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COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAI'I

Surface Water Use Permit Applications, Integration of Appurtenant Rights and Amendments to the Interim Instream Flow Standards, Nā Wai 'Ehā Surface Water Management Areas of Waihe'e, Waiehu, 'Īao, & Waikapū Streams, Maui.	)	Case No. CCH-MA15-01 EXHIBIT LIST

EXHIBIT LIST

PARTY: HUI O NĀ WAI 'EHĀ and MAUI TOMORROW FOUNDATION, INC.

EXHIBIT NUMBER	DESCRIPTION	REFERENCES	REC'D INTO EVIDENCE
Nā Wai-1	Excerpts from Order No. 8 in the *Waiāhole* case, dated August 15, 1995	Opening Brief	
Nā Wai-2	Excerpts from "Preliminary Monitoring and Management Practices Plan for the Waiahole Irrigation System," dated October 31, 1995	Opening Brief	
Nā Wai-3	Curriculum Vitae of Lilikalā K. Kame'eleihiwa	Ex. 1 to Kame'eleihiwa Testimony	

EXHIBIT NUMBER	DESCRIPTION	REFERENCES	REC'D INTO EVIDENCE
Nā Wai-4	1850 Kuleana Act	Ex. 2 to Kameʻeleihiwa Testimony, Opening Brief	
Nā Wai-5	Land Commission Award ("LCA") No. 4429, marked	Ex. 3 to Kameʻeleihiwa Testimony	
Nā Wai-6	Native Register supporting LCA No. 4429, marked, transcribed, translated	Ex. 4 to Kameʻeleihiwa Testimony	
Nā Wai-7	Native Testimony supporting LCA No. 4429, marked	Ex. 5 to Kameʻeleihiwa Testimony	
Nā Wai-8	Native Testimony supporting LCA No. 3339	Ex. 6 to Kameʻeleihiwa Testimony	
Nā Wai-9	LCA No. 4274, Native Testimony in support of LCA No. 4274, Kīpuka map of LCA No. 4274	Ex. 7 to Kameʻeleihiwa Testimony	
NāWai-10	1937 Wailuku Sugar Co. Title Map	Ex. 1 to Smith Testimony	
Nā Wai-11	Registered Map No. 1261 (certified copy of 1882 map surveyed by Monsarrat)	Ex. 2 to Smith Testimony	
Nā Wai-12	Kīpuka search page	Ex. 3 to Smith Testimony	
Nā Wai-13	Kīpuka map for LCA No. 460	Ex. 4 to Smith Testimony	
Nā Wai-14	Kīpuka summary window for LCA No. 460	Ex. 5 to Smith Testimony	
Nā Wai-15	Kīpuka details page for LCA No. 460	Ex. 6 to Smith Testimony	
Nā Wai-16	Kīpuka details page for Government Grant No. 3042	Ex. 7 to Smith Testimony	
Nā Wai-17	Example of Kīpuka TMK and LCA map overlays	Ex. 8 to Smith Testimony	

Hui o Nā Wai ʻEhā and Maui Tomorrow Foundation, Inc. reserve the right to introduce additional exhibits at the contested case hearing for purposes of impeachment

or rebuttal, and to cite to and/or rely on (1) all exhibits admitted in the contested case proceedings (original and remand) in CCH-MA06-01, regarding the ʻĪao Ground Water Management Area High Level Source Water Use Permit Applications and Petition to Amend Interim Instream Flow Standards of Waiheʻe, Waiehu, ʻĪao & Waikapū Streams, and (2) all other documents in the Commission on Water Resource Management's files relative or relevant to this matter, including, but not limited to, all Water Use Permit Applications and Surface Water Use Permit Applications, all Objections filed in response to those applications, all correspondence, and all other filings in CCH-MA 13-02 (provisional recognition) and CCH-MA 15-01.

Dated: Honolulu, Hawaiʻi, February 5, 2016.

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COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII

In the Matter of Water Use Permit Applications, Petitions for Interim Instream Flow Standard Amendments, and Petitions for Water Reservations for the Waiahole Ditch Combined Contested Case Hearing	)))))))	Case No. CCH-OA95-1 ORDER NUMBER 8 INTERIM ORDER IDENTIFYING "EXISTING USES" ALLOWED TO CONTINUE UNDER H.R.S. § 174C-48(a)

ORDER NUMBER 8
INTERIM ORDER IDENTIFYING "EXISTING USES"
ALLOWED TO CONTINUE UNDER H.R.S. § 174C-48(a)

This Order is an interim measure. It establishes existing uses allowed to continue for groundwater from windward aquifers transported by Waiahole Ditch (hereafter referred to as Waiahole Ditch water). This order is based upon evidence received by the Commission on Water Resource Management (Commission) in hearings on June 13, 29, and 30, and July 24, 1995. Pursuant to H.R.S. § 174C-48(a) (hereafter referred to as § 48(a)), these existing uses may continue until the Commission acts upon the permit applications filed in this case. This interim order may be changed based upon new evidence.

In order to establish an existing use allowed to continue under § 48(a), a person must satisfy the criteria to be an applicant and must have timely filed an application within one year after July 15, 1992, the effective date of the designation of the aquifer systems of windward Oahu as a water management area. Based upon the evidence provided, the Commission finds that the following

leased from Campbell and Robinson. W. D. Balfour, an officer of both the Waiahole Irrigation Company and Oahu Sugar Company, signed the application. Where a lessee of a particular parcel files a permit application, the Commission deems the landowner/lessor to be a necessary joint applicant. See H.R.S. § 174C-51(1) (B). Therefore, Campbell and Robinson are joint applicants for a water use permit through WIC's application.

WIC's application also included: the Royal Oahu Resort County Club, Mililani Memorial Park, Mililani Golf Course, Dole Food Company, the State of Hawaii Waiawa Correctional Facility, ICI Seed Company, Bishop Estate, Amfac/JMB Waikele, HSPA, and the U.S. Air Force installation at Kipapa Gulch. In this instance WIC was acting as the agent for these additional end users.

IV. The Need for Management

Based upon the evidence at the hearing, the Commission concludes that there are system losses that have not been adequately quantified and that require management. The State has a constitutional duty to "protect, control and regulate the use of Hawaii's water resources. . . [and] set overall water conservation, quality and use policies. . . ." Haw. Const. art. XI, § 7. The Commission is further mandated to "(p)lan and coordinate programs for the development, conservation, protection, control, and regulation of water resources..." HRS § 174C-5(12).

Testimony by Mr. Bert Hatton and other parties showed that few measuring devices are in place to gauge particular uses and little, if any, information is available regarding transmission and

distribution losses. Only by accurately quantifying source, usage, and losses of Waiahole Ditch water can there be efficient use and the prevention of waste. Under H.R.S. § 174C-50(f) the Commission has the authority to "prescribe the installation of metering or gauging devices" to measure water usage of existing uses. Accordingly, water users with an existing use that may continue pursuant to this order are directed to place meters and gauges in appropriate locations to determine particular uses and system losses, and to report their results regularly to the Waiahole Irrigation Company (WIC). WIC, in turn, is ordered to report the information to the Commission on a monthly basis. WIC shall rate the source gaging stations for discharge versus stage in a certifiable manner.

Appropriate management practices must be implemented. Applicants for existing uses of Waiahole Ditch water shall meet among themselves to propose to the Commission those management practices which they will undertake to ensure reasonable-beneficial use of the water. These practices should include, among others, the use of storage facilities, the staggering of new plantings, the scheduling of water use to smooth out the peaks and valleys in demand, and the repair of the system to reduce losses. This will help the Commission determine if particular water uses are "reasonable-beneficial" as required under the Code in later issuing an existing use water permit. H.R.S. § 174C-50(b) and 49(a) (2).

V. Post-October 1, 1995 Water Needs.

Those parties listed in section I above which meet the criteria in this order for existing uses which may continue under § 48(a) may seek additional water (consistent with § 48(a)) after October 1, 1995 by presenting further evidence of such need in a motion to the Commission.

Dated: Honolulu, Hawaii August 15, 1995

IT IS SO ORDERED

COMMISSION ON WATER RESOURCE MANAGEMENT

MICHAEL D. WILSON
Chair of the Commission on Water Resource Management and Presiding Officer

Preliminary Monitoring and Management Practices Plan For the Waiahole Irrigation System

Prepared for

Waiahole Irrigation Company, Limited
P. O. Box 3230
Honolulu, Hawaii 96801

Prepared by

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October 31, 1995

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B Waiahole Ditch Flows Report For the Month of February 1995

C Supplemental Monthly Supply Reports by WIC, February 1995

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INTRODUCTION

This report presents the Preliminary Monitoring and Management Practices Plan for the Waiahole Irrigation System. It has been prepared pursuant to Order Number 10, clarifying in part, Order Number 8 of the Commission on Water Resource Management (CWRM) which directs Waiahole Irrigation Company (WIC) to submit a preliminary monitoring plan to the CWRM by October 31, 1995. This plan has been prepared for WIC by Tom Nance Water Resource Engineering (TNWRE) with the assistance of the WIC staff and the landowners and tenants who are customers of the irrigation system. Components of this plan are as follows:

Water Use by Customers

1. Identification and Evaluation of Service Connections
2. Implementation of Improved Metering

Gaging of Sources of Supply

1. Identification of Gaging Stations and Compilation of Their Rating Tables
2. Plan to Evaluate and/or Re-Rate the Gaging Stations

Management Practices

1. Past and Ongoing Management Practices by WIC
2. Management Practices by the System's Individual Customers

Prior to the CWRM's orders requiring the development of this monitoring and management practices plan, TNWRE began working on components of it in June 1995. Initial efforts concentrated on identifying and evaluating the service connections and assisting in implementing upgrades of existing meters and installing new ones. There has been significant progress on this work; only a few of the connections remain to be done. Attention is now focused on the gaging stations. Rating curves have been compiled and reviewed but the field work to check these curves against the actual discharge rates of the system's gaging stations remains to be done. As such, this plan should be viewed as a work in progress.

DESCRIPTION OF THE WAIAHOLE IRRIGATION SYSTEM

Exhibit 1 attached to the back of this report is an oversized drawing which depicts the entire ditch system on a CADD format. It includes: sources of supply on the windward side; the main bore across Bishop Estate land; and user connections on lands of the State of Hawaii, Bishop Estate, Castle &

Cooke, Robinson Estate, Royal Oahu Resort, Nihonkai, and Campbell Estate. The drawing identifies all the system's major features: land ownerships; development tunnels; gaging stations on the tunnels and the ditch itself; and all the customer service connections that have been identified to date. The configuration of the service connections on the drawing identify wet wells, pumps, filters, and meters. Although these are shown schematically, they are also reasonably correct geographically as well. There are 11 gaging stations on the development tunnels, the main ditch, and the wasteway at Intake 31 (also known as Gate 31). To date, 44 service connections to the ditch have been identified. Each of these is denoted by two letters which identifies the land ownership followed by a number which identifies the connection's sequential location across the particular property from its upstream to downstream end.

IDENTIFICATION, EVALUATION, AND IMPROVED METERING OF SERVICE CONNECTIONS

The number of identified service connections on each of the land ownerships is summarized in the table below. WIC and TNWRE are confident that all major users have been identified and are included in the descriptions which follow. Several small and mostly intermittent users remain to be identified and/or evaluated, but their combined use represents a negligible portion of the system's total.

Identifying Letters	Land Owner	No. of Service Connections
MC	State of Hawaii (McCandless Pipeline)	1
WC	Waiawa Correctional Facility (State)	1
BE	Bishop Estate	4
CC	Castle & Cooke	6
RE	Robinson Estate	12
CE	Campbell Estate	17
RK	Royal Kunia Golf Course (Royal Oahu Resort)	1
NH	Nihonkai	2
	Total	44

More than half of the active service connections to the ditch system are at sites previously used by Oahu Sugar Company (OSCO). In evaluating these and other connection points, most deficiencies in metering fall in one or more of the following categories:

- Meters are located downstream of filter stations because both OSCO and the new tenants are most interested in water amounts applied to fields. However, at those locations where filter backwash is not returned to the ditch, this amount of use is not accounted for.

- Quite commonly, valves, bends, and other pipe fixtures are located too close to the meters. Inadequate lengths of straight pipe before and after the meters creates turbulence which results in questionable meter accuracy. Laboratory testing by manufacturers has shown that this effect can be greater than 20 percent.

- In many instances, service connections which feature gravity delivery to fields located below the ditch allow open channel flow through the meter. Since all of these meters are calibrated for full pipe flow, the open channel flow creates unpredictably inaccurate results.

- Many meters were simply not working, most often due to clogging by algae and rocks.

- Most of the OSCO meters being used by current tenants were too old and substantially oversized for the current rates of use. Most of these are McCrometer meters, a cable-driven propeller type meter.

To rectify these problems, efforts have been made to standardize service connections and meter installations with the following characteristics:

- Meters are to be located upstream of filters and settling basins and as close to the ditch as practical to account for all water withdrawn from the ditch. However, if the filter backwash is returned to the ditch, meters located downstream of the filters are acceptable.

- Straight sections of pipe before end after the meter are to be in accord with manufacturer's recommendations. If straightening vanes are used, these distances are generally equivalent to five and two pipe diameters, respectively. Without straightening vanes, the manufacturer's required distances are typically 10 to 5 pipe diameters. These standards are necessary to ensure that turbulence does not adversely affect meter accuracy.

- A gear-driven, propeller-type meter in a vaned-type flow tube which is appropriately sized for the expected range of flowrate is the preferred choice. The propeller meter manufactured by Water Specialties fits this description and is widely used in agricultural systems. It has been used in the replacement of a number OSCO's old McCrometer meters.

- Prior to TNWRE's involvement in June 1995, a number of new tenants had, at their own expense and in good faith, installed insertion-type meters which use battery powered data loggers to record flowrate. Manufacturer's tests show these meters to be of comparable accuracy to gear-driven propeller meters and their much smaller propellers due shed algae and tend to clog less. However, they also present added complications on installation and continued accuracy. The propeller must be installed to 1/8 the pipe's inside diameter or it will be inaccurate; the data logger must be calibrated for the particular pipe application (by setting 16 internal switches correctly for the particular application); and there must be some assurance that these settings are not disturbed for the life of the meter. To date, none of these meters have been replaced. WIC is developing a policy on the installation and calibration of these meters as a condition of their continued use.

- Meter locations and piping are being modified to ensure full pipe flow through the meter for all ranges of water use. At many service connections, this has required installing a riser pipe and air relief valve at an appropriate distance downstream of the meter. At others, simply relocating the meter to the upstream side of the filters has sufficed.

Table 1 is a listing of all the system's service connections by landowner. The listing is sequential, starting with the Waiawa Correctional Facility just downstream of Adit 8 and ending below Reservoir 155 in Campbell Estate land. For each connection, the listing identifies the landowner, the letters and numbers used to identify the connection on Exhibit 1, a description of the connection's configuration and meter, and the status of implementing recommended modifications. The status of metering of uses of the system can be generally characterized as follows:

- A substantial number of upgrades have been implemented in the last several months, particularly on Castle & Cooke and Campbell Estate lands.

- On Bishop Estate land, Hawaii Food Products and Waiawa Nursery, which are the most active users, are acceptably metered. However, other more modest uses are not presently measured.

- Improvements and changes to some of the connections on Robinson Estate lands remain to be done.

Table 1

Service Connections of the Waiahole Ditch System
as of October 1995

Landowner	Connection Number	Customer(s)	Description of the Connection and Meter	Status of Upgrade/Recommended Improvements
State of Hawaii	MC-1	Farm Lots in Waiahole-Waikane	The 6-inch delivery pipeline is not metered.	No recommendations have been to date.
State of Hawaii	WC-1	Waiawa Correctional Facility	A pair of booster pumps draw water directly from the ditch via separate, 4-inch pipelines. Draft from the ditch is not metered.	A new meter was recently installed by the State; its certification by WIC is pending.
Bishop Estate	BE-1	Hawaii Food Products, Circle C Ranch, and the Air Force	A 10-inch ductile iron pipe is connected to the ditch at a shallow tunnel section. Unmetered water flows through Y-strainers at the connection point and on to customers.	Use by the Circle C Ranch has been terminated and the Air Force is pursuing an alternate source of supply (the BWS system in Gentry Waipio). Hawaii Food Products use is very modest and could be served by a 2-inch line and meter.
	BE-2	Hawaii Food Products	Engine drive pump has 4-inch ditch intake; a new McCrometer propeller meter is installed on the pump's discharge line downstream of pressure sand filters.	Filter backwash is returned to the ditch. When the meter needs repair or replacement, change to a gear-driven propeller meter.
	BE-3	Waiawa Nursery	Pump draws water from a pre-existing OSCO structure; 4-inch Water Specialties meter is located downstream of pressure sand filters.	Filter backwash is returned to the ditch. The set-up is OK; no changes are necessary.
	BE-4	Teen Challenge	Water taken directly from the ditch via a 2-inch hose and booster pump; there is no meter.	Current use is relatively small. The facility is to be relocated by Jan. 31, 1997. Installation of a 2-inch meter on the pump's discharge line would be appropriate.
Castle & Cooke	CC-1	Mililani Memorial Park	Water is diverted through a pre-existing OSCO structure to sediment basins. From there, water is pumped into a steel storage tank. A 4-inch meter is located on the line to the tank.	Although the meter does not measure losses from the settling basin, these are relatively insignificant. The set-up is OK; no changes are necessary.

Table 1, continued:

Landowner	Connection Number	Customer(s)	Description of the Connection and Meter	Status of Upgrade/Recommended Improvements
Castle & Cooke (continued)	CC-2	Dole Pineapple Fields (East of H-2 Freeway)	Water is drawn directly from the ditch by an engine drive pump. There is a 6-inch Water Specialties propeller meter on the pump's suction line.	The station has not been used recently and is about to be dismantled. No action is necessary.
	CC-3	Dole Pineapple Fields (West of H-2 Freeway)	Connection is at a concrete box with screen. Meter is 6" strap-on McCrometer. It is located downstream of an Amiad Filter and engine-driven booster pump.	Recommended piping and metering modifications have recently been completed by ITC. No further action is necessary.
	CC-4	Mililani Golf Course at Meheula Parkway	10" pipe connection to the ditch; Water Specialties meter in the vault does not work and the vault is flooded; an old 8" Hersey meter is located downstream of the 15th and 16th hole lakes and irrigation pumps.	Recommended piping and metering changes are currently being completed by Roscoe Moss Company.
	CC-5	Mililani Golf Course at 4th Hole Lake	Screen and 6" pipe intake deliver water to the 4th hole lake. The 6" Water Specialties meter on this line does not work.	Recommended modifications to piping and metering have recently been completed by ITC. No further action is necessary.
	CC-6	Castle & Cooke Diversified Ag. Leases Near Gate 12	16" pipe intake delivers water by gravity to numerous ag. lessees on the makai lands. The 16" strap-on propeller meter in the vault next to the ditch does not work.	Recommended modifications to piping and metering have recently been completed by ITC. No further action is necessary.
Robinson Estate	RE-1	Larry Jefts at Field 235 Makai	Water is taken from the ditch with a 3" hose and engine drive pump. 2" Master meter is located between the pump and pressure filters.	This connection was temporary and is no longer in use. No action is required.
	RE-2	Larry Jefts Fields 235 (Mauka) and 260 at Old WP 27 Site	Connection utilizes WP 27 wet well. An insertion-type meter is located downstream of pressure filters. Filter backwash is not measured but it is returned to the ditch. The accuracy of the meter is unknown.	WIC is currently developing a policy on the installation and calibration of the insertion-type meter.

Table 1, continued:

Landowner	Connection Number	Customer(s)	Description of the Connection and Meter	Status of Upgrade/Recommended Improvements
Robinson Estate (continued)	RE-3	Larry Jefts in Gulch of Field 235	A 2" hose is used to withdraw water, siphoning it over the banks of the ditch to a filter station below. A 2" Master meter is located at the high point in the siphon line.	The meter will be located further downstreem to ensure full pipe flow.
	RE-4	Aloun Farm at Fiald 275 (Mauka)	Engine drive pump and 4" hose draw water from the ditch. Thera is no meter.	WIC is currently developing a policy on the installation and calibration of the insertion-type meter.
	RE-5	Larry Jefts' Base Yard	2" hose and small electric motor-driven pump draw water from the ditch. There is a 1" Master meter on tha pump's discharge line.	Set-up is OK; no action is required.
	RE-6	Aloun Farm Field 275 Mauka	3" hose and small engine-driven pump draw water from the ditch. An insertion-type meter is installed on the pump's discharge line.	Piping changes, which are reflected in the system schematic, will feed this use from the RE-7 connection. This draw point will no longer be used.
	RE-7	Aloun Farm For Field 275 Mauka & Makai at WP 25 Site	A 15 HP boostar utilizes the WP 25 wet well to draw water from the ditch. An insertion-type meter is installed on the the pump's discharge line.	WIC is currently developing a policy on the installation and calibration of the insertion-type meter.
	RE-8	Aloun Farm For Field 231	Connection is off 24" pipeline from Res. 225. 3" pump discharge line is flange-connected to an old 8" McCrometer propaller meter.	3" gear-driven propellar meter needs to be installed on the pump discharge line with adequate lengths of straight pipe up and downstream of the meter.
	RE-9	Aloun Farm at Fields 230 & 231	At same location as RE-8. The 6" Micrometer installed on the pump discharge line is flanged directly to 8" and 10" bushings.	Reconfigure the piping to allow straight run; install a 6" gear-driven propeller meter.
	RE-10	Larry Jefts at Fields 230 & 225	At same location as RE-8. 6" strap-on Water Specialties meter is located on 6" aluminum pipe between the pump and Amiad filters.	Meter location is OK; accuracy of strap-on meter on the aluminum however, aluminum pipe ID does not match standard 6" pipe. Replace with tube-type, gear-driven propeller meter or change the pipe.

Table 1, continued:

Landowner	Connection Number	Customer(s)	Description of the Connection and Meter	Status of Upgrade/Recommended Improvements
Robinson Estate (continued)	RE-11	Larry Jefts at Field 230	An insertion-type meter will be installed upstream of the sand filters.	WIC is currently developing a policy on the installation and calibration of the insertion-type meter.
	RE-12	Future Tenant	Connection will be at the site of OSCO's 225 filter station.	WIC to review and approve connection and meter.
Royal Oahu Resort, Inc. and Halekua Dev. Corp.	RK-1	Royal Kunia Golf Course	Connection is off 24"/30" pipeline between Res. 225 and the WP 30 booster station. 6" McCrometer is installed on U-shaped riser pipe.	Delivery is to a higher elevation in the golf course, ensuring full pipe flow. Changing to a gear-driven, propeller type meter will be deferred until the golf course is assured that it will be able to use this source.
Nihonkai	NH-1	Alec & Mike Sou at Field 280	Future connection will utilize the WP 26 wet well.	WIC to review and approve connection and meter.
	NH-2	Alec & Mike Sou at Field 280	Future connection will also use the WP 26 wet well.	WIC to review and approve connection and meter.
Campbell Estate	CE-1	ICI Seeds at Field 166 (Lower) Filter Station	Connection is off 12" pipeline from WP 22 wet well. Recent upgrade by ITC installed new 8" Water Specialties (ML-04) meter.	Excellent set-up; no further action is necessary.
	CE-2 and CE-3	ICI Seeds at Fields 166A & B	Withdrawal is from settling basin next to WP 22 wet well. Two parallel connections, each consisting of booster pumps, pressure filters, and 4" Water Specialties meters located downstream of the filters.	Filter backwash is returned to the ditch. No changes are necessary.
	CE-4	ICI Seeds at Field 146 Sand Filter	Connection is off pipeline from the settling basin next to WP 22. Recent upgrade by ITC installed an 8" Water Specialties (ML-04) meter upstream of the pressure filters.	Excellent set-up; no further action is necessary.

Table 1, continued:

Landowner	Connection Number	Customer(s)	Description of the Connection and Meter	Status of Upgrade/Recommended Improvements
Campbell Estate (continued)	CE-5	HSPA Experimental Station	Connection is off same pipeline which supplies CE-4. Recent upgrade by ITC installed 8" Water Specialties (ML-04) meter.	Set-up is OK; no further action is necessary.
	CE-6	Albert Aoki For Mauka Cattle Ranching	2" hose and small capacity, engine-driven positive displacement pump draw water directly from the ditch. Use is not metered.	ITC is to install a meter on pump discharge line.
	CE-7	Del Monte at WP-32	OSCO booster pump station site is not currently in use. Del Monte will begin use sometime in 1996.	WIC to review and approve connection and meter.
	CE-8	Del Monte at WP 23 Wet Well	ITC recently installed a Water Specialties 6" (ML-04) meter. Recent pipe alteration by Dal Monte will adversely affect metering.	Campbell Estate will get Del Monte to restore ITC's originally intended piping.
	CE-9	Del Monte at Field 156 Filter Station	Connection via pipeline from WP 23 wet well. Recent ITC upgrade installed a 10" Water Specialties (ML-04) meter.	Excellent set-up; no further action is necessary.
	CE-10	HSPA Below Reservoir 155	Connection is at site of WP 33A & B. 6" strap-on Water Specialties meter is downstream of pump and pressure filters.	Connection ie not currently being used; if used in the future, the meter should be relocated upstream of the filters to measure backwash.
	CE-11	Terry Cozzens Below Reservoir 155	Connection is next to CE-10 and is en essentially identical set-up without the pressure filters.	Overhauling meter would be appropriate; Campbell Estate is to follow-up on this.
	CE-12	Rancher at Reservoir 155	Small floating intake and pump draw water directly from Reservoir 155. Use is not metered.	Campbell Estate will follow-up on installing a meter on the pump discharge line.
	CE-13	Del Monte at Field 140 Filter Station	Connection is off mauka-makai pipeline from Reservoir 155. Recent ITC installation of 8" Water Specialties (ML-04) meter upstream of filters.	Excellent set-up; no further action is necessary.

Table 1, continued:

Landowner	Connection Number	Customer(s)	Description of the Connection and Meter	Status of Upgrade/Recommended Improvements
Campbell Estate (continued)	CE-14	Del Monte at Field 140 (Lower) Filter Station	Connection is further downstream of CE-13 connection; a 12" Water Specialties meter is located downstream of filters.	ITC is to install a 10" Water Specialties propeller meter upstream of the filters.
	CE-15	Larry Jefts at Filter Station For Field 110	Connection is next to and essentially identical to CE-14. Larry Jefts has installed a Grainland insertion-type meter before the filters.	Proposed upgrade by ITC has been approved by WIC but has not been implemented yet.
	CE-16	Larry Jefts at Field 105 Filter Station	10" Water Specialties meter is downstream of filters and directly flanged to a tee. It measures Field 105 use plus Makakilo Golf Course (CE-17).	The meter has been relocated upstream of the filters. The piping has been modified so that Makakilo Golf Course use (CE-17) does not pass through the filter station.
	CE-17	Makakilo Golf Course at WP-5	4" McCrometer propeller meter is mounted vertically on a riser pipe.	The meter has been relocated to the bypass at the CE-16 site.

- On both Robinson and Campbell Estate lands, extensive use is made of OSCO's irrigation system below Reservoirs 225 and 155, respectively. A number of services also utilize OSCO's booster station wet wells. Master metering at key locations is being considered to enable system losses in these portions of OSCO's distribution network to be better quantified.

GAGING THE DITCH SYSTEM'S SOURCES OF SUPPLY

The Waiahole Irrigation System has 11 gaging stations which quantify supply from development tunnels and the various properties the ditch system passes through on the windward side and in the main bore across Bishop Estate property. Nine of these stations are Parshall flumes with widths between one and four feet. The other two are a contracted weir and a rated section. Table 2 lists and describes each of these stations. Rating tables used by WIC for each of these are compiled in Appendix A. A sample of the monthly report submitted to the CWRM, which lists average daily flows for all the source gages, can be found in Appendix B (Gate 12, which is on the transmission ditch at the Castle & Cooke-Robinson Estate boundary, is not included in this report). Appendix C contains supplemental reports generated by WIC on a monthly basis which define quantities of water developed on each of the land ownerships.

TNWRE intends to make a field evaluation of each of the gaging stations. For the six free flowing Parshall flumes with rating tables based on the flumes formula (Kahana 21, Waikane 1 and 2, Uwau 4 and 4A, and Gate 12), measurements will be made of the flumes themselves to confirm their appropriate dimensions and installation. Also, the stage reading in the stilling well will be compared to the actual flow depth in the flume. Unless a problem is discovered in this process, it will be assumed that the flume formula is an appropriate basis for these rating tables. The same approach will be used for the 5-foot contracted rectangular weir at the Kahana 3 station. Installation in accordance with standard requirements for contracted rectangular weirs will be checked and dimensional measurements will be taken. If conditions meet those for a free flowing weir, use of the Francis Formula will be taken as an appropriate basis for the rating table.

Three of the stations are 4-foot Parshall flumes for which WIC is using rating curves developed in the 1960s by the U.S. Geological Survey (until 1968, the USGS operated and maintained these stations). The USGS rating tables state that they were developed based on discharge measurements made at various times in these 1950s and 1960s. Notably, the differences between these rating tables and discharge rates derived from the flume formula are not substantial. This is illustrated on Figure 1 for the Gate 31 gaging station (formerly USGS Station 16-2860.00). For discharges below 15 MGD,

Table 2

Gaging Stations of the Waiahole Ditch System

Name of Gaging Station	Measured Flowrate	Type of Gaging Station	Basis of Rating Table
Kahana 3	Development tunnel	5-Foot Rectangular Weir	Francis' Contracted Weir Formula $Q = 3.33\ (L-0.2H)H^{3/2}$
Kahana 21	All flow leaving State land in Kahana	4-Foot Parshall Flume	Flume Formula $Q = 4WH^{1.522W^{0.026}}$ (with minor numerical deviations)
Waikane 1	Development tunnel	2-Foot Parshall Flume	
Waikane 2	Development tunnel	1.5-Foot Parshall Flume	
Uwau 4A	Portion of development tunnel leeward of the crest	1-Foot Parshall Flume	
Uwau 4	Total development tunnel flow	2-Foot Parshall Flume	
Waianu 29	All ditch flow leaving Uwau property	4-Foot Parshall Flume	USGS Rating Table For USGS Station 16-2850.00 dated October 1, 1966
Intake 31 (Gate 31)	Dicharge to windward at the wasteway	4-Foot Parshall Flume	USGS Rating Table For USGS Station 16-2860.00 dated October 1, 1966
North Portal	Total flow developed to main bore at crest	4-Foot Parshall Flume	USGS Rating Table For USGS Station 16-2870.00 dated October 1, 1966
Adit 8	Total flow in main bore at its leeward portal	7-Foot Rated Section With Critical Depth Control	USGS Rating Table For USGS Station 16-2972.00 dated October 1, 1966
Gate 12	Residual ditch flow leaving Castle & Cooke property	4-Foot Parshall Flume	Flume Formula $Q = 4WH^{1.522W^{0.026}}$

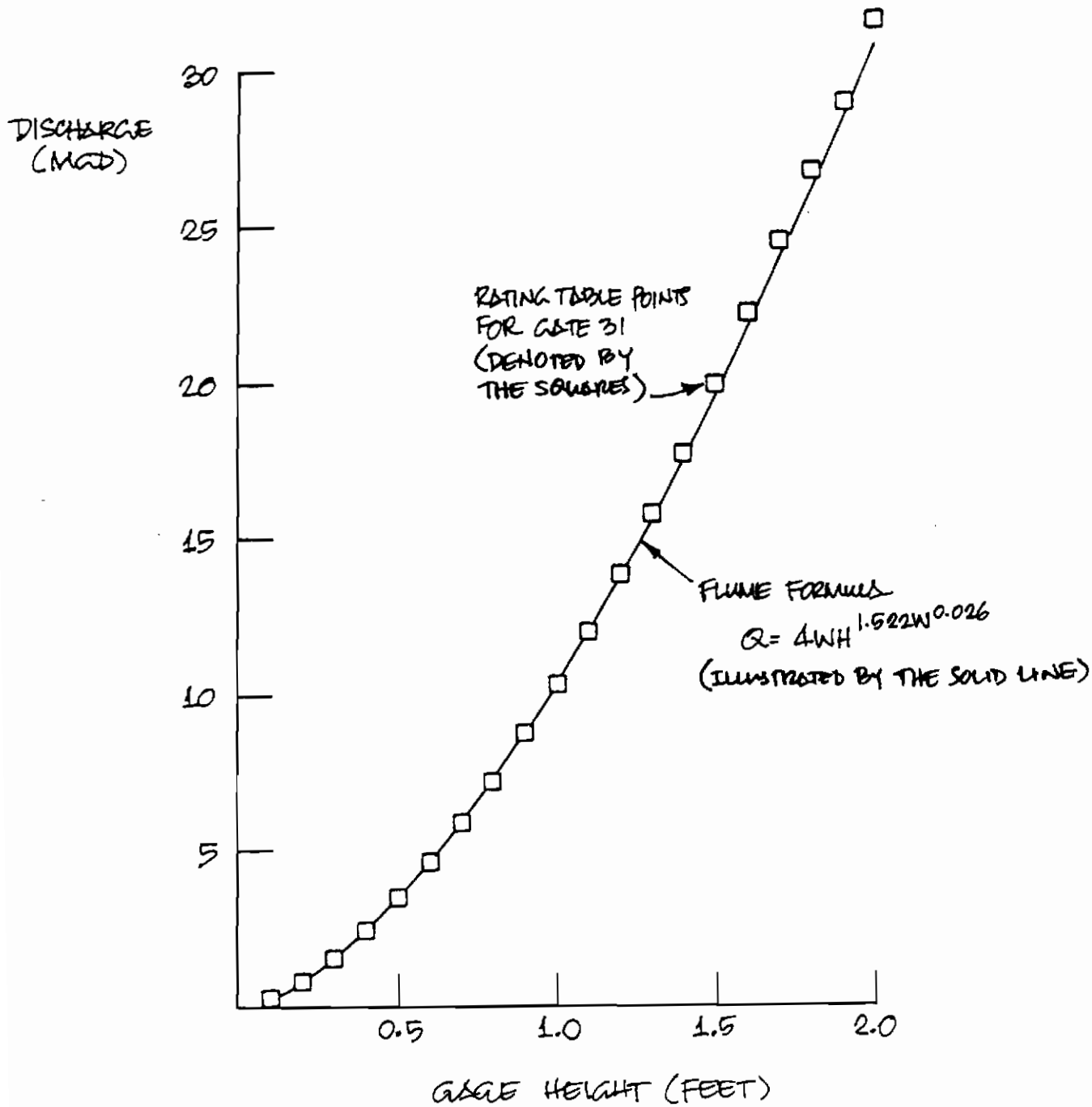

Figure 1

Comparison of the Flume Formula and Rating Table For Gate 31

the flume formula and rating table values are essentially identical. Even at higher flows, the difference is only about 2 percent. Comparisons of the two other USGS-derived rating tables and flume formula yield similar results. In October 1994, the USGS made three measurements to check the rating curve on the 4-foot Parshall flume at the North Portal. Close agreement between the measurements and rating table values led the USGS to conclude that continued use of the 1960's rating curve would be appropriate (November 2, 1994 letter from William Meyer to Rae Loui). As a point of interest, discharge derived from the flume formula is compared to the rating table and USGS measurements in the tally below. A decision on whether or not to do further work on rating these three flumes will be made after field inspection has been completed.

USGS Measurements			1966 USGS Rating Table		Flume Formula	
Date	Gage Height (Feet)	Discharge (MGD)	Discharge (MGD)	% Difference	Discharge (MGD)	% Difference
10-12-94	1.68	37.0	37.3	+0.8	36.3	-1.9
10-20-94	1.65	36.7	36.2	-1.4	35.2	-3.5
10-20-94	0.74	9.92	10.2	+2.6	9.95	+0.3

USGS measurements in September and October 1994 of the rated section at Adit 8 indicated that the 1966 rating curve being used by WIC is 8 to 13 percent lower than actual discharge. Based on this, the USGS created a new rating curve, a copy of which is included in Appendix A. Now that algae has been removed from the gaging site, TNWRE will make its own measurements at the Adit 8 rated section. The CWRM staff will be informed of the measuring days in order for its staff to observe the process. Results of the measurements will be filed with the CWRM.

PRELIMINARY MANAGEMENT PRACTICES PLAN

Efforts by Waiahole Irrigation Company

WIC's management practices fall into the following four categories: (1) frequent system inspections; (2) reducing leaks; (3) coordination of uses by customers; and (4) developing an accounting system for sources of supply and uses by customers to locate and quantify system losses. Brief descriptions of each of these efforts are provided below.

System Inspections. WIC personnel frequently inspect all areas of the system. On the leeward side, the system is inspected twice a day. On the windward side, portions of the supply system are inspected daily and the remainder is done on at least a weekly basis. This substantial commitment of manpower is done so that problems which may develop can be dealt with as soon as practical.

Reducing Leaks. Leak reduction has focused on the system's largest and most visually obvious leakage points, the three redwood siphons. For the past six months, remedial work on the siphons has averaged five man-days per week. This has included the purchase of $5,000 of new steel straps, tapping in wooden plugs in small leak points, and two short-period shutdowns to do more extensive repairs. Since leakage from two of the three siphons collects to a single point and flows through a 24-inch pipe culvert beneath a cane haul road, the depth of water flowing through the culvert can be used to quantify the leakage rate. Six months ago, the depth of flow was 9 inches; in July, it was 5.5 inches; and today, it is 4 inches. Assuming normal depth flow through the culvert and applying the Manning's formula, estimates of these leakage rates are 2.6, 1.0, and 0.54 MGD, respectively. Leakage at present is approximately 20 percent of the rate six months ago.

Slip-lining the siphons with HDPE or other pipe materials has been investigated with several contractors. Preliminary cost estimates for a 36-inch lining sized to convey 25 MGD range up to $1.5 million. The differences in cost arise from the different methods contractors would employ. In any case, WIC would need a water use allocation of sufficient magnitude to justify a capital expenditure of this magnitude.

Coordination of Uses by Customers. Uses of the system has recently changed from essentially one large user, Oahu Sugar Company, to more than 40 customers. Operation of the system is obviously far more complicated than previously. Coordination of withdrawals by customers is necessary: if too much is withdrawn, resarvoirs empty and downstream customers are deprived of adequate supply; if there is too little use, releases to dry gulches on the leeward side may be unavoidable. There have been a few instances when these situations havs occurred in this transition period of the system's operation. WIC personnel are in constant communication with the system's customers so that the total use rate is coordinated to be as reasonably consistent as possible. This is a learning period for both the operators and the customers.

Accounting For Supply and Use to Quantify System Losses. WIC's goal is to develop a reporting system for sources of supply and uses by customers which will locate and quantify losses in the system. The siphons are an obvious location of significant leakage. On the Robinson and Campbell Estate properties, use is made of unlined reservoirs (Nos. 225 and 155, respectively) and OSCO's extensive pipeline network. To quantify losses through these systems, gaging stations at selected locations will nead to be establishad (or, in some cases, reactivated). The existing and operational gaging station at Gate 12 at the Castle & Cooke-Robinson Estate boundary is an example of this. Establishing stations on the inflow into Reservoir 225 and at the Campbell Estate property line at Kunia Road are being considered.

Efforts by Individual Customers of the System

On October 24, 1995, WIC called a meeting of its customers to review its efforts to bring metering to an acceptable level of accuracy and to stress the need for conservation and diligent management practices. A list of attendees at this meeting is provided on Table 3. Each attendee was requested to write a description of its own management practices to ensure reasonable and beneficial uses of the water. Their responses are compiled in Appendix D. Although the HSPA was unable to attend the October 24th meeting, it has been working with the WIC staff. A letter from HSPA summarizing its management practices is included in the Appendix.

Table 3

Attendees at the October 24, 1995 Meeting of Users of the Waiahole Irrigation System

Name	Organization	Phone	Fax
Jerome Fukuda	Waiawa Nursery	671-7912	671-5341
Todd Murata	Royal Oahu Resort	949-1088	943-1809
Robert Creps	Puu Makakilo	487-7916	486-8025
Bert Hatton	Waiahole Irrigation Company	543-8941	543-8944
Ed Chong	Dole / Castle & Cooke	548-2908	548-2975
Bev Kaku	Dole / Castle & Cooke	548-2945	548-2975
Roy Kepoa	Waiawa Correctional Center	455-6915	455-7031
Leighton Wong	Royal Oahu Resort Inc.	678-2654	678-2748
Bob Bevacqua	Kunia Farms	621-1233	621-1213
Alec Sou	Aloun Farms	696-6787	696-7787
Larry Jefts	Waikele Farms, Inc. and Sugarland Farms, Inc.	678-2892	678-2894
Patrice Liu	Gentry / KSBE	599-8345	545-2450
Wallace Nitta	Mililani Small Farm Area	259-7911	259-5387
Greg Fukumitsu	TNWRE	537-1141	538-7757
Bill Paty	Robinson	524-4933	545-8930
Nathan Natori	Carlsmith / Nihonkai	523-2590	523-0842
George Hiu	Campbell Estate	674-3289	674-3111
Jim Russell	Campbell Estate	674-3338	674-3111
Byron Alcos	Waiahole Irrigation Company	251-4732 (Pager) 223-7953 (Cellular)	671-4284

Appendix A

Rating Tables in Use For the Gaging Stations

KAHANA 3

WAIAHOLE IRRIGATION COMPANY

Table For A Five (5) Foot Standard Contracted Rectangular
Weir For The Prospecting Tunnel At Intake #9 In Kahana
Francis' Formula $Q = 3.33\ (L - 0.2H)\ H^{\frac{3}{2}}$

Head In Feet	Million Gallons Per 24 Hours	Head In Feet	Million Gallons Per 24 Hours	Head In Feet	Million Gallon Per 24 Hours
0.01	0.010	0.36	2.291	0.71	6.255
.02	0.030	.37	2.386	.72	6.385
.03	0.056	.38	2.483	.73	6.516
.04	0.086	.39	2.580	.74	6.647
.05	0.120	.40	2.681	.75	6.779
0.06	0.158	0.41	2.779	0.76	6.913
.07	0.199	.42	2.880	.77	7.047
.08	0.242	.43	2.982	.78	7.182
.09	0.290	.44	3.086	.79	7.317
.10	0.339	.45	3.191	.80	7.458
0.11	0.391	0.46	3.296	0.81	7.591
.12	0.445	.47	3.402	.82	7.729
.13	0.502	.48	3.510	.83	7.867
.14	0.560	.49	3.619	.84	8.007
.15	0.623	.50	3.728	.85	8.146
0.16	0.684	0.51	3.839	0.86	8.287
.17	0.749	.52	3.952	.87	8.429
.18	0.816	.53	4.064	.88	8.571
.19	0.885	.54	4.178	.89	8.714
.20	0.954	.55	4.294	.90	8.853
0.21	1.027	0.56	4.409	0.91	9.001
.22	1.101	.57	4.526	.92	9.147
.23	1.176	.58	4.643	.93	9.292
.24	1.253	.59	4.761	.94	9.438
.25	1.332	.60	4.884	.95	9.588
0.26	1.412	0.61	5.002	0.96	9.734
.27	1.494	.62	5.123	.97	9.882
.28	1.576	.63	5.246	.98	10.031
.29	1.661	.64	5.369	.99	10.180
.30	1.748	.65	5.493	1.00	10.330
0.31	1.834	0.66	5.618		
.32	1.923	.67	5.743		
.33	2.013	.68	5.870		
.34	2.104	.69	5.998		
.35	2.198	.70	6.128		

11/21/73

KAHANA 2.

Free Flow Discharge Table of a 4.0' (Foot)

Parshall Measuring Flume

G.Ht.	M.G.D.	G.Ht.	M.G.D.	G.Ht.	M.G.D.	G.Ht.	M.G.D.	G.Ht.	M.G.D.
0.00	0.00	.60	4.62	1.20	13.79	1.80	26.14	2.40	41.16
.01	.03	.61	4.74	1.21	13.97	1.81	26.37	2.41	41.44
.02	.06	.62	4.87	1.22	14.15	1.82	26.60	2.42	41.71
.03	.09	.63	4.99	1.23	14.34	1.83	26.84	2.43	41.98
.04	.12	.64	5.11	1.24	14.52	1.84	27.07	2.44	42.26
.05	.15	.65	5.24	1.25	14.70	1.85	27.30	2.45	42.53
.06	.18	.66	5.37	1.26	14.89	1.86	27.53	2.46	42.81
.07	.21	.67	5.50	1.27	15.08	1.87	27.77	2.47	43.08
.08	.24	.68	5.63	1.28	15.27	1.88	28.00	2.48	43.35
.09	.27	.69	5.76	1.29	15.46	1.89	28.24	2.49	43.63
.10	.30	.70	5.89	1.30	15.65	1.90	28.47	2.50	43.90
.11	.35	.71	6.02	1.31	15.83	1.91	28.71	2.51	44.18
.12	.40	.72	6.16	1.32	16.03	1.92	28.95	2.52	44.46
.13	.45	.73	6.30	1.33	16.22	1.93	29.19	2.53	44.74
.14	.50	.74	6.43	1.34	16.41	1.94	29.43	2.54	45.02
.15	.56	.75	6.57	1.35	16.60	1.95	29.67	2.55	45.30
.16	.61	.76	6.71	1.36	16.80	1.96	29.91	2.56	45.59
.17	.66	.77	6.85	1.37	17.00	1.97	30.14	2.57	45.87
.18	.71	.78	6.99	1.38	17.19	1.98	30.39	2.58	46.15
.19	.76	.79	7.13	1.39	17.39	1.99	30.64	2.59	46.43
.20	.81	.80	7.27	1.40	17.59	2.00	30.87	2.60	46.71
.21	.88	.81	7.42	1.41	17.79	2.01	31.11	2.61	47.00
.22	.95	.82	7.56	1.42	17.98	2.02	31.36	2.62	47.28
.23	1.02	.83	7.70	1.43	18.19	2.03	31.60	2.63	47.57
.24	1.09	.84	7.85	1.44	18.39	2.04	31.86	2.64	47.85
.25	1.16	.85	8.00	1.45	18.59	2.05	32.10	2.65	48.14
.26	1.23	.86	8.15	1.46	18.79	2.06	32.35	2.66	48.43
.27	1.31	.87	8.30	1.47	18.99	2.07	32.60	2.67	48.71
.28	1.39	.88	8.45	1.48	19.20	2.08	32.85	2.68	49.00
.29	1.47	.89	8.60	1.49	19.40	2.09	33.10	2.69	49.28
.30	1.54	.90	8.76	1.50	19.61	2.10	33.34	2.70	49.57
.31	1.63	.91	8.91	1.51	19.82	2.11	33.60	2.71	49.86
.32	1.71	.92	9.07	1.52	20.02	2.12	33.85	2.72	50.16
.33	1.80	.93	9.22	1.53	20.23	2.13	34.10	2.73	50.45
.34	1.89	.94	9.38	1.54	20.44	2.14	34.35	2.74	50.74
.35	1.98	.95	9.54	1.55	20.65	2.15	34.60	2.75	51.04
.36	2.07	.96	9.69	1.56	20.86	2.16	34.86	2.76	51.33
.37	2.16	.97	9.86	1.57	21.07	2.17	35.12	2.77	51.62
.38	2.25	.98	10.02	1.58	21.28	2.18	35.37	2.78	51.91
.39	2.34	.99	10.18	1.59	21.50	2.19	35.62	2.79	52.21
.40	2.44	1.00	10.34	1.60	21.71	2.20	35.88	2.80	52.50
.41	2.53	1.01	10.50	1.61	21.92	2.21	36.14	2.81	52.80
.42	2.63	1.02	10.67	1.62	22.14	2.22	36.40	2.82	53.10
.43	2.73	1.03	10.83	1.63	22.36	2.23	36.56	2.83	53.40
.44	2.83	1.04	11.00	1.64	22.58	2.24	36.92	2.84	53.70
.45	2.93	1.05	11.17	1.65	22.79	2.25	37.18	2.85	54.00
.46	3.04	1.06	11.34	1.66	23.01	2.26	37.44	2.86	54.29
.47	3.14	1.07	11.50	1.67	23.23	2.27	37.71	2.87	54.59
.48	3.25	1.08	11.68	1.68	23.45	2.28	37.96	2.88	54.89
.49	3.36	1.09	11.85	1.69	23.67	2.29	38.23	2.89	55.19
.50	3.46	1.10	12.02	1.70	23.89	2.30	38.49	2.90	55.49
.51	3.57	1.11	12.19	1.71	24.11	2.31	38.75	2.91	55.80
.52	3.68	1.12	12.36	1.72	24.33	2.32	39.02	2.92	56.10
.53	3.80	1.13	12.54	1.73	24.56	2.33	39.29	2.93	56.40
.54	3.91	1.14	12.71	1.74	24.78	2.34	39.55	2.94	56.71
.55	4.03	1.15	12.89	1.75	25.01	2.35	39.82	2.95	57.02
.56	4.14	1.16	13.07	1.76	25.23	2.36	40.09	2.96	57.32
.57	4.26	1.17	13.25	1.77	25.46	2.37	40.36	2.97	57.62
.58	4.38	1.18	13.43	1.78	25.68	2.38	40.63	2.98	57.93
.59	4.50	1.19	13.60	1.79	25.92	2.39	40.89	2.99	58.24

Free Flow Discharge Table of a 4.0' (Foot)

Parshall Measuring Flume (Continued)

G.Ht.	M.G.D.	G.Ht.	M.G.D.	G.Ht.	M.G.D.	G.Ht.	M.G.D.	G.Ht.	M.G.D.
3.00	58.54	3.40	71.33	3.80	85.01	4.20	99.55	4.60	114.92
3.01	58.85	3.41	71.66	3.81	85.36	4.21	99.93	4.61	115.32
3.02	59.16	3.42	72.00	3.82	85.72	4.22	100.30	4.62	115.71
3.03	59.47	3.43	72.33	3.83	86.07	4.23	100.68	4.63	116.11
3.04	59.78	3.44	72.66	3.84	86.43	4.24	101.06	4.64	116.51
3.05	60.10	3.45	73.00	3.85	86.78	4.25	101.44	4.65	116.90
3.06	60.41	3.46	73.33	3.86	87.14	4.26	101.81	4.66	117.30
3.07	60.72	3.47	73.66	3.87	87.50	4.27	102.19	4.67	117.70
3.08	61.03	3.48	73.99	3.88	87.85	4.28	102.57	4.68	118.10
3.09	61.34	3.49	74.33	3.89	88.20	4.29	102.94	4.69	118.49
3.10	61.65	3.50	74.66	3.90	88.56	4.30	103.32	4.70	118.89
3.11	61.97	3.51	75.00	3.91	88.92	4.31	103.70	4.71	119.29
3.12	62.28	3.52	75.34	3.92	89.28	4.32	104.08	4.72	119.69
3.13	62.60	3.53	75.68	3.93	89.65	4.33	104.46	4.73	120.09
3.14	62.92	3.54	76.02	3.94	90.01	4.34	104.84	4.74	120.49
3.15	63.24	3.55	76.36	3.95	90.37	4.35	105.22	4.75	120.90
3.16	63.55	3.56	76.70	3.96	90.73	4.36	105.61	4.76	121.30
3.17	63.87	3.57	77.04	3.97	91.09	4.37	105.99	4.77	121.70
3.18	64.19	3.58	77.38	3.98	91.46	4.38	106.37	4.78	122.10
3.19	64.50	3.59	77.72	3.99	91.82	4.39	106.75	4.79	122.50
3.20	64.82	3.60	78.06	4.00	92.18	4.40	107.13	4.80	122.90
3.21	65.14	3.61	78.40	4.01	92.55	4.41	107.52	4.81	123.31
3.22	65.46	3.62	78.75	4.02	92.91	4.42	107.90	4.82	123.71
3.23	65.79	3.63	79.10	4.03	93.28	4.43	108.29	4.83	124.12
3.24	66.11	3.64	79.44	4.04	93.64	4.44	108.68	4.84	124.53
3.25	66.43	3.65	79.78	4.05	94.01	4.45	109.06	4.85	124.94
3.26	66.75	3.66	80.13	4.06	94.38	4.46	109.45	4.86	125.34
3.27	67.07	3.67	80.48	4.07	94.74	4.47	109.84	4.87	125.75
3.28	67.40	3.68	80.82	4.08	95.10	4.48	110.23	4.88	126.16
3.29	67.72	3.69	81.16	4.09	95.47	4.49	110.61	4.89	126.56
3.30	68.04	3.70	81.51	4.10	95.84	4.50	111.00	4.90	126.97
3.31	68.37	3.71	81.86	4.11	96.21	4.51	111.39	4.91	127.38
3.32	68.70	3.72	82.21	4.12	96.58	4.52	111.78	4.92	127.79
3.33	69.03	3.73	82.56	4.13	96.95	4.53	112.18	4.93	128.20
3.34	69.36	3.74	82.91	4.14	97.32	4.54	112.57	4.94	128.61
3.35	69.68	3.75	83.26	4.15	97.70	4.55	112.96	4.95	129.02
3.36	70.01	3.76	83.61	4.16	98.07	4.56	113.35	4.96	129.44
3.37	70.34	3.77	83.96	4.17	98.44	4.57	113.74	4.97	129.85
3.38	70.67	3.78	84.31	4.18	98.81	4.58	114.14	4.98	130.26
3.39	71.00	3.79	84.66	4.19	99.18	4.59	114.53	4.99	130.67
								5.00	131.08

Computed by W. E. A.

Checked " " on Machine

From Jan. 20, 1950 -

WAIKANE 1 : 2' FL E UNAH 4: 2' FLUME
WAIKANE 2 : 1.5' FLUME UNAH 4A: 1' FLUME

FREE FLOW DISCHARGE THROUGH PARSHALL MEASURING FLUMES

Head, H. (feet)	Discharge, Q, for throat widths, W, of- 3 inches	6 inches	9 inches	1 foot	1.5 feet	2 feet	3 feet	4 feet
	Sec. ft.	Sec.ft.	Sec.ft.	Sec.ft.	Sec.ft.	Sec.ft.	Sec.ft.	Sec.ft.
0.10	0.028	0.05	0.09					
.11	.033	.06	.10					
.12	.037	.07	.12					
.13	.042	.08	.14					
.14	.047	.09	.15					
.15	.053	.10	.17					
.16	.058	.11	.19					
.17	.064	.12	.20					
.18	.070	.14	.22					
.19	.076	.15	.24					
					HLD	HLD	HLD	
.20	.082	.16	.26	0.35	0.51 .330	0.86 .43	0.97	1.26
.21	.089	.18	.28	.37	.55 .355	.71 .46	1.04	1.34
.22	.095	.19	.30	.40	.59 .381	.77 .50	1.12	1.47
.23	.102	.20	.32	.43	.63 .407	.82 .53	1.20	1.58
.24	.109	.22	.35	.46	.67 .433	.88 .57	1.28	1.69
.25	.117	.23	.37	.49	.71 .459	.93 .60	1.37	1.80
.26	.124	.25	.39	.51	.76 .491	.99 .64	1.46	1.91
.27	.131	.26	.41	.54	.80 .517	1.05 .68	1.55	2.03
.28	.138	.28	.44	.58	.85 .549	1.11 .72	1.64	2.15
.29	.146	.29	.46	.61	.90 .582	1.18 .76	1.73	2.27
.30	.154	.31	.49	.64	.94 .608	1.24 .80	1.82	2.39
.31	.162	.32	.51	.68	.99 .640	1.30 .84	1.92	2.52
.32	.170	.34	.54	.71	1.04 .672	1.37 .89	2.02	2.65
.33	.179	.36	.56	.74	1.09 .704	1.44 .93	2.12	2.78
.34	.187	.38	.59	.77	1.14 .737	1.50 .97	2.22	2.92
.35	.196	.39	.62	.80	1.19 .769	1.57 1.01	2.32	3.06
.36	.205	.41	.64	.84	1.25 .808	1.64 1.06	2.42	3.20
.37	.213	.43	.67	.88	1.30 .840	1.72 1.11	2.53	3.34
.38	.222	.45	.70	.92	1.36 .879	1.79 1.16	2.64	3.48
.39	.231	.47	.73	.95	1.42 .911	1.86 1.20	2.75	3.62
.40	.241	.48	.76	.99	1.47 .950	1.93 1.25	2.86	3.77
.41	.250	.50	.78	1.03	1.53 .989	2.01 1.30	2.97	3.92
.42	.260	.52	.81	1.07	1.58 1.024	2.09 1.35	3.08	4.07
.43	.269	.54	.84	1.11	1.64 1.060	2.16 1.40	3.29	4.22
.44	.279	.56	.87	1.15	1.70 1.099	2.24 1.45	3.32	4.38
.45	.289	.58	.90	1.19	1.76 1.138	2.32 1.50	3.44	4.54
.46	.299	.61	.94	1.23	1.82 1.176	2.40 1.55	3.56	4.70
.47	.309	.63	.97	1.27	1.88 1.215	2.48 1.60	3.68	4.86
.48	.319	.65	1.00	1.31	1.94 1.254	2.57 1.66	3.80	5.03
.49	.329	.67	1.03	1.35	2.00 1.293	2.65 1.71	3.92	5.20
.50	.339	.69	1.06	1.39	2.06 1.331	2.73 1.76	4.05	5.36
.51	.350	.71	1.10	1.44	2.13 1.377	2.82 1.82	4.18	5.53
.52	.361	.73	1.13	1.48	2.19 1.415	2.90 1.87	4.31	5.70
.53	.371	.76	1.16	1.52	2.25 1.454	2.99 1.93	4.44	5.88
.54	.382	.78	1.20	1.57	2.32 1.499	3.08 1.99	4.57	6.05
.55	.393	.80	1.23	1.62	2.39 1.545	3.17 2.05	4.70	6.23
.56	.404	.82	1.26	1.66	2.45 1.583	3.26 2.11	4.84	6.41
.57	.415	.85	1.30	1.70	2.52 1.629	3.35 2.17	4.98	6.59
.58	.427	.87	1.33	1.75	2.59 1.671	3.44 2.22	5.11	6.77
.59	.438	.89	1.37	1.80	2.66 1.717	3.53 2.25	5.25	6.96

Head, H. (feet)	3 inches Sec.ft.	6 inches Sec.ft.	9 inches Sec.ft.	1 foot Sec.ft.	MGD	1.5 feet Sec.ft.	MGD	2 feet Sec.ft.	MGD	3 feet Sec.ft.	4 feet Sec.ft.
0.60	0.450	0.92	1.40	1.84	1.19	2.73	1.764	3.62	2.34	5.39	7.15
.61	.462	.94	1.44	1.88	1.22	2.80	1.810	3.72	2.40	5.53	7.34
.62	.474	.97	1.48	1.93	1.25	2.87	1.855	3.81	2.46	5.68	7.53
.63	.485	.99	1.51	1.98	1.28	2.95	1.907	3.91	2.53	5.82	7.72
.64	.497	1.02	1.55	2.03	1.31	3.02	1.952	4.01	2.59	5.97	7.91
.65	.509	1.04	1.59	2.08	1.34	3.09	1.997	4.11	2.66	6.12	8.11
.66	.522	1.07	1.63	2.13	1.38	3.17	2.049	4.20	2.71	6.26	8.31
.67	.534	1.10	1.66	2.18	1.41	3.24	2.094	4.30	2.78	6.41	8.51
.68	.546	1.12	1.70	2.23	1.44	3.31	2.139	4.40	2.84	6.56	8.71
.69	.558	1.15	1.74	2.28	1.47	3.39	2.199	4.50	2.91	6.71	8.91
.70	.571	1.17	1.78	2.33	1.51	3.46		4.60	2.97	6.86	9.11
.71	.584	1.20	1.82	2.38	1.54	3.54		4.70	3.04	7.02	9.32
.72	.597	1.23	1.86	2.43	1.57	3.62		4.81	3.11	7.17	9.53
.73	.610	1.26	1.90	2.48	1.60	3.69		4.91	3.17	7.33	9.74
.74	.623	1.28	1.94	2.53	1.64	3.77		5.02	3.24	7.49	9.95
.75	.636	1.31	1.98	2.58	1.67	3.85		5.12	3.31	7.65	10.2
.76	.649	1.34	2.02	2.63	1.70	3.93		5.23	3.38	7.81	10.4
.77	.662	1.36	2.06	2.68	1.73	4.01		5.34	3.45	7.97	10.6
.78	.675	1.39	2.10	2.74	1.77	4.09	2.64	5.44	3.52	8.13	10.8
.79	.689	1.42	2.14	2.80	1.81	4.17	2.70	5.55	3.59	8.30	11.0
.80	.702	1.45	2.18	2.85	1.84	4.26	2.75	5.66	3.66	8.46	11.3
.81	.716	1.48	2.22	2.90	1.87	4.34	2.81	5.77	3.73	8.63	11.5
.82	.730	1.50	2.27	2.96	1.91	4.42	2.86	5.88	3.80	8.79	11.7
.83	.744	1.53	2.31	3.02	1.95	4.50	2.91	6.00	3.88	8.96	11.9
.84	.757	1.56	2.35	3.07	1.98	4.59	2.97	6.11	3.95	9.13	12.2
.85	.771	1.59	2.39	3.12	2.02	4.67	3.02	6.22	4.02	9.30	12.4
.86	.786	1.62	2.44	3.18	2.06	4.76	3.08	6.33	4.09	9.48	12.6
.87	.800	1.65	2.48	3.24	2.09	4.84	3.13	6.44	4.16	9.65	12.8
.88	.814	1.68	2.52	3.29	2.13	4.93	3.19	6.56	4.24	9.82	13.1
.89	.828	1.71	2.57	3.35	2.17	5.01	3.24	6.68	4.32	10.0	13.3
.90	.843	1.74	2.61	3.41	2.20	5.10	3.30	6.80	4.39	10.2	13.6
.91	.858	1.77	2.66	3.46	2.24	5.19	3.35	6.92	4.47	10.4	13.8
.92	.872	1.81	2.70	3.52	2.28	5.28	3.41	7.03	4.54	10.5	14.0
.93	.887	1.84	2.75	3.58	2.31	5.37	3.47	7.15	4.62	10.7	14.3
.94	.902	1.87	2.79	3.64	2.35	5.46	3.53	7.27	4.70	10.9	14.5
.95	.916	1.90	2.84	3.70	2.39	5.55	3.59	7.39	4.78	11.1	14.8
.96	.931	1.93	2.88	3.76	2.43	5.64	3.65	7.51	4.85	11.3	15.0
.97	.946	1.97	2.93	3.82	2.47	5.73	3.70	7.63	4.93	11.4	15.3
.98	.961	2.00	2.98	3.88	2.51	5.82	3.76	7.75	5.01	11.6	15.5
.99	.977	2.03	3.02	3.94	2.55	5.91	3.82	7.88	5.09	11.8	15.8
1.00	.992	2.06	3.07	4.00	2.59	6.00	3.88	8.00	5.17	12.0	16.0
1.01	1.01	2.09	3.12	4.06	2.62	6.09	3.94	8.12	5.24	12.2	16.3
1.02	1.02	2.12	3.17	4.12	2.66	6.19	4.00	8.25	5.33	12.4	16.5
1.03	1.04	2.16	3.21	4.18	2.70	6.28	4.06	8.38	5.42	12.6	16.8
1.04	1.05	2.19	3.26	4.25	2.75	6.37	4.12	8.50	5.49	12.8	17.0
1.05	1.07	2.22	3.31	4.31	2.79	6.47	4.18	8.63	5.58	13.0	17.3
1.06	1.08	2.26	3.36	4.37	2.82	6.56	4.24	8.76	5.66	13.2	17.5
1.07	1.10	2.29	3.40	4.43	2.86	6.66	4.30	8.88	5.74	13.3	17.8
1.08	1.12	2.32	3.45	4.50	2.91	6.75	4.36	9.01	5.82	13.5	18.1
1.09	1.13	2.36	3.50	4.56	2.95	6.85	4.43	9.14	5.91	13.7	18.3

PAGE 3 OF 5

Head, H. (feet)	3 inches	6 inches	9 inches	1 foot	1.5 feet	2 feet	3 feet	4 feet
	Sec.ft.	Sec.ft.	Sec.ft.	Sec.ft.	Sec.ft.	Sec.ft.	Sec.ft.	Sec.ft.
1.10		2.40	3.55	4.62	6.95	9.27	13.9	18.4
1.11		2.43	3.60	4.68	7.04	9.40	14.1	18.9
1.12		2.46	3.65	4.75	7.14	9.54	14.3	19.1
1.13		2.50	3.70	4.82	7.24	9.67	14.5	19.4
1.14		2.53	3.75	4.88	7.34	9.80	14.7	19.7
1.15		2.57	3.80	4.94	7.44	9.94	14.9	19.9
1.16		2.60	3.85	5.01	7.54	10.1	15.1	20.2
1.17		2.64	3.90	5.08	7.64	10.2	15.3	20.5
1.18		2.68	3.95	5.15	7.74	10.3	15.6	20.8
1.19		2.71	4.01	5.21	7.84	10.5	15.8	21.1
1.20		2.75	4.06	5.28	7.94	10.6	16.0	21.3
1.21		2.78	4.11	5.34	8.05	10.8	16.2	21.6
1.22		2.82	4.16	5.41	8.15	10.9	16.4	21.9
1.23		2.86	4.22	5.48	8.25	11.0	16.6	22.2
1.24		2.89	4.27	5.55	8.36	11.2	16.8	22.5
1.25		2.93	4.32	5.62	8.46	11.3	17.0	22.8
1.26		2.97	4.37	5.69	8.56	11.5	17.2	23.0
1.27		3.01	4.43	5.76	8.67	11.6	17.4	23.3
1.28		3.04	4.48	5.82	8.77	11.7	17.7	23.6
1.29		3.08	4.53	5.89	8.88	11.9	17.9	23.9
1.30		3.12	4.59	5.96	8.99	12.0	18.1	24.2
1.31		3.16	4.64	6.03	9.09	12.2	18.3	24.5
1.32		3.19	4.69	6.10	9.20	12.3	18.5	24.8
1.33		3.23	4.75	6.18	9.30	12.4	18.8	25.1
1.34		3.27	4.80	6.25	9.41	12.6	19.0	25.4
1.35		3.31	4.86	6.32	9.52	12.7	19.2	25.7
1.36		3.35	4.92	6.39	9.63	12.9	19.4	26.0
1.37		3.39	4.97	6.46	9.74	13.0	19.6	26.3
1.38		3.43	5.03	6.53	9.85	13.2	19.9	26.6
1.39		3.47	5.08	6.60	9.96	13.3	20.1	26.9
1.40		3.51	5.14	6.68	10.1	13.5	20.3	27.2
1.41		3.55	5.19	6.75	10.2	13.8	20.6	27.5
1.42		3.59	5.25	6.82	10.3	13.8	20.8	27.8
1.43		3.63	5.31	6.89	10.4	13.9	21.0	28.1
1.44		3.67	5.37	6.97	10.5	14.1	21.2	28.5
1.45		3.71	5.42	7.04	10.6	14.2	21.5	28.8
1.46		3.75	5.48	7.12	10.7	14.4	21.7	29.1
1.47		3.79	5.54	7.19	10.8	14.5	21.9	29.4
1.48		3.83	5.59	7.26	11.0	14.7	22.2	29.7
1.49		3.87	5.65	7.34	11.1	14.9	22.4	30.0
1.50			5.71	7.41	11.2	15.0	22.6	30.3
1.51			5.77	7.49	11.3	15.2	22.9	30.7
1.52			5.83	7.57	11.4	15.3	23.1	31.0
1.53			5.89	7.64	11.5	15.5	23.4	31.3
1.54			5.94	7.72	11.7	15.6	23.6	31.6
1.55			6.00	7.80	11.8	15.8	23.8	32.0
1.56			6.06	7.87	11.9	15.9	24.1	32.3
1.57			6.12	7.95	12.0	16.1	24.3	32.6
1.58			6.18	8.02	12.1	16.3	24.6	32.9
1.59			6.24	8.10	12.2	16.4	24.8	33.3

Head, H. (feet)	3 inches	6 inches	9 inches	1 foot	1.5 feet	2 feet	3 feet	4 feet
	Sec. ft.	Sec.ft.	Sec.ft.	Sec.ft.	Sec.ft.	Sec.ft.	Sec.ft.	Sec.ft.
1.60			6.31	8.18	12.4	16.6	25.1	33.6
1.61			6.37	8.26	12.5	16.7	25.3	33.9
1.62			6.43	8.34	12.6	16.9	25.5	34.3
1.63			6.49	8.42	12.7	17.1	25.8	34.6
1.64			6.55	8.49	12.8	17.2	26.0	34.9
1.65			6.61	8.57	13.0	17.4	26.3	35.3
1.66			6.67	8.65	13.1	17.6	26.5	35.6
1.67			6.73	8.73	13.2	17.7	26.8	35.9
1.68			6.79	8.81	13.3	17.9	27.0	36.3
1.69			6.86	8.89	13.5	18.0	27.3	36.6
1.70			6.92	8.97	13.6	18.2	27.6	37.0
1.71			6.98	9.05	13.7	18.4	27.8	37.3
1.72			7.04	9.13	13.8	18.5	28.1	37.7
1.73			7.11	9.21	13.9	18.7	28.3	38.0
1.74			7.17	9.29	14.1	18.9	28.6	38.3
1.75			7.23	9.38	14.2	19.0	28.8	38.7
1.76			7.29	9.46	14.3	19.2	29.1	39.0
1.77			7.36	9.54	14.4	19.4	29.3	39.4
1.78			7.42	9.62	14.6	19.6	29.6	39.7
1.79			7.48	9.70	14.7	19.7	29.9	40.1
1.80			7.54	9.79	14.8	19.9	30.1	40.5
1.81			7.61	9.87	15.0	20.1	30.4	40.8
1.82			7.68	9.95	15.1	20.2	30.7	41.2
1.83			7.74	10.0	15.2	20.4	30.9	41.5
1.84			7.81	10.1	15.3	20.6	31.2	41.9
1.85			7.87	10.2	15.5	20.8	31.5	42.2
1.86			7.94	10.3	15.6	20.9	31.7	42.6
1.87			8.00	10.4	15.7	21.1	32.0	43.0
1.88			8.06	10.5	15.8	21.3	32.3	43.3
1.89			8.13	10.5	16.0	21.5	32.5	43.7
1.90			8.20	10.6	16.1	21.6	32.8	44.1
1.91			8.26	10.7	16.2	21.8	33.1	44.4
1.92			8.33	10.8	16.4	22.0	33.3	44.8
1.93			8.40	10.9	16.5	22.2	33.6	45.2
1.94			8.46	11.0	16.6	22.4	33.9	45.5
1.95			8.52	11.1	16.7	22.5	34.1	45.9
1.96			8.59	11.1	16.9	22.7	34.4	46.3
1.97			8.66	11.2	17.0	22.9	34.7	46.6
1.98			8.73	11.3	17.2	23.1	35.0	47.0
1.99			8.80	11.4	17.3	23.2	35.3	47.4
2.00				11.5	17.4	23.4	35.5	47.8
2.01				11.6	17.6	23.6	35.8	48.1
2.02				11.7	17.7	23.8	36.1	48.5
2.03				11.8	17.8	24.0	36.4	48.9
2.04				11.8	18.0	24.2	36.7	49.3
2.05				11.9	18.1	24.3	36.9	49.7
2.06				12.0	18.2	24.5	37.2	50.1
2.07				12.1	18.4	24.7	37.5	50.4
2.08				12.2	18.5	24.9	37.8	50.8
2.09				12.3	18.7	25.1	38.1	51.2

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Head, H. (feet)	3 inches	6 inches	9 inches	1 foot	1.5 feet	2 feet	3 feet	4 feet
	Sec.ft.	Sec.ft.	Sec.ft.	Sec.ft.	Sec.ft.	Sec.ft.	Sec.ft.	Sec.ft.
2.10				12.4	18.8	25.3	38.4	51.6
2.11				12.5	18.9	25.5	38.6	52.0
2.12				12.6	19.0	25.6	38.9	52.4
2.13				12.6	19.2	25.8	39.2	52.8
2.14				12.7	19.3	26.0	39.5	53.2
2.15				12.8	19.5	26.2	39.8	53.5
2.16				12.9	19.6	26.4	40.1	53.9
2.17				13.0	19.7	26.6	40.4	54.3
2.18				13.1	19.9	26.8	40.7	54.7
2.19				13.2	20.0	27.0	41.0	55.1
2.20				13.3	20.2	27.2	41.3	55.5
2.21				13.4	20.3	27.3	41.5	55.9
2.22				13.5	20.5	27.5	41.8	56.3
2.23				13.6	20.6	27.7	42.1	56.7
2.24				13.7	20.7	27.9	42.4	57.1
2.25				13.7	20.9	28.1	42.7	57.5
2.26				13.8	21.0	28.3	43.0	57.9
2.27				13.9	21.2	28.5	43.3	58.3
2.28				14.0	21.3	28.7	43.6	58.7
2.29				14.1	21.4	28.9	43.9	59.2
2.30				14.2	21.6	29.1	44.2	59.6
2.31				14.3	21.7	29.3	44.5	60.0
2.32				14.4	21.9	29.5	44.8	60.4
2.33				14.5	22.0	29.7	45.1	60.8
2.34				14.6	22.2	29.9	45.4	61.2
2.35				14.7	22.4	30.1	45.7	61.6
2.36				14.8	22.5	30.3	46.0	62.0
2.37				14.9	22.6	30.5	46.4	62.4
2.38				15.0	22.8	30.7	46.7	62.9
2.39				15.1	22.9	30.9	47.0	63.3
2.40				15.2	23.0	31.1	47.3	63.7
2.41				15.3	23.2	31.3	47.6	64.1
2.42				15.4	23.3	31.5	47.9	64.5
2.43				15.5	23.5	31.7	48.2	65.0
2.44				15.6	23.7	31.9	48.5	65.4
2.45				15.6	23.8	32.1	48.8	65.8
2.46				15.7	23.9	32.3	49.1	66.2
2.47				15.9	24.1	32.5	49.5	66.7
2.48				15.9	24.2	32.7	49.8	67.1
2.49				16.0	24.4	32.9	50.1	67.5
2.50				16.1	24.6	33.1	50.4	67.9

WAIAHU 207

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(Rev. 6-62)

UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY (WATER RESOURCES DIVISION)

Rating table for Waiahole tunnel at Waiahu, near Waiahole, Oahu ~~Dated~~ Table 2, 19

Sta. No. 16:2850.00

from Oct 1, 1966 to ; from to

from to ; from to

Gage height Feet	.00 Cfs	.01 Cfs	.02 Cfs	.03 Cfs	.04 Cfs	.05 Cfs	.06 Cfs	.07 Cfs	.08 Cfs	.09 Cfs	Difference Cfs
0.0											
.1											
.2											
.3											
.4											
.5											
.6	MS 6.01	6.15	6.30	6.44	6.59	6.72	6.85	6.98	7.17	7.30	
.7	9.3	9.52	9.74	9.96	10.2	10.4	10.6	10.8	11.1	11.3	
.8	7.43	7.63	7.76	7.89	8.08	8.27	8.40	8.53	8.73	8.92	2.2
.9	11.5	11.8	12.0	12.2	12.5	12.8	13.0	13.2	13.5	13.8	
1.0	9.05	9.18	9.37	9.57	9.69	9.82	10.02	10.21	10.34	10.47	2.5
.1	14.0	14.2	14.5	14.8	15.0	15.2	15.5	15.8	16.0	16.2	
.2	10.66	10.86	10.99	11.12	11.31	11.50	11.63	11.76	11.96	12.15	2.5
.3	16.5	16.8	17.0	17.2	17.5	17.8	18.0	18.2	18.5	18.8	
.4	12.25	12.47	12.67	12.86	13.06	13.25	13.44	13.64	13.83	14.03	2.5
.5	19.0	19.3	19.6	19.9	20.2	20.5	20.8	21.1	21.4	21.7	
.6	14.21	14.41	14.61	14.80	14.99	15.19	15.38	15.58	15.77	15.97	3.0
.7	22.0	22.3	22.6	22.9	23.2	23.5	23.8	24.1	24.4	24.7	
.8	16.15	16.35	16.55	16.74	16.93	17.13	17.32	17.52	17.71	17.91	
.9	25.0	25.3	25.6	25.9	26.2	26.5	26.8	27.1	27.4	27.7	
2.0	18.1	18.3	18.5	18.7	18.9	19.1	19.3	19.5	19.6	19.8	
.1	28.0	28.3	28.6	28.9	29.2	29.5	29.8	30.1	30.4	30.7	
.2	20.3	20.5	20.5	20.7	20.9	21.2	21.4	21.6	21.8	22.1	3.0
.3	31.0	31.4	31.7	32.0	32.4	32.8	33.1	33.4	33.8	34.2	
.4	22.3	22.5	22.8	23.0	23.2	23.4	23.7	23.9	24.1	24.3	3.5
.5	34.5	34.8	35.2	35.6	35.9	36.2	36.6	37.0	37.3	37.6	
.6	24.6	24.8	25.0	25.2	25.5	25.7	25.9	26.1	26.4	26.6	
.7	38.0	38.4	38.7	39.0	39.4	39.8	40.1	40.4	40.8	41.2	
.8	26.8	27.0	27.3	27.5	27.7	27.9	28.2	28.4	28.6	28.8	
.9	41.5	41.8	42.2	42.6	42.9	43.2	43.6	44.0	44.3	44.6	
3.0	29.1	29.3	29.5	29.7	30.0	30.2	30.4	30.6	30.9	31.2	
.1	45.0	45.4	45.7	46.0	46.4	46.8	47.1	47.4	47.8	48.2	
.2	31.3	31.6	31.9	32.1	32.4	32.6	32.9	33.2	33.4	33.7	3.5
.3	48.5	48.9	49.4	49.7	50.1	50.5	50.9	51.3	51.7	52.1	
.4	33.9	34.2	34.4	34.7	35.0	35.2	35.5	35.7	36.0	36.3	4.0
.5	52.5	52.9	53.3	53.7	54.1	54.5	54.9	55.3	55.7	56.1	
.6	36.5	36.8	37.0	37.3	37.6	37.8	38.1	38.3	38.6	38.8	
.7	56.5	56.9	57.3	57.7	58.1	58.5	58.9	59.3	59.7	60.1	
.8	39.1	39.4	39.6	39.9	40.1	40.4	40.7	40.9	41.2	41.4	
.9	60.5	60.9	61.3	61.7	62.1	62.5	62.9	63.3	63.7	64.1	4.0
4.0	41.7	42.0	42.3	42.5	42.8	43.2	43.4	43.7	44.0	44.3	
.1	64.5	65.0	65.4	65.8	66.3	66.8	67.2	67.6	68.1	68.6	4.5
.2	44.6	44.9	45.2	45.5	45.8	46.0	46.3	46.7	46.9	47.2	
.3	69.0	69.4	69.9	70.4	70.8	71.2	71.7	72.2	72.6	73.0	
.4	47.5	47.8	48.1	48.3	48.7	49.0	49.2	49.5	49.8	50.2	
.5	73.2	74.0	74.4	74.8	75.3	75.8	76.2	76.6	77.1	77.6	
.6	50.4	50.7	51.0	51.3	51.6	51.8	52.2	52.5	52.7	53.0	
.7	78.2	78.4	79.3	79.4	79.8	80.2	80.7	81.2	81.6	82.0	
.8	53.3	53.6	53.9	54.2	54.5	54.8	55.1	55.3	55.6	56.0	
.9	82.5	83.0	83.4	83.8	84.3	84.8	85.2	85.6	86.1	86.6	4.5
5.0	56.2	56.6	57.4	57.2	57.5	57.8	58.2	58.5	58.8	59.1	
.1	87.0	87.5	88.0	88.5	89.0	89.5	90.0	90.5	91.0	91.5	5.0

Computed by C.W. 12/29/1968 Checked by / /19 Remarks

40' PARSHALL FLUME

WAIAHOLE 20

PAGE 2 OF 2

9-210-F (Rev. 1-62)

UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY (WATER RESOURCES DIVISION)

Rating table for Waiahole tunnel at Waianu near Waiahole ~~Dated~~ Table 2, 19

Sta. No. 16:2850.00

from Oct. 1, 1966 to ; from to

from to ; from to

Gage height	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09	Differences
Feet	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs
9.0	59.5 92.0	59.8 92.5	60.1 93.0	60.4 93.5	60.8 94.0	61.1 94.5	61.4 95.0	61.7 95.5	62.0 96.0	62.4 96.5	
.1	62.7 97.0	63.0 97.5	63.3 98.0	63.7 98.5	64.0 99.0	64.3 99.5	64.6 100	64.6 100	65.3 101	65.9 102	5.0
.2	65.9 102	65.9 102	66.6 103	67.2 104	67.2 104	67.2 104	67.9 105	68.5 106	68.5 106	68.5 106	
.3	69.2 107	69.8 108	69.8 108	69.8 108	70.4 109	71.1 110	71.1 110	71.1 110	71.7 111	72.4 112	
.4	72.4 112	73.0 113	73.0 113	73.7 114	73.7 114	74.3 115	74.3 115	75.0 116	75.0 116	75.6 117	5.0
.5	76.3 118	76.3 118	76.9 119	76.9 119	77.6 120	77.6 120	78.2 121	78.2 121	78.9 122	78.9 122	5.5
.6	79.5 123	80.1 124	80.1 124	80.8 125	80.8 125	81.4 126	81.4 126	82.1 127	82.1 127	82.7 128	
.7	82.7 128	83.4 129	84.0 130	84.0 130	84.7 131	84.7 131	85.3 132	85.3 132	86.0 133	86.0 133	
.8	86.6 134	87.3 135	87.3 135	87.9 136	87.9 136	88.5 137	88.5 137	89.2 138	89.2 138	89.8 139	
.9	90.5 140	90.5 140	91.1 141	91.1 141	91.8 142	91.8 142	92.4 143	92.4 143	93.1 144	93.1 144	
4.0	93.7 145	94.4 146	94.4 146	95.0 147	95.0 147	95.7 148	95.7 148	96.3 149	96.3 149	96.9 150	
.1	96.9 150	97.6 151	98.2 152	98.2 152	98.9 153	98.9 153	99.5 154	99.5 154	100.2 155	100.2 155	5.5
.2	100.8 156										
.3											
.4											
.5											
.6											
.7											
.8											
.9											
.0											
.1											
.2											
.3											
.4											
.5											
.6											
.7											
.8											
.9											

Computed by CW 10/29/1968; Checked by / /19 Remarks

UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY (WATER RESOURCES DIVISION)

Rating table for Waiahole tunnel wasteway at intake 31, near Waiahole, Oahu **Dated** Table 2, 19

Sta. No. 16-2860.00

from Oct. 1, 1966 to ; from to

from RED FIGURES - M.G. to ; from to

Gage height	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09	Difference
Feet	Cfs	Cfs	Cfs	Cfs	Cfs	Cfs	Cfs	Cfs	Cfs	Cfs	Cfs
.0	0	0	.01 .02	.02 .03	.03 .05	.05 .08	.09 .14	.13 .20	.17 .26	.21 .33	Extrapolation
.1	.26 .40	.30 .47	.35 .54	.40 .62	.45 .69	.50 .77	.55 .85	.60 .93	.66 1.02	.72 1.11	
.2	.78 1.20	.84 1.30	.91 1.41	.98 1.52	1.05 1.63	1.13 1.75	1.21 1.87	1.29 1.99	1.36 2.11	1.44 2.23	
.3	1.52 2.35	1.60 2.48	1.70 2.63	1.78 2.75	1.87 2.89	1.96 3.03	2.05 3.17	2.14 3.31	2.23 3.45	2.33 3.60	
.4	2.42 3.75	2.52 3.90	2.62 4.05	2.71 4.20	2.81 4.35	2.91 4.50	3.01 4.65	3.10 4.80	3.20 4.95	3.30 5.10	
.5	3.39 5.25	3.50 5.42	3.62 5.60	3.74 5.78	3.85 5.95	3.96 6.12	4.07 6.30	4.19 6.48	4.30 6.65	4.41 6.82	1.5
.6	4.52 7.00	4.65 7.20	4.78 7.40	4.91 7.60	5.04 7.80	5.17 8.00	5.30 8.20	5.43 8.40	5.56 8.60	5.69 8.80	1.75
.7	5.82 9.00	5.95 9.20	6.08 9.40	6.20 9.60	6.33 9.80	6.46 10.0	6.59 10.2	6.72 10.4	6.85 10.6	6.98 10.8	2.0
.8	7.11 11.0	7.24 11.2	7.43 11.5	7.63 11.8	7.76 12.0	7.89 12.2	8.08 12.5	8.27 12.8	8.40 13.0	8.53 13.2	2.0
.9	8.73 13.5	8.92 13.8	9.05 14.0	9.18 14.2	9.37 14.5	9.57 14.8	9.69 15.0	9.82 15.2	10.02 15.5	10.21 15.8	2.5
1.0	10.34 16.0	10.47 16.2	10.66 16.5	10.86 16.8	10.99 17.0	11.12 17.2	11.31 17.5	11.50 17.8	11.63 18.0	11.76 18.2	2.5
.1	11.96 18.5	12.15 18.8	12.34 19.1	12.54 19.4	12.73 19.7	12.93 20.0	13.12 20.3	13.31 20.6	13.51 20.9	13.70 21.2	2.5
.2	13.90 21.5	14.09 21.8	14.28 22.1	14.48 22.4	14.67 22.7	14.87 23.0	15.06 23.3	15.25 23.6	15.44 23.9	15.64 24.2	3.0
.3	15.83 24.5	16.03 24.8	16.22 25.1	16.42 25.4	16.61 25.7	16.80 26.0	17.00 26.3	17.19 26.6	17.39 26.9	17.55 27.2	3.0
.4	17.77 27.5	17.97 27.8	18.23 28.2	18.48 28.6	18.68 28.9	18.87 29.2	19.13 29.6	19.39 30.0	19.58 30.3	19.78 30.6	3.0
.5	20.04 31.0	20.29 31.4	20.49 31.7	20.68 32.0	20.94 32.4	21.20 32.8	21.39 33.1	21.59 33.4	21.85 33.8	22.10 34.2	3.5
.6	22.30 34.5	22.49 34.8	22.75 35.2	23.01 35.6	23.20 35.9	23.40 36.2	23.66 36.6	23.11 37.0	24.11 37.3	24.30 37.6	
.7	24.55 38.0	24.82 38.4	25.01 38.7	25.21 39.0	25.46 39.4	25.72 39.8	25.92 40.1	26.11 40.4	26.37 40.8	26.63 41.2	
.8	27.02 41.5	27.02 41.8	27.27 42.2	27.53 42.6	27.73 42.9	27.92 43.2	28.18 43.6	28.44 44.0	28.63 44.3	28.83 44.6	
.9	29.25 45.0	29.34 45.4	29.60 45.8	29.86 46.2	30.12 46.6	30.38 47.0	30.64 47.4	30.89 47.8	31.15 48.2	31.41 48.6	3.5
2.0	31.67 49.0	31.93 49.4	32.19 49.8	32.45 50.2	32.70 50.6	32.76 51.0	33.22 51.4	33.48 51.8	33.74 52.2	34.0 52.6	4.0
.1	34.25 53.0	34.51 53.4	34.77 53.8	35.03 54.2	35.29 54.6	35.55 55.0	35.81 55.4	36.06 55.8	36.32 56.2	36.58 56.6	
.2	36.84 57.0	37.10 57.4	37.36 57.8	37.62 58.2	37.87 58.6	38.13 59.0	38.39 59.4	38.65 59.8	38.91 60.2	39.17 60.6	
.3	39.43 61.0	39.68 61.4	40.01 61.9	40.33 62.4	40.59 62.8	40.85 63.2	41.17 63.7	41.49 64.2	41.75 64.6	42.01 65.0	4.0
.4	42.34 65.5	42.66 66.0	42.92 66.4	43.17 66.8	43.50 67.3	43.82 67.8	44.08 68.2	44.34 68.6	44.66 69.1	44.98 69.6	4.5
.5	45.24 70.0	45.50 70.4	45.82 70.9	46.15 71.4	46.41 71.8	46.66 72.2	46.99 72.7	47.31 73.2	47.57 73.6	47.83 74.0	
.6	48.15 74.5	48.47 75.0	48.73 75.4	48.99 75.8	49.31 76.3	49.64 76.8	49.90 77.2	50.15 77.6	50.48 78.1	50.80 78.6	4.5
.7	51.06 79.0	51.38 79.5	51.71 80.0	52.03 80.5	52.35 81.0	52.67 81.5	53.00 82.0	53.32 82.5	53.64 83.0	53.97 83.5	5.0
.8	54.29 84.0	54.61 84.5	54.94 85.0	55.26 85.5	55.58 86.0	55.91 86.5	56.23 87.0	56.55 87.5	56.88 88.0	57.20 88.5	
.9	57.52 89.0	57.85 89.5	58.17 90.0	58.49 90.5	58.81 91.0	59.14 91.5	59.46 92.0	59.78 92.5	60.11 93.0	60.43 93.5	5.0

Computed by W.C.V. 10/8/1968; Checked by C.W. 10/24/1968 Remarks

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UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY (WATER RESOURCES DIVISION)

Rating table for ____ Sta. No. 16-2870.00

Waiahole tunnel at north portal near Waiahole, Oahu Dated Table 3, 19__

from Oct. 1, 1966 to ____; from ____ to ____

from ____ to ____; from ____ to ____

Gage height	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09	Difference
Feet	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs	cfs
0.0	0	.02 .03	.05 .07	.08 .12	.12 .18	.16 .24	.19 .30	.24 .37	.29 .45	.34 .52	Curvilinear Interpolation
.1	.39 .60	.43 .67	.48 .75	.54 .83	.59 .91	.65 1.00	.70 1.09	.76 1.18	.82 1.27	.88 1.36	
.2	.94 1.45	1.00 1.55	1.65	1.07 1.75	1.20 1.85	1.26 1.95	1.33 2.06	1.41 2.18	1.49 2.30	1.56 2.42	
.3	1.65 2.55	1.73 2.68	1.82 2.81	1.91 2.95	2.00 3.09	2.09 3.23	2.18 3.37	2.27 3.51	2.36 3.65	2.46 3.80	
.4	2.55 3.95	2.66 4.11	2.76 4.27	2.86 4.43	2.97 4.59	3.07 4.75	3.17 4.91	3.28 5.07	3.38 5.23	3.48 5.39	
.5	3.59 5.55	3.71 5.74	3.83 5.92	3.94 6.10	4.07 6.28	4.19 6.48	4.30 6.68	4.42 6.88	4.54 7.08	4.67 7.28	1.6
.6	4.78 7.40	4.91 7.60	5.04 7.80	5.17 8.00	5.30 8.20	5.43 8.40	5.56 8.60	5.69 8.80	5.82 9.00	5.95 9.20	1.85
.7	6.09 9.40	6.21 9.61	6.35 9.82	6.46 10.0	6.59 10.2	6.72 10.4	6.92 10.7	7.04 10.9	7.17 11.1	7.30 11.3	2.0
.8	7.43 11.5	7.63 11.8	7.76 12.0	7.89 12.2	8.08 12.5	8.27 12.8	8.46 13.0	8.53 13.2	8.73 13.5	8.92 13.8	2.1
.9	9.05 14.0	9.18 14.2	9.37 14.5	9.57 14.8	9.69 15.0	9.82 15.2	10.01 15.5	10.21 15.8	10.34 16.0	10.47 16.2	2.2
1.0	10.66 16.5	10.86 16.8	10.99 17.0	11.12 17.2	11.31 17.5	11.50 17.8	11.63 18.0	11.76 18.2	11.96 18.5	12.15 18.8	
.1	12.3 19.0	12.5 19.3	12.7 19.6	12.9 19.9	13.1 20.2	13.2 20.5	13.4 20.8	13.6 21.1	13.8 21.4	14.0 21.7	2.5
.2	14.2 22.0	14.4 22.3	14.6 22.6	14.8 22.9	15.0 23.2	15.2 23.5	15.4 23.8	15.6 24.1	15.8 24.4	16.0 24.7	2.8
.3	16.2 25.0	16.4 25.3	16.5 25.6	16.7 25.9	16.9 26.2	17.1 26.5	17.3 26.8	17.5 27.1	17.7 27.4	17.9 27.7	
.4	18.1 28.0	18.3 28.3	18.5 28.6	18.7 28.9	18.9 29.2	19.1 29.5	19.3 29.8	19.5 30.1	19.6 30.4	19.8 30.7	
.5	20.0 31.0	20.3 31.4	20.5 31.7	20.7 32.0	20.9 32.4	21.2 32.8	21.4 33.1	21.6 33.4	21.8 33.8	22.1 34.2	3.0
.6	22.3 34.5	22.5 34.8	22.8 35.2	23.0 35.6	23.2 35.9	23.4 36.2	23.7 36.6	23.9 37.0	24.1 37.3	24.3 37.6	3.5
.7	24.6 38.0	24.8 38.4	25.0 38.7	25.2 39.0	25.5 39.4	25.7 39.8	25.9 40.1	26.1 40.4	26.4 40.8	26.6 41.2	
.8	26.8 41.5	27.0 41.8	27.3 42.2	27.5 42.6	27.7 42.9	27.9 43.2	28.2 43.6	28.4 44.0	28.6 44.3	28.8 44.6	
.9	29.1 45.0	29.3 45.4	29.6 45.8	29.9 46.2	30.1 46.6	30.4 47.0	30.6 47.4	30.9 47.8	31.2 48.2	31.4 48.6	3.5
2.0	31.7 49.0	31.9 49.4	32.2 49.8	32.4 50.2	32.7 50.6	33.0 51.0	33.2 51.4	33.5 51.8	33.7 52.2	34.0 52.6	4.0
.1	34.3 53.0	34.5 53.4	34.8 53.8	35.0 54.2	35.3 54.6	35.5 55.0	35.8 55.4	36.1 55.8	36.3 56.2	36.6 56.6	
.2	36.8 57.0	37.1 57.4	37.4 57.8	37.6 58.2	37.9 58.6	38.1 59.0	38.4 59.4	38.6 59.8	38.9 60.2	39.2 60.6	
.3	39.4 61.0	39.7 61.4	40.0 61.8	40.3 62.4	40.6 62.8	40.8 63.2	41.2 63.7	41.5 64.2	41.8 64.8	42.0 65.0	4.0
.4	42.3 65.5	42.7 66.0	42.9 66.4	43.2 66.8	43.5 67.3	43.8 67.8	44.1 68.2	44.3 68.6	44.7 69.1	45.0 69.6	4.5
.5	45.2 70.0	45.5 70.4	45.8 70.9	46.1 71.4	46.4 71.8	46.7 72.2	47.0 72.7	47.3 73.2	47.6 73.6	47.8 74.0	
.6	48.2 74.5	48.5 75.0	48.7 75.4	49.0 75.8	49.3 76.3	49.6 76.8	49.9 77.2	50.2 77.6	50.5 78.1	50.8 78.6	
.7	51.1 79.0	51.3 79.4	51.6 79.9	52.0 80.4	52.2 80.8	52.5 81.2	52.8 81.7	53.1 82.2	53.4 82.6	53.6 83.0	
.8	54.0 83.5	54.3 84.0	54.5 84.4	54.8 84.8	55.1 85.3	55.5 85.8	55.7 86.2	56.0 86.6	56.3 87.1	56.6 87.6	
.9	56.9 88.0	57.1 88.4	57.5 88.9	57.8 89.4	58.0 89.8	58.3 90.2	58.6 90.7	58.9 91.2	59.2 91.6	59.5 92.0	4.5 4.0

Computed by W.C.V. 10/24/1968; Checked by C.W. 10/30/1968 Remarks ____

9-210
(rev. 2-66)

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY (WATER RESOURCES DIVISION)

Sta. No. 16-2870.00

Rating table for Waiahole tunnel at north portal, near Waiahole, Oahu

from Oct. 1, 1966 to ....., from ..... to ....., from ..... to .....

Gage height Feet	Discharge Cfs	Difference Cfs	Gage height Feet	Discharge Cfs	Difference Cfs	Gage height Feet	Discharge Cfs	Difference Cfs	Gage height Feet	Discharge Cfs	Difference Cfs	Gage height Feet	Discharge Cfs	Difference Cfs	Gage height Feet	Discharge Cfs	Difference Cfs	Gage height Feet	Discharge Cfs	Difference Cfs
.00			1.00	16.5	2.5	3.00	60.1 93.0	5.0	.00			.00			.00			.00		
.10			.10	19.0	3.0	.10	12.3 98.0		.10			.10			.10			.10		
.20			.20	22.0		.20	66.6 103		.20			.20			.20			.20		
.30			.30	25.0		.30	14.2 108		.30			.30			.30			.30		
.40			.40	28.0	3.0	.40	73.0 113		.40			.40			.40			.40		
.50			.50	31.0	3.5	.50	76.3 118	5.0	.50			.50			.50			.50		
.60			.60	34.5		.60	76.5 123	6.0	.60			.60			.60			.60		
.70			.70	38.0		.70	23.4 129		.70			.70			.70			.70		
.80			.80	41.5	3.5	.80	57.3 135		.80			.80			.80			.80		
.90			.90	45.0	4.0	.90	71.1 141		.90			.90			.90			.90		
0.00	0	curvilinear expansion	2.00	49.0		4.00	95.0 147		.00			.00			.00			.00		
.10	.60		.10	53.0		.10	98.6 153		.10			.10			.10			.10		
.20	1.45		.20	57.0	4.0	.20	102.6 159		.20			.20			.20			.20		
.30	2.55		.30	61.0	4.5	.30	111.1 165		.30			.30			.30			.30		
.40	3.95	1.60	.40	65.5		.40	112.5 171	6.0	.40			.40			.40			.40		
.50	5.55	1.85	.50	70.0		.10	114.4 177		.50			.50			.50			.50		
.60	7.40	2.0	.60	74.5		.60			.60			.60			.60			.60		
.70	9.40	2.1	.70	79.0		.70			.70			.70			.70			.70		
.80	11.5	2.5	.80	83.5	4.5	.50			.80			.80			.80			.80		
.90	14.0	2.5	.90	88.0	5.0	.90			.90			.90			.90			.90		

This table is applicable for open-channel conditions. It is based on 11 discharge measurements made during 1956-66 (29, 31, 36, 49, 52, 59, 60) 1967 (61, 62), 1968 (63), and is ..... well defined between ..... cfs and ..... cfs.

the same as table 2, but in cfs.

Comp by YIK date 10/14/6

Ckd by CW date 10/30/6

Table No. 3

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY (WATER RESOURCES DIVISION)

Station Number: 16-2972.00

Station Name: Waiahole tunnel at adit 8, near Kaipuhu, Oahu

Table No. 3

From: Oct. 1, 1966 to

Gage height Feet	.00 cfs.	.01 cfs.	.02 cfs.	.03 cfs.	.04 cfs.	.05 cfs.	.06 cfs.	.07 cfs.	.08 cfs.	.09 cfs.	Difference cfs.
	RED FIGURES = MILL. GALS PER DAY										
1.0											
.1											
.2											
.3											
.4											
.5											
.6	MGD 6.58	MG 6.72	6.85	7.04	7.24	7.37	7.56	7.76	7.95	8.08	
.7	CFS 10.1	10.4	10.6	10.9	11.2	11.4	11.7	12.0	12.3	12.5	2.7
.8	MG 8.27	8.47	8.66	8.85	9.05	9.24	9.44	9.63	9.82	10.02	3.0
.9	12.8	13.1	13.4	13.7	14.0	14.3	14.6	14.9	15.2	15.5	3.2
2.0	10.21	10.41	10.60	10.80	11.05	11.25	11.44	11.63	11.89	12.09	3.2
.1	15.8	16.1	16.4	16.8	17.1	17.4	17.7	18.0	18.4	18.7	3.2
.2	12.28	12.47	12.67	12.93	13.17	13.31	13.51	13.70	13.96	14.15	3.5
.3	19.0	19.3	19.6	20.0	20.3	20.6	20.9	21.2	21.6	21.9	3.8
.4	14.3	14.6	14.8	15.0	15.3	15.5	15.7	15.9	16.2	16.4	4.0
.5	22.2	22.6	22.9	23.2	23.6	24.0	24.3	24.6	25.0	25.4	4.0
.6	16.6	16.9	17.1	17.3	17.6	17.8	18.1	18.4	18.5	18.8	4.5
.7	25.7	26.1	26.5	26.8	27.2	27.6	28.0	28.4	28.7	29.1	4.5
.8	19.1	19.3	19.6	19.8	20.1	20.4	20.6	20.9	21.1	21.4	4.5
.9	29.5	29.9	30.3	30.7	31.1	31.5	31.9	32.3	32.7	33.1	5.0
3.0	21.7	21.9	22.2	22.4	22.7	22.9	23.2	23.5	23.7	24.0	5.0
.1	33.5	33.9	34.3	34.7	35.1	35.5	35.9	36.3	36.7	37.1	5.0
.2	24.2	24.6	24.8	25.1	25.4	25.7	26.0	26.2	26.6	26.9	5.5
.3	37.5	38.0	38.4	38.8	39.3	39.8	40.2	40.6	41.1	41.6	5.5
.4	27.1	27.4	27.7	28.1	28.3	28.6	28.9	29.2	29.5	29.7	5.5
.5	42.0	42.4	42.9	43.4	43.8	44.2	44.7	45.2	45.6	46.0	5.5
.6	30.1	30.4	30.6	30.9	31.2	31.5	31.8	32.1	32.4	32.7	5.5
.7	46.5	47.0	47.4	47.8	48.3	48.8	49.2	49.6	50.1	50.6	5.5
.8	33.0	33.3	33.6	33.9	34.3	34.6	34.9	35.2	35.5	35.9	5.5
.9	51.0	51.5	52.0	52.5	53.0	53.5	54.0	54.5	55.0	55.5	5.0
4.0	36.2	36.5	36.8	37.2	37.5	37.8	38.1	38.5	38.8	39.1	5.0
.1	56.0	56.5	57.0	57.5	58.0	58.5	59.0	59.5	60.0	60.5	5.0
.2	39.4	39.8	40.1	40.5	40.8	41.2	41.6	41.9	42.3	42.7	5.5
.3	61.6	61.6	62.1	62.6	63.2	63.8	64.3	64.8	65.4	66.0	5.5
.4	43.0	43.3	43.7	44.1	44.4	44.7	45.1	45.5	458	46.1	5.5
.5	66.5	67.0	67.6	68.2	68.7	69.2	69.8	70.4	70.9	71.4	5.5
.6	46.5	46.9	47.3	47.7	48.1	48.5	48.9	49.2	49.6	50.0	6.0
.7	72.0	72.6	73.2	73.8	74.4	75.0	75.6	76.2	76.8	77.4	6.0
.8	50.4	50.8	51.2	51.6	52.0	52.4	52.7	53.1	53.5	53.9	6.0
.9	78.0	78.6	79.2	79.8	80.4	81.0	81.6	82.2	82.8	83.4	6.0
5.0	54.3	54.7	55.1	55.5	55.8	56.2	56.6	57.0	57.4	57.8	6.5
.1	84.0	84.6	85.2	85.8	86.4	87.0	87.6	88.2	88.8	89.4	6.5
.2	58.2	58.6	59.0	59.5	59.8	60.2	60.7	61.1	61.5	61.9	6.5
.3	90.0	90.6	91.3	92.0	92.6	93.2	93.9	94.6	95.2	95.8	6.5
.4	62.4	62.8	63.2	63.6	64.1	64.5	64.6	65.3	65.9	65.9	6.5
.5	96.5	97.2	97.8	98.4	99.1	99.8	100.0	101	102.1	102	6.5
.6	66.6	67.2	67.2	67.9	68.5	68.5	69.2	69.8	70.4	70.4	7.0
.7	103	104	104	105.9	106	106	107	108	109	109	7.0
.8	71.1	71.7	71.7	72.4	73.0	73.7	73.7	74.3	75.0	75.0	7.0
.9	110	111	112	113	114	115	116	117	118	118	7.0
	75.6	76.3	76.3	76.9	77.6	77.6	78.2	78.9	79.5	79.5	
	117	118	118	119	120	120	121	122	123	123	

Computed by WCC 10/4/1968 Checked by [illegible] 11/6/1968 [illegible]

7.0' RATED SECTION w/ CRITICAL DEPTH CONTROL

UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY (WATER RESOURCES DIVISION)

No. 16-2872.00

Rating table for Waiahole tunnel at adit 8, near Waipahu, Oahu

PAGE 2 OF 2

Oct. 1, 1963 to from to from to

	Discharge	Difference	Gage height	Discharge	Difference	Gage height	Discharge	Difference	Gage height	Discharge	Difference	Gage height	Discharge	Difference	Gage height	Discharge	Difference	Gage height	Discharge	Difference
	Cfs	Cfs	Feet	Cfs	Cfs	Feet	Cfs	Cfs	Feet	Cfs	Cfs	Feet	Cfs	Cfs	Feet	Cfs	Cfs	Feet	Cfs	Cfs
			2.00	19.0	3.2	4.00	80.1	7												
							124													
							84.7													
.10			.10	22.2	3.5	.10	131	7												
							89.2													
.20			.20	25.7	3.8	.20	138	8												
							94.4													
.30			.30	29.5	4.0	.30	146													
							99.5													
.40			.40	33.5	4.0	.40	154													
							104.7													
.50			.50	37.5	4.5	.50	162													
							109.9													
.60			.60	42.0	4.5	.60	170													
							115.0													
.70			.70	46.5	4.5	.70	178	8												
							130.2													
.80			.80	51.0	5.0	.80	186													
.90			.90	56.0	5.0	.90														
1.00			3.00	61.0	5.5	5.00														
.10			.10	66.5	5.5	.10														
.20			.20	72.0	6.0	.20														
.30			.30	78.0	6.0	.30														
.40			.40	84.0	6.0	.40														
.50			.50	90.0	6.5	.50														
.60			.60	96.5	6.5	.60														
.70	10.1	2.7	.70	103	7.0	.70														
.80	12.8	3.0	.80	111	7.0	.80														
.90	15.8	3.2	.90	117	7.0	.90														

This table is applicable for open channel conditions, Rating Table No. 10 Measurements used: 1964, 1966, 1967 (78, 87, 101, 106-112)

About the same as table 2, but in cfs.

Computed by WTS 10/3/68
Checked by 11/6/68

Page No. 3

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NOV. 1994 REVISED RATING CURVE FOR ADIT 8 USGS

16287200
KAIAHOLE TUNNEL AT ADIT 8 NEAR WAIPAHU,OAHU, HI
OFFSET: 1.00

EXPANDED RATING TABLE
DATE PROCESSED: 11-01-1994 8:16:25 BY RFONTAIN
CD: 2 TYPE: 001 RATING NO: 4
START DATE/TIME: - - ( )

BASED ON 6 DISCHARGE MEASUREMENTS, MOS _____, AMC _____, AMC IS [illegible] WELL DEFINED BETWEEN 10 AND 100 CFS
CONF BY [illegible] DATE 11/1/94 CHK. BY [illegible] DATE 11/1/94

UPDATE OF 1965 USGS RATING FOR ADIT 8

GAGE HEIGHT (FEET)	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09	DIFF IN 3 PER TENTH FT
			DISCHARGE IN CUBIC FEET PER SECOND				(EXPANDED PRECISION)				
1.60			10.00*	10.26	10.52	10.79	11.06	11.33	11.60	11.88	2.700
1.70	12.16	12.44	12.72	13.01	13.30	13.59	13.88	14.18	14.47	14.77	2.920
1.80	15.08	15.38	15.69	16.00	16.31	16.62	16.94	17.26	17.58	17.90	3.140
1.90	18.22	18.55	18.88	19.21	19.55	19.88	20.22	20.56	20.90	21.25	3.380
2.00	21.60	21.94	22.30	22.65	23.00	23.36	23.72	24.08	24.45	24.81	3.580
2.10	25.18	25.55	25.92	26.29	26.67	27.05	27.43	27.81	28.19	28.58	3.790
2.20	28.97	29.36	29.75	30.14	30.54	30.93	31.33	31.74	32.14	32.56	3.980
2.30	32.95	33.36	33.77	34.18	34.60	35.02	35.43	35.86	36.28	36.70	4.180
2.40	37.13	37.56	37.99	38.42	38.85	39.29	39.72	40.16	40.60	41.05	4.360
2.50	41.49	41.94	42.39	42.84	43.29	43.74	44.20	44.65	45.11	45.57	4.550
2.60	46.04	46.50	46.97	47.44	47.90	48.38	48.85	49.32	49.80	50.29	4.720
2.70	50.78	51.24	51.72	52.21	52.70	53.18	53.67	54.17	54.66	55.16	4.850
2.80	55.65	56.15	56.65	57.15	57.65	58.16	58.67	59.18	59.69	60.20	5.070
2.90	60.72	61.23	61.75	62.27	62.79	63.31	63.85	64.38	64.85	65.42	5.230
3.00	65.95	66.48	67.01	67.55	68.08	68.62	69.16	69.70	70.25	70.79	5.390
3.10	71.34	71.88	72.43	72.98	73.54	74.09	74.65	75.20	75.76	76.32	5.550
3.20	76.89	77.45	78.02	78.58	79.15	79.72	80.29	80.86	81.44	82.01	5.700
3.30	82.59	83.17	83.75	84.33	84.92	85.50	86.09	86.68	87.27	87.86	5.860
3.40	88.45	89.05	89.64	90.24	90.84	91.44	92.04	92.64	93.25	93.86	6.010
3.50	94.46	95.07	95.68	96.30	96.91	97.52	98.14	98.76	.35	100.00*	

PAGE 1 OF 2

WAIAHOLE DITCH RATED SECTION BELOW GATE #12
Parshall Flume 4 Ft.

Head Ft.	M.G.D.	Head Ft.	M.G.D.	Head Ft.	M.G.D.	Head Ft.	M.G.D.
.20	.81						
.21	.88	.56	4.14	.91	8.91	1.26	14.9
.22	.95	.57	4.26	.92	9.07	1.27	15.1
.23	1.01	.58	4.38	.93	9.22	1.28	15.3
.24	1.09	.59	4.50	.94	9.38	1.29	15.5
.25	1.16	.60	4.62	.95	9.54	1.30	15.7
.26	1.23	.61	4.74	.96	9.69	1.31	15.8
.27	1.31	.62	4.87	.97	9.86	1.32	16.0
.28	1.39	.63	4.99	.98	10.0	1.33	16.2
.29	1.47	.64	5.11	.99	10.2	1.34	16.4
.30	1.54	.65	5.24	1.00	10.3	1.35	16.6
.31	1.63	.66	5.37	1.01	10.5	1.36	16.8
.32	1.71	.67	5.50	1.02	10.7	1.37	17.0
.33	1.80	.68	5.63	1.03	10.8	1.38	17.2
.34	1.89	.69	5.76	1.04	11.0	1.39	17.4
.35	1.97	.70	5.89	1.05	11.2	1.40	17.6
.36	2.06	.71	6.02	1.06	11.3	1.41	17.8
.37	2.15	.72	6.16	1.07	11.5	1.42	18.0
.38	2.25	.73	6.30	1.08	11.7	1.43	18.2
.39	2.34	.74	6.43	1.09	11.9	1.44	18.4
.40	2.44	.75	6.57	1.10	12.0	1.45	18.6
.41	2.53	.76	6.71	1.11	12.2	1.46	18.8
.42	2.63	.77	6.84	1.12	12.4	1.47	19.0
.43	2.73	.78	6.99	1.13	12.5	1.48	19.2
.44	2.83	.79	7.13	1.14	12.7	1.49	19.4
.45	2.93	.80	7.27	1.15	12.9	1.50	19.6
.46	3.04	.81	7.42	1.16	13.1	1.51	19.8
.47	3.14	.82	7.56	1.17	13.3	1.52	20.0
.48	3.25	.83	7.71	1.18	13.4	1.53	20.2
.49	3.35	.84	7.86	1.19	13.6	1.54	20.4
.50	3.46	.85	8.00	1.20	13.8	1.55	20.6
.51	3.57	.86	8.15	1.21	14.0	1.56	20.9
.52	3.68	.87	8.30	1.22	14.2	1.57	21.1
.53	3.80	.88	8.45	1.23	14.3	1.58	21.3
.54	3.91	.89	8.60	1.24	14.5	1.59	21.5
.55	4.03	.90	8.76	1.25	14.7	1.60	21.7

WAIAHOLE DITCH RATED SECTION BELOW GATE #12
Parshall Flume 4 Ft.

Head Ft.	M.G.D.	Head Ft.	M.G.D.	Head Ft.	M.G.D.	Head Ft.	M.G.D.
1.61	21.30	1.86	27.50	2.11	33.60	2.36	40.10
1.62	22.20	1.87	27.80	2.12	33.90	2.37	40.30
1.63	22.40	1.88	28.00	2.13	34.10	2.38	40.70
1.64	22.60	1.89	28.20	2.14	34.30	2.39	40.90
1.65	22.80	1.90	28.50	2.15	34.60	2.40	41.20
1.66	23.00	1.91	28.70	2.16	34.80	2.41	41.40
1.67	23.20	1.92	29.00	2.17	35.10	2.42	41.70
1.68	23.50	1.93	29.20	2.18	35.40	2.43	41.90
1.69	23.70	1.94	29.40	2.19	35.60	2.44	42.30
1.70	23.90	1.95	29.70	2.20	35.90	2.45	42.50
1.71	24.10	1.96	29.90	2.21	36.10	2.46	42.80
1.72	24.30	1.97	30.10	2.22	36.40	2.47	43.00
1.73	24.60	1.98	30.40	2.23	36.60	2.48	43.40
1.74	24.80	1.99	30.60	2.24	36.90	2.49	43.60
1.75	25.00	2.00	30.90	2.25	37.20	2.50	43.90
1.76	25.20	2.01	31.10	2.26	37.40		
1.77	25.50	2.02	31.30	2.27	37.70		
1.78	25.70	2.03	31.60	2.28	37.90		
1.79	25.90	2.04	31.90	2.29	38.20		
1.80	26.10	2.05	32.10	2.30	38.50		
1.81	26.40	2.06	32.30	2.31	38.80		
1.82	26.60	2.07	32.60	2.32	39.00		
1.83	26.80	2.08	32.80	2.33	39.30		
1.84	27.10	2.09	33.10	2.34	39.60		
1.85	27.30	2.10	33.30	2.35	39.80		

Appendix B

Waiahole Ditch Flows Report
For the Month of February 1995

WAIAHOLE DITCH FLOWS FILE LISTING
3/14/95

2/95	ADIT 8		NORTH PORTAL		WAIANU 29		KAHANA 21		INTAKE 31		WAIAWA	
Date	Hgt	MGD	Hgt	MGD	Hgt	MGD	Hgt	MGD	Hgt	MGD	Hgt	MGD
1	2.03	12.930	.87	7.760	1.56	21.400	.33	1.800	1.19	13.700		
2	2.05	13.310	.87	7.760	1.56	21.400	.33	1.800	1.19	13.700		
3	2.01	12.470	.84	8.080	1.56	21.400	.33	1.800	1.21	14.090		
4	2.01	12.470	.84	8.080	1.56	21.400	.33	1.800	1.21	14.090		
5	2.01	12.470	.84	8.080	1.56	21.400	.33	1.800	1.22	14.280		
6	2.01	12.470	.84	8.080	1.55	21.200	.32	1.710	1.23	14.480		
7	2.01	12.470	.84	8.080	1.55	21.200	.32	1.710	1.23	14.480		
8	2.01	12.470	.84	8.080	1.55	21.200	.32	1.710	1.23	14.480		
9	2.01	12.470	.84	8.080	1.55	21.200	.32	1.710	1.23	14.480		
10	2.01	12.470	.84	8.080	1.55	21.200	.32	1.710	1.23	14.480		
11	2.01	12.470	.84	8.080	1.54	20.900	.32	1.710	1.23	14.480		
12	2.01	12.470	.84	8.080	1.54	20.900	.32	1.710	1.23	14.480		
13	2.00	12.280	.79	7.300	1.55	21.200	.33	1.800	1.23	14.480		
14	2.01	12.470	.79	7.300	1.61	22.500	.43	2.730	1.31	16.030		
15	2.01	12.470	.79	7.300	1.55	21.200	.33	1.800	1.25	14.870		
16	1.97	11.630	.81	7.630	1.55	21.200	.32	1.710	1.27	15.250		
17	1.97	11.630	.84	8.080	1.55	21.200	.31	1.630	1.25	14.870		
18	1.97	11.630	.84	8.080	1.67	23.900	.49	3.360	1.35	16.800		
19	1.97	11.630	.84	8.080	1.57	21.600	.34	1.890	1.25	14.870		
20	1.97	11.630	.84	8.080	1.56	21.400	.32	1.710	1.25	14.870		
21	1.97	11.630	.83	7.890	1.55	21.200	.31	1.630	1.23	14.480		
22	1.97	11.630	.83	7.890	1.55	21.200	.31	1.630	1.23	14.480		
23	1.97	11.630	.83	7.890	1.55	21.200	.31	1.630	1.23	14.480		
24	1.97	11.630	.83	7.890	1.55	21.200	.36	2.070	1.23	14.480		
25	1.97	11.630	.85	8.270	1.67	23.900	.52	3.680	1.35	16.800		
26	1.97	11.630	.85	8.270	1.59	22.100	.48	3.040	1.29	15.640		
27	1.97	11.630	.83	7.890	1.57	21.600	.33	1.800	1.27	15.250		
28	1.97	11.630	.83	7.890	1.57	21.600	.33	1.800	1.27	15.250		
	55.81	339.350	23.36	222.050	43.84	603.000	9.71	54.880	34.89	414.120	.00	.000

WAIAHOLE DITCH FLOWS FILE LISTING
3/14/95

2/95	WAIKANE 1		WAIKANE 2		KAHANA 3		UWAU 4		UWAU 4A		WAIAHOLE	
Date	Hgt	MGD	Hgt	MGD	Hgt	MGD	Hgt	MGD	Hgt	MGD	Hgt	MGD
1	.89	4.320	.41	.989	.19	.885	1.95	14.540	1.60	5.290		
2	.89	4.320	.41	.989	.19	.885	1.95	14.540	1.60	5.290		
3	.89	4.320	.41	.989	.19	.885	1.95	14.540	1.60	5.290		
4	.89	4.320	.41	.989	.19	.885	1.95	14.540	1.60	5.290		
5	.89	4.320	.41	.989	.19	.885	1.95	14.540	1.60	5.290		
6	.89	4.320	.41	.989	.19	.885	1.95	14.540	1.60	5.290		
7	.89	4.320	.41	.989	.19	.885	1.95	14.540	1.60	5.290		
8	.89	4.320	.41	.989	.19	.885	1.95	14.540	1.60	5.290		
9	.89	4.320	.41	.989	.19	.885	1.95	14.540	1.60	5.290		
10	.89	4.320	.41	.989	.19	.885	1.95	14.540	1.60	5.290		
11	.89	4.320	.41	.989	.19	.885	1.95	14.540	1.60	5.290		
12	.89	4.320	.42	1.021	.19	.885	1.95	14.540	1.60	5.290		
13	.89	4.320	.42	1.021	.18	.816	1.95	14.540	1.60	5.290		
14	.89	4.320	.42	1.021	.18	.816	1.95	14.540	1.60	5.290		
15	.89	4.320	.42	1.021	.18	.816	1.95	14.540	1.60	5.290		
16	.89	4.320	.42	1.021	.18	.816	1.95	14.540	1.60	5.290		
17	.89	4.320	.42	1.021	.18	.816	1.95	14.540	1.60	5.290		
18	.89	4.320	.42	1.021	.18	.816	1.95	14.540	1.60	5.290		
19	.89	4.320	.42	1.021	.18	.816	1.95	14.540	1.60	5.290		
20	.89	4.320	.42	1.021	.18	.816	1.95	14.540	1.60	5.290		
21	.88	4.240	.42	1.021	.18	.816	1.98	14.930	1.62	5.390		
22	.88	4.240	.42	1.021	.18	.816	1.98	14.930	1.62	5.390		
23	.88	4.240	.42	1.021	.18	.816	1.98	14.930	1.62	5.390		
24	.88	4.240	.42	1.021	.18	.816	1.98	14.930	1.62	5.390		
25	.88	4.240	.42	1.021	.18	.816	1.98	14.930	1.62	5.390		
26	.88	4.240	.42	1.021	.18	.816	1.98	14.930	1.62	5.390		
27	.88	4.240	.42	1.021	.18	.816	1.98	14.930	1.62	5.390		
28	.88	4.240	.42	1.021	.18	.816	1.98	14.930	1.62	5.390		
	24.84	120.320	11.65	28.236	5.16	23.676	54.84	410.240	44.96	148.920	.00	.000

Appendix C

Supplemental Monthly Supply Reports by WIC, February 1995

Report #1

WAIAHOLE IRRIGATION CO., LTD.

Statement of Water Received from Bishop Estate, During Month of FEBRUARY, 1995

	SURFACE WATER		UNDERGROUND WATER						RAINFALL
	WAIAWA		ADIT 8		NORTH PORTAL		Total Undergrd. Water	Total Water Received	WAIAWA
Date	Feet	Mil. Gals	Feet	Mil. Gals	Feet	Mil. Gals	Mill. Gals	Mill. Gals	Inches
1	.00	.000	2.03	12.930	.87	7.760	5.170		
2	.00	.000	2.05	13.310	.87	7.760	5.550		
3	.00	.000	2.01	12.470	.84	8.080	4.390		
4	.00	.000	2.01	12.470	.84	8.080	4.390		
5	.00	.000	2.01	12.470	.84	8.080	4.390		
6	.00	.000	2.01	12.470	.84	8.080	4.390		
7	.00	.000	2.01	12.470	.84	8.080	4.390		
8	.00	.000	2.01	12.470	.84	8.080	4.390		
9	.00	.000	2.01	12.470	.84	8.080	4.390		
10	.00	.000	2.01	12.470	.84	8.080	4.390		
11	.00	.000	2.01	12.470	.84	8.080	4.390		
12	.00	.000	2.01	12.470	.84	8.080	4.390		
13	.00	.000	2.00	12.280	.79	7.300	4.980		
14	.00	.000	2.01	12.470	.79	7.300	5.170		
15	.00	.000	2.01	12.470	.79	7.300	5.170		
16	.00	.000	1.97	11.630	.81	7.630	4.000		
17	.00	.000	1.97	11.630	.84	8.080	3.550		
18	.00	.000	1.97	11.630	.84	8.080	3.550		
19	.00	.000	1.97	11.630	.84	8.080	3.550		
20	.00	.000	1.97	11.630	.84	8.080	3.550		
21	.00	.000	1.97	11.630	.83	7.890	3.740		
22	.00	.000	1.97	11.630	.83	7.890	3.740		
23	.00	.000	1.97	11.630	.83	7.890	3.740		
24	.00	.000	1.97	11.630	.83	7.890	3.740		
25	.00	.000	1.97	11.630	.85	8.270	3.360		
26	.00	.000	1.97	11.630	.85	8.270	3.360		
27	.00	.000	1.97	11.630	.83	7.890	3.740		
28	.00	.000	1.97	11.630	.83	7.890	3.740		20.20
TOTAL		.000		339.350		222.050	117.300	117.300	20.20
MGD		.000		12.119		7.930	4.189	4.189	

WAIAHOLE IRRIG. CO., LTD.

BY _____ SUPERINTENDENT

Report #3

WAIAHOLE IRRIGATION CO., LTD.

Water Measurement During Month of FEBRUARY, 1995

Date	Total Water At NORTH PORTAL Boundary Feet	Total Water At NORTH PORTAL Boundary Mill. Gals	WAIAHOLE Pump Mill. Gals	Total Gravity Water At NORTH PORTAL Mill. Gals	Gravity Water By-Passed At INTAKE 31 Mill. Gals	Total Gravity Water Passing STATE Land Mill. Gals	Total Gravity Water At WAIANU 29 Mill. Gals	Total Gravity Water STATE Land Mill. Gals
1	.87	7.760	.000	7.760	13.700	21.460	21.400	.060
2	.87	7.760	.000	7.760	13.700	21.460	21.400	.060
3	.84	8.080	.000	8.080	14.090	22.170	21.400	.770
4	.84	8.080	.000	8.080	14.090	22.170	21.400	.770
5	.84	8.080	.000	8.080	14.280	22.360	21.400	.960
6	.84	8.080	.000	8.080	14.480	22.560	21.200	1.360
7	.84	8.080	.000	8.080	14.480	22.560	21.200	1.360
8	.84	8.080	.000	8.080	14.480	22.560	21.200	1.360
9	.84	8.080	.000	8.080	14.480	22.560	21.200	1.360
10	.84	8.080	.000	8.080	14.480	22.560	21.200	1.360
11	.84	8.080	.000	8.080	14.480	22.560	20.900	1.660
12	.84	8.080	.000	8.080	14.480	22.560	20.900	1.660
13	.79	7.300	.000	7.300	14.480	21.780	21.200	.580
14	.79	7.300	.000	7.300	16.030	23.330	22.500	.830
15	.79	7.300	.000	7.300	14.870	22.170	21.200	.970
16	.81	7.630	.000	7.630	15.250	22.880	21.200	1.680
17	.84	8.080	.000	8.080	14.870	22.950	21.200	1.750
18	.84	8.080	.000	8.080	16.800	24.880	23.900	.980
19	.84	8.080	.000	8.080	14.870	22.950	21.600	1.350
20	.84	8.080	.000	8.080	14.870	22.950	21.400	1.550
21	.83	7.890	.000	7.890	14.480	22.370	21.200	1.170
22	.83	7.890	.000	7.890	14.480	22.370	21.200	1.170
23	.83	7.890	.000	7.890	14.480	22.370	21.200	1.170
24	.83	7.890	.000	7.890	14.480	22.370	21.200	1.170
25	.85	8.270	.000	8.270	16.800	25.070	23.900	1.170
26	.85	8.270	.000	8.270	15.640	23.910	22.100	1.810
27	.83	7.890	.000	7.890	15.250	23.140	21.600	1.540
28	.83	7.890	.000	7.890	15.250	23.140	21.600	1.540
TOTAL		222.050	.000	222.050	414.120	636.170	603.000	33.170
MGD		7.930	.000	7.930	14.790	22.720	21.535	1.184

Report #4

WAIAHOLE IRRIGATION CO., LTD.

Water Measurement During Month of FEBRUARY, 1995

	KAHANA 21		KAHANA Dev. Tunnel		Difference Gravity Water	WAIANU 29		KAHANA 21 & Dev-1,2,3,4	Grav. Waianu 1 & Makawai
Date	Feet	Mil. Gals	Feet	Mil. Gals	Mill. Gals	Feet	Mil. Gals	Mill. Gals	Mill. Gals
1	.33	1.800	.19	.885	.915	1.56	21.400	22.534	.060
2	.33	1.800	.19	.885	.915	1.56	21.400	22.534	.060
3	.33	1.800	.19	.885	.915	1.56	21.400	22.534	.770
4	.33	1.800	.19	.885	.915	1.56	21.400	22.534	.770
5	.33	1.800	.19	.885	.915	1.56	21.400	22.534	.960
6	.32	1.710	.19	.885	.825	1.55	21.200	22.444	1.360
7	.32	1.710	.19	.885	.825	1.55	21.200	22.444	1.360
8	.32	1.710	.19	.885	.825	1.55	21.200	22.444	1.360
9	.32	1.710	.19	.885	.825	1.55	21.200	22.444	1.360
10	.32	1.710	.19	.885	.825	1.55	21.200	22.444	1.360
11	.32	1.710	.19	.885	.825	1.54	20.900	22.444	1.660
12	.32	1.710	.19	.885	.825	1.54	20.900	22.476	1.660
13	.33	1.800	.18	.816	.984	1.55	21.200	22.497	.580
14	.43	2.730	.18	.816	1.914	1.61	22.500	23.427	.830
15	.33	1.800	.18	.816	.984	1.55	21.200	22.497	.970
16	.32	1.710	.18	.816	.894	1.55	21.200	22.407	1.680
17	.31	1.630	.18	.816	.814	1.55	21.200	22.327	1.750
18	.49	3.360	.18	.816	2.544	1.67	23.900	24.057	.980
19	.34	1.890	.18	.816	1.074	1.57	21.600	22.587	1.350
20	.32	1.710	.18	.816	.894	1.56	21.400	22.407	1.550
21	.31	1.630	.18	.816	.814	1.55	21.200	22.637	1.170
22	.31	1.630	.18	.816	.814	1.55	21.200	22.637	1.170
23	.31	1.630	.18	.816	.814	1.55	21.200	22.637	1.170
24	.36	2.070	.18	.816	1.254	1.55	21.200	23.077	1.170
25	.52	3.680	.18	.816	2.864	1.67	23.900	24.687	1.170
26	.48	3.040	.18	.816	2.224	1.59	22.100	24.047	1.810
27	.33	1.800	.18	.816	.984	1.57	21.600	22.807	1.540
28	.33	1.800	.18	.816	.984	1.57	21.600	22.807	1.540
TOTAL		54.880		23.676	31.204		603.000	637.352	33.170
MGD		1.960		.845	1.114		21.535	22.762	1.184

Report # 5

WAIAHOLE IRRIGATION CO., LTD.

Water Measurement During Month of FEBRUARY, 1995

	KAHANA 21		WAIANU 29		Difference WAIKANE-UWAU WAIKANE 2	NORTH PORTAL Boundary		ADIT 8		Difference WAIAWA	WAIAHOLE Pump
Date	Feet	Mil. Gals	Feet	Mil. Gals	Mill. Gals	Feet	Mil. Gals	Feet	Mil. Gals	Mill. Gals	Mill. Gals
1	.33	1.800	1.56	21.400	19.600	.87	7.760	2.03	12.930	5.170	.000
2	.33	1.800	1.56	21.400	19.600	.87	7.760	2.05	13.310	5.550	.000
3	.33	1.800	1.56	21.400	19.600	.84	8.080	2.01	12.470	4.390	.000
4	.33	1.800	1.56	21.400	19.600	.84	8.080	2.01	12.470	4.390	.000
5	.33	1.800	1.56	21.400	19.600	.84	8.080	2.01	12.470	4.390	.000
6	.32	1.710	1.55	21.200	19.490	.84	8.080	2.01	12.470	4.390	.000
7	.32	1.710	1.55	21.200	19.490	.84	8.080	2.01	12.470	4.390	.000
8	.32	1.710	1.55	21.200	19.490	.84	8.080	2.01	12.470	4.390	.000
9	.32	1.710	1.55	21.200	19.490	.84	8.080	2.01	12.470	4.390	.000
10	.32	1.710	1.55	21.200	19.490	.84	8.080	2.01	12.470	4.390	.000
11	.32	1.710	1.54	20.900	19.190	.84	8.080	2.01	12.470	4.390	.000
12	.32	1.710	1.54	20.900	19.190	.84	8.080	2.01	12.470	4.390	.000
13	.33	1.800	1.55	21.200	19.400	.79	7.300	2.00	12.280	4.980	.000
14	.43	2.730	1.61	22.500	19.770	.79	7.300	2.01	12.470	5.170	.000
15	.33	1.800	1.55	21.200	19.400	.79	7.300	2.01	12.470	5.170	.000
16	.32	1.710	1.55	21.200	19.490	.81	7.630	1.97	11.630	4.000	.000
17	.31	1.630	1.55	21.200	19.570	.84	8.080	1.97	11.630	3.550	.000
18	.49	3.360	1.67	23.900	20.540	.84	8.080	1.97	11.630	3.550	.000
19	.34	1.890	1.57	21.600	19.710	.84	8.080	1.97	11.630	3.550	.000
20	.32	1.710	1.56	21.400	19.690	.84	8.080	1.97	11.630	3.550	.000
21	.31	1.630	1.55	21.200	19.570	.83	7.890	1.97	11.630	3.740	.000
22	.31	1.630	1.55	21.200	19.570	.83	7.890	1.97	11.630	3.740	.000
23	.31	1.630	1.55	21.200	19.570	.83	7.890	1.97	11.630	3.740	.000
24	.36	2.070	1.55	21.200	19.130	.83	7.890	1.97	11.630	3.740	.000
25	.52	3.680	1.67	23.900	20.220	.85	8.270	1.97	11.630	3.360	.000
26	.48	3.040	1.59	22.100	19.060	.85	8.270	1.97	11.630	3.360	.000
27	.33	1.800	1.57	21.600	19.800	.83	7.890	1.97	11.630	3.740	.000
28	.33	1.800	1.57	21.600	19.800	.83	7.890	1.97	11.630	3.740	.000
TOTAL		54.880		603.000	548.120		222.050		339.350	117.300	.000
MGD		1.960		21.535	19.575		7.930		12.119	4.189	.000

Report #6

WAIAHOLE IRRIGATION CO., LTD.

Water Measurement During Month of FEBRUARY, 1995

	ADIT 8		NORTH PORTAL Boundary		Difference Bishop Estate Water	Total Gravity NP Boundary + Pump Water	Water By-Passed At INTAKE 31		Total Water NORTH PORTAL
Date	Feet	Mil. Gals	Feet	Mil. Gals	Mill. Gals	Mill. Gals	Feet	Mil. Gals	Mill. Gals
1	2.03	12.930	.87	7.760	5.170	7.760	1.19	13.700	21.460
2	2.05	13.310	.87	7.760	5.550	7.760	1.19	13.700	21.460
3	2.01	12.470	.84	8.080	4.390	8.080	1.21	14.090	22.170
4	2.01	12.470	.84	8.080	4.390	8.080	1.21	14.090	22.170
5	2.01	12.470	.84	8.080	4.390	8.080	1.22	14.280	22.360
6	2.01	12.470	.84	8.080	4.390	8.080	1.23	14.480	22.560
7	2.01	12.470	.84	8.080	4.390	8.080	1.23	14.480	22.560
8	2.01	12.470	.84	8.080	4.390	8.080	1.23	14.480	22.560
9	2.01	12.470	.84	8.080	4.390	8.080	1.23	14.480	22.560
10	2.01	12.470	.84	8.080	4.390	8.080	1.23	14.480	22.560
11	2.01	12.470	.84	8.080	4.390	8.080	1.23	14.480	22.560
12	2.01	12.470	.84	8.080	4.390	8.080	1.23	14.480	22.560
13	2.00	12.280	.79	7.300	4.980	7.300	1.23	14.480	21.780
14	2.01	12.470	.79	7.300	5.170	7.300	1.31	16.030	23.330
15	2.01	12.470	.79	7.300	5.170	7.300	1.25	14.870	22.170
16	1.97	11.630	.81	7.630	4.000	7.630	1.27	15.250	22.880
17	1.97	11.630	.84	8.080	3.550	8.080	1.25	14.870	22.950
18	1.97	11.630	.84	8.080	3.550	8.080	1.35	16.800	24.880
19	1.97	11.630	.84	8.080	3.550	8.080	1.25	14.870	22.950
20	1.97	11.630	.84	8.080	3.550	8.080	1.25	14.870	22.950
21	1.97	11.630	.83	7.890	3.740	7.890	1.23	14.480	22.370
22	1.97	11.630	.83	7.890	3.740	7.890	1.23	14.480	22.370
23	1.97	11.630	.83	7.890	3.740	7.890	1.23	14.480	22.370
24	1.97	11.630	.83	7.890	3.740	7.890	1.23	14.480	22.370
25	1.97	11.630	.85	8.270	3.360	8.270	1.35	16.800	25.070
26	1.97	11.630	.85	8.270	3.360	8.270	1.29	15.640	23.910
27	1.97	11.630	.83	7.890	3.740	7.890	1.27	15.250	23.140
28	1.97	11.630	.83	7.890	3.740	7.890	1.27	15.250	23.140
TOTAL		339.350		222.050	117.300	222.050		414.120	636.170
MGD		12.119		7.930	4.189	7.930		14.790	22.720

WAIAHOLE IRRIGATION CO., LTD.

WATER RECEIVED FROM STATE LANDS IN KAHANA, WAIANU I
AND MAKAWAI VALLEYS

Month of FEBRUARY, 1995

	Kahana Valley		Waianu I + Makawai Valleys		
Date	Surface	Underground	Surface & Underground	Waiahole Pump	Remarks
1	.915	.885	.060	.000	
2	.915	.885	.060	.000	
3	.915	.885	.770	.000	
4	.915	.885	.770	.000	
5	.915	.885	.960	.000	
6	.825	.885	1.360	.000	
7	.825	.885	1.360	.000	
8	.825	.885	1.360	.000	
9	.825	.885	1.360	.000	
10	.825	.885	1.360	.000	
11	.825	.885	1.660	.000	
12	.825	.885	1.660	.000	
13	.984	.816	.580	.000	
14	1.914	.816	.830	.000	
15	.984	.816	.970	.000	
16	.894	.816	1.680	.000	
17	.814	.816	1.750	.000	
18	2.544	.816	.980	.000	
19	1.074	.816	1.350	.000	
20	.894	.816	1.550	.000	
21	.814	.816	1.170	.000	
22	.814	.816	1.170	.000	
23	.814	.816	1.170	.000	
24	1.254	.816	1.170	.000	
25	2.864	.816	1.170	.000	
26	2.224	.816	1.810	.000	
27	.984	.816	1.540	.000	
28	.984	.816	1.540	.000	
TOTAL	31.204	23.676	33.170	.000	
Avg/Day	1.114	.845	1.184	.000	
To Date	71.924	50.076	78.040	.000	

Appendix D

Management Practices of Waiahole Irrigation System Customers

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

GEORGE IRANON
DIRECTOR

ERIC P. PENAROSA
DEPUTY DIRECTOR

WALTER M. OZAWA
DEPUTY DIRECTOR

RUDY P. ALIVADO
DEPUTY DIRECTOR

STATE OF HAWAII
DEPARTMENT OF PUBLIC SAFETY
WAIAWA CORRECTIONAL CENTER
P.O. BOX 1839
Pearl City, Hawaii 96782-8839

No. _____

October 25, 1995

Mr. Greg Fukumitsu
c/o Tom Nance Water Resource Engineering
680 Ala Moana Boulevard
Suite 406
Honolulu, Hawaii 96813

Dear Mr. Fukumitsu:

The following are comments on:
A) Map
B) Draft Report
C) Downstream Connection to Shut-down

A) MAP: The service connections to Waiawa Correctional Facility distribution system has a missing reservoir. This reservoir is an underground storage, which is approximately 95,000 gallons. It is located at the eastside of the upper booster on the drawing. Other than that, the Map seems to be in order.

B) DRAFT REPORT: This is the draft to the Meter Service Connections. The status of the present service connection to Waiawa Correctional Facility is unmetering. In September 1995, Waiawa Correctional Facility has relocated the meter to receive a true reading of the water distribution.

A letter from Frances Watkins, Acting Warden, was sent to the Attorney General's Office. It was given to Mr. Rick J. Eichor, Deputy Attorney General.

C) DOWNSTREAM CONNECTION TO SHUT-DOWN: Waiawa Correctional Facility will use the shut-down only on a temporary basis. During these temporary shut-downs, Waiawa Facility will do minor improvements to the booster pump. The minor improvements will be the repairs to the pipelines to this facility.

The downstream shut-down to the system will not interfere with the sources of the water supply to the other users. The reason for this is that the service connection to Waiawa Correctional Facility will be shut-down at the booster pump (WC-1).

Should there be a downstream shut-down at ADIT 8 Rated Section, it is because repair service has been done to the walls in the tunnel.

The future plans for Waiawa Correctional Facility is to have the inmate population increased with additional staffing. The inmate population will consist of three hundred (300) to five hundred (500) inmates, plus additional staff members. More information will be available and sent to you.

Should you have any questions, please feel free to contact me at 455-6915.

Sincerely,

Roy K. Kepoo 10/25/95

Roy Kepoo, Facility Superintendent
Waiawa Correctional Facility

WCF:RK:am

c Frances Watkins, Acting Warden
Operations File

HAWAII FOOD PRODUCTS, INC.

October 24, 1995

TNWRE
680 Ala Moana Blvd.
Suite 406
Honolulu, Hawaii 96713

Re: Water Management at Connection # BE-1

Gentlemen:

As not to waste our precious water, we are following all good management practices of conserving water. At BE-1 we have daily inspection of our water lines, check the pressure of water, and make necessary repairs to broken lines. If we are unable to make necessary adjustments or repairs to broken lines or problem areas, we contact Waiawa Nursery (our landlord) and Waiahole Water Co. immediately to attend to the problem.

Sincerely,

Norman Oshiro
General Manager

HAWAII FOOD PRODUCTS, INC.

October 24, 1995

TNWRE
680 Ala Moana Blvd.
Suite 406
Honolulu, Hawaii 96713

Re: Water Management at Connection # BE-2

Gentlemen:

In following good water management practices, we at connection # BE-2 have daily inspection of Waihole ditch for sufficient water flow and water quality. We inspect the water pump, water lines, and maintain the drip irrigation lines on our fields. We make necessary adjustments and repairs to broken lines or problem areas. Our contacts are Waiawa Nursery (our landlord) and Waiahole Water Co. for Emergencies or if immediate attention needs to attend to.

Sincerely,

Norman Oshiro
General Manager

X C P. Tim
RKO
D-5

WAIAWA NURSERY LTD.

MEMORANDUM TO:GREG FUKUMITSU
FROM: *Jerome Fukuda*
DATE: October 25,1995
SUBJECT: WAIAWA NURSERY WATER MANAGEMENT

The Waiawa Nursery field stock trees at their Waiawa field use emitter heads that puts out a spray to cover the root ball pattern of the tree it is watering. The other system being used is drip irrigation for the potted plants that are up there.

The fields are watered only during the week and while the plants are being watered we have our personnel check all lines and emitters. They will repair any broken lines on the spot , or turn off the system until it can be repaired.

If there are any questions as to our water management procedures please feel free to call me at 599-8227.

Jerome S. Fukuda
General Manager

MILILANI GROUP, INC.

P.O. BOX 457, PEARL CITY, OAHU, HAWAII 96782-0457

MILILANI MEMORIAL PARK
MILILANI MORTUARY
MILILANI CREMATORY
TELEPHONE 677-5631

MILILANI FUNERAL TRUST PLAN
TELEPHONE 677-5631

MILILANI DOWNTOWN MORTUARY
20 S. KUKUI ST., HONOLULU, HI
TELEPHONE 538-6207

MILILANI LIFE INS. CO. LTD
38 S. KUKUI ST., HONOLULU, HI
TELEPHONE 523-3002

MILILANI MEMORIAL PARK

Water from the Waiahole Ditch is piped through a filter bed at a slow-sand filtration pool. This filtered water is chlorinated, then pumped into a storage tank. The water flows through an 8-inch PVC main line by gravity feed into 6-inch and 4-inch secondary main lines. The flow is controlled by gravity feed for both irrigation and two mortuary halls.

The residual chlorine and turbidity is monitored at the Makai funeral hall. Computer reports are sent to William Wong, Department of Health-Safe Drinking Water Branch at the end of each month. These reports are required by the EPA under the Surface Water Treatment Rule.

Fecal coliform is monitored by the Department of Health once every month. Water sampling for the fecal coliform bacteria is done by Mililani Memorial Park at sites designated by the Department of Health in the cemetery grounds. These samples are delivered to the Department of Health for testing at the laboratory to determine acceptable or non-acceptable levels of bacteria in the water lines.

10/24/95

Castle & Cooke
Land Company

FAX TRANSMITTAL

TO:	TOM NANCE WATER RES. ENG.	DATE:	10/25/95
ATTN:	GREG FUKUMITSU	FAX NO:	5387757
FROM:	LORNA for ED CHONG	PHONE NO:	548-2908

NO. OF PAGES BEING FAXED (INCLUDING THIS PAGE) 2

Please call Lorna at 548-2912 if you do not receive all the pages.

MESSAGE: STATEMENT OF WATER USE

THE ATTACHED STATEMENT WAS PREPARED BY JERRY VRIESENGA, PRESIDENT OF DOLE FOOD COMPANY HAWAII.

HARD COPY TO FOLLOW BY MAIL.

After water has been removed from the Waiahole ditch system, Dole has a very sophisticated irrigation system to insure that water is not lost. Even though Waiahole water is clean, the water goes through a filter system prior to field distribution. The drip irrigation system delivers water to fixed increment sizes and there is no lost water because the system accepts only the quantity needed. When we are not irrigating, the filter system is closed and water is not removed from the ditch. We do have to wash the filters on occasion which results in a very minimal water loss.

FAXED 10/25/95

MILILANI GOLF CLUB
Sports Shinko (Mililani) Co., Ltd.
95-176 Kuahelani Avenue • Mililani Town • Hawaii 96789 • Telephone 623-2222 • FAX 623-9441

STATEMENT ON MANAGEMENT OF USE AT THE MILILANI GOLF CLUB IN RELATION TO WAIAHOLE DITCH IRRIGATION WATER.

The Mililani Golf Club includes some 165 acres, all of which acreage is dependent on the Waiahole Ditch water. There are two intake systems from Waiahole Ditch to Mililani Golf Club in operation at this current time. Each system is equipped with the water meter which has been dysfuntional at this time. Two new water meters are being installed replacing the old ones. Maintenance of this system includes: removal of flotsam and other debris at the intake screen, keeping record on total water usage, repairing the mainlines and meters, cleaning of valves and water meters.

Wherever and whenever possible, we will make an effort to conserve usage of water from the Waiahole Ditch.

Yasuo Nishida

Yasuo Nishida, General Manager

October 25, 1995

Date

D-1

CASTLE & COOKE LAND COMPANY

P.O. BOX 2990•HONOLULU, HAWAII 96802
TELEPHONE: (808) 548-6611
FAX NO.: (808) 548-2975

TRANSMITTAL LETTER

Date: October 24, 1995 Fax No.: 5387757

To: Greg Fukumitsu From: Bev Kaku
C&C Land Co.

Copies	Date	Description
1		Waiahole Ditch Irrigation Water

TRANSMITTED FOR:

[ ] Your Information
[ ] Your Signature and Return
[ ] Your Signature and Forwarding
[ ] As Noted Below
[ ] Per Our Conversation
[ ] Your Further Necessary Action
[ ] Your Approval
[ ] Your Review and Comment
[ ] Per Your Request
[x] SEE REMARKS BELOW

IF YOU HAVE ANY QUESTIONS, PLEASE DO NOT HESITATE TO CALL

Hard Copy to Follow by Mail _x_Yes ___No
Number of pages being faxed including cover sheet (2)

Please call me at 548-2912 if you do not receive all the pages.

REMARKS: The attached was prepared by Ken Kato, president of Hawaiian Foliage & Landscape, Inc., the party responsible for maintaining the water system for the Mililani farmers.

Please call me at 548-2912 if you have any questions.

Waiahole Ditch Irrigation Water

I. Management of Use at the Mililani Agriculture Park (Dole Food Company, Inc./Castle & Cooke)

The Mililani Agriculture Park includes some 586 acres plus 40 acres of Robinson Estate Lands, all of which acreage is dependent on the Waiahole Ditch water. The primary water meter installed many years ago and dysfunctional over the past five years was recently replaced by a 12" in-line meter some distance from the water intake at the ditch. Maintenance of this system includes: removal of flotsam and other debris at the intake screen, record keeping on the total water usage and the allocation of water usage amongst the farmers, repairing the mainlines, monitoring the time-sharing of water amongst the principal farmers, and cleaning of valves and water meters as the same leads to occlusion of pipes, particularly where these fittings occur.

Wherever and whenever possible, all farmers are encouraged to conserve usage of water by using drip irrigated systems.

RECEIVED
OCT 24 1995
TOM NANCE
WATER RESOURCE ENGINEERING

Royal Oahu Resort, Inc.
dba Royal Kunia Country Club
460 Ena Road, Suite #301 Honolulu Hawaii 96815
Phone (808)949-1088 Fax (808)943-1809

TN
GF
LS
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LT
MW
Job 95-29

Facsimile Transmission

TO: TNWRE **FAX #:** 538-7757

ATTN: Greg Fukumitsu **DATE:** October 24, 1995

FROM: **Leighton Wong**
Superintendent
SUBJECT: WIC Water Monitoring Plan

PAGES: 2 **(including cover sheet)**

Message: The Royal Kunia Country Club golf course has installed a state-of-the-art irrigation system which is the Toro Network 8000. This is a computer controlled system which is linked to a weather station on the premises. The weather station translates solar radiation, wind speed, relative humidity, and temperature, coupled with soil type, porosity of soil, plant type and terrain in the central computer to derive an evapotranspiration rate for the run time of the irrigation cycle. This is a very efficient means of determining water usage because we are replenishing the plants and soils with the identical amounts of water which had been lost to the atmosphere. We are also capable of irrigating in short, frequent cycles through the night to allow water to percolate and not run off therefore efficiently using the water.

The golf course is staffed every day with personnel capable of detecting leaks and repairing pipelines. Security personnel are on the premises after hours to report unusual conditions and pipeline breaks to the golf course superintendent. Pipeline ruptures are detected by personnel inspecting the golf course and through flow meters linked to the central computer. The flow screen on the central computer will show water pumpage from the main booster pump station indicating a ruptured line during non irrigation periods.

Enclosed in this fax are changes made to Exhibit 2, "draft form" of the monitoring plan presented by WIC. Changes made were the results of discussion with Bert Hatton.

CONFIDENTIALITY NOTE: The information in this facsimile message is intended only for the use of the individual or entity named above. If the reader of this message is not the intended recipient, you are hereby notified that any dissemination, distribution, or copy of this facsimile message is strictly prohibited. If you have received this facsimile message in error, please immediately notify us by telephone and return the original message to us at the address above via the United States Postal Service.

October 28, 1996

Larry Jefts
Waikele Farms, Inc.
Singerland Farms, Inc
P.O. Box 27
Kunia, Hi. 96759

Waiahole Irrigation Co., Ltd.
P.O. Box 3230
700 Bishop Street
Honolulu, Hi. 96801

RE: Water Use Plan

Dear Bert,

The following is a brief outline of how we expect to use the water from WIC. The fields that we have under our control on both Robinson, and Campbell, add up to about 3900 acres. There is about 1660 tillable acres that was in sugar during the past crop cycle. Of that acreage about 1300 acres was served by WIC. In addition about 300 acres were in sugar, but not during the last crop cycle. There are also more than 1700 acres that will need water for livestock, as has been the practice in the past.

We intend to bring all of this area into production, both livestock and crop during the next calendar year, if water is available. Vegetable crops for local markets will be grown on most of the tillable acreage. Our understanding is that water will be made available at the edge of the ditch, through our water metering devices. It is our intention to monitor the function of the metering devices, and maintain them in operating condition. Also , we will maintain in good operating condition, a system of pumps, filters, mainlines, and submains to deliver the water. Any leaks will be repaired as soon as discovered. All backflush water from filters will be either, returned to the ditch or utilized in a cropping system.

It is our intention to use primarily drip irrigation, wherever practical. In any sprinkler application only low pressure, low angle, delivery systems will be used. Mulch paper will be the practice in many of the drip irrigated acres. This will reduce the water requirements, by reducing soil evaporation. For several years we have used a system of soil moisture monitoring devices. These allow, an on demand type of watering program. We also use a low quantity, high frequency program. Just in time watering, and not more than required at any given time, is part of the system. Most of our crops, bellpepper, tomato, melons, onions, cucumbers, to name a few, are transplanted. This means that these crops spend up to thirty percent of their growing time in a nursery setting. In this way, a few thousand gallons of water, will water several acres of growing crops each day.

We will closely monitor both the delivery lines, and the water troughs each day, in the livestock operation. Small amounts of water will also be used for field spraying, fire drills, etc.

We are very much looking forward to working with WIC. We need to develop a team effort for our joint well being. This means if we discover a problem with the ditch we will report to your people right then. As your people go about their day to day work, they can do the same. If any concerns are seen please report these to our office at 688-2892 so we may fix the problem. Again, I am looking forward to working with you, to bring the Waiahole ditch back to full utilization very soon.

Sincerely yours,

Larry Jefts

Larry Jefts

Aloun Farms
86-323 Mailiilii Road
Waianae, Hawaii 96792
Tel: (808) 696-6787; Fax: (808) 696-7787

October 28, 1995

TO: BURT HATTON
WAIAHOLE DITCH IRRICATION CO.
AMFAC JMB

FROM: Alec Sou, General Manager

RE: WATER USE MANAGEMENT

On Aloun Farms, we have tested and implemented some of the more efficient practices of irrigation system and techniques. With our multiple crops, we use a combination of both drip and overhead sprinklers. Where water can be conserved, drip system with an appropriate flow is used. With crops that have no effective methods other than the overhead sprinklers, we have gone to a bush head, micro sprinklers irrigation to which has a lower elevation of water throwing then the traditional impact sprinkler heads, therefore minimize surface and air evaporation.

Two full time personnel and a part-timer have been assigned to daily monitoring the field. In addition, between the managers (my brother, Mike Sou, and father, Aloun Sou), all fields are daily visited by the family member. In most areas, mainline controller valve have been install for each blocks. Therefore, should there be any leaks, small blocks of 5 to 10 acres can be shut-off for immediate repair rather than having to shut the main system which often requires a longer period to be shut and restart again.

In the months ahead, automation of blocks are being examine and where deem feasible, the automation valve will be installed.

As for down stream of the ditch, particularly where the ditch system flows through our property, a combine monitoring efforts from WIC and land tenents is in the works. All Aloun Farms' personnel, particularly the irrigation crew, have been instructed to be mindful of any dumping, plugging and diversion of ditch flow. Immediate notification will be sent to the Waiahole Ditch Irrigation Co.

At each of our meter site, there is a pre-meter valve. Should there be a problem with any of our pumps, pre-meter valve would be shut to prevent any back-flows. Should there be any question with our irrigation program, please feel free to contact me. Thank you.

HSPA

HAWAIIAN SUGAR PLANTERS' ASSOCIATION, 99-193 AIEA HEIGHTS DRIVE, AIEA, HAWAII
MAILING ADDRESS: P.O. BOX 1057, AIEA, HAWAII 96701-1057
TELEPHONE: (808) 487-5561 FAX: (808) 486-5020

STEPHANIE A. WHALEN
President - Director
Experiment Station

October 30, 1995

Mr. Bert Hatton
Senior Vice President-Asset Management
Amfac/JMB Hawaii, Inc.
P. O. Box 3230
Honolulu, HI 96801

Dear Bert:

The Experiment Station, Hawaiian Sugar Planters' Association operates a 78 acre experimental farm, the Kunia Substation, at the end of the Waiahole Ditch distribution system. Water entering the farm is metered and we have recently installed a more efficient filter to protect our farm-wide drip irrigation system.

All irrigation water at the Kunia Substation is applied to crops via a low pressure drip irrigation system, thereby minimizing excessive loss to leaching. The amounts of water required for irrigation are determined by reading the daily loss of water from a five foot evaporation pan or by calculating the loss using meteorological data collected at the farm.

Sincerely,

Stephanie A. Whalen

SAW:cp

D-16

TN
GF
LS
GS
LT
MW
Job

Brian C. Nishida
Vice President
General Manager

Del Monte Fresh Produce (Hawaii) Inc.

RECEIVED
OCT 26 1995
TOM NANCE
WATER RESOURCE ENGINEERING

October 25, 1995

Via Fax/Hard Copy to Follow

Mr. Greg Fukumitsu
Tom Nance Water Resource Engineering
680 Ala Moana Boulevard, Suite 406
Honolulu, Hawaii 96813

Dear Mr. Fukumitsu:

Del Monte is committed to water conservation in the production of our pineapple and diversified crops. The conservation measures employed include use of drip irrigation, plastic mulches, careful scheduling, and rapid repairs of leaks in the system. Another important aspect of our efforts is the training of our employees in water conservation.

Sincerely,

Brian C. Nishida
Vice President & General Manager

BCN:djn

xc B. Bevacqua

BB:COMNT/WTR.CONSRVTN

P.O. Box 200 Kunia, Hawaii 96759 • Telephone 808-621-1221 • Fax 808-621-1213

THE ESTATE OF JAMES CAMPBELL

RECEIVED
OCT 2? 1995

October 25, 1995

TOM NANCE
SOURCE ENGINEERING

Mr. Bert Hatton
Senior Vice President-Asset Management
AMFAC/JMB Hawaii, Inc.
P. O. Box 3230
Honolulu, HI 96801

Dear Bert:

Water management practices adopted by the Estate of James Campbell for the Estate's agricultural lands in Kunia and Ewa include providing for delivery of irrigation water as requested by our tenants.

To accomplish this objective, the Estate has contracted with a third party to be responsible for operating pumps, valves, and pipelines as needed, utilizing both pump and gravity flow water. They monitor the irrigation systems daily to assure operating status of all facilities, and coordinate repair and maintenance when necessary. This includes the major supply pipelines in the Kunia area, such as the 30"-diameter WP-10 pipeline transporting Waiahole water from Reservoir #155 down to the metering points of several large tenants. Many large leaks from this pipeline, totalling about 0.5-1.0 MGD, were repaired in mid-1994 when the Kunia lands reverted back to the Estate.

At months' end, the contractor reads and records all water meter readings for tenants so that the Estate can provide tenants with information necessary for their monthly water use and billings.

The Estate recognizes the need for responsible use and measurement of irrigation water, and is taking these measures to assure that proper attention is being given to these important issues on our property.

Very truly yours,

Wouter Nicolai
Manager, Agriculture/Natural Resources

jek:01032100\K10383

1001 Kamokila Boulevard, Kapolei, Hawaii

October 25, 1995

fax to Greg Fukumitsu
Tom Nance Water Resource
538-7757 fax

From Bob Creps
Pu'u Makakilo
487-7916 phone

as a followup to our meeting on Tuesday, October 24th:

1. I have no comments on draft copy of schematic.
2. comment on CE-17, Makakilo Golf Course at WP-5, Puu Makakilo is obtaining price to change meter to gear-driven propeller type and will make conversion in near future.
3. management practices below the meter. Puu Makakilo monitors for leaks between the 105 filter station and the sump pond and between the sump pond and the reservoir on the golf course at hole #2. The irrigation system for the golf course is state of the art, monitoring temperature and rainfall to minimize water usage, and monitoring pressure in the lines to detect any leaks in the system.

Thank you
Robert Creps

CURRICULUM VITAE: 2016

Lilikalā K. Kame'eleihiwa

Education:

University of Hawai'i-Manoa:	B.A. Hawaiian Language and Hawaiian Studies- 1980
University of Hawai'i-Manoa:	M.A. Pacific Island Studies - 1982
University of Hawai'i-Manoa:	Ph.D. Pacific & Hawaiian History - 1986

Teaching and Research Interests:

Traditional Hawaiian history, literature and land tenure practices before contact with the west, and changes during the Kingdom of Hawai'i. Comparative Hawaiian and Polynesian genealogy, history, sexual practices, mythology and literature, including Oli (chant) and Mele (song) having to do with the ancient study of celestial bodies, Traditional Hawaiian/Pacific Navigation and Astronomy studying temples designed to measure equinox and solstices. Hawaiian Sovereignty Issues and the United Nations Permanent Forum on Indigenous Issues. Research on Ceded Lands, Oʻahu Fishponds & Food Sustainability, modern Hawaiian and Polynesian Sovereignty movements, and International Rights for Native Peoples.

Professional Experience:

Director:	Kamakakuokalani Center for Hawaiian Studies, University of Hawai'i-Manoa: August 1, 2014 to Present. July 1998 to June 2004. July 1993 to June 1994. (Sabbatical leave: January 1 – June 30, 2004).
Professor:	University of Hawai'i-Manoa (Hawaiian Studies): June 1999 to present (Sabbatical 1995, 2004)
Chair:	Budget Subcommittee, Pukoʻa UH System Native Hawaiian Advisory Council (January 2002 to present.)
Adjunct Professor	Hawai'i Community College, Hilo, Hawai'i (Hawaiian Lifestyles Program): November 2007 to present.
Chair:	Curriculum Committee, Kamakakuokalani Center for Hawaiian Studies, University of Hawai'i-Manoa (September 2012 to August 2014)
Chair:	Building Planning Committee for the new School of Hawaiian Knowledge, (July 2003 to 2007)
Adjunct Professor	The Union Institute, Cincinnati, Ohio, (Hawaiian Culture) (March 1997 to 2004)

Associate Professor: University of Hawai'i-Manoa (Hawaiian Studies): June 1992 to June 1999 (Sabbatical 1995)

Assistant Professor: University of Hawai'i-Manoa (Hawaiian Studies): January 1987 to June 1992

Publications and Creative Works:

Natives in New York: Seeking Justice at the United Nations Permanent Forum on Indigenous Issues. Co-producer with Na'alehu Anthony. Documentary of young Hawaiian university students from the Kamakakuokalani Center for Hawaiian Studies on journey to the United Nations to present interventions on behalf of the Hawaiian people. May 2005.

Na Kai 'Ewalu: the Kamakakuokalani Center for Hawaiian Studies - Producer of a KCHS monthly television show on courses and events at KCHS, University of Hawai'i - Manoa, June 2003 to 2004. Co-Producer with Professor Kanalu Young, September 2001 to May 2003.

Na Wahine Kapu: Divine Hawaiian Women. Honolulu: 'Ai Pohaku Press, August 1999. 41 pages. Second printing December 2002. Third Printing 2015.

He Mo'olelo Ka'ao o Kamapua'a: A Legendary Traditional of Kamapua'a, the Hawaiian Pig-God. Honolulu: Bishop Museum Press. 1996. 200 pages. Second printing January 2005. E-book 2013.

An Act of War: The Overthrow of the Hawaiian Nation. Scriptwriter of a historical documentary written in conjunction with Haunani-Kay Trask and Na Maka o ka 'Aina Video Company for ITVS (Independent Television and Video Service) a subsidiary of PBS (Public Broadcasting Service). May 1993.

Native Land and Foreign Desires: *Pehea La E Pono Ai?* Honolulu: Bishop Museum Press. 1992. (Hard cover and paperback). 424 pages. Nominated in 1993 for a Po'okela Award in the category of Excellence in Hawaiian Culture. Second printing January 2004. E-book 2013.

Maui: the Mischief Maker. Editor. Honolulu: Bishop Museum Press, 1991. Written and illustrated by Dietrich Varez.

Chapters and Short Articles in Books:

"Kaulana O'ahu me he 'Āina Momona Mamuli o Nā Ha'awina 'Aumākua: [Famous is O'ahu as a Land Fat with Food because of Ancestral Teachings]." Chapter included in a book called "Diet for a Small Island." Expected publication by University of Hawai'i Press is Spring 2016.

"Hawai'i, the Fiftieth State" in The New Book of Knowledge. 1999. Bethel: Grolier Educational.

"De Mensen [the Hawaiian People]" and "De Goden [the Hawaiian Gods] and captions for photographs by internationally acclaimed photographer Tomas Micek in Hawaii. 1999. Lisse: Rebo International. Essays published in Dutch.

"The Mahele of 1848" in the revised Atlas of Hawai'i. Third Edition. 1998. Edited by Sonia P. Juvik and James O. Juvik. Honolulu: University of Hawai'i Press.

"*Ua Mau Ke Ea o Ka 'Aina i Ka Pono*: The Concepts of Sovereignty and Religious Sanction of Correct Political Behavior," [pp. 34-43] and

"The Role of American Missionaries in the 1893 Overthrow of the Hawaiian Government; Historical Events, 1820-1893," [106-119] in Hawai'i: Return to Nationhood. 1995. Edited by Ulla Hasager and Jonathan Friedman. Document 75, Copenhagen: International Working Group for Indigenous Affairs (IWGIA).

Articles in Refereed Journals:

"The Miracle of Higher Education at UH Manoa?" Article co-authored with Kaiwipuni Lipe in Hūlili: Multidisciplinary Research on Hawaiian Well-Being Journal. Forthcoming in Volume 11, in Spring 2016.

"Hawai'i-nui-akea Cousins: Ancestral Gods and Bodies of Knowledge are Treasures for the Descendants" in Te Kaharoa e-Journal, 2009. Vol. 2, pp. 42-63. http://blogs.libr.canterbury.ac.nz/edu.php?itemid=4955.

"Kumulipo: A Cosmogonic Guide to Decolonization and Indigenization" in International Indigenous Journal of Entrepeneurship, Advancement, Strategy & Education, WIPCE 2005 Special Edition. Hamilton: Te Wananga o Aotearoa, Vol. 1, Issue 1, pp. 119-130.

Review of The Apotheosis of Captain Cook by Gananath Obeyesekere in Pacific Studies, Vol.17, No. 2 -June 1994. Pp. 214-218.

Review of Anahulu, the Anthropology of History in the Kingdom of Hawai'i, Vols. I and II, by Patrick Kirch and Marshall Sahlins, in Journal of the Contemporary Pacific, Vol.6, No.1. Spring 1994. Pp. 111-118.

"Polynesien," article in Enzyklopedia des Maerchens. Published in German by the Akademie Der Wissenschaften Zu Gottinge, 2002. Band 10, Lieferung 3. Pp. 1167-1174.

"The Legacy of Colonialism and the Role of the University - a Native Hawaiian Viewpoint," in Restructuring for Ethnic Peace, 1991. Ed. Majid Tehranian, Honolulu: Institute for Peace, Pp. 102-109.

Articles published in other periodicals and on the Web:

Two articles on "History of Hawaiian Culture and Society Prior to Western Contact" and on "Hawaiian Mythology" in posted conjunction with the Holo Mai Pele Hula Drama aired on PBS. 2002. See http://www.piccom.org/holomaipele/hula1.html.

"Hawaiian Issues in Political Reviews - Polynesia," in Journal of the Contemporary Pacific. Honolulu: University of Hawai'i. Spring 1998. Pp. 205-212.

"The Hawaiian Sovereignty Movement: January - August 1993", in Journal of Pacific History--Political Chronicles, Vol. 28, No. 3: 63-72, December 1993. Pp. 63-72.

"Hawaiian Immersion Language Schools: An exciting new alternative in the D.O.E.," Kamehameha Journal of Education.. Vol 3, No. 2: 109-118, Fall 1992

Translations in Books and Literary Journals:

"*Mele Aloha i Ka Na'auao* " (A love chant to wisdom) and "*Punana Ka Manu* " (The birds are nesting), annotated translations of 2 traditional chants in Marshall Sahlins' Islands of History. Chicago: University of Chicago Press. 1985.

"Hui Aloha 'Aina" (Statement of the Patriotic League), translated excerpt from the Blount Report of 1893; and

"Ua Kaupaona pu 'ia ka Hawai'i me na Miliona Dala? "(Is Hawai'i worth only a Million Dollars?) and "*Ho'ohui'aina Wahakole*" (The Quarrelsome Annexationists), annotated translations of articles printed

July 14, 1893 in the Hawaiian newspaper Ka Lei Momi; and "*Mele Ko'ihonua no Lili'u* " (A Political Chant for Queen Lili'u); "*Ho'ohui'aina Pala ka Mai'a* " (Annexation is Rotten Bananas [Bad Luck]); *"Mau Hawai'i i ka Lanakila"* (Hawai'i is preserved with Victory); and *"'A'ole Hopo iho o Hawai'i"* (Hawai'i is not Fearful), annotated translations of patriotic songs from *Buke Mele Lahui*, published in 1985, all published in Hawai'i Review , Vol.16, No.3, Winter 1993.

Video/Radio:

Na Hulu Kupuna Video Series - Co-Producer with Makalapua Ka'awa of Ke'ena 'Olelo Hawai'i of the Hawaiian Language Department, University of Hawai'i - Manoa, directed by Na Maka o ka 'Aina. Continously aired on 'Olelo Public Broadcasting, Honolulu, Hawai'i.
First 3 in the series were interviews with Kaleipua Pahulehua, Katherine Maunakea, and James Hu'eu Jr. in 1993.
Second set of 4 were interviews with Margaret Aipolani, Alina Kanahele, Leimana Kanahele, and Esther Makua'ole in 1995 and 1996.

A History of the 1893 American Overthrow of the Hawaiian Government. Scriptwriter for a 10 part radio series for Hui Na'auao, broadcast January 1993 on Kaua'i.

Internal University Reports and Other Unpublished Work:

With Keali‘i Gora, wrote “Brief History of the UH Puko‘a and Kuali‘i Native Hawaiian Councils, Advisory to the UH President and the UHM Chancellor, with Reference to Advocacy for Native Hawaiians in the University of Hawai‘i, Institutional Racism, and Budget Support for UH Native Hawaiian Serving Programs.” (June 6, 2011)

Wrote extensive Budget reports and Biennium Budget justifications for the Puko‘a Native Hawaiian UH System Advisory Council, for the Kuali‘i Native Hawaiian UH Manoa Advisory Council and for Kamakakuokalani Center for Hawaiian Studies. 2001 to present.

With Keali‘i Gora, wrote “Puko’a Stocktaking and UH Benchmarks for Serving Native Hawaiians, A Biennium Budget Proposal FY 2009-20015 for Native Hawaiians Achieving Academic Excellence.” Power point Presentation of 98 slides. (June 5, 2008)

Co-wrote all copy for the Kamakakuokalani Calendars of 2004, 2005, 2006 and 2007. (June 2003 to 2007)

Wrote “Puko’a Stocktaking and UH Benchmarks for Serving Native Hawaiians, A Biennium Budget Proposal FY 2007-09 for Native Hawaiians Achieving Academic Excellence.” 42 pages. (March 2006)

Co-wrote the Center for Hawaiian Studies proposal for a Master’s program in Hawaiian Studies. (May 2005)

Co-wrote the Puko’a UH Manoa Native Hawaiian Advisory Council Charter. (August 2004)

Co-wrote the Kuali’i Council Report on Transforming UH Manoa into a Hawaiian Place of Learning. (December 2003)

Co-wrote the Kuali’i UH Manoa Native Hawaiian Advisory Council Charter. (June 2003)

Co-wrote the Center for Hawaiian Studies proposal for a Master’s program in Hawaiian Studies. (2000)

Wrote Curriculum and Faculty Review sections of the Hawaiian Studies Program Review for the School for Hawaiian, Asian and Pacific Studies 1990-1997. (1997)

Wrote the proposed Masters and Doctorate section, with graduate course proposals, for the 1988 Hawaiian Studies Ten Year Plan, required by the University of Hawai'i in order

to obtain permission to plan the new Hawaiian Studies building. (1987)

Participated in 8 month deliberations and drafted Curriculum and Instructions, and Student Services sections of the 1986 Ka'u: Hawaiian Studies Task Force Report, under the direction of the Vice-President for Academic affairs. (1986)

Anonymous Reviews for Bishop Museum Press, Center for Family Studies Journal at Wisconsin University, Journal of the Contemporary Pacific, Journal of the Polynesian Society, National Geographic Society, Marsden Fund of the Royal Society of New Zealand, Social Process in Hawai'i, University of Auckland, University of Waikato.

Fellowships, Grants and Awards:

Principal Investigator, Brandt Fund for Comparative Polynesian Studies, grant of to take 13 students and staff to Tahiti and French Polynesia on the first Hawaiian Studies Study Abroad coarse ever offered – Hwst 675: Studying Polynesian Temple Design – 18 temples on 6 islands. $62,404. July 5-26, 2014

Principal Investigator, OHA [Office of Hawaiian Affairs] Grant to take Kamakakūokalani students and staff to NYC to present at the United Nations Permanent Forum on Indigenous Issues. $7,671. May 19-28, 2014

Principal Investigator, Administration for Native Americans [ANA] Grant for Kamakakūoka‘aina: Ancestral Visions of ‘Aina, in partnership with the Edith Kanaka‘ole Foundation, and Kekuhi Kanahele as director of the grant, to Train Young Native Hawaiians in Ancestral Konohiki Knowledge of Land Management with a view to Food Sustainability. $586,596 over three years. September 2010

Principal Investigator, OHA [Office of Hawaiian Affairs] Grant # 2294: Education for the Nation [One Year Extension of Previous Grant #1588] to teach Community Culture Classes, and Train students to Work on the Ceded Lands Project. $305,000. March 2008

Principal Investigator as Budget Chair of Puko’a UH System Native Hawaiian Advisory Council, Hawai’i State Legislature, Initiative to Promote Academic Excellence for Hawaiians on all 10 University of Hawai’i campuses. $4.8 Million and 54 Permanent Positions. May 2007

Principal Investigator, NOAA [National Oceanographic and Aeronautics Administration]. Grant to develop curriculum about the North West Hawaiian Islands. $100,000. August 2003

Principal Investigator on a Grant from Chancellor Peter Englert to support Kuali‘i Council Programs to promote Academic Excellence for Hawaiians at University of Hawai’i at Manoa for $1.4 million and 34 Permanent Positions for 2 years. March 2003

Principal Investigator on Grants from VP for Academic Affairs Ed Laws [$50,000] and Kamahemeha Schools’ CEO of Hamilton McCubbin [$10,000] to make the DVD

'Natives in New York: Seeking Justice at the United Nations.' January 2003

Principal Investigator, OHA [Office of Hawaiian Affairs] Grant to teach Community Culture Classes, Develop a Library for OHA Documents, and Train students to Work on the Ceded Lands Project. $1.5 million over 5 years. April 2002

Co-Investigator with Tep Dobry [UHM: Engineering], Gene Magallanes [University of Washington: Engineering], and Herb Schroeder [University of Alaska: Engineering] a Grant from NSF: National Science Foundation for the LSAMP [Louis Stokes Alliance for Minority Participation] Project to attract more Native and Minority students into Engineering for $120,000 over 2 years. March 2002

Co-Investigator with Lehua Kinilau of Ka Lahui Hawai'i and Pono Kaulike on an Administration for Native Americans [ANA] Grant for the Kia'i 'Āina Ceded Lands Inventory Project [to train students in Hawaiian land researching techniques], for $300,000 over 2 years. February 2002

Principal Investigator on a Grant from President Dobelle to support Kuali'i Council Programs to Promote Academic Excellence for Hawaiians at University of Hawai'i at Manoa for $1.5 million for 2 years. July 2001

Principal Investigator, HUD [Housing & Urban Development] AN-NHIAC Grant for Project ABCDE to expand the role and effectiveness of the University of Hawai'i at Manoa in addressing the community development needs in the Hawaiian communities of Papakolea and Maunalaha Valley. $330,000 over two years. January 2001

Co-Investigator with Kim Bridges and Will McClatchy of the Botany Department on the Hui Konohiki Project [to train students in Hawaiian and Western land stewardship] which was awarded 5 tenure track positions by UH President Ken Mortimer [2 in KCHS]. April 2001

Expert Witness /Consultancies:

Expert discussant on UN PFII Side Event Panel on the "UNDRIP IN INDIGENOUS HAWAIIAN EDUCATION AT THE UNIVERSITY OF HAWAI'I," power point presentation on the "UNDRIP and Indigenous Knowledge Curriculum," with Keali'i Gora, Pualani Kauila and Maile Tauali'i. United Nations Permanent Forum on Indigenous Issues, New York. May 28, 2013.

Expert discussant for the Christensen Fund, the Ford Foundation, and the Tamplais Foundation in the panel dialogue ***From Aspiration to Implementation: Practical Lessons on Using UNDRIP and Advancing Indigenous Peoples' Rights***, power point presentation on the implementation of the "UNDRIP in Indigenous Hawaiian Education at the University of Hawai'i at Mānoa," Ford Foundation, New York. May 24, 2013.

Expert witness for Global Impact consultation workshop for *A Business Reference Guide to UNDRIP*. Global Impact offices at 801 Second Avenue, New York City.

May 23, 2013.

Expert discussant on UN PFII Panel on Indigenous Education, power point presentation on the implementation of the "UNDRIP in Indigenous Hawaiian Education at the University of Hawai‘i at Mānoa," United Nations Permanent Forum on Indigenous Issues, New York. May 21, 2013.

Leader of Delegation and Expert Witness on Higher Education for Indigenous Hawaiians for Kamakakuokalani Center for Hawaiian Studies at the United Nations Permanent Forum on Indigenous Issues, New York. May 20-31, 2013

Expert Consultant to UNESCO World Heritage Technical Workshop, Ra‘iatea, French Polynesia. Invited to present a Power point Presentation on "Taputapuatea as the Center of Polynesian Religion." December 6-10, 2011.

Leader of Delegation and Expert Witness on Hawaiian Water Issues for Kamakakuokalani Center for Hawaiian Studies at the United Nations Permanent Forum on Indigenous Issues, New York. May 16-27, 2011

Leader of Delegation and Expert Witness on Higher Education for Native Hawaiians for Kamakakuokalani Center for Hawaiian Studies at the United Nations Permanent Forum on Indigenous Issues, New York. April 12-23, 2010

Expert Consultant to UNESCO World Heritage Technical Workshop, Maupiti, French Polynesia. Invited to present a Power point Presentation on "Religious Significance of Temples on Moku Manamana, Northwest Hawaiian Islands and Taputapuatea Temple of Ra‘iatea." November 1-7, 2009.

National Oceanic and Atmospheric Administration [NOAA] Special Consultation with UNESCO World Heritage Officers, Kamakakuokalani Centre for Hawaiian Studies, University of Hawai‘i at Mānoa. Power Point presentation on "Ancestral Gods as Symbols of Hawaiian Scientific Knowledge; Temples as Sacred Spaces for Learning Ancestral Knowledge." August 2, 2009.

Leader of Delegation and Expert Witness on Hawaiian Land Tenure for Kamakakuokalani Center for Hawaiian Studies at the United Nations Permanent Forum on Indigenous Issues, New York. May 18-29, 2009

Leader of Delegation and Expert Witness on Hawaiian Education and Culture for Kamakakuokalani Center for Hawaiian Studies at the United Nations Permanent Forum on Indigenous Issues, New York. April 21- May 2, 2008

Protocol Consultant for E Pili Kakou Hawaiian Cultural Delegation to Ua Pou, Marquesas Islands, French Polynesia: December 11-23, 2007

Leader of Delegation and Expert Witness on Hawaiian Education and Culture for Kamakakuokalani Center for Hawaiian Studies at the United Nations Permanent

Forum on Indigenous Issues, New York. May 14-25, 2007

Invited Participant and Leader of the Kamakakuokalani Center for Hawaiian Studies delegation for Cultural and Intellectual exchange, the 4th Annual Maohi Native Cultural Festival on November 18, 19 and 20, 2006, in Tahiti Nui, Polynesia. November 15-22, 2006

Leader of Delegation and Expert Witness on Hawaiian Education and Culture for Kamakakuokalani Center for Hawaiian Studies at the United Nations Permanent Forum on Indigenous Issues, New York. Also premiered the video 'Natives in New York: Seeking Justice at the United Nations," at the United Nations. May 12-31, 2006

Protocol Expert and Cultural Investigator for the Polynesian Voyaging Society trip to Moku Manamana of the North Western Hawaiian Islands: July 12 – 18, 2005

Leader of Delegation and Expert Witness on Hawaiian Education and Culture for Kamakakuokalani Center for Hawaiian Studies at the United Nations Permanent Forum on Indigenous Issues, New York. May 15-30, 2005

Invited Participant, United Nations' Second Prepcom for World Summit on Information Society to be held in Tunis in September 2005, Geneva Switzerland. February 17-25, 2005

Leader of Delegation and Expert Witness on Hawaiian Education and Culture for Kamakakuokalani Center for Hawaiian Studies at the United Nations Permanent Forum on Indigenous Issues, New York. May 5-21, 2004

Protocol Consultant for Hawai'inui'akea Hawaiian Cultural Delegation to Hiva Oa, Marquesas Islands, French Polynesia: December 13-21, 2003

Observer, United Nations World Summit on Information Society, Geneva Switzerland. December 8-12, 2003

Protocol Expert and Cultural Investigator for the Polynesian Voyaging Society trip to Nihoa of the North Western Hawaiian Islands: September 9 – 15, 2003

Leader of Delegation and Expert Witness on Hawaiian Education and Culture for Kamakakuokalani Center for Hawaiian Studies at the United Nations Permanent Forum on Indigenous Issues, New York. May 2003

Consultant to Principal Investigator Judith Vergun of SOEST for a Grant from NSF: National Science Foundation for the Kumu Ola: Hawaiian Science Project for $350,000 over 5 years. August 2002

Observer, 25th Inuit Circumpolar Convention on Self Determination for Inuits of Alaska, Canada, Greenland and the Soviet Union, Kuujjuaq, Nunavik, Canada. August 2002

Expert Witness on Hawaiian Education and Culture for Ka Lahui Hawai'i [the Hawaiian Nation] at the first session o f the United Nations Permanent Forum on

Indigenous Issues, New York. May 2002

Courses Taught:

Hawai'i: Center of the Pacific	Hwst 107
Hawaiian Mythology	Hwst 270
Ka Ho'okele Holokahiki: Hawaiian Voyaging	Hwst 281 & 282
Hawaiian Genealogies	Hwst 341
Chiefs of Post-Contact Hawai'i	Hwst 342
Pana O'ahu: Famous Place Names	Hwst 362
Oli Makawalu	Hwst 371
Mahele Land Awards	Hwst 440
ʻIke Akua Papakū Makawalu Ancestral Understanding of Elements	Hwst 470
Envisioning the Nation	Hwst 490
Directed Reading	Hwst 499
Hawaiian Archival Research	Hwst 602
Writing a Hawaiian Thesis Proposal	Hwst 604
Kumu Kahiki: Comparative Tahitian Literature & Mythology	Hwst 670
Huakaʻi Huli Heiau Hawaiʻinuiakea: Study Abroad Researching Polynesian Temples – Society Islands	Hwst 675
Kukulu Aupuni: Envisioning the Nation	Hwst 690

Courses Written for the Department:

Papahulilani, Introduction to Hawaiian Astronomy	Hwst 271
Kalo: the Divine Ancestor	Hwst 351 & 352
Malama Loko I'a: Fishpond Management	Hwst 397
Hawaiian Institutions	Hwst 445
Haʻiʻolelo Kuʻe: Hawaiian Political Speech	Hwst 491

As well as all of the Hwst courses listed above in previous section.

Current Graduate Chair:

Tiani Akeo, M.A.	(Hawaiian Studies)
Ikaika Mahoe, M.A.	(Hawaiian Studies)

Past Graduate Chair:

Keoni Baclayon, M.A.	(Hawaiian Studies)

Donna Camvel, M.A.	(Hawaiian Studies)
Raymond Estrella, M.A.	(Hawaiian Studies)
Mehana Hind, M.A.	(Hawaiian Studies)
Manu Ka‘iama, M.A.	(Hawaiian Studies)
Keoni Kuoha, M.A.	(Hawaiian Studies)
John Kalei Laimana, M.A.	(Hawaiian Studies)
Lilinoe Lindsey, M.A.	(Hawaiian Studies)
Kapua Renaud, M.A.	(Hawaiian Studies)
Keola Ryan, M.A.	(Hawaiian Studies)
Jaime Ni‘oi Tabag, M.A.	(Hawaiian Studies)
Kanoa O‘Connor, M.A.	(Hawaiian Studies)
Manuwai Peters, M.A.	(Pacific Island Studies)
Hiwahiwa Steele, M.A.	(Hawaiian Studies)
Noenoe Wong-Wilson, M.A.	(Pacific Island Studies)

Past Graduate Advising:

Kehau Abad, Ph.D.	(Archaeology)
Kekuewa Kikiloi, M.A.	(Archaeology)
April Hokulani Drexel, MFA	(Art: Painting)
Maile Andrade, MFA	(Art: Ceramics/ Fiber Arts)
Ka'au McKenney, M.A.	(Education)
Ku Kahakalau, Ph.D.	(Education)
Carlos Andrade, Ph.D.	(Geography)
Kapa Oliveira, M.A. & Ph.D.	(Geography)
Rene Louis, Ph.D.	(Geography)
April Drexel, Ph.D.	(Hawaiian History)
Jonathan Osorio, Ph.D.	(Hawaiian History)
Leilani Basham, M.A.	(Hawaiian History)
Momi Kamahele, Ph.D.	(Hawaiian History)
Terry Kanalu Young, Ph.D.	(Hawaiian History)
Kalei Tsuha, M.A.	(Hawaiian Language)
Hinano Brumaghim, M.A.	(Hawaiian Studies)
Kulani Jeremiah-Wong	(Hawaiian Studies)
Puali‘ili‘i Rossi-Fukino	(Hawaiian Studies)
Ka‘ahiki Solis	(Hawaiian Studies)
Wahine Tong, M.A.	(Hawaiian Studies)
Mere Whaanga, PhD	(Maori Studies, Waikato University, N.Z.)
Aroha Yates-Smith, Ph.D.	(Maori Studies, Waikato University, N.Z.)
Kapulani Antonio, M.A.	(Pacific Island Studies)
Kalei Lumho, M.A.	(Pacific Island Studies)
Kau'i Dalire, M.A.	(Pacific Island Studies)
Kealalokahi Losch, M.A.	(Pacific Island Studies)
Ku‘uipo Cummings, M.A.	(Pacific Island Studies)
Napua Spock, M.A.	(Pacific Island Studies)
Ku'ualoha Meyer, M.A.	(Polynesian Religion)
Nahua Patrinos, Ph.D.	(Political Science)

Ayda Aukahi Austin, M.A., Ph.D (Psychology)
Kamana'opono Crabbe, Ph.D (Psychology)

Invited Conference Presentations:

Keynote Address and Power Point Presentation on "Haumea, Earth Mother Empowering Divine Hawaiian Female, and their Knowledge Systems," at the 14th Annual Hawai'i International Conference on Arts and the Humanities, Hilton Hawaiian Village, Honolulu, Hawai'i on January 10, 2016.

Keynote Address and Power Point Presentation on "Hawaiian Gods, Tahitian Ancetors, Measuring Temples in Hawai'i and the Society Islands," at the first annual Oceania Ensemble Conference, East-West Center, University of Hawai'i at Manoa, Honolulu, Hawai'i on November 11, 2016.

Keynote Address and Power Point Presentation on "Ancestral Knowledge Guiding our Vision for the Future," At the first 'Aimalama: Pacific Peoples Lunar Conference on Climate Change: E Mauiliauhonua - Readapting to Ancestral Knowledge of Survival, University of Hawai'i at Manoa, Honolulu, Hawai'i on September 27, 2015.

Power Point Presentation on "Ancestral O'ahu fishponds and the Miracle of Food Sustainability: Fresh Water Springs making 1.3 Million Pounds of Fish Annually" at Hanohano Hawai'i Kuauli: 23rd Annual Hawai'i Conservation Conference, UH Hilo Celebrating Collaboration & Wisdom Across Hawai'i's Ecosystems, University of Hawai'i at Hilo, Hilo, Hawai'i on August 4, 2015.

Power Point Presentation on "Hawaiian Ancestral Knowledge of Water Management on O'ahu and the Largest Fishponds in the Pacific Feeding our People Today?" at the 3rd Hawai'i Sustainability in Higher Education Conference, University of Hawai'i at Manoa, Honolulu, Hawai'i on February 27, 2015.

Power Point Presentation on "Ancestral Knowledge From Haumea Earth Mother Defines Indigenous Hawaiian Identity, And Decolonizes Our Most Private Parts!" at the Nga Pae o Te Maramataka International Indigenous Development Research Conference at Auckland University, Auckland, New Zealand on November 26, 2014.

Power Point Presentation on "Ancestral Knowledge From Haumea Earth Mother Defines Indigenous Hawaiian Identity, And Decolonizes Our Most Private Parts!" at the Nga Pae o Te Maramataka International Indigenous Development Research Conference at Auckland University, Auckland, New Zealand on November 26, 2014.

Panel discussant on "Native Hawaiian academics open university doors for Native Hawaiian students" on a Panel on Indigenous Knowledge in Universities. at the Nga Pae o Te Maramataka Indigenous Research Conference at Auckland University, Auckland, New Zealand on November 26, 2014.

Power Point Presentation and panel on "Akua Wahine, Empowering Hawaiian Female

Knowledge & Identity: Haumea by Lilikalā Kameʻeleihiwa and Pelehonuamea by Pualani Kanahele" at the World Indigenous Peoples Conference on Education [WIPCE HONOLULU] at Kapiʻolani Community College in Honolulu, Oʻahu, Hawaiʻi on May 23, 2014.

Power Point Presentation and panel with Melody MacKenzie, Nalani Minton, and David Sing on "Pūkoʻa Council: The UH System Native Hawaiian Advisory Council, Opening Doors In Higher Education For Native Hawaiians" at the World Indigenous Peoples Conference on Education [WIPCE HONOLULU] at Kapiʻolani Community College in Honolulu, Oʻahu, Hawaiʻi on May 22, 2014.

Power Point Presentation and panel with Moanikeala and Raymond Estrella on "Hawaiian Ancestral Knowledge for Food Sustainability: See avakonohiki.org" at the World Indigenous Peoples Conference on Education [WIPCE HONOLULU] at Kapiʻolani Community College in Honolulu, Oʻahu, Hawaiʻi on May 22, 2014.

Round the Island Lecture and Tour on "Tour of Oʻahu Sites Sacred To The Female Akua [Goddesses]" at the World Indigenous Peoples Conference on Education [WIPCE HONOLULU] at Kapiʻolani Community College in Honolulu, Oʻahu, Hawaiʻi on May 21, 2014.

Power Point Presentation on "Hawaiian Ancestral Knowledge of Water Management on O'ahu and the Largest Fishponds in the Pacific Feeding our People Today?" at the World Indigenous Peoples Conference on Education [WIPCE HONOLULU] at Kapiʻolani Community College in Honolulu, Oʻahu, Hawaiʻi on May 20, 2014.

Power Point Presentation on "The Sexual Colonization of the Hawaiian People" for the E Kamaʻiloi Kākou Series at the Hawaiʻi State Legislature in Honolulu, Oʻahu, Hawaiʻi on January 28, 2014.

Indigenous Studies PhD Panel Presentation with Ray Barnhardt, Beth Leonard, Rosita Worl and Sean Topkok at the AFN [Alaska Federation of Natives] Convention on "Traditional Family Values" at the Carlson Center in Fairbanks, Alaska, October 24, 2013.

Power Point Presentation on "Haumea Hānau ma ka Lolo: 4,000 Acres of Oʻahu Fishponds Managed by Hawaiian Female Intellect" at the ʻAha Wahine Native Hawaiians Womenʻs Conference, Leeward Community College, ʻEwa, Oʻahu, August 17, 2012.

Power Point Presentation on "Wahine Kapu, Wahine Mana, Wahine Maʻi: Sacred Hawaiian Women, Powerful Hawaiian Women, Sexual Hawaiian Women!" at the ʻAha Wahine Native Hawaiians Womenʻs Conference, Windward Community College, Kaneʻohe, Oʻahu, February 4, 2012.

Power point Presentation on "Taputapuatea as the Center of Polynesian Religion," at the UNESCO World Heritage Technical Workshop in Raʻiatea, French Polynesia, December 6-10, 2011.

Power point Presentation and discussion leader for CNHA Annual Emerging Leaders Forum of Indigenous Leaders discussing the Impact of the UN DRIP [United Nations‘ Declaration on the Rights of Indigenous Peoples], including OHA Federal Political Analyst Esther Kia‘aina, UHM Richardson Law School Professor Melody MacKenzie, AFN [Alaska Federation of Natives] President Julie Kitka and Dick Trudell, Founder and Executive Director of The American Indian Lawyer Training Program, Inc. (Ailtp) and Its American Indian Resources Institute (AIRI), in the Hawaii Convention Center, in Honolulu, August 22, 2011.

Power point Presentations, and discussion leader for 3 panels at the World Indigenous People‘s Conference on Education [WIPCE PERU] on Chanting the Universe, on Ancestral Knowledge in Sacred Spaces, and on The United Nations Declaration on the Rights of Indigenous Peoples as it applies to Higher Education in Hawai‘i, in Cusco, Peru, in August 14-19, 2011.

Power Point presentation on “What can we do to reduce our vulnerability and strengthen the resiliency of our food systems in a changing climate?” at the ‘O Ke Au I Kahuli; Pehea La Ka Hawai‘I I Pono Ai? Conference, Halau o Haumea, UHM, Honolulu on November 16, 2010

Power point presentation on “Haumea as the Source of Great Female Goddesses,” for the Healing Our Spirit Worldwide Conference held at the Hawai‘i Convention Center in Honolulu on September 9, 2010.

Hookui Ka Mana Conference 2009: Gathering the Spiritual Power of Hawaiian Elders, Convened by Dr. Pualani Kanahele at Keauhou Outrigger Hotel, Keauhou, Kona, Hawai’i. Power Point presentation on “Kuu Oihana, Kuu Lealea, Kuu Hana Nanea, O Na Moolelo Kahiko me Na Mookuauhau Haawina Aumakua,” on September 21, 2009.

Ka ‘Aha Hula o Hālauaola: Hula Conference 2009, Kamehameha Schools, Honolulu, Hawai‘i. Power Point presentation, with Kaiwipuni Lipe, on “‘O Haumeanuiāiwiwa, Akua Wahine o O‘ahu.” on July 29, 2009.

Ka ‘Aha Hula o Hālauaola: Hula Conference 2009, Kamehameha Schools, Honolulu, Hawai‘i. Power Point presentation, with Kaiwipuni Lipe, on “‘O Haumeanuiāiwiwa, Akua Wahine o O‘ahu.” on July 29, 2009.

Ka ‘Aha Hula o Hālauaola: Hula Conference 2009, Kamehameha Schools, Honolulu, Hawai‘i. Power Point presentation, with Keali‘i‘olu‘olu Gora, on “Are You Feeling Mane‘o?” on July 27, 2009.

New York Hawaiian Society Meeting, Greenwich, New York City, New York. Power Point presentation, with Keali‘i‘olu‘olu Gora, on “The Hina Side of Kane‘on May 29, 2009.

United Nations Permanent Forum on Indigenous Issues Eighth Meeting (May 18-29, 2009), United Nations on 1st Avenue, New York City, New York. Intervention on ‘Pacific Caucus Report on Land Tenure‘ on May 27, 2009.

Papakū Makawalu Training for Educators, Participant by Invitation Only, by Dr. Pualani

Kanahele (February 14-15, 2009) at the Outrigger Keauhou Hotel, Kona, Hawai‘i. Power Point Presentation on “Papaku La and Heiau,” on February 15, 2009.

Papakū Makawalu Training for Traditional Practitioners and Chanters, Participant by Invitation Only, by Dr. Pualani Kanahele (January 23-25, 2009) at the Sheraton Keauhou Hotel, Kona, Hawai‘i.

Invited Participant to the 44th Presidential Inaugural Ceremony of Barack Obama (January 16-22, 2009) in Washington DC, and meeting with Representative Eni Faleomavaenga regarding his support for the USA Adoption of the UN Declaration of Rights of Indigenous Peoples on January 21, 2009,

Alaska Federation of Natives Youth and Elders Conference and Convention in Anchorage, Alaska (October 17-26, 2008). Power Point presentation and panel discussion with Keali‘i‘olu‘olu Gora on “United Nations Declaration on the Rights of Indigenous Peoples,” on October 25, 2008.

Papakū Makawalu Training for Educators, Participant by Invitation Only, by Dr. Pualani Kanahele (September 26-28, 2008) at the Sheraton Keauhou Hotel, Kona, Hawai‘i. Power Point Presentation on “Ali‘i Nui of Ke‘ekū,” on September 27, 2008.

Tensions in Academic Discourse Conference (June 18-20, 2008) at the University of Bergamo. Begamo, Italy. Power Point Presentation on “Decoding Indigenous Hawaiian Epistemology,” and Panel Discussion with Prof. Maile Andrade, Kimo Armitage and Manu Kaiama on June 19, 2008.

Exhibiting Polynesia: Past, Present and Future Conference (June 16-18, 2008) at the Musee Branly, Paris, France. Power Point Presentation on “Gods as Ancestors: Art as Descendants,” and Panel Discussion with Prof. Maile Andrade, Kimo Armitage and Manu Kaiama on June 17, 2008.

Papakū Makawalu Training for Educators, Participant by Invitation Only, by Dr. Pualani Kanahele (June 11-14, 2008) at the Outrigger Keauhou Hotel, Kona, Hawai‘i.

Third Annual Statewide Summit for Bilingual Parents (May 17, 2008), at the Double Tree Hotel Oak Brook, Chicago, Illinois. Power Point Keynote Address on “100 Generations of Ancestral Wisdom, Inspiring Native Hawaiian Scholars, Enchanting the World with Education for the Nation, Hawaiian Scholarship in the 21st Century,” and Panel Discussion on “‘Ola Ka ‘Ōlelo Hawai‘i: Hawaiian Language Lives, Hawaiian Language Immersion Education: 1983-2008,” on May 17. 2008.

United Nations Permanent Forum on Indigenous Issues Seventh Meeting (April 21 – May 2, 2008), United Nations on 1st Avenue, New York City, New York. Intervention on ‘Status Report on Education for Native Hawaiians’ on April 25, 2008.

16th Annual Maui Arts Festival, Ritz-Carlton Hotel at Kapalua, Maui. (March 21-24, 2008) Power Point Presentation on “Ka Mana o Ka Leo Le‘ale‘a: The Power of the Voice in Joyful

Celebration." March 22, 2008.

E Pili Kakou I Ho'okahi Lahui Conference (December 13-15, 2007) at the Radisson Arue Hotel, Arue, Tahiti. Power point presentation with Keali'i'olu'olu Gora on 'The Poetry of Na Mele Ma'i Me Na Mele Kolohe: Genital Chants and Risque Songs,' with translation into French by Kimo Armitage, as well as an afternoon Workshop on 'Dancing Mele Ma'i and Hula Kolohe,' both on December 13, 2007.

E Pili Kakou I Ho'okahi Lahui Pre-Conference (December 9-12, 2007) at the Haururu Retreat Center at Fare Hape, Papeno'o, Tahiti. Power point presentation on "Ka Le'ale'a o Na Kupuna: Hawaiian Sexuality and the Celebration of Life," with translation into French by Kimo Armitage and Vaihere Doudoute, on December 11, 2007.

Inauguration of UH Manoa Chancellor Virginia Hinshaw – Kennedy Theater, Honolulu, Hawai'i. Short Speech and Blessing chant calling the ancestors on behalf of Kuali'i Council. November 19, 2007.

ASHE [Association for the Study of Higher Education] Conference (November 7-10, 2007) at the Marriott Hotel – Louisville, Kentucky. Power point presentation on "100 Generations of Ancestral Hawaiian Knowledge; Inspiring Native Hawaiian Scholars and Enchanting the World – the Hawai'inuiakea School of Hawaiian Knowledge," on November 9, 2007.

NIEA [National Indian Education Association] Conference (October 24-27, 2007) at the Honolulu Convention Center – Honolulu, Hawai'i. Power point presentation on "'O Ka 'Ike Hanauna Kahiko: Generations of Ancestral Hawaiian Knowledge; Education for the Nation," on October 27, 2007.

ANSEP [Alaska Native Science and Engineering Program] Dissemination Conference (October 11-13, 2007) at the University of Alaska – Anchorage, Anchorage, Alaska. Keynote presentation on "Native Science Programs, Social Justice and Celebrating Ancestral Knowledge," on October 12, 2007.

United Nations Permanent Forum on Indigenous Issues Sixth Meeting (May 14 – 25, 2007), United Nations on 1st Avenue, New York City, New York. Intervention on 'Status Report on Education for Native Hawaiians' on May 23, 2007.

15th Annual Maui Arts Festival, Ritz-Carlton Hotel at Kapalua, Maui. (April 5-7, 2007) Power Point Presentation with Keali'i'olu'olu Gora on 'Na Mele Ma'i Me Na Mele Kolohe: Genital Chants and Risque Songs." April 6, 2007.

Conference on "Coming into Balance: Traditional Knowledge, Science and Indigenous Education" at the Institute for American Indian Art, Santa Fe, New Mexico. (March 2-7, 2007), Plenary Keynote Power Point Presentation on "Kumulipo: An Guide to Ancestral understandings of the Universe for Native Hawaiian Science Curriculum," on March 3, 2007.

Ethnobotany Summit – Public Face of Ethnobotany, sponsored by the National Tropical Botanical Garden, Lawa'i, Kaua'i, Hawai'i. Plenary Keynote Power Point Presentation on "Kumulipo as Science Curriculum," on January 28, 2007.

United Nations Permanent Forum on Indigenous Issues Fifth Meeting (May 12 – 31, 2006), United Nations on 1st Avenue, New York City, New York. Inaugural DVD showing and discussion with Keali'i'olu'olu Gora on on "Natives in New York, Seeking Justice at the United Nations," on May 17, 2006.

14th Annual Maui Arts Festival, Ritz-Carlton Hotel at Kapalua, Maui. (April 8-10, 2006) Power Point Presentation with Keali'i'olu'olu Gora on 'Pehea Kou Piko; the Three Seats of Learning." April 9, 2006.

Celebrating Indigenous Knowledge*Turoua ngā Whetū* Colloquium, Te Tumu Maori Studies, University of Otago, Te Waipounamu, New Zealand. (February 14-17, 2006). Power Point Keynote on "Hawai'inuiākea: Lanakila Wale Kō Kākou Mau Kūpuna Akua; Victorious indeed are our Ancestral Divinities and Ancestral Legacies," on February 16, 2006.

International Symposium on Indigenous Peoples and the University, Hokkaido University, Sapporo, Japan. Power Point Keynote on "The Kamakakūokalani Center For Hawaiian Studies, A Paradigm For Ainu Studies?" on December 11, 2005.

Inaugural Conference on Higher Education and Indigenous Research, Te Whare Wananga o Awānuiarangi, Whakatāne, Aotearoa, New Zealand. Power Point Presentation on "Ka Leʻaleʻa o Na Kūpuna: Hawaiian Sexuality II," on December 2, 2005.

World Indigenous Peoples's Conference on Education [WIPCE], jointly sponsored by Universities of Waikato and Aotearoa, Hamilton, Aotearoa New Zealand. (November 27-December 1, 1995) Power Point Presentation on "Kumulipo as Science Curriculum," on November 30, 2005.

World Indigenous Peoples's Conference on Education [WIPCE], jointly sponsored by Universities of Waikato and Aotearoa, Hamilton, Aotearoa New Zealand. DVD presentation and discussion with Naʻalehu Anthony of "Natives in New York, Seeking Justice at the United Nations," on November 29, 2005.

World Indigenous Peoples's Conference on Education [WIPCE], jointly sponsored by Universities of Waikato and Aotearoa, Hamilton, Aotearoa New Zealand. Power Point Presentation on "Ka Leʻaleʻa o Na Kūpuna: Hawaiian Sexuality II," on November 28, 2005.

Inaugural Hawaiʻinuiākea Film Festival, Kamakakūokalani Center for Hawaiian Studies, University of Hawaiʻi at Mānoa. (October 27-DVD presentation and discussion of "Natives in New York, Seeking Justice at the United Nations," on October 29, 2005.

Alaska Federation of Natives Youth and Elders Conference in Fairbanks, Alaska. DVD presentation and discussion with Keali‘i‘olu‘olu Gora on "Natives in New York, Seeking Justice at the United Nations," on October 18, 2005.

Pagan Pride Concert under the direction of Kumu Hula Pua Kanahele at the Maui Performing Arts Center Auditorium. Performance of 4 Chant Solos. July 30 & 31, 2005.

Pasifika-Hawai'i Film Festival, New York City, NY. Inaugural DVD showing and discussion with Keali'i'olu'olu Gora on on "Natives in New York, Seeking Justice at the United Nations," on May 22, 2005.

United Nations Permanent Forum on Indigenous Issues Fourth Meeting (May 15 – 31, 2005, United Nations on 1st Avenue, New York City, New York. Intervention on behalf of Indigenous Education in Hawai'i. May 18, 2005.

13th Annual Maui Arts Festival, Ritz-Carlton Hotel at Kapalua, Maui. Power Point Presentation with Keali'i'olu'olu Gora on 'The Hawaiian Gods of Agriculture and Fishing." March 26, 2005.

Native Hawaiian Women's Conference, University of Hawai'i at Manoa, in Honolulu, Hawai'i. Power Point presentation on "Na Wahine Kapu: Divine Hawaiian Women," on August 19, 2004.

Alaska Federation of Natives Leadership Forum: Building Knowledge Based Economies in Anchorage, Alaska. Power Point presentation on "Spirituality, Values and Development of a People," on June 28, 2004 at the Alaska Native Heritage Center.

Pasifika-Hawai'i Film Festival, New York City, NY. Power Point Presentation with Keali'i'olu'olu Gora on 'The Hina Side of Kane: Male and Female Hawaiian Identity." May 23, 2004.

United Nations Permanent Forum on Indigenous Issues Third Meeting (May 5 – 21, 2004, United Nations on 1st Avenue, New York City, New York. Blessing Chant for Opening Ceremonies following Kofi Annan's address. Intervention on behalf of Indigenous Women's Caucus on "Education for Indigenous Women in 2003."

12th Annual Maui Arts Festival, Ritz-Carlton Hotel at Kapalua, Maui. Power Point Presentation with Keali'i'olu'olu Gora on 'The Hina Side of Kane: Male and Female Hawaiian Identity." April 10, 2004.

Pagan Pride Concert under the direction of Kumu Hula Pua Kanahele at the University of Hawai'i-Hilo Auditorium. Performance of 4 Chant Solos. January 17 & 18, 2004.

HOATA: DU 6eme Festival Des Arts Des Iles Marquise (14-19 December 2003) in Hivaoa, Marquesas, French Polynesia. Delivered an extemporaneous speech entirely in Hawaiian on "'O Papahanaumoku Noho ia Wakea, 'O Na Kupuna o Ka Lahui Hawai', Na Hoahanau Ho'i o Ka Lahui Hivaoa [Papahanaumoku and Wakea, Ancestors of the

Hawaiian People, Cousins of the Marquesans] on December 18, 2003.

United Nations World Summit on Information Technology in Geneva, Switzerland. Power Point Presentation with Pi'ilani Ka'aloa on "Education for the Nation: Hawaiian Scholarship in the 21st Century – The Role of Information Communication Technology." Presentation at the ICT for Development Platform at the Palexpo. December 8-12, 2003.

International Indigenous Education Conference - University of Central Michigan, Mount Pleasant, Michigan. Address on "Indigenous Education at the Kamakakuokalani Center for Hawaiian Studies" on October 6, 2003.

First Annual Kamehameha Schools Research Conference on Education and Well Being of Hawaiians at Turtle Bay Hilton, Kahuku, O'ahu. Keynote power point presentation on "Hawaiian Sexuality." September 18, 2003.

United Nations Permanent Forum on Indigenous Issues Second Meeting (May 15 – 24, 2003, United Nations on 1st Avenue, New York City, New York. Interventions on "Cultural Challenges for Pacific Islanders" and Educational Status of Native Hawaiians."

11th Annual Maui Arts Festival, Ritz-Carlton Hotel at Kapalua, Maui. Power Point Presentation with Keali'i'olu'olu Gora on 'Hawaiian Sexuality." April 9, 2003.

Oregon State University, Corvalis, Oregon to deliver a power point presentation on "Hawaiian Resource Management" for a class on Indigenous Resource management. March 12 –15, 2003

Alaska Federation of Natives 36th Annual Convention: 'Our Children, Our Spirit, Our Life' and Youth and Elders Conference: 'Hope, Beauty, Strength and Reawakening" (October 21-27, 2002) - Egan Convention Center, Anchorage, Alaska. Presentation on "Wellness and Healing Based on Cultural Strengths" on October 22, 2002.

Ainu Association Memorial Gathering to Celebrate International Day for the World's Indigenous Peoples (August 9, 2002), Bitadori, Hokkaido, Japan. Power Point Presentation on "Ka Lahui Hawai'i [the Hawaiian Nation] and Indigenous People's Rights to Self-Determination," on August 9, 2002.

United Nations Permanent Forum on Indigenous Issues First Meeting (May 13 – 24, 2002, United Nations on 1st Avenue, New York City, New York. Interventions on "Land and Housing for Native Hawaiians" on May 17, 2002, and "Education and Culture for Native Hawaiians" on May 20, 2002. Performed traditional protocols to close the forum proceedings on May 24, 2002.

Alaska Federation of Natives 35th Annual Convention: Indigenous Peoples – Our Place in the 21st Century (October 25-27, 2001) - Egan Convention Center, Anchorage, Alaska. Keynote Power Point Address on "Hui Konohiki: the Center for Hawaiian Studies presents Building the Next Generation of Native Resource Managers for the 21st

Century" on October 24, 2001.

Native Women and Wellness Conference (August 7, 2001) – Hilton Hawaiian Village Tapa Ballroom, Honolulu, Hawai'i. Keynote Power Point Address on "Nä Wahine Kapu: Sacred Hawaiian Women."

Halau a Ola International Hula Conference (July 29 – August 4, 2001) – Edith Kanaka'ole Auditorium and Hawai'i Community College, Hilo, Hawai'i. Keynote Power Point Address on "Le'ale'a o Na Kupuna: Hawaiian Sexuality and the Ancestral Celebration of Life."

Te Reo Māori Language Commission Conference (June 4-6, 2001) – Te Papa National Museum, Wellington, Aotearoa, New Zealand. Keynote Power Point Address on "Whakaora Reo, Tirotiro Whetü, Ngä Tohu Ätea: Language Regeneration, Star Lines and Cosmogonic Genealogies: Navigating the Ancestors" on June 5, 2001.

Indigenous Political Movements Series – University of Michigan Latin American and Caribbean Studies and the Department of Anthropology, Ann Arbor, Michigan. Keynote Power Point Address on "Hawaiian Sovereignty: A 100 Year Search for Peace and Justice" on April 6, 2001.

Science – Ethics – Power: Controversy over the Production of Knowledge and Indigenous Peoples – Rackham Assembly Hall, University of Michigan Office of the Provost, and the Latin American and Caribbean Studies and the Department of Anthropology, Ann Arbor, Michigan. Panel discussion on "Adverse Effects of Anthropologists on Native Hawaiians" on April 6, 2001.

Wellness and Women X Conference – Weaving Our Cultural Strengths Through Tradition (March 4-8, 2001) – San Diego, California. Opening Keynote Power Point Address on "Nä Wahine Kapu: Sacred Native Women" on March 4, 2001.

Alaska Federation of Natives 35th Annual Convention: Indigenous Peoples – Our Place in the 21st Century (October 19-21, 2000) - Egan Convention Center, Anchorage, Alaska. Keynote Power Point Address on "Hawaiian Education for the 21st Century at the Center for Hawaiian Studies" on October 19, 2000.

Toi Te Tupu, Toi Te Mana, Toi Te Whenua: Maori Development in a Global Society Conference (July 3- 7, 2000) – Te Putahi a Toi, Massey University, Palmerston North, Aotearoa [New Zealand]. Keynote Power Point Address on "Ea Hawai'i: Hawaiian Sovereignty Movement – Nation within a Nation or Independence."

Documentary/Television Interviews:

United Nations Declaration on the Rights of Indigenous Peoples (March 2008) – 'Olelo Television, Honolulu, Hawai'i. Forum discussion with Mililani Trask, Julian Aguon,

Joshua Cooper, and Kealii Gora on Indigenous Human Rights at the United Nations. Broadcast on Channel 53.

Ua Mau Ke Ea (April 2007) – ‘Olelo Television, Honolulu, Hawai’i. Interview by Professor Manu Kaiama for a discussion with Bill Mehe‘ula on the Akaka Bill, Federal Recognition and other Hawaiian Issues. Broadcast on Channel 53.

Meet Colleen Hanabusa. (November 2002) – ‘Olelo Television, Honolulu, Hawai’i. Interview by Senator Hanabusa on Federal Recognition and other Hawaiian Issues. Broadcast on Channel 53.

Island Issues.(February 2002) – ‘Olelo Television, Honolulu, Hawai’i. Interview by Bob Rees on the Kamakakuokalani Center for Hawaiian Studies ‘Education for the Nation.’ Broadcast on Channel 53.

Ke Kulana, He Mahu (July 2002) - Film, Honolulu, Hawai’i. Interview by Kathryn Xian on Traditional Hawaiian Sexuality. Broadcast in various Film Festivals, beginning with a Gay Rights Conference in San Francisco, July 2002.

On the Trail of Mark Twain: Around the World with Peter Ustinov in the Footsteps. (September 1999) - Granada Television, London, Great Britain.
Interview on Hawaiian history and culture. Broadcast in America on PBS.

Te Pito o te Henua: Rapa Nui. (March 10, 1999) - Hawai'i State Department of Education Advance Technology Research. Interview on recent trip to Rapa Nui and similarities between Hawaiian and Rapa Nui culture. Video by Anne-Marie Kirk, Honolulu, Hawai'i.

Koho Hewa II: Visions for the Future - Land, Government, & Self Determination. (August 24, 1996) - Scriptwriter and Executive Producer, with Keali’i Gora, of a live call-in show on the alternatives to the State plan to co-opt the Hawaiian Sovereignty movement broadcast on Channel 23, ‘Olelo Public Broadcasting, Honolulu, Hawai’i.

Koho Hewa: the Illegal Vote. (June 18, 1996) - Scriptwriter and Executive Producer, with Keali’i Gora, of a live call-in show on the State Run Plebiscite/Native Hawaiian Vote broadcast on Channel 53, ‘Olelo Public Broadcasting, Honolulu, Hawai’i.

The Voyage Home, Hawai'iloa's Northwest Journey, documentary by Karin Williams on the Hawaiian double hulled voyaging canoe Hawai'iloa's visit to the Tlingit, Haida, Tsimshian Native peoples of Northwest coast of Canada and Alaska (May 1996) - Ketchikan, Haines & Juneau, Alaska - Interview on "Native Management of Resources and the Decolonization Process."

Kalopa'a o Waiahole (Hard Taro of Waiahole), documentary on the theft of the Waiahole water supply by Hawaiian videography company Na Maka o Ka 'Aina (February 1996) - Waiahole, O'ahu - Interview on "The Importance of Community Struggle for Retention of Hawaiian Resources."

First Friday television talk show, Channel 53, 'Olelo Corporation for Community Television (November 1, 1996) - Honolulu, O'ahu - Interview on "Native Initiated Political Alternatives to State controlled 'Sovereignty'."

First Friday television talk show, Channel 53, 'Olelo Corporation for Community Television (September 6, 1996) - Honolulu, O'ahu - Interview on "Unfair Reporting by A Racist Settler Rag - the Honolulu Advertiser."

Interviews:

Various newspaper and magazine interviews with The City Sun, Financial Times, Fiji Times, Honolulu Advertiser, Honolulu Star Bulletin, Juneau Empire, Ketchikan Daily News, Los Angeles Times, Mid-Week Magazine, The Nation, National Journal, San Francisco Examiner, Otago Daily Times, Pacific Islands Monthly.

Numerous interviews for Celtic Television, Chilean News, Granada Television, Maori Television, ABC, NBC, CBS, PBS, and the Discovery Channel. Various radio interviews with Radio Australian, Radio Pacifica, National Public Radio, WYNC Radio, and Hawai'i Public Radio.

University Service:

Member, Committee on Administration and Budget (CAB) for the UHM Faculty Senate (August 2015 to present)

Senator for Hawai‘inuiakea School of Hawaiian Knowledge to the UHM Faculty Senate (May 2015 to present)

Kuali‘i Council representative to the UHM Strategic Planning Committee on a Native Hawaiian Place of Learning, advisory to the UH Manoa Chancellor (May 2015 to present)

Founding member and chair of Budget Subcommittee of the Puko’a UH System Native Hawaiian Advisory Council to UH President. (January 2002 to present)

Founding member of the Kuali’i UHM Native Hawaiian Advisory Council to the UHM Chancellor (January 2001 to present); Chair of Budget Subcommittee (January 2001 to January 2008)

Leader of Kamakakuokalani Delegation of Staff and Students to the United Nations Permanent Forum on Indigenous Issues in New York (May 2000 to present)

Chair, Curriculum Committee, Kamakakuokalani Center for Hawaiian Studies, University of Hawai'i-Manoa (September 2012 to August 2014.)

Chair, Building Planning Committee for the new School of Hawaiian Knowledge, (July

2003 to 2008.)

Secretary, SEC (UHM Senate Faculty Executive) (2010 to August 2012).

Senator for Hawai‘inuiakea School of Hawaiian Knowledge to the UHM Faculty Senate (2008 to August 2012)

SEC liaison with the CORGE (Committee on Research and Graduate Education) and recording Secretary to the SEC (2011-2012)

SEC liaison with the GEC (General Education Committee) and the Committee on Student Affairs (2010-2011)

Member of the UHM Faculty Senate Committee on Professional Matters. (September 2009 to 2010).

Member, HSHK Curriculum Committee - University of Hawai'i-Mänoa. (September 2008 to present; Interim chair September 2008 – September 2009)

Serve as a Member of 1 TPC committee, for junior faculty of KCHS. (November 2009 to March 2010)

Co-Chair with Maori Film Professor Merata Mita, Hawai’inuiakea Film Festival at UH Manoa. (October 2005, October 2006, August 2007)
Graduate Student Academic Advisor for Hawaiian Studies majors - University of Hawai'i-Mänoa. (January 1989 - present)

Chair of the KCHS Building Committee for the proposed Hawai’inuiakea School of Hawaiian Knowledge building. (January 2003 to present)

Leader of Kamakakuokalani Delegation of Staff and Students to the Alaska Federation of Natives Convention/ Elders and Youth Conference. (October 2002 to present)

Founding Member, ‘Aha Kuhina, Hawai’inuiakea School of Hawaiian Knowledge. (June 2007 to December 2007)

Served as chair of two TPC committees, and as a Member of 3 other TPC committees, all for junior faculty of KCHS. (September 2006 to December 2007)

Member, President David McClain’s UH Manoa Chancellor Search Committee. (July 2006 to February 2007)

Co-founder with Merata Mita of the UHM Academy of Creative Media, Hawai’inuiākea Film Festival, Kamakakuokalani Center for Hawaiian Studies, University of Hawai’i at Manoa. (August 2005 to September 2007)

Member, President David McClain’s UH Manoa Biennium Budget Committee. (June to

August 2005, June to August 2006, July 2008)

Member, Chancellor Englert's Manoa Budget Advisory Group. (December 2003 to August 2004)

Chair, Kamakakuokalani Calendar Committee, (June 2003 to June 2007, June 2009)

Member, President Dobelle's Advisory Council. (September 2002 to October 2003)

Member, SHAPS Curriculum Committee - University of Hawai'i-Mänoa. (September 1989 to December 2003)

Community Organizations:

Member, Board of Directors of the Polynesian Voyaging Society. (1996 to present).

Member, Papahanaumokuakea Northwest Hawaiian Islands Cultural Advisory Committee (March 2002 to September 2012).

Member, Advisory Council to of Kamehameha Schools CEO Dee Jay Mailer, the Trustees (October 2003 to June 2008)

Member, Halau Ku Mana Hawaiian Culture Charter School Advisory Board (July 2001 to February 2004).

Member, Advisory Council to Kamehameha Schools CEO Hamilton McCubbin, (October 2001 to March 2003)

Member, Senator Akaka's State Working Group on Federal Recognition for Hawaiians (April 2000 to June 2002).

Travel:

Aotearoa [New Zealand], Australia, Borabora, Britain, Canada, Fiji, France, Germany, Hiva Oa and Ua Pou [Marquesas], Huahine, Hokkaido, Italy, Japan, Maupiti, Mo'orea, The Netherlands, Nunavut, Peru, Ra'iatea, Rapa Nui [Easter Island], Rarotonga [Cook Islands], Switzerland, Taha'a, Tahiti, Vanuatu, United States: Alaska, California, Connecticut, Illinois, Kentucky, Michigan, Minnesota, Nevada, New Mexico, New York, Oregon, Washington, D.C., Washington State.

Foreign Language Proficiency:

(Ratings: Native, Excellent, Good, Fair, Poor)

Hawaiian: Excellent French: Fair Reading Ability

References:

Dr. Gregory A. Cajete. Associate Professor, Director of Native American Studies, University College, University of New Mexico, Albuquerque, NM 87131

Dr. Pualani Kanahele, Director, Research and 'Development for Hawaiian and Related Programs, Hawai'i Community College, Kumu Hula of Halau Kekuhi, Hilo, Hawai'i.

Julie E Kitka, President, Alaska Federation of Natives, Honorary Doctorate of Humane Letters, UAA 2006. Expertise: Alaska Native Self Sufficiency challenges, property rights and institutional development; socio-economic development; developing partnerships.

Les Malezar, Co-Chair of the National Congress of Australia's First Peoples, Chair of the Pacific Caucus at the UN Permanent Forum on Indigenous Issues. Expertise: Human Rights of Indigenous Peoples.

Dr. Margaret Mutu, Professor, Department of Maori Studies, Private Bag, University of Auckland, New Zealand.

Nainoa Thompson, President, Polynesian Voyaging Society, Expert on Traditional Hawaiian Celestial Navigation, Special advisor to the President of the University of Hawai`i on Native Hawaiian affairs; Regent Emeritus of the University of Hawai`i Board of Regents.

Dr. Herb Schroeder, Vice Provost and Founder Alaska Native Science & Engineering Program (ANSEP), Professor of Engineering, University of Alaska at Anchorage

Dr. Michael M. Walker, Professor, School of Biological Sciences, University of Auckland, New Zealand.

January 2016

AN ACT

CONFIRMING CERTAIN RESOLUTIONS OF THE KING AND PRIVY COUNCIL, PASSED ON THE 21ST DAY OF DECEMBER, A. D. 1849, GRANTING TO THE COMMON PEOPLE ALLODIAL TITLES FOR THEIR OWN LANDS AND HOUSE LOTS, AND CERTAIN OTHER PRIVILEGES.

CONTENTS.

SECTION 1. 2. Fee-simple titles to be granted to natives occupying certain lands.
3. Land commission empowered to grant fee-simple titles.
4. Certain government lands on each island to be offered for sale.
5. House lots not to exceed one quarter of an acre.
6. Grants of kalo ground to be limited to actual cultivation by each claimant.
7. Certain rights reserved to natives.

BE IT ENACTED *by the House of Nobles and Representatives of the Hawaiian Islands, in Legislative council assembled :*

That the following sections which were passed by the King, in privy council on the 21st 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 :

1. 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 lands they so occupy and improve, and whose claims to said lands shall be recognized as genuine by the land commission : Provided, however, that this 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.

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, that this resolution shall not extend to house lots or other lands situated in the districts of Honolulu, Lahaina and Hilo.

3. 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 of lands 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.

4. 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 land, at a minimum price of fifty cents per acre.

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.

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.

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, house timber, 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 in Honolulu, this 6th day of August, A. D. 1850.

KAMEHAMEHA.

KEONI ANA.

AN ACT

AMENDING THE LAW RELATING TO THE KING'S CHAMBERLAIN.

CONTENTS.

SECTION 1. Duties of the King's chamberlain enumerated.
2. All fish for the King to be delivered to the King's steward.
3. Powers conferred on chamberlain by previous acts, repealed by this.
4. Repeal of certain former acts relating to chamberlain.

Whereas, the chamberlain of the King is a high officer of the crown, and whereas, the duties assigned to the chamberlain by law, extend to matters inconsistant with his dignity, and not usually performed by King's chamberlains, therefore:

BE IT ENACTED *by the King's Majesty, by and with the advice and consent of the House of Nobles and Representatives of the Hawaiian Islands, in Legislative council assembled:*

1. That from the date of the publication hereof, the duties of the chamberlain shall be the following:

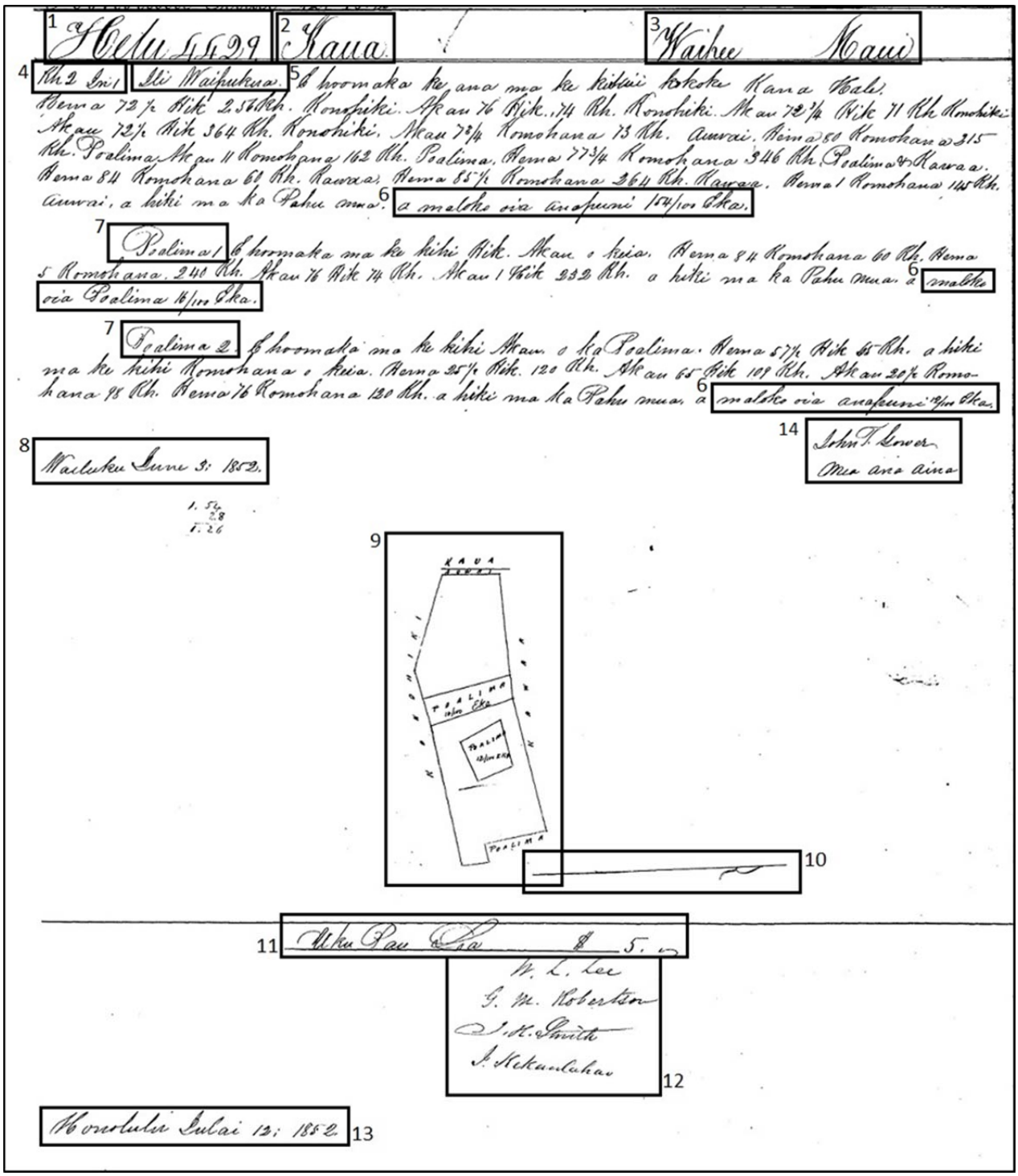
(1.) To see that the Palace and grounds are kept in proper order:

(2.) To superintend the preparations and dressing of the King for all receptions, audiences, and royal processions:

(3.) To regulate access to the King, and to receive, make known to His Majesty, and by His Majesty's order, grant or refuse all applications, by all strangers wishing to have such access, excepting foreign ministers, consuls, naval and military officers, or other distinguished foreigners applying to be presented to His Majesty, through the representatives or consuls of their respective nations:

(4.) To receive and present such petitions to the King as may not be sent through any of the King's ministers:

(5.) To see that the King's physician, surgeon, apothecary, chap-

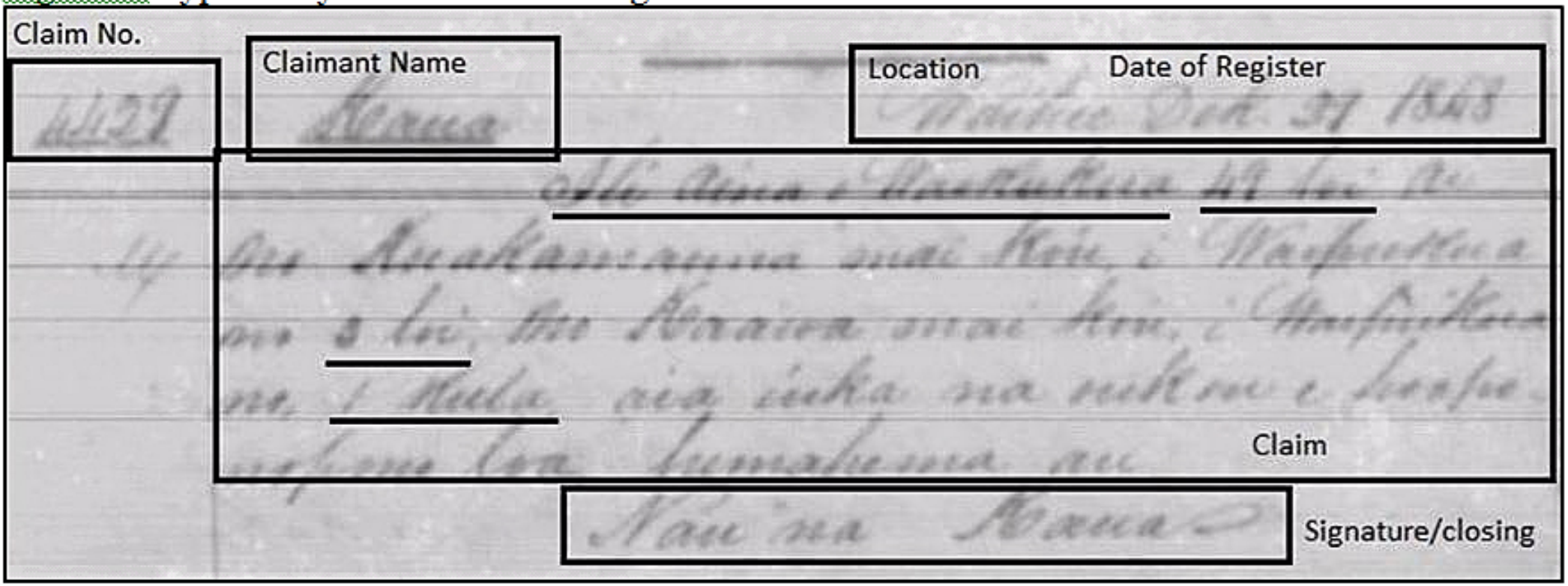


Source: L.C.A. book 6, p. 83.

1. L.C.A. number
2. Claimant's name
3. Location of the L.C.A.

4. Survey scale (this is typically located near the survey diagram)
5. ‘Ili that the parcel is located in
6. Total area of the parcel in acres
7. Poalima (appears to be excluded from the award in this example)
8. Location and date of survey
9. Survey diagram
10. Bearing north
11. Total cost of the survey
12. Signatures of the Land Commissioners
13. Location and date of Commissioners’ signatures
14. Surveyor

Figure 5. Typical layout of a Native Register



Source: Native Register book 6, p. 169.

Transcription:

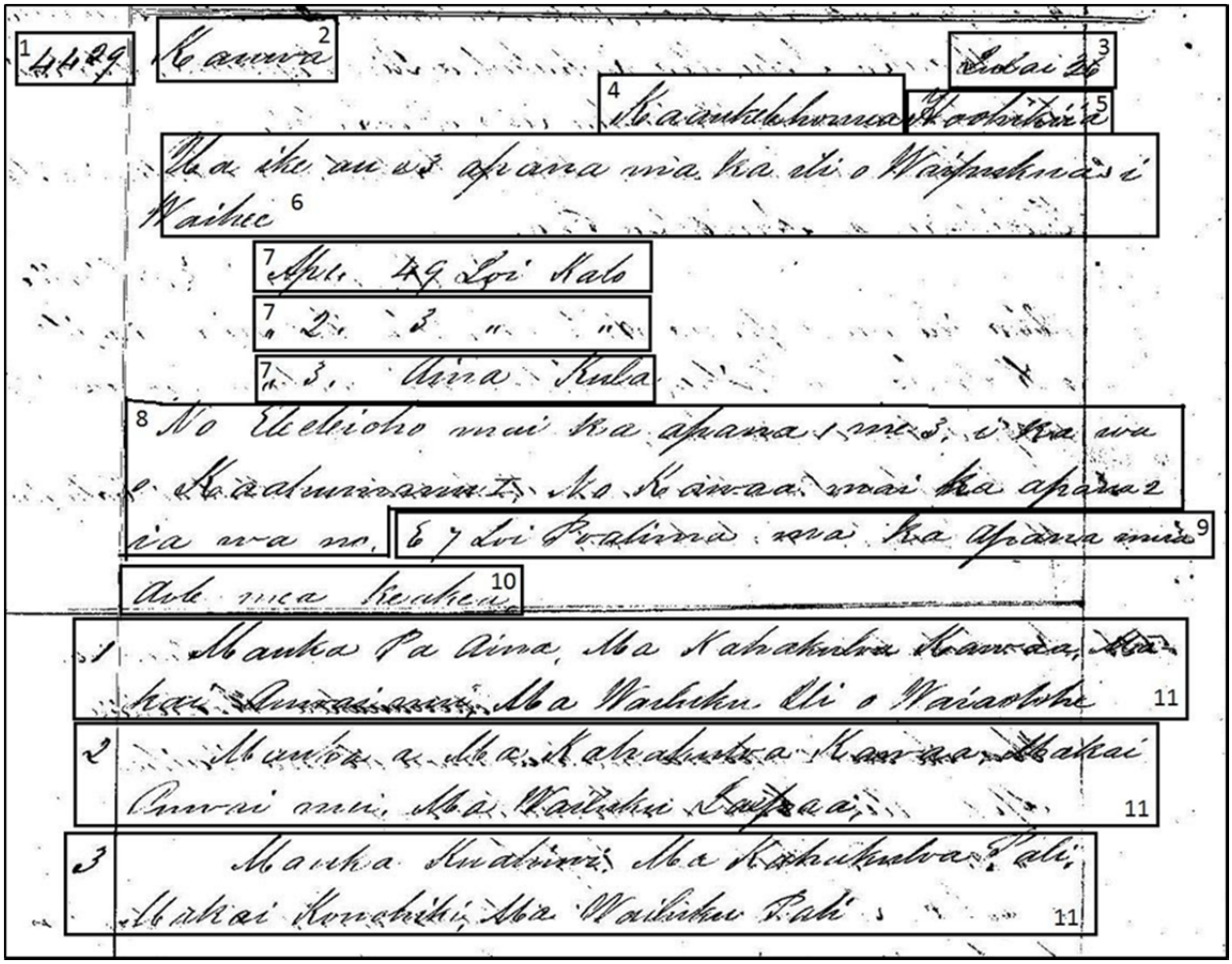
4429 Kaua Waihee Dek. 29, 1848

Ili aina o Waikukua 49 loi ai
no Kuakamauna mai ko'u i Waipukua
no 3 loi, no Kaaina mai ko'u i Waipukua
no, 1 Kula, aia iuka na oukou e hoopo-
nopono loa, hemahema au
Nau na Kaua

Translation:

4429 Kaua Waihee, Dec. 29, 1848

'Ili of Waikukua, 49 loi,
My land is from Kuakamauna in Waipukua
for 3 lo'i, my land in Waipukua is from
Kaaina, 1 kula, it is mauka, it is you folks
who shall correct this, for I do not know
well.
By Kaua



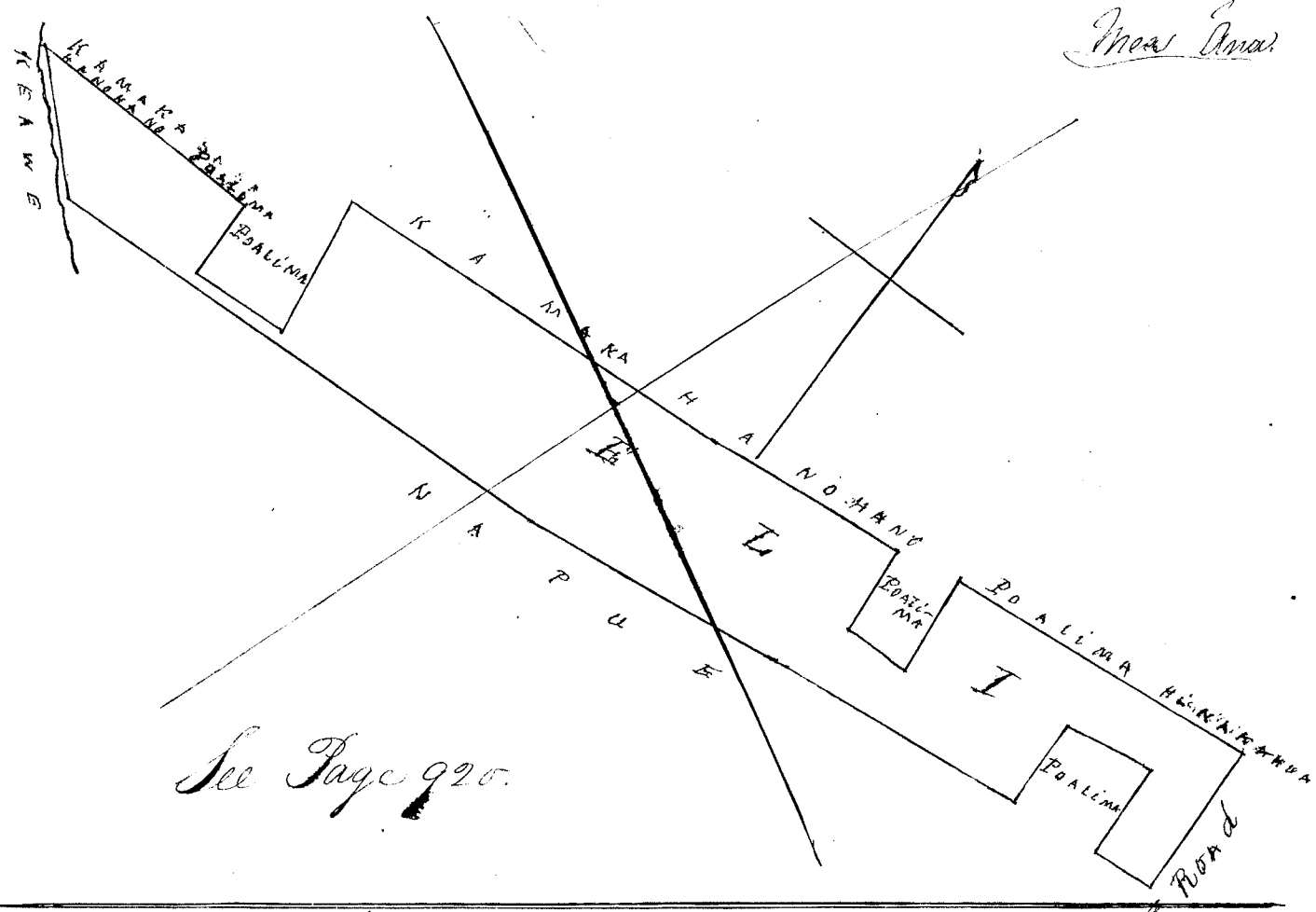
Source: Native Testimony book 5, p. 278.

1. Claim number
2. Claimant name
3. Date of testimony
4. Witness name
5. "Sworn"
6. Witness testimony regarding his/her knowledge of claimant's land ("I have seen/know of three pieces of land in the 'ili of Waipukua in Waihe'e)
7. **<u>Witness' testimony listing the claimant's land and description of each 'āpana</u>**
8. Witness testimony regarding who the claimant received his/her land from
9. Testimony regarding how many loi poalima were included in claimant's land (poalima weren't always included in an L.C.A., although they are prevalent throughout Nā Wai 'Ehā)

10. Witness testimony regarding whether the claimant's title/interest was disputed, in this case it was not ("There was no one who disputed his claim").
11. Witness testimony regarding general boundaries of claimant's parcels such as whose land bordered each side of a parcel or a particular land feature.

a hiki i ka Poalima. A. 3.° – Kom. 111 Kaul. ma ka Poalima. Hem. 83.° 45 Kom. 101 ma ka Poalima, Hem. 1.° 30 Hi. 166 Kaul. ma ka Poalima, Hem. 86.° 15 Kom. 3.02 Kaul. ma ko Napue Hem. 83.° – Kom. 333 Kaul. ma ko Napue. Hem. 88.° – Kom. 6.37 Kaul. ma ko Napue a hiki i kahi i hoomaka'i = 2 31/100 Eka ma keia Kuleana.

E. Bailey,
Mea Ana



Eka Pau loa $6.00

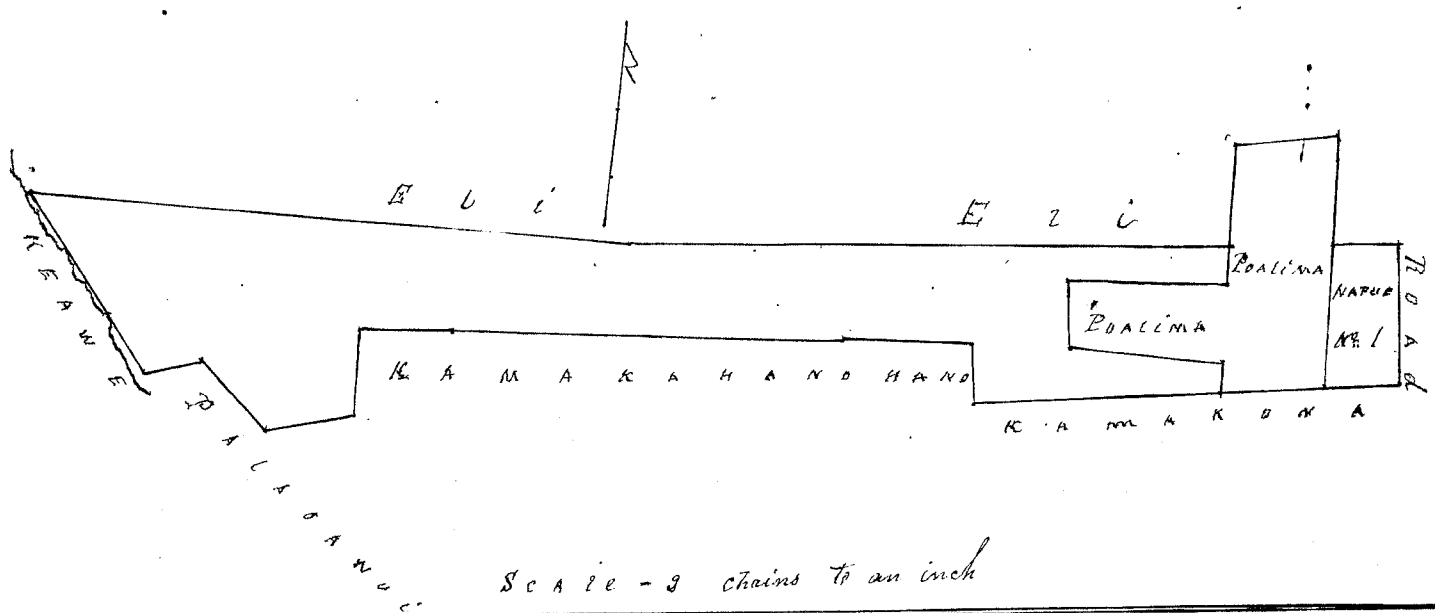
Note.
This survey afterwards objected in part & new one rendered as entered Page 920. J. H. S. Lee.
Approved by Comm.r "
July 1. 1852

J. H. Lee
Surveyor
G. M. Robertson
J. Kekauonohi
J. H. Smith
Honolulu August 4 = 1857

Helu 3339 Napue Wailuku Maui

Palapala no ke ana ana i ke Kuleana 3339 no Napue; e moe ana ma ka ili o Kalua i Wailuku Mokupuni o Maui, He aina kalo. E hoomaka ma kapa alanui, ma ke kihi Hikinahowa o keia aina, e pili ana me ko Kamakona, a e holo ana. Apana 1, A. 1.° – Kom. 121 Kaul. ma kapa alanui, Hem. 86.° 15 Kom. 73 Kaul. ma ko Eli a hiki i ka Poalima, Hem. 3.° – Hi. 129 ma ko Poalima. A. 81.° – Hi. 77 Kaul. ma ko Kamakona a hiki i kahi i hoomaka'i = 11/100 o ka Eka ma keia Apana. Apana 2, E hoomaka ma kona kihi Hikina – Akau e pili ana me ka Poalima a me ko Eli, a e holo ana. Hem. 86.° – 15 Kom. 302 Kaul. Kaul. ma ko Eli, Hem. 83.° – Kom. 333 Kaul. ma ko Eli Hem. 88.° – Kom 6.37 Kaul. ma ko Eli. Hem. 39.° – Hi. 227 Kaul. ma ko ka Auwai o Kalua A. 70.° 45 Hi. 100 Kaul. ma ko Palaoanui Hem. 49.° 45 Hi. 101 Kaul. ma ko Palaoanui A. 73.° 45 Hi. 92 ma ko Kamahahanohano A. 1.° – Kom. 90 Kaul. ma ko Kamahahanohano. A. 84.° 30 Hi. 517 Kaul. ma ko Kamahahanohano A. 85.° 45 Hi. 135 Kaul. ma ko Kamahahanohano, Hem. 9.° 45 Hi. 61 Kaul. ma ko Kamahahanohano A. 81.° – Hi. 358 Kaul. ma ko Kamakona a i ka Poalima, Alaila, ma ka poalima wale no, A. 1.° 30 Kom. 32 Kaul. Hem. 89.° 15 Kom. 150 Kaul. A. 7.° 45 Kom. 66 Kaul; A. 85.° Hi. 167 Kaul; A. 1.° 30 Kom. 45 Kaul. a hiki i kahi i hoomaka'i = 1 42/100 Eka ma keia apana.

E. Bailey
Mea Ana



Uku Pau ka $5.00

N. Lee
G. M. Robertson
J. Kekaulahao
J. H. Smith

Honolulu August 4 1851.

Ola 5228 Kuikelani — Wailuku Maui

Palapala no ke ana ana i ke Kuleana 5228 no Kuikelani ma ka ili o Kuhua i Wailuku ma ke kapuni o Maui. Apana 1 he kula.

E hoomaka ana ke kiki Konohana Akau e pili ana ma ke ala hoolina o Kaili a me Kekuauli, a e holo ana A. 83° 45' Hi. 7.30 Kaulahao ma ka Kaili a Kaauwai i ka Makauahwa.

He. 73° Hi. 4.93 " " Kamakauahwa – a i ole – ma kona iho.
He. 4° 45 K. 3.51 " " Haleola
He. 36° 30' K. 1.78 " " "
He. 3° 45' K. 1.14 " " "
He. 86° 15' K. 4.21 " " " a kiki i ka Poalima
A. 78° 30' K. .77 " " Poalima
He. 10° 15' K. 1.23 " " " a kiki i ka Kaai
A. 79° K. .30 " " Kaai via ka hoolina o Kekuauli.
A. 40° K. 3.56 " " " " " "
A. 86° 45' K. 3.22 " " " " " "
A. 20° K. .12 " " Kamakahanohano
A. 8° K. 1.28 " " "
A. 82° Hi. 1.45 " " Kaai – kona pahale
A. 7° 15' K. 2.27 " " " a kiki i kahi i hoomaka'i.

A malo ko keia Apana 6 47/100 Eka.

Apana 2. E hoomaka ma ke kiki Hikina Akau o keia Apana ma kapa alanui e pili ana me ke Kamakauahwa, a e holo ana A. 80° K. 12.30 Kaulahao ma ka Kamakauahwa.

He. 73° Hi. 4.93 " " kona iho no
He. 4° 45' K. .19 " " " "
He. 79° 30' Hi. 2.93 " " Haleola
He. 82° 15' Hi. 4.52 " " " a kiki i ke Alanui
A. 20° 30' K. .62 " " Alanui a kiki i kahi i hoomaka'i, a malo ka ia Apana 64/100 Eka

E. Bailey
Mea Ana.

M. Kowhiti (K. Kalama. M. o Namauu.

3339 Nafue Julai 5. 1849

Namanalau Hock. Ua ike au i kona aina ma Waiuku. 2 Mookalo, 3 lei mu ke kula, 1 ao Afana.

No Nakalepuhia mai kona i ka M. K. 1825. Aole mea kaka. Eha fralima iloko.

Pani na aoao. M. o Co. Lawsenea. W. o Hale me Kamakaka. M. fo aina. M. o Kamakakauehane me Kamakona.

3620. Kekuauli See p. 588

Ua kauu iloko o ka kulana kala 3633.

3209. Aua. Waiuku Julai 6. 1849.

Kahikauula Hock. Ua ike au i kona aina ma Waiuku. Eha ka afana.

Afana 1. Aina kalo ma Nialaula 1.
" 2. 2 lei " " " 2.
" 3. 3 " " " " 3.

Aole alu ka Afana 1.2. i ka M. K. 1837. No makahiki no kauu mai o Koa i ka Afana 3. Aole mea kaka.

1 Pani na aoao. M. o Kekoa. W. o Kaua. M. o Kahikauula. M. fala ne.

2 Pani na aoao. M. o Pae. W. fala ne. M. o Kahikauula. W. o Kalapu.

3 Pani na aoao. M. o Kaukalui. W. o Nafula. M. o Paaa. M. o Koua.

Naiuiua (M) Hock. Ua ike au 5 kikale ma ka ili o Kalua ma Waiuku.

No M. Keomaitani mai i ka M. K. 1846. No K. Kuikaitani mai ke Keomaitani, Aole mea kaka.

Pani na aoao. M. o Palauami. W. o Makakauehane. M. o

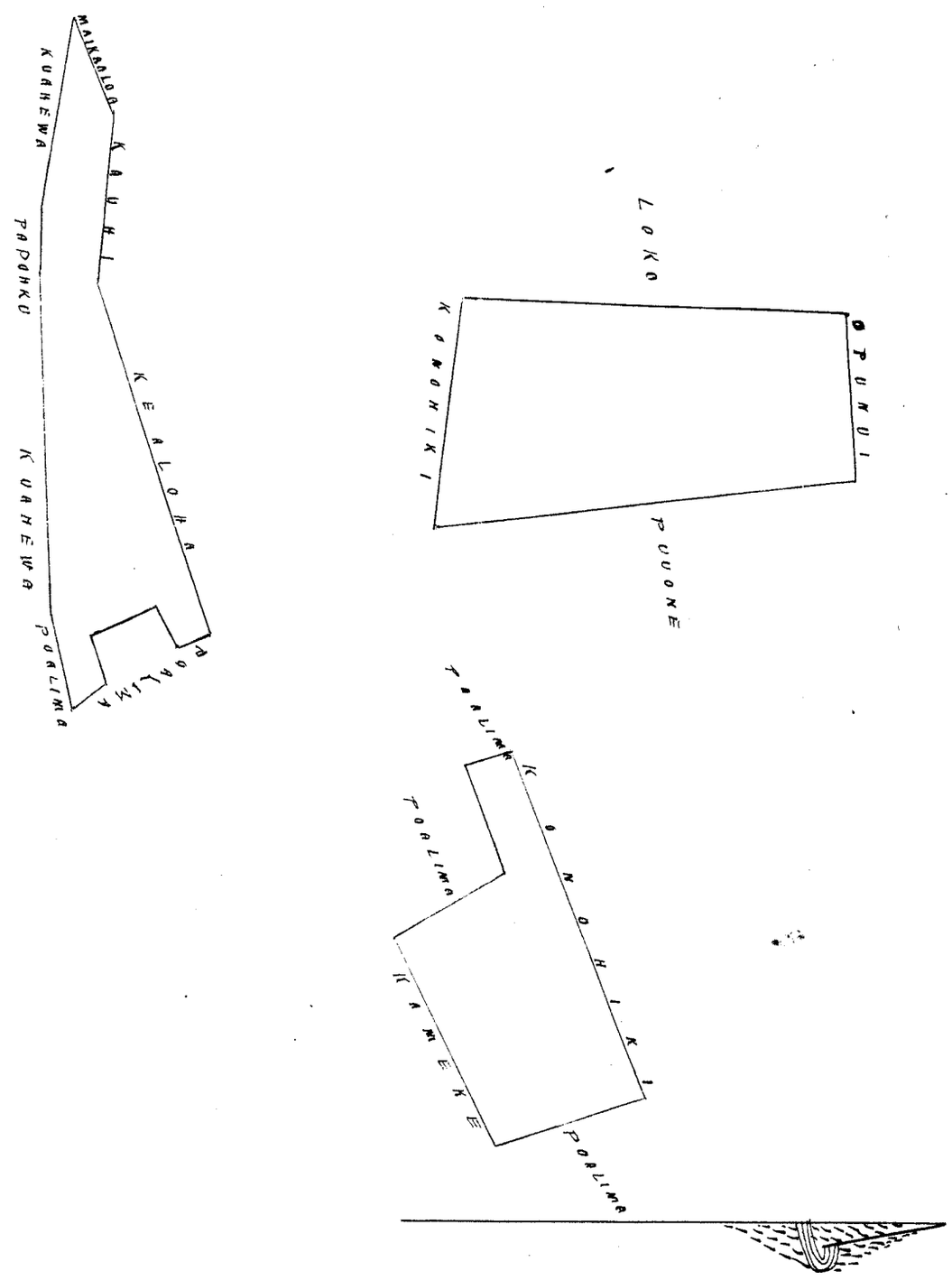
Helu 4274 Kuanea — Waihee Maui

Apana 1 Ili Pulolo. Choomaka ke ana ma ke kihi Komohana o Kuahewa Apana 2 Akau 66½ Hik. 121 Kh. Maikaaloa. Hema 85 Hik. 203 Kh. Kauhi. Akau 71½ Hik. 452. Kealoha Hema 18 Hik. 41 Kh. Poalima. Hema 64 Komohana 57 Kh. Poalima. Hema 26 Hik. 85 Kh. Poalima Akau 70¾ Hik. 63 Kh. Poalima. Hema 34¾ Hik. 53 Kh. Poalima. Hema 79 Komohana 118 Kh Poalima. Hema 87½ Komohana 416 Kh. Kuahewa 1 Akau 87 Komohana 75 Kh. Papohaku. Akau 80¼ Komohana 232 Kh. Kuahewa 2 a hiki ma ka Pahu mua, a maloko oia anapuni 77/100 Eka.

Apana 2, Mahele 1 Ili Pulolo. Choomaka ke ana ma ke kihi Hema o poli i ke kihi o ka Poalima. Akau 30¼ Komohana 153 Kh. Poalima. Hema 69¾ Komohana 135 Kh. Poalima. Akau 18¾ Komohana 57 Kh. Poalima Akau 68¾ Hik. 446 Kh. Poalima Hema 18¾ Hik. 178 Kh. Poalima. Hema 64¼ Komohana 280 Kh. Kameke, a hiki i kahi i hoomakai, a maloko oia anapuni 82/100 Eka.

Mahele 2. Choomaka ke ana ma ke kiki Komohana Hema o kia, o poli ana me ka Paapohaku. Hema 84½ Hik. 286 Kh. no kela a as o ke alanui Akau 7¼ Komohana 506 Kh. Puuone. Hema 86½ Komohana 204 Kh. Opunui. Hema 1 Komohana 462 Kh. ma ka Paapohaku. a hiki ma ka Pahu mua, a maloko oia anapuni 1 14/100 Eka

John T. Gower
Mea ana ana.



Uku Pau Loa $6.00

W. L. Lee
G. M. Robertson
J. H. Smith
P. Kekaulahao

Honolulu Iulai 12, 1852.

4274 Kuanea Iulai 24 1849

E. Kaauwai Hoohikiia

Ua ike au e 2 ~~mau~~ Apana makaia mau ili ma Waihee

Apl. Puuku Kalo ma Puulolo

2. " " me Pa Kalo ma Puulolo me Kapuhe

Noie aku no i Ka 1862, aole mea Kaaka

3 Poalima ma Ka Apana, me Ka Apana 2.

1 Manka Loi Paahao, Ma Kahakuloa Kahanamui, Makai Poalima, Ma Wailuku Naea Ili o Waiakamaoma,

2 Manka a Ma Kahakuloa Poalima, Makai Punone, Ma Wailuku Naea me Kapahuwai,

3962 Mapukacha Iulai 24 1849

Pu Hoohikiia

Ua ike au e 2 apana ma Ka ili o Kalopue ma Waihee

Apl. Mro Kalo me Kula

" 2. " " "

No Kana wahine mai na Kona aina mai Kona mau makua mai i Ka ma a Kamehameha I. Ua make Kona makuakane o Keliilawaia i Ka 1847, o Kona Hooilina o Kana Kaikamahine o Ukumea, 1 Poalima ma Ka Apana ma, 2 Poalima ma Ka Apana 2. aole mea Kaaka.

1 Manka a Ma Kahakuloa, a Makai iliaina o Mahaaka, Ma Wailuku Keola,

2 Manka Poalima, Ma Kahakuloa Poalima Makai Ili o Mahaaka, Ma Wailuku Iliaina o Kapaoko.

TITLE MAP
WAILUKU SUGAR COMPANY
WAILUKU, MAUI, T. H.

COMPILED FROM MAPS MADE BY
E. D. BALDWIN, A. C. ALEXANDER
AND THE
ENGINEERING DEPARTMENT OF WAILUKU SUGAR COMPANY
UNDER THE DIRECTION OF
ROBERT P. BRUCE

SCALE: 1 INCH = 400 FEET

OCTOBER – 1937

BY: R. M. TOWILL
CIVIL ENGINEER & SURVEYOR
HONOLULU, OAHU, T. H.

AREAS OF ALL LANDS WITHIN THE BOUNDARIES OF THE
WAILUKU SUGAR COMPANY

	ACRES			
CANE AREA (Fee Simple)	4415.3			
" " (Leased)	22.7	4438.0		
IRRIGATION DITCHES, CANE FLUMES AND	81			
RESERVOIRS	69	150.0		
PLANTATION ROADS, TRAILS AND	157			
RAILROADS	41	198.0		
GRAZING LAND (Fee Simple) INCLUDING WASTE	2619			
" " (Leased) " "	176.3	2795.3		
SUNDRY PLANTATION LANDS: HOUSE LOTS, STABLES, MILL AND OFFICE SITE, RECREATION GROUNDS, ETC.		158.5		
OTHER LANDS – MISCELLANEOUS AREAS NOT USED		51.9		
LAND LEASED TO OTHERS		140.4		
FOREST AND WASTE BELOW FOREST RESERVE LINE		3536.9		
TOTAL – WAILUKU SUGAR COMPANY CONTROLLED LAND BELOW FOREST RESERVE LINE		11,469.0		
LESS ABOVE LEASED LANDS		199.0		
TOTAL – WAILUKU SUGAR COMPANY LAND BELOW FOREST RESERVE LINE			11,270	
" " " " ABOVE " " "			15,330	
TOTAL – WAILUKU SUGAR COMPANY LAND				26,600
WAILUKU TOWN, GOVERNMENT LAND, GOVERNMENT ROADS AND KULEANAS NOT OWNED				1,400
TOTAL – OF ALL LANDS WITHIN THE BOUNDARIES OF THE WAILUKU SUGAR COMPANY				28,000

Na Wai-11

EXHIBIT 2

KIPUKA
Search
Print
go
Search Results
Clear Results
TMK
Ili
Ahupuaa
Moku
Historic Sites
Land Awards
Crown Lands
Export Results
Search using Place Name or State Site Number
Data compiled from the State Historic Preservation Division (SHPD) historic sites database and Geographic Place Names provided by the State Office of Planning. Does contain multiple errors and inaccuracies. Please direct corrections or questions to kipukainfo@oha.org
Terrain
Street
Aerial
Navigate
Search
Tools
Layers
Bookmarks
OHA
100km
85mi

KIPUKA
Search
Print
460
go
26 Records Found.
Clear Results
Crown Lands (0)
TMK (0)
'Ili (0)
Ahupua'a (0)
Moku (0)
Historic Sites (0)
Land Awards (26)
Export Results
DETAILS >
STREET/BIRD's EYE >
Naluahi
Grant
GO TO >
460:1
Puupahoehoe
Land Commission Awa
460:2
Puupahoehoe
Terrain
Street
Aerial
Navigate
Search
Tools
Layers
Bookmarks
100m
400ft

Land Award
Type: Land Commission Award
Claimant: Puupahoehoe
Helu: 460:1
Tax Map Key Parcel
TMK#: 235004028
Owner: HARDERS,THEODORE & ZELIE FAM LTD PTNSHP /etal
Ahupua'a: Waikapū
Moku: Pū'ali Komohana
Mokupuni: Maui

Land Award - Puupahoehoe

Add Data

Location

Mokupuni:	Maui
Moku:	Pūʻali Komohana
Ahupuaʻa:	Waikapū
ʻIli:	None Found

Description

Award Type:	Land Commission Award
Award Year:	1855
Helu:	460:1
Claimant:	Puupahoehoe
Grant #:	2165
Notes:	In Pilipili.

Source

Links to Other Records

Land Commission Award
Native Register
Native Register-Continued
Native Testimony
Royal Patent Grant
Survey Boundaries
Survey Notes-Royal Patent

KIPUKA

He ali'i ka 'āina; he kauwā ke kanaka

Print this Page

Land Award - Pupuhi, A

Add Data

Location

Mokupuni:	Maui
Moku:	Pū'ali Komohana
Ahupua'a:	Waikapū
'Ili:	None Found

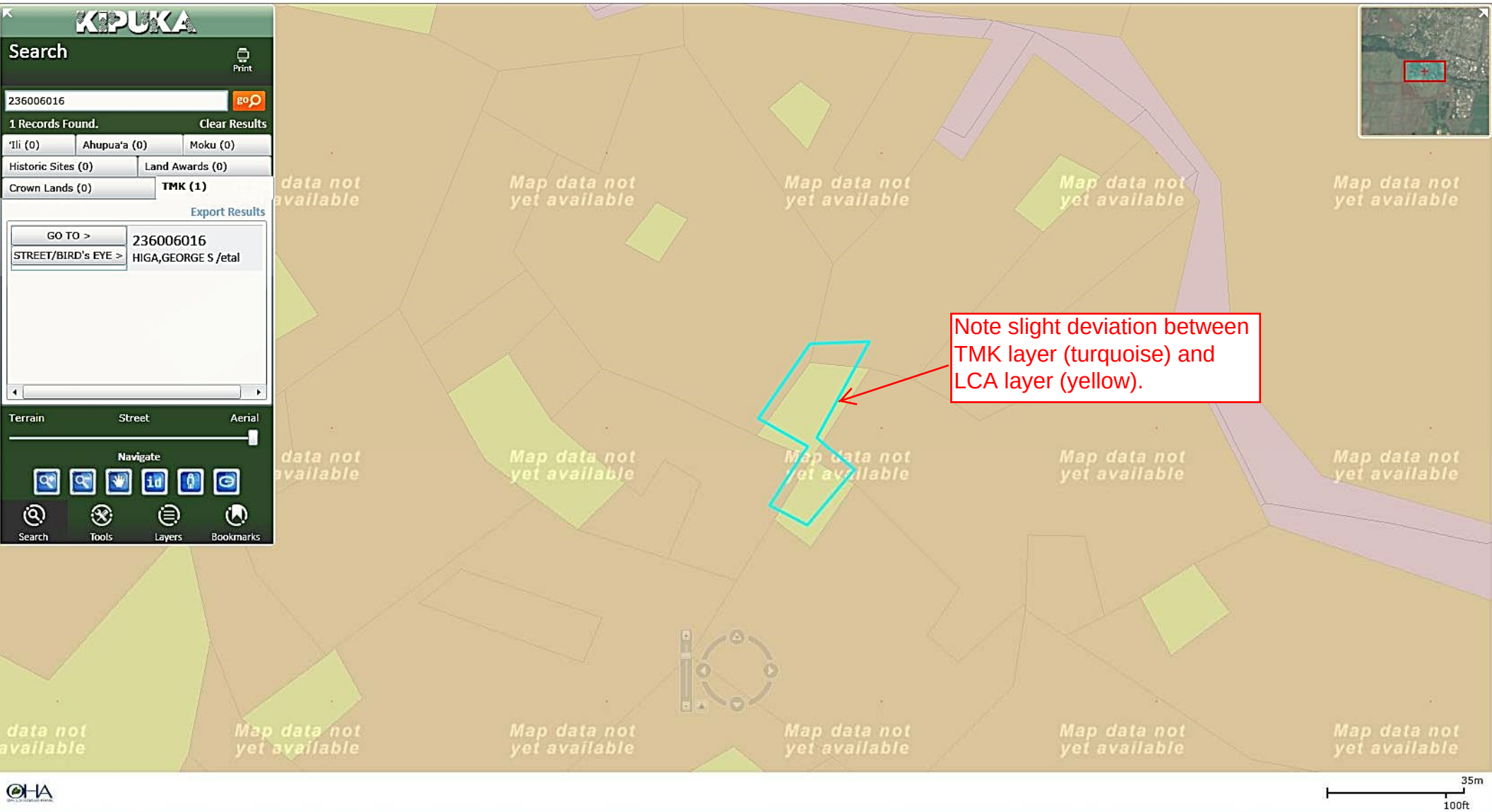
Description

Award Type:	Grant
Award Year:	1867
Helu:	3042
Claimant:	Pupuhi, A
Notes:	Granted 1.26 acres in 1867, Book 14.

Source

Links to Other Records

Government Grant


KIPUKA
Search
Print
236006016
go
1 Records Found.
Clear Results
'Ili (0)
Ahupua'a (0)
Moku (0)
Historic Sites (0)
Land Awards (0)
Crown Lands (0)
TMK (1)
Export Results
GO TO >
STREET/BIRD's EYE >
236006016
HIGA,GEORGE S /etal
Terrain
Street
Aerial
Navigate
Search
Tools
Layers
Bookmarks
Map data not yet available
Note slight deviation between TMK layer (turquoise) and LCA layer (yellow).
35m
100ft