



**STATE OF HAWAII**  
**DEPARTMENT OF LAND AND NATURAL RESOURCES**  
**COMMISSION ON WATER RESOURCE MANAGEMENT**

**ORIGINAL**

**APPLICATION FOR SURFACE WATER USE PERMIT**  
**FOR EXISTING USE IN THE NA WAI EHA, MAUI, SURFACE WATER**  
**MANAGEMENT AREAS**

For Official Use Only:  
**RECEIVED**  
**COMMISSION ON WATER**  
**RESOURCE MANAGEMENT**  
**2009 APR 22 PM 4:06**  
 Event ID:

**FORM SWUPA-E (NA WAI EHA, MAUI)**

For detailed instructions on filling out this application, refer to the attached instructions.

**APPLICANT INFORMATION:** Note: In accordance with §174C-51(1)(B), HRS, *In the event a lessee, licensee, developer, or any other person with a terminable interest or estate in the land, which is the water source of the permitted water, applies for a water permit, the landowner shall also be stated as a joint applicant for the water permit.*

<b>1. APPLICANT'S NAME</b> Hawaiian Commercial & Sugar Company		Applicant's Contact Garret Hew		<b>2. SOURCE LANDOWNER'S NAME</b> Wailuku Water Company Hawaiian Commercial & Sugar Company		Source Landowner's Contact Clayton Suzuki Garret Hew	
Applicant's Mailing Address, or Principal Place of Business P.O. Box 266 Puunene, Hawaii 96784				Source Landowner's Mailing Address, or Principal Place of Business 255 East Waiko Road Wailuku, HI 96793			
Applicant's Phone 808-877-6950	Applicant's Fax 808-871-2149	Applicant's E-mail ghew@hcsugar.com	Source Landowner's Phone 808-244-2208	Source Landowner's 808-242-7068	Source Landowner's E-mail csuzuki@wailukuwater.com		

**EXISTING SOURCE INFORMATION**

The following must be attached before this application is accepted as complete:  
 • Portion of 7.5-Minute Series USGS topographic map (scale 1:24,000) labeled with stream and diversion locations and quad map name.  
 • Property Tax Map Key (TMK), showing stream or diversion location, and location of water use referenced to established property boundaries.  
 • Photograph(s) of the surface water diversion works and end use.

**3. SURFACE WATER HYDROLOGIC UNIT AND CODE:**  Waihee/6022  Waiehu/6023  Iao/6024  Waikapu/6001

**4. DIVERSION LOCATION:** Choose the appropriate category and enter information in either 4a or 4b.

**4a. TMK OF STREAM DIVERSION LOCATION:** \_\_\_\_\_ - \_\_\_\_\_ - \_\_\_\_\_ : \_\_\_\_\_  
 Zone Sector Plat Parcel

**4b. TMK OF DITCH DIVERSION LOCATION:** \_\_\_\_\_ - \_\_\_\_\_ - \_\_\_\_\_ : \_\_\_\_\_ See attached  
 Zone Sector Plat Parcel

**5. STREAM DIVERSION:** How is water diverted from the stream to your property? Check all that apply.

Pipe  Pump  Ditch/auwai  Other Describe: Reservoirs

Is the diverted water returned to the stream or ditch?  Yes.  No. If yes, how much water is returned?

**6. FLOW MEASUREMENT INFORMATION:**

Does the stream diversion have a flowmeter with totalizer or other device to measure diverted amounts?

Yes. Enter the installation date:

Describe the device and enter measured amounts in Table 1.

No. Explain how you are measuring flow to justify amounts shown in Table 1 in the space below

See Table 1 under Other column for explanation of gauging of water.

**EXISTING USER INFORMATION**

**7. APPURTENANT RIGHT:** Do you claim an appurtenant right for your water use?  Yes  No

If yes, has the appurtenant right been established by the courts or the Commission?  Yes  No

**8. END USER INFORMATION:** Are you an end user on an existing water system?  Yes  No

If yes, who is the operator of the water system? Hawaiian Commercial and Sugar Company and Wailuku Water Co.

**9. REGISTRATION AND DECLARATION OF WATER USE:** Do you have a Registration and Declaration of Water Use with the Commission?

Yes. List the file reference name(s): HC&S

No

**10. STREAM DIVERSION WORKS PERMIT (SDWP):**

Have you ever been issued a SDWP by the Commission?

Yes. List the permit number(s):

No

**NOTE:** Signing below indicates that the signatories understand and affirm that the information provided on this application is accurate and true to the best of their knowledge. Furthermore, the signatories understand that: 1) if necessary, further information may be required before the application is considered complete; 2) if a water use permit is granted by the Commission, this permit will be subject, but not limited, to any existing legal uses, changes in sustainable yields and instream flow standards, Hawaiian Home Lands uses, and any other conditions imposed by the Commission; and 3) the applicant is responsible for paying the required public notice fees associated with this application.

**11. APPLICANT**  
  
 Signature  
 Chris Benjamin  
 Print  
 April 22, 2009  
 Date

**12. SOURCE LANDOWNER**  
 \_\_\_\_\_  
 Signature  
 \_\_\_\_\_  
 Print  
 \_\_\_\_\_  
 Date

**SURFACE WATER USE PERMIT APPLICATION  
EXISTING USE (NA WAI EHA, MAUI)**

**TABLE 1: 12-MONTH AVERAGE DAILY USE**  
**Measured or Calculated Use of Water at the Source: (Check one)  Stream  Ditch  Auwai**  
**As of the Effective Date of Designation, April 30, 2008**

MONTH / YEAR	AVERAGE DAILY USE FOR THE MONTH IN GALLONS PER DAY (GPD)	Check one item per box				OTHER Please describe
		METERED	ESTIMATED	ACTIVE BUT UNKNOWN	INACTIVE	
May 2007	23.41 mgd	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	HC&S operates two continuous gauging stations to record the aggregate flow of water from Waihee, North and South Waiehu and Iao Streams. The Waihee Ditch at Field 63 (Hopoi) gauging station is located on the Waihee ditch and the Spreckels Ditch at Wailuku gauging station is located on the Spreckels Ditch. Both of these gauging stations are located to the South of Iao Stream. The water that is gauged goes to HC&S Reservoirs 73 & 74. The average daily use as indicated on Table 1 is in million gallons per day (mgd).
June 2007	16.67 mgd	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
July 2007	41.90 mgd	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
August 2007	28.66 mgd	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
September 2007	35.33 mgd	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
October 2007	40.48 mgd	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
November 2007	36.40 mgd	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
December 2007	33.18 mgd	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
January 2008	33.59 mgd	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
February 2008	28.32 mgd	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
March 2008	32.42 mgd	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
April 2008	29.32 mgd	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>SUM OF AVERAGE DAILY USE FOR THE MONTH</b>	379.68 mgd	<b>GPD</b>				
<b>AVERAGE DAILY USE (Average of the above)</b>	31.64 mgd	<b>GPD</b>				

**SURFACE WATER USE PERMIT APPLICATION  
EXISTING USE (NA WAI EHA, MAUI)**

**TABLE 2: LAND USE CONSISTENCY/EFFICIENCY**  
(Attach additional copies of Table 2 if necessary)

LAND USE CONSISTENCY						EFFICIENCY OF USE			
1. PURPOSE / WATER USE CATEGORY	2. USE TMK ATTACH THE FOLLOWING: • Property tax map, showing use location in reference to established property boundaries • Photograph of the area of use	3. STATE LAND USE DISTRICT	4. CDUP REQ'D Enter either: Yes and Date approved, or Yes and not acquired, or No	5. COUNTY ZONING CODE	6. SMAP REQ'D Enter either: Yes and Date approved, or Yes and not acquired, or No	7. REQUESTED QUANTITY OF USE Gallons per Day (GPD)	8. SUB-METERED? (Yes or No)	9. UNITS OR NET ACREAGE	10. APPLICANT'S JUSTIFICATION FOR REQUESTED QUANTITY OF USE FOR ITEM 7. If applicable, attach sheets to show how this number was calculated. For irrigation uses, fill in Table 3.
<b>Uses that require potable (drinking) water</b>									
	____ - ____ - ____ : ____ Zone      Sector      Plat      Parcel								
	____ - ____ - ____ : ____ Zone      Sector      Plat      Parcel								
	____ - ____ - ____ : ____ Zone      Sector      Plat      Parcel								
	____ - ____ - ____ : ____ Zone      Sector      Plat      Parcel								
<b>TOTAL POTABLE USE</b>							<b>GPD</b>		
<b>Uses that do not require potable water</b>									
	____ - ____ - ____ : ____ Zone      Sector      Plat      Parcel								SEE ATTACHED NARRATIVE
	____ - ____ - ____ : ____ Zone      Sector      Plat      Parcel								
	____ - ____ - ____ : ____ Zone      Sector      Plat      Parcel								
	____ - ____ - ____ : ____ Zone      Sector      Plat      Parcel								
<b>TOTAL NON-POTABLE USE</b>							<b>GPD</b>		
<b>TOTAL USE REQUESTED</b> (Sum of Total Potable Use and Total Non-Potable Use above) =							<b>GPD</b>		
If total use requested is not equal to the total monthly average in Table 1, please explain.									
In accordance with §174C-51(5), please explain if there are any limitations (legal, contractual, etc.) on the use(s) of water described above.									

**SURFACE WATER USE PERMIT APPLICATION  
EXISTING USE (NA WAI EHA, MAUI)**

**TABLE 3: IRRIGATION INFORMATION**

List all crops as separate line items and include landscape and golf course irrigation, grown in the 12 months prior to April 30, 2008. Attach additional copies of Table 3 if necessary.

1. USE TAX MAP KEY (TMK) Attach map outlining area and photo.	2. CROP	3. TOTAL ACREAGE	4. NET IRRIGATED ACREAGE	5. BEGIN ROWTH PERIOD (Month)	6. END GROWTH PERIOD (Month)	7. IRRIGATION SYSTEM (Refer to instructions.)	8. IRRIGATION PRACTICE (Refer to instructions.)
____ - ____ - ____ : ____ Zone      Sector      Plat      Parcel							SEE ATTACHED NARRATIVE
____ - ____ - ____ : ____ Zone      Sector      Plat      Parcel							
____ - ____ - ____ : ____ Zone      Sector      Plat      Parcel							
____ - ____ - ____ : ____ Zone      Sector      Plat      Parcel							
____ - ____ - ____ : ____ Zone      Sector      Plat      Parcel							
____ - ____ - ____ : ____ Zone      Sector      Plat      Parcel							
____ - ____ - ____ : ____ Zone      Sector      Plat      Parcel							
____ - ____ - ____ : ____ Zone      Sector      Plat      Parcel							
____ - ____ - ____ : ____ Zone      Sector      Plat      Parcel							
____ - ____ - ____ : ____ Zone      Sector      Plat      Parcel							

**SURFACE WATER USE PERMIT APPLICATION  
EXISTING USE (NA WAI EHA, MAUI)**

**TABLE 4: ALTERNATIVES ANALYSIS**

	<b>Potable Alternatives</b> Attach additional sheets if necessary.	<b>Non-Potable Alternatives</b> Attach additional sheets if necessary.
Municipal sources		SEE ATTACHED NARRATIVE
Wastewater reuse		
Ditch system		
Desalinization		
Ground water		
Other (specify)		

**PUBLIC INTEREST**

§174C-2(c) states that: *The state water code shall be liberally interpreted to obtain maximum beneficial use of the waters of the State for purposes such as domestic uses, aquaculture uses, irrigation and other agricultural uses, power development, and commercial and industrial uses. However, adequate provision shall be made for the protection of traditional and customary Hawaiian rights, the protection and procreation of fish and wildlife, the maintenance of proper ecological balance and scenic beauty, and the preservation and enhancement of waters of the State for municipal uses, public recreation, public water supply, agriculture, and navigation. Such objectives are declared to be in the public interest.*

Explain below how the uses in your application are consistent with the public interest as described above. Attach additional sheets if necessary.  
SEE ATTACHED NARRATIVE

**SURFACE WATER USE PERMIT APPLICATION  
EXISTING USE (NA WAI EHA, MAUI)**

**TABLE 4: ALTERNATIVES ANALYSIS**

	<b>Potable Alternatives</b> Attach additional sheets if necessary.	<b>Non-Potable Alternatives</b> Attach additional sheets if necessary.
Municipal sources		SEE ATTACHED NARRATIVE
Wastewater reuse		
Ditch system		
Desalinization		
Ground water		
Other (specify)		

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Explain below how the uses in your application are consistent with the public interest as described above. Attach additional sheets if necessary.  
SEE ATTACHED NARRATIVE

**APPLICATION BY HC&S FOR WATER USE PERMIT IN  
NA WAI EHA SURFACE WATER MANAGEMENT AREA FOR  
EXISTING AGRICULTURAL USES (WAIHE`E-HOPOI FIELDS)**

Hawaiian Commercial & Sugar Company (“HC&S”) requests a water use permit for the continued use of 36.29 mgd (12-MAV) of Na Wai Eha surface water for agricultural uses supplied via the Waiale Reservoirs. HC&S has been continuously using the waters of Na Wai Eha for over a century for sugar cane production and, therefore, is an existing use.

The portion of HC&S’s approximately 35,000-acre sugar plantation that is irrigated with Na Wai Eha stream water consists of two groups of fields on the western side of the plantation. The first group, designated by HC&S internally as the Waihe`e-Hopoi Fields, currently consists of approximately 4,408<sup>1</sup> acres that receive most of their irrigation water via the Waiale Reservoirs (also known as Reservoirs 73 and 74). It is the subject of this water use permit application.

The second group of fields is denominated the `Iao-Waikapu Fields. Consisting of 1,491 acres, these fields are not serviced by the Waiale Reservoirs and thus, are the subject of a separate water use permit application.

**I. TIMELY APPLICATION**

Pursuant to Hawaii Revised Statutes (“HRS”) § 174C-50(c), applications for existing uses shall be made within one year of the effective date of designation of the water management area. The effective date of the Na Wai Eha surface water management area is April 30, 2008. This application for an existing use permit is timely.

**II. BACKGROUND**

**A. HC&S’s Plantation and Irrigation System**

Alexander & Baldwin, Inc. (“A&B”), parent company of HC&S, has been engaged in the cultivation of sugar on Maui since 1870. At one time, in the late 1800s, there were nearly 100 sugar plantations, and at its peak, sugar cane cultivation was spread across 200,000 acres of the Hawaiian Islands. HC&S is the result of a series of mergers over many years that combined 14 predecessor sugar plantations, including the original plantation of Samuel T. Alexander and Henry P. Baldwin, whose partnership grew into A&B. Today HC&S is the sole surviving sugar plantation in Hawaii. The HC&S plantation consists of over 43,000 acres of land in central Maui, of which about 35,000 are under cultivation.

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<sup>1</sup> In the Na Wai Eha IIFS contested case proceedings, reference to the “Waihe`e-Hopoi Fields” excluded Fields 921 and 922 because those fields were irrigated exclusively with cannery wastewater from Maui Pineapple Company (“MPC”). After 2006, however, insufficient quantities of MPC wastewater were available to meet the irrigation needs of Fields 921 and 922 due to a slowdown in MPC’s canning operations. Na Wai Eha water has since been used on Fields 921 and 922, consequently in this application, reference to the “Waihe`e-Hopoi Fields” includes Fields 921 and 922.

Two irrigation systems constructed over 100 years ago provide HC&S with the reliable source of water necessary for the success of the sugar plantation. Both were designed and constructed to utilize the force of gravity to transport water via ditches and pipelines from the stream diversions, which collect surface water, to the lower elevations where it is applied to the fields. The larger East Maui Irrigation System (EMI) collects water from a number of streams in East Maui.

Although the EMI System provides the bulk of irrigation water for the plantation, its gravity flow dependent infrastructure cannot deliver water across the low point in the “saddle” of the Central Maui isthmus to HC&S’s fields on the Western side of the plantation. HC&S’s Waihe`e-Hopoi Fields and `Iao-Waikapu Fields thus rely on Na Wai Eha water collected and transported, also by the force of gravity, through the West Maui Irrigation System, which is jointly owned and operated by HC&S and Wailuku Water Company. See Section II.B., below.

As back-up to these two irrigation systems, to cushion the plantation against weather variability and enable HC&S to continue to irrigate in times of low rainfall, the plantation also relies upon brackish groundwater pumped from several wells. Only one of these wells, HC&S Well No. 7, is situated on the Western side of the plantation and able to introduce water at an adequate elevation to deliver water to the Waihe`e-Hopoi Fields. Well No. 7 can service all of the Waihe`e-Hopoi Fields except Field 715.

Irrigation methods progressed from furrow irrigation to a short period in the early 1970s when HC&S converted to sprinkler irrigation. In 1986, HC&S completed a 12-year project to install a drip irrigation system across its plantation—a \$30 million investment in water efficiency that, if made today, would cost \$90 million. Drip remains today the most efficient irrigation technology available. (A small section of the plantation has been converted back to overhead sprinklers in order to utilize recycled mill water. See Sections III.B.2.c and III.C.2, below). HC&S further recycles its mill wash water for use in fields in proximity of the mill and filter station, which does not include the Waihe`e-Hopoi Fields.

## **B. West Maui Irrigation System**

The West Maui Irrigation System is a complex system that collects water from central Maui streams - Waihe`e, Waiehu, `Iao, and Waikapu - generally referred to collectively as Na Wai Eha. Some portions of the system are jointly owned and maintained by HC&S and Wailuku Water Company (“WWC”), other portions are owned and maintained solely by either WWC or HC&S.

In the late 1800s, HC&S and Wailuku Sugar Company were actively competing for cane lands and water rights, which competition spawned years of litigation. After many years of controversy, the two companies settled their differences through an exchange of lands and other property rights and an agreement on the sharing of water. Through the West Maui Irrigation System, Wailuku Sugar Company and HC&S have irrigated their respective cane fields in the central Maui isthmus.

Within the West Maui Irrigation System, the two primary ditches are Waihe`e Ditch and Spreckels Ditch.

Waihe`e Ditch Upstream of Hopoi Chute. Water from Waihe`e Stream is diverted into the Waihe`e Ditch. An amount of water determined by WWC to be necessary for it to service kuleanas in Waihe`e Valley is dropped into Spreckels Ditch, from where it is then directed into the ditch that services the kuleanas. Water from the northern tributary of Waiehu Stream is diverted into North Waiehu Ditch, from which various other kuleanas served by WWC withdraw water. Any excess water remaining in North Waiehu Ditch is fed into Waihe`e Ditch. `Iao Stream is diverted into the `Iao-Maniania Ditch, which services various kuleanas and other WWC customers. Any excess water remaining in the `Iao-Maniania Ditch is fed into the Waihe`e Ditch. At Hopoi, some or all the water in the Waihe`e Ditch at that point can be diverted via the Hopoi Chute Ditch into HC&S's Waiale Reservoirs. Any water not diverted into the Hopoi Chute Ditch remains in the Waihe`e Ditch.

From the early 1900s to 1988, the Waihe`e Ditch water was shared between WWC and HC&S in accordance with the following allocation: 7/12 to WWC and 5/12 to HC&S. This was administered by WWC opening the gate to the Hopoi Chute Ditch from 7:00 p.m. to 5:00 a.m. and closing it from 5:00 a.m. to 7:00 p.m. daily. After 1988, however, when WWC's predecessor stopped cultivating sugar cane thus minimizing WWC's need for water downstream of the Hopoi Chute, WWC generally left the gate open and the water formerly used by WWC has flowed into the Waiale Reservoirs for use by HC&S.

Waihe`e Ditch Downstream of Hopoi Chute. `Iao Stream is also diverted into the `Iao-Waikapu Ditch, which services some of WWC's customers. Any excess water remaining in the `Iao-Waikapu Ditch is fed into the Waihe`e Ditch downstream of the Hopoi Chute. HC&S obtains water from this portion of the system to irrigate sugar cane on fields that HC&S either owns or leases from third parties. (This use is the subject of another water use permit application.)

Spreckels Ditch: Waihe`e Stream to South Waiehu Stream. The Spreckels Ditch diversion on Waihe`e Stream feeds water directly into Spreckels Ditch. At a point downstream of this diversion, as noted above, WWC drops an amount of water determined by WWC to be necessary to service kuleanas in Waihe`e Valley from Waihe`e Ditch into Spreckels Ditch, from which it can be directed into the ditch that services the kuleanas.

From the early 1900s to 1988, when WWC's predecessor stopped cultivating sugar cane, the Waihe`e Stream water collected in Spreckels Ditch where, after satisfying kuleana users, the water was shared equally between WWC and HC&S. This was administered by WWC closing its intakes off of the ditch that fed its reservoirs and fields below the Spreckels Ditch from 7:00 p.m. to 7:00 a.m. daily. After 1988, however, the water previously taken by WWC and not delivered to kuleana or other users has flowed down into the Waiale Reservoirs for use by HC&S.

Spreckels Ditch: South Waiehu Stream to Waiale Reservoir. HC&S diverts water from South Waiehu Stream via a stream diversion and short ditch that transports the diverted water into

the Spreckels Ditch. Downstream of the South Waiehu intake, HC&S has a ground water development tunnel (Well No. 5330-02) which draws `Iao Ground Water Management Area High-Level Source Water into Spreckels Ditch via an underground network of pipes and tunnels. HC&S has filed a separate WUPA for Well No. 5330-02. Further downstream in the Spreckels Ditch, HC&S diverts `Iao Stream water into the Spreckels Ditch. Water from Spreckels Ditch is deposited into the Waiale Reservoirs for use by HC&S.

Waiale Reservoirs. From the Waiale Reservoirs, HC&S distributes water to approximately 4,408 acres through irrigation ditches and pipes owned, operated, and maintained by HC&S. Most of this land is planted in sugar cane, but approximately 600 acres are utilized for other agricultural purposes by Monsanto Company, which leases the land from HC&S.

### **III. CRITERIA FOR EXISTING USE PERMIT**

To obtain a water use permit for existing uses, HC&S must demonstrate that the use (1) was existing as of the effective date of designation and (2) is reasonable-beneficial. HRS § 174C-50(b). Case law further dictates that an analysis of alternative sources is required in determining whether a use is reasonable-beneficial.

#### **A. Existing Use on Date of Designation**

April 30, 2008 is the date of designation of Na Wai Eha as a surface water management area. For more than 100 years prior to that date, HC&S or its predecessors had been utilizing Na Wai Eha waters to grow sugar cane in the central Maui isthmus. Since 2002, Monsanto Company has been growing seed on land leased from HC&S. Monsanto currently has approximately 600 acres under lease.

##### **1. Location of Use**

The Waiale Reservoirs provide irrigation water to 4,408 acres which HC&S refers to internally as the Waihe`e-Hopoi Fields all of which are owned by HC&S except 134 acres that HC&S leases from the State of Hawaii Department of Land and Natural Resources and Department of Hawaiian Home Lands. HC&S leases 600 acres to Monsanto Company for seed cultivation and currently cultivates sugar cane on the remaining 3,808 acres.

In the past, reference to the “Waihe`e-Hopoi Fields” excluded Fields 921 and 922 because those fields were irrigated exclusively with wastewater from Maui Pineapple Company (“MPC”). After 2006, however, because of a slowdown in MPC’s canning operations, wastewater alone was insufficient to meet the irrigation needs of Fields 921 and 922 and Na Wai Eha water has since been used on these fields. Consequently, current reference to the “Waihe`e-Hopoi Fields” includes Fields 921 and 922.

HC&S plants and irrigates according to fields and not tax map keys (TMKs). Fields are not coterminus with TMKs; there may be many fields within one TMK, and in some cases, one field may straddle two TMKs. TMKs, therefore, are not the most appropriate designation for

the location of use. Instead, please refer to the attached map identifying the location of use by field numbers, with a TMK overlay. The map also identifies the land leased to Monsanto.

A modified Table 3 provides TMK, crop, and total acreage information cross-referenced to Field Numbers. (For the columns labeled “Begin Growth Period” and “End Growth Period,” see discussion in Section III.B.1.a., below. A discussion of irrigation systems and practices is contained in Section III.B.2, below.)

## 2. Amount of Use

Table 1 shows the average amount of water used to irrigate the Waihe`e-Hopoi Fields during the one-year period preceding the date of designation. These measurements were obtained by utilizing continuous gauging stations on the Waihe`e Ditch (Waihe`e Ditch at Field 63-Hopoi Station) and Spreckels Ditch (Spreckels Ditch at Waihe`e Station).

Please note that the period from May 2007 through April 2008 was an inordinately dry period during which stream flows and, thus, HC&S’s irrigation usage, were lower than normal. In every month during this period except October 2007 and January 2008, West Maui ditch deliveries to the Waiale Reservoirs were lower than the long-term average from 1993 through 2007. During three of the months in the preceding year (May and August 2007 and April 2008), ditch deliveries were lower than average by more than a third. Indeed, during that period, every county of this state was declared a drought disaster area, qualifying farmers for federal assistance from the U.S. Department of Agriculture and rainfall in parts of Maui, including central Maui, was less than half of normal. Historic records from the USGS Puu Kukui rain gauge, USGS 205327156351102, indicate the severity of the drought for this period. Consequently, the water usage data for this period understates the amount of water historically used from these four streams to grow sugar cane. Therefore, HC&S’s existing use request of 36.29 mgd exceeds the usage data for the year preceding designation that is noted in Table 1.

### **B. Reasonable-Beneficial**

“Reasonable-beneficial” is defined in HRS § 174C-3 as follows:

“Reasonable-beneficial use” means the use of water in such a quantity as is necessary for economic and efficient utilization, for a purpose, and in a manner which is both reasonable and consistent with the state and county land use plans and the public interest.

#### 1. Quantity Requested

HC&S is requesting an existing use allocation of 36.29 mgd (12-MAV). While this exceeds the approximately 31.64 mgd delivered to the Waiale Reservoirs over the last twelve months, it is less than the daily average of 39 mgd delivered to the Waiale Reservoirs from 1993 through July 2007.

The quantity requested covers existing uses: the irrigation needs of HC&S and Monsanto, water for the mill in processing cane, and system losses within the HC&S portion of the West Maui Irrigation System.

a. Sugar Cane Growth Cycles and HC&S Irrigation Practices

Sugar cane is a two-year crop. To maximize the efficiency of its harvesting and milling operations, HC&S, seeks to harvest and replant approximately half of its cultivated acres each year. The goal is to schedule the harvesting and planting operations relatively evenly over the approximately ten months that the mill is operating, which has historically been from approximately February through November of each calendar year. Harvesting and grinding typically is shut down in December and January in order to conduct maintenance and repair at the mill and to avoid the inefficiencies of harvesting when the muddiest conditions are most likely to be encountered. Accordingly, in any given month, the crop age of the sugar cane across the plantation is staggered, field by field, over the entire 24 month crop cycle as the result of this deliberate effort to maintain a consistent harvest schedule.

To cultivate sugar cane, first the land is prepared by breaking up the soil, which facilitates water movement. Then specially designed machines create furrows, inject drip irrigation tubing into the soil and drop in seed pieces. For seven to ten days after first planting, the field is watered relatively heavily to keep the seed piece moist to ensure germination. This is continued, if sufficient water is available, through the next six to eight weeks to keep away the lesser cornstalk borer (*Elasmopalpis lignosellus*) from boring into the shoots. Thereafter, water is applied in accordance with HC&S's computerized water balance model in an amount intended to match the rate of evapo-transpiration. See discussion in III.B.2, below. During the last six months before harvesting, the amount of water applied is purposely reduced to induce the plant to produce sucrose. Finally, fields are usually not irrigated at all approximately 40 to 60 days prior to harvest.

A few weeks after harvesting, the cane stumps send out new shoots (ratoons). These shoots are cultivated for the second and subsequent crops. Ratoon crops go through the same irrigation cycle.

After the ratoon crop is harvested, the land is fallowed for 15 to 30 days. At any given time, approximately 150 to 200 acres (5%) of the Waihe'e-Hopoi Fields are fallow.

Cane is normally propagated by vegetative cuttings. At about eight to nine months of age, cane stalks are mechanically cut into 12-inch sections. Each seed piece has two to three nodes from which new plants will grow. These cuttings are dipped into 122-degree water for 20 minutes (for smut control) and then into a cold water fungicide solution for one minute to prevent fungus rot of the seed.

Seed cane requires more water than crop cane because the growing cycle is shorter, resulting in three crop cycles during a 24-month period, and the absence of a "ripening" phase. At any given time, approximately 1600 acres of the Waihe'e-Hopoi Fields will be planted in seed cane.

Average Daily Water Usage. HC&S does not, in the ordinary course of its operations, calculate or use the average daily water use statistic because it can miscalculate the actual irrigation requirement of the sugarcane. HC&S's operations are geared toward meeting the specific needs of each of its fields based upon where it is in the crop cycle and real time measurements designed to monitor the soil moisture of each field on a daily basis. Irrigation water is applied based on the daily needs of each field, which frequently are dramatically higher or lower than what the daily average might be.

HC&S did, however, undertake an intensive effort to calculate the average daily use of the Waihe'e-Hopoi Fields from 2004 to 2006 for the purpose of the Na Wai Eha Contested Case Hearing pertaining to the setting of Interim Instream Flow Standards. This was done by retrieving data from HC&S irrigation database on hours of operation of the drip systems for the fields and then performing calculations based on flow rates and acres cultivated. For 2004, the average daily use for these fields was 6,395 gpad, for 2005 it was 7,831 and for 2006 it was 6,254. The average for these three years was 6,826 gpad.

HC&S believes that the average daily use from these three years is indicative of the average daily requirement for the Waihe'e-Hopoi Fields based upon the irrigation practices in place during those years (which are similar to those currently being employed) and the range of weather conditions encountered.

b. Other Agricultural Production

Monsanto Company leases approximately 600 acres from HC&S for production of seed, such as corn and soybeans. Irrigation water is provided from the Waiale Reservoirs through HC&S's irrigation system. Average water usage by Monsanto is 94,000 gpd, which, averaged over 600 acres, amounts to less than 200 gpad.

c. Puunene Mill

Puunene Mill utilizes water from multiple sources, including the Waiale Reservoirs, to wash harvested cane prior to processing and for cooling the boilers. This use is estimated to average 1.0 to 1.5 mgd, but could be as high as 8.0 mgd.

d. Measuring Point

Due to the complexity of the system - the waters from the four streams are comingled and there are intervening users along the way - HC&S proposes that its water allocation for this permit be measured as follows:

- o The amount of water entering Waiale Reservoir through Hopoi Chute measured at the Waihe'e Ditch at Field 63 (Hopoi) gauging station, plus
- o The amount of water entering Waiale Reservoir via Spreckels Ditch measured at the Spreckels Ditch at the Wailuku gauging station, less 100,000 gallons per

day of groundwater contributed by the `Iao Tunnel (assuming the requested water use permit is granted).

2. Economic and Efficient Utilization

a. Sugar Cane

The requested allocation represents the following:

- ✓ 25,993,408 gpd for the cultivation of sugar cane (6,826 gpad x 3,808 acres)
- ✓ Plus 94,000 gpd for Monsanto's uses
- ✓ Plus 1.5 mgd for mill uses
- ✓ Plus 9 mgd for system losses<sup>2</sup>
- ✓ Less 0.3 mgd obtained from alternative sources (`Iao Tunnel water and recycled MPC water)

HC&S utilizes drip irrigation for most of its fields. Drip irrigation is the most efficient irrigation technology available today. In 1986, HC&S completed a 12-year project to install a drip irrigation system across its plantation – a \$30 million investment in water efficiency that if made today would cost \$90 million. The only fields which have not been equipped with drip irrigation are those fields irrigated with recycled mill water as drip irrigation was found to be impracticable as the particulates in the recycled mill water clog up the drip tubes. Thus, where recycled mill water is used, overhead sprinklers, rather than drip irrigation, is utilized.

Section III.B.1.a., above describes the amounts of water that HC&S applies at different stages of the growth cycles of crop cane and seed cane. These figures are approximations and averages because HC&S determines irrigation needs of each field on a day-to-day basis employing a computerized water balance model, thereby ensuring the most effective and efficient use of available water. Pan ratios, established by extensive industry research and documented in Ekern and Chang<sup>3</sup> are used to estimate the amount of water required in various crop stages. The water balance model essentially calculates a water budget that accounts for “deposits” of water in the form of rainfall and irrigation and “withdrawals” in the form of evapo-transpiration. HC&S uses its water balance model as a managerial tool to determine what needs to be irrigated thus using available water resources with the greatest efficiency.

Evaporation pans used in the past have been replaced by a system of weather stations across the plantation that provide evaporation and rainfall data. Fifteen major automated weather stations situated across the plantation transmit hourly data which is used to calculate daily evaporation data using a modified Penman equation. Rainfall data is recorded daily from 41 manual gauges. Two of the weather stations and four of the rainfall stations are located in the fields irrigated with Na Wai Eha water. The evaporation and rainfall data, along with the data on the soil moisture storage values, irrigation flow rates and the number of irrigation

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<sup>2</sup> In the Na Wai Eha IIFS contested case proceedings, HC&S identified 9-12 mgd of system losses. HC&S is conservatively applying for 9 mgd for system losses in this application.

<sup>3</sup> Ekern, Paul C. and J. Chang (1985) *Pan Evaporation: State of Hawaii 1894-1983*, DLNR Division of Water and Land Development Report 74, p. 49.

hours applied for each field constitute the variables used for the water balance model. The result is the water status for each field. The model then prioritizes the field needs, indicating which field should receive water next based on the estimated soil moisture status of each field.

Adequately meeting evapo-transpiration rates has been shown to be directly correlated with crop yield potential. Ekern<sup>4</sup>, reporting on the consumptive use of water by sugarcane, found that pan evaporation alone was a suitable parameter for estimating water use by the plant. When the cane does not have adequate water, it does not grow, does not produce sugar. Hence at the time of harvest the cane has not reached its maximum growth age, which means lower sugar production. Additionally, under-irrigated cane is more susceptible to diseases, which also reduces sugar yield. Moreover, during prolonged drought conditions such as HC&S experienced over the last 15 years, replanting of harvested fields is delayed to conserve water, which then results in lost sugar production, thus reducing HC&S's total yields.

The key agronomic driver in determining sugar viability is per acre yields, which is measured in tons of sugar per acre ("TSA"). In order to remain viable, i.e., to generate sufficient revenues to carry its fixed and variable costs and return a reasonable profit on investments made in the plantation, HC&S has determined that, on a long-term basis, yields need to be between 12 and 14 TSA per crop cycle, which translates into over 200,000 tons of sugar per year given the acreage that HC&S has in cultivation.

b. Other Agricultural Production

Monsanto Company's average water usage over the approximately 600 acres that it leases from HC&S for production of seed, such as corn and soybeans, amounts to 94,000 gpd. Averaged over the 600 leased acres, this amounts to less than 200 gpad.

The low water usage reflects the practice common in the seed industry of leaving large amounts of land fallow at any given time. In the Waiahole Ditch case, the Water Commission found that Garst Seeds, which cultivates seed corn, established a reasonable-beneficial use of 600 gpad applied to all cultivated acres. That amount translated to 1800 gpad per planted acre with the assumption that only about one-third of the cultivated lands were planted at any given time.

c. Mill

Water is used at the Puunene Mill to wash the harvested cane prior to processing and for cooling the boilers. All of the water used at the mill is recycled as irrigation water. Water from the mill is transported via an open ditch to the filter station where it is filtered through sand filters. The recycled water is then distributed in nearby fields (not the Waihe'e-Hopoi Fields, which are distant to the filter station) utilizing traveling overhead sprinklers and fixed overhead sprinklers. Originally, recycled mill water was distributed directly through a drip irrigation system. However, due to difficulty filtering the water to the level suitable for drip

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<sup>4</sup> Ekern, Paul C. (1970), *Consumptive Use of Water by Sugarcane* in Hawaii Water Resources Research Center Technical Report 37, p. 58.

irrigation, HC&S invested in overhead sprinklers in order to utilize the recycled water for irrigation on select fields.

d. System Losses

HC&S's system losses amount to approximately 25 percent. Seepage from four unlined reservoirs with a surface area of 56.1 acres account for most of those losses. Evaporation from the 2.84 miles of open ditches also contributes to system losses.

The Waiale Reservoirs were constructed by HC&S in 1908 and are used to impound water for irrigation purposes. The reservoirs are earthen structures with a combined storage capacity of approximately 94 million gallons. The smaller of the two, Reservoir 74, is typically kept dry for safety reasons as it is downstream of the larger Reservoir 73 and thus provides spillover capacity in the event of flood conditions.

In the recently adopted Water Resource Protection Plan (June 2008) ("WRPP"), the Commission recognized that "[i]nfiltration is key to sustaining ground water resources. Human activities, especially agricultural and urban activities, alter infiltration and runoff patterns, affecting the components of the hydrologic cycle." WRPP at p. 3-8. Also noting that "[i]t has become difficult in recent years to construct reservoirs for surface storage of water because of environmental concerns and because of the difficulty in locating suitable sites," the WRPP suggests the use of aquifers for storage as an alternative to surface storage. WRPP at p. 3-3. Seepage from reservoirs and ditches, while denominated as system losses, contribute to recharge of the Kahului Aquifer System.

3. Consistent with State and County Land Use Plans

All of the lands that are the subject of this application are classified as Agriculture under the State land use classification and zoned for agricultural use. See Table 2.

4. In the Public Interest

a. Public Interest in Agriculture

The lands irrigated by the water sources which are the subject of this allocation application are an integral part of HC&S's approximately 35,000-acre sugar plantation, the sole surviving sugar plantation in Hawaii and the largest single agricultural operation in the State (in terms of acreage and number of employees).

Agriculture is clearly in the public interest. Article XI, § 3 of the state constitution states:

The State shall conserve and protect agricultural lands, promote diversified agriculture, increase agricultural self-sufficiency and assure the availability of agriculturally suitable lands.

Moreover, the State Water Code specifically declares that the use of water for “irrigation and other agricultural uses” is in the public interest. HRS § 174C-2(c).

b. Economic Importance of HC&S

According to Wilcox, “[t]he sugar industry was the prime force in transforming Hawaii from a traditional, insular, agrarian, and debt-ridden society into a multicultural, cosmopolitan, and prosperous one.” Wilcox, *Sugar Water: Hawaii’s Plantation Ditches* (1997) at 2.

Although Na Wai Eha water is used to irrigate only a portion of the plantation, the economic importance of HC&S is relevant to this application because key to HC&S’s viability is economies of scale.

With approximately 800 full time workers, HC&S is one of the largest employers on Maui. EMI employs another 17 workers. About 650 HC&S employees are unionized and both HC&S and EMI enjoy low turnover rates. HC&S provides over \$47 million annually in wages and benefits to its Maui resident employees, and another \$5 million annually in benefits to over 900 HC&S retirees.

HC&S provides high quality job opportunities for positions such as farm supervisors, managers, research scientists, mechanics, welders, mill workers, machinery operators, and technicians. HC&S has also created many quality jobs for high school graduates through its apprenticeship program. Many of these individuals have gone on to secure jobs in other industries.

With its ‘buy local first’ policy, HC&S purchases services and goods from many other businesses and support industries in Hawaii. Each year, HC&S spends more than \$100 million in the domestic economy, primarily on Maui.

c. Contributions to Energy Independence

HC&S generates its own electrical power. It is 100% energy self-sufficient and also provides 7% of the power sold by the local utility, Maui Electric Company—power generated primarily from renewable resources.

HC&S’ power is generated principally through a combination of burning of bagasse and other supplemental fuels (needed to provide year-round ‘firm power’ to MECO, as explained below, during times when bagasse is not available) in its power plant and the operation of its hydropower turbines on its East Maui Irrigation System. The total power generation capacity of HC&S’s combined system is 36 MW during cane grinding periods (30 MW from steam and 6 MW from hydropower).

HC&S has a firm power contract with Maui Electric Company (“MECO”) pursuant to which HC&S is obligated to supply to MECO 12 MW of power from 7:00 a.m. to 9:00 p.m. daily except Sunday, and 8 MW at all other times. Continued power production by HC&S from the burning of bagasse is an important part of MECO’s plan to reduce dependence on fossil fuels.

Power produced by HC&S is also critical to MECO because it is firm power. Other forms of alternative energy, such as solar and wind power, cannot be consistently relied upon, and therefore, require standby generating capacity. This means that MECO needs to have on hand the ability to generate power whenever the solar and wind generating facilities are not producing. HC&S, with its firm power contract, provides this standby power. Reducing the amount of power provided to MECO and the Maui community would be counterproductive to the State's policy as articulated in the Hawaii Clean Energy Initiative of reducing the state's dependence on fossil fuels, developing renewable energy sources and increasing Hawaii's energy self-sustainability.

### C. Alternative Sources

#### 1. HC&S Well No. 7

Prior to the closure of Wailuku Sugar in 1988, when HC&S's share of the West Maui Irrigation System water was much less, HC&S pumped brackish ground water from Well No. 7 to irrigate some of the Waihe'e-Hopoi Fields. As presently configured, Well No. 7 can be utilized to pump 14 mgd into HC&S's internal ditch system for use on all the Waihe'e-Hopoi Fields with the exception of Field 715. The additional infrastructure necessary to pump to Field 715 is estimated to require a capital investment of \$475,000. With the addition of a booster pump and related infrastructure, at an additional capital cost estimated to be \$525,000, this could be increased to 28 mgd. Resumption of pumping from Well No. 7 as an alternative to the use of surface water has the following drawbacks and limitations.

Financial Impacts. As presently configured, to pump 14 mgd of irrigation water from Well No. 7 for the Waihe'e-Hopoi Fields would require 12 megawatt hours per day (24 hrs x .5 MW per hr). If HC&S had to replace more than 14 mgd for the Waihe'e-Hopoi Fields, it would have to increase the pumping of Well No. 7 from 14 to 28 mgd due to the size of the installed pumps and the power requirement would double. HC&S does not consistently have sufficient surplus power to run Well No. 7 given its total generating capacity of 30-36 MW (depending on ditch flows and the resulting amount of hydropower available), and its own internal needs of 14 MW and its obligation to provide MECO with 12 MW of power from 7:00 a.m. to 9:00 p.m. daily except Sunday, and 8 MW at all other times. When the power is available, reducing the amount of power provided to MECO would nevertheless be counterproductive to the State's policy of reducing reliance on fossil fuels, developing clean renewable energy sources and increasing our energy self-sustainability. And, because MECO relies on HC&S for firm power, the contract between MECO and HC&S provides for significant monetary penalties when power supply obligations are not met as would be the case should HC&S have to devote more power to pumping Well No. 7. Additionally, the revenues derived from power sales under the MECO contract is a very important factor in the continued economic viability of HC&S.

In addition to the additional power costs (or lost revenues) to operate Well No. 7, significant capital costs could be involved if substitute water is needed for Field 715 (\$475,000 for a distribution pipeline), for replacement needs beyond 14 mgd (\$525,000 for a booster pump

and other infrastructure). Should HC&S be unable to consistently provide the necessary power itself and needed to rely upon purchasing power from MECO, upgrades to HC&S's pumps and equipment would be required that have been estimated to require an additional capital investment of \$777,650.

Lastly, the brackish quality of ground water pumped from Well No. 7 could, over time, have a negative effect on sugar yields because the salt content in the water causes the cane plant to store salt which, in turn reduces the plant's capacity for storing sugar. Additionally, levels of magnesium salts exceed the concentration of calcium in these waters. Constant use of Well No. 7 water without regular remediation will result in massive soils with a cloddy texture, which is not conducive to capillary water movement. Unless calcium is applied on a regular basis, the result will be an artificial deficiency of potassium in the plant. Productivity for fields regularly receiving Well No. 7 water will therefore depend on additional expenditures for application of gypsum on a regular basis. Reduced yields and/or resulting increased costs to mitigate directly affect the economic viability of HC&S, especially as a disproportionately high number of the highest yielding fields are located in the region supplied with Na Wai Eha waters.

In order to compensate for the effects of irrigating with pumped brackish water, an additional amount of water above that needed to reach 100% soil moisture storage would periodically need to be applied to flush the salts from the sugarcane plant's root zone. Consistent use of water from Well No. 7 therefore would require the use of an additional amount of ditch water in order to mitigate the impact on yields.

For the foregoing reasons, ground water pumped from Well No. 7, while physically feasible, is not a preferred alternative source to ditch water for irrigating the Waihe'e-Hopoi Fields. Impacts involve either immediate and significant increased costs and/or decreased revenues for HC&S.

## 2. Recycled Process Water from HC&S's Puunene Mill

HC&S recycles the process water from its Puunene Mill for re-use as irrigation water. In 1997, HC&S embarked on a project to use reclaimed process water from the Puunene Mill for certain fields in Puunene and Paia via drip irrigation. The project ran into difficulties in filtering the water to the level suitable for drip irrigation (so particulates did not plug up the drip tubing); the high nitrogen content of the water, which interfered with ripening of the cane; high cost of maintenance and repairs; and declining yields. Due to these problems, HC&S had to invest in overhead sprinklers to utilize the mill water in fields near the mill and the filter station. While the Waihe'e-Hopoi Fields do not utilize any of the recycled mill water, it is mentioned here to make clear that the mill water is not available to reduce the amount of water requested in this application.

## 3. Recycled Wastewater from Maui Pineapple Company

Maui Pineapple Company transports wastewater from its cannery facility to HC&S Fields 921 and 922. The amount of recycled wastewater available from this source has varied widely

through the years, ranging from a high of 848.5 million gallons in 2005 (average 2.3 mgd) to a low of 153.8 million gallons in 2008 (average 420,000 gpd). The shutdown of the canning operation will reduce the amount of wastewater available in the future even lower, by approximately one-half of 2008 levels. The amount of water requested by this application therefore assumes that 200,000 gpd of recycled wastewater from MPC will continue to be available.

#### 4. Recycled County Wastewater

There is no existing infrastructure to deliver recycled wastewater from the County's Kahului Wastewater Treatment facility to HC&S's fields. The cost of constructing such infrastructure would be cost-prohibitive for HC&S. Additionally, because the County wastewater treatment facility is a secondary treatment facility, the organic material that remains in the wastewater would negatively impact ripening sugar cane fields. The negative attributes will reduce yields and add cost to the current operations.

#### 5. Desalinization

There are no desalinization plants on Maui. Given current technology and power costs, it would be cost-prohibitive to desalinate water for irrigation of sugar crops.

#### 6. Other HC&S Wells

HC&S operates a number of wells that supplement surface water from the East Maui Irrigation System. These wells (except Well No. 7, discussed above) are not alternative sources to Na Wai Eha water as existing gravity flow dependent infrastructure feeds this water to HC&S's eastern fields, not to the Waihe'e-Hopoi Fields. The cost of constructing the infrastructure to pump water from these brackish wells uphill to west side fields would be cost-prohibitive to HC&S. Moreover, the parts of the plantation serviced by the EMI System are already water short and cannot afford to lose this secondary groundwater source.

### IV. CONCLUSION

Based on the foregoing, HC&S respectfully requests a water use permit allocating 36.29 mgd of surface water collected from the Na Wai Eha surface water management area through the West Maui Irrigation System for existing agricultural uses on HC&S's Waihe'e-Hopoi Fields.

**SURFACE WATER USE PERMIT APPLICATION  
EXISTING USE (NA WAI EHA, MAUI)**

**TABLE 1: 12-MONTH AVERAGE DAILY USE**  
**Measured or Calculated Use of Water at the Source: (Check one)  Stream  Ditch  Auwai**  
**As of the Effective Date of Designation, April 30, 2008**

MONTH / YEAR	AVERAGE DAILY USE FOR THE MONTH IN GALLONS PER DAY (GPD)	Check one item per box				OTHER Please describe
		METERED	ESTIMATED	ACTIVE BUT UNKNOWN	INACTIVE	
May 2007	23.41 mgd	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	HC&S operates two continuous gauging stations to record the aggregate flow of water from Waihee, North and South Waiehu and Iao Streams. The Waihee Ditch at Field 63 (Hopoi) gauging station is located on the Waihee ditch and the Spreckels Ditch at Wailuku gauging station is located on the Spreckels Ditch. Both of these gauging stations are located to the South of Iao Stream. The water that is gauged goes to HC&S Reservoir 73. The average daily use as indicated on Table 1 is in million gallons per day (mgd).
June 2007	16.67 mgd	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
July 2007	41.90 mgd	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
August 2007	28.66 mgd	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
September 2007	35.33 mgd	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
October 2007	40.48 mgd	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
November 2007	36.40 mgd	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
December 2007	33.18 mgd	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
January 2008	33.59 mgd	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
February 2008	28.32 mgd	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
March 2008	32.42 mgd	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
April 2008	29.32 mgd	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
<b>SUM OF AVERAGE DAILY USE FOR THE MONTH</b>	379.68 mgd					
<b>AVERAGE DAILY USE (Average of the above)</b>	31.64 mgd					

**Table 2: Land Use Consistency/Efficiency - Hopoi**

Land Use Consistency						Efficiency of Use
1. Purpose Water Use Category	2. Use TMK	3. State Land Use District	4. CDUP Required	5. County Zoning Code	6. SMAP Required	See Attached Narrative
AGRCP	3-8-005:002	Agriculture	No	Agriculture	No	
AGRCP	3-8-005:003	Agriculture	No	Agriculture	No	
AGRCP	3-8-005:017	Agriculture	No	Agriculture	No	
AGRCP	3-8-005:018	Agriculture	No	Agriculture	No	
AGRCP	3-8-006:001	Agriculture	No	Agriculture	No	
AGRCP	3-8-006:003	Agriculture	No	Agriculture	No	
AGRCP	3-8-008:008	Agriculture	No	Agriculture	No	
AGRCP	3-8-008:035	Agriculture	No	Agriculture	No	
AGRCP	3-8-008:036	Agriculture	No	Agriculture	No	

**Table 3: Irrigation Information - Hopoi**

1. Use Tax Map Key (TMK)	2. Crop	3. Total Acreage	4. Net Irrigated Acreage	Field Numbers	Irrigation System and Practice
3-8-005:002	Sugar Cane	4409.077	<b>See Attached Hopoi Field Acreage</b>	902 (portion), 903, 904 (portion), 905, 906, 909, 910, 913 (portion), 919, 921, 922	<b>See Attached Narrative</b>
3-8-005:002	Seed Production - Corn, soybeans	4,409.077		904 (portion), 908, 913 (portion)	
3-8-005:003	Sugar Cane	432.287		907, 918 (portion)	
3-8-005:017	Sugar Cane	22.210		918 (portion)	
3-8-005:018	Sugar Cane	0.070		902 (portion)	
3-8-006:003	Sugar Cane	1255.251		715, 716, 718, 719	
3-8-008:008	Sugar Cane	6.926		912 (portion)	
3-8-008:035	Sugar Cane	97.433		912 (portion)	
3-8-008:036	Sugar Cane	80.000		912 (portion)	
3-8-006:001	Processing	N/A		Puunene Mill	

### Tax Map Key of Stream Diversion Location - Hopoi

<b>Stream</b>	<b>Ditch Diversion</b>	<b>Tax Map Key</b>
Waihee	Waihee	3-2-014:001
Waihee	Spreckels	3-2-014:001
North Waiehu	North Waiehu	3-2-014:001
South Waiehu	Spreckels	3-2-017:018
lao	lao Maniania	3-3-003:003
lao	lao Waikapu	3-3-003:003
lao	Spreckels	3-4-017:139

### Hopoi Fields

<b>Field Number</b>	<b>Cane Acres</b>	<b>Monsanto Leased Acres</b>	<b>Total Acres</b>
715	174.5		174.5
716	143.3		143.3
718	371.6		371.6
719	243.0		243.0
902	292.7		292.7
903	365.6		365.6
904	71.1	240.1	311.2
905	154.8		154.8
906	348.8		348.8
907	184.2		184.2
908		245.5	245.5
909	260.1		260.1
910	260.4		260.4
912	134.0		134.0
913	281.5	114.6	396.1
918	98.6		98.6
919	122.4		122.4
921	138.4		138.4
922	163.2		163.2
<b>Total</b>	<b>3808.2</b>	<b>600.2</b>	<b>4408.4</b>



Iao Maniania Ditch Gauge



Iao Waikapu Ditch Gauge



Waihee Ditch Intake North



Waihee Ditch Intake South



South Waikapu Intake



South Waikapu Ditch Gauge



Iao Intake



North Waiehu Ditch Intake



Spreckels Ditch Intake



Waihee Ditch Gauge



Spreckels Ditch Gauge



Reservoir #6 Intake

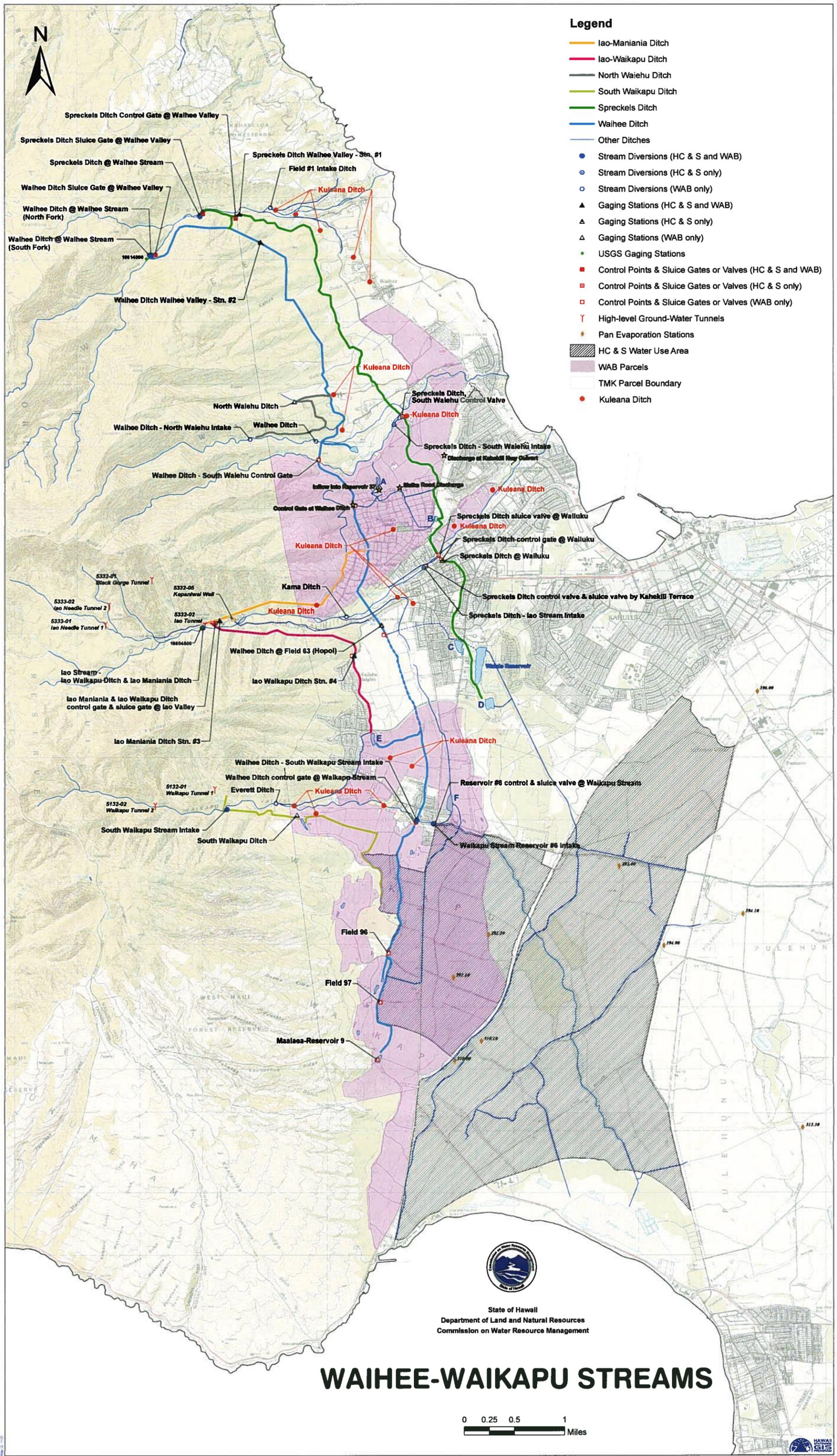


Waihee Ditch Intake on Waikapu Stream



**South Waiehu Stream Diversion to Spreckels Ditch**





**Legend**

- Iao-Maniania Ditch
- Iao-Waikapu Ditch
- North Waiehu Ditch
- South Waikapu Ditch
- Spreckels Ditch
- Waihee Ditch
- Other Ditches
- Stream Diversions (HC & S and WAB)
- Stream Diversions (HC & S only)
- Stream Diversions (WAB only)
- ▲ Gaging Stations (HC & S and WAB)
- ▲ Gaging Stations (HC & S only)
- ▲ Gaging Stations (WAB only)
- USGS Gaging Stations
- Control Points & Sluice Gates or Valves (HC & S and WAB)
- Control Points & Sluice Gates or Valves (HC & S only)
- Control Points & Sluice Gates or Valves (WAB only)
- Y High-level Ground-Water Tunnels
- ◆ Pan Evaporation Stations
- HC & S Water Use Area
- WAB Parcels
- TMK Parcel Boundary
- Kuleana Ditch



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

# WAIHEE-WAIKAPU STREAMS

