lowrie Ditch
Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
LOWR	2007	500	2	1	3/14/06	8.52	24	4	4	0.14	0	4.6	0.648	0	100	
LOWR	2007	500	2	1	3/15/06	8.55	24	5	4	0.08	0	4.6	0.648	0	100	
LOWR	2007	500	2	1	3/16/06	8.59	0	5	S	0.13	0.05	4.6	0	0	98	
LOWR	2007	500	2	1	3/17/06	8.62	4	5	2	0.13	0	4.6	0.108	0	97	
LOWR	2007	500	2	1	3/18/06	8.65	0	5	3	0.2139	0	4.6	0	0	93	
LOWR	2007	500	2	1	3/19/06	8.68	0	S	3	0.2139	0.48	4.6	0	0	98	
LOWR	2007	500	2	1	3/20/06	8.72	0	2	3	0.2	1.04	4.6	0	0	100	
LOWR	2007	500	2	1	3/21/06	8.75	0	2	S	0.13	0	4.6	0	0	97	
LOWR	2007	500	2	1	3/22/06	8.78	0	2	2	0.13	0	4.6	0	0	94	
LOWR	2007	500	2	1	3/23/06	8.82	0	2	3	0.19	0.02	4.6	0	0	90	
LOWR	2007	500	2	1	3/24/06	8.85	0	S	3	0.25	0.8	4.6	0	0	100	
LOWR	2007	500	2	1	3/25/06	8.88	24	2	3	0.12	0	4.6	0.648	0	100	
LOWR	2007	500	2	1	3/26/06	8.91	24	3	3	0.12	0.11	4.6	0.648	0	100	
LOWR	2007	500	2	1	3/27/06	8.95	0	4	3	0.2139	0.88	4.6	0	0	100	
LOWR	2007	500	2	1	3/28/06	8.98	0	5	3	0.2139	0.45	4.6	0	0	100	
LOWR	2007	500	2	1	3/29/06	9.01	0	6	3	0.2139	1.48	4.6	0	0	100	
LOWR	2007	500	2	1	3/30/06	9.05	21	7	3	0.2139	2.8	4.6	0.567	0	100	
LOWR	2007	500	2	1	3/31/06	9.08	24	8	3	0.14	0	4.6	0.648	0	100	
LOWR	2007	500	2	1	4/1/06	9.11	24	9	3	0.18	0.08	4.6	0.648	0	100	
LOWR	2007	500	2	1	4/2/06	9.14	24	10	3	0.21	0.08	4.6	0.648	0	100	SC
LOWR	2007	500	2	1	4/3/06	9.18	24	11	3	0.28	0	4.6	0.648	0	100	
LOWR	2007	500	2	1	4/4/06	9.21	0	11	S	0.22	0	4.6	0	0	95	
LOWR	2007	500	2	1	4/5/06	9.24	0	11	2	0.28	0	4.6	0	0	89	
LOWR	2007	500	2	1	4/6/06	9.28	0	11	3	0.19	0	4.6	0	0	85	
LOWR	2007	500	2	1	4/7/06	9.31	0	S	3	0.27	0.2	4.6	0	0	83	
LOWR	2007	500	2	1	4/8/06	9.34	16	2	3	0.21	0.05	4.6	0.432	0	89	
LOWR	2007	500	2	1	4/9/06	9.38	24	3	3	0.19	0	4.6	0.648	0	99	
LOWR	2007	500	2	1	4/10/06	9.41	24	4	3	0.2	0	4.6	0.648	0	100	
LOWR	2007	500	2	1	4/11/06	9.44	24	5	3	0.17	0	4.6	0.648	0	100	
LOWR	2007	500	2	1	4/12/06	9.47	0	5	S	0.13	0	4.6	0	0	97	
LOWR	2007	500	2	1	4/13/06	9.51	0	5	2	0.13	0.14	4.6	0	0	97	
LOWR	2007	500	2	1	4/14/06	9.54	0	5	3	0.32	0.03	4.6	0	0	91	
LOWR	2007	500	2	1	4/15/06	9.57	21	S	3	0.22	0.09	4.6	0.567	0	100	
LOWR	2007	500	2	1	4/16/06	9.61	24	2	3	0.24	0	4.6	0.648	0	100	
LOWR	2007	500	2	1	4/17/06	9.64	0	2	S	0.28	0.05	4.6	0	0	95	
LOWR	2007	500	2	1	4/18/06	9.67	0	2	2	0.23	0	4.6	0	0	90	
LOWR	2007	500	2	1	4/19/06	9.70	0	2	3	0.23	0.13	4.6	0	0	87	

F500: Lowrie Ditch
Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
LOWR	2007	500	2	1	4/20/06	9.74	0	2	4	0.22	0.04	4.6	0	0	83	
LOWR	2007	500	2	1	4/21/06	9.77	24	S	4	0.22	0.1	4.6	0.648	0	95	
LOWR	2007	500	2	1	4/22/06	9.80	24	2	4	0.21	0	4.6	0.648	0	100	
LOWR	2007	500	2	1	4/23/06	9.84	24	3	4	0.27	0.11	4.6	0.648	0	100	
LOWR	2007	500	2	1	4/24/06	9.87	0	3	S	0.29	0	4.6	0	0	93	
LOWR	2007	500	2	1	4/25/06	9.90	0	3	2	0.24	0	4.6	0	0	88	
LOWR	2007	500	2	1	4/26/06	9.93	0	3	3	0.27	0	4.6	0	0	82	
LOWR	2007	500	2	1	4/27/06	9.97	21	S	3	0.26	0	4.6	0.567	0	89	
LOWR	2007	500	2	1	4/28/06	10.00	24	2	3	0.22	0	4.6	0.648	0	98	
LOWR	2007	500	2	1	4/29/06	10.03	24	3	3	0.23	0	4.6	0.648	0	100	
LOWR	2007	500	2	1	4/30/06	10.07	24	4	3	0.19	0	4.6	0.648	0	100	
LOWR	2007	500	2	1	5/1/06	10.10	24	5	3	0.21	0.17	4.6	0.648	0	100	
LOWR	2007	500	2	1	5/2/06	10.13	0	5	S	0.23	0	4.6	0	0	95	
LOWR	2007	500	2	1	5/3/06	10.16	0	5	2	0.27	0	4.6	0	0	89	
LOWR	2007	500	2	1	5/4/06	10.20	0	5	3	0.23	0	4.6	0	0	84	
LOWR	2007	500	2	1	5/5/06	10.23	21	S	3	0.16	0.98	4.6	0.567	0	100	
LOWR	2007	500	2	1	5/6/06	10.26	24	2	3	0.09	0.33	4.6	0.648	0	100	
LOWR	2007	500	2	1	5/7/06	10.30	24	3	3	0.21	0.18	4.6	0.648	0	100	
LOWR	2007	500	2	1	5/8/06	10.33	0	3	S	0.25	0.1	4.6	0	0	96	
LOWR	2007	500	2	1	5/9/06	10.36	0	3	2	0.3	0	4.6	0	0	90	
LOWR	2007	500	2	1	5/10/06	10.39	21	S	2	0.3	0	4.6	0.567	0	96	
LOWR	2007	500	2	1	5/11/06	10.43	24	2	2	0.3	0	4.6	0.648	0	100	
LOWR	2007	500	2	1	5/12/06	10.46	24	3	2	0.2913	0	4.6	0.648	0	100	
LOWR	2007	500	2	1	5/13/06	10.49	24	4	2	0.2913	0	4.6	0.648	0	100	
LOWR	2007	500	2	1	5/14/06	10.53	24	5	2	0.2913	0	4.6	0.648	0	100	
LOWR	2007	500	2	1	5/15/06	10.56	0	6	2	0.2913	0.28	4.6	0	0	99	
LOWR	2007	500	2	1	5/16/06	10.59	0	6	S	0.2913	0	4.6	0	0	93	
LOWR	2007	500	2	1	5/17/06	10.63	0	6	2	0.2913	0	4.6	0	0	87	
LOWR	2007	500	2	1	5/18/06	10.66	0	S	2	0.2913	0.25	4.6	0	0	86	
LOWR	2007	500	2	1	5/19/06	10.69	22	2	2	0.2913	0	4.6	0.594	0	92	
LOWR	2007	500	2	1	5/20/06	10.72	24	3	2	0.2913	0	4.6	0.648	0	100	
LOWR	2007	500	2	1	5/21/06	10.76	24	4	2	0.2913	0	4.6	0.648	0	100	
LOWR	2007	500	2	1	5/22/06	10.79	0	4	S	0.2913	0	4.6	0	0	93	
LOWR	2007	500	2	1	5/23/06	10.82	0	4	2	0.2913	0	4.6	0	0	87	
LOWR	2007	500	2	1	5/24/06	10.86	0	4	3	0.2913	0	4.6	0	0	81	
LOWR	2007	500	2	1	5/25/06	10.89	0	4	4	0.2913	0	4.6	0	0	74	
LOWR	2007	500	2	1	5/26/06	10.92	21	S	4	0.2913	0	4.6	0.567	0	80	

F500: Lowrie Ditch
Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
LOWR	2007	500	2	1	5/27/06	10.95	24	2	4	0.2913	0	4.6	0.648	0	88	
LOWR	2007	500	2	1	5/28/06	10.99	24	3	4	0.2913	0	4.6	0.648	0	96	
LOWR	2007	500	2	1	5/29/06	11.02	0	3	S	0.2913	0	4.6	0	0	89	
LOWR	2007	500	2	1	5/30/06	11.05	0	3	2	0.2913	0	4.6	0	0	83	
LOWR	2007	500	2	1	5/31/06	11.09	0	3	3	0.2913	0	4.6	0	0	77	
LOWR	2007	500	2	1	6/1/06	11.12	0	3	4	0.3407	0	4.6	0	0	69	
LOWR	2007	500	2	1	6/2/06	11.15	0	3	5	0.3407	0	4.6	0	0	62	?
LOWR	2007	500	2	1	6/3/06	11.18	0	3	6	0.3407	0	4.6	0	0	54	?
LOWR	2007	500	2	1	6/4/06	11.22	16	S	6	0.3407	0	4.6	0.432	0	56	?
LOWR	2007	500	2	1	6/5/06	11.25	24	2	6	0.3407	0	4.6	0.648	0	63	
LOWR	2007	500	2	1	6/6/06	11.28	0	2	S	0.3407	0	4.6	0	0	56	?
LOWR	2007	500	2	1	6/7/06	11.32	0	2	2	0.3407	0	4.6	0	0	48	?
LOWR	2007	500	2	1	6/8/06	11.35	0	2	3	0.29	0	4.6	0	0	42	?
LOWR	2007	500	2	1	6/9/06	11.38	0	2	4	0.31	0	4.6	0	0	35	?
LOWR	2007	500	2	1	6/10/06	11.41	24	S	4	0.31	0	4.6	0.648	0	43	?
LOWR	2007	500	2	1	6/11/06	11.45	0	1	S	0.33	0	4.6	0	0	35	?
LOWR	2007	500	2	1	6/12/06	11.48	0	1	2	0.33	0	4.6	0	0	28	?
LOWR	2007	500	2	1	6/13/06	11.51	0	1	3	0.32	0	4.6	0	0	21	?
LOWR	2007	500	2	1	6/14/06	11.55	0	1	4	0.28	0.03	4.6	0	0	16	?
LOWR	2007	500	2	1	6/15/06	11.58	0	1	5	0.28	0.11	4.6	0	0	12	?
LOWR	2007	500	2	1	6/16/06	11.61	16	S	5	0.3407	0.11	4.6	0.432	0	17	?
LOWR	2007	500	2	1	6/17/06	11.64	0	1	S	0.3407	0	4.6	0	0	9	?
LOWR	2007	500	2	1	6/18/06	11.68	0	1	2	0.27	0	4.6	0	0	3	?
LOWR	2007	500	2	1	6/19/06	11.71	0	1	3	0.31	0	4.6	0	0.31	0	WS-0
LOWR	2007	500	2	1	6/20/06	11.74	24	S	3	0.29	0	4.6	0.648	0	7	?
LOWR	2007	500	2	1	6/21/06	11.78	24	2	3	0.28	0	4.6	0.648	0	15	?
LOWR	2007	500	2	1	6/22/06	11.81	0	2	S	0.29	0	4.6	0	0	9	?
LOWR	2007	500	2	1	6/23/06	11.84	0	2	2	0.25	0	4.6	0	0	4	?
LOWR	2007	500	2	1	6/24/06	11.88	0	2	3	0.24	0	4.6	0	0.24	0	WS-0
LOWR	2007	500	2	1	6/25/06	11.91	0	2	4	0.24	0	4.6	0	0.24	0	WS-1
LOWR	2007	500	2	1	6/26/06	11.94	0	2	5	0.3407	0.05	4.6	0	0.3407	0	WS-2
LOWR	2007	500	2	1	6/27/06	11.97	0	2	6	0.3407	0	4.6	0	0.3407	0	WS-3
LOWR	2007	500	2	1	6/28/06	12.01	0	2	7	0.3407	0	4.6	0	0.3407	0	WS-4
LOWR	2007	500	2	1	6/29/06	12.04	0	2	8	0.29	0	4.6	0	0.29	0	WS-5
LOWR	2007	500	2	1	6/30/06	12.07	0	2	9	0.29	0	4.6	0	0.29	0	WS-6
LOWR	2007	500	2	1	7/1/06	12.11	0	2	10	0.3506	0	4.6	0	0.3506	0	WS-7
LOWR	2007	500	2	1	7/2/06	12.14	0	2	11	0.3506	0	4.6	0	0.3506	0	WS-8

F500: Lowrie Ditch
Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
LOWR	2007	500	2	1	7/3/06	12.17	0	2	12	0.33	0	4.6	0	0.33	0	WS-9
LOWR	2007	500	2	1	7/4/06	12.20	0	2	13	0.33	0	4.6	0	0.33	0	WS-10
LOWR	2007	500	2	1	7/5/06	12.24	0	2	14	0.3506	0	4.6	0	0.3506	0	WS-11
LOWR	2007	500	2	1	7/6/06	12.27	0	2	15	0.3506	0	4.6	0	0.3506	0	WS-12
LOWR	2007	500	2	1	7/7/06	12.30	0	2	16	0.23	0	4.6	0	0.23	0	WS-13
LOWR	2007	500	2	1	7/8/06	12.34	0	2	17	0.23	0	4.6	0	0.23	0	WS-14
LOWR	2007	500	2	1	7/9/06	12.37	22	S	17	0.3506	0	4.6	0.594	0	5	
LOWR	2007	500	2	1	7/10/06	12.40	24	2	17	0.3506	0.09	4.6	0.648	0	13	?
LOWR	2007	500	2	1	7/11/06	12.43	16	3	17	0.23	0.09	4.6	0.432	0	20	?
LOWR	2007	500	2	1	7/12/06	12.47	24	4	17	0.23	0.03	4.6	0.648	0	29	?
LOWR	2007	500	2	1	7/13/06	12.50	24	5	17	0.3506	0	4.6	0.648	0	36	?
LOWR	2007	500	2	1	7/14/06	12.53	0	5	S	0.3506	0	4.6	0	0	28	?
LOWR	2007	500	2	1	7/15/06	12.57	0	5	2	0.25	0	4.6	0	0	23	?
LOWR	2007	500	2	1	7/16/06	12.60	16	S	2	0.25	0.03	4.6	0.432	0	27	?
LOWR	2007	500	2	1	7/17/06	12.63	24	2	2	0.3506	0	4.6	0.648	0	34	?
LOWR	2007	500	2	1	7/18/06	12.66	0	2	S	0.3506	0	4.6	0	0	26	?
LOWR	2007	500	2	1	7/19/06	12.70	0	2	2	0.27	0	4.6	0	0	20	?
LOWR	2007	500	2	1	7/20/06	12.73	0	2	3	0.27	0.1	4.6	0	0	17	?
LOWR	2007	500	2	1	7/21/06	12.76	0	2	4	0.3506	0	4.6	0	0	9	
LOWR	2007	500	2	1	7/22/06	12.80	0	2	5	0.3506	0	4.6	0	0	1	
LOWR	2007	500	2	1	7/23/06	12.83	20	S	5	0.32	0	4.6	0.54	0	6	?
LOWR	2007	500	2	1	7/24/06	12.86	0	1	S	0.32	0	4.6	0	0.32	0	WS-0
LOWR	2007	500	2	1	7/25/06	12.89	0	1	2	0.3506	0	4.6	0	0.3506	0	WS-1
LOWR	2007	500	2	1	7/26/06	12.93	0	1	3	0.3506	0	4.6	0	0.3506	0	WS-2
LOWR	2007	500	2	1	7/27/06	12.96	0	1	4	0.31	0	4.6	0	0.31	0	WS-3
LOWR	2007	500	2	1	7/28/06	12.99	16	S	4	0.31	0	4.6	0.432	0	2	?
LOWR	2007	500	2	1	7/29/06	13.03	24	2	4	0.3506	0.11	4.6	0.648	0	11	?
LOWR	2007	500	2	1	7/30/06	13.06	24	3	4	0.3506	0	4.6	0.648	0	17	?
LOWR	2007	500	2	1	7/31/06	13.09	0	3	S	0.3506	0	4.6	0	0	10	?
LOWR	2007	500	2	1	8/1/06	13.13	0	3	2	0.23	0	4.6	0	0	5	?
LOWR	2007	500	2	1	8/2/06	13.16	0	3	3	0.32	0	4.6	0	0.32	0	WS-0
LOWR	2007	500	2	1	8/3/06	13.19	0	3	4	0.33	0	4.6	0	0.33	0	WS-1
LOWR	2007	500	2	1	8/4/06	13.22	0	3	5	0.32	0	4.6	0	0.32	0	WS-2
LOWR	2007	500	2	1	8/5/06	13.26	0	3	6	0.27	0.05	4.6	0	0.27	0	WS-3
LOWR	2007	500	2	1	8/6/06	13.29	22	S	6	0.27	0	4.6	0.594	0	7	?
LOWR	2007	500	2	1	8/7/06	13.32	24	2	6	0.3	0	4.6	0.648	0	14	?
LOWR	2007	500	2	1	8/8/06	13.36	24	3	6	0.32	0	4.6	0.648	0	21	?

F500: Lowrie Ditch
Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
LOWR	2007	500	2	1	8/9/06	13.39	0	3	S	0.34	0	4.6	0	0	14	?
LOWR	2007	500	2	1	8/10/06	13.42	0	3	2	0.33	0	4.6	0	0	7	?
LOWR	2007	500	2	1	8/11/06	13.45	0	3	3	0.31	0	4.6	0	0.31	0	WS-0
LOWR	2007	500	2	1	8/12/06	13.49	0	3	4	0.31	0	4.6	0	0.31	0	WS-1
LOWR	2007	500	2	1	8/13/06	13.52	22	S	4	0.28	0	4.6	0.594	0	6	?
LOWR	2007	500	2	1	8/14/06	13.55	0	1	S	0.3	0	4.6	0	0.3	0	WS-0
LOWR	2007	500	2	1	8/15/06	13.59	0	1	2	0.28	0	4.6	0	0.28	0	WS-1
LOWR	2007	500	2	1	8/16/06	13.62	0	1	3	0.32	0.09	4.6	0	0.32	0	WS-2
LOWR	2007	500	2	1	8/17/06	13.65	8	1	4	0.31	0	4.6	0.216	0.31	0	WS-3
LOWR	2007	500	2	1	8/18/06	13.68	24	S	4	0.29	0.1	4.6	0.648	0	9	?
LOWR	2007	500	2	1	8/19/06	13.72	24	2	4	0.32	0	4.6	0.648	0	17	?
LOWR	2007	500	2	1	8/20/06	13.75	0	2	S	0.3	0	4.6	0	0	10	?
LOWR	2007	500	2	1	8/21/06	13.78	0	2	2	0.3	0	4.6	0	0	4	?
LOWR	2007	500	2	1	8/22/06	13.82	21	S	2	0.27	0	4.6	0.567	0	10	?
LOWR	2007	500	2	1	8/23/06	13.85	24	2	2	0.23	0	4.6	0.648	0	19	?
LOWR	2007	500	2	1	8/24/06	13.88	9	3	2	0.24	0	4.6	0.243	0	19	?
LOWR	2007	500	2	1	8/25/06	13.91	5	3	S	0.24	0	4.6	0.135	0	17	?
LOWR	2007	500	2	1	8/26/06	13.95	0	3	2	0.19	0	4.6	0	0	13	
LOWR	2007	500	2	1	8/27/06	13.98	0	3	3	0.16	0	4.6	0	0	9	
LOWR	2007	500	2	1	8/28/06	14.01	0	3	4	0.29	0	4.6	0	0	3	
LOWR	2007	500	2	1	8/29/06	14.05	0	3	5	0.32	0	4.6	0	0.32	0	WS-0
LOWR	2007	500	2	1	8/30/06	14.08	9	S	5	0.32	0	4.6	0.243	0.32	0	WS-1
LOWR	2007	500	2	1	8/31/06	14.11	16	2	5	0.3	0	4.6	0.432	0	2	
LOWR	2007	500	2	1	9/1/06	14.14	16	3	5	0.31	0	4.6	0.432	0	5	?
LOWR	2007	500	2	1	9/2/06	14.18	0	3	S	0.23	0.05	4.6	0	0	1	?
LOWR	2007	500	2	1	9/3/06	14.21	0	3	2	0.26	0	4.6	0	0.26	0	WS-0
LOWR	2007	500	2	1	9/4/06	14.24	0	3	3	0.28	0	4.6	0	0.28	0	WS-1
LOWR	2007	500	2	1	9/5/06	14.28	0	3	4	0.25	0	4.6	0	0.25	0	WS-2
LOWR	2007	500	2	1	9/6/06	14.31	8	3	5	0.25	0	4.6	0.216	0.25	0	WS-3
LOWR	2007	500	2	1	9/7/06	14.34	0	3	6	0.32	0	4.6	0	0.32	0	WS-4
LOWR	2007	500	2	1	9/8/06	14.38	0	3	7	0.29	0	4.6	0	0.29	0	WS-5
LOWR	2007	500	2	1	9/9/06	14.41	0	3	8	0.28	0.1	4.6	0	0.28	0	WS-6
LOWR	2007	500	2	1	9/10/06	14.44	22	S	8	0.31	0	4.6	0.594	0	6	?
LOWR	2007	500	2	1	9/11/06	14.47	0	1	S	0.35	0	4.6	0	0.35	0	WS-0
LOWR	2007	500	2	1	9/12/06	14.51	0	1	2	0.32	0	4.6	0	0.32	0	WS-1
LOWR	2007	500	2	1	9/13/06	14.54	0	1	3	0.3	0	4.6	0	0.3	0	WS-2
LOWR	2007	500	2	1	9/14/06	14.57	7	1	4	0.25	0	4.6	0.189	0.25	0	WS-3

F500: Lowrie Ditch
Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
LOWR	2007	500	2	1	9/15/06	14.61	0	1	5	0.21	0	4.6	0	0.21	0	WS-4
LOWR	2007	500	2	1	9/16/06	14.64	0	1	6	0.21	0	4.6	0	0.21	0	WS-5
LOWR	2007	500	2	1	9/17/06	14.67	0	1	7	0.3137	0	4.6	0	0.3137	0	WS-6
LOWR	2007	500	2	1	9/18/06	14.70	0	1	8	0.3137	0	4.6	0	0.3137	0	WS-7
LOWR	2007	500	2	1	9/19/06	14.74	0	1	9	0.3137	0	4.6	0	0.3137	0	WS-8
LOWR	2007	500	2	1	9/20/06	14.77	0	1	10	0.32	0	4.6	0	0.32	0	WS-9
LOWR	2007	500	2	1	9/21/06	14.80	7	1	11	0.32	0.09	4.6	0.189	0.32	0	WS-10
LOWR	2007	500	2	1	9/22/06	14.84	0	1	12	0.25	0	4.6	0	0.25	0	WS-11
LOWR	2007	500	2	1	9/23/06	14.87	0	1	13	0.31	0	4.6	0	0.31	0	WS-12
LOWR	2007	500	2	1	9/24/06	14.90	0	1	14	0.18	0	4.6	0	0.18	0	WS-13
LOWR	2007	500	2	1	9/25/06	14.93	19	S	14	0.19	0.43	4.6	0.513	0	16	?
LOWR	2007	500	2	1	9/26/06	14.97	24	2	14	0.15	0	4.6	0.648	0	27	?
LOWR	2007	500	2	1	9/27/06	15.00	0	2	S	0.23	0	4.6	0	0	22	?
LOWR	2007	500	2	1	9/28/06	15.03	0	2	2	0.26	0	4.6	0	0	16	?
LOWR	2007	500	2	1	9/29/06	15.07	0	2	3	0.23	0	4.6	0	0	11	?
LOWR	2007	500	2	1	9/30/06	15.10	12	S	3	0.23	0	4.6	0.324	0	13	?
LOWR	2007	500	2	1	10/1/06	15.13	24	2	3	0.18	0	4.6	0.648	0	23	?
LOWR	2007	500	2	1	10/2/06	15.16	0	2	S	0.23	0	4.6	0	0	18	?
LOWR	2007	500	2	1	10/3/06	15.20	0	2	2	0.29	0	4.6	0	0	12	?
LOWR	2007	500	2	1	10/4/06	15.23	0	2	3	0.26	0	4.6	0	0	6	?
LOWR	2007	500	2	1	10/5/06	15.26	0	2	4	0.2	0	4.6	0	0	2	?
LOWR	2007	500	2	1	10/6/06	15.30	0	2	5	0.2	0	4.6	0	0.2	0	WS-0
LOWR	2007	500	2	1	10/7/06	15.33	0	2	6	0.17	0	4.6	0	0.17	0	WS-1
LOWR	2007	500	2	1	10/8/06	15.36	0	2	7	0.21	0	4.6	0	0.21	0	WS-2
LOWR	2007	500	2	1	10/9/06	15.39	0	2	8	0.18	0	4.6	0	0.18	0	WS-3
LOWR	2007	500	2	1	10/10/06	15.43	0	2	9	0.21	0	4.6	0	0.21	0	WS-4
LOWR	2007	500	2	1	10/11/06	15.46	0	2	10	0.22	0	4.6	0	0.22	0	WS-5
LOWR	2007	500	2	1	10/12/06	15.49	0	2	11	0.19	0	4.6	0	0.19	0	WS-6
LOWR	2007	500	2	1	10/13/06	15.53	0	2	12	0.18	0	4.6	0	0.18	0	WS-7
LOWR	2007	500	2	1	10/14/06	15.56	0	2	13	0.21	0	4.6	0	0.21	0	WS-8
LOWR	2007	500	2	1	10/15/06	15.59	4	2	14	0.2	0	4.6	0.108	0.2	0	WS-9
LOWR	2007	500	2	1	10/16/06	15.63	16	S	14	0.05	0	4.6	0.432	0	8	?
LOWR	2007	500	2	1	10/17/06	15.66	20	2	14	0.05	3.45	4.6	0.54	0	93	
LOWR	2007	500	2	1	10/18/06	15.69	24	3	14	0.2571	0	4.6	0.648	0	100	
LOWR	2007	500	2	1	10/19/06	15.72	0	3	S	0.2571	0	4.6	0	0	94	
LOWR	2007	500	2	1	10/20/06	15.76	0	S	1	0.2571	0.2	4.6	0	0	93	
LOWR	2007	500	2	1	10/21/06	15.79	0	2	1	0.2571	0.58	4.6	0	0	100	

F500: Lowrie Ditch
Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
LOWR	2007	500	2	1	10/22/06	15.82	0	3	1	0.2571	0.25	4.6	0	0	99	
LOWR	2007	500	2	1	10/23/06	15.86	0	3	S	0.2571	0	4.6	0	0	94	
LOWR	2007	500	2	1	10/24/06	15.89	0	3	2	0.2571	0	4.6	0	0	88	
LOWR	2007	500	2	1	10/25/06	15.92	0	3	3	0.27	0	4.6	0	0	82	
LOWR	2007	500	2	1	10/26/06	15.95	0	3	4	0.27	0	4.6	0	0	76	
LOWR	2007	500	2	1	10/27/06	15.99	0	3	5	0.2571	0	4.6	0	0	71	
LOWR	2007	500	2	1	10/28/06	16.02	0	3	6	0.2571	0	4.6	0	0	65	?
LOWR	2007	500	2	1	10/29/06	16.05	0	3	7	0.2571	0	4.6	0	0	60	?
LOWR	2007	500	2	1	10/30/06	16.09	0	3	8	0.2571	0	4.6	0	0	54	?
LOWR	2007	500	2	1	10/31/06	16.12	0	3	9	0.2571	0	4.6	0	0	48	?
LOWR	2007	500	2	1	11/1/06	16.15	22	S	9	0.2057	0	4.6	0.594	0	57	
LOWR	2007	500	2	1	11/2/06	16.18	5	2	9	0.2057	0.3	4.6	0.135	0	62	SC
LOWR	2007	500	2	1	11/3/06	16.22	16	3	9	0.2057	6.2	4.6	0.432	0	100	
LOWR	2007	500	2	1	11/4/06	16.25	0	3	S	0.2057	0.05	4.6	0	0	96	
LOWR	2007	500	2	1	11/5/06	16.28	0	3	2	0.2057	0	4.6	0	0	92	
LOWR	2007	500	2	1	11/6/06	16.32	22	S	2	0.2	0	4.6	0.594	0	100	
LOWR	2007	500	2	1	11/7/06	16.35	0	1	S	0.2	0	4.6	0	0	95	
LOWR	2007	500	2	1	11/8/06	16.38	0	1	2	0.2057	0.07	4.6	0	0	92	
LOWR	2007	500	2	1	11/9/06	16.41	0	1	3	0.23	0	4.6	0	0	87	
LOWR	2007	500	2	1	11/10/06	16.45	0	1	4	0.18	0.05	4.6	0	0	84	
LOWR	2007	500	2	1	11/11/06	16.48	0	1	5	0.19	0	4.6	0	0	80	
LOWR	2007	500	2	1	11/12/06	16.51	0	1	6	0.18	0	4.6	0	0	76	
LOWR	2007	500	2	1	11/13/06	16.55	0	1	7	0.17	0	4.6	0	0	73	
LOWR	2007	500	2	1	11/14/06	16.58	0	1	8	0.08	0	4.6	0	0	71	
LOWR	2007	500	2	1	11/15/06	16.61	0	1	9	0.16	0	4.6	0	0	67	
LOWR	2007	500	2	1	11/16/06	16.64	0	1	10	0.22	0	4.6	0	0	63	
LOWR	2007	500	2	1	11/17/06	16.68	0	1	11	0.22	0	4.6	0	0	58	
LOWR	2007	500	2	1	11/18/06	16.71	0	1	12	0.19	0	4.6	0	0	54	
LOWR	2007	500	2	1	11/19/06	16.74	0	1	13	0.21	0	4.6	0	0	49	?
LOWR	2007	500	2	1	11/20/06	16.78	0	1	14	0.21	0	4.6	0	0	45	?
LOWR	2007	500	2	1	11/21/06	16.81	0	1	15	0.21	0	4.6	0	0	40	?
LOWR	2007	500	2	1	11/22/06	16.84	0	1	16	0.16	0	4.6	0	0	37	?
LOWR	2007	500	2	1	11/23/06	16.88	0	1	17	0.16	0.18	4.6	0	0	37	?
LOWR	2007	500	2	1	11/24/06	16.91	0	1	18	0.16	0	4.6	0	0	34	?
LOWR	2007	500	2	1	11/25/06	16.94	0	1	19	0.13	0	4.6	0	0	31	?
LOWR	2007	500	2	1	11/26/06	16.97	0	1	20	0.17	0	4.6	0	0	27	?
LOWR	2007	500	2	1	11/27/06	17.01	0	1	21	0.22	0.05	4.6	0	0	23	?

F500: Lowrie Ditch
Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
LOWR	2007	500	2	1	11/28/06	17.04	0	1	22	0.17	0	4.6	0	0	20	?
LOWR	2007	500	2	1	11/29/06	17.07	0	1	23	0.12	0	4.6	0	0	17	?
LOWR	2007	500	2	1	11/30/06	17.11	0	S	23	0.08	0.55	4.6	0	0	27	?
LOWR	2007	500	2	1	12/1/06	17.14	22	2	23	0.1	0.03	4.6	0.594	0	39	?
LOWR	2007	500	2	1	12/2/06	17.17	24	3	23	0.05	0.07	4.6	0.648	0	53	
LOWR	2007	500	2	1	12/3/06	17.20	0	4	23	0.05	4.45	4.6	0	0	100	
LOWR	2007	500	2	1	12/4/06	17.24	0	4	S	0.1687	0	4.6	0	0	96	
LOWR	2007	500	2	1	12/5/06	17.27	0	4	2	0.1687	0	4.6	0	0	92	
LOWR	2007	500	2	1	12/6/06	17.30	0	4	3	0.17	0	4.6	0	0	88	
LOWR	2007	500	2	1	12/7/06	17.34	0	4	4	0.16	0	4.6	0	0	85	
LOWR	2007	500	2	1	12/8/06	17.37	0	4	5	0.21	0	4.6	0	0	80	
LOWR	2007	500	2	1	12/9/06	17.40	0	4	6	0.24	0	4.6	0	0	75	
LOWR	2007	500	2	1	12/10/06	17.43	22	S	6	0.21	0	4.6	0.594	0	84	
LOWR	2007	500	2	1	12/11/06	17.47	24	2	6	0.22	0	4.6	0.648	0	93	
LOWR	2007	500	2	1	12/12/06	17.50	0	2	S	0.22	0	4.6	0	0	88	
LOWR	2007	500	2	1	12/13/06	17.53	0	2	2	0.2	0	4.6	0	0	84	
LOWR	2007	500	2	1	12/14/06	17.57	0	2	3	0.2	0	4.6	0	0	79	
LOWR	2007	500	2	1	12/15/06	17.60	0	2	4	0.19	0	4.6	0	0	75	
LOWR	2007	500	2	1	12/16/06	17.63	0	2	5	0.17	0.1	4.6	0	0	74	
LOWR	2007	500	2	1	12/17/06	17.66	0	2	6	0.21	0	4.6	0	0	69	
LOWR	2007	500	2	1	12/18/06	17.70	0	2	7	0.2	0	4.6	0	0	65	
LOWR	2007	500	2	1	12/19/06	17.73	0	2	8	0.2	0	4.6	0	0	60	
LOWR	2007	500	2	1	12/20/06	17.76	0	2	9	0.2	0	4.6	0	0	56	
LOWR	2007	500	2	1	12/21/06	17.80	0	2	10	0.2	0	4.6	0	0	52	
LOWR	2007	500	2	1	12/22/06	17.83	0	2	11	0.1687	0	4.6	0	0	48	
LOWR	2007	500	2	1	12/23/06	17.86	0	2	12	0.1687	0	4.6	0	0	44	?
LOWR	2007	500	2	1	12/24/06	17.89	0	2	13	0.1687	0	4.6	0	0	41	?
LOWR	2007	500	2	1	12/25/06	17.93	0	2	14	0.1687	0	4.6	0	0	37	?
LOWR	2007	500	2	1	12/26/06	17.96	0	2	15	0.1687	0.1	4.6	0	0	36	?
LOWR	2007	500	2	1	12/27/06	17.99	0	2	16	0.1687	0	4.6	0	0	32	?
LOWR	2007	500	2	1	12/28/06	18.03	0	2	17	0.1687	0	4.6	0	0	28	?
LOWR	2007	500	2	1	12/29/06	18.06	0	S	17	0.18	0.35	4.6	0	0	32	?
LOWR	2007	500	2	1	12/30/06	18.09	0	1	S	0.19	0	4.6	0	0	28	?
LOWR	2007	500	2	1	12/31/06	18.13	0	1	2	0.2	0	4.6	0	0	23	?
LOWR	2007	500	2	1	1/1/07	18.16	0	1	3	0.18	0	4.6	0	0	20	?
LOWR	2007	500	2	1	1/2/07	18.19	0	1	4	0.12	0	4.6	0	0	17	?
LOWR	2007	500	2	1	1/3/07	18.22	0	1	5	0.16	0	4.6	0	0	13	?

F500: Lowrie Ditch
Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
LOWR	2007	500	2	1	1/4/07	18.26	0	1	6	0.13	0.12	4.6	0	0	13	?
LOWR	2007	500	2	1	1/5/07	18.29	0	1	7	0.11	0	4.6	0	0	11	?
LOWR	2007	500	2	1	1/6/07	18.32	0	1	8	0.18	0	4.6	0	0	7	?
LOWR	2007	500	2	1	1/7/07	18.36	18	S	8	0.15	0	4.6	0.486	0	14	?
LOWR	2007	500	2	1	1/8/07	18.39	24	2	8	0.09	0.03	4.6	0.648	0	27	?
LOWR	2007	500	2	1	1/9/07	18.42	0	2	S	0.16	0	4.6	0	0	24	?
LOWR	2007	500	2	1	1/10/07	18.45	0	2	2	0.14	0.03	4.6	0	0	21	?
LOWR	2007	500	2	1	1/11/07	18.49	0	2	3	0.2	0	4.6	0	0	17	?
LOWR	2007	500	2	1	1/12/07	18.52	0	2	4	0.2	0	4.6	0	0	12	?
LOWR	2007	500	2	1	1/13/07	18.55	0	2	5	0.19	0	4.6	0	0	8	?
LOWR	2007	500	2	1	1/14/07	18.59	0	2	6	0.19	0	4.6	0		4	RIPE
LOWR	2007	500	2	1	1/15/07	18.62	0	2	7	0.17	0	4.6	0		1	RIPE
LOWR	2007	500	2	1	1/16/07	18.65	0	2	8	0.21	0	4.6	0		0	RIPE
LOWR	2007	500	2	1	1/17/07	18.68	0	2	9	0.22	0	4.6	0		0	RIPE
LOWR	2007	500	2	1	1/18/07	18.72	0	2	10	0.24	0	4.6	0		0	RIPE
LOWR	2007	500	2	1	1/19/07	18.75	0	2	11	0.23	0	4.6	0		0	RIPE
LOWR	2007	500	2	1	1/20/07	18.78	0	2	12	0.17	0	4.6	0		0	RIPE
LOWR	2007	500	2	1	1/21/07	18.82	0	2	13	0.16	0	4.6	0		0	RIPE
LOWR	2007	500	2	1	1/22/07	18.85	0	2	14	0.12	0	4.6	0		0	RIPE
LOWR	2007	500	2	1	1/23/07	18.88	0	2	15	0.18	0	4.6	0		0	RIPE
LOWR	2007	500	2	1	1/24/07	18.91	0	2	16	0.15	0	4.6	0		0	RIPE
LOWR	2007	500	2	1	1/25/07	18.95	0	2	17	0.18	0	4.6	0		0	RIPE
LOWR	2007	500	2	1	1/26/07	18.98	0	2	18	0.24	0	4.6	0		0	RIPE
LOWR	2007	500	2	1	1/27/07	19.01	0	2	19	0.1787	0	4.6	0		0	RIPE
LOWR	2007	500	2	1	1/28/07	19.05	0	2	20	0.2	0	4.6	0		0	RIPE
LOWR	2007	500	2	1	1/29/07	19.08	0	2	21	0.21	0	4.6	0		0	RIPE
LOWR	2007	500	2	1	1/30/07	19.11	0	S	21	0.1787	0.3	4.6	0		2	RIPE
LOWR	2007	500	2	1	1/31/07	19.14	0	1	S	0.1787	0	4.6	0		0	RIPE
LOWR	2007	500	2	1	2/1/07	19.18	0	S	1	0.1968	0.75	4.6	0		12	RIPE
LOWR	2007	500	2	1	2/2/07	19.21	0	2	1	0.19	0.36	4.6	0		15	RIPE
LOWR	2007	500	2	1	2/3/07	19.24	0	2	S	0.2	0.07	4.6	0		12	RIPE
LOWR	2007	500	2	1	2/4/07	19.28	0	2	2	0.16	0	4.6	0		9	RIPE
LOWR	2007	500	2	1	2/5/07	19.31	0	2	3	0.17	0	4.6	0		5	RIPE
LOWR	2007	500	2	1	2/6/07	19.34	0	2	4	0.21	0	4.6	0		1	RIPE
LOWR	2007	500	2	1	2/7/07	19.38	0	2	5	0.1968	0	4.6	0		0	RIPE
LOWR	2007	500	2	1	2/8/07	19.41	0	S	5	0.1	0.43	4.6	0		7	RIPE
LOWR	2007	500	2	1	2/9/07	19.44	0	1	S	0.17	0.05	4.6	0		4	RIPE

F500: Lowrie Ditch
Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
LOWR	2007	500	2	1	2/10/07	19.47	0	1	2	0.1968	0.05	4.6	0		1	RIPE
LOWR	2007	500	2	1	2/11/07	19.51	0	1	3	0.22	0	4.6	0		0	RIPE
LOWR	2007	500	2	1	2/12/07	19.54	0	1	4	0.23	0	4.6	0		0	RIPE
LOWR	2007	500	2	1	2/13/07	19.57	0	1	5	0.24	0	4.6	0		0	RIPE
LOWR	2007	500	2	1	2/14/07	19.61	0	1	6	0.22	0	4.6	0		0	RIPE
LOWR	2007	500	2	1	2/15/07	19.64	0	1	7	0.2	0	4.6	0		0	RIPE
LOWR	2007	500	2	1	2/16/07	19.67	0	S	7	0.14	0.22	4.6	0		1	RIPE
LOWR	2007	500	2	1	2/17/07	19.70	0	2	7	0.21	0.54	4.6	0		8	RIPE
LOWR	2007	500	2	1	2/18/07	19.74	0	2	S	0.2	0.15	4.6	0		7	RIPE
LOWR	2007	500	2	1	2/19/07	19.77	0	2	2	0.2	0	4.6	0		3	RIPE
LOWR	2007	500	2	1	2/20/07	19.80	0	2	3	0.1968	0	4.6	0		0	RIPE
LOWR	2007	500	2	1	2/21/07	19.84	0	2	4	0.1968	0.14	4.6	0		0	RIPE
LOWR	2007	500	2	1	2/22/07	19.87	0	2	5	0.1968	0.09	4.6	0		0	RIPE
LOWR	2007	500	2	1	2/23/07	19.90	0	2	6	0.1968	0	4.6	0		0	RIPE
LOWR	2007	500	2	1	2/24/07	19.93	0	2	7	0.1968	0.08	4.6	0		0	RIPE
LOWR	2007	500	2	1	2/25/07	19.97	0	2	8	0.1968	0	4.6	0		0	RIPE
LOWR	2007	500	2	1	2/26/07	20.00	0	2	9	0.22	0	4.6	0		0	RIPE
LOWR	2007	500	2	1	2/27/07	20.03	0	2	10	0.2	0	4.6	0		0	RIPE
LOWR	2007	500	2	1	2/28/07	20.07	0	2	11	0.22	0	4.6	0		0	RIPE
LOWR	2007	500	2	1	3/1/07	20.10	0	2	12	0.26	0	4.6	0		0	RIPE
LOWR	2007	500	2	1	3/2/07	20.13	0	2	13	0.22	0	4.6	0		0	RIPE
LOWR	2007	500	2	1	3/3/07	20.16	0	2	14	0.17	0	4.6	0		0	RIPE
LOWR	2007	500	2	1	3/4/07	20.20	0	2	15	0.17	0	4.6	0		0	RIPE
LOWR	2007	500	2	1	3/5/07	20.23	0	2	16	0.21	0	4.6	0		0	RIPE
LOWR	2007	500	2	1	3/6/07	20.26	0	2	17	0.22	0	4.6	0		0	RIPE
LOWR	2007	500	2	1	3/7/07	20.30	0	2	18	0.17	0	4.6	0		0	RIPE
LOWR	2007	500	2	1	3/8/07	20.33	0	2	19	0.17	0	4.6	0		0	RIPE
LOWR	2007	500	2	1	3/9/07	20.36	22	S	19	0.26	0	4.6	0.594		7	RIPE
LOWR	2007	500	2	1	3/10/07	20.39	0	2	19	0.09	0.85	4.6	0		23	RIPE
LOWR	2007	500	2	1	3/11/07	20.43	0	3	19	0.22	0.3	4.6	0		25	RIPE
LOWR	2007	500	2	1	3/12/07	20.46	0	3	S	0.2139	0	4.6	0		20	RIPE
LOWR	2007	500	2	1	3/13/07	20.49	0	3	2	0.09	0	4.6	0		18	RIPE
LOWR	2007	500	2	1	3/14/07	20.53	0	3	3	0.12	0.12	4.6	0		18	RIPE
LOWR	2007	500	2	1	3/15/07	20.56	0	S	3	0.15	1.6	4.6	0		50	RIPE
LOWR	2007	500	2	1	3/16/07	20.59	0	1	S	0.17	0.17	4.6	0		50	RIPE
LOWR	2007	500	2	1	3/17/07	20.63	0	1	2	0.26	0.09	4.6	0		46	RIPE
LOWR	2007	500	2	1	3/18/07	20.66	0	S	2	0.18	0.6	4.6	0		55	RIPE

F500: Lowrie Ditch
Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
LOWR	2007	500	2	1	3/19/07	20.69	0	2	2	0.28	0.24	4.6	0		55	RIPE
LOWR	2007	500	2	1	3/20/07	20.72	0	3	2	0.23	0.28	4.6	0		56	RIPE
LOWR	2007	500	2	1	3/21/07	20.76	0	3	S	0.31	0	4.6	0		49	RIPE
LOWR	2007	500	2	1	3/22/07	20.79	0	3	2	0.27	0	4.6	0		43	RIPE
LOWR	2007	500	2	1	3/23/07	20.82	0	3	3	0.25	0	4.6	0		38	RIPE
LOWR	2007	500	2	1	3/24/07	20.86	0	3	4	0.23	0	4.6	0		33	RIPE
LOWR	2007	500	2	1	3/25/07	20.89	0	3	5	0.26	0	4.6	0		27	RIPE
LOWR	2007	500	2	1	3/26/07	20.92	0	3	6	0.2	0	4.6	0		23	RIPE
LOWR	2007	500	2	1	3/27/07	20.95	0	3	7	0.2139	0	4.6	0		18	RIPE
LOWR	2007	500	2	1	3/28/07	20.99	0	3	8	0.21	0	4.6	0		13	RIPE
LOWR	2007	500	2	1	3/29/07	21.02	0	3	9	0.2	0	4.6	0		9	RIPE
LOWR	2007	500	2	1	3/30/07	21.05	0	3	10	0.21	0	4.6	0		4	RIPE
LOWR	2007	500	2	1	3/31/07	21.09	0	3	11	0.21	0	4.6	0		0	RIPE
LOWR	2007	500	2	1	4/1/07	21.12	0	3	12	0.2	0	4.6	0		0	RIPE
LOWR	2007	500	2	1	4/2/07	21.15	0	3	13	0.23	0.09	4.6	0		0	RIPE
LOWR	2007	500	2	1	4/3/07	21.18	0	3	14	0.27	0	4.6	0		0	RIPE
LOWR	2007	500	2	1	4/4/07	21.22	22	S	14	0.25	0	4.6	0.594		7	RIPE
LOWR	2007	500	2	1	4/5/07	21.25	24	2	14	0.23	0	4.6	0.648		16	RIPE
LOWR	2007	500	2	1	4/6/07	21.28	24	3	14	0.24	0	4.6	0.648		25	RIPE
LOWR	2007	500	2	1	4/7/07	21.32	0	3	S	0.27	0	4.6	0		19	RIPE
LOWR	2007	500	2	1	4/8/07	21.35	0	3	2	0.22	0	4.6	0		14	DRY
LOWR	2007	500	2	1	4/9/07	21.38	0	3	3	0.25	0	4.6	0		9	DRY
LOWR	2007	500	2	1	4/10/07	21.41	0	3	4	0.31	0	4.6	0		2	DRY
LOWR	2007	500	2	1	4/11/07	21.45	0	3	5	0.26	0	4.6	0		0	DRY
LOWR	2007	500	2	1	4/12/07	21.48	0	3	6	0.21	0	4.6	0		0	DRY
LOWR	2007	500	2	1	4/13/07	21.51	0	3	7	0.28	0	4.6	0		0	DRY
LOWR	2007	500	2	1	4/14/07	21.55	0	3	8	0.34	0	4.6	0		0	DRY
LOWR	2007	500	2	1	4/15/07	21.58	0	3	9	0.29	0	4.6	0		0	DRY
LOWR	2007	500	2	1	4/16/07	21.61	0	3	10	0.27	0	4.6	0		0	DRY
LOWR	2007	500	2	1	4/17/07	21.64	0	3	11	0.26	0	4.6	0		0	DRY
LOWR	2007	500	2	1	4/18/07	21.68	0	3	12	0.27	0	4.6	0		0	DRY
LOWR	2007	500	2	1	4/19/07	21.71	0	3	13	0.28	0	4.6	0		0	DRY
LOWR	2007	500	2	1	4/20/07	21.74	0	3	14	0.26	0	4.6	0		0	DRY
LOWR	2007	500	2	1	4/21/07	21.78	0	S	14	0.3	0.32	4.6	0		0	DRY
LOWR	2007	500	2	1	4/22/07	21.81	0	1	S	0.33	0	4.6	0		0	DRY
LOWR	2007	500	2	1	4/23/07	21.84	0	1	2	0.23	0	4.6	0		0	DRY
LOWR	2007	500	2	1	4/24/07	21.88	0	S	2	0.24	0.74	4.6	0		10	DRY

F500: Lowrie Ditch
Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
LOWR	2007	500	2	1	4/25/07	21.91	0	1	S	0.3	0	4.6	0		4	DRY
LOWR	2007	500	2	1	4/26/07	21.94	0	1	2	0.3	0	4.6	0		0	DRY
LOWR	2007	500	2	1	4/27/07	21.97	0	1	3	0.27	0	4.6	0		0	DRY
LOWR	2007	500	2	1	4/28/07	22.01	0	1	4	0.26	0	4.6	0		0	DRY
LOWR	2007	500	2	1	4/29/07	22.04	0	1	5	0.26	0	4.6	0		0	DRY
LOWR	2007	500	2	1	4/30/07	22.07	0	1	6	0.18	0	4.6	0		0	DRY
LOWR	2007	500	2	1	5/1/07	22.11	0	1	7	0.29	0	4.6	0		0	DRY
LOWR	2007	500	2	1	5/2/07	22.14	0	1	8	0.29	0	4.6	0		0	END
										135.6459	51.56*		103.815	17.8168		

**** Actual Rainfall total not fully useable by the plant as irrigation. Please see cover memo for explanation of "Effective Rainfall"***

F500: Lowrie Ditch
Crop Cycle: 2007-2009(2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
LOWR	2009	500	2	1	6/4/07	0.00	0	S	S	0.09324	0	1.5318	0	0	0	IPLT
LOWR	2009	500	2	1	6/5/07	0.03	12	S	1	0.11322	0	1.5318	0.324	0	13	IPLT
LOWR	2009	500	2	1	6/6/07	0.07	24	2	1	0.10656	0	1.5318	0.648	0	49	IPLT
LOWR	2009	500	2	1	6/7/07	0.10	24	3	1	0.07659	0	1.5318	0.648	0	86	IPLT
LOWR	2009	500	2	1	6/8/07	0.13	0	3	S	0.07992	0	1.5318	0	0	81	IPLT
LOWR	2009	500	2	1	6/9/07	0.16	0	3	2	0.11655	0	1.5318	0	0	73	IPLT
LOWR	2009	500	2	1	6/10/07	0.20	24	S	2	0.10989	0	1.5318	0.648	0	100	IPLT
LOWR	2009	500	2	1	6/11/07	0.23	24	2	2	0.0999	0	1.5318	0.648	0	100	IPLT
LOWR	2009	500	2	1	6/12/07	0.26	0	2	S	0.10323	0	1.5318	0	0	93	IPLT
LOWR	2009	500	2	1	6/13/07	0.30	0	2	2	0.08991	0	1.5318	0	0	87	IPLT
LOWR	2009	500	2	1	6/14/07	0.33	0	2	3	0.05661	0	1.5318	0	0	83	IPLT
LOWR	2009	500	2	1	6/15/07	0.36	5	2	4	0.10656	0	1.5318	0.135	0	85	IPLT
LOWR	2009	500	2	1	6/16/07	0.39	0	2	5	0.09657	0	1.5318	0	0	79	IPLT
LOWR	2009	500	2	1	6/17/07	0.43	0	2	6	0.10656	0	1.5318	0	0	72	IPLT
LOWR	2009	500	2	1	6/18/07	0.46	0	2	7	0.08991	0	1.5318	0	0	66	IPLT
LOWR	2009	500	2	1	6/19/07	0.49	0	2	8	0.0999	0	1.5318	0	0	59	IPLT
LOWR	2009	500	2	1	6/20/07	0.53	20	S	8	0.10323	0	1.5318	0.54	0	88	IPLT
LOWR	2009	500	2	1	6/21/07	0.56	24	2	8	0.10656	0	1.5318	0.648	0	100	IPLT
LOWR	2009	500	2	1	6/22/07	0.59	24	3	8	0.0999	0	1.5318	0.648	0	100	IPLT
LOWR	2009	500	2	1	6/23/07	0.63	0	3	S	0.0999	0	1.5318	0	0	93	
LOWR	2009	500	2	1	6/24/07	0.66	0	3	2	0.09657	0	1.5318	0	0	87	
LOWR	2009	500	2	1	6/25/07	0.69	0	3	3	0.0999	0	1.5318	0	0	80	
LOWR	2009	500	2	1	6/26/07	0.72	22	S	3	0.10323	0	1.5318	0.594	0	100	
LOWR	2009	500	2	1	6/27/07	0.76	22	2	3	0.10656	0	1.5318	0.594	0	100	
LOWR	2009	500	2	1	6/28/07	0.79	0	2	S	0.08325	0	1.5318	0	0	94	
LOWR	2009	500	2	1	6/29/07	0.82	24	S	1	0.0999	0	1.5318	0.648	0	100	
LOWR	2009	500	2	1	6/30/07	0.86	0	1	S	0.10656	0	1.5318	0	0	93	
LOWR	2009	500	2	1	7/1/07	0.89	0	1	2	0.08658	0	1.5318	0	0	87	
LOWR	2009	500	2	1	7/2/07	0.92	0	1	3	0.08991	0	1.5318	0	0	81	
LOWR	2009	500	2	1	7/3/07	0.95	0	1	4	0.10656	0	1.5318	0	0	74	
LOWR	2009	500	2	1	7/4/07	0.99	0	1	5	0.07659	0	1.5318	0	0	69	?
LOWR	2009	500	2	1	7/5/07	1.02	0	1	6	0.09657	0	1.5318	0	0	63	?
LOWR	2009	500	2	1	7/6/07	1.05	0	1	7	0.10656	0	1.5318	0	0	56	?
LOWR	2009	500	2	1	7/7/07	1.09	0	1	8	0.10323	0	1.5318	0	0	49	?
LOWR	2009	500	2	1	7/8/07	1.12	21	S	8	0.10656	0	1.5318	0.567	0	79	
LOWR	2009	500	2	1	7/9/07	1.15	24	2	8	0.0999	0	1.5318	0.648	0	100	
LOWR	2009	500	2	1	7/10/07	1.18	0	2	S	0.0999	0	1.5318	0	0	93	

F500: Lowrie Ditch
Crop Cycle: 2007-2009(2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
LOWR	2009	500	2	1	7/11/07	1.22	0	2	2	0.0999	0	1.5318	0	0	86	
LOWR	2009	500	2	1	7/12/07	1.25	0	2	3	0.0999	0	1.5318	0	0	80	
LOWR	2009	500	2	1	7/13/07	1.28	0	2	4	0.09657	0	1.5318	0	0	74	
LOWR	2009	500	2	1	7/14/07	1.32	0	2	5	0.08991	0	1.5318	0	0	68	?
LOWR	2009	500	2	1	7/15/07	1.35	0	2	6	0.07326	0	1.5318	0	0	63	?
LOWR	2009	500	2	1	7/16/07	1.38	0	2	7	0.08991	0	1.5318	0	0	57	?
LOWR	2009	500	2	1	7/17/07	1.41	0	2	8	0.0999	0	1.5318	0	0	51	?
LOWR	2009	500	2	1	7/18/07	1.45	0	2	9	0.0999	0	1.5318	0	0	44	?
LOWR	2009	500	2	1	7/19/07	1.48	0	2	10	0.0999	0	1.5318	0	0	38	?
LOWR	2009	500	2	1	7/20/07	1.51	0	2	11	0.097782	0	1.551028	0	0	31	AC?
LOWR	2009	500	2	1	7/21/07	1.55	0	2	12	0.079237	0.1	1.584746	0	0	31	?
LOWR	2009	500	2	1	7/22/07	1.58	21	S	12	0.084442	0	1.618464	0.567	0	61	?
LOWR	2009	500	2	1	7/23/07	1.61	24	2	12	0.096976	0	1.652182	0.648	0	93	
LOWR	2009	500	2	1	7/24/07	1.64	24	3	12	0.098955	0	1.6859	0.648	0	100	
LOWR	2009	500	2	1	7/25/07	1.68	0	3	S	0.112149	0	1.719618	0	0	91	
LOWR	2009	500	2	1	7/26/07	1.71	0	3	2	0.110536	0	1.753336	0	0	83	
LOWR	2009	500	2	1	7/27/07	1.74	0	3	3	0.128202	0	1.787054	0	0	74	
LOWR	2009	500	2	1	7/28/07	1.78	0	3	4	0.130621	0	1.820772	0	0	66	?
LOWR	2009	500	2	1	7/29/07	1.81	0	3	5	0.129008	0	1.85449	0	0	57	?
LOWR	2009	500	2	1	7/30/07	1.84	22	S	5	0.09441	0	1.888208	0.594	0	83	
LOWR	2009	500	2	1	7/31/07	1.88	0	1	S	0.104453	0	1.921926	0	0	76	?
LOWR	2009	500	2	1	8/1/07	1.91	0	1	2	0.131793	0	1.955644	0	0	68	?
LOWR	2009	500	2	1	8/2/07	1.94	0	1	3	0.125416	0	1.989362	0	0	60	?
LOWR	2009	500	2	1	8/3/07	1.97	0	1	4	0.083562	0	2.02308	0	0	55	?
LOWR	2009	500	2	1	8/4/07	2.01	0	1	5	0.125196	0	2.056798	0	0	48	?
LOWR	2009	500	2	1	8/5/07	2.04	0	1	6	0.145427	0	2.090516	0	0	41	?
LOWR	2009	500	2	1	8/6/07	2.07	0	1	7	0.147773	0	2.124234	0	0	33	?
LOWR	2009	500	2	1	8/7/07	2.11	0	1	8	0.136045	0	2.157952	0	0	26	?
LOWR	2009	500	2	1	8/8/07	2.14	0	1	9	0.142935	0	2.19167	0	0	19	?
LOWR	2009	500	2	1	8/9/07	2.17	0	1	10	0.130621	0	2.225388	0	0	13	
LOWR	2009	500	2	1	8/10/07	2.20	0	1	11	0.137511	0	2.259106	0	0	7	
LOWR	2009	500	2	1	8/11/07	2.24	0	1	12	0.154516	0	2.292824	0	0.1545164	0	WS-0
LOWR	2009	500	2	1	8/12/07	2.27	0	1	13	0.156789	0	2.326542	0	0.1567887	0	WS-1
LOWR	2009	500	2	1	8/13/07	2.30	0	1	14	0.128275	0.03	2.36026	0	0.128275	0	WS-2
LOWR	2009	500	2	1	8/14/07	2.34	16	S	14	0.114495	0	2.393978	0.432	0	13	?
LOWR	2009	500	2	1	8/15/07	2.37	24	2	14	0.089719	0	2.427696	0.648	0	36	?
LOWR	2009	500	2	1	8/16/07	2.40	0	2	S	0.155176	0	2.461414	0	0	29	?

F500: Lowrie Ditch
Crop Cycle: 2007-2009(2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
LOWR	2009	500	2	1	8/17/07	2.43	0	2	2	0.157302	0	2.495132	0	0	22	?
LOWR	2009	500	2	1	8/18/07	2.47	0	2	3	0.148433	0	2.52885	0	0	16	?
LOWR	2009	500	2	1	8/19/07	2.50	0	2	4	0.178266	0	2.562568	0	0	9	
LOWR	2009	500	2	1	8/20/07	2.53	18	S	4	0.141103	0.15	2.596286	0.486	0	28	?
LOWR	2009	500	2	1	8/21/07	2.57	24	2	4	0.171522	0	2.630004	0.648	0	45	?
LOWR	2009	500	2	1	8/22/07	2.60	0	2	S	0.173721	0	2.663722	0	0	38	?
LOWR	2009	500	2	1	8/23/07	2.63	0	2	2	0.1466	0	2.69744	0	0	32	?
LOWR	2009	500	2	1	8/24/07	2.66	0	2	3	0.112809	0	2.731158	0	0	28	?
LOWR	2009	500	2	1	8/25/07	2.70	0	2	4	0.108191	0	2.764876	0	0	24	?
LOWR	2009	500	2	1	8/26/07	2.73	0	2	5	0.152098	0	2.798594	0	0	18	
LOWR	2009	500	2	1	8/27/07	2.76	0	2	6	0.15393	0	2.832312	0	0	12	
LOWR	2009	500	2	1	8/28/07	2.80	0	2	7	0.168224	0	2.86603	0	0	6	
LOWR	2009	500	2	1	8/29/07	2.83	0	2	8	0.170203	0	2.899748	0	0.1702026	0	WS-0
LOWR	2009	500	2	1	8/30/07	2.86	0	2	9	0.140296	0	2.933466	0	0.1402962	0	WS-1
LOWR	2009	500	2	1	8/31/07	2.89	22	S	9	0.141909	0	2.967184	0.594	0	15	?
LOWR	2009	500	2	1	9/1/07	2.93	24	2	9	0.189187	0.06	3.000902	0.648	0	32	?
LOWR	2009	500	2	1	9/2/07	2.96	24	3	9	0.184716	0	3.03462	0.648	0	47	?
LOWR	2009	500	2	1	9/3/07	2.99	24	4	9	0.186768	0	3.068338	0.648	0	61	?
LOWR	2009	500	2	1	9/4/07	3.03	0	4	S	0.141616	0	3.102056	0	0	56	?
LOWR	2009	500	2	1	9/5/07	3.06	0	4	2	0.184056	0	3.135774	0	0	50	?
LOWR	2009	500	2	1	9/6/07	3.09	16	S	2	0.158475	0	3.169492	0.432	0	58	UREA, 1,500?
LOWR	2009	500	2	1	9/7/07	3.13	5	1	S	0.174088	0	3.20321	0.135	0	56	?
LOWR	2009	500	2	1	9/8/07	3.16	0	1	2	0.140736	0	3.236928	0	0	51	?
LOWR	2009	500	2	1	9/9/07	3.19	0	1	3	0.206193	0	3.270646	0	0	44	?
LOWR	2009	500	2	1	9/10/07	3.22	0	1	4	0.201135	0	3.304364	0	0	38	?
LOWR	2009	500	2	1	9/11/07	3.26	0	1	5	0.159647	0	3.338082	0	0	32	?
LOWR	2009	500	2	1	9/12/07	3.29	0	1	6	0.18325	0	3.3718	0	0	27	?
LOWR	2009	500	2	1	9/13/07	3.32	0	1	7	0.155469	0	3.405518	0	0	22	?
LOWR	2009	500	2	1	9/14/07	3.36	0	1	8	0.194392	0	3.439236	0	0	16	
LOWR	2009	500	2	1	9/15/07	3.39	0	1	9	0.113249	0	3.472954	0	0	12	
LOWR	2009	500	2	1	9/16/07	3.42	0	1	10	0.160087	0	3.506672	0	0	8	
LOWR	2009	500	2	1	9/17/07	3.45	0	1	11	0.215502	0	3.54039	0	0	2	
LOWR	2009	500	2	1	9/18/07	3.49	0	1	12	0.163166	0.17	3.574108	0	0	2	
LOWR	2009	500	2	1	9/19/07	3.52	0	1	13	0.203921	0	3.607826	0	0.2039206	0	WS-0
LOWR	2009	500	2	1	9/20/07	3.55	16	S	13	0.189994	0	3.641544	0.432	0	6	?
LOWR	2009	500	2	1	9/21/07	3.59	24	2	13	0.175773	0	3.675262	0.648	0	19	?

F500: Lowrie Ditch
Crop Cycle: 2007-2009(2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
LOWR	2009	500	2	1	9/22/07	3.62	24	3	13	0.153197	0	3.70898	0.648	0	32	?
LOWR	2009	500	2	1	9/23/07	3.65	24	4	13	0.203408	0	3.742698	0.648	0	44	?
LOWR	2009	500	2	1	9/24/07	3.68	0	4	S	0.172402	0	3.776416	0	0	39	?
LOWR	2009	500	2	1	9/25/07	3.72	0	4	2	0.182224	0	3.810134	0	0	34	?
LOWR	2009	500	2	1	9/26/07	3.75	0	4	3	0.192193	0	3.843852	0	0	28	?
LOWR	2009	500	2	1	9/27/07	3.78	22	S	3	0.134872	0	3.87757	0.594	0	40	?
LOWR	2009	500	2	1	9/28/07	3.82	0	1	S	0.187062	0	3.911288	0	0	35	?
LOWR	2009	500	2	1	9/29/07	3.85	24	S	1	0.180098	0	3.945006	0.648	0	46	?
LOWR	2009	500	2	1	9/30/07	3.88	24	2	1	0.190287	0	3.978724	0.648	0	57	?
LOWR	2009	500	2	1	10/1/07	3.91	0	3	1	0.165731	0.2	4.012442	0	0	58	?
LOWR	2009	500	2	1	10/2/07	3.95	0	3	S	0.193512	0	4.04616	0	0	53	?
LOWR	2009	500	2	1	10/3/07	3.98	0	3	2	0.195125	0	4.079878	0	0	47	?
LOWR	2009	500	2	1	10/4/07	4.01	0	3	3	0.160967	0	4.113596	0	0	43	?
LOWR	2009	500	2	1	10/5/07	4.05	0	3	4	0.19835	0	4.147314	0	0	38	?
LOWR	2009	500	2	1	10/6/07	4.08	22	S	4	0.163606	0	4.181032	0.594	0	48	?
LOWR	2009	500	2	1	10/7/07	4.11	24	2	4	0.210738	0.25	4.21475	0.648	0	64	UREA, 2,800?
LOWR	2009	500	2	1	10/8/07	4.14	5	2	S	0.129301	0	4.248468	0.135	0	63	?
LOWR	2009	500	2	1	10/9/07	4.18	0	2	2	0.195491	0	4.282186	0	0	58	?
LOWR	2009	500	2	1	10/10/07	4.21	0	2	3	0.215795	0	4.315904	0	0	53	?
LOWR	2009	500	2	1	10/11/07	4.24	0	2	4	0.217481	0	4.349622	0	0	47	?
LOWR	2009	500	2	1	10/12/07	4.28	22	S	4	0.161993	0	4.38334	0.594	0	57	?
LOWR	2009	500	2	1	10/13/07	4.31	24	2	4	0.201648	0	4.417058	0.648	0	67	?
LOWR	2009	500	2	1	10/14/07	4.34	24	3	4	0.24189	0	4.450776	0.648	0	75	?
LOWR	2009	500	2	1	10/15/07	4.38	5	3	S	0.214476	0	4.484494	0.135	0	73	?
LOWR	2009	500	2	1	10/16/07	4.41	0	3	2	0.196444	0	4.518212	0	0	68	?
LOWR	2009	500	2	1	10/17/07	4.44	22	S	2	0.188015	0	4.55193	0.594	0	76	?
LOWR	2009	500	2	1	10/18/07	4.47	24	2	2	0.229282	0	4.585648	0.648	0	85	?
LOWR	2009	500	2	1	10/19/07	4.51	24	3	2	0.22	0	4.6	0.648	0	94	AC?
LOWR	2009	500	2	1	10/20/07	4.54	0	3	S	0.21	0	4.6	0	0	89	?
LOWR	2009	500	2	1	10/21/07	4.57	0	3	2	0.19	0	4.6	0	0	85	?
LOWR	2009	500	2	1	10/22/07	4.61	0	3	3	0.22	0	4.6	0	0	81	?
LOWR	2009	500	2	1	10/23/07	4.64	0	3	4	0.24	0	4.6	0	0	75	?
LOWR	2009	500	2	1	10/24/07	4.67	0	3	5	0.24	0	4.6	0	0	70	?
LOWR	2009	500	2	1	10/25/07	4.70	22	S	5	0.19	0	4.6	0.594	0	79	?
LOWR	2009	500	2	1	10/26/07	4.74	24	2	5	0.2	0.05	4.6	0.648	0	90	?
LOWR	2009	500	2	1	10/27/07	4.77	0	2	S	0.2	0	4.6	0	0	85	?

F500: Lowrie Ditch
Crop Cycle: 2007-2009(2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
LOWR	2009	500	2	1	10/28/07	4.80	0	S	1	0.18	0.35	4.6	0	0	89	?
LOWR	2009	500	2	1	10/29/07	4.84	0	1	S	0.2571	0.15	4.6	0	0	87	?
LOWR	2009	500	2	1	10/30/07	4.87	0	1	2	0.2571	0	4.6	0	0	81	?
LOWR	2009	500	2	1	10/31/07	4.90	0	1	3	0.2571	0	4.6	0	0	76	?
LOWR	2009	500	2	1	11/1/07	4.93	0	1	4	0.169055	0	3.78051	0	0	88	?
LOWR	2009	500	2	1	11/2/07	4.97	0	1	5	0.170182	0	3.805713	0	0	82	SC?
LOWR	2009	500	2	1	11/3/07	5.00	16	S	5	0.171309	0	3.830917	0.432	0	89	?
LOWR	2009	500	2	1	11/4/07	5.03	0	1	S	0.172436	0	3.85612	0	0	84	?
LOWR	2009	500	2	1	11/5/07	5.07	0	S	1	0.173563	0.53	3.881324	0	0	92	?
LOWR	2009	500	2	1	11/6/07	5.10	0	1	S	0.17469	0	3.906527	0	0	87	?
LOWR	2009	500	2	1	11/7/07	5.13	22	S	1	0.175817	0	3.93173	0.594	0	97	?
LOWR	2009	500	2	1	11/8/07	5.16	24	2	1	0.176944	0	3.956934	0.648	0	100	
LOWR	2009	500	2	1	11/9/07	5.20	24	3	1	0.178071	0	3.982137	0.648	0	100	UREA, 1,300
LOWR	2009	500	2	1	11/10/07	5.23	5	3	S	0.179198	0	4.007341	0.135	0	98	
LOWR	2009	500	2	1	11/11/07	5.26	0	3	2	0.180325	0	4.032544	0	0	93	
LOWR	2009	500	2	1	11/12/07	5.30	0	3	3	0.181452	0	4.057747	0	0	88	
LOWR	2009	500	2	1	11/13/07	5.33	0	3	4	0.182579	0	4.082951	0	0	83	?
LOWR	2009	500	2	1	11/14/07	5.36	0	3	5	0.183706	0	4.108154	0	0	78	?
LOWR	2009	500	2	1	11/15/07	5.39	22	S	5	0.184833	0	4.133358	0.594	0	87	
LOWR	2009	500	2	1	11/16/07	5.43	0	1	S	0.18596	0	4.158561	0	0	82	?
LOWR	2009	500	2	1	11/17/07	5.46	0	1	2	0.187087	0	4.183764	0	0	77	?
LOWR	2009	500	2	1	11/18/07	5.49	0	1	3	0.188214	0	4.208968	0	0	72	?
LOWR	2009	500	2	1	11/19/07	5.53	0	1	4	0.189341	0	4.234171	0	0	67	?
LOWR	2009	500	2	1	11/20/07	5.56	24	S	4	0.190468	0.58	4.259375	0.648	0	91	
LOWR	2009	500	2	1	11/21/07	5.59	5	1	S	0.191595	0.05	4.284578	0.135	0	91	
LOWR	2009	500	2	1	11/22/07	5.63	0	S	1	0.192722	0.4	4.309781	0	0	95	
LOWR	2009	500	2	1	11/23/07	5.66	0	1	S	0.193849	0.12	4.334985	0	0	93	
LOWR	2009	500	2	1	11/24/07	5.69	22	S	1	0.194976	0	4.360188	0.594	0	100	
LOWR	2009	500	2	1	11/25/07	5.72	24	2	1	0.196103	0	4.385392	0.648	0	100	
LOWR	2009	500	2	1	11/26/07	5.76	0	2	S	0.19723	0	4.410595	0	0	94	
LOWR	2009	500	2	1	11/27/07	5.79	0	2	2	0.198357	0	4.435798	0	0	89	
LOWR	2009	500	2	1	11/28/07	5.82	22	S	2	0.048489	0	4.461002	0.594	0	100	
LOWR	2009	500	2	1	11/29/07	5.86	24	2	2	0.136537	1	4.486205	0.648	0	100	
LOWR	2009	500	2	1	11/30/07	5.89	24	3	2	0.147111	0	4.511409	0.648	0	100	
LOWR	2009	500	2	1	12/1/07	5.92	0	3	S	0.147933	0	4.536612	0	0	96	
LOWR	2009	500	2	1	12/2/07	5.95	0	3	2	0.1673	0.15	4.561815	0	0	95	
LOWR	2009	500	2	1	12/3/07	5.99	0	S	2	0.168224	0.75	4.587019	0	0	100	

F500: Lowrie Ditch
Crop Cycle: 2007-2009(2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
LOWR	2009	500	2	1	12/4/07	6.02	0	2	2	0.22	0.96	4.6	0	0	100	
LOWR	2009	500	2	1	12/5/07	6.05	0	2	S	0.09	0	4.6	0	0	98	
LOWR	2009	500	2	1	12/6/07	6.09	0	S	1	0.08	2.3	4.6	0	0	100	
LOWR	2009	500	2	1	12/7/07	6.12	0	2	1	0.14	0.4	4.6	0	0	100	
LOWR	2009	500	2	1	12/8/07	6.15	22	3	1	0.14	0.42	4.6	0.594	0	100	
LOWR	2009	500	2	1	12/9/07	6.18	5	3	S	0.13	0	4.6	0.135	0	100	
LOWR	2009	500	2	1	12/10/07	6.22	0	3	2	0.14	0	4.6	0	0	96	
LOWR	2009	500	2	1	12/11/07	6.25	0	3	3	0.18	0	4.6	0	0	93	
LOWR	2009	500	2	1	12/12/07	6.28	0	3	4	0.17	0	4.6	0	0	89	
LOWR	2009	500	2	1	12/13/07	6.32	22	S	4	0.14	0.12	4.6	0.594	0	100	
LOWR	2009	500	2	1	12/14/07	6.35	24	2	4	0.15	0.5	4.6	0.648	0	100	
LOWR	2009	500	2	1	12/15/07	6.38	24	3	4	0.14	0.05	4.6	0.648	0	100	
LOWR	2009	500	2	1	12/16/07	6.41	24	4	4	0.18	0.38	4.6	0.648	0	100	
LOWR	2009	500	2	1	12/17/07	6.45	24	5	4	0.19	0.37	4.6	0.648	0	100	
LOWR	2009	500	2	1	12/18/07	6.48	24	6	4	0.18	0.06	4.6	0.648	0	100	
LOWR	2009	500	2	1	12/19/07	6.51	24	7	4	0.17	0	4.6	0.648	0	100	
LOWR	2009	500	2	1	12/20/07	6.55	24	8	4	0.16	0	4.6	0.648	0	100	
LOWR	2009	500	2	1	12/21/07	6.58	0	8	S	0.13	0	4.6	0	0	97	
LOWR	2009	500	2	1	12/22/07	6.61	0	8	2	0.16	0	4.6	0	0	93	
LOWR	2009	500	2	1	12/23/07	6.64	0	8	3	0.15	0	4.6	0	0	90	
LOWR	2009	500	2	1	12/24/07	6.68	0	8	4	0.13	0	4.6	0	0	87	
LOWR	2009	500	2	1	12/25/07	6.71	0	8	5	0.15	0	4.6	0	0	84	
LOWR	2009	500	2	1	12/26/07	6.74	22	S	5	0.15	0	4.6	0.594	0	94	
LOWR	2009	500	2	1	12/27/07	6.78	24	2	5	0.1	0	4.6	0.648	0	100	
LOWR	2009	500	2	1	12/28/07	6.81	24	3	5	0.16	0.01	4.6	0.648	0	100	
LOWR	2009	500	2	1	12/29/07	6.84	24	4	5	0.18	0	4.6	0.648	0	100	
LOWR	2009	500	2	1	12/30/07	6.88	0	4	S	0.09	0	4.6	0	0	98	
LOWR	2009	500	2	1	12/31/07	6.91	0	4	2	0.05	0.1	4.6	0	0	99	
LOWR	2009	500	2	1	1/1/08	6.94	0	S	2	0.15	0.47	4.6	0	0	100	
LOWR	2009	500	2	1	1/2/08	6.97	0	1	S	0.11	0	4.6	0	0	97	
LOWR	2009	500	2	1	1/3/08	7.01	22	S	1	0.16	0.2	4.6	0.594	0	100	
LOWR	2009	500	2	1	1/4/08	7.04	22	2	1	0.16	0	4.6	0.594	0	100	
LOWR	2009	500	2	1	1/5/08	7.07	24	3	1	0.17	0	4.6	0.648	0	100	
LOWR	2009	500	2	1	1/6/08	7.11	24	4	1	0.16	0	4.6	0.648	0	100	
LOWR	2009	500	2	1	1/7/08	7.14	24	5	1	0.14	0	4.6	0.648	0	100	UREA, 1,300
LOWR	2009	500	2	1	1/8/08	7.17	5	5	S	0.14	0	4.6	0.135	0	99	
LOWR	2009	500	2	1	1/9/08	7.20	0	5	2	0.13	0	4.6	0	0	97	

F500: Lowrie Ditch
Crop Cycle: 2007-2009(2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
LOWR	2009	500	2	1	1/10/08	7.24	0	5	3	0.15	0	4.6	0	0	93	
LOWR	2009	500	2	1	1/11/08	7.27	0	5	4	0.17	0	4.6	0	0	90	
LOWR	2009	500	2	1	1/12/08	7.30	0	5	5	0.15	0	4.6	0	0	86	
LOWR	2009	500	2	1	1/13/08	7.34	16	S	5	0.1	0	4.6	0.432	0	94	
LOWR	2009	500	2	1	1/14/08	7.37	24	2	5	0.18	0.04	4.6	0.648	0	100	
LOWR	2009	500	2	1	1/15/08	7.40	24	3	5	0.14	0.06	4.6	0.648	0	100	UREA, 700
LOWR	2009	500	2	1	1/16/08	7.43	5	3	S	0.18	0	4.6	0.135	0	99	
LOWR	2009	500	2	1	1/17/08	7.47	0	3	2	0.15	0	4.6	0	0	95	
LOWR	2009	500	2	1	1/18/08	7.50	0	3	3	0.14	0	4.6	0	0	92	
LOWR	2009	500	2	1	1/19/08	7.53	0	3	4	0.17	0	4.6	0	0	89	
LOWR	2009	500	2	1	1/20/08	7.57	0	S	4	0.18	0.22	4.6	0	0	89	
LOWR	2009	500	2	1	1/21/08	7.60	0	1	S	0.16	0	4.6	0	0	86	
LOWR	2009	500	2	1	1/22/08	7.63	0	1	2	0.17	0	4.6	0	0	82	
LOWR	2009	500	2	1	1/23/08	7.66	0	1	3	0.14	0	4.6	0	0	79	
LOWR	2009	500	2	1	1/24/08	7.70	0	1	4	0.19	0	4.6	0	0	75	
LOWR	2009	500	2	1	1/25/08	7.73	0	1	5	0.15	0	4.6	0	0	72	
LOWR	2009	500	2	1	1/26/08	7.76	0	S	5	0.2	0.45	4.6	0	0	77	
LOWR	2009	500	2	1	1/27/08	7.80	0	1	S	0.16	0.18	4.6	0	0	78	
LOWR	2009	500	2	1	1/28/08	7.83	0	1	2	0.15	0.1	4.6	0	0	77	
LOWR	2009	500	2	1	1/29/08	7.86	0	S	2	0.1	0.58	4.6	0	0	87	
LOWR	2009	500	2	1	1/30/08	7.89	5	2	2	0.07	0.8	4.6	0.135	0	100	
LOWR	2009	500	2	1	1/31/08	7.93	0	3	2	0.12	0.56	4.6	0	0	100	
LOWR	2009	500	2	1	2/1/08	7.96	22	4	2	0.1	0	4.6	0.594	0	100	
LOWR	2009	500	2	1	2/2/08	7.99	0	4	S	0.07	0	4.6	0	0	98	
LOWR	2009	500	2	1	2/3/08	8.03	0	S	1	0.12	1.13	4.6	0	0	100	
LOWR	2009	500	2	1	2/4/08	8.06	0	1	S	0.12	0.1	4.6	0	0	99	
LOWR	2009	500	2	1	2/5/08	8.09	16	S	1	0.09	0.05	4.6	0.432	0	100	
LOWR	2009	500	2	1	2/6/08	8.13	24	2	1	0.13	0.03	4.6	0.648	0	100	
LOWR	2009	500	2	1	2/7/08	8.16	24	3	1	0.16	0	4.6	0.648	0	100	
LOWR	2009	500	2	1	2/8/08	8.19	0	3	S	0.17	0	4.6	0	0	96	
LOWR	2009	500	2	1	2/9/08	8.22	0	3	2	0.21	0	4.6	0	0	91	
LOWR	2009	500	2	1	2/10/08	8.26	0	3	3	0.21	0	4.6	0	0	87	
LOWR	2009	500	2	1	2/11/08	8.29	0	3	4	0.21	0	4.6	0	0	82	
LOWR	2009	500	2	1	2/12/08	8.32	22	S	4	0.19	0	4.6	0.594	0	91	
LOWR	2009	500	2	1	2/13/08	8.36	24	2	4	0.21	0	4.6	0.648	0	100	
LOWR	2009	500	2	1	2/14/08	8.39	0	2	S	0.19	0	4.6	0	0	95	
LOWR	2009	500	2	1	2/15/08	8.42	0	2	2	0.19	0	4.6	0	0	91	

F500: Lowrie Ditch
Crop Cycle: 2007-2009(2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
LOWR	2009	500	2	1	2/16/08	8.45	0	2	3	0.17	0	4.6	0	0	88	
LOWR	2009	500	2	1	2/17/08	8.49	0	2	4	0.18	0	4.6	0	0	84	
LOWR	2009	500	2	1	2/18/08	8.52	0	2	5	0.17	0	4.6	0	0	80	
LOWR	2009	500	2	1	2/19/08	8.55	0	2	6	0.2	0	4.6	0	0	76	
LOWR	2009	500	2	1	2/20/08	8.59	0	2	7	0.2	0	4.6	0	0	71	
LOWR	2009	500	2	1	2/21/08	8.62	0	2	8	0.2	0	4.6	0	0	67	
LOWR	2009	500	2	1	2/22/08	8.65	18	S	8	0.18	0	4.6	0.486	0	74	
LOWR	2009	500	2	1	2/23/08	8.68	5	1	S	0.18	0	4.6	0.135	0	73	
LOWR	2009	500	2	1	2/24/08	8.72	0	1	2	0.19	0	4.6	0	0	68	
LOWR	2009	500	2	1	2/25/08	8.75	0	1	3	0.12	0.1	4.6	0	0	68	
LOWR	2009	500	2	1	2/26/08	8.78	0	1	4	0.17	0	4.6	0	0	64	
LOWR	2009	500	2	1	2/27/08	8.82	16	S	4	0.18	0	4.6	0.432	0	70	
LOWR	2009	500	2	1	2/28/08	8.85	24	2	4	0.18	0	4.6	0.648	0	80	UREA, 1,300
LOWR	2009	500	2	1	2/29/08	8.88	5	2	S	0.23	0	4.6	0.135	0	78	
LOWR	2009	500	2	1	3/1/08	8.91	0	2	2	0.22	0	4.6	0	0	73	
LOWR	2009	500	2	1	3/2/08	8.95	0	2	3	0.18	0	4.6	0	0	69	
LOWR	2009	500	2	1	3/3/08	8.98	0	2	4	0.24	0	4.6	0	0	64	
LOWR	2009	500	2	1	3/4/08	9.01	0	2	5	0.22	0	4.6	0	0	59	
LOWR	2009	500	2	1	3/5/08	9.05	0	2	6	0.23	0	4.6	0	0	54	
LOWR	2009	500	2	1	3/6/08	9.08	0	2	7	0.27	0	4.6	0	0	48	?
LOWR	2009	500	2	1	3/7/08	9.11	0	2	8	0.22	0	4.6	0	0	44	?
LOWR	2009	500	2	1	3/8/08	9.14	0	2	9	0.18	0	4.6	0	0	40	?
LOWR	2009	500	2	1	3/9/08	9.18	0	2	10	0.21	0	4.6	0	0	35	?
LOWR	2009	500	2	1	3/10/08	9.21	0	2	11	0.18	0	4.6	0	0	31	?
LOWR	2009	500	2	1	3/11/08	9.24	0	2	12	0.21	0	4.6	0	0	27	?
LOWR	2009	500	2	1	3/12/08	9.28	0	2	13	0.29	0	4.6	0	0	20	?
LOWR	2009	500	2	1	3/13/08	9.31	0	2	14	0.28	0	4.6	0	0	14	?
LOWR	2009	500	2	1	3/14/08	9.34	0	2	15	0.22	0	4.6	0	0	9	?
LOWR	2009	500	2	1	3/15/08	9.38	0	2	16	0.26	0	4.6	0	0	4	?
LOWR	2009	500	2	1	3/16/08	9.41	0	2	17	0.2	0	4.6	0	0.2	0	WS-0
LOWR	2009	500	2	1	3/17/08	9.44	0	2	18	0.21	0	4.6	0	0.21	0	WS-1
LOWR	2009	500	2	1	3/18/08	9.47	0	2	19	0.24	0.14	4.6	0	0.24	0	WS-2
LOWR	2009	500	2	1	3/19/08	9.51	0	2	20	0.27	0	4.6	0	0.27	0	WS-3
LOWR	2009	500	2	1	3/20/08	9.54	0	2	21	0.23	0	4.6	0	0.23	0	WS-4
LOWR	2009	500	2	1	3/21/08	9.57	0	2	22	0.24	0	4.6	0	0.24	0	WS-5
LOWR	2009	500	2	1	3/22/08	9.61	21	S	22	0.24	0	4.6	0.567	0	7	?
LOWR	2009	500	2	1	3/23/08	9.64	24	2	22	0.28	0	4.6	0.648	0	15	?

F500: Lowrie Ditch
Crop Cycle: 2007-2009(2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
LOWR	2009	500	2	1	3/24/08	9.67	24	3	22	0.27	0	4.6	0.648	0	23	?
LOWR	2009	500	2	1	3/25/08	9.70	24	4	22	0.28	0	4.6	0.648	0	31	?
LOWR	2009	500	2	1	3/26/08	9.74	0	4	S	0.3	0	4.6	0	0	24	?
LOWR	2009	500	2	1	3/27/08	9.77	0	4	2	0.29	0	4.6	0	0	18	?
LOWR	2009	500	2	1	3/28/08	9.80	0	4	3	0.22	0	4.6	0	0	13	?
LOWR	2009	500	2	1	3/29/08	9.84	0	4	4	0.29	0	4.6	0	0	7	?
LOWR	2009	500	2	1	3/30/08	9.87	0	4	5	0.26	0	4.6	0	0	1	?
LOWR	2009	500	2	1	3/31/08	9.90	0	4	6	0.3	0	4.6	0	0.3	0	WS-0
LOWR	2009	500	2	1	4/1/08	9.93	0	4	7	0.28	0.05	4.6	0	0.28	0	SCWS-1
LOWR	2009	500	2	1	4/2/08	9.97	0	4	8	0.18	0.1	4.6	0	0.18	0	WS-2
LOWR	2009	500	2	1	4/3/08	10.00	0	4	9	0.16	0	4.6	0	0.16	0	WS-3
LOWR	2009	500	2	1	4/4/08	10.03	0	4	10	0.26	0.1	4.6	0	0.26	0	WS-4
LOWR	2009	500	2	1	4/5/08	10.07	0	4	11	0.25	0	4.6	0	0.25	0	WS-5
LOWR	2009	500	2	1	4/6/08	10.10	20	S	11	0.17	0	4.6	0.54	0	8	?
LOWR	2009	500	2	1	4/7/08	10.13	24	2	11	0.22	0.4	4.6	0.648	0	26	?
LOWR	2009	500	2	1	4/8/08	10.16	24	3	11	0.22	0	4.6	0.648	0	35	?
LOWR	2009	500	2	1	4/9/08	10.20	24	4	11	0.07	0	4.6	0.648	0	47	UREA, 1,500?
LOWR	2009	500	2	1	4/10/08	10.23	5	5	11	0.19	0.55	4.6	0.135	0	58	???
LOWR	2009	500	2	1	4/11/08	10.26	0	5	S	0.2	0	4.6	0	0	54	?
LOWR	2009	500	2	1	4/12/08	10.30	0	5	2	0.22	0	4.6	0	0	49	?
LOWR	2009	500	2	1	4/13/08	10.33	0	5	3	0.24	0	4.6	0	0	44	?
LOWR	2009	500	2	1	4/14/08	10.36	0	5	4	0.34	0	4.6	0	0	36	?
LOWR	2009	500	2	1	4/15/08	10.39	0	5	5	0.29	0	4.6	0	0	30	?
LOWR	2009	500	2	1	4/16/08	10.43	0	5	6	0.27	0	4.6	0	0	24	?
LOWR	2009	500	2	1	4/17/08	10.46	20	S	6	0.21	0	4.6	0.54	0	31	?
LOWR	2009	500	2	1	4/18/08	10.49	24	2	6	0.3	0	4.6	0.648	0	39	?
LOWR	2009	500	2	1	4/19/08	10.53	0	2	S	0.31	0	4.6	0	0	32	?
LOWR	2009	500	2	1	4/20/08	10.56	0	2	2	0.28	0	4.6	0	0	26	?
LOWR	2009	500	2	1	4/21/08	10.59	0	2	3	0.33	0	4.6	0	0	19	?
LOWR	2009	500	2	1	4/22/08	10.63	0	2	4	0.3	0	4.6	0	0	12	?
LOWR	2009	500	2	1	4/23/08	10.66	0	2	5	0.22	0	4.6	0	0	8	?
LOWR	2009	500	2	1	4/24/08	10.69	0	2	6	0.24	0	4.6	0	0	2	?
LOWR	2009	500	2	1	4/25/08	10.72	0	2	7	0.25	0	4.6	0	0.25	0	WS-0 ?
LOWR	2009	500	2	1	4/26/08	10.76	16	S	7	0.27	0	4.6	0.432	0	3	?
LOWR	2009	500	2	1	4/27/08	10.79	0	1	S	0.33	0	4.6	0	0.33	0	WS-0
LOWR	2009	500	2	1	4/28/08	10.82	0	1	2	0.28	0	4.6	0	0.28	0	WS-1

F500: Lowrie Ditch
Crop Cycle: 2007-2009(2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
LOWR	2009	500	2	1	4/29/08	10.86	4	1	3	0.16	0	4.6	0.108	0.16	0	WS-2
LOWR	2009	500	2	1	4/30/08	10.89	0	1	4	0.29	0	4.6	0	0.29	0	WS-3
LOWR	2009	500	2	1	5/1/08	10.92	0	1	5	0.3	0	4.6	0	0.3	0	WS-4
LOWR	2009	500	2	1	5/2/08	10.95	0	1	6	0.33	0	4.6	0	0.33	0	WS-5
LOWR	2009	500	2	1	5/3/08	10.99	0	1	7	0.27	0	4.6	0	0.27	0	WS-6
LOWR	2009	500	2	1	5/4/08	11.02	22	S	7	0.27	0	4.6	0.594	0	7	UREA?
LOWR	2009	500	2	1	5/5/08	11.05	24	2	7	0.27	0	4.6	0.648	0	15	?
LOWR	2009	500	2	1	5/6/08	11.09	0	2	S	0.29	0	4.6	0	0	8	?
LOWR	2009	500	2	1	5/7/08	11.12	0	2	2	0.31	0	4.6	0	0	2	?
LOWR	2009	500	2	1	5/8/08	11.15	22	S	2	0.35	0.1	4.6	0.594	0	9	?
LOWR	2009	500	2	1	5/9/08	11.18	24	2	2	0.33	0.1	4.6	0.648	0	18	?
LOWR	2009	500	2	1	5/10/08	11.22	24	3	2	0.32	0	4.6	0.648	0	25	?
LOWR	2009	500	2	1	5/11/08	11.25	5	3	S	0.34	0	4.6	0.135	0	21	?
LOWR	2009	500	2	1	5/12/08	11.28	0	3	2	0.32	0	4.6	0	0	14	?
LOWR	2009	500	2	1	5/13/08	11.32	0	3	3	0.21	0	4.6	0	0	9	?
LOWR	2009	500	2	1	5/14/08	11.35	0	3	4	0.29	0	4.6	0	0	3	?
LOWR	2009	500	2	1	5/15/08	11.38	0	3	5	0.26	0	4.6	0	0.26	0	WS-0
LOWR	2009	500	2	1	5/16/08	11.41	0	3	6	0.27	0	4.6	0	0.27	0	WS-1
LOWR	2009	500	2	1	5/17/08	11.45	0	3	7	0.31	0	4.6	0	0.31	0	WS-2
LOWR	2009	500	2	1	5/18/08	11.48	20	S	7	0.31	0	4.6	0.54	0	5	?
LOWR	2009	500	2	1	5/19/08	11.51	0	1	S	0.32	0	4.6	0	0.32	0	WS-0
LOWR	2009	500	2	1	5/20/08	11.55	0	1	2	0.32	0	4.6	0	0.32	0	WS-1
LOWR	2009	500	2	1	5/21/08	11.58	0	1	3	0.28	0	4.6	0	0.28	0	WS-2
LOWR	2009	500	2	1	5/22/08	11.61	0	1	4	0.27	0	4.6	0	0.27	0	WS-3
LOWR	2009	500	2	1	5/23/08	11.64	0	1	5	0.3	0	4.6	0	0.3	0	WS-4
LOWR	2009	500	2	1	5/24/08	11.68	0	1	6	0.34	0	4.6	0	0.34	0	WS-5
LOWR	2009	500	2	1	5/25/08	11.71	0	1	7	0.35	0	4.6	0	0.35	0	WS-6
LOWR	2009	500	2	1	5/26/08	11.74	0	1	8	0.36	0	4.6	0	0.36	0	WS-7
LOWR	2009	500	2	1	5/27/08	11.78	22	S	8	0.34	0	4.6	0.594	0	5	?
LOWR	2009	500	2	1	5/28/08	11.81	0	1	S	0.36	0	4.6	0	0.36	0	WS-0
LOWR	2009	500	2	1	5/29/08	11.84	0	1	2	0.34	0	4.6	0	0.34	0	WS-1
LOWR	2009	500	2	1	5/30/08	11.88	0	1	3	0.35	0	4.6	0	0.35	0	WS-2
LOWR	2009	500	2	1	5/31/08	11.91	0	1	4	0.32	0	4.6	0	0.32	0	WS-3
LOWR	2009	500	2	1	6/1/08	11.94	0	1	5	0.33	0	4.6	0	0.33	0	WS-4
LOWR	2009	500	2	1	6/2/08	11.97	0	1	6	0.36	0	4.6	0	0.36	0	WS-5
LOWR	2009	500	2	1	6/3/08	12.01	0	1	7	0.37	0	4.6	0	0.37	0	WS-6
LOWR	2009	500	2	1	6/4/08	12.04	0	1	8	0.34	0	4.6	0	0.34	0	WS-7

F500: Lowrie Ditch
Crop Cycle: 2007-2009(2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
LOWR	2009	500	2	1	6/5/08	12.07	0	1	9	0.36	0	4.6	0	0.36	0	WS-8
LOWR	2009	500	2	1	6/6/08	12.11	22	S	9	0.35	0	4.6	0.594	0	5	?
LOWR	2009	500	2	1	6/7/08	12.14	10	2	9	0.35	0	4.6	0.27	0	3	?
LOWR	2009	500	2	1	6/8/08	12.17	0	2	S	0.4	0	4.6	0	0.4	0	WS-0
LOWR	2009	500	2	1	6/9/08	12.20	0	2	2	0.35	0	4.6	0	0.35	0	WS-1
LOWR	2009	500	2	1	6/10/08	12.24	0	2	3	0.34	0	4.6	0	0.34	0	WS-2
LOWR	2009	500	2	1	6/11/08	12.27	7	2	4	0.16	0	4.6	0.189	0.16	0	WS-3
LOWR	2009	500	2	1	6/12/08	12.30	8	2	5	0.33	0	4.6	0.216	0.33	0	WS-0
LOWR	2009	500	2	1	6/13/08	12.34	8	2	6	0.34	0	4.6	0.216	0.34	0	WS-1
LOWR	2009	500	2	1	6/14/08	12.37	0	2	7	0.33	0	4.6	0	0.33	0	WS-2
LOWR	2009	500	2	1	6/15/08	12.40	0	2	8	0.34	0	4.6	0	0.34	0	WS-3
LOWR	2009	500	2	1	6/16/08	12.43	0	2	9	0.22	0	4.6	0	0.22	0	WS-4
LOWR	2009	500	2	1	6/17/08	12.47	0	2	10	0.17	0	4.6	0	0.17	0	WS-5
LOWR	2009	500	2	1	6/18/08	12.50	0	2	11	0.35	0	4.6	0	0.35	0	WS-6
LOWR	2009	500	2	1	6/19/08	12.53	0	2	12	0.31	0	4.6	0	0.31	0	WS-7
LOWR	2009	500	2	1	6/20/08	12.57	0	2	13	0.33	0	4.6	0	0.33	0	WS-8
LOWR	2009	500	2	1	6/21/08	12.60	0	2	14	0.29	0	4.6	0	0.29	0	WS-9
LOWR	2009	500	2	1	6/22/08	12.63	0	2	15	0.3	0	4.6	0	0.3	0	WS-10
LOWR	2009	500	2	1	6/23/08	12.66	0	2	16	0.35	0	4.6	0	0.35	0	WS-11
LOWR	2009	500	2	1	6/24/08	12.70	0	2	17	0.34	0	4.6	0	0.34	0	WS-12
LOWR	2009	500	2	1	6/25/08	12.73	0	2	18	0.36	0	4.6	0	0.36	0	WS-13
LOWR	2009	500	2	1	6/26/08	12.76	0	2	19	0.32	0	4.6	0	0.32	0	WS-14
LOWR	2009	500	2	1	6/27/08	12.80	20	S	19	0.27	0	4.6	0.54	0	5	?
LOWR	2009	500	2	1	6/28/08	12.83	24	2	19	0.32	0	4.6	0.648	0	13	?
LOWR	2009	500	2	1	6/29/08	12.86	24	3	19	0.31	0	4.6	0.648	0	20	?
LOWR	2009	500	2	1	6/30/08	12.89	0	3	S	0.28	0	4.6	0	0	14	?
LOWR	2009	500	2	1	7/1/08	12.93	0	3	2	0.2	0	4.6	0	0	9	?
LOWR	2009	500	2	1	7/2/08	12.96	0	3	3	0.28	0	4.6	0	0	3	
LOWR	2009	500	2	1	7/3/08	12.99	0	3	4	0.3	0	4.6	0	0.3	0	WS-0
LOWR	2009	500	2	1	7/4/08	13.03	0	3	5	0.35	0	4.6	0	0.35	0	WS-1
LOWR	2009	500	2	1	7/5/08	13.06	0	3	6	0.38	0	4.6	0	0.38	0	WS-2
LOWR	2009	500	2	1	7/6/08	13.09	0	3	7	0.35	0	4.6	0	0.35	0	WS-3
LOWR	2009	500	2	1	7/7/08	13.13	0	3	8	0.32	0	4.6	0	0.32	0	WS-4
LOWR	2009	500	2	1	7/8/08	13.16	0	3	9	0.29	0	4.6	0	0.29	0	WS-5
LOWR	2009	500	2	1	7/9/08	13.19	0	3	10	0.26	0	4.6	0	0.26	0	WS-6
LOWR	2009	500	2	1	7/10/08	13.22	0	3	11	0.32	0.05	4.6	0	0.32	0	WS-7
LOWR	2009	500	2	1	7/11/08	13.26	0	3	12	0.32	0	4.6	0	0.32	0	WS-8

F500: Lowrie Ditch
Crop Cycle: 2007-2009(2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
LOWR	2009	500	2	1	7/12/08	13.29	0	3	13	0.32	0	4.6	0	0.32	0	WS-9
LOWR	2009	500	2	1	7/13/08	13.32	0	3	14	0.36	0	4.6	0	0.36	0	WS-10
LOWR	2009	500	2	1	7/14/08	13.36	0	3	15	0.28	0	4.6	0	0.28	0	WS-11
LOWR	2009	500	2	1	7/15/08	13.39	0	3	16	0.31	0	4.6	0	0.31	0	WS-12
LOWR	2009	500	2	1	7/16/08	13.42	0	3	17	0.27	0	4.6	0	0.27	0	WS-13
LOWR	2009	500	2	1	7/17/08	13.45	20	S	17	0.32	0	4.6	0.54	0	4	?
LOWR	2009	500	2	1	7/18/08	13.49	24	2	17	0.29	0.8	4.6	0.648	0	29	?
LOWR	2009	500	2	1	7/19/08	13.52	24	3	17	0.27	0	4.6	0.648	0	38	?
LOWR	2009	500	2	1	7/20/08	13.55	0	3	S	0.3506	0	4.6	0	0	30	?
LOWR	2009	500	2	1	7/21/08	13.59	0	3	2	0.29	0.04	4.6	0	0	25	?
LOWR	2009	500	2	1	7/22/08	13.62	0	3	3	0.29	0	4.6	0	0	18	?
LOWR	2009	500	2	1	7/23/08	13.65	0	3	4	0.25	0.14	4.6	0	0	16	?
LOWR	2009	500	2	1	7/24/08	13.68	22	S	4	0.35	0.03	4.6	0.594	0	22	?
LOWR	2009	500	2	1	7/25/08	13.72	0	1	S	0.35	0	4.6	0	0	14	?
LOWR	2009	500	2	1	7/26/08	13.75	0	1	2	0.34	0	4.6	0	0	7	?
LOWR	2009	500	2	1	7/27/08	13.78	0	1	3	0.34	0	4.6	0	0.34	0	WS-0
LOWR	2009	500	2	1	7/28/08	13.82	0	1	4	0.28	0	4.6	0	0.28	0	WS-1
LOWR	2009	500	2	1	7/29/08	13.85	0	S	4	0.32	0.4	4.6	0	0	1	?
LOWR	2009	500	2	1	7/30/08	13.88	0	1	S	0.35	0	4.6	0	0.35	0	WS-0
LOWR	2009	500	2	1	7/31/08	13.91	0	1	2	0.35	0	4.6	0	0.35	0	WS-1
LOWR	2009	500	2	1	8/1/08	13.95	0	1	3	0.33	0	4.6	0	0.33	0	WS-2
LOWR	2009	500	2	1	8/2/08	13.98	20	S	3	0.35	0	4.6	0.54	0	4	?
LOWR	2009	500	2	1	8/3/08	14.01	24	2	3	0.19	0	4.6	0.648	0	14	?
LOWR	2009	500	2	1	8/4/08	14.05	0	2	S	0.36	0.05	4.6	0	0	7	?
LOWR	2009	500	2	1	8/5/08	14.08	0	2	2	0.37	0	4.6	0	0.37	0	WS-0
LOWR	2009	500	2	1	8/6/08	14.11	0	2	3	0.25	0	4.6	0	0.25	0	WS-1
LOWR	2009	500	2	1	8/7/08	14.14	22	S	3	0.35	0	4.6	0.594	0	5	?
LOWR	2009	500	2	1	8/8/08	14.18	24	2	3	0.33	0	4.6	0.648	0	12	?
LOWR	2009	500	2	1	8/9/08	14.21	24	3	3	0.35	0	4.6	0.648	0	18	?
LOWR	2009	500	2	1	8/10/08	14.24	24	4	3	0.31	0.1	4.6	0.648	0	28	?
LOWR	2009	500	2	1	8/11/08	14.28	0	4	S	0.33	0	4.6	0	0	21	?
LOWR	2009	500	2	1	8/12/08	14.31	0	4	2	0.38	0	4.6	0	0	12	?
LOWR	2009	500	2	1	8/13/08	14.34	0	4	3	0.27	0	4.6	0	0	6	?
LOWR	2009	500	2	1	8/14/08	14.38	22	S	3	0.34	0.19	4.6	0.594	0	16	?
LOWR	2009	500	2	1	8/15/08	14.41	22	2	3	0.34	0	4.6	0.594	0	22	?
LOWR	2009	500	2	1	8/16/08	14.44	24	3	3	0.33	0	4.6	0.648	0	29	?
LOWR	2009	500	2	1	8/17/08	14.47	5	3	S	0.37	0	4.6	0.135	0	23	?

F500: Lowrie Ditch
Crop Cycle: 2007-2009(2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
LOWR	2009	500	2	1	8/18/08	14.51	0	3	2	0.31	0	4.6	0	0	17	?
LOWR	2009	500	2	1	8/19/08	14.54	0	3	3	0.34	0	4.6	0	0	9	?
LOWR	2009	500	2	1	8/20/08	14.57	0	3	4	0.31	0	4.6	0	0	3	?
LOWR	2009	500	2	1	8/21/08	14.61	0	3	5	0.32	0	4.6	0	0.32	0	WS-0
LOWR	2009	500	2	1	8/22/08	14.64	16	S	5	0.28	0	4.6	0.432	0	3	?
LOWR	2009	500	2	1	8/23/08	14.67	24	2	5	0.32	0	4.6	0.648	0	10	
LOWR	2009	500	2	1	8/24/08	14.70	0	2	S	0.35	0	4.6	0	0	2	?
LOWR	2009	500	2	1	8/25/08	14.74	0	2	2	0.33	0	4.6	0	0.33	0	WS-0
LOWR	2009	500	2	1	8/26/08	14.77	0	2	3	0.29	0	4.6	0	0.29	0	WS-1
LOWR	2009	500	2	1	8/27/08	14.80	0	2	4	0.31	0.18	4.6	0	0.31	0	WS-2
LOWR	2009	500	2	1	8/28/08	14.84	0	2	5	0.34	0	4.6	0	0.34	0	WS-3
LOWR	2009	500	2	1	8/29/08	14.87	0	2	6	0.3	0	4.6	0	0.3	0	WS-4
LOWR	2009	500	2	1	8/30/08	14.90	20	S	6	0.28	0	4.6	0.54	0	5	?
LOWR	2009	500	2	1	8/31/08	14.93	24	2	6	0.33	0.08	4.6	0.648	0	14	?
LOWR	2009	500	2	1	9/1/08	14.97	24	3	6	0.25	0	4.6	0.648	0	22	?
LOWR	2009	500	2	1	9/2/08	15.00	0	3	S	0.31	0	4.6	0	0	16	?
LOWR	2009	500	2	1	9/3/08	15.03	0	3	2	0.31	0	4.6	0	0	9	?
LOWR	2009	500	2	1	9/4/08	15.07	0	3	3	0.32	0	4.6	0	0	2	?
LOWR	2009	500	2	1	9/5/08	15.10	0	3	4	0.27	0	4.6	0	0.27	0	WS-0
LOWR	2009	500	2	1	9/6/08	15.13	0	3	5	0.28	0	4.6	0	0.28	0	WS-1
LOWR	2009	500	2	1	9/7/08	15.16	0	3	6	0.28	0	4.6	0	0.28	0	WS-2
LOWR	2009	500	2	1	9/8/08	15.20	0	3	7	0.28	0	4.6	0	0.28	0	WS-3
LOWR	2009	500	2	1	9/9/08	15.23	0	3	8	0.29	0	4.6	0	0.29	0	WS-4
LOWR	2009	500	2	1	9/10/08	15.26	0	3	9	0.25	0	4.6	0	0.25	0	WS-5
LOWR	2009	500	2	1	9/11/08	15.30	0	3	10	0.31	0	4.6	0	0.31	0	WS-6
LOWR	2009	500	2	1	9/12/08	15.33	0	3	11	0.3	0	4.6	0	0.3	0	WS-7
LOWR	2009	500	2	1	9/13/08	15.36	0	3	12	0.19	0	4.6	0	0.19	0	WS-8
LOWR	2009	500	2	1	9/14/08	15.39	0	3	13	0.25	0	4.6	0	0.25	0	WS-9
LOWR	2009	500	2	1	9/15/08	15.43	0	3	14	0.29	0	4.6	0	0.29	0	WS-10
LOWR	2009	500	2	1	9/16/08	15.46	0	3	15	0.26	0	4.6	0	0.26	0	WS-11
LOWR	2009	500	2	1	9/17/08	15.49	0	3	16	0.3	0	4.6	0	0.3	0	WS-12
LOWR	2009	500	2	1	9/18/08	15.53	0	3	17	0.29	0	4.6	0	0.29	0	WS-13
LOWR	2009	500	2	1	9/19/08	15.56	0	3	18	0.28	0	4.6	0	0.28	0	WS-14
LOWR	2009	500	2	1	9/20/08	15.59	0	3	19	0.3	0	4.6	0	0.3	0	WS-15
LOWR	2009	500	2	1	9/21/08	15.63	0	3	20	0.3	0	4.6	0	0.3	0	WS-16
LOWR	2009	500	2	1	9/22/08	15.66	0	3	21	0.3	0	4.6	0	0.3	0	WS-17
LOWR	2009	500	2	1	9/23/08	15.69	0	3	22	0.23	0	4.6	0	0.23	0	WS-18

F500: Lowrie Ditch

Crop Cycle: 2007-2009(2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
LOWR	2009	500	2	1	9/24/08	15.72	16	S	22	0.23	0	4.6	0.432	0	4	?
LOWR	2009	500	2	1	9/25/08	15.76	24	2	22	0.22	0	4.6	0.648	0	13	
LOWR	2009	500	2	1	9/26/08	15.79	0	2	S	0.24	0	4.6	0	0	8	?
LOWR	2009	500	2	1	9/27/08	15.82	0	2	2	0.27	0	4.6	0	0	2	?
LOWR	2009	500	2	1	9/28/08	15.86	0	2	3	0.24	0	4.6	0	0.24	0	WS-0
LOWR	2009	500	2	1	9/29/08	15.89	0	2	4	0.25	0	4.6	0	0.25	0	WS-1
LOWR	2009	500	2	1	9/30/08	15.92	0	S	4	0.2	0.22	4.6	0	0.2	0	WS-2
LOWR	2009	500	2	1	10/1/08	15.95	0	1	S	0.27	0	4.6	0	0.27	0	WS-3
LOWR	2009	500	2	1	10/2/08	15.99	0	1	2	0.27	0	4.6	0	0.27	0	WS-4
LOWR	2009	500	2	1	10/3/08	16.02	0	1	3	0.28	0	4.6	0	0.28	0	WS-5
LOWR	2009	500	2	1	10/4/08	16.05	0	1	4	0.29	0	4.6	0	0.29	0	WS-6
LOWR	2009	500	2	1	10/5/08	16.09	0	1	5	0.28	0	4.6	0	0.28	0	WS-7
LOWR	2009	500	2	1	10/6/08	16.12	0	1	6	0.31	0	4.6	0	0.31	0	WS-8
LOWR	2009	500	2	1	10/7/08	16.15	0	1	7	0.26	0	4.6	0	0.26	0	WS-9
LOWR	2009	500	2	1	10/8/08	16.18	0	1	8	0.21	0	4.6	0	0.21	0	WS-10
LOWR	2009	500	2	1	10/9/08	16.22	0	1	9	0.26	0	4.6	0	0.26	0	WS-11
LOWR	2009	500	2	1	10/10/08	16.25	0	1	10	0.24	0	4.6	0	0.24	0	WS-12
LOWR	2009	500	2	1	10/11/08	16.28	0	1	11	0.28	0	4.6	0	0.28	0	WS-13
LOWR	2009	500	2	1	10/12/08	16.32	0	1	12	0.27	0	4.6	0	0.27	0	WS-14
LOWR	2009	500	2	1	10/13/08	16.35	0	1	13	0.17	0	4.6	0	0.17	0	WS-15
LOWR	2009	500	2	1	10/14/08	16.38	0	1	14	0.16	0	4.6	0	0.16	0	WS-16
LOWR	2009	500	2	1	10/15/08	16.41	22	S	14	0.19	0	4.6	0.594	0	8	?
LOWR	2009	500	2	1	10/16/08	16.45	24	2	14	0.27	0	4.6	0.648	0	17	?
LOWR	2009	500	2	1	10/17/08	16.48	0	2	S	0.22	0	4.6	0	0	12	?
LOWR	2009	500	2	1	10/18/08	16.51	0	2	2	0.19	0	4.6	0	0	8	?
LOWR	2009	500	2	1	10/19/08	16.55	0	2	3	0.25	0	4.6	0	0	2	?
LOWR	2009	500	2	1	10/20/08	16.58	0	2	4	0.26	0	4.6	0	0.26	0	WS-0
LOWR	2009	500	2	1	10/21/08	16.61	0	2	5	0.19	0	4.6	0	0.19	0	WS-1
LOWR	2009	500	2	1	10/22/08	16.64	0	2	6	0.28	0	4.6	0	0.28	0	WS-2
LOWR	2009	500	2	1	10/23/08	16.68	0	2	7	0.21	0	4.6	0	0.21	0	WS-3
LOWR	2009	500	2	1	10/24/08	16.71	0	2	8	0.18	0	4.6	0	0.18	0	WS-4
LOWR	2009	500	2	1	10/25/08	16.74	0	2	9	0.18	0	4.6	0	0.18	0	WS-5
LOWR	2009	500	2	1	10/26/08	16.78	0	2	10	0.2	0	4.6	0	0.2	0	WS-6
LOWR	2009	500	2	1	10/27/08	16.81	0	2	11	0.15	0	4.6	0	0.15	0	WS-7
LOWR	2009	500	2	1	10/28/08	16.84	0	2	12	0.15	0	4.6	0	0.15	0	WS-8
LOWR	2009	500	2	1	10/29/08	16.88	0	2	13	0.2	0	4.6	0	0.2	0	WS-9
LOWR	2009	500	2	1	10/30/08	16.91	0	2	14	0.2	0	4.6	0	0.2	0	WS-10

F500: Lowrie Ditch

Crop Cycle: 2007-2009(2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
LOWR	2009	500	2	1	10/31/08	16.94	0	2	15	0.21	0	4.6	0	0.21	0	WS-11
LOWR	2009	500	2	1	11/1/08	16.97	0	2	16	0.22	0	4.6	0	0.22	0	SCWS-12
LOWR	2009	500	2	1	11/2/08	17.01	0	2	17	0.2	0	4.6	0	0.2	0	WS-13
LOWR	2009	500	2	1	11/3/08	17.04	0	2	18	0.21	0	4.6	0	0.21	0	WS-14
LOWR	2009	500	2	1	11/4/08	17.07	0	2	19	0.13	0	4.6	0	0.13	0	WS-15
LOWR	2009	500	2	1	11/5/08	17.11	0	2	20	0.21	0	4.6	0	0.21	0	WS-16
LOWR	2009	500	2	1	11/6/08	17.14	0	2	21	0.22	0	4.6	0	0.22	0	WS-17
LOWR	2009	500	2	1	11/7/08	17.17	0	2	22	0.2	0	4.6	0	0.2	0	WS-18
LOWR	2009	500	2	1	11/8/08	17.20	0	2	23	0.23	0	4.6	0	0.23	0	WS-19
LOWR	2009	500	2	1	11/9/08	17.24	0	2	24	0.24	0	4.6	0	0.24	0	WS-20
LOWR	2009	500	2	1	11/10/08	17.27	0	2	25	0.2	0	4.6	0	0.2	0	WS-21
LOWR	2009	500	2	1	11/11/08	17.30	20	S	25	0.22	0	4.6	0.54	0	6	?
LOWR	2009	500	2	1	11/12/08	17.34	24	2	25	0.18	0	4.6	0.648	0	17	?
LOWR	2009	500	2	1	11/13/08	17.37	0	2	S	0.13	0	4.6	0	0	14	?
LOWR	2009	500	2	1	11/14/08	17.40	0	2	2	0.16	0	4.6	0	0	10	?
LOWR	2009	500	2	1	11/15/08	17.43	0	2	3	0.16	0	4.6	0	0	7	?
LOWR	2009	500	2	1	11/16/08	17.47	0	2	4	0.12	0.11	4.6	0	0	7	?
LOWR	2009	500	2	1	11/17/08	17.50	0	2	5	0.18	0	4.6	0	0	3	?
LOWR	2009	500	2	1	11/18/08	17.53	0	S	5	0.12	0.75	4.6	0	0	16	?
LOWR	2009	500	2	1	11/19/08	17.57	0	1	S	0.19	0.1	4.6	0	0	14	?
LOWR	2009	500	2	1	11/20/08	17.60	20	S	1	0.19	0	4.6	0.54	0	22	?
LOWR	2009	500	2	1	11/21/08	17.63	0	1	S	0.14	0	4.6	0	0	19	?
LOWR	2009	500	2	1	11/22/08	17.66	0	1	2	0.07	0	4.6	0	0	18	?
LOWR	2009	500	2	1	11/23/08	17.70	11	S	2	0.18	0	4.6	0.297	0	20	?
LOWR	2009	500	2	1	11/24/08	17.73	0	1	S	0.25	0	4.6	0	0	15	?
LOWR	2009	500	2	1	11/25/08	17.76	0	1	2	0.2	0	4.6	0	0	10	?
LOWR	2009	500	2	1	11/26/08	17.80	0	1	3	0.21	0	4.6	0	0	6	
LOWR	2009	500	2	1	11/27/08	17.83	0	1	4	0.23	0	4.6	0	0	1	
LOWR	2009	500	2	1	11/28/08	17.86	0	1	5	0.17	0	4.6	0	0.17	0	WS-0
LOWR	2009	500	2	1	11/29/08	17.89	0	1	6	0.1	0	4.6	0	0.1	0	WS-1
LOWR	2009	500	2	1	11/30/08	17.93	0	1	7	0.16	0.16	4.6	0	0.16	0	WS-2
LOWR	2009	500	2	1	12/1/08	17.96	0	1	8	0.17	0	4.6	0	0.17	0	WS-3
LOWR	2009	500	2	1	12/2/08	17.99	0	1	9	0.09	0.08	4.6	0	0.09	0	WS-4
LOWR	2009	500	2	1	12/3/08	18.03	0	1	10	0.15	0	4.6	0	0.15	0	WS-5
LOWR	2009	500	2	1	12/4/08	18.06	0	1	11	0.17	0	4.6	0	0.17	0	WS-6
LOWR	2009	500	2	1	12/5/08	18.09	0	1	12	0.18	0	4.6	0	0.18	0	WS-7
LOWR	2009	500	2	1	12/6/08	18.13	0	1	13	0.2	0	4.6	0	0.2	0	WS-8

F500: Lowrie Ditch

Crop Cycle: 2007-2009(2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
LOWR	2009	500	2	1	12/7/08	18.16	20	S	13	0.19	0	4.6	0.54	0	7	?
LOWR	2009	500	2	1	12/8/08	18.19	24	2	13	0.18	0	4.6	0.648	0	17	?
LOWR	2009	500	2	1	12/9/08	18.22	0	2	S	0.12	0	4.6	0	0	15	?
LOWR	2009	500	2	1	12/10/08	18.26	0	2	2	0.13	0	4.6	0	0	12	?
LOWR	2009	500	2	1	12/11/08	18.29	0	2	3	0.04	0	4.6	0	0	11	?
LOWR	2009	500	2	1	12/12/08	18.32	0	S	3	0.11	2.7	4.6	0	0	67	
LOWR	2009	500	2	1	12/13/08	18.36	0	1	S	0.11	0	4.6	0	0	65	
LOWR	2009	500	2	1	12/14/08	18.39	0	S	1	0.08	0.52	4.6	0	0	74	
LOWR	2009	500	2	1	12/15/08	18.42	0	1	S	0.11	0	4.6	0	0	72	
LOWR	2009	500	2	1	12/16/08	18.45	0	1	2	0.16	0	4.6	0	0	69	
LOWR	2009	500	2	1	12/17/08	18.49	0	1	3	0.17	0	4.6	0	0	65	
LOWR	2009	500	2	1	12/18/08	18.52	0	1	4	0.15	0	4.6	0	0	62	
LOWR	2009	500	2	1	12/19/08	18.55	0	1	5	0.16	0	4.6	0	0	58	
LOWR	2009	500	2	1	12/20/08	18.59	0	1	6	0.19	0	4.6	0	0	54	
LOWR	2009	500	2	1	12/21/08	18.62	0	1	7	0.18	0	4.6	0	0	50	?
LOWR	2009	500	2	1	12/22/08	18.65	0	1	8	0.19	0	4.6	0	0	46	?
LOWR	2009	500	2	1	12/23/08	18.68	0	1	9	0.16	0	4.6	0	0	43	?
LOWR	2009	500	2	1	12/24/08	18.72	0	S	9	0.12	0.22	4.6	0	0	45	?
LOWR	2009	500	2	1	12/25/08	18.75	0	1	S	0.14	0.12	4.6	0	0	44	?
LOWR	2009	500	2	1	12/26/08	18.78	0	S	1	0.08	0.35	4.6	0	0	50	?
LOWR	2009	500	2	1	12/27/08	18.82	0	2	1	0.11	0.3	4.6	0	0	54	?
LOWR	2009	500	2	1	12/28/08	18.85	0	2	S	0.11	0	4.6	0	0	52	?
LOWR	2009	500	2	1	12/29/08	18.88	0	2	2	0.14	0	4.6	0		49	RIPE
LOWR	2009	500	2	1	12/30/08	18.91	0	2	3	0.05	0	4.6	0		48	RIPE
LOWR	2009	500	2	1	12/31/08	18.95	0	S	3	0.12	0.85	4.6	0		64	RIPE
LOWR	2009	500	2	1	1/1/09	18.98	0	1	S	0.14	0	4.6	0		61	RIPE
LOWR	2009	500	2	1	1/2/09	19.01	0	1	2	0.14	0	4.6	0		58	RIPE
LOWR	2009	500	2	1	1/3/09	19.05	0	1	3	0.1787	0	4.6	0		54	RIPE
LOWR	2009	500	2	1	1/4/09	19.08	0	1	4	0.1787	0	4.6	0		50	RIPE
LOWR	2009	500	2	1	1/5/09	19.11	0	1	5	0.1787	0	4.6	0		46	RIPE
LOWR	2009	500	2	1	1/6/09	19.14	0	1	6	0.1787	0	4.6	0		42	RIPE
LOWR	2009	500	2	1	1/7/09	19.18	0	1	7	0.1787	0	4.6	0		38	RIPE
LOWR	2009	500	2	1	1/8/09	19.21	0	1	8	0.1787	0	4.6	0		34	RIPE
LOWR	2009	500	2	1	1/9/09	19.24	0	1	9	0.1787	0	4.6	0		30	RIPE
LOWR	2009	500	2	1	1/10/09	19.28	0	1	10	0.1787	0	4.6	0		26	RIPE
LOWR	2009	500	2	1	1/11/09	19.31	0	1	11	0.1787	0.12	4.6	0		25	RIPE
LOWR	2009	500	2	1	1/12/09	19.34	0	1	12	0.1787	0	4.6	0		21	RIPE

F500: Lowrie Ditch

Crop Cycle: 2007-2009(2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
LOWR	2009	500	2	1	1/13/09	19.38	0	1	13	0.1787	0	4.6	0		17	RIPE
LOWR	2009	500	2	1	1/14/09	19.41	0	1	14	0.1787	0	4.6	0		13	RIPE
LOWR	2009	500	2	1	1/15/09	19.44	0	1	15	0.1787	0	4.6	0		10	RIPE
LOWR	2009	500	2	1	1/16/09	19.47	0	S	15	0.1787	0.22	4.6	0		11	RIPE
LOWR	2009	500	2	1	1/17/09	19.51	0	2	15	0.1787	0.63	4.6	0		20	RIPE
LOWR	2009	500	2	1	1/18/09	19.54	0	2	S	0.1787	0.05	4.6	0		18	RIPE
LOWR	2009	500	2	1	1/19/09	19.57	0	2	2	0.1787	0	4.6	0		14	RIPE
LOWR	2009	500	2	1	1/20/09	19.61	0	2	3	0.1787	0	4.6	0		10	RIPE
LOWR	2009	500	2	1	1/21/09	19.64	0	2	4	0.1787	0	4.6	0		6	RIPE
LOWR	2009	500	2	1	1/22/09	19.67	0	2	5	0.1787	0	4.6	0		2	RIPE
LOWR	2009	500	2	1	1/23/09	19.70	0	2	6	0.1787	0	4.6	0		0	RIPE
LOWR	2009	500	2	1	1/24/09	19.74	0	2	7	0.1787	0	4.6	0		0	RIPE
LOWR	2009	500	2	1	1/25/09	19.77	0	2	8	0.1787	0	4.6	0		0	RIPE
LOWR	2009	500	2	1	1/26/09	19.80	0	2	9	0.1787	0	4.6	0		0	RIPE
LOWR	2009	500	2	1	1/27/09	19.84	0	S	9	0.04	0.85	4.6	0		17	DRY
LOWR	2009	500	2	1	1/28/09	19.87	0	2	9	0.04	1.15	4.6	0		41	DRY
LOWR	2009	500	2	1	1/29/09	19.90	0	3	9	0.1787	0.46	4.6	0		47	DRY
LOWR	2009	500	2	1	1/30/09	19.93	0	3	S	0.1787	0	4.6	0		43	DRY
LOWR	2009	500	2	1	1/31/09	19.97	0	3	2	0.1787	0	4.6	0		40	DRY
LOWR	2009	500	2	1	2/1/09	20.00	0	3	3	0.1968	0	4.6	0		35	DRY
LOWR	2009	500	2	1	2/2/09	20.03	0	3	4	0.1968	0	4.6	0		31	DRY
LOWR	2009	500	2	1	2/3/09	20.07	0	S	4	0.1968	0.5	4.6	0		38	DRY
LOWR	2009	500	2	1	2/4/09	20.10	0	1	S	0.1968	0	4.6	0		33	DRY
LOWR	2009	500	2	1	2/5/09	20.13	0	1	2	0.1968	0	4.6	0		29	DRY
LOWR	2009	500	2	1	2/6/09	20.16	0	1	3	0.1968	0	4.6	0		25	DRY
LOWR	2009	500	2	1	2/7/09	20.20	0	1	4	0.1968	0	4.6	0		21	DRY
LOWR	2009	500	2	1	2/8/09	20.23	0	1	5	0.1968	0	4.6	0		16	DRY
LOWR	2009	500	2	1	2/9/09	20.26	0	1	6	0.1968	0	4.6	0		12	DRY
LOWR	2009	500	2	1	2/10/09	20.30	0	1	7	0.1968	0	4.6	0		8	DRY
LOWR	2009	500	2	1	2/11/09	20.33	0	1	8	0.1968	0	4.6	0		3	DRY
LOWR	2009	500	2	1	2/12/09	20.36	0	1	9	0.1968	0	4.6	0		0	DRY
LOWR	2009	500	2	1	2/13/09	20.39	0	1	10	0.1968	0	4.6	0		0	DRY
LOWR	2009	500	2	1	2/14/09	20.43	0	1	11	0.1968	0	4.6	0		0	DRY
LOWR	2009	500	2	1	2/15/09	20.46	0	1	12	0.1968	0	4.6	0		0	DRY
LOWR	2009	500	2	1	2/16/09	20.49	0	1	13	0.1968	0	4.6	0		0	DRY
LOWR	2009	500	2	1	2/17/09	20.53	0	1	14	0.1968	0	4.6	0		0	DRY
LOWR	2009	500	2	1	2/18/09	20.56	0	1	15	0.1968	0	4.6	0		0	DRY

F500: Lowrie Ditch

Crop Cycle: 2007-2009(2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
LOWR	2009	500	2	1	2/19/09	20.59	0	1	16	0.1968	0	4.6	0		0	DRY
LOWR	2009	500	2	1	2/20/09	20.63	0	1	17	0.1968	0	4.6	0		0	DRY
LOWR	2009	500	2	1	2/21/09	20.66	0	1	18	0.1968	0	4.6	0		0	DRY
LOWR	2009	500	2	1	2/22/09	20.69	0	1	19	0.1968	0	4.6	0		0	DRY
LOWR	2009	500	2	1	2/23/09	20.72	0	1	20	0.1968	0	4.6	0		0	DRY
LOWR	2009	500	2	1	2/24/09	20.76	0	1	21	0.1968	0	4.6	0		0	DRY
LOWR	2009	500	2	1	2/25/09	20.79	0	1	22	0.1968	0.1	4.6	0		0	DRY
LOWR	2009	500	2	1	2/26/09	20.82	0	1	23	0.1968	0	4.6	0		0	DRY
LOWR	2009	500	2	1	2/27/09	20.86	0	1	24	0.1968	0	4.6	0		0	DRY
LOWR	2009	500	2	1	2/28/09	20.89	0	1	25	0.1968	0	4.6	0		0	DRY
LOWR	2009	500	2	1	3/1/09	20.92	0	S	25	0.2139	0.21	4.6	0		0	DRY
LOWR	2009	500	2	1	3/2/09	20.95	0	1	S	0.2139	0.12	4.6	0		0	DRY
LOWR	2009	500	2	1	3/3/09	20.99	0	S	1	0.2139	0.2	4.6	0		0	DRY
LOWR	2009	500	2	1	3/4/09	21.02	0	1	S	0.2139	0	4.6	0		0	DRY
LOWR	2009	500	2	1	3/5/09	21.05	0	1	2	0.2139	0.08	4.6	0		0	DRY
LOWR	2009	500	2	1	3/6/09	21.09	0	1	3	0.2139	0	4.6	0		0	DRY
LOWR	2009	500	2	1	3/7/09	21.12	0	S	3	0.2139	0.27	4.6	0		1	DRY
LOWR	2009	500	2	1	3/8/09	21.15	0	1	S	0.2139	0.15	4.6	0		0	DRY
LOWR	2009	500	2	1	3/9/09	21.18	0	1	2	0.2139	0.14	4.6	0		0	DRY
LOWR	2009	500	2	1	3/10/09	21.22	0	1	3	0.2139	0	4.6	0		0	DRY
LOWR	2009	500	2	1	3/11/09	21.25	0	1	4	0.2139	0	4.6	0		0	DRY
LOWR	2009	500	2	1	3/12/09	21.28	0	S	4	0.2139	0.78	4.6	0		12	DRY
LOWR	2009	500	2	1	3/13/09	21.32	0	2	4	0.2139	0.35	4.6	0		15	DRY
LOWR	2009	500	2	1	3/14/09	21.35	0	3	4	0.2139	0.7	4.6	0		25	DRY
LOWR	2009	500	2	1	3/15/09	21.38	0	3	S	0.2139	0	4.6	0		21	DRY
LOWR	2009	500	2	1	3/16/09	21.41	0	S	1	0.2139	0.22	4.6	0		21	DRY
LOWR	2009	500	2	1	3/17/09	21.45	0	1	S	0.2139	0	4.6	0		16	DRY
LOWR	2009	500	2	1	3/18/09	21.48	0	1	2	0.2139	0.08	4.6	0		13	DRY
LOWR	2009	500	2	1	3/19/09	21.51	0	1	3	0.2139	0	4.6	0		9	DRY
LOWR	2009	500	2	1	3/20/09	21.55	0	1	4	0.2139	0.05	4.6	0		5	DRY
LOWR	2009	500	2	1	3/21/09	21.58	0	1	5	0.2139	0	4.6	0		0	DRY
LOWR	2009	500	2	1	3/22/09	21.61	0	1	6	0.2139	0	4.6	0		0	DRY
LOWR	2009	500	2	1	3/23/09	21.64	0	1	7	0.2139	0	4.6	0		0	DRY
LOWR	2009	500	2	1	3/24/09	21.68	0	1	8	0.2139	0	4.6	0		0	DRY
LOWR	2009	500	2	1	3/25/09	21.71	0	1	9	0.2139	0	4.6	0		0	DRY
LOWR	2009	500	2	1	3/26/09	21.74	0	1	10	0.2139	0	4.6	0		0	DRY
LOWR	2009	500	2	1	3/27/09	21.78	0	1	11	0.2139	0	4.6	0		0	DRY

F500: Lowrie Ditch

Crop Cycle: 2007-2009(2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
LOWR	2009	500	2	1	3/28/09	21.81	0	1	12	0.2139	0	4.6	0		0	END
										136.2879	33.34*		83.7	42.3639995		

**** Actual Rainfall total not fully useable by the plant as irrigation. Please see cover memo for explanation of "Effective Rainfall"***

F602: Haiku Ditch

Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAIK	2007	602	2	2	6/9/05	0	24	S	S	0.0999	0.05	1.3653	0.648	0	43	IPLT
HAIK	2007	602	2	2	6/10/05	0.032894737	24	2	1	0.09657	0.03	1.3653	0.648	0	86	IPLT
HAIK	2007	602	2	2	6/11/05	0.065789474	24	3	1	0.09657	0.02	1.3653	0.648	0	100	IPLT
HAIK	2007	602	2	2	6/12/05	0.098684211	24	4	1	0.08325	0.1	1.3653	0.648	0	100	IPLT
HAIK	2007	602	2	1	6/13/05	0.131578947	24	5	1	0.10989	0	1.3653	0.648	0	100	IPLT
HAIK	2007	602	2	2	6/14/05	0.164473684	24	6	1	0.0999	0	1.3653	0.648	0	100	IPLT
HAIK	2007	602	2	2	6/15/05	0.197368421	24	7	1	0.11322	0	1.3653	0.648	0	100	IPLT
HAIK	2007	602	2	2	6/16/05	0.230263158	24	8	1	0.0999	0	1.3653	0.648	0	100	IPLT
HAIK	2007	602	2	2	6/17/05	0.263157895	0	8	S	0.09657	0	1.3653	0	0	92	IPLT
HAIK	2007	602	2	2	6/18/05	0.296052632	24	S	1	0.09324	0	1.3653	0.648	0	100	IPLT
HAIK	2007	602	2	2	6/19/05	0.328947368	24	2	1	0.08325	0	1.3653	0.648	0	100	IPLT
HAIK	2007	602	2	2	6/20/05	0.361842105	0	2	S	0.08658	0.08	1.3653	0	0	99	IPLT
HAIK	2007	602	2	2	6/21/05	0.394736842	0	2	2	0.06327	0	1.3653	0	0	94	IPLT
HAIK	2007	602	2	2	6/22/05	0.427631579	22	S	2	0.07659	0	1.3653	0.594	0	100	IPLT
HAIK	2007	602	2	2	6/23/05	0.460526316	24	2	2	0.09324	0	1.3653	0.648	0	100	IPLT
HAIK	2007	602	2	2	6/24/05	0.493421053	24	3	2	0.09324	0	1.3653	0.648	0	100	IPLT
HAIK	2007	602	2	2	6/25/05	0.526315789	24	4	2	0.10989	0	1.3653	0.648	0	100	IPLT
HAIK	2007	602	2	2	6/26/05	0.559210526	0	4	S	0.06993	0.05	1.3653	0	0	98	IPLT
HAIK	2007	602	2	2	6/27/05	0.592105263	24	S	1	0.07992	0	1.3653	0.648	0	100	IPLT
HAIK	2007	602	2	2	6/28/05	0.625	24	2	1	0.09324	0	1.3653	0.648	0	100	IPLT
HAIK	2007	602	2	2	6/29/05	0.657894737	24	3	1	0.08991	0	1.3653	0.648	0	100	IF
HAIK	2007	602	2	2	6/30/05	0.690789474	7	3	S	0.09324	0	1.3653	0.189	0	100	HAF
HAIK	2007	602	2	2	7/1/05	0.723684211	0	3	2	0.09657	0	1.3653	0	0	92	
HAIK	2007	602	2	2	7/2/05	0.756578947	0	3	3	0.09657	0.02	1.3653	0	0	87	HAF
HAIK	2007	602	2	2	7/3/05	0.789473684	0	3	4	0.09657	0.05	1.3653	0	0	83	
HAIK	2007	602	2	2	7/4/05	0.822368421	0	3	5	0.09324	0	1.3653	0	0	77	IPLT
HAIK	2007	602	2	2	7/5/05	0.855263158	24	S	5	0.0999	0	1.3653	0.648	0	100	IPLT
HAIK	2007	602	2	2	7/6/05	0.888157895	7	1	S	0.08991	0	1.3653	0.189	0	100	
HAIK	2007	602	2	2	7/7/05	0.921052632	0	1	2	0.09324	0	1.3653	0	0	93	
HAIK	2007	602	2	2	7/8/05	0.953947368	22	S	2	0.04995	0.1	1.3653	0.594	0	100	I
HAIK	2007	602	2	2	7/9/05	0.986842105	24	2	2	0.07992	0.11	1.3653	0.648	0	100	I
HAIK	2007	602	2	2	7/10/05	1.019736842	24	3	2	0.0666	0	1.3653	0.648	0	100	I
HAIK	2007	602	2	2	7/11/05	1.052631579	24	4	2	0.08991	0	1.3653	0.648	0	100	IPLT
HAIK	2007	602	2	2	7/12/05	1.085526316	24	5	2	0.07326	0.15	1.3653	0.648	0	100	IPLT
HAIK	2007	602	2	2	7/13/05	1.118421053	24	6	2	0.0999	0.02	1.3653	0.648	0	100	
HAIK	2007	602	2	2	7/14/05	1.151315789	0	6	S	0.08658	0	1.3653	0	0	93	IPLT
HAIK	2007	602	2	2	7/15/05	1.184210526	22	S	1	0.0666	0.06	1.3653	0.594	0	100	IPLT

F602: Haiku Ditch

Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAIK	2007	602	2	2	7/16/05	1.217105263	24	2	1	0.09324	0.28	1.3653	0.648	0	100	
HAIK	2007	602	2	2	7/17/05	1.25	0	2	S	0.10989	0.07	1.3653	0	0	97	IPLT
HAIK	2007	602	2	2	7/18/05	1.282894737	22	S	1	0.08325	0	1.3653	0.594	0	100	I
HAIK	2007	602	2	2	7/19/05	1.315789474	24	2	1	0.10323	0	1.3653	0.648	0	100	
HAIK	2007	602	2	2	7/20/05	1.348684211	7	2	S	0.10989	0	1.3653	0.189	0	100	
HAIK	2007	602	2	2	7/21/05	1.381578947	7	2	2	0.09657	0.04	1.3653	0.189	0	100	
HAIK	2007	602	2	2	7/22/05	1.414473684	0	2	3	0.09324	0.04	1.3653	0	0	96	
HAIK	2007	602	2	2	7/23/05	1.447368421	0	2	4	0.05994	0	1.3653	0	0	91	
HAIK	2007	602	2	2	7/24/05	1.480263158	0	2	5	0.09657	0	1.3653	0	0	84	
HAIK	2007	602	2	2	7/25/05	1.513157895	0	2	6	0.09441	0	1.382438	0	0	76	AC?
HAIK	2007	602	2	2	7/26/05	1.546052632	0	2	7	0.110243	0	1.412491	0	0	67	?
HAIK	2007	602	2	2	7/27/05	1.578947368	4	2	8	0.102034	0	1.442544	0.108	0	66	?
HAIK	2007	602	2	2	7/28/05	1.611842105	4	2	9	0.046692	0.02	1.472597	0.108	0	70	?
HAIK	2007	602	2	2	7/29/05	1.644736842	0	2	10	0.09529	0.05	1.50265	0	0	66	?
HAIK	2007	602	2	2	7/30/05	1.677631579	0	2	11	0.108411	0	1.532703	0	0	57	?
HAIK	2007	602	2	2	7/31/05	1.710526316	0	2	12	0.099102	0	1.562756	0	0	50	?
HAIK	2007	602	2	2	8/1/05	1.743421053	0	2	13	0.124317	0	1.592809	0	0	41	?
HAIK	2007	602	2	2	8/2/05	1.776315789	0	2	14	0.098955	0	1.622862	0	0	34	?
HAIK	2007	602	2	2	8/3/05	1.809210526	0	2	15	0.129008	0	1.652915	0	0	26	?
HAIK	2007	602	2	2	8/4/05	1.842105263	0	2	16	0.114934	0	1.682968	0	0	18	I
HAIK	2007	602	2	2	8/5/05	1.875	22	S	16	0.116987	0	1.713021	0.594	0	46	WC
HAIK	2007	602	2	2	8/6/05	1.907894737	0	1	S	0.146036	0	1.743074	0	0	37	WC
HAIK	2007	602	2	2	8/7/05	1.940789474	0	1	2	0.148553	0	1.773127	0	0	28	WC
HAIK	2007	602	2	2	8/8/05	1.973684211	0	1	3	0.151071	0	1.80318	0	0	19	?
HAIK	2007	602	2	2	8/9/05	2.006578947	0	1	4	0.153589	0.14	1.833233	0	0	18	WC
HAIK	2007	602	2	2	8/10/05	2.039473684	0	1	5	0.156107	0	1.863286	0	0	9	WC
HAIK	2007	602	2	2	8/11/05	2.072368421	0	1	6	0.129301	0	1.893339	0	0	2	
HAIK	2007	602	2	2	8/12/05	2.105263158	0	1	7	0.112589	0	1.923392	0	0.1125888	0	WS-0
HAIK	2007	602	2	2	8/13/05	2.138157895	22	S	7	0.09529	0	1.953445	0.594	0	25	IPLT
HAIK	2007	602	2	2	8/14/05	2.171052632	24	2	7	0.140296	0	1.983498	0.648	0	50	PLT?
HAIK	2007	602	2	2	8/15/05	2.203947368	0	2	S	0.152244	0	2.013551	0	0	42	?
HAIK	2007	602	2	2	8/16/05	2.236842105	0	2	2	0.139563	0	2.043604	0	0	34	?
HAIK	2007	602	2	2	8/17/05	2.269736842	0	2	3	0.171962	0	2.073657	0	0	26	?
HAIK	2007	602	2	2	8/18/05	2.302631579	16	S	3	0.164192	0.02	2.10371	0.432	0	39	IPLT
HAIK	2007	602	2	2	8/19/05	2.335526316	24	2	3	0.140516	0	2.133763	0.648	0	62	?
HAIK	2007	602	2	2	8/20/05	2.368421053	24	3	3	0.15305	0.37	2.163816	0.648	0	100	
HAIK	2007	602	2	2	8/21/05	2.401315789	0	3	S	0.149825	0	2.193869	0	0	91	

F602: Haiku Ditch

Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAIK	2007	602	2	2	8/22/05	2.434210526	0	3	2	0.146453	0	2.223922	0	0	83	
HAIK	2007	602	2	2	8/23/05	2.467105263	0	3	3	0.137438	0	2.253975	0	0	76	IPLT
HAIK	2007	602	2	2	8/24/05	2.5	22	S	3	0.155982	0	2.284028	0.594	0	94	I
HAIK	2007	602	2	2	8/25/05	2.532894737	16	2	3	0.146747	0	2.314081	0.432	0	100	IPLT
HAIK	2007	602	2	2	8/26/05	2.565789474	24	3	3	0.142935	0	2.344134	0.648	0	100	I
HAIK	2007	602	2	2	8/27/05	2.598684211	24	4	3	0.138977	0	2.374187	0.648	0	100	
HAIK	2007	602	2	2	8/28/05	2.631578947	0	4	S	0.123144	0	2.40424	0	0	93	
HAIK	2007	602	2	2	8/29/05	2.664473684	0	4	2	0.094997	0	2.434293	0	0	88	
HAIK	2007	602	2	2	8/30/05	2.697368421	0	4	3	0.156276	0	2.464346	0	0	81	
HAIK	2007	602	2	2	8/31/05	2.730263158	0	4	4	0.176433	0	2.494399	0	0	73	PLT?
HAIK	2007	602	2	2	9/1/05	2.763157895	0	4	5	0.178559	0	2.524452	0	0	65	?
HAIK	2007	602	2	2	9/2/05	2.796052632	0	4	6	0.174454	0	2.554505	0	0	57	?
HAIK	2007	602	2	2	9/3/05	2.828947368	22	S	6	0.170203	0	2.584558	0.594	0	73	IPLT
HAIK	2007	602	2	2	9/4/05	2.861842105	24	2	6	0.191313	0	2.614611	0.648	0	89	IPLT
HAIK	2007	602	2	2	9/5/05	2.894736842	24	3	6	0.174161	0	2.644664	0.648	0	100	
HAIK	2007	602	2	2	9/6/05	2.927631579	0	3	S	0.163093	0.05	2.674717	0	0	94	
HAIK	2007	602	2	2	9/7/05	2.960526316	0	3	2	0.151731	0.03	2.70477	0	0	89	
HAIK	2007	602	2	2	9/8/05	2.993421053	0	3	3	0.180098	0.03	2.734823	0	0	82	
HAIK	2007	602	2	2	9/9/05	3.026315789	0	3	4	0.182077	0	2.764876	0	0	75	
HAIK	2007	602	2	2	9/10/05	3.059210526	0	3	5	0.19769	0	2.794929	0	0	67	?
HAIK	2007	602	2	2	9/11/05	3.092105263	22	S	5	0.199816	0	2.824982	0.594	0	80	IPLT
HAIK	2007	602	2	2	9/12/05	3.125	24	2	5	0.174088	0.01	2.855035	0.648	0	96	
HAIK	2007	602	2	2	9/13/05	3.157894737	0	2	S	0.15481	0	2.885088	0	0	90	
HAIK	2007	602	2	2	9/14/05	3.190789474	0	2	2	0.135092	0.04	2.915141	0	0	86	
HAIK	2007	602	2	2	9/15/05	3.223684211	0	S	2	0.122118	1.4	2.945194	0	0	100	IPLT
HAIK	2007	602	2	2	9/16/05	3.256578947	22	2	2	0.116107	0.05	2.975247	0.594	0	100	I
HAIK	2007	602	2	2	9/17/05	3.289473684	24	3	2	0.18325	0	3.0053	0.648	0	100	
HAIK	2007	602	2	2	9/18/05	3.322368421	24	4	2	0.155469	0	3.035353	0.648	0	100	I
HAIK	2007	602	2	2	9/19/05	3.355263158	24	5	2	0.179438	0	3.065406	0.648	0	100	
HAIK	2007	602	2	2	9/20/05	3.388157895	0	5	S	0.181198	0	3.095459	0	0	93	
HAIK	2007	602	2	2	9/21/05	3.421052632	0	5	2	0.175334	0	3.125512	0	0	86	
HAIK	2007	602	2	2	9/22/05	3.453947368	0	5	3	0.130841	0	3.155565	0	0	81	
HAIK	2007	602	2	2	9/23/05	3.486842105	16	S	3	0.124317	0	3.185618	0.432	0	90	
HAIK	2007	602	2	2	9/24/05	3.519736842	7	1	S	0.164705	0	3.215671	0.189	0	90	
HAIK	2007	602	2	2	9/25/05	3.552631579	0	1	2	0.182077	0	3.245724	0	0	84	
HAIK	2007	602	2	2	9/26/05	3.585526316	0	1	3	0.191753	0	3.275777	0	0	77	IPLT
HAIK	2007	602	2	2	9/27/05	3.618421053	22	S	3	0.201575	0	3.30583	0.594	0	88	IPLT

F602: Haiku Ditch

Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAIK	2007	602	2	2	9/28/05	3.651315789	24	2	3	0.203408	0.01	3.335883	0.648	0	100	IPLT
HAIK	2007	602	2	2	9/29/05	3.684210526	24	3	3	0.164192	0	3.365936	0.648	0	100	
HAIK	2007	602	2	2	9/30/05	3.717105263	0	4	3	0.140809	0.3	3.395989	0	0	100	
HAIK	2007	602	2	2	10/1/05	3.75	0	5	3	0.133699	0.23	3.426042	0	0	100	
HAIK	2007	602	2	2	10/2/05	3.782894737	0	5	S	0.160161	0	3.456095	0	0	94	
HAIK	2007	602	2	2	10/3/05	3.815789474	0	5	2	0.119039	0	3.486148	0	0	90	
HAIK	2007	602	2	2	10/4/05	3.848684211	0	5	3	0.188674	0	3.516201	0	0	84	
HAIK	2007	602	2	2	10/5/05	3.881578947	0	5	4	0.190287	0.01	3.546254	0	0	78	I
HAIK	2007	602	2	2	10/6/05	3.914473684	22	S	4	0.139563	0.04	3.576307	0.594	0	91	I
HAIK	2007	602	2	2	10/7/05	3.947368421	0	1	S	0.140736	0.12	3.60636	0	0	90	
HAIK	2007	602	2	2	10/8/05	3.980263158	24	S	1	0.224039	0	3.636413	0.648	0	100	
HAIK	2007	602	2	2	10/9/05	4.013157895	0	1	S	0.22589	0.09	3.666466	0	0	95	
HAIK	2007	602	2	2	10/10/05	4.046052632	0	1	2	0.227742	0.02	3.696519	0	0	89	
HAIK	2007	602	2	2	10/11/05	4.078947368	0	1	3	0.229593	0.01	3.726572	0	0	82	IF
HAIK	2007	602	2	2	10/12/05	4.111842105	7	1	4	0.231445	0.07	3.756625	0.189	0	82	
HAIK	2007	602	2	2	10/13/05	4.144736842	0	1	5	0.233296	0.09	3.786678	0	0	78	
HAIK	2007	602	2	2	10/14/05	4.177631579	0	1	6	0.235148	0	3.816731	0	0	71	IPLT
HAIK	2007	602	2	2	10/15/05	4.210526316	24	S	6	0.236999	0	3.846784	0.648	0	81	
HAIK	2007	602	2	2	10/16/05	4.243421053	24	2	6	0.238851	0	3.876837	0.648	0	91	
HAIK	2007	602	2	2	10/17/05	4.276315789	0	2	S	0.240703	0	3.90689	0	0	84	
HAIK	2007	602	2	2	10/18/05	4.309210526	0	2	2	0.242554	0	3.936943	0	0	77	
HAIK	2007	602	2	2	10/19/05	4.342105263	0	2	3	0.244406	0	3.966996	0	0	70	?
HAIK	2007	602	2	2	10/20/05	4.375	0	2	4	0.246257	0	3.997049	0	0	64	?
HAIK	2007	602	2	2	10/21/05	4.407894737	0	2	5	0.248109	0	4.027102	0	0	57	?
HAIK	2007	602	2	2	10/22/05	4.440789474	0	2	6	0.24996	0.08	4.057155	0	0	53	?
HAIK	2007	602	2	2	10/23/05	4.473684211	22	S	6	0.251812	0.61	4.087208	0.594	0	75	?
HAIK	2007	602	2	2	10/24/05	4.506578947	24	2	6	0.2526	0.1	4.1	0.648	0	87	AC
HAIK	2007	602	2	2	10/25/05	4.539473684	24	3	6	0.2526	0	4.1	0.648	0	97	I
HAIK	2007	602	2	2	10/26/05	4.572368421	24	4	6	0.2526	0	4.1	0.648	0	100	
HAIK	2007	602	2	2	10/27/05	4.605263158	0	4	S	0.2526	0	4.1	0	0	93	WC
HAIK	2007	602	2	2	10/28/05	4.638157895	22	S	1	0.2526	0.1	4.1	0.594	0	100	I
HAIK	2007	602	2	2	10/29/05	4.671052632	24	2	1	0.2526	0	4.1	0.648	0	100	
HAIK	2007	602	2	2	10/30/05	4.703947368	24	3	1	0.2526	0.01	4.1	0.648	0	100	I
HAIK	2007	602	2	2	10/31/05	4.736842105	24	4	1	0.2526	0	4.1	0.648	0	100	
HAIK	2007	602	2	2	11/1/05	4.769736842	0	4	S	0.172397	0.05	3.257266	0	0	100	
HAIK	2007	602	2	2	11/2/05	4.802631579	0	4	2	0.173586	0.06	3.279729	0	0	95	SCI
HAIK	2007	602	2	2	11/3/05	4.835526316	0	4	3	0.174775	0	3.302193	0	0	89	I

F602: Haiku Ditch

Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAIK	2007	602	2	2	11/4/05	4.868421053	22	S	3	0.175964	0	3.324657	0.594	0	100	I
HAIK	2007	602	2	2	11/5/05	4.901315789	0	1	S	0.177153	0	3.347121	0	0	94	
HAIK	2007	602	2	2	11/6/05	4.934210526	22	S	1	0.178341	0	3.369585	0.594	0	100	I
HAIK	2007	602	2	2	11/7/05	4.967105263	24	2	1	0.17953	0	3.392049	0.648	0	100	I
HAIK	2007	602	2	2	11/8/05	5	24	3	1	0.180719	0.17	3.414513	0.648	0	100	I
HAIK	2007	602	2	2	11/9/05	5.032894737	24	4	1	0.181908	0.06	3.436977	0.648	0	100	I
HAIK	2007	602	2	2	11/10/05	5.065789474	7	4	S	0.183097	0	3.459441	0.189	0	99	
HAIK	2007	602	2	2	11/11/05	5.098684211	0	4	2	0.184286	0	3.481905	0	0	93	
HAIK	2007	602	2	2	11/12/05	5.131578947	0	4	3	0.185475	0	3.504368	0	0	87	
HAIK	2007	602	2	2	11/13/05	5.164473684	0	4	4	0.12903	0	3.526832	0	0	83	
HAIK	2007	602	2	2	11/14/05	5.197368421	0	4	5	0.112539	0	3.549296	0	0	79	I
HAIK	2007	602	2	2	11/15/05	5.230263158	22	S	5	0.174232	0.04	3.57176	0.594	0	92	I
HAIK	2007	602	2	2	11/16/05	5.263157895	24	2	5	0.192861	0	3.594224	0.648	0	100	
HAIK	2007	602	2	2	11/17/05	5.296052632	0	2	S	0.167603	0	3.616688	0	0	94	
HAIK	2007	602	2	2	11/18/05	5.328947368	0	2	2	0.142016	0	3.639152	0	0	90	IF
HAIK	2007	602	2	2	11/19/05	5.361842105	0	2	3	0.142892	0	3.661616	0	0	85	
HAIK	2007	602	2	2	11/20/05	5.394736842	0	2	4	0.143769	0	3.68408	0	0	81	
HAIK	2007	602	2	2	11/21/05	5.427631579	0	2	5	0.108484	0	3.706544	0	0	77	
HAIK	2007	602	2	2	11/22/05	5.460526316	0	2	6	0.100047	0	3.729007	0	0	74	
HAIK	2007	602	2	2	11/23/05	5.493421053	0	2	7	0.082349	0	3.751471	0	0	72	
HAIK	2007	602	2	2	11/24/05	5.526315789	0	S	7	0.082842	0.65	3.773935	0	0	86	
HAIK	2007	602	2	2	11/25/05	5.559210526	0	1	S	0.200931	0	3.796399	0	0	80	
HAIK	2007	602	2	2	11/26/05	5.592105263	0	1	2	0.1304	0	3.818863	0	0	77	
HAIK	2007	602	2	2	11/27/05	5.625	0	1	3	0.037476	0.08	3.841327	0	0	77	
HAIK	2007	602	2	2	11/28/05	5.657894737	0	S	3	0.113087	1.2	3.863791	0	0	100	
HAIK	2007	602	2	2	11/29/05	5.690789474	0	1	S	0.113744	0	3.886255	0	0	96	
HAIK	2007	602	2	2	11/30/05	5.723684211	0	1	2	0.133468	0	3.908719	0	0	92	
HAIK	2007	602	2	2	12/1/05	5.756578947	0	1	3	0.115059	0	3.931183	0	0	89	
HAIK	2007	602	2	2	12/2/05	5.789473684	0	1	4	0.12536	0	3.953646	0	0	85	
HAIK	2007	602	2	2	12/3/05	5.822368421	0	1	5	0.126072	0	3.97611	0	0	81	
HAIK	2007	602	2	2	12/4/05	5.855263158	0	1	6	0.087774	0	3.998574	0	0	79	
HAIK	2007	602	2	2	12/5/05	5.888157895	0	1	7	0.147111	0.13	4.021038	0	0	78	
HAIK	2007	602	2	2	12/6/05	5.921052632	16	S	7	0.157795	0	4.043502	0.432	0	84	
HAIK	2007	602	2	2	12/7/05	5.953947368	0	1	S	0.148755	0	4.065966	0	0	80	I
HAIK	2007	602	2	2	12/8/05	5.986842105	22	S	1	0.16952	0.1	4.08843	0.594	0	92	I
HAIK	2007	602	2	2	12/9/05	6.019736842	0	1	S	0.18	0	4.1	0	0	88	
HAIK	2007	602	2	2	12/10/05	6.052631579	0	1	2	0.18	0.11	4.1	0	0	86	

F602: Haiku Ditch

Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAIK	2007	602	2	2	12/11/05	6.085526316	0	1	3	0.17	0.04	4.1	0	0	83	
HAIK	2007	602	2	2	12/12/05	6.118421053	0	1	4	0.17	0.07	4.1	0	0	80	
HAIK	2007	602	2	2	12/13/05	6.151315789	0	1	5	0.2	0	4.1	0	0	75	
HAIK	2007	602	2	2	12/14/05	6.184210526	0	1	6	0.19	0	4.1	0	0	71	
HAIK	2007	602	2	2	12/15/05	6.217105263	0	1	7	0.14	0	4.1	0	0	67	I
HAIK	2007	602	2	2	12/16/05	6.25	24	S	7	0.14	0	4.1	0.648	0	80	IF
HAIK	2007	602	2	2	12/17/05	6.282894737	7	1	S	0.1668	0	4.1	0.189	0	80	
HAIK	2007	602	2	2	12/18/05	6.315789474	0	1	2	0.1668	0	4.1	0	0	76	
HAIK	2007	602	2	2	12/19/05	6.348684211	0	1	3	0.1668	0	4.1	0	0	72	
HAIK	2007	602	2	2	12/20/05	6.381578947	0	1	4	0.1668	0	4.1	0	0	68	
HAIK	2007	602	2	2	12/21/05	6.414473684	0	1	5	0.1668	0	4.1	0	0	64	
HAIK	2007	602	2	2	12/22/05	6.447368421	0	1	6	0.1668	0	4.1	0	0	60	
HAIK	2007	602	2	2	12/23/05	6.480263158	0	1	7	0.1668	0	4.1	0	0	56	?
HAIK	2007	602	2	2	12/24/05	6.513157895	0	1	8	0.1668	0	4.1	0	0	52	?
HAIK	2007	602	2	2	12/25/05	6.546052632	6	1	9	0.1668	0	4.1	0.162	0	52	?
HAIK	2007	602	2	2	12/26/05	6.578947368	0	1	10	0.1668	0	4.1	0	0	48	?
HAIK	2007	602	2	2	12/27/05	6.611842105	0	1	11	0.1668	0	4.1	0	0	44	?
HAIK	2007	602	2	2	12/28/05	6.644736842	0	1	12	0.1668	0	4.1	0	0	40	?
HAIK	2007	602	2	2	12/29/05	6.677631579	0	1	13	0.1668	0	4.1	0	0	35	?
HAIK	2007	602	2	2	12/30/05	6.710526316	0	1	14	0.1668	0	4.1	0	0	31	?
HAIK	2007	602	2	2	12/31/05	6.743421053	0	1	15	0.1668	0	4.1	0	0	27	?
HAIK	2007	602	2	2	1/1/06	6.776315789	0	1	16	0.17	0	4.1	0	0	23	?
HAIK	2007	602	2	2	1/2/06	6.809210526	0	1	17	0.1755	0.03	4.1	0	0	20	?
HAIK	2007	602	2	2	1/3/06	6.842105263	0	1	18	0.1755	0	4.1	0	0	15	?
HAIK	2007	602	2	2	1/4/06	6.875	0	1	19	0.1755	0	4.1	0	0	11	?
HAIK	2007	602	2	2	1/5/06	6.907894737	0	1	20	0.1755	0	4.1	0	0	7	
HAIK	2007	602	2	2	1/6/06	6.940789474	0	1	21	0.1755	0.06	4.1	0	0	4	
HAIK	2007	602	2	2	1/7/06	6.973684211	0	1	22	0.1755	0	4.1	0	0.1755	0	WS-0
HAIK	2007	602	2	2	1/8/06	7.006578947	0	1	23	0.19	0	4.1	0	0.19	0	WS-1
HAIK	2007	602	2	2	1/9/06	7.039473684	0	1	24	0.19	0.02	4.1	0	0.19	0	WS-2
HAIK	2007	602	2	2	1/10/06	7.072368421	0	1	25	0.23	0.07	4.1	0	0.23	0	WS-3
HAIK	2007	602	2	2	1/11/06	7.105263158	0	1	26	0.23	0	4.1	0	0.23	0	I
HAIK	2007	602	2	2	1/12/06	7.138157895	22	S	26	0.1755	0.3	4.1	0.594	0	17	?
HAIK	2007	602	2	2	1/13/06	7.171052632	24	2	26	0.1755	0	4.1	0.648	0	29	?
HAIK	2007	602	2	2	1/14/06	7.203947368	24	3	26	0.1755	0	4.1	0.648	0	40	?
HAIK	2007	602	2	2	1/15/06	7.236842105	24	4	26	0.1755	0	4.1	0.648	0	52	
HAIK	2007	602	2	2	1/16/06	7.269736842	24	5	26	0.1755	0	4.1	0.648	0	63	

F602: Haiku Ditch
Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAIK	2007	602	2	2	1/17/06	7.302631579	12	6	26	0.1755	0.15	4.1	0.324	0	70	
HAIK	2007	602	2	2	1/18/06	7.335526316	24	7	26	0.1755	0	4.1	0.648	0	82	
HAIK	2007	602	2	2	1/19/06	7.368421053	0	7	S	0.1755	0	4.1	0	0	78	
HAIK	2007	602	2	2	1/20/06	7.401315789	0	7	2	0.1755	0	4.1	0	0	73	
HAIK	2007	602	2	2	1/21/06	7.434210526	0	7	3	0.1755	0	4.1	0	0	69	
HAIK	2007	602	2	2	1/22/06	7.467105263	0	7	4	0.1755	0	4.1	0	0	65	
HAIK	2007	602	2	2	1/23/06	7.5	0	7	5	0.1755	0	4.1	0	0	61	
HAIK	2007	602	2	2	1/24/06	7.532894737	0	7	6	0.1755	0	4.1	0	0	56	I
HAIK	2007	602	2	2	1/25/06	7.565789474	22	S	6	0.1755	0.48	4.1	0.594	0	78	I
HAIK	2007	602	2	2	1/26/06	7.598684211	24	2	6	0.1755	0.04	4.1	0.648	0	91	
HAIK	2007	602	2	2	1/27/06	7.631578947	0	2	S	0.1755	0.15	4.1	0	0	90	
HAIK	2007	602	2	2	1/28/06	7.664473684	0	2	2	0.1755	0	4.1	0	0	86	
HAIK	2007	602	2	2	1/29/06	7.697368421	0	2	3	0.1755	0	4.1	0	0	81	
HAIK	2007	602	2	2	1/30/06	7.730263158	0	2	4	0.1755	0	4.1	0	0	77	
HAIK	2007	602	2	2	1/31/06	7.763157895	0	2	5	0.1755	0	4.1	0	0	73	
HAIK	2007	602	2	2	2/1/06	7.796052632	0	2	6	0.1793	0	4.1	0	0	69	
HAIK	2007	602	2	2	2/2/06	7.828947368	22	S	6	0.1793	0	4.1	0.594	0	79	I
HAIK	2007	602	2	2	2/3/06	7.861842105	24	2	6	0.1793	0.2	4.1	0.648	0	95	I
HAIK	2007	602	2	2	2/4/06	7.894736842	24	3	6	0.1793	0	4.1	0.648	0	100	
HAIK	2007	602	2	2	2/5/06	7.927631579	0	3	S	0.1793	0	4.1	0	0	95	
HAIK	2007	602	2	2	2/6/06	7.960526316	0	3	2	0.1793	0	4.1	0	0	91	
HAIK	2007	602	2	2	2/7/06	7.993421053	0	3	3	0.1793	0	4.1	0	0	86	
HAIK	2007	602	2	2	2/8/06	8.026315789	0	3	4	0.1793	0	4.1	0	0	82	
HAIK	2007	602	2	2	2/9/06	8.059210526	0	3	5	0.1793	0	4.1	0	0	78	
HAIK	2007	602	2	2	2/10/06	8.092105263	0	3	6	0.1793	0	4.1	0	0	73	
HAIK	2007	602	2	2	2/11/06	8.125	0	3	7	0.1793	0	4.1	0	0	69	
HAIK	2007	602	2	2	2/12/06	8.157894737	0	3	8	0.1793	0	4.1	0	0	65	
HAIK	2007	602	2	2	2/13/06	8.190789474	0	3	9	0.1793	0	4.1	0	0	60	I
HAIK	2007	602	2	2	2/14/06	8.223684211	22	S	9	0.1793	0.12	4.1	0.594	0	73	I
HAIK	2007	602	2	2	2/15/06	8.256578947	24	2	9	0.1793	0.1	4.1	0.648	0	87	IF
HAIK	2007	602	2	2	2/16/06	8.289473684	7	2	S	0.1793	0	4.1	0.189	0	87	
HAIK	2007	602	2	2	2/17/06	8.322368421	0	2	2	0.1793	0	4.1	0	0	83	
HAIK	2007	602	2	2	2/18/06	8.355263158	0	2	3	0.1793	0	4.1	0	0	79	
HAIK	2007	602	2	2	2/19/06	8.388157895	0	2	4	0.1793	0	4.1	0	0	74	
HAIK	2007	602	2	2	2/20/06	8.421052632	22	S	4	0.1793	0.44	4.1	0.594	0	95	I
HAIK	2007	602	2	2	2/21/06	8.453947368	24	2	4	0.1793	0.01	4.1	0.648	0	100	I
HAIK	2007	602	2	2	2/22/06	8.486842105	24	3	4	0.09	0.1	4.1	0.648	0	100	

F602: Haiku Ditch
Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAIK	2007	602	2	2	2/23/06	8.519736842	0	3	S	0.18	0	4.1	0	0	95	
HAIK	2007	602	2	2	2/24/06	8.552631579	0	3	2	0.16	0	4.1	0	0	91	
HAIK	2007	602	2	2	2/25/06	8.585526316	16	S	2	0.17	0	4.1	0.432	0	98	
HAIK	2007	602	2	2	2/26/06	8.618421053	24	2	2	0.1	0	4.1	0.648	0	100	
HAIK	2007	602	2	2	2/27/06	8.651315789	24	3	2	0.21	0.18	4.1	0.648	0	100	IF
HAIK	2007	602	2	2	2/28/06	8.684210526	0	3	S	0.17	0	4.1	0	0	95	
HAIK	2007	602	2	2	3/1/06	8.717105263	0	3	2	0.13	0	4.1	0	0	92	
HAIK	2007	602	2	2	3/2/06	8.75	0	3	3	0.17	0	4.1	0	0	88	
HAIK	2007	602	2	2	3/3/06	8.782894737	16	S	3	0.2	0	4.1	0.432	0	94	I
HAIK	2007	602	2	2	3/4/06	8.815789474	24	2	3	0.2	0	4.1	0.648	0	100	I
HAIK	2007	602	2	2	3/5/06	8.848684211	24	3	3	0.22	0	4.1	0.648	0	100	
HAIK	2007	602	2	2	3/6/06	8.881578947	24	4	3	0.26	0	4.1	0.648	0	100	I
HAIK	2007	602	2	2	3/7/06	8.914473684	7	4	S	0.19	0	4.1	0.189	0	99	
HAIK	2007	602	2	2	3/8/06	8.947368421	0	4	2	0.19	0	4.1	0	0	95	
HAIK	2007	602	2	2	3/9/06	8.980263158	0	4	3	0.14	0	4.1	0	0	91	
HAIK	2007	602	2	2	3/10/06	9.013157895	0	4	4	0.18	0	4.1	0	0	87	I
HAIK	2007	602	2	2	3/11/06	9.046052632	22	S	4	0.24	0	4.1	0.594	0	96	I
HAIK	2007	602	2	2	3/12/06	9.078947368	24	2	4	0.21	0	4.1	0.648	0	100	I
HAIK	2007	602	2	2	3/13/06	9.111842105	24	3	4	0.16	0	4.1	0.648	0	100	I
HAIK	2007	602	2	2	3/14/06	9.144736842	7	3	S	0.12	0	4.1	0.189	0	100	
HAIK	2007	602	2	2	3/15/06	9.177631579	0	3	2	0.07	0	4.1	0	0	98	
HAIK	2007	602	2	2	3/16/06	9.210526316	0	3	3	0.12	0.03	4.1	0	0	96	
HAIK	2007	602	2	2	3/17/06	9.243421053	0	3	4	0.17	0	4.1	0	0	91	
HAIK	2007	602	2	2	3/18/06	9.276315789	16	S	4	0.17	0	4.1	0.432	0	98	I
HAIK	2007	602	2	2	3/19/06	9.309210526	24	2	4	0.07	0.35	4.1	0.648	0	100	I
HAIK	2007	602	2	2	3/20/06	9.342105263	24	3	4	0.19	0.7	4.1	0.648	0	100	
HAIK	2007	602	2	2	3/21/06	9.375	0	3	S	0.13	0	4.1	0	0	96	
HAIK	2007	602	2	2	3/22/06	9.407894737	0	3	2	0.11	0	4.1	0	0	94	
HAIK	2007	602	2	2	3/23/06	9.440789474	0	3	3	0.19	0	4.1	0	0	89	
HAIK	2007	602	2	2	3/24/06	9.473684211	0	S	3	0.21	1.62	4.1	0	0	100	
HAIK	2007	602	2	2	3/25/06	9.506578947	0	1	S	0.11	0	4.1	0	0	97	
HAIK	2007	602	2	2	3/26/06	9.539473684	0	1	2	0.08	0.06	4.1	0	0	96	
HAIK	2007	602	2	2	3/27/06	9.572368421	0	S	2	0.08	0.88	4.1	0	0	100	
HAIK	2007	602	2	2	3/28/06	9.605263158	0	2	2	0.09	0.26	4.1	0	0	100	
HAIK	2007	602	2	2	3/29/06	9.638157895	0	3	2	0.08	1.35	4.1	0	0	100	
HAIK	2007	602	2	2	3/30/06	9.671052632	0	4	2	0.15	1.9	4.1	0	0	100	
HAIK	2007	602	2	2	3/31/06	9.703947368	0	4	S	0.12	0.02	4.1	0	0	97	

F602: Haiku Ditch
Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAIK	2007	602	2	2	4/1/06	9.736842105	0	4	2	0.15	0.1	4.1	0	0	96	
HAIK	2007	602	2	2	4/2/06	9.769736842	0	4	3	0.18	0.05	4.1	0	0	93	SC
HAIK	2007	602	2	2	4/3/06	9.802631579	0	4	4	0.24	0	4.1	0	0	87	
HAIK	2007	602	2	2	4/4/06	9.835526316	0	4	5	0.26	0	4.1	0	0	80	
HAIK	2007	602	2	2	4/5/06	9.868421053	0	4	6	0.27	0	4.1	0	0	74	?
HAIK	2007	602	2	2	4/6/06	9.901315789	0	4	7	0.18	0	4.1	0	0	70	?
HAIK	2007	602	2	2	4/7/06	9.934210526	22	S	7	0.27	0.15	4.1	0.594	0	81	I
HAIK	2007	602	2	2	4/8/06	9.967105263	24	2	7	0.23	0	4.1	0.648	0	91	I
HAIK	2007	602	2	2	4/9/06	10	24	3	7	0.21	0.06	4.1	0.648	0	100	I
HAIK	2007	602	2	2	4/10/06	10.03289474	7	3	S	0.21	0	4.1	0.189	0	99	
HAIK	2007	602	2	2	4/11/06	10.06578947	0	3	2	0.23	0.05	4.1	0	0	95	
HAIK	2007	602	2	2	4/12/06	10.09868421	0	3	3	0.14	0.18	4.1	0	0	96	
HAIK	2007	602	2	2	4/13/06	10.13157895	0	S	3	0.29	0.24	4.1	0	0	94	
HAIK	2007	602	2	2	4/14/06	10.16447368	0	1	S	0.32	0.02	4.1	0	0	87	
HAIK	2007	602	2	2	4/15/06	10.19736842	22	S	1	0.25	0.02	4.1	0.594	0	96	I
HAIK	2007	602	2	2	4/16/06	10.23026316	24	2	1	0.25	0	4.1	0.648	0	100	
HAIK	2007	602	2	2	4/17/06	10.26315789	24	3	1	0.28	0	4.1	0.648	0	100	
HAIK	2007	602	2	2	4/18/06	10.29605263	0	3	S	0.25	0.04	4.1	0	0	94	
HAIK	2007	602	2	2	4/19/06	10.32894737	0	3	2	0.26	0.08	4.1	0	0	90	
HAIK	2007	602	2	2	4/20/06	10.36184211	22	S	2	0.24	0	4.1	0.594	0	99	I
HAIK	2007	602	2	2	4/21/06	10.39473684	24	2	2	0.22	0.02	4.1	0.648	0	100	I
HAIK	2007	602	2	2	4/22/06	10.42763158	24	3	2	0.21	0	4.1	0.648	0	100	
HAIK	2007	602	2	2	4/23/06	10.46052632	0	3	S	0.27	0.06	4.1	0	0	94	
HAIK	2007	602	2	2	4/24/06	10.49342105	0	3	2	0.24	0	4.1	0	0	89	
HAIK	2007	602	2	2	4/25/06	10.52631579	16	S	2	0.19	0	4.1	0.432	0	94	I
HAIK	2007	602	2	2	4/26/06	10.55921053	24	2	2	0.24	0	4.1	0.648	0	100	I
HAIK	2007	602	2	2	4/27/06	10.59210526	24	3	2	0.25	0	4.1	0.648	0	100	I
HAIK	2007	602	2	2	4/28/06	10.625	7	3	S	0.24	0	4.1	0.189	0	98	
HAIK	2007	602	2	2	4/29/06	10.65789474	0	3	2	0.17	0	4.1	0	0	94	
HAIK	2007	602	2	2	4/30/06	10.69078947	0	3	3	0.19	0	4.1	0	0	89	
HAIK	2007	602	2	2	5/1/06	10.72368421	0	3	4	0.24	0.05	4.1	0	0	85	
HAIK	2007	602	2	2	5/2/06	10.75657895	0	3	5	0.23	0	4.1	0	0	79	I
HAIK	2007	602	2	2	5/3/06	10.78947368	22	S	5	0.26	0	4.1	0.594	0	87	I
HAIK	2007	602	2	2	5/4/06	10.82236842	24	2	5	0.21	0.66	4.1	0.648	0	100	?
HAIK	2007	602	2	2	5/5/06	10.85526316	0	3	5	0.16	0.66	4.1	0	0	100	?
HAIK	2007	602	2	2	5/6/06	10.88815789	0	4	5	0.1	0.28	4.1	0	0	100	
HAIK	2007	602	2	2	5/7/06	10.92105263	0	4	S	0.21	0.14	4.1	0	0	98	

F602: Haiku Ditch
Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAIK	2007	602	2	2	5/8/06	10.95394737	0	4	2	0.27	0.04	4.1	0	0	92	I
HAIK	2007	602	2	2	5/9/06	10.98684211	22	S	2	0.31	0	4.1	0.594	0	99	I
HAIK	2007	602	2	2	5/10/06	11.01973684	24	2	2	0.31	0	4.1	0.648	0	100	
HAIK	2007	602	2	2	5/11/06	11.05263158	24	3	2	0.31	0	4.1	0.648	0	100	I
HAIK	2007	602	2	2	5/12/06	11.08552632	24	4	2	0.3032	0	4.1	0.648	0	100	I
HAIK	2007	602	2	2	5/13/06	11.11842105	24	5	2	0.3032	0	4.1	0.648	0	100	
HAIK	2007	602	2	2	5/14/06	11.15131579	24	6	2	0.3032	0.02	4.1	0.648	0	100	
HAIK	2007	602	2	2	5/15/06	11.18421053	0	6	S	0.3032	0.18	4.1	0	0	96	
HAIK	2007	602	2	2	5/16/06	11.21710526	0	6	2	0.3032	0	4.1	0	0	89	
HAIK	2007	602	2	2	5/17/06	11.25	16	S	2	0.3032	0	4.1	0.432	0	92	I
HAIK	2007	602	2	2	5/18/06	11.28289474	24	2	2	0.3032	0.16	4.1	0.648	0	100	I
HAIK	2007	602	2	2	5/19/06	11.31578947	24	3	2	0.3032	0	4.1	0.648	0	100	I
HAIK	2007	602	2	2	5/20/06	11.34868421	24	4	2	0.3032	0.02	4.1	0.648	0	100	
HAIK	2007	602	2	2	5/21/06	11.38157895	0	4	S	0.3032	0.08	4.1	0	0	94	
HAIK	2007	602	2	2	5/22/06	11.41447368	0	4	2	0.3032	0	4.1	0	0	87	
HAIK	2007	602	2	2	5/23/06	11.44736842	0	4	3	0.3032	0	4.1	0	0	79	
HAIK	2007	602	2	2	5/24/06	11.48026316	0	4	4	0.3032	0	4.1	0	0	72	I
HAIK	2007	602	2	2	5/25/06	11.51315789	22	S	4	0.3032	0	4.1	0.594	0	79	
HAIK	2007	602	2	2	5/26/06	11.54605263	24	2	4	0.3032	0	4.1	0.648	0	87	
HAIK	2007	602	2	2	5/27/06	11.57894737	0	2	S	0.3032	0	4.1	0	0	80	
HAIK	2007	602	2	2	5/28/06	11.61184211	0	2	2	0.3032	0	4.1	0	0	73	
HAIK	2007	602	2	2	5/29/06	11.64473684	0	2	3	0.3032	0	4.1	0	0	65	?
HAIK	2007	602	2	2	5/30/06	11.67763158	0	2	4	0.3032	0	4.1	0	0	58	?
HAIK	2007	602	2	2	5/31/06	11.71052632	0	2	5	0.3032	0	4.1	0	0	50	?
HAIK	2007	602	2	2	6/1/06	11.74342105	0	2	6	0.3557	0	4.1	0	0	42	?
HAIK	2007	602	2	2	6/2/06	11.77631579	0	2	7	0.3557	0	4.1	0	0	33	?
HAIK	2007	602	2	2	6/3/06	11.80921053	22	S	7	0.3557	0	4.1	0.594	0	39	I
HAIK	2007	602	2	2	6/4/06	11.84210526	24	2	7	0.3557	0	4.1	0.648	0	46	I
HAIK	2007	602	2	2	6/5/06	11.875	24	3	7	0.3557	0	4.1	0.648	0	53	?
HAIK	2007	602	2	2	6/6/06	11.90789474	0	3	S	0.3557	0	4.1	0	0	44	?
HAIK	2007	602	2	2	6/7/06	11.94078947	0	3	2	0.3557	0	4.1	0	0	36	?
HAIK	2007	602	2	2	6/8/06	11.97368421	0	3	3	0.26	0	4.1	0	0	29	?
HAIK	2007	602	2	2	6/9/06	12.00657895	0	3	4	0.3	0	4.1	0	0	22	?
HAIK	2007	602	2	2	6/10/06	12.03947368	0	3	5	0.3	0	4.1	0	0	15	?
HAIK	2007	602	2	2	6/11/06	12.07236842	0	3	6	0.3557	0	4.1	0	0	6	?
HAIK	2007	602	2	2	6/12/06	12.10526316	0	3	7	0.3557	0	4.1	0	0.3557	0	I
HAIK	2007	602	2	2	6/13/06	12.13815789	22	S	7	0.34	0	4.1	0.594	0	6	I

F602: Haiku Ditch
Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAIK	2007	602	2	2	6/14/06	12.17105263	24	2	7	0.31	0	4.1	0.648	0	14	I
HAIK	2007	602	2	2	6/15/06	12.20394737	24	3	7	0.31	0	4.1	0.648	0	22	I
HAIK	2007	602	2	2	6/16/06	12.23684211	24	4	7	0.3557	0.08	4.1	0.648	0	31	?
HAIK	2007	602	2	2	6/17/06	12.26973684	0	4	S	0.3557	0	4.1	0	0	23	?
HAIK	2007	602	2	2	6/18/06	12.30263158	0	4	2	0.3557	0	4.1	0	0	14	?
HAIK	2007	602	2	2	6/19/06	12.33552632	0	4	3	0.36	0	4.1	0	0	5	?
HAIK	2007	602	2	2	6/20/06	12.36842105	0	4	4	0.34	0	4.1	0	0.34	0	I
HAIK	2007	602	2	2	6/21/06	12.40131579	22	S	4	0.34	0	4.1	0.594	0	6	I
HAIK	2007	602	2	2	6/22/06	12.43421053	22	2	4	0.3557	0	4.1	0.594	0	12	I
HAIK	2007	602	2	2	6/23/06	12.46710526	24	3	4	0.3557	0	4.1	0.648	0	19	I
HAIK	2007	602	2	2	6/24/06	12.5	24	4	4	0.27	0	4.1	0.648	0	28	I
HAIK	2007	602	2	2	6/25/06	12.53289474	0	4	S	0.16	0	4.1	0	0	24	?
HAIK	2007	602	2	2	6/26/06	12.56578947	0	4	2	0.26	0	4.1	0	0	18	I
HAIK	2007	602	2	2	6/27/06	12.59868421	20	S	2	0.26	0	4.1	0.54	0	24	?
HAIK	2007	602	2	2	6/28/06	12.63157895	0	1	S	0.36	0	4.1	0	0	16	?
HAIK	2007	602	2	2	6/29/06	12.66447368	7	1	2	0.34	0	4.1	0.189	0	12	?
HAIK	2007	602	2	2	6/30/06	12.69736842	0	1	3	0.34	0	4.1	0	0	4	?
HAIK	2007	602	2	2	7/1/06	12.73026316	24	S	3	0.3503	0	4.1	0.648	0	11	I
HAIK	2007	602	2	2	7/2/06	12.76315789	0	1	S	0.3503	0	4.1	0	0	2	?
HAIK	2007	602	2	2	7/3/06	12.79605263	0	1	2	0.36	0	4.1	0	0.36	0	WS-0
HAIK	2007	602	2	2	7/4/06	12.82894737	0	1	3	0.36	0	4.1	0	0.36	0	WS-1
HAIK	2007	602	2	2	7/5/06	12.86184211	0	1	4	0.3503	0	4.1	0	0.3503	0	WS-2
HAIK	2007	602	2	2	7/6/06	12.89473684	0	1	5	0.3503	0	4.1	0	0.3503	0	WS-3
HAIK	2007	602	2	2	7/7/06	12.92763158	0	1	6	0.32	0	4.1	0	0.32	0	WS-4
HAIK	2007	602	2	2	7/8/06	12.96052632	0	1	7	0.32	0	4.1	0	0.32	0	WS-5
HAIK	2007	602	2	2	7/9/06	12.99342105	22	S	7	0.3503	0	4.1	0.594	0	5	?
HAIK	2007	602	2	2	7/10/06	13.02631579	0	1	S	0.3503	0.05	4.1	0	0.3503	0	I
HAIK	2007	602	2	2	7/11/06	13.05921053	16	S	1	0.31	0.05	4.1	0.432	0	4	I
HAIK	2007	602	2	2	7/12/06	13.09210526	0	1	S	0.31	0.02	4.1	0	0.31	0	WS-0
HAIK	2007	602	2	2	7/13/06	13.125	0	1	2	0.3503	0.02	4.1	0	0.3503	0	WS-1
HAIK	2007	602	2	2	7/14/06	13.15789474	0	1	3	0.3503	0	4.1	0	0.3503	0	WS-2
HAIK	2007	602	2	2	7/15/06	13.19078947	22	S	3	0.31	0	4.1	0.594	0	6	I
HAIK	2007	602	2	2	7/16/06	13.22368421	24	2	3	0.31	0.02	4.1	0.648	0	15	I
HAIK	2007	602	2	2	7/17/06	13.25657895	24	3	3	0.3503	0	4.1	0.648	0	22	I
HAIK	2007	602	2	2	7/18/06	13.28947368	24	4	3	0.3503	0	4.1	0.648	0	30	I
HAIK	2007	602	2	2	7/19/06	13.32236842	24	5	3	0.21	0	4.1	0.648	0	40	I
HAIK	2007	602	2	2	7/20/06	13.35526316	24	6	3	0.21	0.05	4.1	0.648	0	52	?

F602: Haiku Ditch
Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAIK	2007	602	2	2	7/21/06	13.38815789	0	6	S	0.3503	0	4.1	0	0	44	?
HAIK	2007	602	2	2	7/22/06	13.42105263	0	6	2	0.3503	0	4.1	0	0	35	?
HAIK	2007	602	2	2	7/23/06	13.45394737	22	S	2	0.32	0	4.1	0.594	0	42	?
HAIK	2007	602	2	2	7/24/06	13.48684211	0	1	S	0.32	0	4.1	0	0	34	?
HAIK	2007	602	2	2	7/25/06	13.51973684	0	1	2	0.3503	0	4.1	0	0	26	?
HAIK	2007	602	2	2	7/26/06	13.55263158	0	1	3	0.3503	0	4.1	0	0	17	?
HAIK	2007	602	2	2	7/27/06	13.58552632	0	1	4	0.35	0	4.1	0	0	8	
HAIK	2007	602	2	2	7/28/06	13.61842105	24	S	4	0.35	0.02	4.1	0.648	0	16	I
HAIK	2007	602	2	2	7/29/06	13.65131579	24	2	4	0.3503	0.17	4.1	0.648	0	28	?
HAIK	2007	602	2	2	7/30/06	13.68421053	0	2	S	0.3503	0	4.1	0	0	19	?
HAIK	2007	602	2	2	7/31/06	13.71710526	0	2	2	0.3503	0	4.1	0	0	11	?
HAIK	2007	602	2	2	8/1/06	13.75	16	S	2	0.21	0	4.1	0.432	0	16	I
HAIK	2007	602	2	2	8/2/06	13.78289474	24	2	2	0.31	0	4.1	0.648	0	24	I
HAIK	2007	602	2	2	8/3/06	13.81578947	24	3	2	0.38	0	4.1	0.648	0	31	?
HAIK	2007	602	2	2	8/4/06	13.84868421	0	3	S	0.35	0	4.1	0	0	22	?
HAIK	2007	602	2	2	8/5/06	13.88157895	22	S	1	0.28	0.02	4.1	0.594	0	30	I
HAIK	2007	602	2	2	8/6/06	13.91447368	24	2	1	0.31	0.04	4.1	0.648	0	40	I
HAIK	2007	602	2	2	8/7/06	13.94736842	24	3	1	0.34	0	4.1	0.648	0	47	?
HAIK	2007	602	2	2	8/8/06	13.98026316	0	3	S	0.33	0	4.1	0	0	39	?
HAIK	2007	602	2	2	8/9/06	14.01315789	0	3	2	0.36	0	4.1	0	0	30	?
HAIK	2007	602	2	2	8/10/06	14.04605263	0	3	3	0.34	0	4.1	0	0	22	?
HAIK	2007	602	2	2	8/11/06	14.07894737	0	3	4	0.35	0	4.1	0	0	13	?
HAIK	2007	602	2	2	8/12/06	14.11184211	0	3	5	0.32	0	4.1	0	0	6	
HAIK	2007	602	2	2	8/13/06	14.14473684	0	3	6	0.31	0	4.1	0	0.31	0	WS-0
HAIK	2007	602	2	2	8/14/06	14.17763158	0	3	7	0.26	0	4.1	0	0.26	0	WS-1
HAIK	2007	602	2	2	8/15/06	14.21052632	16	S	7	0.2	0	4.1	0.432	0	5	I
HAIK	2007	602	2	2	8/16/06	14.24342105	24	2	7	0.31	0	4.1	0.648	0	13	?
HAIK	2007	602	2	2	8/17/06	14.27631579	0	2	S	0.33	0	4.1	0	0	5	?
HAIK	2007	602	2	2	8/18/06	14.30921053	22	S	1	0.32	0.02	4.1	0.594	0	13	?
HAIK	2007	602	2	2	8/19/06	14.34210526	0	1	S	0.31	0.02	4.1	0	0	5	
HAIK	2007	602	2	2	8/20/06	14.375	0	1	2	0.31	0	4.1	0	0.31	0	WS-0
HAIK	2007	602	2	2	8/21/06	14.40789474	0	1	3	0.33	0	4.1	0	0.33	0	WS-1
HAIK	2007	602	2	2	8/22/06	14.44078947	0	1	4	0.29	0	4.1	0	0.29	0	WS-2
HAIK	2007	602	2	2	8/23/06	14.47368421	0	1	5	0.24	0	4.1	0	0.24	0	WS-3
HAIK	2007	602	2	2	8/24/06	14.50657895	0	1	6	0.23	0	4.1	0	0.23	0	WS-4
HAIK	2007	602	2	2	8/25/06	14.53947368	0	1	7	0.22	0	4.1	0	0.22	0	WS-5
HAIK	2007	602	2	2	8/26/06	14.57236842	0	1	8	0.2	0	4.1	0	0.2	0	WS-6

F602: Haiku Ditch

Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAIK	2007	602	2	2	8/27/06	14.60526316	0	1	9	0.15	0	4.1	0	0.15	0	WS-7
HAIK	2007	602	2	2	8/28/06	14.63815789	0	1	10	0.26	0	4.1	0	0.26	0	WS-8
HAIK	2007	602	2	2	8/29/06	14.67105263	0	1	11	0.33	0	4.1	0	0.33	0	WS-9
HAIK	2007	602	2	2	8/30/06	14.70394737	0	1	12	0.35	0	4.1	0	0.35	0	WS-10
HAIK	2007	602	2	2	8/31/06	14.73684211	0	1	13	0.32	0	4.1	0	0.32	0	WS-11
HAIK	2007	602	2	2	9/1/06	14.76973684	0	1	14	0.35	0	4.1	0	0.35	0	WS-12
HAIK	2007	602	2	2	9/2/06	14.80263158	0	1	15	0.26	0.04	4.1	0	0.26	0	WS-13
HAIK	2007	602	2	2	9/3/06	14.83552632	0	1	16	0.25	0.05	4.1	0	0.25	0	WS-14
HAIK	2007	602	2	2	9/4/06	14.86842105	0	1	17	0.27	0	4.1	0	0.27	0	WS-15
HAIK	2007	602	2	2	9/5/06	14.90131579	24	S	17	0.24	0	4.1	0.648	0	9	I
HAIK	2007	602	2	2	9/6/06	14.93421053	24	2	17	0.16	0	4.1	0.648	0	21	?
HAIK	2007	602	2	2	9/7/06	14.96710526	0	2	S	0.31	0	4.1	0	0	14	?
HAIK	2007	602	2	2	9/8/06	15	0	2	2	0.32	0	4.1	0	0	6	?
HAIK	2007	602	2	2	9/9/06	15.03289474	0	2	3	0.3	0	4.1	0	0.3	0	WS-0
HAIK	2007	602	2	2	9/10/06	15.06578947	0	2	4	0.34	0	4.1	0	0.34	0	WS-1
HAIK	2007	602	2	2	9/11/06	15.09868421	0	2	5	0.24	0	4.1	0	0.24	0	WS-2
HAIK	2007	602	2	2	9/12/06	15.13157895	22	S	5	0.23	0	4.1	0.594	0	8	
HAIK	2007	602	2	2	9/13/06	15.16447368	24	2	5	0.29	0	4.1	0.648	0	17	?
HAIK	2007	602	2	2	9/14/06	15.19736842	0	2	S	0.24	0	4.1	0	0	11	?
HAIK	2007	602	2	2	9/15/06	15.23026316	0	2	2	0.19	0	4.1	0	0	7	?
HAIK	2007	602	2	2	9/16/06	15.26315789	0	2	3	0.19	0	4.1	0	0	2	?
HAIK	2007	602	2	2	9/17/06	15.29605263	0	2	4	0.3	0	4.1	0	0.3	0	WS-0
HAIK	2007	602	2	2	9/18/06	15.32894737	0	2	5	0.3	0	4.1	0	0.3	0	WS-1
HAIK	2007	602	2	2	9/19/06	15.36184211	0	2	6	0.3	0	4.1	0	0.3	0	WS-2
HAIK	2007	602	2	2	9/20/06	15.39473684	0	2	7	0.31	0	4.1	0	0.31	0	WS-3
HAIK	2007	602	2	2	9/21/06	15.42763158	0	2	8	0.34	0	4.1	0	0.34	0	I
HAIK	2007	602	2	2	9/22/06	15.46052632	22	S	8	0.26	0	4.1	0.594	0	8	I
HAIK	2007	602	2	2	9/23/06	15.49342105	7	1	S	0.28	0	4.1	0.189	0	5	?
HAIK	2007	602	2	2	9/24/06	15.52631579	0	1	2	0.2	0	4.1	0	0	1	
HAIK	2007	602	2	2	9/25/06	15.55921053	0	1	3	0.2	0.09	4.1	0	0.2	0	WS-0
HAIK	2007	602	2	2	9/26/06	15.59210526	0	1	4	0.13	0	4.1	0	0.13	0	WS-1
HAIK	2007	602	2	2	9/27/06	15.625	0	1	5	0.25	0	4.1	0	0.25	0	WS-2
HAIK	2007	602	2	2	9/28/06	15.65789474	0	1	6	0.27	0	4.1	0	0.27	0	WS-3
HAIK	2007	602	2	2	9/29/06	15.69078947	0	1	7	0.25	0	4.1	0	0.25	0	WS-4
HAIK	2007	602	2	2	9/30/06	15.72368421	0	1	8	0.25	0	4.1	0	0.25	0	WS-5
HAIK	2007	602	2	2	10/1/06	15.75657895	0	1	9	0.16	0	4.1	0	0.16	0	WS-6
HAIK	2007	602	2	2	10/2/06	15.78947368	0	1	10	0.15	0	4.1	0	0.15	0	WS-7

F602: Haiku Ditch

Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAIK	2007	602	2	2	10/3/06	15.82236842	24	S	10	0.28	0	4.1	0.648	0	8	?
HAIK	2007	602	2	2	10/4/06	15.85526316	0	1	S	0.25	0	4.1	0	0	2	?
HAIK	2007	602	2	2	10/5/06	15.88815789	0	1	2	0.18	0	4.1	0	0.18	0	WS-0
HAIK	2007	602	2	2	10/6/06	15.92105263	0	1	3	0.18	0	4.1	0	0.18	0	WS-1
HAIK	2007	602	2	2	10/7/06	15.95394737	0	1	4	0.15	0	4.1	0	0.15	0	WS-2
HAIK	2007	602	2	2	10/8/06	15.98684211	0	1	5	0.19	0	4.1	0	0.19	0	WS-3
HAIK	2007	602	2	2	10/9/06	16.01973684	0	1	6	0.18	0	4.1	0	0.18	0	WS-4
HAIK	2007	602	2	2	10/10/06	16.05263158	0	1	7	0.19	0	4.1	0	0.19	0	WS-5
HAIK	2007	602	2	2	10/11/06	16.08552632	0	1	8	0.2	0	4.1	0	0.2	0	WS-6
HAIK	2007	602	2	2	10/12/06	16.11842105	0	1	9	0.17	0	4.1	0	0.17	0	WS-7
HAIK	2007	602	2	2	10/13/06	16.15131579	0	1	10	0.16	0	4.1	0	0.16	0	WS-8
HAIK	2007	602	2	2	10/14/06	16.18421053	0	1	11	0.17	0	4.1	0	0.17	0	WS-9
HAIK	2007	602	2	2	10/15/06	16.21710526	0	1	12	0.2	0	4.1	0	0.2	0	WS-10
HAIK	2007	602	2	2	10/16/06	16.25	0	S	12	0.05	0.38	4.1	0	0	8	I
HAIK	2007	602	2	2	10/17/06	16.28289474	22	2	12	0.05	3.8	4.1	0.594	0	100	I
HAIK	2007	602	2	2	10/18/06	16.31578947	24	3	12	0.2526	0	4.1	0.648	0	100	I
HAIK	2007	602	2	2	10/19/06	16.34868421	7	3	S	0.2526	0	4.1	0.189	0	98	
HAIK	2007	602	2	2	10/20/06	16.38157895	0	S	1	0.2526	0.2	4.1	0	0	97	I
HAIK	2007	602	2	2	10/21/06	16.41447368	0	1	S	0.2526	0	4.1	0	0	91	I
HAIK	2007	602	2	2	10/22/06	16.44736842	0	1	2	0.2526	0	4.1	0	0	84	
HAIK	2007	602	2	2	10/23/06	16.48026316	0	1	3	0.2526	0	4.1	0	0	78	
HAIK	2007	602	2	2	10/24/06	16.51315789	0	1	4	0.2526	0.02	4.1	0	0	73	
HAIK	2007	602	2	2	10/25/06	16.54605263	0	1	5	0.2526	0	4.1	0	0	66	?
HAIK	2007	602	2	2	10/26/06	16.57894737	0	1	6	0.21	0	4.1	0	0	61	?
HAIK	2007	602	2	2	10/27/06	16.61184211	0	1	7	0.19	0	4.1	0	0	57	?
HAIK	2007	602	2	2	10/28/06	16.64473684	0	1	8	0.19	0	4.1	0	0	52	?
HAIK	2007	602	2	2	10/29/06	16.67763158	0	1	9	0.21	0	4.1	0	0	47	?
HAIK	2007	602	2	2	10/30/06	16.71052632	0	1	10	0.15	0	4.1	0	0	43	?
HAIK	2007	602	2	2	10/31/06	16.74342105	0	1	11	0.16	0	4.1	0	0	39	?
HAIK	2007	602	2	2	11/1/06	16.77631579	0	1	12	0.16	0.06	4.1	0	0	37	I
HAIK	2007	602	2	2	11/2/06	16.80921053	7	S	12	0.217	0.8	4.1	0.189	0	56	SC
HAIK	2007	602	2	2	11/3/06	16.84210526	0	2	12	0.217	3.8	4.1	0	0	100	
HAIK	2007	602	2	2	11/4/06	16.875	0	2	S	0.217	0	4.1	0	0	94	
HAIK	2007	602	2	2	11/5/06	16.90789474	0	2	2	0.217	0	4.1	0	0	89	
HAIK	2007	602	2	2	11/6/06	16.94078947	0	2	3	0.16	0	4.1	0	0	85	
HAIK	2007	602	2	2	11/7/06	16.97368421	0	2	4	0.16	0	4.1	0	0	81	
HAIK	2007	602	2	2	11/8/06	17.00657895	0	2	5	0.217	0	4.1	0	0	76	

F602: Haiku Ditch

Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAIK	2007	602	2	2	11/9/06	17.03947368	0	2	6	0.14	0	4.1	0	0	72	
HAIK	2007	602	2	2	11/10/06	17.07236842	0	2	7	0.14	0	4.1	0	0	69	
HAIK	2007	602	2	2	11/11/06	17.10526316	24	S	7	0.15	0	4.1	0.648	0	81	
HAIK	2007	602	2	2	11/12/06	17.13815789	24	2	7	0.15	0	4.1	0.648	0	93	
HAIK	2007	602	2	2	11/13/06	17.17105263	0	2	S	0.14	0	4.1	0	0	90	
HAIK	2007	602	2	2	11/14/06	17.20394737	0	2	2	0.1	0	4.1	0	0	87	
HAIK	2007	602	2	2	11/15/06	17.23684211	0	2	3	0.14	0	4.1	0	0	84	
HAIK	2007	602	2	2	11/16/06	17.26973684	0	2	4	0.18	0	4.1	0	0	80	
HAIK	2007	602	2	2	11/17/06	17.30263158	0	2	5	0.17	0	4.1	0	0	75	
HAIK	2007	602	2	2	11/18/06	17.33552632	0	2	6	0.16	0	4.1	0	0	72	
HAIK	2007	602	2	2	11/19/06	17.36842105	0	2	7	0.19	0	4.1	0	0	67	
HAIK	2007	602	2	2	11/20/06	17.40131579	0	2	8	0.19	0	4.1	0	0	62	
HAIK	2007	602	2	2	11/21/06	17.43421053	0	2	9	0.18	0	4.1	0	0	58	?
HAIK	2007	602	2	2	11/22/06	17.46710526	0	2	10	0.13	0	4.1	0	0	55	?
HAIK	2007	602	2	2	11/23/06	17.5	0	2	11	0.13	0.12	4.1	0	0	55	?
HAIK	2007	602	2	2	11/24/06	17.53289474	0	2	12	0.14	0	4.1	0	0	51	?
HAIK	2007	602	2	2	11/25/06	17.56578947	0	2	13	0.11	0	4.1	0	0	48	?
HAIK	2007	602	2	2	11/26/06	17.59868421	0	2	14	0.14	0	4.1	0	0	45	?
HAIK	2007	602	2	2	11/27/06	17.63157895	0	2	15	0.17	0	4.1	0	0	41	?
HAIK	2007	602	2	2	11/28/06	17.66447368	0	2	16	0.13	0	4.1	0	0	38	?
HAIK	2007	602	2	2	11/29/06	17.69736842	7	2	17	0.11	0	4.1	0.189	0	40	?
HAIK	2007	602	2	2	11/30/06	17.73026316	0	S	17	0.09	0.45	4.1	0	0	48	?
HAIK	2007	602	2	2	12/1/06	17.76315789	0	1	S	0.12	0.05	4.1	0	0	47	?
HAIK	2007	602	2	2	12/2/06	17.79605263	0	S	1	0.12	0.6	4.1	0	0	58	?
HAIK	2007	602	2	2	12/3/06	17.82894737	0	2	1	0.1668	3.35	4.1	0	0	100	
HAIK	2007	602	2	2	12/4/06	17.86184211	0	2	S	0.1668	0.03	4.1	0	0	96	
HAIK	2007	602	2	2	12/5/06	17.89473684	0	2	2	0.1668	0	4.1	0	0	92	
HAIK	2007	602	2	2	12/6/06	17.92763158	0	2	3	0.13	0	4.1	0	0	89	
HAIK	2007	602	2	2	12/7/06	17.96052632	0	2	4	0.17	0.03	4.1	0	0	86	
HAIK	2007	602	2	2	12/8/06	17.99342105	0	2	5	0.21	0	4.1	0	0	80	
HAIK	2007	602	2	2	12/9/06	18.02631579	0	2	6	0.22	0	4.1	0	0	75	
HAIK	2007	602	2	2	12/10/06	18.05921053	0	2	7	0.17	0	4.1	0	0	71	
HAIK	2007	602	2	2	12/11/06	18.09210526	0	2	8	0.17	0.03	4.1	0	0	67	
HAIK	2007	602	2	2	12/12/06	18.125	0	2	9	0.15	0	4.1	0	0	64	
HAIK	2007	602	2	2	12/13/06	18.15789474	0	2	10	0.14	0	4.1	0	0	60	
HAIK	2007	602	2	2	12/14/06	18.19078947	0	2	11	0.19	0	4.1	0	0	56	
HAIK	2007	602	2	2	12/15/06	18.22368421	0	2	12	0.18	0	4.1	0	0	51	

F602: Haiku Ditch

Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAIK	2007	602	2	2	12/16/06	18.25657895	0	2	13	0.18	0.02	4.1	0	0	47	?
HAIK	2007	602	2	2	12/17/06	18.28947368	0	2	14	0.14	0	4.1	0	0	44	?
HAIK	2007	602	2	2	12/18/06	18.32236842	0	2	15	0.18	0	4.1	0	0	40	?
HAIK	2007	602	2	2	12/19/06	18.35526316	0	2	16	0.18	0	4.1	0	0	35	?
HAIK	2007	602	2	2	12/20/06	18.38815789	0	2	17	0.16	0	4.1	0	0	31	?
HAIK	2007	602	2	2	12/21/06	18.42105263	0	2	18	0.16	0	4.1	0	0	27	?
HAIK	2007	602	2	2	12/22/06	18.45394737	0	2	19	0.1668	0	4.1	0	0	23	?
HAIK	2007	602	2	2	12/23/06	18.48684211	22	S	19	0.1668	0	4.1	0.594	0	34	?
HAIK	2007	602	2	2	12/24/06	18.51973684	7	1	S	0.1668	0	4.1	0.189	0	34	?
HAIK	2007	602	2	2	12/25/06	18.55263158	0	1	2	0.1668	0	4.1	0	0	30	?
HAIK	2007	602	2	2	12/26/06	18.58552632	0	1	3	0.1668	0.07	4.1	0	0	28	?
HAIK	2007	602	2	2	12/27/06	18.61842105	0	1	4	0.1668	0	4.1	0	0	24	?
HAIK	2007	602	2	2	12/28/06	18.65131579	0	1	5	0.1	0	4.1	0	0	21	?
HAIK	2007	602	2	2	12/29/06	18.68421053	0	1	6	0.14	0.11	4.1	0	0	21	?
HAIK	2007	602	2	2	12/30/06	18.71710526	0	1	7	0.17	0	4.1	0	0	17	?
HAIK	2007	602	2	2	12/31/06	18.75	0	1	8	0.17	0	4.1	0	0	12	?
HAIK	2007	602	2	2	1/1/07	18.78289474	0	1	9	0.15	0	4.1	0	0	9	?
HAIK	2007	602	2	2	1/2/07	18.81578947	0	1	10	0.15	0	4.1	0	0	5	?
HAIK	2007	602	2	2	1/3/07	18.84868421	0	1	11	0.16	0	4.1	0	0	1	?
HAIK	2007	602	2	2	1/4/07	18.88157895	0	1	12	0.13	0	4.1	0	0.13	0	WS-0 ?
HAIK	2007	602	2	2	1/5/07	18.91447368	0	1	13	0.12	0.1	4.1	0	0.12	0	WS-1
HAIK	2007	602	2	2	1/6/07	18.94736842	0	1	14	0.17	0	4.1	0	0.17	0	WS-2
HAIK	2007	602	2	2	1/7/07	18.98026316	22	S	14	0.12	0.02	4.1	0.594	0	12	?
HAIK	2007	602	2	2	1/8/07	19.01315789	24	2	14	0.07	0	4.1	0.648	0	26	?
HAIK	2007	602	2	2	1/9/07	19.04605263	24	3	14	0.12	0	4.1	0.648	0	39	?
HAIK	2007	602	2	2	1/10/07	19.07894737	0	3	S	0.1	0	4.1	0	0	36	?
HAIK	2007	602	2	2	1/11/07	19.11184211	0	3	2	0.16	0	4.1	0	0	32	?
HAIK	2007	602	2	2	1/12/07	19.14473684	0	3	3	0.18	0	4.1	0	0	28	?
HAIK	2007	602	2	2	1/13/07	19.17763158	0	3	4	0.2	0	4.1	0	0	23	?
HAIK	2007	602	2	2	1/14/07	19.21052632	0	3	5	0.17	0	4.1	0	0	19	?
HAIK	2007	602	2	2	1/15/07	19.24342105	0	3	6	0.15	0	4.1	0	0	15	?
HAIK	2007	602	2	2	1/16/07	19.27631579	0	3	7	0.19	0.02	4.1	0	0	11	?
HAIK	2007	602	2	2	1/17/07	19.30921053	0	3	8	0.18	0	4.1	0	0	7	?
HAIK	2007	602	2	2	1/18/07	19.34210526	0	3	9	0.21	0	4.1	0	0	1	?
HAIK	2007	602	2	2	1/19/07	19.375	0	3	10	0.19	0	4.1	0	0.19	0	WS-0
HAIK	2007	602	2	2	1/20/07	19.40789474	0	3	11	0.14	0	4.1	0	0.14	0	WS-1
HAIK	2007	602	2	2	1/21/07	19.44078947	0	3	12	0.14	0	4.1	0	0.14	0	WS-2

F602: Haiku Ditch

Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAIK	2007	602	2	2	1/22/07	19.47368421	0	3	13	0.11	0	4.1	0	0.11	0	WS-3
HAIK	2007	602	2	2	1/23/07	19.50657895	0	3	14	0.16	0	4.1	0	0.16	0	WS-4
HAIK	2007	602	2	2	1/24/07	19.53947368	0	3	15	0.14	0	4.1	0	0.14	0	WS-5
HAIK	2007	602	2	2	1/25/07	19.57236842	0	3	16	0.15	0	4.1	0	0.15	0	WS-6
HAIK	2007	602	2	2	1/26/07	19.60526316	0	3	17	0.18	0	4.1	0	0.18	0	WS-7
HAIK	2007	602	2	2	1/27/07	19.63815789	0	3	18	0.15	0	4.1	0	0.15	0	WS-8
HAIK	2007	602	2	2	1/28/07	19.67105263	0	3	19	0.17	0	4.1	0	0.17	0	WS-9
HAIK	2007	602	2	2	1/29/07	19.70394737	0	3	20	0.17	0	4.1	0	0.17	0	WS-10
HAIK	2007	602	2	2	1/30/07	19.73684211	0	S	20	0.21	0.48	4.1	0	0	6	?
HAIK	2007	602	2	2	1/31/07	19.76973684	0	1	S	0.19	0	4.1	0	0	1	?
HAIK	2007	602	2	2	2/1/07	19.80263158	0	S	1	0.16	1.1	4.1	0	0	24	?
HAIK	2007	602	2	2	2/2/07	19.83552632	0	1	S	0.15	0.19	4.1	0	0	25	?
HAIK	2007	602	2	2	2/3/07	19.86842105	0	1	2	0.18	0	4.1	0	0	21	?
HAIK	2007	602	2	2	2/4/07	19.90131579	0	1	3	0.13	0	4.1	0	0	18	?
HAIK	2007	602	2	2	2/5/07	19.93421053	0	1	4	0.17	0	4.1	0	0	14	?
HAIK	2007	602	2	2	2/6/07	19.96710526	0	1	5	0.18	0	4.1	0	0	9	?
HAIK	2007	602	2	2	2/7/07	20	0	1	6	0.17	0	4.1	0	0	5	?
HAIK	2007	602	2	2	2/8/07	20.03289474	0	S	6	0.09	0.52	4.1	0	0	16	?
HAIK	2007	602	2	2	2/9/07	20.06578947	0	1	S	0.14	0.09	4.1	0	0	14	?
HAIK	2007	602	2	2	2/10/07	20.09868421	0	S	1	0.17	0.2	4.1	0	0	15	?
HAIK	2007	602	2	2	2/11/07	20.13157895	0	1	S	0.19	0	4.1	0	0	10	?
HAIK	2007	602	2	2	2/12/07	20.16447368	0	1	2	0.21	0	4.1	0	0	5	?
HAIK	2007	602	2	2	2/13/07	20.19736842	0	1	3	0.19	0	4.1	0	0	1	
HAIK	2007	602	2	2	2/14/07	20.23026316	0	1	4	0.17	0	4.1	0	0.17	0	WS-0
HAIK	2007	602	2	2	2/15/07	20.26315789	0	1	5	0.17	0	4.1	0	0.17	0	WS-1
HAIK	2007	602	2	2	2/16/07	20.29605263	0	S	5	0.13	0.3	4.1	0	0	4	?
HAIK	2007	602	2	2	2/17/07	20.32894737	0	2	5	0.21	0.4	4.1	0	0	8	?
HAIK	2007	602	2	2	2/18/07	20.36184211	0	2	S	0.2	0.17	4.1	0	0	8	?
HAIK	2007	602	2	2	2/19/07	20.39473684	0	2	2	0.23	0	4.1	0	0	2	?
HAIK	2007	602	2	2	2/20/07	20.42763158	0	2	3	0.24	0.05	4.1	0	0.24	0	WS-0 ?
HAIK	2007	602	2	2	2/21/07	20.46052632	0	2	4	0.21	0.03	4.1	0	0.21	0	WS-1
HAIK	2007	602	2	2	2/22/07	20.49342105	0	2	5	0.22	0	4.1	0	0.22	0	WS-2
HAIK	2007	602	2	2	2/23/07	20.52631579	0	2	6	0.2	0	4.1	0	0.2	0	WS-3
HAIK	2007	602	2	2	2/24/07	20.55921053	0	2	7	0.19	0	4.1	0	0.19	0	WS-4
HAIK	2007	602	2	2	2/25/07	20.59210526	0	2	8	0.22	0	4.1	0	0.22	0	WS-5
HAIK	2007	602	2	2	2/26/07	20.625	0	2	9	0.2	0	4.1	0	0.2	0	WS-6
HAIK	2007	602	2	2	2/27/07	20.65789474	0	2	10	0.21	0	4.1	0	0.21	0	WS-7

F602: Haiku Ditch

Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAIK	2007	602	2	2	2/28/07	20.69078947	0	2	11	0.23	0	4.1	0	0.23	0	WS-8
HAIK	2007	602	2	2	3/1/07	20.72368421	0	2	12	0.24	0	4.1	0	0.24	0	WS-9
HAIK	2007	602	2	2	3/2/07	20.75657895	0	2	13	0.19	0	4.1	0	0.19	0	WS-10
HAIK	2007	602	2	2	3/3/07	20.78947368	0	2	14	0.16	0	4.1	0	0.16	0	WS-11
HAIK	2007	602	2	2	3/4/07	20.82236842	0	2	15	0.15	0.03	4.1	0	0.15	0	WS-12
HAIK	2007	602	2	2	3/5/07	20.85526316	0	2	16	0.19	0	4.1	0	0.19	0	WS-13
HAIK	2007	602	2	2	3/6/07	20.88815789	0	2	17	0.18	0	4.1	0	0.18	0	WS-14
HAIK	2007	602	2	2	3/7/07	20.92105263	0	2	18	0.17	0	4.1	0	0.17	0	WS-15
HAIK	2007	602	2	2	3/8/07	20.95394737	0	2	19	0.17	0	4.1	0		0	RIPE/DRY
HAIK	2007	602	2	2	3/9/07	20.98684211	0	2	20	0.23	0	4.1	0		0	RIPE/DRY
HAIK	2007	602	2	2	3/10/07	21.01973684	0	S	20	0.07	0.84	4.1	0		18	RIPE/DRY
HAIK	2007	602	2	2	3/11/07	21.05263158	0	2	20	0.19	0.28	4.1	0		20	RIPE/DRY
HAIK	2007	602	2	2	3/12/07	21.08552632	0	2	S	0.18	0	4.1	0		16	RIPE/DRY
HAIK	2007	602	2	2	3/13/07	21.11842105	0	2	2	0.07	0	4.1	0		14	RIPE/DRY
HAIK	2007	602	2	2	3/14/07	21.15131579	0	S	2	0.1	0.24	4.1	0		18	RIPE/DRY
HAIK	2007	602	2	2	3/15/07	21.18421053	0	2	2	0.15	0.9	4.1	0		36	RIPE/DRY
HAIK	2007	602	2	2	3/16/07	21.21710526	0	3	2	0.16	0.21	4.1	0		37	RIPE/DRY
HAIK	2007	602	2	2	3/17/07	21.25	0	3	S	0.24	0	4.1	0		31	RIPE/DRY
HAIK	2007	602	2	2	3/18/07	21.28289474	0	S	1	0.17	0.32	4.1	0		35	RIPE/DRY
HAIK	2007	602	2	2	3/19/07	21.31578947	0	1	S	0.25	0.18	4.1	0		33	RIPE/DRY
HAIK	2007	602	2	2	3/20/07	21.34868421	0	S	1	0.22	0.28	4.1	0		35	RIPE/DRY
HAIK	2007	602	2	2	3/21/07	21.38157895	0	1	S	0.3	0.08	4.1	0		30	RIPE/DRY
HAIK	2007	602	2	2	3/22/07	21.41447368	0	1	2	0.26	0	4.1	0		23	RIPE/DRY
HAIK	2007	602	2	2	3/23/07	21.44736842	0	1	3	0.2	0	4.1	0		18	RIPE/DRY
HAIK	2007	602	2	2	3/24/07	21.48026316	0	1	4	0.25	0	4.1	0		12	RIPE/DRY
HAIK	2007	602	2	2	3/25/07	21.51315789	0	1	5	0.26	0	4.1	0		6	RIPE/DRY
HAIK	2007	602	2	2	3/26/07	21.54605263	0	1	6	0.18	0	4.1	0		1	RIPE/DRY
HAIK	2007	602	2	2	3/27/07	21.57894737	0	1	7	0.18	0	4.1	0		0	RIPE/DRY
HAIK	2007	602	2	2	3/28/07	21.61184211	0	1	8	0.19	0	4.1	0		0	RIPE/DRY
HAIK	2007	602	2	2	3/29/07	21.64473684	0	1	9	0.17	0	4.1	0		0	RIPE/DRY
HAIK	2007	602	2	2	3/30/07	21.67763158	0	1	10	0.18	0	4.1	0		0	RIPE/DRY
HAIK	2007	602	2	2	3/31/07	21.71052632	0	1	11	0.18	0	4.1	0		0	RIPE/DRY
HAIK	2007	602	2	2	4/1/07	21.74342105	0	1	12	0.2	0	4.1	0		0	RIPE/DRY
HAIK	2007	602	2	2	4/2/07	21.77631579	0	1	13	0.23	0.13	4.1	0		0	RIPE/DRY
HAIK	2007	602	2	2	4/3/07	21.80921053	0	1	14	0.25	0	4.1	0		0	RIPE/DRY
HAIK	2007	602	2	2	4/4/07	21.84210526	0	1	15	0.23	0	4.1	0		0	RIPE/DRY
HAIK	2007	602	2	2	4/5/07	21.875	0	1	16	0.22	0	4.1	0		0	RIPE/DRY

F602: Haiku Ditch

Crop Cycle: 2005-2007(2007 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAIK	2007	602	2	2	4/6/07	21.90789474	0	1	17	0.22	0	4.1	0		0	RIPE/DRY
HAIK	2007	602	2	2	4/7/07	21.94078947	0	1	18	0.25	0	4.1	0		0	RIPE/DRY
HAIK	2007	602	2	2	4/8/07	21.97368421	0	1	19	0.21	0	4.1	0		0	RIPE/DRY
HAIK	2007	602	2	2	4/9/07	22.00657895	0	1	20	0.16	0	4.1	0		0	RIPE/DRY
HAIK	2007	602	2	2	4/10/07	22.03947368	0	1	21	0.24	0	4.1	0		0	RIPE/DRY
HAIK	2007	602	2	2	4/11/07	22.07236842	0	1	22	0.22	0	4.1	0		0	RIPE/DRY
HAIK	2007	602	2	2	4/12/07	22.10526316	0	1	23	0.18	0	4.1	0		0	RIPE/DRY
HAIK	2007	602	2	2	4/13/07	22.13815789	0	1	24	0.25	0	4.1	0		0	RIPE/DRY
HAIK	2007	602	2	2	4/14/07	22.17105263	0	1	25	0.3	0	4.1	0		0	RIPE/DRY
HAIK	2007	602	2	2	4/15/07	22.20394737	0	1	26	0.3	0	4.1	0		0	RIPE/DRY
HAIK	2007	602	2	2	4/16/07	22.23684211	0	1	27	0.26	0.05	4.1	0		0	RIPE/DRY
HAIK	2007	602	2	2	4/17/07	22.26973684	0	1	28	0.29	0.08	4.1	0		0	RIPE/DRY
HAIK	2007	602	2	2	4/18/07	22.30263158	0	1	29	0.27	0	4.1	0		0	END
										134.282	43.08*		112.617	21.8952888		

**** Actual Rainfall total not fully useable by the plant as irrigation. Please see cover memo for explanation of "Effective Rainfall"***

F602: Haiku Ditch

Crop Cycle: 2007-2009(2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAIK	2009	602	2	1	6/20/07	0	0	S	S	0.0999	0	1.3653	0	0	0	IPLT
HAIK	2009	602	2	1	6/21/07	0.032894737	0	1	2	0.0999	0.02	1.3653	0	0	0	IPLT
HAIK	2009	602	2	1	6/22/07	0.065789474	22	S	2	0.0999	0	1.3653	0.594	0	36	IPLT
HAIK	2009	602	2	1	6/23/07	0.098684211	24	2	2	0.10323	0	1.3653	0.648	0	76	IPLT
HAIK	2009	602	2	1	6/24/07	0.131578947	24	3	2	0.10323	0	1.3653	0.648	0	100	IPLT
HAIK	2009	602	2	1	6/25/07	0.164473684	24	4	2	0.10323	0	1.3653	0.648	0	100	IPLT
HAIK	2009	602	2	1	6/26/07	0.197368421	24	5	2	0.08991	0	1.3653	0.648	0	100	IPLT
HAIK	2009	602	2	1	6/27/07	0.230263158	24	6	2	0.10656	0	1.3653	0.648	0	100	IPLT
HAIK	2009	602	2	1	6/28/07	0.263157895	7	6	S	0.08325	0	1.3653	0.189	0	100	IPLT
HAIK	2009	602	2	1	6/29/07	0.296052632	7	6	2	0.09324	0	1.3653	0.189	0	100	IPLT
HAIK	2009	602	2	1	6/30/07	0.328947368	7	6	3	0.09657	0	1.3653	0.189	0	100	IPLT
HAIK	2009	602	2	1	7/1/07	0.361842105	7	6	4	0.08991	0	1.3653	0.189	0	100	IPLT
HAIK	2009	602	2	1	7/2/07	0.394736842	24	S	4	0.0999	0	1.3653	0.648	0	100	IPLT
HAIK	2009	602	2	1	7/3/07	0.427631579	7	1	S	0.08658	0	1.3653	0.189	0	100	IPLT
HAIK	2009	602	2	1	7/4/07	0.460526316	0	1	2	0.07659	0	1.3653	0	0	94	IPLT
HAIK	2009	602	2	1	7/5/07	0.493421053	0	1	3	0.09324	0	1.3653	0	0	87	IPLT
HAIK	2009	602	2	1	7/6/07	0.526315789	0	1	4	0.10323	0	1.3653	0	0	80	IPLT
HAIK	2009	602	2	1	7/7/07	0.559210526	0	1	5	0.10323	0	1.3653	0	0	72	IPLT
HAIK	2009	602	2	1	7/8/07	0.592105263	0	1	6	0.10656	0	1.3653	0	0	64	IPLT
HAIK	2009	602	2	1	7/9/07	0.625	0	1	7	0.10323	0	1.3653	0	0	57	IPLT
HAIK	2009	602	2	1	7/10/07	0.657894737	22	S	7	0.09324	0	1.3653	0.594	0	93	IPLT
HAIK	2009	602	2	1	7/11/07	0.690789474	24	2	7	0.09657	0	1.3653	0.648	0	100	IPLT
HAIK	2009	602	2	1	7/12/07	0.723684211	0	2	S	0.09324	0	1.3653	0	0	93	
HAIK	2009	602	2	1	7/13/07	0.756578947	0	2	2	0.09657	0	1.3653	0	0	86	
HAIK	2009	602	2	1	7/14/07	0.789473684	0	2	3	0.08325	0	1.3653	0	0	79	
HAIK	2009	602	2	1	7/15/07	0.822368421	0	2	4	0.07659	0.1	1.3653	0	0	81	
HAIK	2009	602	2	1	7/16/07	0.855263158	0	2	5	0.07659	0	1.3653	0	0	76	
HAIK	2009	602	2	1	7/17/07	0.888157895	0	2	6	0.08658	0	1.3653	0	0	69	
HAIK	2009	602	2	1	7/18/07	0.921052632	0	2	7	0.09657	0	1.3653	0	0	62	?
HAIK	2009	602	2	1	7/19/07	0.953947368	0	2	8	0.09324	0	1.3653	0	0	55	?
HAIK	2009	602	2	1	7/20/07	0.986842105	0	2	9	0.10323	0	1.3653	0	0	48	?
HAIK	2009	602	2	1	7/21/07	1.019736842	0	2	10	0.11665	0.05	1.3653	0	0	43	?
HAIK	2009	602	2	1	7/22/07	1.052631579	0	2	11	0.08658	0	1.3653	0	0	37	?
HAIK	2009	602	2	1	7/23/07	1.085526316	24	S	11	0.08658	0.05	1.3653	0.648	0	81	I
HAIK	2009	602	2	1	7/24/07	1.118421053	22	2	11	0.08658	0	1.3653	0.594	0	100	
HAIK	2009	602	2	1	7/25/07	1.151315789	24	3	11	0.09657	0	1.3653	0.648	0	100	

F602: Haiku Ditch

Crop Cycle: 2007-2009(2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAIK	2009	602	2	1	7/26/07	1.184210526	0	3	S	0.0999	0	1.3653	0	0	92	
HAIK	2009	602	2	1	7/27/07	1.217105263	0	3	2	0.10656	0	1.3653	0	0	84	
HAIK	2009	602	2	1	7/28/07	1.25	0	3	3	0.10989	0	1.3653	0	0	76	
HAIK	2009	602	2	1	7/29/07	1.282894737	0	3	4	0.10323	0	1.3653	0	0	69	?
HAIK	2009	602	2	1	7/30/07	1.315789474	0	3	5	0.07992	0	1.3653	0	0	63	?
HAIK	2009	602	2	1	7/31/07	1.348684211	0	3	6	0.07992	0	1.3653	0	0	57	?
HAIK	2009	602	2	1	8/1/07	1.381578947	22	S	6	0.09657	0	1.3653	0.594	0	93	I
HAIK	2009	602	2	1	8/2/07	1.414473684	24	2	6	0.09324	0	1.3653	0.648	0	100	
HAIK	2009	602	2	1	8/3/07	1.447368421	24	3	6	0.0666	0.02	1.3653	0.648	0	100	
HAIK	2009	602	2	1	8/4/07	1.480263158	0	3	S	0.08658	0	1.3653	0	0	93	
HAIK	2009	602	2	1	8/5/07	1.513157895	0	3	2	0.09441	0	1.382438	0	0	85	AC
HAIK	2009	602	2	1	8/6/07	1.546052632	0	3	3	0.103353	0	1.412491	0	0	76	
HAIK	2009	602	2	1	8/7/07	1.578947368	0	3	4	0.098515	0	1.442544	0	0	68	?
HAIK	2009	602	2	1	8/8/07	1.611842105	0	3	5	0.096976	0	1.472597	0	0	60	?
HAIK	2009	602	2	1	8/9/07	1.644736842	0	3	6	0.09529	0	1.50265	0	0	52	?
HAIK	2009	602	2	1	8/10/07	1.677631579	0	3	7	0.097196	0.02	1.532703	0	0	46	?
HAIK	2009	602	2	1	8/11/07	1.710526316	0	3	8	0.083855	0	1.562756	0	0	40	?
HAIK	2009	602	2	1	8/12/07	1.743421053	22	S	8	0.120432	0	1.592809	0.594	0	69	?
HAIK	2009	602	2	1	8/13/07	1.776315789	24	2	8	0.098955	0.06	1.622862	0.648	0	100	
HAIK	2009	602	2	1	8/14/07	1.809210526	24	3	8	0.088693	0.03	1.652915	0.648	0	100	
HAIK	2009	602	2	1	8/15/07	1.842105263	0	3	S	0.082096	0	1.682968	0	0	93	
HAIK	2009	602	2	1	8/16/07	1.875	0	3	2	0.121165	0	1.713021	0	0	84	
HAIK	2009	602	2	1	8/17/07	1.907894737	0	3	3	0.123291	0	1.743074	0	0	76	
HAIK	2009	602	2	1	8/18/07	1.940789474	0	3	4	0.121092	0	1.773127	0	0	67	?
HAIK	2009	602	2	1	8/19/07	1.973684211	0	3	5	0.140736	0	1.80318	0	0	59	?
HAIK	2009	602	2	1	8/20/07	2.006578947	0	3	6	0.120725	0.13	1.833233	0	0	58	?
HAIK	2009	602	2	1	8/21/07	2.039473684	0	3	7	0.131793	0.05	1.863286	0	0	53	?
HAIK	2009	602	2	1	8/22/07	2.072368421	0	3	8	0.129301	0	1.893339	0	0	45	?
HAIK	2009	602	2	1	8/23/07	2.105263158	0	3	9	0.098515	0	1.923392	0	0	39	?
HAIK	2009	602	2	1	8/24/07	2.138157895	0	3	10	0.076232	0	1.953445	0	0	35	?
HAIK	2009	602	2	1	8/25/07	2.171052632	0	3	11	0.082243	0	1.983498	0	0	30	?
HAIK	2009	602	2	1	8/26/07	2.203947368	22	S	11	0.103133	0	2.013551	0.594	0	54	?
HAIK	2009	602	2	1	8/27/07	2.236842105	24	2	11	0.114641	0	2.043604	0.648	0	79	?
HAIK	2009	602	2	1	8/28/07	2.269736842	0	2	S	0.116327	0	2.073657	0	0	73	?
HAIK	2009	602	2	1	8/29/07	2.302631579	0	2	2	0.123144	0	2.10371	0	0	66	?
HAIK	2009	602	2	1	8/30/07	2.335526316	0	2	3	0.098882	0	2.133763	0	0	60	?

F602: Haiku Ditch

Crop Cycle: 2007-2009(2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAIK	2009	602	2	1	8/31/07	2.368421053	0	2	4	0.100274	0	2.163816	0	0	55	?
HAIK	2009	602	2	1	9/1/07	2.401315789	0	2	5	0.144474	0.03	2.193869	0	0	49	?
HAIK	2009	602	2	1	9/2/07	2.434210526	0	2	6	0.146453	0	2.223922	0	0	41	?
HAIK	2009	602	2	1	9/3/07	2.467105263	0	2	7	0.159428	0	2.253975	0	0	34	?
HAIK	2009	602	2	1	9/4/07	2.5	22	S	7	0.105845	0.02	2.284028	0.594	0	56	?
HAIK	2009	602	2	1	9/5/07	2.532894737	24	2	7	0.129814	0	2.314081	0.648	0	77	?
HAIK	2009	602	2	1	9/6/07	2.565789474	24	3	7	0.108631	0	2.344134	0.648	0	99	?
HAIK	2009	602	2	1	9/7/07	2.598684211	0	3	S	0.127395	0	2.374187	0	0	93	?
HAIK	2009	602	2	1	9/8/07	2.631578947	0	3	2	0.11728	0	2.40424	0	0	87	?
HAIK	2009	602	2	1	9/9/07	2.664473684	0	3	3	0.160307	0	2.434293	0	0	79	?
HAIK	2009	602	2	1	9/10/07	2.697368421	0	3	4	0.150265	0	2.464346	0	0	72	?
HAIK	2009	602	2	1	9/11/07	2.730263158	0	3	5	0.121678	0	2.494399	0	0	66	?
HAIK	2009	602	2	1	9/12/07	2.763157895	0	3	6	0.141616	0	2.524452	0	0	60	?
HAIK	2009	602	2	1	9/13/07	2.796052632	0	3	7	0.143302	0	2.554505	0	0	53	?
HAIK	2009	602	2	1	9/14/07	2.828947368	22	S	7	0.144987	0	2.584558	0.594	0	70	?
HAIK	2009	602	2	1	9/15/07	2.861842105	24	2	7	0.089279	0	2.614611	0.648	0	91	?
HAIK	2009	602	2	1	9/16/07	2.894736842	24	3	7	0.135458	0	2.644664	0.648	0	100	?
HAIK	2009	602	2	1	9/17/07	2.927631579	0	3	S	0.169616	0.02	2.674717	0	0	93	?
HAIK	2009	602	2	1	9/18/07	2.960526316	0	3	2	0.145134	0.02	2.70477	0	0	87	?
HAIK	2009	602	2	1	9/19/07	2.993421053	0	3	3	0.173428	0	2.734823	0	0	80	?
HAIK	2009	602	2	1	9/20/07	3.026315789	22	S	3	0.175334	0	2.764876	0.594	0	94	?
HAIK	2009	602	2	1	9/21/07	3.059210526	0	1	S	0.149972	0	2.794929	0	0	88	?
HAIK	2009	602	2	1	9/22/07	3.092105263	0	1	2	0.144694	0	2.824982	0	0	82	?
HAIK	2009	602	2	1	9/23/07	3.125	0	1	3	0.160161	0	2.855035	0	0	75	?
HAIK	2009	602	2	1	9/24/07	3.157894737	0	1	4	0.147773	0	2.885088	0	0	69	?
HAIK	2009	602	2	1	9/25/07	3.190789474	22	S	4	0.149312	0	2.915141	0.594	0	84	?
HAIK	2009	602	2	1	9/26/07	3.223684211	24	2	4	0.158035	0	2.945194	0.648	0	100	?
HAIK	2009	602	2	1	9/27/07	3.256578947	24	3	4	0.116107	0	2.975247	0.648	0	100	?
HAIK	2009	602	2	1	9/28/07	3.289473684	24	4	4	0.1466	0	3.0053	0.648	0	100	
HAIK	2009	602	2	1	9/29/07	3.322368421	24	5	4	0.133259	0	3.035353	0.648	0	100	
HAIK	2009	602	2	1	9/30/07	3.355263158	0	5	S	0.157009	0	3.065406	0	0	93	
HAIK	2009	602	2	1	10/1/07	3.388157895	0	5	2	0.143448	0.09	3.095459	0	0	91	
HAIK	2009	602	2	1	10/2/07	3.421052632	0	5	3	0.19058	0.05	3.125512	0	0	85	
HAIK	2009	602	2	1	10/3/07	3.453947368	0	5	4	0.169323	0	3.155565	0	0	79	?
HAIK	2009	602	2	1	10/4/07	3.486842105	0	5	5	0.147626	0	3.185618	0	0	74	?
HAIK	2009	602	2	1	10/5/07	3.519736842	0	5	6	0.180391	0	3.215671	0	0	68	?

F602: Haiku Ditch

Crop Cycle: 2007-2009(2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAIK	2009	602	2	1	10/6/07	3.552631579	0	5	7	0.150412	0	3.245724	0	0	62	?
HAIK	2009	602	2	1	10/7/07	3.585526316	22	S	7	0.175773	0.15	3.275777	0.594	0	79	?
HAIK	2009	602	2	1	10/8/07	3.618421053	24	2	7	0.120945	0.02	3.30583	0.648	0	95	
HAIK	2009	602	2	1	10/9/07	3.651315789	24	3	7	0.170862	0.08	3.335883	0.648	0	100	
HAIK	2009	602	2	1	10/10/07	3.684210526	24	4	7	0.172402	0	3.365936	0.648	0	100	
HAIK	2009	602	2	1	10/11/07	3.717105263	24	5	7	0.165658	0	3.395989	0.648	0	100	
HAIK	2009	602	2	1	10/12/07	3.75	24	6	7	0.150412	0	3.426042	0.648	0	100	
HAIK	2009	602	2	1	10/13/07	3.782894737	0	7	7	0.151731	0.4	3.456095	0	0	100	
HAIK	2009	602	2	1	10/14/07	3.815789474	0	7	S	0.178559	0	3.486148	0	0	94	
HAIK	2009	602	2	1	10/15/07	3.848684211	0	7	2	0.19725	0.03	3.516201	0	0	88	
HAIK	2009	602	2	1	10/16/07	3.881578947	0	7	3	0.172988	0	3.546254	0	0	82	
HAIK	2009	602	2	1	10/17/07	3.914473684	0	7	4	0.148286	0	3.576307	0	0	77	
HAIK	2009	602	2	1	10/18/07	3.947368421	0	7	5	0.184716	0	3.60636	0	0	72	?
HAIK	2009	602	2	1	10/19/07	3.980263158	0	7	6	0.195125	0	3.636413	0	0	66	?
HAIK	2009	602	2	1	10/20/07	4.013157895	0	7	7	0.152024	0	3.666466	0	0	61	?
HAIK	2009	602	2	1	10/21/07	4.046052632	0	7	8	0.135239	0	3.696519	0	0	57	?
HAIK	2009	602	2	1	10/22/07	4.078947368	0	7	9	0.172695	0	3.726572	0	0	52	?
HAIK	2009	602	2	1	10/23/07	4.111842105	0	7	10	0.201575	0	3.756625	0	0	46	?
HAIK	2009	602	2	1	10/24/07	4.144736842	0	7	11	0.212423	0	3.786678	0	0	40	?
HAIK	2009	602	2	1	10/25/07	4.177631579	22	S	11	0.195491	0.05	3.816731	0.594	0	51	?
HAIK	2009	602	2	1	10/26/07	4.210526316	24	2	11	0.206413	0.04	3.846784	0.648	0	64	?
HAIK	2009	602	2	1	10/27/07	4.243421053	24	3	11	0.217481	0	3.876837	0.648	0	74	?
HAIK	2009	602	2	1	10/28/07	4.276315789	24	4	11	0.181051	0.1	3.90689	0.648	0	88	
HAIK	2009	602	2	1	10/29/07	4.309210526	24	5	11	0.201648	0.09	3.936943	0.648	0	100	
HAIK	2009	602	2	1	10/30/07	4.342105263	0	5	S	0.222539	0	3.966996	0	0	93	
HAIK	2009	602	2	1	10/31/07	4.375	0	5	2	0.17548	0	3.997049	0	0	88	
HAIK	2009	602	2	1	11/1/07	4.407894737	0	S	2	0.124812	0.3	3.010163	0	0	100	
HAIK	2009	602	2	1	11/2/07	4.440789474	0	1	S	0.096156	0	3.032627	0	0	96	SC
HAIK	2009	602	2	1	11/3/07	4.473684211	0	1	2	0.081966	0	3.05509	0	0	92	
HAIK	2009	602	2	1	11/4/07	4.506578947	0	1	3	0.030025	0	3.077554	0	0	91	
HAIK	2009	602	2	1	11/5/07	4.539473684	0	S	3	0.098293	0.6	3.100018	0	0	100	
HAIK	2009	602	2	1	11/6/07	4.572368421	0	1	S	0.083774	0	3.122482	0	0	96	
HAIK	2009	602	2	1	11/7/07	4.605263158	0	1	2	0.099718	0	3.144946	0	0	92	
HAIK	2009	602	2	1	11/8/07	4.638157895	0	1	3	0.108155	0	3.16741	0	0	88	
HAIK	2009	602	2	1	11/9/07	4.671052632	0	1	4	0.147823	0	3.189874	0	0	83	
HAIK	2009	602	2	1	11/10/07	4.703947368	0	1	5	0.141029	0	3.212338	0	0	78	

F602: Haiku Ditch

Crop Cycle: 2007-2009(2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAIK	2009	602	2	1	11/11/07	4.736842105	0	1	6	0.118346	0	3.234802	0	0	74	
HAIK	2009	602	2	1	11/12/07	4.769736842	22	S	6	0.095335	0	3.257266	0.594	0	89	
HAIK	2009	602	2	1	11/13/07	4.802631579	24	2	6	0.127989	0	3.279729	0.648	0	100	
HAIK	2009	602	2	1	11/14/07	4.835526316	24	3	6	0.13692	0	3.302193	0.648	0	100	
HAIK	2009	602	2	1	11/15/07	4.868421053	0	3	S	0.137852	0	3.324657	0	0	95	
HAIK	2009	602	2	1	11/16/07	4.901315789	0	3	2	0.130619	0	3.347121	0	0	90	
HAIK	2009	602	2	1	11/17/07	4.934210526	0	3	3	0.139715	0	3.369585	0	0	85	
HAIK	2009	602	2	1	11/18/07	4.967105263	0	3	4	0.132373	0	3.392049	0	0	81	
HAIK	2009	602	2	1	11/19/07	5	0	3	5	0.116593	0	3.414513	0	0	77	
HAIK	2009	602	2	1	11/20/07	5.032894737	0	S	5	0.100594	0.3	3.436977	0	0	82	
HAIK	2009	602	2	1	11/21/07	5.065789474	0	1	S	0.084377	0	3.459441	0	0	79	
HAIK	2009	602	2	1	11/22/07	5.098684211	0	S	1	0.127387	0.57	3.481905	0	0	91	
HAIK	2009	602	2	1	11/23/07	5.131578947	0	1	S	0.128209	0.05	3.504368	0	0	89	
HAIK	2009	602	2	1	11/24/07	5.164473684	0	1	2	0.137632	0.1	3.526832	0	0	87	
HAIK	2009	602	2	1	11/25/07	5.197368421	0	1	3	0.121195	0	3.549296	0	0	83	
HAIK	2009	602	2	1	11/26/07	5.230263158	0	1	4	0.113251	0	3.57176	0	0	79	
HAIK	2009	602	2	1	11/27/07	5.263157895	22	S	4	0.105197	0	3.594224	0.594	0	92	
HAIK	2009	602	2	1	11/28/07	5.296052632	24	2	4	0.035285	0	3.616688	0.648	0	100	
HAIK	2009	602	2	1	11/29/07	5.328947368	24	3	4	0.106512	0.93	3.639152	0.648	0	100	
HAIK	2009	602	2	1	11/30/07	5.361842105	24	4	4	0.107169	0	3.661616	0.648	0	100	
HAIK	2009	602	2	1	12/1/07	5.394736842	0	4	S	0.098841	0	3.68408	0	0	96	
HAIK	2009	602	2	1	12/2/07	5.427631579	0	S	1	0.072323	0.38	3.706544	0	0	100	
HAIK	2009	602	2	1	12/3/07	5.460526316	0	2	1	0.045476	0.63	3.729007	0	0	100	
HAIK	2009	602	2	1	12/4/07	5.493421053	0	3	1	0.155549	1.5	3.751471	0	0	100	
HAIK	2009	602	2	1	12/5/07	5.526315789	0	4	1	0.064433	0.32	3.773935	0	0	100	
HAIK	2009	602	2	1	12/6/07	5.559210526	0	5	1	0.064817	2.2	3.796399	0	0	100	
HAIK	2009	602	2	1	12/7/07	5.592105263	0	6	1	0.102457	1.1	3.818863	0	0	100	
HAIK	2009	602	2	1	12/8/07	5.625	0	7	1	0.112429	0.8	3.841327	0	0	100	
HAIK	2009	602	2	1	12/9/07	5.657894737	0	7	S	0.103663	0	3.863791	0	0	96	
HAIK	2009	602	2	1	12/10/07	5.690789474	0	7	2	0.113744	0	3.886255	0	0	93	
HAIK	2009	602	2	1	12/11/07	5.723684211	0	7	3	0.162069	0	3.908719	0	0	88	
HAIK	2009	602	2	1	12/12/07	5.756578947	0	7	4	0.163	0	3.931183	0	0	83	
HAIK	2009	602	2	1	12/13/07	5.789473684	0	7	5	0.12536	0.07	3.953646	0	0	82	
HAIK	2009	602	2	1	12/14/07	5.822368421	0	S	5	0.126072	0.42	3.97611	0	0	88	
HAIK	2009	602	2	1	12/15/07	5.855263158	0	2	5	0.136537	0.35	3.998574	0	0	93	
HAIK	2009	602	2	1	12/16/07	5.888157895	0	3	5	0.166726	0.22	4.021038	0	0	94	

F602: Haiku Ditch

Crop Cycle: 2007-2009(2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAIK	2009	602	2	1	12/17/07	5.921052632	0	4	5	0.187382	0.3	4.043502	0	0	96	
HAIK	2009	602	2	1	12/18/07	5.953947368	0	4	S	0.178506	0.04	4.065966	0	0	92	
HAIK	2009	602	2	1	12/19/07	5.986842105	0	4	2	0.16952	0	4.08843	0	0	88	
HAIK	2009	602	2	1	12/20/07	6.019736842	0	4	3	0.15	0	4.1	0	0	84	
HAIK	2009	602	2	1	12/21/07	6.052631579	0	4	4	0.14	0	4.1	0	0	80	
HAIK	2009	602	2	1	12/22/07	6.085526316	0	4	5	0.14	0.01	4.1	0	0	77	
HAIK	2009	602	2	1	12/23/07	6.118421053	0	4	6	0.13	0	4.1	0	0	74	
HAIK	2009	602	2	1	12/24/07	6.151315789	0	4	7	0.1	0.06	4.1	0	0	73	
HAIK	2009	602	2	1	12/25/07	6.184210526	0	4	8	0.1668	0.12	4.1	0	0	72	
HAIK	2009	602	2	1	12/26/07	6.217105263	0	4	9	0.1668	0.03	4.1	0	0	69	
HAIK	2009	602	2	1	12/27/07	6.25	0	4	10	0.1668	0.03	4.1	0	0	65	
HAIK	2009	602	2	1	12/28/07	6.282894737	0	4	11	0.1668	0.02	4.1	0	0	62	
HAIK	2009	602	2	1	12/29/07	6.315789474	0	4	12	0.14	0	4.1	0	0	58	
HAIK	2009	602	2	1	12/30/07	6.348684211	0	4	13	0.08	0	4.1	0	0	56	?
HAIK	2009	602	2	1	12/31/07	6.381578947	0	4	14	0.05	0.09	4.1	0	0	57	?
HAIK	2009	602	2	1	1/1/08	6.414473684	0	S	14	0.13	0.7	4.1	0	0	71	
HAIK	2009	602	2	1	1/2/08	6.447368421	0	1	S	0.1	0	4.1	0	0	69	
HAIK	2009	602	2	1	1/3/08	6.480263158	0	1	2	0.14	0.13	4.1	0	0	69	
HAIK	2009	602	2	1	1/4/08	6.513157895	0	1	3	0.15	0	4.1	0	0	65	
HAIK	2009	602	2	1	1/5/08	6.546052632	0	1	4	0.12	0.02	4.1	0	0	62	?
HAIK	2009	602	2	1	1/6/08	6.578947368	0	1	5	0.12	0	4.1	0	0	60	?
HAIK	2009	602	2	1	1/7/08	6.611842105	0	1	6	0.13	0	4.1	0	0	56	?
HAIK	2009	602	2	1	1/8/08	6.644736842	0	1	7	0.11	0	4.1	0	0	54	?
HAIK	2009	602	2	1	1/9/08	6.677631579	0	1	8	0.11	0	4.1	0	0	51	?
HAIK	2009	602	2	1	1/10/08	6.710526316	0	1	9	0.12	0	4.1	0	0	48	?
HAIK	2009	602	2	1	1/11/08	6.743421053	0	1	10	0.12	0	4.1	0	0	45	?
HAIK	2009	602	2	1	1/12/08	6.776315789	0	1	11	0.13	0	4.1	0	0	42	?
HAIK	2009	602	2	1	1/13/08	6.809210526	0	1	12	0.1	0	4.1	0	0	40	?
HAIK	2009	602	2	1	1/14/08	6.842105263	0	1	13	0.16	0.03	4.1	0	0	36	?
HAIK	2009	602	2	1	1/15/08	6.875	22	S	13	0.14	0.04	4.1	0.594	0	48	?
HAIK	2009	602	2	1	1/16/08	6.907894737	24	2	13	0.15	0	4.1	0.648	0	61	?
HAIK	2009	602	2	1	1/17/08	6.940789474	24	3	13	0.14	0	4.1	0.648	0	73	?
HAIK	2009	602	2	1	1/18/08	6.973684211	24	4	13	0.13	0	4.1	0.648	0	86	
HAIK	2009	602	2	1	1/19/08	7.006578947	24	5	13	0.12	0	4.1	0.648	0	98	
HAIK	2009	602	2	1	1/20/08	7.039473684	0	5	S	0.1755	0.09	4.1	0	0	96	
HAIK	2009	602	2	1	1/21/08	7.072368421	0	5	2	0.1755	0	4.1	0	0	92	

F602: Haiku Ditch

Crop Cycle: 2007-2009(2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAIK	2009	602	2	1	1/22/08	7.105263158	0	5	3	0.1755	0	4.1	0	0	88	
HAIK	2009	602	2	1	1/23/08	7.138157895	0	5	4	0.15	0	4.1	0	0	84	
HAIK	2009	602	2	1	1/24/08	7.171052632	0	5	5	0.2	0.03	4.1	0	0	80	?
HAIK	2009	602	2	1	1/25/08	7.203947368	0	5	6	0.15	0	4.1	0	0	76	?
HAIK	2009	602	2	1	1/26/08	7.236842105	0	S	6	0.2	0.3	4.1	0	0	79	?
HAIK	2009	602	2	1	1/27/08	7.269736842	0	1	S	0.18	0.06	4.1	0	0	76	?
HAIK	2009	602	2	1	1/28/08	7.302631579	22	S	1	0.14	0.05	4.1	0.594	0	88	
HAIK	2009	602	2	1	1/29/08	7.335526316	24	2	1	0.08	0.26	4.1	0.648	0	100	
HAIK	2009	602	2	1	1/30/08	7.368421053	4	3	1	0.07	0.6	4.1	0.108	0	100	
HAIK	2009	602	2	1	1/31/08	7.401315789	0	4	1	0.1	0.38	4.1	0	0	100	
HAIK	2009	602	2	1	2/1/08	7.434210526	0	5	1	0.09	0.56	4.1	0	0	100	
HAIK	2009	602	2	1	2/2/08	7.467105263	0	6	1	0.06	0.58	4.1	0	0	100	
HAIK	2009	602	2	1	2/3/08	7.5	0	7	1	0.13	0.75	4.1	0	0	100	
HAIK	2009	602	2	1	2/4/08	7.532894737	0	7	S	0.11	0.07	4.1	0	0	99	
HAIK	2009	602	2	1	2/5/08	7.565789474	0	7	2	0.09	0.06	4.1	0	0	98	
HAIK	2009	602	2	1	2/6/08	7.598684211	0	7	3	0.09	0.02	4.1	0	0	96	
HAIK	2009	602	2	1	2/7/08	7.631578947	22	S	3	0.13	0	4.1	0.594	0	100	
HAIK	2009	602	2	1	2/8/08	7.664473684	0	1	S	0.16	0.03	4.1	0	0	96	
HAIK	2009	602	2	1	2/9/08	7.697368421	0	1	2	0.19	0	4.1	0	0	92	
HAIK	2009	602	2	1	2/10/08	7.730263158	0	1	3	0.19	0	4.1	0	0	87	
HAIK	2009	602	2	1	2/11/08	7.763157895	0	1	4	0.19	0	4.1	0	0	82	
HAIK	2009	602	2	1	2/12/08	7.796052632	0	1	5	0.18	0	4.1	0	0	78	
HAIK	2009	602	2	1	2/13/08	7.828947368	0	1	6	0.18	0	4.1	0	0	74	
HAIK	2009	602	2	1	2/14/08	7.861842105	0	1	7	0.19	0	4.1	0	0	69	
HAIK	2009	602	2	1	2/15/08	7.894736842	22	S	7	0.17	0	4.1	0.594	0	79	
HAIK	2009	602	2	1	2/16/08	7.927631579	24	2	7	0.15	0	4.1	0.648	0	92	
HAIK	2009	602	2	1	2/17/08	7.960526316	24	3	7	0.14	0	4.1	0.648	0	100	
HAIK	2009	602	2	1	2/18/08	7.993421053	24	4	7	0.15	0	4.1	0.648	0	100	
HAIK	2009	602	2	1	2/19/08	8.026315789	7	4	S	0.17	0	4.1	0.189	0	100	
HAIK	2009	602	2	1	2/20/08	8.059210526	0	4	2	0.17	0	4.1	0	0	95	
HAIK	2009	602	2	1	2/21/08	8.092105263	0	4	3	0.17	0	4.1	0	0	91	
HAIK	2009	602	2	1	2/22/08	8.125	0	4	4	0.16	0	4.1	0	0	87	
HAIK	2009	602	2	1	2/23/08	8.157894737	0	4	5	0.15	0	4.1	0	0	84	
HAIK	2009	602	2	1	2/24/08	8.190789474	0	4	6	0.16	0	4.1	0	0	80	
HAIK	2009	602	2	1	2/25/08	8.223684211	0	S	6	0.12	0.28	4.1	0	0	84	
HAIK	2009	602	2	1	2/26/08	8.256578947	0	1	S	0.15	0	4.1	0	0	80	

F602: Haiku Ditch

Crop Cycle: 2007-2009(2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAIK	2009	602	2	1	2/27/08	8.289473684	0	1	2	0.17	0	4.1	0	0	76	
HAIK	2009	602	2	1	2/28/08	8.322368421	22	S	2	0.17	0	4.1	0.594	0	86	
HAIK	2009	602	2	1	2/29/08	8.355263158	24	2	2	0.19	0	4.1	0.648	0	97	
HAIK	2009	602	2	1	3/1/08	8.388157895	24	3	2	0.18	0	4.1	0.648	0	100	
HAIK	2009	602	2	1	3/2/08	8.421052632	0	3	S	0.17	0	4.1	0	0	95	
HAIK	2009	602	2	1	3/3/08	8.453947368	0	3	2	0.19	0	4.1	0	0	91	
HAIK	2009	602	2	1	3/4/08	8.486842105	0	3	3	0.18	0	4.1	0	0	86	
HAIK	2009	602	2	1	3/5/08	8.519736842	0	3	4	0.18	0	4.1	0	0	82	
HAIK	2009	602	2	1	3/6/08	8.552631579	0	3	5	0.2	0	4.1	0	0	77	
HAIK	2009	602	2	1	3/7/08	8.585526316	0	3	6	0.15	0	4.1	0	0	73	
HAIK	2009	602	2	1	3/8/08	8.618421053	0	3	7	0.16	0	4.1	0	0	70	
HAIK	2009	602	2	1	3/9/08	8.651315789	0	3	8	0.19	0	4.1	0	0	65	
HAIK	2009	602	2	1	3/10/08	8.684210526	0	3	9	0.18	0	4.1	0	0	60	
HAIK	2009	602	2	1	3/11/08	8.717105263	0	3	10	0.18	0	4.1	0	0	56	
HAIK	2009	602	2	1	3/12/08	8.75	0	3	11	0.23	0	4.1	0	0	50	
HAIK	2009	602	2	1	3/13/08	8.782894737	0	3	12	0.26	0	4.1	0	0	44	?
HAIK	2009	602	2	1	3/14/08	8.815789474	0	3	13	0.24	0	4.1	0	0	38	?
HAIK	2009	602	2	1	3/15/08	8.848684211	0	3	14	0.26	0	4.1	0	0	32	?
HAIK	2009	602	2	1	3/16/08	8.881578947	0	3	15	0.2	0	4.1	0	0	27	?
HAIK	2009	602	2	1	3/17/08	8.914473684	0	3	16	0.15	0	4.1	0	0	23	?
HAIK	2009	602	2	1	3/18/08	8.947368421	0	3	17	0.23	0	4.1	0	0	18	?
HAIK	2009	602	2	1	3/19/08	8.980263158	0	3	18	0.25	0	4.1	0	0	12	?
HAIK	2009	602	2	1	3/20/08	9.013157895	0	3	19	0.18	0	4.1	0	0	7	?
HAIK	2009	602	2	1	3/21/08	9.046052632	0	3	20	0.21	0	4.1	0	0	2	?
HAIK	2009	602	2	1	3/22/08	9.078947368	16	S	20	0.22	0	4.1	0.432	0	7	?
HAIK	2009	602	2	1	3/23/08	9.111842105	24	2	20	0.27	0	4.1	0.648	0	17	?
HAIK	2009	602	2	1	3/24/08	9.144736842	24	3	20	0.24	0	4.1	0.648	0	27	?
HAIK	2009	602	2	1	3/25/08	9.177631579	24	4	20	0.24	0	4.1	0.648	0	36	?
HAIK	2009	602	2	1	3/26/08	9.210526316	0	4	S	0.27	0	4.1	0	0	30	?
HAIK	2009	602	2	1	3/27/08	9.243421053	0	4	2	0.26	0	4.1	0	0	24	?
HAIK	2009	602	2	1	3/28/08	9.276315789	0	4	3	0.25	0	4.1	0	0	17	?
HAIK	2009	602	2	1	3/29/08	9.309210526	22	S	3	0.29	0	4.1	0.594	0	25	?
HAIK	2009	602	2	1	3/30/08	9.342105263	24	2	3	0.26	0	4.1	0.648	0	34	?
HAIK	2009	602	2	1	3/31/08	9.375	24	3	3	0.28	0	4.1	0.648	0	43	?
HAIK	2009	602	2	1	4/1/08	9.407894737	0	3	S	0.27	0	4.1	0	0	37	SC?
HAIK	2009	602	2	1	4/2/08	9.440789474	0	3	2	0.18	0	4.1	0	0	32	?

F602: Haiku Ditch

Crop Cycle: 2007-2009(2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAIK	2009	602	2	1	4/3/08	9.473684211	0	3	3	0.16	0.08	4.1	0	0	30	?
HAIK	2009	602	2	1	4/4/08	9.506578947	0	3	4	0.23	0.1	4.1	0	0	27	?
HAIK	2009	602	2	1	4/5/08	9.539473684	0	3	5	0.25	0.02	4.1	0	0	22	?
HAIK	2009	602	2	1	4/6/08	9.572368421	0	3	6	0.19	0	4.1	0	0	17	?
HAIK	2009	602	2	1	4/7/08	9.605263158	0	3	7	0.21	0.18	4.1	0	0	16	?
HAIK	2009	602	2	1	4/8/08	9.638157895	22	S	7	0.19	0.02	4.1	0.594	0	27	?
HAIK	2009	602	2	1	4/9/08	9.671052632	24	2	7	0.07	0	4.1	0.648	0	41	?
HAIK	2009	602	2	1	4/10/08	9.703947368	24	3	7	0.17	0.48	4.1	0.648	0	64	?
HAIK	2009	602	2	1	4/11/08	9.736842105	24	4	7	0.21	0	4.1	0.648	0	75	
HAIK	2009	602	2	1	4/12/08	9.769736842	24	5	7	0.21	0	4.1	0.648	0	85	
HAIK	2009	602	2	1	4/13/08	9.802631579	24	6	7	0.26	0.08	4.1	0.648	0	97	
HAIK	2009	602	2	1	4/14/08	9.835526316	24	7	7	0.31	0.09	4.1	0.648	0	100	
HAIK	2009	602	2	1	4/15/08	9.868421053	0	7	S	0.28	0	4.1	0	0	93	
HAIK	2009	602	2	1	4/16/08	9.901315789	0	7	2	0.23	0	4.1	0	0	87	
HAIK	2009	602	2	1	4/17/08	9.934210526	0	7	3	0.19	0	4.1	0	0	82	
HAIK	2009	602	2	1	4/18/08	9.967105263	0	7	4	0.23	0	4.1	0	0	77	
HAIK	2009	602	2	1	4/19/08	10	0	7	5	0.26	0	4.1	0	0	70	
HAIK	2009	602	2	1	4/20/08	10.03289474	0	7	6	0.29	0	4.1	0	0	63	?
HAIK	2009	602	2	1	4/21/08	10.06578947	0	7	7	0.31	0	4.1	0	0	56	?
HAIK	2009	602	2	1	4/22/08	10.09868421	0	7	8	0.25	0	4.1	0	0	50	?
HAIK	2009	602	2	1	4/23/08	10.13157895	0	7	9	0.18	0	4.1	0	0	45	?
HAIK	2009	602	2	1	4/24/08	10.16447368	22	S	9	0.22	0	4.1	0.594	0	54	?
HAIK	2009	602	2	1	4/25/08	10.19736842	24	2	9	0.22	0	4.1	0.648	0	65	?
HAIK	2009	602	2	1	4/26/08	10.23026316	0	2	S	0.24	0	4.1	0	0	59	?
HAIK	2009	602	2	1	4/27/08	10.26315789	0	2	2	0.26	0	4.1	0	0	53	?
HAIK	2009	602	2	1	4/28/08	10.29605263	0	2	3	0.26	0	4.1	0	0	46	?
HAIK	2009	602	2	1	4/29/08	10.32894737	0	2	4	0.15	0	4.1	0	0	43	?
HAIK	2009	602	2	1	4/30/08	10.36184211	0	2	5	0.26	0	4.1	0	0	36	?
HAIK	2009	602	2	1	5/1/08	10.39473684	0	2	6	0.29	0	4.1	0	0	29	?
HAIK	2009	602	2	1	5/2/08	10.42763158	0	2	7	0.31	0	4.1	0	0	22	?
HAIK	2009	602	2	1	5/3/08	10.46052632	0	2	8	0.24	0	4.1	0	0	16	?
HAIK	2009	602	2	1	5/4/08	10.49342105	0	2	9	0.26	0	4.1	0	0	10	?
HAIK	2009	602	2	1	5/5/08	10.52631579	0	2	10	0.26	0	4.1	0	0	3	?
HAIK	2009	602	2	1	5/6/08	10.55921053	0	2	11	0.28	0	4.1	0	0.28	0	WS-0
HAIK	2009	602	2	1	5/7/08	10.59210526	0	2	12	0.3	0	4.1	0	0.3	0	WS-1
HAIK	2009	602	2	1	5/8/08	10.625	0	2	13	0.34	0.03	4.1	0	0.34	0	WS-2

F602: Haiku Ditch

Crop Cycle: 2007-2009(2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAIK	2009	602	2	1	5/9/08	10.65789474	0	2	14	0.32	0	4.1	0	0.32	0	WS-3
HAIK	2009	602	2	1	5/10/08	10.69078947	0	2	15	0.35	0	4.1	0	0.35	0	WS-4
HAIK	2009	602	2	1	5/11/08	10.72368421	0	2	16	0.36	0.05	4.1	0	0.36	0	WS-5
HAIK	2009	602	2	1	5/12/08	10.75657895	0	2	17	0.31	0	4.1	0	0.31	0	WS-6
HAIK	2009	602	2	1	5/13/08	10.78947368	0	2	18	0.17	0	4.1	0	0.17	0	WS-7
HAIK	2009	602	2	1	5/14/08	10.82236842	0	2	19	0.25	0	4.1	0	0.25	0	WS-8
HAIK	2009	602	2	1	5/15/08	10.85526316	0	2	20	0.23	0	4.1	0	0.23	0	WS-9
HAIK	2009	602	2	1	5/16/08	10.88815789	22	S	20	0.23	0	4.1	0.594	0	8	?
HAIK	2009	602	2	1	5/17/08	10.92105263	24	2	20	0.28	0	4.1	0.648	0	17	?
HAIK	2009	602	2	1	5/18/08	10.95394737	24	3	20	0.29	0	4.1	0.648	0	26	?
HAIK	2009	602	2	1	5/19/08	10.98684211	24	4	20	0.3	0	4.1	0.648	0	35	?
HAIK	2009	602	2	1	5/20/08	11.01973684	24	5	20	0.27	0	4.1	0.648	0	44	?
HAIK	2009	602	2	1	5/21/08	11.05263158	0	5	S	0.22	0	4.1	0	0	38	?
HAIK	2009	602	2	1	5/22/08	11.08552632	0	5	2	0.17	0	4.1	0	0	34	?
HAIK	2009	602	2	1	5/23/08	11.11842105	0	5	3	0.27	0	4.1	0	0	28	?
HAIK	2009	602	2	1	5/24/08	11.15131579	0	5	4	0.29	0	4.1	0	0	21	?
HAIK	2009	602	2	1	5/25/08	11.18421053	0	5	5	0.34	0	4.1	0	0	12	?
HAIK	2009	602	2	1	5/26/08	11.21710526	0	5	6	0.31	0	4.1	0	0	5	?
HAIK	2009	602	2	1	5/27/08	11.25	0	5	7	0.29	0	4.1	0	0.29	0	WS-0?
HAIK	2009	602	2	1	5/28/08	11.28289474	0	5	8	0.31	0	4.1	0	0.31	0	WS-1
HAIK	2009	602	2	1	5/29/08	11.31578947	0	5	9	0.32	0	4.1	0	0.32	0	WS-2
HAIK	2009	602	2	1	5/30/08	11.34868421	0	5	10	0.35	0	4.1	0	0.35	0	WS-3
HAIK	2009	602	2	1	5/31/08	11.38157895	0	5	11	0.33	0	4.1	0	0.33	0	WS-4
HAIK	2009	602	2	1	6/1/08	11.41447368	0	5	12	0.32	0	4.1	0	0.32	0	WS-5
HAIK	2009	602	2	1	6/2/08	11.44736842	0	5	13	0.35	0	4.1	0	0.35	0	WS-6
HAIK	2009	602	2	1	6/3/08	11.48026316	0	5	14	0.36	0	4.1	0	0.36	0	WS-7
HAIK	2009	602	2	1	6/4/08	11.51315789	24	S	14	0.24	0	4.1	0.648	0	9	?
HAIK	2009	602	2	1	6/5/08	11.54605263	0	1	S	0.35	0	4.1	0	0	1	
HAIK	2009	602	2	1	6/6/08	11.57894737	0	1	2	0.3	0	4.1	0	0.3	0	WS-0
HAIK	2009	602	2	1	6/7/08	11.61184211	0	1	3	0.27	0	4.1	0	0.27	0	WS-1
HAIK	2009	602	2	1	6/8/08	11.64473684	0	1	4	0.32	0	4.1	0	0.32	0	WS-2
HAIK	2009	602	2	1	6/9/08	11.67763158	0	1	5	0.36	0	4.1	0	0.36	0	WS-3
HAIK	2009	602	2	1	6/10/08	11.71052632	0	1	6	0.34	0	4.1	0	0.34	0	WS-4
HAIK	2009	602	2	1	6/11/08	11.74342105	0	1	7	0.16	0	4.1	0	0.16	0	WS-5
HAIK	2009	602	2	1	6/12/08	11.77631579	0	1	8	0.24	0	4.1	0	0.24	0	WS-6
HAIK	2009	602	2	1	6/13/08	11.80921053	0	1	9	0.33	0	4.1	0	0.33	0	WS-7

F602: Haiku Ditch

Crop Cycle: 2007-2009(2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAIK	2009	602	2	1	6/14/08	11.84210526	0	1	10	0.3	0	4.1	0	0.3	0	WS-8
HAIK	2009	602	2	1	6/15/08	11.875	0	1	11	0.33	0	4.1	0	0.33	0	WS-9
HAIK	2009	602	2	1	6/16/08	11.90789474	0	1	12	0.26	0	4.1	0	0.26	0	WS-10
HAIK	2009	602	2	1	6/17/08	11.94078947	0	1	13	0.25	0	4.1	0	0.25	0	WS-11
HAIK	2009	602	2	1	6/18/08	11.97368421	0	1	14	0.31	0	4.1	0	0.31	0	WS-12
HAIK	2009	602	2	1	6/19/08	12.00657895	0	1	15	0.32	0	4.1	0	0.32	0	WS-13
HAIK	2009	602	2	1	6/20/08	12.03947368	0	1	16	0.33	0	4.1	0	0.33	0	WS-14
HAIK	2009	602	2	1	6/21/08	12.07236842	0	1	17	0.33	0	4.1	0	0.33	0	WS-15
HAIK	2009	602	2	1	6/22/08	12.10526316	0	1	18	0.29	0	4.1	0	0.29	0	WS-16
HAIK	2009	602	2	1	6/23/08	12.13815789	24	S	18	0.36	0	4.1	0.648	0	7	?
HAIK	2009	602	2	1	6/24/08	12.17105263	0	1	S	0.36	0	4.1	0	0.36	0	WS-0
HAIK	2009	602	2	1	6/25/08	12.20394737	0	1	2	0.37	0	4.1	0	0.37	0	WS-1
HAIK	2009	602	2	1	6/26/08	12.23684211	0	1	3	0.31	0	4.1	0	0.31	0	WS-2
HAIK	2009	602	2	1	6/27/08	12.26973684	0	1	4	0.27	0	4.1	0	0.27	0	WS-3
HAIK	2009	602	2	1	6/28/08	12.30263158	0	1	5	0.28	0	4.1	0	0.28	0	WS-4
HAIK	2009	602	2	1	6/29/08	12.33552632	0	1	6	0.27	0	4.1	0	0.27	0	WS-5
HAIK	2009	602	2	1	6/30/08	12.36842105	0	1	7	0.26	0	4.1	0	0.26	0	WS-6
HAIK	2009	602	2	1	7/1/08	12.40131579	0	1	8	0.18	0	4.1	0	0.18	0	WS-7
HAIK	2009	602	2	1	7/2/08	12.43421053	0	1	9	0.26	0.1	4.1	0	0.26	0	WS-8
HAIK	2009	602	2	1	7/3/08	12.46710526	0	1	10	0.28	0	4.1	0	0.28	0	WS-9
HAIK	2009	602	2	1	7/4/08	12.5	0	1	11	0.33	0	4.1	0	0.33	0	WS-10
HAIK	2009	602	2	1	7/5/08	12.53289474	0	1	12	0.25	0	4.1	0	0.25	0	WS-11
HAIK	2009	602	2	1	7/6/08	12.56578947	0	1	13	0.28	0	4.1	0	0.28	0	WS-12
HAIK	2009	602	2	1	7/7/08	12.59868421	0	1	14	0.29	0	4.1	0	0.29	0	WS-13
HAIK	2009	602	2	1	7/8/08	12.63157895	0	1	15	0.26	0	4.1	0	0.26	0	WS-14
HAIK	2009	602	2	1	7/9/08	12.66447368	0	1	16	0.19	0	4.1	0	0.19	0	WS-15
HAIK	2009	602	2	1	7/10/08	12.69736842	0	1	17	0.28	0	4.1	0	0.28	0	WS-16
HAIK	2009	602	2	1	7/11/08	12.73026316	0	1	18	0.29	0	4.1	0	0.29	0	WS-17
HAIK	2009	602	2	1	7/12/08	12.76315789	0	1	19	0.3	0	4.1	0	0.3	0	WS-18
HAIK	2009	602	2	1	7/13/08	12.79605263	0	1	20	0.32	0	4.1	0	0.32	0	WS-19
HAIK	2009	602	2	1	7/14/08	12.82894737	0	1	21	0.27	0	4.1	0	0.27	0	WS-20
HAIK	2009	602	2	1	7/15/08	12.86184211	0	1	22	0.25	0	4.1	0	0.25	0	WS-21
HAIK	2009	602	2	1	7/16/08	12.89473684	0	1	23	0.25	0	4.1	0	0.25	0	WS-22
HAIK	2009	602	2	1	7/17/08	12.92763158	0	1	24	0.3	0	4.1	0	0.3	0	WS-23
HAIK	2009	602	2	1	7/18/08	12.96052632	0	S	24	0.28	0.44	4.1	0	0	3	?
HAIK	2009	602	2	1	7/19/08	12.99342105	0	1	S	0.25	0.03	4.1	0	0.25	0	WS-0

F602: Haiku Ditch
Crop Cycle: 2007-2009(2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAIK	2009	602	2	1	7/20/08	13.02631579	0	1	2	0.3503	0	4.1	0	0.3503	0	WS-1
HAIK	2009	602	2	1	7/21/08	13.05921053	0	1	3	0.25	0	4.1	0	0.25	0	WS-2
HAIK	2009	602	2	1	7/22/08	13.09210526	0	1	4	0.32	0	4.1	0	0.32	0	WS-3
HAIK	2009	602	2	1	7/23/08	13.125	0	1	5	0.27	0.06	4.1	0	0.27	0	WS-4
HAIK	2009	602	2	1	7/24/08	13.15789474	0	1	6	0.35	0.08	4.1	0	0.35	0	WS-5
HAIK	2009	602	2	1	7/25/08	13.19078947	24	S	6	0.34	0	4.1	0.648	0	7	?
HAIK	2009	602	2	1	7/26/08	13.22368421	0	1	S	0.3	0	4.1	0	0.3	0	WS-0
HAIK	2009	602	2	1	7/27/08	13.25657895	12	S	1	0.33	0.02	4.1	0.324	0.33	0	WS-1
HAIK	2009	602	2	1	7/28/08	13.28947368	24	2	1	0.31	0	4.1	0.648	0	8	?
HAIK	2009	602	2	1	7/29/08	13.32236842	24	3	1	0.32	0.14	4.1	0.648	0	20	?
HAIK	2009	602	2	1	7/30/08	13.35526316	16	4	1	0.35	0.04	4.1	0.432	0	23	?
HAIK	2009	602	2	1	7/31/08	13.38815789	12	5	1	0.35	0	4.1	0.324	0	22	?
HAIK	2009	602	2	1	8/1/08	13.42105263	0	5	S	0.3	0	4.1	0	0	15	?
HAIK	2009	602	2	1	8/2/08	13.45394737	0	5	2	0.3	0	4.1	0	0	7	?
HAIK	2009	602	2	1	8/3/08	13.48684211	0	5	3	0.17	0	4.1	0	0	3	
HAIK	2009	602	2	1	8/4/08	13.51973684	0	5	4	0.29	0.04	4.1	0	0.29	0	WS-0?
HAIK	2009	602	2	1	8/5/08	13.55263158	0	5	5	0.37	0	4.1	0	0.37	0	WS-1
HAIK	2009	602	2	1	8/6/08	13.58552632	24	S	5	0.26	0	4.1	0.648	0	9	?
HAIK	2009	602	2	1	8/7/08	13.61842105	24	2	5	0.35	0	4.1	0.648	0	16	?
HAIK	2009	602	2	1	8/8/08	13.65131579	24	3	5	0.33	0	4.1	0.648	0	24	?
HAIK	2009	602	2	1	8/9/08	13.68421053	24	4	5	0.35	0	4.1	0.648	0	31	?
HAIK	2009	602	2	1	8/10/08	13.71710526	0	4	S	0.28	0	4.1	0	0	24	?
HAIK	2009	602	2	1	8/11/08	13.75	24	S	1	0.32	0.03	4.1	0.648	0	33	?
HAIK	2009	602	2	1	8/12/08	13.78289474	7	1	S	0.36	0	4.1	0.189	0	29	?
HAIK	2009	602	2	1	8/13/08	13.81578947	0	1	2	0.25	0	4.1	0	0	23	?
HAIK	2009	602	2	1	8/14/08	13.84868421	16	S	2	0.23	0.14	4.1	0.432	0	31	?
HAIK	2009	602	2	1	8/15/08	13.88157895	0	1	S	0.33	0	4.1	0	0	23	?
HAIK	2009	602	2	1	8/16/08	13.91447368	0	1	2	0.31	0	4.1	0	0	16	?
HAIK	2009	602	2	1	8/17/08	13.94736842	0	1	3	0.36	0	4.1	0	0	7	?
HAIK	2009	602	2	1	8/18/08	13.98026316	0	1	4	0.33	0	4.1	0	0.33	0	WS-0
HAIK	2009	602	2	1	8/19/08	14.01315789	0	1	5	0.33	0	4.1	0	0.33	0	WS-1
HAIK	2009	602	2	1	8/20/08	14.04605263	0	1	6	0.21	0	4.1	0	0.21	0	WS-2
HAIK	2009	602	2	1	8/21/08	14.07894737	24	S	6	0.32	0	4.1	0.648	0	8	?
HAIK	2009	602	2	1	8/22/08	14.11184211	0	1	S	0.3	0.08	4.1	0	0	2	?
HAIK	2009	602	2	1	8/23/08	14.14473684	0	1	2	0.31	0	4.1	0	0.31	0	WS-0
HAIK	2009	602	2	1	8/24/08	14.17763158	0	1	3	0.28	0	4.1	0	0.28	0	WS-1

F602: Haiku Ditch
Crop Cycle: 2007-2009(2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAIK	2009	602	2	1	8/25/08	14.21052632	0	1	4	0.3	0	4.1	0	0.3	0	WS-2
HAIK	2009	602	2	1	8/26/08	14.24342105	0	1	5	0.27	0	4.1	0	0.27	0	WS-3
HAIK	2009	602	2	1	8/27/08	14.27631579	0	1	6	0.25	0	4.1	0	0.25	0	WS-4
HAIK	2009	602	2	1	8/28/08	14.30921053	0	1	7	0.31	0.03	4.1	0	0.31	0	WS-5
HAIK	2009	602	2	1	8/29/08	14.34210526	0	1	8	0.26	0	4.1	0	0.26	0	WS-6
HAIK	2009	602	2	1	8/30/08	14.375	0	1	9	0.24	0	4.1	0	0.24	0	WS-7
HAIK	2009	602	2	1	8/31/08	14.40789474	0	1	10	0.29	0	4.1	0	0.29	0	WS-8
HAIK	2009	602	2	1	9/1/08	14.44078947	0	1	11	0.27	0	4.1	0	0.27	0	WS-9
HAIK	2009	602	2	1	9/2/08	14.47368421	0	1	12	0.3	0.05	4.1	0	0.3	0	WS-10
HAIK	2009	602	2	1	9/3/08	14.50657895	0	1	13	0.26	0	4.1	0	0.26	0	WS-11
HAIK	2009	602	2	1	9/4/08	14.53947368	24	S	13	0.29	0	4.1	0.648	0	8	?
HAIK	2009	602	2	1	9/5/08	14.57236842	24	2	13	0.26	0	4.1	0.648	0	18	?
HAIK	2009	602	2	1	9/6/08	14.60526316	24	3	13	0.26	0	4.1	0.648	0	27	?
HAIK	2009	602	2	1	9/7/08	14.63815789	7	3	S	0.25	0	4.1	0.189	0	26	?
HAIK	2009	602	2	1	9/8/08	14.67105263	0	3	2	0.27	0	4.1	0	0	19	?
HAIK	2009	602	2	1	9/9/08	14.70394737	0	3	3	0.28	0	4.1	0	0	12	?
HAIK	2009	602	2	1	9/10/08	14.73684211	0	3	4	0.22	0	4.1	0	0	7	?
HAIK	2009	602	2	1	9/11/08	14.76973684	0	3	5	0.23	0	4.1	0	0	1	?
HAIK	2009	602	2	1	9/12/08	14.80263158	0	3	6	0.23	0	4.1	0	0.23	0	WS-0
HAIK	2009	602	2	1	9/13/08	14.83552632	0	3	7	0.16	0	4.1	0	0.16	0	WS-1
HAIK	2009	602	2	1	9/14/08	14.86842105	0	3	8	0.21	0	4.1	0	0.21	0	WS-2
HAIK	2009	602	2	1	9/15/08	14.90131579	16	S	8	0.26	0	4.1	0.432	0	4	?
HAIK	2009	602	2	1	9/16/08	14.93421053	24	2	8	0.26	0	4.1	0.648	0	13	?
HAIK	2009	602	2	1	9/17/08	14.96710526	0	2	S	0.27	0	4.1	0	0	7	?
HAIK	2009	602	2	1	9/18/08	15	0	2	2	0.24	0	4.1	0	0	1	?
HAIK	2009	602	2	1	9/19/08	15.03289474	0	2	3	0.24	0	4.1	0	0.24	0	WS-0
HAIK	2009	602	2	1	9/20/08	15.06578947	0	2	4	0.26	0	4.1	0	0.26	0	WS-1
HAIK	2009	602	2	1	9/21/08	15.09868421	0	2	5	0.27	0	4.1	0	0.27	0	WS-2
HAIK	2009	602	2	1	9/22/08	15.13157895	0	2	6	0.26	0	4.1	0	0.26	0	WS-3
HAIK	2009	602	2	1	9/23/08	15.16447368	0	2	7	0.22	0.05	4.1	0	0.22	0	WS-4
HAIK	2009	602	2	1	9/24/08	15.19736842	0	2	8	0.23	0	4.1	0	0.23	0	WS-5
HAIK	2009	602	2	1	9/25/08	15.23026316	0	2	9	0.2	0	4.1	0	0.2	0	WS-6
HAIK	2009	602	2	1	9/26/08	15.26315789	0	2	10	0.19	0	4.1	0	0.19	0	WS-7
HAIK	2009	602	2	1	9/27/08	15.29605263	0	2	11	0.18	0	4.1	0	0.18	0	WS-8
HAIK	2009	602	2	1	9/28/08	15.32894737	0	2	12	0.2	0	4.1	0	0.2	0	WS-9
HAIK	2009	602	2	1	9/29/08	15.36184211	0	2	13	0.21	0	4.1	0	0.21	0	WS-10

F602: Haiku Ditch
Crop Cycle: 2007-2009(2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAIK	2009	602	2	1	9/30/08	15.39473684	0	S	13	0.19	0.28	4.1	0	0	2	?
HAIK	2009	602	2	1	10/1/08	15.42763158	0	1	S	0.25	0	4.1	0	0.25	0	WS-0
HAIK	2009	602	2	1	10/2/08	15.46052632	0	1	2	0.22	0	4.1	0	0.22	0	WS-1
HAIK	2009	602	2	1	10/3/08	15.49342105	12	S	2	0.26	0	4.1	0.324	0	1	?
HAIK	2009	602	2	1	10/4/08	15.52631579	12	2	2	0.27	0	4.1	0.324	0	2	?
HAIK	2009	602	2	1	10/5/08	15.55921053	22	3	2	0.22	0	4.1	0.594	0	12	?
HAIK	2009	602	2	1	10/6/08	15.59210526	6	3	S	0.28	0	4.1	0.162	0	9	?
HAIK	2009	602	2	1	10/7/08	15.625	0	3	2	0.19	0	4.1	0	0	4	?
HAIK	2009	602	2	1	10/8/08	15.65789474	0	3	3	0.17	0	4.1	0	0.17	0	WS-0
HAIK	2009	602	2	1	10/9/08	15.69078947	0	3	4	0.23	0	4.1	0	0.23	0	WS-1
HAIK	2009	602	2	1	10/10/08	15.72368421	0	3	5	0.22	0.1	4.1	0	0.22	0	WS-2
HAIK	2009	602	2	1	10/11/08	15.75657895	0	3	6	0.26	0	4.1	0	0.26	0	WS-3
HAIK	2009	602	2	1	10/12/08	15.78947368	0	3	7	0.24	0	4.1	0	0.24	0	WS-4
HAIK	2009	602	2	1	10/13/08	15.82236842	0	3	8	0.16	0	4.1	0	0.16	0	WS-5
HAIK	2009	602	2	1	10/14/08	15.85526316	0	3	9	0.15	0	4.1	0	0.15	0	WS-6
HAIK	2009	602	2	1	10/15/08	15.88815789	0	3	10	0.15	0	4.1	0	0.15	0	WS-7
HAIK	2009	602	2	1	10/16/08	15.92105263	0	3	11	0.23	0	4.1	0	0.23	0	WS-8
HAIK	2009	602	2	1	10/17/08	15.95394737	0	3	12	0.24	0	4.1	0	0.24	0	WS-9
HAIK	2009	602	2	1	10/18/08	15.98684211	0	3	13	0.17	0.05	4.1	0	0.17	0	WS-10
HAIK	2009	602	2	1	10/19/08	16.01973684	0	3	14	0.25	0.05	4.1	0	0.25	0	WS-11
HAIK	2009	602	2	1	10/20/08	16.05263158	0	3	15	0.19	0	4.1	0	0.19	0	WS-12
HAIK	2009	602	2	1	10/21/08	16.08552632	0	3	16	0.18	0	4.1	0	0.18	0	WS-13
HAIK	2009	602	2	1	10/22/08	16.11842105	0	3	17	0.24	0	4.1	0	0.24	0	WS-14
HAIK	2009	602	2	1	10/23/08	16.15131579	0	3	18	0.2	0	4.1	0	0.2	0	WS-15
HAIK	2009	602	2	1	10/24/08	16.18421053	0	3	19	0.17	0	4.1	0	0.17	0	WS-16
HAIK	2009	602	2	1	10/25/08	16.21710526	0	3	20	0.14	0	4.1	0	0.14	0	WS-17
HAIK	2009	602	2	1	10/26/08	16.25	0	3	21	0.18	0	4.1	0	0.18	0	WS-18
HAIK	2009	602	2	1	10/27/08	16.28289474	0	3	22	0.14	0	4.1	0	0.14	0	WS-19
HAIK	2009	602	2	1	10/28/08	16.31578947	0	3	23	0.13	0	4.1	0	0.13	0	WS-20
HAIK	2009	602	2	1	10/29/08	16.34868421	0	3	24	0.19	0	4.1	0	0.19	0	WS-21
HAIK	2009	602	2	1	10/30/08	16.38157895	0	3	25	0.18	0	4.1	0	0.18	0	WS-22
HAIK	2009	602	2	1	10/31/08	16.41447368	22	S	25	0.2	0.09	4.1	0.594	0	11	?
HAIK	2009	602	2	1	11/1/08	16.44736842	0	1	S	0.21	0	4.1	0	0	6	SC ?
HAIK	2009	602	2	1	11/2/08	16.48026316	0	1	2	0.2	0	4.1	0	0	1	?
HAIK	2009	602	2	1	11/3/08	16.51315789	0	1	3	0.18	0	4.1	0	0.18	0	WS-0
HAIK	2009	602	2	1	11/4/08	16.54605263	0	1	4	0.11	0	4.1	0	0.11	0	WS-1

F602: Haiku Ditch
Crop Cycle: 2007-2009(2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAIK	2009	602	2	1	11/5/08	16.57894737	0	1	5	0.17	0	4.1	0	0.17	0	WS-2
HAIK	2009	602	2	1	11/6/08	16.61184211	0	1	6	0.2	0	4.1	0	0.2	0	WS-3
HAIK	2009	602	2	1	11/7/08	16.64473684	0	1	7	0.21	0	4.1	0	0.21	0	WS-4
HAIK	2009	602	2	1	11/8/08	16.67763158	0	1	8	0.22	0	4.1	0	0.22	0	WS-5
HAIK	2009	602	2	1	11/9/08	16.71052632	0	1	9	0.23	0	4.1	0	0.23	0	WS-6
HAIK	2009	602	2	1	11/10/08	16.74342105	0	1	10	0.2	0	4.1	0	0.2	0	WS-7
HAIK	2009	602	2	1	11/11/08	16.77631579	0	1	11	0.18	0	4.1	0	0.18	0	WS-8
HAIK	2009	602	2	1	11/12/08	16.80921053	0	1	12	0.15	0	4.1	0	0.15	0	WS-9
HAIK	2009	602	2	1	11/13/08	16.84210526	24	S	12	0.13	0	4.1	0.648	0	12	?
HAIK	2009	602	2	1	11/14/08	16.875	24	2	12	0.15	0.35	4.1	0.648	0	33	?
HAIK	2009	602	2	1	11/15/08	16.90789474	24	3	12	0.14	0	4.1	0.648	0	45	?
HAIK	2009	602	2	1	11/16/08	16.94078947	24	4	12	0.11	0	4.1	0.648	0	58	
HAIK	2009	602	2	1	11/17/08	16.97368421	24	5	12	0.17	0.01	4.1	0.648	0	70	
HAIK	2009	602	2	1	11/18/08	17.00657895	0	6	12	0.11	0.24	4.1	0	0	73	
HAIK	2009	602	2	1	11/19/08	17.03947368	0	7	12	0.18	0.22	4.1	0	0	74	
HAIK	2009	602	2	1	11/20/08	17.07236842	0	7	S	0.16	0	4.1	0	0	70	
HAIK	2009	602	2	1	11/21/08	17.10526316	0	7	2	0.13	0	4.1	0	0	67	
HAIK	2009	602	2	1	11/22/08	17.13815789	0	7	3	0.05	0	4.1	0	0	66	
HAIK	2009	602	2	1	11/23/08	17.17105263	0	S	3	0.17	0.2	4.1	0	0	67	
HAIK	2009	602	2	1	11/24/08	17.20394737	0	1	S	0.25	0	4.1	0	0	61	
HAIK	2009	602	2	1	11/25/08	17.23684211	0	1	2	0.21	0	4.1	0	0	56	HAF
HAIK	2009	602	2	1	11/26/08	17.26973684	0	1	3	0.21	0	4.1	0	0	50	?HAF
HAIK	2009	602	2	1	11/27/08	17.30263158	0	1	4	0.2	0	4.1	0	0	46	?
HAIK	2009	602	2	1	11/28/08	17.33552632	0	1	5	0.15	0	4.1	0	0	42	?
HAIK	2009	602	2	1	11/29/08	17.36842105	0	1	6	0.1	0	4.1	0	0	40	?
HAIK	2009	602	2	1	11/30/08	17.40131579	0	1	7	0.15	0	4.1	0	0	36	?
HAIK	2009	602	2	1	12/1/08	17.43421053	0	1	8	0.17	0.13	4.1	0	0	35	?
HAIK	2009	602	2	1	12/2/08	17.46710526	0	1	9	0.1	0	4.1	0	0	32	?
HAIK	2009	602	2	1	12/3/08	17.5	0	1	10	0.13	0.18	4.1	0	0	34	?
HAIK	2009	602	2	1	12/4/08	17.53289474	0	1	11	0.15	0	4.1	0	0	30	?
HAIK	2009	602	2	1	12/5/08	17.56578947	0	1	12	0.17	0	4.1	0	0	26	?
HAIK	2009	602	2	1	12/6/08	17.59868421	0	1	13	0.16	0	4.1	0	0	22	?
HAIK	2009	602	2	1	12/7/08	17.63157895	0	1	14	0.15	0	4.1	0	0	18	?
HAIK	2009	602	2	1	12/8/08	17.66447368	0	1	15	0.16	0	4.1	0	0	14	?
HAIK	2009	602	2	1	12/9/08	17.69736842	0	1	16	0.12	0	4.1	0	0	11	
HAIK	2009	602	2	1	12/10/08	17.73026316	0	1	17	0.13	0	4.1	0	0	8	

F602: Haiku Ditch
Crop Cycle: 2007-2009(2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAIK	2009	602	2	1	12/11/08	17.76315789	0	1	18	0.04	0	4.1	0	0	7	
HAIK	2009	602	2	1	12/12/08	17.79605263	0	S	18	0.12	3.53	4.1	0	0	90	
HAIK	2009	602	2	1	12/13/08	17.82894737	0	1	S	0.11	0	4.1	0	0	88	
HAIK	2009	602	2	1	12/14/08	17.86184211	0	S	1	0.09	0.2	4.1	0	0	90	
HAIK	2009	602	2	1	12/15/08	17.89473684	0	1	S	0.11	0.06	4.1	0	0	89	
HAIK	2009	602	2	1	12/16/08	17.92763158	0	1	2	0.15	0	4.1	0	0	86	
HAIK	2009	602	2	1	12/17/08	17.96052632	0	1	3	0.14	0	4.1	0	0	82	
HAIK	2009	602	2	1	12/18/08	17.99342105	0	1	4	0.13	0	4.1	0	0	79	
HAIK	2009	602	2	1	12/19/08	18.02631579	0	1	5	0.13	0	4.1	0	0	76	
HAIK	2009	602	2	1	12/20/08	18.05921053	0	1	6	0.16	0	4.1	0	0	72	
HAIK	2009	602	2	1	12/21/08	18.09210526	0	1	7	0.15	0	4.1	0	0	68	
HAIK	2009	602	2	1	12/22/08	18.125	0	1	8	0.17	0	4.1	0	0	64	
HAIK	2009	602	2	1	12/23/08	18.15789474	0	1	9	0.16	0	4.1	0	0	60	
HAIK	2009	602	2	1	12/24/08	18.19078947	0	1	10	0.13	0.05	4.1	0	0	58	
HAIK	2009	602	2	1	12/25/08	18.22368421	0	S	10	0.15	0.3	4.1	0		62	RIPE
HAIK	2009	602	2	1	12/26/08	18.25657895	0	2	10	0.08	0.2	4.1	0		65	RIPE
HAIK	2009	602	2	1	12/27/08	18.28947368	0	3	10	0.12	0.35	4.1	0		70	RIPE
HAIK	2009	602	2	1	12/28/08	18.32236842	0	3	S	0.12	0.03	4.1	0		68	RIPE
HAIK	2009	602	2	1	12/29/08	18.35526316	0	3	2	0.14	0	4.1	0		65	RIPE
HAIK	2009	602	2	1	12/30/08	18.38815789	0	3	3	0.07	0.02	4.1	0		64	RIPE
HAIK	2009	602	2	1	12/31/08	18.42105263	0	S	3	0.13	0.52	4.1	0		73	RIPE
HAIK	2009	602	2	1	1/1/09	18.45394737	0	1	S	0.1755	0	4.1	0		69	RIPE
HAIK	2009	602	2	1	1/2/09	18.48684211	0	1	2	0.1755	0	4.1	0		65	RIPE
HAIK	2009	602	2	1	1/3/09	18.51973684	0	1	3	0.1755	0	4.1	0		60	RIPE
HAIK	2009	602	2	1	1/4/09	18.55263158	0	1	4	0.15	0	4.1	0		57	RIPE
HAIK	2009	602	2	1	1/5/09	18.58552632	0	1	5	0.15	0	4.1	0		53	RIPE
HAIK	2009	602	2	1	1/6/09	18.61842105	0	1	6	0.1755	0	4.1	0		49	RIPE
HAIK	2009	602	2	1	1/7/09	18.65131579	0	1	7	0.1755	0	4.1	0		44	RIPE
HAIK	2009	602	2	1	1/8/09	18.68421053	0	1	8	0.1755	0	4.1	0		40	RIPE
HAIK	2009	602	2	1	1/9/09	18.71710526	0	1	9	0.1755	0	4.1	0		36	RIPE
HAIK	2009	602	2	1	1/10/09	18.75	0	1	10	0.1755	0	4.1	0		32	RIPE
HAIK	2009	602	2	1	1/11/09	18.78289474	0	1	11	0.1755	0	4.1	0		27	RIPE
HAIK	2009	602	2	1	1/12/09	18.81578947	0	1	12	0.1755	0.05	4.1	0		24	RIPE
HAIK	2009	602	2	1	1/13/09	18.84868421	0	1	13	0.1755	0	4.1	0		20	RIPE
HAIK	2009	602	2	1	1/14/09	18.88157895	0	1	14	0.1755	0	4.1	0		16	RIPE
HAIK	2009	602	2	1	1/15/09	18.91447368	0	1	15	0.1755	0	4.1	0		11	RIPE

F602: Haiku Ditch
Crop Cycle: 2007-2009(2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAIK	2009	602	2	1	1/16/09	18.94736842	0	S	15	0.1755	0.35	4.1	0		16	RIPE
HAIK	2009	602	2	1	1/17/09	18.98026316	0	2	15	0.1755	1.45	4.1	0		47	RIPE
HAIK	2009	602	2	1	1/18/09	19.01315789	0	2	S	0.1755	0	4.1	0		42	RIPE
HAIK	2009	602	2	1	1/19/09	19.04605263	0	2	2	0.1755	0	4.1	0		38	RIPE
HAIK	2009	602	2	1	1/20/09	19.07894737	0	2	3	0.1755	0	4.1	0		34	RIPE
HAIK	2009	602	2	1	1/21/09	19.11184211	0	2	4	0.1755	0	4.1	0		30	RIPE
HAIK	2009	602	2	1	1/22/09	19.14473684	0	2	5	0.1755	0	4.1	0		25	RIPE
HAIK	2009	602	2	1	1/23/09	19.17763158	0	2	6	0.1755	0	4.1	0		21	RIPE
HAIK	2009	602	2	1	1/24/09	19.21052632	0	2	7	0.1755	0	4.1	0		17	RIPE
HAIK	2009	602	2	1	1/25/09	19.24342105	0	2	8	0.1755	0	4.1	0		13	RIPE
HAIK	2009	602	2	1	1/26/09	19.27631579	0	2	9	0.1755	0	4.1	0		8	RIPE
HAIK	2009	602	2	1	1/27/09	19.30921053	0	2	10	0.1755	0.1	4.1	0		6	DRY
HAIK	2009	602	2	1	1/28/09	19.34210526	0	S	10	0.1755	1.45	4.1	0		37	DRY
HAIK	2009	602	2	1	1/29/09	19.375	0	2	10	0.1755	0.74	4.1	0		51	DRY
HAIK	2009	602	2	1	1/30/09	19.40789474	0	2	S	0.1755	0	4.1	0		47	DRY
HAIK	2009	602	2	1	1/31/09	19.44078947	0	2	2	0.1755	0	4.1	0		43	DRY
HAIK	2009	602	2	1	2/1/09	19.47368421	0	2	3	0.1793	0	4.1	0		38	DRY
HAIK	2009	602	2	1	2/2/09	19.50657895	0	2	4	0.1793	0	4.1	0		34	DRY
HAIK	2009	602	2	1	2/3/09	19.53947368	0	S	4	0.07	0.26	4.1	0		39	DRY
HAIK	2009	602	2	1	2/4/09	19.57236842	0	2	4	0.14	0.2	4.1	0		40	DRY
HAIK	2009	602	2	1	2/5/09	19.60526316	0	2	S	0.16	0	4.1	0		36	DRY
HAIK	2009	602	2	1	2/6/09	19.63815789	0	2	2	0.13	0	4.1	0		33	DRY
HAIK	2009	602	2	1	2/7/09	19.67105263	0	2	3	0.17	0	4.1	0		29	DRY
HAIK	2009	602	2	1	2/8/09	19.70394737	0	2	4	0.2	0	4.1	0		24	DRY
HAIK	2009	602	2	1	2/9/09	19.73684211	0	2	5	0.17	0	4.1	0		20	DRY
HAIK	2009	602	2	1	2/10/09	19.76973684	0	2	6	0.18	0	4.1	0		15	DRY
HAIK	2009	602	2	1	2/11/09	19.80263158	0	2	7	0.13	0	4.1	0		12	DRY
HAIK	2009	602	2	1	2/12/09	19.83552632	0	2	8	0.19	0	4.1	0		8	DRY
HAIK	2009	602	2	1	2/13/09	19.86842105	0	2	9	0.19	0	4.1	0		3	DRY
HAIK	2009	602	2	1	2/14/09	19.90131579	0	2	10	0.1793	0.16	4.1	0		2	DRY
HAIK	2009	602	2	1	2/15/09	19.93421053	0	2	11	0.24	0.03	4.1	0		0	DRY
HAIK	2009	602	2	1	2/16/09	19.96710526	0	2	12	0.24	0	4.1	0		0	DRY
HAIK	2009	602	2	1	2/17/09	20	0	2	13	0.1793	0	4.1	0		0	DRY
HAIK	2009	602	2	1	2/18/09	20.03289474	0	2	14	0.1793	0	4.1	0		0	DRY
HAIK	2009	602	2	1	2/19/09	20.06578947	0	2	15	0.1793	0.12	4.1	0		0	DRY
HAIK	2009	602	2	1	2/20/09	20.09868421	0	2	16	0.1793	0.08	4.1	0		0	DRY

F602: Haiku Ditch

Crop Cycle: 2007-2009(2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAIK	2009	602	2	1	2/21/09	20.13157895	0	2	17	0.1793	0.05	4.1	0		0	DRY
HAIK	2009	602	2	1	2/22/09	20.16447368	0	2	18	0.1793	0	4.1	0		0	DRY
HAIK	2009	602	2	1	2/23/09	20.19736842	0	2	19	0.1793	0	4.1	0		0	DRY
HAIK	2009	602	2	1	2/24/09	20.23026316	0	2	20	0.1793	0	4.1	0		0	DRY
HAIK	2009	602	2	1	2/25/09	20.26315789	0	2	21	0.1793	0	4.1	0		0	DRY
HAIK	2009	602	2	1	2/26/09	20.29605263	0	2	22	0.1793	0.04	4.1	0		0	DRY
HAIK	2009	602	2	1	2/27/09	20.32894737	0	2	23	0.1793	0	4.1	0		0	DRY
HAIK	2009	602	2	1	2/28/09	20.36184211	0	2	24	0.1793	0	4.1	0		0	DRY
HAIK	2009	602	2	1	3/1/09	20.39473684	0	2	25	0.2148	0	4.1	0		0	DRY
HAIK	2009	602	2	1	3/2/09	20.42763158	0	2	26	0.2148	0.06	4.1	0		0	DRY
HAIK	2009	602	2	1	3/3/09	20.46052632	0	5	26	0.2148	0.24	4.1	0		0	DRY
HAIK	2009	602	2	1	3/4/09	20.49342105	0	2	26	0.2148	0.2	4.1	0		0	DRY
HAIK	2009	602	2	1	3/5/09	20.52631579	0	2	5	0.2148	0	4.1	0		0	DRY
HAIK	2009	602	2	1	3/6/09	20.55921053	0	2	2	0.2148	0	4.1	0		0	DRY
HAIK	2009	602	2	1	3/7/09	20.59210526	0	2	3	0.2148	0.18	4.1	0		0	DRY
HAIK	2009	602	2	1	3/8/09	20.625	0	2	4	0.2148	0.06	4.1	0		0	DRY
HAIK	2009	602	2	1	3/9/09	20.65789474	0	2	5	0.2148	0.12	4.1	0		0	DRY
HAIK	2009	602	2	1	3/10/09	20.69078947	0	2	6	0.2148	0	4.1	0		0	DRY
HAIK	2009	602	2	1	3/11/09	20.72368421	0	2	7	0.2148	0	4.1	0		0	DRY
HAIK	2009	602	2	1	3/12/09	20.75657895	0	2	8	0.2148	0.08	4.1	0		0	DRY
HAIK	2009	602	2	1	3/13/09	20.78947368	0	5	8	0.2148	0.8	4.1	0		14	DRY
HAIK	2009	602	2	1	3/14/09	20.82236842	0	1	5	0.2148	0.05	4.1	0		10	DRY
HAIK	2009	602	2	1	3/15/09	20.85526316	0	5	1	0.2148	0.5	4.1	0		17	DRY
HAIK	2009	602	2	1	3/16/09	20.88815789	0	2	1	0.2148	0.42	4.1	0		22	DRY
HAIK	2009	602	2	1	3/17/09	20.92105263	0	2	5	0.2148	0	4.1	0		16	DRY
HAIK	2009	602	2	1	3/18/09	20.95394737	0	2	2	0.2148	0.06	4.1	0		13	DRY
HAIK	2009	602	2	1	3/19/09	20.98684211	0	2	3	0.2148	0	4.1	0		7	DRY
HAIK	2009	602	2	1	3/20/09	21.01973684	0	2	4	0.2148	0.02	4.1	0		3	DRY
HAIK	2009	602	2	1	3/21/09	21.05263158	0	2	5	0.2148	0	4.1	0		0	DRY
HAIK	2009	602	2	1	3/22/09	21.08552632	0	2	6	0.2148	0	4.1	0		0	DRY
HAIK	2009	602	2	1	3/23/09	21.11842105	0	2	7	0.2148	0	4.1	0		0	DRY
HAIK	2009	602	2	1	3/24/09	21.15131579	0	2	8	0.2148	0	4.1	0		0	DRY
HAIK	2009	602	2	1	3/25/09	21.18421053	0	2	9	0.2148	0	4.1	0		0	DRY
HAIK	2009	602	2	1	3/26/09	21.21710526	0	2	10	0.2148	0	4.1	0		0	DRY
HAIK	2009	602	2	1	3/27/09	21.25	0	2	11	0.2148	0	4.1	0		0	DRY
HAIK	2009	602	2	1	3/28/09	21.28289474	0	2	12	0.2148	0	4.1	0		0	DRY

F602: Haiku Ditch

Crop Cycle: 2007-2009(2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAIK	2009	602	2	1	3/29/09	21.31578947	0	2	13	0.2148	0	4.1	0		0	DRY
HAIK	2009	602	2	1	3/30/09	21.34868421	0	2	14	0.2148	0.06	4.1	0		0	DRY
HAIK	2009	602	2	1	3/31/09	21.38157895	0	2	15	0.2148	0	4.1	0		0	DRY
HAIK	2009	602	2	1	4/1/09	21.41447368	0	2	16	0.2497	0	4.1	0		0	DRY
HAIK	2009	602	2	1	4/2/09	21.44736842	0	2	17	0.2497	0	4.1	0		0	DRY
HAIK	2009	602	2	1	4/3/09	21.48026316	0	2	18	0.2497	0	4.1	0		0	DRY
HAIK	2009	602	2	1	4/4/09	21.51315789	0	2	19	0.2497	0	4.1	0		0	DRY
HAIK	2009	602	2	1	4/5/09	21.54605263	0	2	20	0.2497	0	4.1	0		0	DRY
HAIK	2009	602	2	1	4/6/09	21.57894737	0	2	21	0.2497	0	4.1	0		0	DRY
HAIK	2009	602	2	1	4/7/09	21.61184211	0	2	22	0.2497	0	4.1	0		0	DRY
HAIK	2009	602	2	1	4/8/09	21.64473684	0	2	23	0.2497	0	4.1	0		0	DRY
HAIK	2009	602	2	1	4/9/09	21.67763158	0	2	24	0.2497	0	4.1	0		0	DRY
HAIK	2009	602	2	1	4/10/09	21.71052632	0	5	24	0.2497	0.3	4.1	0		1	DRY
HAIK	2009	602	2	1	4/11/09	21.74342105	0	1	5	0.2497	0	4.1	0		0	DRY
HAIK	2009	602	2	1	4/12/09	21.77631579	0	1	2	0.2497	0	4.1	0		0	DRY
HAIK	2009	602	2	1	4/13/09	21.80921053	0	1	3	0.2497	0	4.1	0		0	DRY
HAIK	2009	602	2	1	4/14/09	21.84210526	0	1	4	0.2497	0.08	4.1	0		0	DRY
HAIK	2009	602	2	1	4/15/09	21.875	0	1	5	0.2497	0	4.1	0		0	DRY
HAIK	2009	602	2	1	4/16/09	21.90789474	0	1	6	0.2497	0	4.1	0		0	DRY
HAIK	2009	602	2	1	4/17/09	21.94078947	0	1	7	0.2497	0	4.1	0		0	DRY
HAIK	2009	602	2	1	4/18/09	21.97368421	0	1	8	0.2497	0	4.1	0		0	DRY
HAIK	2009	602	2	1	4/19/09	22.00657895	0	1	9	0.2497	0	4.1	0		0	DRY
HAIK	2009	602	2	1	4/20/09	22.03947368	0	1	10	0.2497	0	4.1	0		0	DRY
HAIK	2009	602	2	1	4/21/09	22.07236842	0	5	10	0.2497	1.6	4.1	0		32	DRY
HAIK	2009	602	2	1	4/22/09	22.10526316	0	1	5	0.2497	0.08	4.1	0		28	DRY
HAIK	2009	602	2	1	4/23/09	22.13815789	0	1	2	0.2497	0	4.1	0		22	DRY
HAIK	2009	602	2	1	4/24/09	22.17105263	0	5	2	0.2497	0.3	4.1	0		23	DRY
HAIK	2009	602	2	1	4/25/09	22.20394737	0	1	5	0.2497	0.04	4.1	0		18	DRY
HAIK	2009	602	2	1	4/26/09	22.23684211	0	1	2	0.2497	0	4.1	0		12	DRY
HAIK	2009	602	2	1	4/27/09	22.26973684	0	1	3	0.2497	0	4.1	0		6	DRY
HAIK	2009	602	2	1	4/28/09	22.30263158	0	1	4	0.2497	0	4.1	0		0	DRY
HAIK	2009	602	2	1	4/29/09	22.33552632	0	1	5	0.2497	0	4.1	0		0	DRY
HAIK	2009	602	2	1	4/30/09	22.36842105	0	1	6	0.2497	0	4.1	0		0	DRY
HAIK	2009	602	2	1	5/1/09	22.40131579	0	1	7	0.3032	0.09	4.1	0		0	DRY
HAIK	2009	602	2	1	5/2/09	22.43421053	0	1	8	0.3032	0	4.1	0		0	DRY
HAIK	2009	602	2	1	5/3/09	22.46710526	0	1	9	0.3032	0	4.1	0		0	DRY

F602: Haiku Ditch

Crop Cycle: 2007-2009(2009 Crop)

Ditch	Harv Year	Field	Block	Plot	Entry Date	Crop Age	Hours Irr	Days Irr	Days off	Adj Evap ac-in	Actual Rain	Adj SMS ac-in	Curr Irr ac-in	Deficit	Cur % SMS	Comments
HAIK	2009	602	2	1	5/4/09	22.5	0	1	10	0.3032	0	4.1	0		0	DRY
HAIK	2009	602	2	1	5/5/09	22.53289474	0	1	11	0.3032	0	4.1	0		0	DRY
HAIK	2009	602	2	1	5/6/09	22.56578947	0	1	12	0.3032	0	4.1	0		0	DRY
HAIK	2009	602	2	1	5/7/09	22.59868421	0	1	13	0.3032	0	4.1	0		0	DRY
HAIK	2009	602	2	1	5/8/09	22.63157895	0	1	14	0.3032	0	4.1	0		0	DRY
HAIK	2009	602	2	1	5/9/09	22.66447368	0	1	15	0.3032	0	4.1	0		0	DRY
HAIK	2009	602	2	1	5/10/09	22.69736842	0	1	16	0.3032	0	4.1	0		0	DRY
HAIK	2009	602	2	1	5/11/09	22.73026316	0	1	17	0.3032	0	4.1	0		0	DRY
HAIK	2009	602	2	1	5/12/09	22.76315789	0	1	18	0.3032	0	4.1	0		0	DRY
HAIK	2009	602	2	1	5/13/09	22.79605263	0	1	19	0.3032	0	4.1	0		0	DRY
HAIK	2009	602	2	1	5/14/09	22.82894737	0	1	20	0.3032	0	4.1	0		0	DRY
HAIK	2009	602	2	1	5/15/09	22.86184211	0	1	21	0.3032	0	4.1	0		0	END
										133.8409	38.34*		72.792	34.3603		

**** Actual Rainfall total not fully useable by the plant as irrigation. Please see cover memo for explanation of "Effective Rainfall"***

7.0 May 2010 - Additional Information

- **Division of Aquatic Resources:** Response to a request for stream flow estimates for H_{50} and H_{70} and the Division of Aquatic Resources' position statement on Minimum Habitat Flows.
- **Maui Department of Water Supply:** Response to a request for additional information including: 1) Break out of total monthly demand for the Upcountry Maui water system to show contributions from surface water and groundwater; 2) Cost to operate the Pookela Well; and 3) The aquifers (groundwater hydrologic units) of the Upcountry Maui water system.
- **Hawaiian Commercial & Sugar Company:** Scientific references on rock ramp fish ladders.

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

May 17, 2010

TO: Ken C. Kawahara, Deputy Director-Water
Commission on Water Resources Management

CC: Laura H. Thielen, Chairperson
Department of Land & Natural Resources

FROM: Robert T. Nishimoto, Environmental Program Manager
Division of Aquatic Resources

SUBJECT: Request for stream flow estimates for H_{50} and H_{70} and the Division of Aquatic Resources' position statement on Minimum Habitat Flows

The Division of Aquatic Resources (DAR) is responsible for the protection and management of living aquatic resources in the waters of Hawaii. The DAR realizes that the Commission on Water Resource Management (CWRM) has the responsibility of balancing the current and future value of multiple uses of water when rendering its decisions on specific Instream Flow Standards. By contrast, the DAR's recommendations focus only on the requirements of the native aquatic biota that fall within the scope of our authority, and do not consider additional instream or offstream uses of stream water. This memorandum reflects DAR's position on the recommendations that support restoration of native species habitat, migratory pathways for upstream recruiting individuals and downstream drifting larvae, and overall population structure and health for eight native fish and macroinvertebrate species inhabiting East Maui streams.

On March 11, 2010, the Division of Aquatic Resources met with Native Hawaiian Legal Corporation (NHLC), Commission on Water Resource Management (CWRM), Hawaiian Commercial & Sugar (HC&S), and Maui Department of Water Supply to discuss current data that CWRM has received to date. The DAR presented a spreadsheet of East Maui Stream flow ranks for H_{90} and H_{100} which are the percent of habitat based on the USGS IFIM study for East Maui Streams. It was requested that DAR recalculate the flow ranks for H_{50} and H_{70}. H_{50} and H_{70} were not presented by DAR as DAR staff had already determined that these flow rates for these habitat levels would not support all aspects of the native species life history requirements.

The former administrator to DAR misconstrued DAR's position to the March 11th meeting participants when he stated that DAR could calculate H_{50} and H_{70} flow rates. While DAR has the ability to calculate flows for any habitat level based on the USGS

IFIM study, DAR does not believe that H_{50} or H_{70} reflect viable flow rates for the protection of native aquatic biota.

On May 4, 2010, the DAR was directed by the DLNR administration to provide the H_{70} and H_{50} flow estimates for the DAR recommended streams and these are provide in this document. It is understandable why such a request would be made. Almost by definition, there is an expectation that a linear relationship exists between the amount of habitat and the number of animals. Thus it is tempting to assume that H_{70} is only 20% less habitat then H_{90} and therefore would result in only 20% less animals. Similarly, H_{50} is only 20% less then H_{70} and therefore only an additional 20% less animals. This conclusion IS NOT supported by the DAR.

DAR fully comprehends the rationale, methods, and results of the USGS IFIM study, and thus understands that it considers only a limited portion of the life history requirements of the native species. The USGS IFIM study primarily considered the attributes of water depth, velocity, and substrate, yet did not consider important components like food production or availability, the presence of suitable refuges, pathways for migration, the availability of spawning habitats, flow mediated triggers for reproductive events, or seasonally variable flow rates. The is not intended as a criticism to the quality of the work provided by USGS, only that as USGS states in their report, "These results are intended to be used along with other biological and hydrological information in development, negotiations, or mediated settlements for instream flow requirements." DAR's position is that H_{min} (H_{90}) or 64% of the naturally occurring base flow represents the minimum viable flow expected to provide suitable conditions for growth, reproduction, and recruitment of native stream animals. Flows lower than the minimum habitat flow would serve primarily maintenance flows where the adult animals "survive" until more suitable flows return.

The DAR's recommendations are based on several lines of evidence. First, DAR biologists and technicians spent considerable time and effort surveying habitat and animal populations in these streams. The results of these surveys found that while some areas within the streams do contain native animals, many stream sections had few or no native species. Second, the DAR compared the results of the stream surveys with estimates of expected native species occurrence by utilizing the Hawaiian Stream Habitat Evaluation Procedure (HSHEP) analytic model, with the results for the 19 East Maui streams provided to CWRM staff on November 20, 2009. The results of the HSHEP also suggest that native animals are missing from a number of stream sections where they should naturally exist. Finally, the DAR used available information and the extensive experience of its staff to develop a general life history description of island stream animals and used this in determining the final list of actions needed to support restoration of native species in these 19 streams.

A general consensus among DAR staff and many outside researchers regarding stream flow and native stream animals' life history is that the animals' behavior changes with changes in seasonal stream flow. For adult animals, periods of higher base flow triggers many reproductive events. The animals react to the higher flows to initiate courtship and

spawning. The animals attached the fertilized eggs to the substrate (fish and mollusks) or to their body (crustaceans). After a period of development, the larvae hatch from the eggs and drift downstream. The newly hatched larvae have a short period of time to reach the ocean before dying thus higher flows serve to successfully transport larger numbers of newly hatched larvae from spawning sites further inland. Once the larvae reach the ocean, they spend 3 to 5 months (in most species) developing in ocean waters. When the animals are ready to return to the stream, they usually return in mass in response to high stream flow events. The small animals, averaging ¼ to 1 inch long, move upstream to find suitable adult habitat. The juveniles that find suitable habitat mature into adults. Adults live for multiple years and can spawn multiple times in a single spawning season. There is evidence in Hawaii and in other Pacific islands that native island stream animals' reproduction commences with the beginning of the wet season and recruitment of young animals peaks toward the end of the wet season. As a result of this generalized life history pattern, the creation of an artificial "wet season" with higher base flows in a flow controlled stream may support many of the animals life history requirements.

DAR supports the following positions regarding restoration efforts in East Maui Streams.

As a general position regarding stream diversion and native aquatic animals:

- The removal of stream diversions and the complete restoration of stream flow would be the best possible condition for native aquatic animals. DAR understands that management of the resource is a balance between the needs of the animals and the needs of people thus supports some use of water from East Maui Streams.
- In no case are additional diversions of stream water recommended, although current levels of stream flow diversion may be appropriate on some streams. Flow restoration is only recommended on 8 of the 19 streams under consideration.
- The prioritization of the East Maui Streams is based upon the "biggest bang for the buck" concept, where priority is placed on streams with the greatest potential to increase suitable habitat for native species.
- The restoration of suitable flows to a single stream is more appropriate than the return of inadequate flow to multiples streams. DAR supports the trade-offs on the restoration of a smaller number of streams with sufficient water (see below) over the return of insufficient water (for example at H_{50} or H_{70} levels) to a larger number of streams.
- Restoration of stream flow should reflect the water budget of the individual stream catchment. The use of trans-basin water diversions from ditches to restore stream sections should be avoided where at all possible.
- Co-mingling of stream and ditch flows should be avoided where at all possible to limit the potential spread of invasive aquatic species.
- Restoration of streams should be spread out in a geographic sense. This will provide a greater protection against localized habitat disruptions, a wider benefit to estuarine and nursery habitat for nearshore marine species, and result in more comprehensive ecosystem function across the entire East Maui sector.
- Implementation of a long-term monitoring program to analyze the effect of restored flows to native biota, their health, and all aspects of their life history.

With respect to amount of water flow needed in the stream:

- The goal of returning H_{min} during the wet season and C_{min} during the dry season is considered the minimum viable flow to achieve suitable conditions for native aquatic animals.
- Minimum viable habitat flow (H_{min}) for the maintenance of suitable instream habitat is defined as 64% of Median Base Flow (BFQ_{50})(also defined as H_{90} by USGS studies). DAR expects that these flows will provide suitable conditions for growth, reproduction, and recruitment of native stream animals.
- Minimum viable connectivity flow (C_{min}) for the maintenance of a wetted pathway between the ocean and stream habitats is defined as 20% BFQ_{50}. These flows are expected to allow adult animals to move among habitats and allow recruiting animals to move upstream to suitable habitats. These flows are considered by DAR to be too low to expect suitable long-term growth and reproduction of native stream animals.
- Seasonally adjusted flows, H_{min} during the wet season and C_{min} during the dry season may mimic the natural flow variability observed in Hawaiian streams and support most ecological functions required by the stream animals. Seasonally adjusted flows would also provide maximum water for human use during periods of highest needs in the dry season and provide increased water to the stream animals during the period of lowest demand during the wet season. The increased wet season flows are intended to trigger reproductive events and maximize production of native animals.
- A "share-the-pain" approach in dealing with droughts may be appropriate. When an area is experiencing drought conditions then instream flow requirements may be suspended. The native aquatic animals in Hawaii streams have evolved in a system where droughts and the resultant low flows periodically occur and the animals can repopulate a stream when more favorable conditions return. This is not supportive of the continuous man-made artificial drought conditions currently experienced in many East Maui Streams as a result of stream diversion.

With respect to entrainment of native animals in stream diversions:

- The DAR realizes that complete elimination of entrainment for native stream animals is unlikely, but an avoidance of entrainment at diversion locations is important to maximize populations of native stream animals while minimizing the negative impacts from stream diversions.
- As newly recruiting animals move upstream to adult habitats, they follow the available path of water in the stream. Thus release of water from sluice gates in the immediate vicinity of diversion intakes serves to funnel animals to the intake and results in high rates of entrainment (and ultimately death) of animals migrating upstream. Therefore, water releases should provide a pathway as far away as possible from the point of diversion to minimize entrainment of upstream migrating animals.
- As newly hatched animals travel downstream to the ocean, they passively drift with the stream water. Thus release of water from sluice gates in the immediate vicinity of diversion intakes serves to concentrate animals near the intake and

results in high rates of entrainment (and ultimately death) of animals drifting downstream. Therefore, water releases should provide a pathway as far away as possible from the point of diversion to minimize entrainment of downstream drifting animals.

The following are the flow recommendations for the 8 East Maui Streams (Table 1). The H_{min} and C_{min} flow are provided (highlighted in green) along with the USGS H_{70} (removal of 63% of median base flow for all species less opae and 77% of median base flow for opae) and USGS H_{50} (removal of 83% of median base flow for all species less opae and >99% of median base flow for opae). The DAR recommendations of H_{min} and C_{min} flows represent essential actions that will greatly enhance native species habitat, connectivity, and overall population structure and viability. In no case are additional diversions of stream water recommended.

Note: DAR has seen little evidence in its surveys across the State of Hawaii that substantial (83%) to nearly complete (>99%) removal of base flow from a stream results in only losing 50% of its animals as suggested by the USGS study and thus does not support the designation of these flow amounts as 70 and 50% of available habitat.

Table 1. Various level of flow diversion for East Maui streams.

	Average stream flow below lower most diversion	H_{min}: DAR Recommended minimum habitat flow for wet season (H_{50} from USGS)	USGS H_{70} for all animals less opae (not supported by DAR)	USGS H_{70} for opae (not supported by DAR)	C_{min}: DAR Recommended minimum connectivity flow for dry season	USGS H_{50} for all animals less opae (not supported by DAR)	USGS H_{50} for opae (not supported by DAR)
		Amount of flow (cfs) remaining after diversion of x% of Median Base flow (BFQ_{50})					
Stream	Undiverted BFQ_{50} (cfs)	H_{min}: 36%	H_{70}: 63%	H_{70}: 77%	C_{min}: 80%	H_{50}: 83%	H_{50}: 99%
Waikamoi	6.9	4.4	2.5	1.6	1.4	1.2	0.1
Puohokamoa	10.5	6.7	3.9	2.4	2.1	1.8	0.1
Haipuaena	5.2	3.3	1.9	1.2	1.0	0.9	0.1
W. Wailua Iki	7.0	4.5	2.6	1.6	1.4	1.2	0.1
E. Wailua Iki	7.0	4.5	2.6	1.6	1.4	1.2	0.1
Kopiliula	8.0	5.1	3.0	1.8	1.6	1.4	0.1
Waiohue	6.8	4.3	2.5	1.6	1.4	1.1	0.1
Hanawï	no flow restoration recommended only modification of diversion for passage						

We apologize for any confusion created by the lack of clarity surrounding DAR's position on suitable instream flow requirements to support native aquatic animals. We hope this memorandum clarifies DAR's position on the subject. We understand the developing appropriate instream flow standards is a complex and difficult task and hope we can continue to support CWRM by providing well-reasoned scientific information that supports DAR's mandate to protect and manage the living aquatic resources in the waters of the State of Hawaii.

CHARMAINE TAVARES
Mayor

JEFFREY K. ENG
Director

DEPARTMENT OF WATER SUPPLY
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COMMISSION ON WATER
RESOURCE MANAGEMENT
2010 MAY 17 AM 10: 55

May 13, 2010

Mr. Ken C. Kawahara, P.E., Deputy Director
Commission on Water Resource Management
State of Hawaii
P.O. Box 621
Honolulu, HI 96809

Dear Mr. Kawahara:

Subject: Requests for Additional Information

At our meeting of May 11, 2010, CWRM Chairperson Laura Thielen requested responses to additional information requests as shown below.

1. **Break out total monthly demand for the Upcountry Maui water system to show contributions from surface water and groundwater.**

   Please see enclosure (1).

2. **Cost to operate the Pookela Well.**

The Pookela Well is the sole back-up source for the Upcountry Maui water system during times of drought conditions or in the event of an operational emergency. Therefore, the well has operated only intermittently since it was brought on-line in May 2007. The cost of electricity to operate the well is the most significant expense associated with its operation. The average electricity cost since May 2007 to the present is $1.75 per one thousand gallons pumped. This well is the department's most expensive well to operate.

3. **The Aquifers (Groundwater Hydrologic Units) of the Upcountry Maui water system.**

   The Pookela Well is located in the Makawao Aquifer (7 MGD SY).

The Department of Water Supply is an Equal Opportunity provider and employer. To file a complaint of discrimination, write: USDA, Director, Office of Civil Rights, Room 326-W, Whitten Building, 14th and Independence Avenue, SW, Washington DC 20250-9410. Or call (202) 720-5964 (voice and TDD)

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The Haiku and Kaupakalua Wells are located in the Haiku Aquifer (27 MGD SY).

If you have any questions, please feel free to contact me at (808) 270-7816.

Sincerely,

JEFFREY K. ENG
Director

Enclosure: Monthly Demand for Upcountry Systems, Surface Water versus Ground Water

copy w/enclosure: Jane E. Lovell, Deputy Corporation Counsel

Average Monthly Demand for Upcountry Systems
Surface Water versus Ground Water
(MGD)

	January		February		March		April		May		June		July		August		September		October		November		December	
	surface water	ground water	surface water	ground water	surface water	ground water	surface water	ground water	surface water	ground water	surface water	ground water	surface water	ground water	surface water	ground water	surface water	ground water	surface water	ground water	surface water	ground water	surface water	ground water
2009	4.4	1.0	5.3	1.0	5.1	1.0	6.3	1.1	6.5	1.3	6.6	2.2	7.5	1.4	7.1	1.2	7.6	1.6	7.2	1.8	6.1	1.8	4.6	2.0
2008	5.4	0.9	5.0	1.0	6.4	1.2	6.3	1.2	6.8	1.3	6.1	2.6	6.6	2.0	7.4	1.1	6.7	1.7	6.8	1.6	4.9	2.0	4.5	1.0
2007	6.9	1.0	6.3	1.0	6.2	1.0	8.2	0.4	9.4	0.4	9.6	0.4	8.6	0.3	8.2	0.3	7.4	0.3	8.0	0.3	6.6	0.4	4.8	0.9
2006	6.7	0.9	5.2	1.0	5.4	0.9	6.4	0.9	6.9	1.0	8.5	1.1	9.5	1.1	9.4	1.2	8.4	1.2	6.7	1.2	5.8	1.0	6.1	1.0
2005	4.6	0.9	5.8	1.1	5.9	1.1	7.0	1.0	7.7	1.3	8.1	1.2	8.3	1.0	8.9	1.1	7.9	1.1	7.1	0.9	6.7	0.9	6.4	1.0

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