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COMMISSION ON WATER RESOURCE MANAGEMENT

OF THE STATE OF HAWAII

PETITION TO AMEND INTERIM INSTREAM FLOW STANDARDS FOR HONOPOU, HUELO (PUOLUA), HANEHOI, WAIKAMOI, ALO, WAHINEPEE, PUOHOKAMOA, HAIPUAENA, PUNALAU/KOLEA, HONOMANU, NUAAILUA, PIINAAU, PALAUHULU, OHIA (WAIANU), WAIOKAMILO, KUALANI, WAILUANUI, WEST WAILUAIKI, EAST WAILUAIKI, KOPILIULA, PUAKAA, WAIOHUE, PAAKEA, WAIAAKA, KAPAULA, HANAWI, AND MAKAPIPI STREAMS	Case No. CCH-MA-13-01 HAWAIIAN COMMERCIAL AND SUGAR COMPANY'S BRIEF IN SUPPORT OF ITS SUBMISSION OF PROPOSED FINDINGS OF FACT AND CONCLUSIONS OF LAW; CERTIFICATE OF SERVICE Hearing Officer: Dr. Lawrence Miike

HAWAIIAN COMMERCIAL AND SUGAR COMPANY'S BRIEF IN SUPPORT OF ITS SUBMISSION OF PROPOSED FINDINGS OF FACT AND CONCLUSIONS OF LAW

Pursuant to Minute Order 15, Hawaiian Commercial and Sugar Company submits its Brief in Support of Proposed Findings of Fact and Conclusions of Law.

DATED: Honolulu, Hawai'i, October 2, 2015.

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HAWAIIAN COMMERCIAL AND SUGAR COMPANY'S BRIEF IN SUPPORT OF ITS SUBMISSION OF PROPOSED FINDINGS OF FACT AND CONCLUSIONS OF LAW

I. SUMMARY OF ARGUMENT

Hawaiian Commercial and Sugar Company ("***HC&S***") submits its brief in support of the Proposed Findings of Fact and Conclusions of Law submitted herewith (the "***HC&S' Proposed Findings***").

At the outset, it should be noted that this proceeding arises out of the decision by the Hawai`i Supreme Court that the petitioners were entitled to contested case proceedings. That decision vacated the interim instream flow standards ("***IIFS***") established by the Commission on Water Resources Management ("***CWRM***") in 2008 and 2010 on procedural grounds, and not on the merits of the 2008 and 2010 IIFS. In other words, the court did not hold that the 2008 and 2010 IIFS for the 27 East Maui streams were inadequate to meet the criteria or standards for IIFS or were violative of the public trust. Notwithstanding the vacation of the 2008 and 2010 IIFS, those decisions have already been implemented, and continue to be implemented, by HC&S.

After extensive review of hundreds of exhibits and fifteen days of testimony, it is even clearer that the prior IIFS decisions of CWRM represent the proper balance between instream values and noninstream uses that best serves the public interest. Accordingly, the prior decisions remain should be adopted herein.

II. ARGUMENT

A. CWRM Must Give Adequate Consideration to the Economic and Public Interest Repercussions of Reducing Surface Water Diversions from East Maui Streams.

1. The availability of East Maui surface water for irrigation of sugarcane is of substantial importance to the viability of HC&S.

In setting IIFS, CWRM is required to "weigh the importance of the present or potential instream values with the importance of the present or potential uses of water for noninstream

purposes, including the economic impact of restricting such uses[.]" HRS § 174C-71(2)(D). Because HC&S is one of the largest employers on the island of Maui, a significant purchaser of services and goods on-island and in the State of Hawai'i, and a strong supporter of charitable and community organizations on Maui, it is imperative that CWRM give adequate consideration to the economic and public interest repercussions of reducing the amount of surface water available to HC&S for irrigation.

Sugar production is one of the factors critical to the economic viability of HC&S that HC&S is able to manage. (FOF 672) Sugar production is influenced by yield per acre and acreage harvested. Of the two, yield per acre is more critical than acreage harvested. The key agronomic driver in determining sugar production is per acre yields, measured in Tons of Sugar per Acre ("***TSA***"). (FOF 672) On a long term basis, sustainable yields should 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. HC&S needs to achieve yields in this range to generate sufficient revenues to carry its fixed and variable costs and return a reasonable profit to its shareholders. (FOF 673) The single most important variable affecting yields per acre is the amount of irrigation water available to HC&S. (FOF 674) Sugar yields increase as water application to the cane plant increases. (FOF 631) Conversely, the loss of a significant amount of irrigation water will result in lower sugar yields. (FOF 674)

HC&S already operates on less than the optimal amount of water needed for the East Maui Fields. Contrary to Nā Moku's arguments that EMI has progressively taken more water over time, EMI deliveries of surface water to HC&S have trended downward over time. Over its history, the long-term average of EMI deliveries to HC&S has been approximately 165 million gallons per day ("***mgd***"). In the ten-year period from 1925 to 1934, the average deliveries to

HC&S at the Maliko Gulch boundary were 173 mgd. For the ten-year period from 1964 to 1975, the average deliveries were 160 mgd. In the ten-year period from 2004 through 2013, the average deliveries dropped to 126 mgd.[1] (FOF 622)

HC&S regularly operates at a total water deficit for the East Maui Fields. Based on monthly averages, the only months HC&S has had adequate water over the long term have been November and December. (FOF 634) According to HC&S' modified Penman equation for evapotranspiration, HC&S' daily irrigation requirements are 5,146 gallons per acre per day ("***gpad***"). (FOF 629.H) For the 24-year period from 1986 to 2009, HC&S has been operating on 85% of its water needs for the East Maui Fields. Based on average need of 270 mgd, the plantation's water demands are not met 10 months out of the year. Only during the winter months of November and December are the water needs of the plantation satisfied with available water. (FOF 628) More recent data continue to show that HC&S is not generally able to fully satisfy its irrigation requirements for the East Maui Fields. For the six-year period from 2008 to 2013, HC&S operated at an average of 89% of its required irrigation. (FOF 629)

2. HC&S' system losses are reasonable.

HC&S' estimated system losses are well within the range of losses expected of systems of similar size and type. Because direct measurement of seepage and evaporation losses is impractical to do on a large scale, HC&S estimated its system loss rate by calculating the amount of available to it, including both surface water and pumped groundwater, that it does not utilize

[1] MT suggested at the hearing that HC&S has concealed from CWRM the water that EMI diverts west of Honopou to Maliko Gulch. The suggestion is baseless. In response to a CWRM request for information on HC&S' monthly water needs, HC&S wrote a letter dated March 19, 2010—before CWRM made its IIFS decisions for the 19 East Maui streams on May 25, 2010—attaching a report of average surface water delivers at Maliko Gulch. *See* Exh. C-71 (Exh. G-1 thereto); Volner, Tr., 3/23/15, p. 11, l. 12 to p. 14, l. 4.

for irrigation or other operations.[2] (FOF 637, 638) For the period of 2008 to 2013, HC&S' system losses totaled an average of 15,206 mg per year, which represents 22.7% of the total amount of surface water and pumped ground water available to HC&S during the same six-year period.[3] (FOF 637)

To obtain a benchmark against which the estimated 22.7% loss rate could be compared, HC&S consulted the National Engineering Handbook published by the Soil Conservation Service of the U.S. Department of Agriculture ("***USDA***"), which provides seepage rate factors that can be applied to various sections of the HC&S system. HC&S calculated the average surface area under water for each type of material that holds or conveys the water (i.e., lined concrete ditch or unlined reservoirs). For each type of material, HC&S selected a relatively low seepage factor along with a relatively high seepage factor from the National Engineering Handbook and applied each factor to the estimated surface area under water to calculate what would represent low seepage loss and high seepage loss in the HC&S system per USDA standards. Based on the foregoing calculations, a low seepage loss per day in the HC&S system was estimated to be 30.75 mgd, or 16.76% of average daily water deliveries of surface water and groundwater of 183.48 mgd; a high seepage loss per day was estimated to be 65.06 mgd, or 35.46% of average daily water deliveries. (FOF 638) HC&S then calculated average daily evaporation from the surface of the water contained the same ditches and reservoirs by multiplying the average daily evaporation rate of 0.40 acre-inches by the average daily surface area of the water in the HC&S system (243.48 acres), which yielded an average daily

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[2] The majority of the EMI Ditch system is lined, so system losses experienced by HC&S occur primarily within the HC&S irrigation and reservoir system. (FOF 600)

[3] System losses include water lost due to seepage, evaporation, back-flushing of filters, drip tube ruptures or breaks, animal damage, and pipeline breaks. (FOF 637)

evaporation loss rate of 2.64 mgd. This was added to the high and low seepage loss factor calculations, yielding an estimated range of losses from seepage and evaporation of from 33.40 mgd (18.20% of average water deliveries) to 67.70 mgd (36.90% of average water deliveries). (FOF 639) The midpoint of this range is 27.55% of average water deliveries. HC&S' estimated system loss rate of 22.70% falls below this average. (FOF 640) In sum, HC&S' system losses are not unreasonably high per national standards.

It is important to remember that the amount of water "lost" to the ground water aquifers due to infiltration from unlined reservoirs is a function of the size of the reservoir and underlying geology, as well as the water level in the reservoir and the duration that the water remains in the reservoir. Most losses due to infiltration occur in times of high rainfall, when the water levels in the reservoirs are higher, and water sits in the reservoirs for a greater length of time. Conversely, during the summer season, it is infrequent that water availability exceeds the needs of the crop, and thus, there is rarely water to store. When reservoir levels are low and water does not remain long in the reservoirs, infiltration would be less than average. (FOF 641)

Reducing HC&S' system losses would be prohibitively expensive. In or around 2010, HC&S obtained a quote for installation of polypropylene lining of $4/square foot. Based on this quote, it would cost approximately $43.5 million to line HC&S' 31 unlined reservoirs. (FOF 634) It would not be cost-beneficial to incur such a large expense to reduce below-average system losses.

Lining HC&S' reservoirs would also be of limited effectiveness in making more water available to enhance instream values. Water loss due to infiltration from unlined reservoirs occurs mostly during times of high rainfall, when there is enough water to store in the reservoirs. In times of low flow, when reservoir levels are low and water does not remain long in reservoirs,

infiltration would be less than average. Therefore, lining the unlined reservoirs would not significantly reduce system losses under low flow conditions when water is most scarce. (FOF 641)

Moreover, lining HC&S' reservoirs would eliminate the benefit of recharge of the groundwater aquifers underlying the reservoirs. HC&S withdraws water from such aquifers to supplement surface water supplies. (FOF 642) The relationship between surface water infiltration into the ground and aquifer recharge is well-documented by, among other things, a 2014 USGS study and the State Water Resource Protection Plan. (FOF 642.B and 642.C) It is also noteworthy that land licenses issued to EMI by the state in the 1950s and 1960s contained provisions allowing EMI to discharge water into "gulches, reservoirs and other places approved by the Territorial Hydrographer" for the express purpose of "replenishing the ground water resources of the Central Maui area . . . ." (FOF 642.A) That such a provision was included in the land licenses underscores the point that surface water infiltration is not inherently wasteful because it replenishes groundwater resources.

HC&S is cognizant of the Hearings Officer's comments to the effect that the Hawai'i Supreme Court in the Waiāhole cases rejected aquifer recharge groundwater recharge as a justification for system losses.[4] Respectfully, the Hawai'i Supreme Court did not clearly articulate such a rule.

The Hearings Officer's comments appear to refer to the holding in *Waiāhole II* reversing

[4] At the evidentiary hearing in this proceeding, Dr Miike remarked: "Wait, wait. Whether or not that seepage does recharge the aquifer is a separate question about whether that's a reasonable and beneficial use. That's what the Waiahole case said." Hearings Officer, Tr., 3/30/15, p. 188, ll. 4-8. Further, the minutes of the CWRM meeting held on December 17, 2009 state: "Dr. Miike noted that the argument regarding system losses being used to recharge the aquifer was made and lost in the Waiāhole case by Waiāhole Water Company; so, they were mandated to take reasonable steps to mitigate those losses." Exh. C-103, p. 9.

CWRM's grant of a use permit for system losses to Agribusiness Development Company ("***ADC***"), the successor in interest to Waiāhole Irrigation Company. CWRM's findings did not convince the Court that ADC met its burden of demonstrating reasonable-beneficial use based, particularly because CWRM determined that 1.5 mgd of the 2.0 mgd requested in ADC's application were probably due to leakage and seepage, and ADC had not addressed the feasibility and costs of relining the unlined portion of its ditch and/or two reservoirs. The Court thus invalidated the permit issued to ADC. *See In re Water Use Permit Applications*, 105 Hawai'i 1, 27, 93 P.3d 643, 669 (2004).

The above holding is inapposite to the instant proceeding for two reasons. First, the holding pertains to the reasonable-beneficial use standard applicable to water use permit applications, which are not at issue in this proceeding. Second, the holding did not explicitly preclude CWRM from considering the impact of seepage on aquifer recharge as a factor in determining the reasonableness of system losses. Aquifer recharge was not one of the reasons upon which CWRM based its decision to issue a water use permit to ADC. As such, the Court had no occasion to decide whether aquifer recharge could validly be considered as a factor in assessing the reasonableness of system losses.

3. HC&S lacks reasonable alternative water sources.

The Hawai'i Supreme Court teaches that the availability of alternative water sources is a consideration in the weighing of the relative "importance" of instream values with the "importance" of noninstream purposes because the availability of alternative sources diminishes the importance of diverting stream water for noninstream use. *See In re 'Īao Water Management Area High-Level Source Water Use Permit Applications*, 128 Hawai'i 228, 259, 287 P.3d 129, 160 (2012) ("***Nā Wai 'Ehā***"); HAR § 13-169-40(c).

a. Increased groundwater pumping

Of the 30,000 acres comprising the East Maui Fields of the HC&S plantation, 17,200 acres can be irrigated with well water. However, the irrigation needs of all these fields cannot be satisfied solely with pumped groundwater. (FOF 644) HC&S lacks the infrastructure to service the remaining 11,800 acres of the East Maui portion of the HC&S plantation with pumped groundwater on a consistent basis. Groundwater can be delivered to 7,000 acres via a shared pipeline that serves as a penstock line for a hydroelectric unit for the majority of the year. This pump system was designed and built to be an emergency water source that diverts primary groundwater currently being used at the Lowrie Ditch to a higher elevation in the event of extreme drought. As such, the electrical requirements to use this pump system are extremely high, and use of the system would reduce overall groundwater availability on a per acre basis for the plantation. (FOF 645)

Increased groundwater pumping coupled with a reduction in surface water importation would also likely result in degradation of the aquifer and an increase in salinity levels. Rising salinity levels have been demonstrated to be correlated to increased reliance on pumped groundwater. (FOF 646)

b. Recycled wastewater

Recycled wastewater is not a viable alternative water source for irrigation of the East Maui Fields in the immediate future because it is speculative whether the infrastructure and upgrades to the Kahului Wastewater Reclamation Facility ("***Kahului WWRF***") necessary for the County of Maui to provide such water to HC&S will be built. HC&S prefers R-1 water (i.e., recycled water that is at all times oxidized, filtered, and then exposed to a high level of disinfection) due to its user flexibility and concerns about workers coming in direct contact with the recycled water. (FOF 648) Seed cane is the best use of recycled water because nitrogen

present in recycled water can reduce sugar yields in mature cane if recycled water is used at 100% concentration. (FOF 650) The most desirable location for HC&S to use recycled water would be in the vicinity of Maui Lani towards Maalaea where seed cane is cultivated. (FOF 651)

The Kahului WWRF currently produces R-2 recycled water. (FOF 647) According to the "Central Maui Recycled Water Verification Study" published by the Maui County Council in 2010 (the "***Verification Study***"), certain upgrades would need to be installed to upgrade the Kahului WWRF to R-1 water capability. The estimated cost of the upgrades is $4.97 million. (FOF 651) The Verification Study analyzed three options for distribution of R-1 water after the upgrade of the Kahului WWRF to R-1 water capability is complete. None of the options would entail distributing recycled wastewater for use by HC&S on its East Maui Fields. Option 3 would develop a distribution system from the Kahului WWRF to HC&S where R-1 water could be used for agriculture irrigation on HC&S' West Maui fields. An abbreviated version of Option 3 (Option 3A) would create a dedicated system that would only serve HC&S by constructing only enough R-1 pipe along Kaahumanu Avenue to reach the existing Maui Land and Pineapple pipelines. The estimated cost of Option 3 is $1.85 million, and the estimated cost of Option 3A is $11.38 million. (FOF 652)

Before Option 3 or Option 3A can be built, the County of Maui must complete Option 1, which would entail developing a distribution system from the Kahului WWRF to Maui Lani where R-1 water could be used for landscape irrigation at commercial properties in the Kaahumanu Avenue vicinity. The estimated cost of Option 1 is $24.02 million. (FOF 652) The Verification Study does not provide a timeline for when any of the three options for developing a recycled water distribution system from the Kahului WWRF to the Central Maui region would be completed, but because the upgrade of the Kahului WWRF to R-1 water capability is a

prerequisite to developing any of the options, none of the options will be completed, if at all, until sometime after 2020. (FOF 653) Even assuming the Kahului WWRF were upgraded to R-1 water capability, and both Option 1 and Option 3 or Option 3A were built – which is speculative at best – there would still be no system in place to deliver R-1 water to HC&S' East Maui Fields. It would be even more difficult and costly to design and construct a system to transport reclaimed water to irrigate the East Maui fields since they are located much farther away from the KWWRF and at much higher elevations. (FOF 656)

c. Additional reservoirs

In the 1960s, HC&S considered the alternative of building a large reservoir for water storage, but decided not to pursue this alternative after a study indicated that a billion-gallon reservoir would provide only a 10-day supply of water for the plantation. (FOF 657) A reservoir would need to have an extremely large storage capacity to meet demands for a prolonged period of time during the summer months when water would be the most valuable to HC&S. Given that HC&S' daily water needs in the summer months are in the range of 200-300 mgd, even a billion-gallon reservoir would provide 200 mgd for only five days. (FOF 658)

Finding an appropriate location for such a large reservoir would be problematic. A billion-gallon reservoir is approximately 3,800 acre feet. If the reservoir is 10 feet deep, the reservoir would occupy approximately 30 acres. (FOF 660) To be of the most value to HC&S, a large reservoir would need to be located at the highest elevation at the head of Wailoa Ditch (i.e., above Paia or Haliimaile), which supplies the greatest amount of water to HC&S, so as to maximize the ability of the reservoir to supply water to various parts of the plantation during dry periods. HC&S has not considered building a larger number of smaller reservoirs at higher elevations because that would not be the best use of reservoirs. (FOF 659) Siting a 30-acre

reservoir at the highest elevation on the plantation would be very difficult and costly. (FOF 660, 662) In 2009, HC&S estimated that building a billion-gallon reservoir on Maui would cost well in excess of $150 million. (FOF 663)

d. Green harvesting

Maui Tomorrow Foundation ("***MT***") has suggested that HC&S could reduce its irrigation requirements by practicing green harvesting methods, which involve foregoing the pre-harvest burn of cane trash and mechanical harvesting of cane. (FOF 664) Any reduction in irrigation requirements that HC&S could achieve from green harvesting methods would be minimal. The water savings that could theoretically be realized from green harvesting are due to the green trash blanket on the ground reducing evaporation from the soil surface. Soil surface evaporation at the HC&S plantation is very low, however, because HC&S installs drip irrigation tubing below the ground, and HC&S generally does not irrigate its fields to the point that the surface becomes wet. (FOF 665)

Unlike regions where green harvesting reported is practiced, sugar is a two-year crop in Hawai'i. Water usage in connection with mechanical harvesting in a one-year crop cycle would likely be higher than that corresponding to a two-year crop cycle. That is because sugarcane that is mechanically harvested in a one-year crop cycle is ratooned (i.e., cut and allowed to regrow) multiple times over a four to five year period. Every time the crop is ratooned, it must be irrigated the next day to prevent damage to the corn stock core. Mechanically harvested sugarcane also has a shorter ripening and drying off phase. (FOF 666)

Finally, green harvesting is not logistically feasible. Mechanical harvesting requires that the fields be free of rocks. Based on that limitation, approximately 12,000 acres could effectively be mechanically harvested if HC&S were to purchase the equipment. Approximately

another 4,000 to 5,000 acres would require extensive rock clearing in order to be mechanically harvested. The remaining 13,000 to 14,000 acres cannot be mechanically harvested. (FOF 667) Another practical challenge is that the desert-like climate where most of the plantation is situated does not promote good trash breakdown over a four to five-year period. Consequently, after a crop is ratooned, the trash must be disposed of either by burning or plowing. [FOF 668)

4. Further reductions in the availability of East Maui surface water for irrigation would place significant financial stress on HC&S and threaten the public benefits of keeping HC&S in operation.

As part of its duty to "weigh the importance of the present or potential instream values with the importance of the present or potential uses of water for noninstream purposes," CWRM must analyze "the economic impact of restricting such [noninstream] uses." HRS § 174C-71(2)(D). Furthermore, the ultimate goal of engaging in the balancing analysis is to ascertain what constitutes the best expression of the public interest. *See* HRS § 174C-71(2)(A) (stating that CWRM's duty is to adopt IIFS "in order to protect the public interest pending the establishment of a permanent instream flow standard[.]"); HAR § 13-169-20(6) ("Expressions of the public interest should be sought in the implementation of this chapter.") Hence, the impact of reductions in restricting noninstream uses on public benefits resulting from such uses must be considered by CWRM.

At the outset, it should be noted that while this contested case proceeding replaces the prior IIFS proceedings and decisions made by the CWRM for the subject 27 streams in 2008 and 2010, those decisions have been already implemented by HC&S. Thus, the economic impacts of restricting noninstream uses discussed herein address any further reductions in the amount of East Maui surface water available for diversion and irrigation of HC&S' plantation in addition to the impacts currently being borne by HC&S as a result of the IIFS amendments to East Maui

streams in 2008 and 2010. Table 1 below summarizes the 2008 amendments to the IIFS for streams covered in the 8 Prioritized IIFS Petitions and their estimate annual economic impact on HC&S based on HC&S' incremental economic impacts model.[5] Table 2 below summarizes the 2010 amendments to the IIFS for the remaining 19 East Maui streams and the corresponding annual economic impact to HC&S of the amendments.

The 2008 IIFS amendments reduced the amount of surface water available for diversion by a total of 7.29 cubic feet per second ("***cfs***") (4.70) mgd. On an annual basis, the economic impact of the 2008 IIFS amendments on HC&S is approximately $296,307 million. The 2010 IIFS amendments reduced the amount of surface water available for diversion by a total of 14.33 cfs (9.26 mgd) during the wet season and 0.70 cfs (0.45 mgd) during the dry season. On an annual basis, the economic impact of the 2010 IIFS amendments on HC&S is approximately $2.34 million. Any economic impacts to HC&S of further reductions in surface water diversions resulting from this proceeding would be in addition to the $2.64 million combined economic impact of the 2008 and 2010 IIFS amendments. (COL 133)

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[5] HC&S' incremental impacts model separately assesses reduction of deliveries to the upper two ditches (the Wailoa Ditch and Kauhikoa Ditch) and reduction of deliveries to the lower two ditches (the Lowrie Ditch and Haiku Ditch). (FOF 695) Reduced deliveries to the Wailoa Ditch and Kauhikoa Ditch result in reduced water availability to irrigate the 12,800 acres of sugarcane that cannot be irrigated with ground water. The financial impact is therefore calculated in terms of HC&S' anticipated loss in sugar yields due to the average decrease in available water. The estimated value to HC&S of the average yield per million gallons of available water is $1,390. Therefore, the estimated average annual financial impact to HC&S per million gallons of reduced deliveries to either the Wailoa Ditch or the Kauhikoa Ditch is $507,858.00. (FOF 696) Reduced deliveries to the Lowrie Ditch and Haiku Ditch are assumed to be compensated for by increased pumping of brackish ground water. The financial impact is therefore calculated in terms of the average cost of this pumping to be $439 per million gallons. Therefore, the estimated average annual financial impact to HC&S per million gallons of reduced deliveries to either the Lowrie Ditch or the Haiku Ditch is $160,250.00 and $74,825.00, respectively. (FOF 697)

Table 1: Economic Impacts to HC&S of the 2008 IIFS Decision

	TERMINAL EMI DITCH	CURRENT IIFS		RESTORATION AMOUNTS		ECONOMIC IMPACT TO HC&S (ANNUAL)
		cfs	*mgd*	*cfs*	*mgd*	
Honopou Site A	Haiku	2.00	1.29	1.87	1.21	$90,539
Honopou Site B	Haiku	0.72	0.47			
Hanehoi (Puolua)	Haiku	0.89	0.57	0.89	0.57	$42,650
Hanehoi Site B	Haiku	0.63	0.41	0.63	0.41	$30,678
Hanehoi Site C	Haiku	1.15	0.74	1.15	0.74	
Pi'ina'au	Wailoa	Status quo	Status quo	--	--	$0
Palauhulu	Wailoa	5.50	3.56	0.70*	0.45*	$33,671
Waiokamilo	Wailoa	4.90	3.17	--	--	$0
Kualani	Wailoa	Status quo	Status quo	--	--	$0
Wailuanui	Wailoa	3.05	1.97	2.05	1.32	$98,769
Waikani	n/a	Status quo	Status quo	--	--	$0
	TOTALS	**16.97**	**10.97**	**7.29**	**4.70**	**$296,307**

*The flow HC&S is required to release to meet the IIFS for Palauhulu appears to be more than the stated restoration amount for that stream because of the losing section below the release point at Ko'olau Ditch

Table 2: Economic Impacts to HC&S of Restoring H_{90} Flow to Streams Addressed in CWRM's 2010 IIFS Decision

	TERMINAL EMI DITCH	CURRENT IIFS				RESTORATION AMOUNTS				ECONOMIC IMPACT TO HC&S (ANNUAL)
		Wet		Dry		Wet		Dry		
		cfs	*mgd*	*cfs*	*mgd*	*cfs*	*mgd*	*cfs*	*mgd*	
Waikamoi	Lowrie	2.80	1.81	0	0	2.60	1.68	0	0	$145,026 (wet) $0 (dry)
Alo	Lowrie	--	--	--	--	--	--	--	--	$0
Wahinepe'e	Lowrie	0.50	0.32	*(Annual)*		--	--	--	--	$0
Puohokamoa	Lowrie	0.40	0.26	*(Annual)*		--	--	--	--	$0
Haipua'ena	Lowrie	0.10	0.06	*(Annual)*		--	--	--	--	$0
Punalau	Lowrie	0.20	0.13	*(Annual)*		--	--	--	--	$0
Honomanū	Wailoa	0	0	*(Annual)*		--	--	--	--	$0
Nua'ailua	Wailoa	3.10	2.00	*(Annual)*		--	--	--	--	$0
Ohia	n/a	4.60	2.97	*(Annual)*		--	--	--	--	$0
W. Wailuaiki	Wailoa	3.80	2.46	0.40	0.26	3.80	2.46	0.40	0.26	$624,665 (wet) $66,022 (dry)
E. Wailuaiki	Wailoa	3.70	2.39	0.20	0.13	3.70	2.39	0.20	0.13	$606,890 (wet) $33,011 (dry)
Kopili'ula	Wailoa	0.50	0.32	*(Annual)*		--	--	--	--	$0
Puakaa	Wailoa	0.60	0.39	*(Annual)*		--	--	--	--	$0
Waiohue	Wailoa	3.20	2.07	0.10	0.06	3.20	2.07	0.10	0.06	$525,633 (wet) $15,236 (dry)
Pa'akea	Wailoa	1.50	0.97	*(Annual)*		--	--	--	--	$0
Waiaaka	Wailoa	0.00	0.00	*(Annual)*		--	--	--	--	$0
Kapaula	Wailoa	0.20	0.13	*(Annual)*		--	--	--	--	$0
Hanawi	Wailoa	0.10	0.06	*(Annual)*		0.10	0.06	*(Annual)*		$30,417
Makapipi	Wailoa	0.93	0.60	*(Annual)*		0.93	0.60	*(Annual)*		$304,715
	TOTALS	**26.23**	**16.94**	**0.70**	**0.45**	**14.33**	**9.26**	**0.70**	**0.45**	**$2,351,669**

It is difficult to estimate the economic impacts of further upward amendment of IIFS without knowing what the IIFS are. However, because Nā Moku and MT have argued in favor of restoring H_{90} flow to all of the streams at issue in this proceeding, it is instructive to analyze the economic impacts of that scenario. Because the streams that are the subject of the 8 Prioritized IIFS Petitions (Honopou, Hanehoi/Puolua, Pi'ina'au, Palauhulu, Waiokamilo, Kualani, and Wailuanui) either already have their IIFS set to at least H_{90}, or data are lacking to calculate the H_{90} flow for some of those streams, the impacts analysis will be limited to the 19 remaining streams. As shown in Table 3 below, setting the IIFS for all 19 streams set at the H_{90} flow year-round would return a total of 40.83 cfs (26.38 mgd). The total economic impact to HC&S of reductions in surface water resulting from the amendments is estimated at $5.79 million. (COL 134) This is more than double the $2.64 million in annual economic impact already borne by HC&S as a result of the 2008 and 2010 IIFS amendments. In other words, the combined impacts of the prior IIFS decisions and releasing additional flow to meet the H_{90} flow standard in all streams would total over $8.43 million.

Table 3: Economic Impacts to HC&S of Restoring H_{90} Flow to Streams Within Scope of the 19 East Maui IIFS Petitions

	DAR RANK	TERMINAL EMI DITCH	CURRENT IIFS				H_{90} FLOW		THEORETICAL RETURNED AMOUNTS (ANNUAL)		ECONOMIC IMPACT TO HC&S (ANNUAL)
			Wet		Dry						
			cfs	*mgd*	*cfs*	*mgd*	*cfs*	*mgd*	*cfs*	*mgd*	
Waikamoi	4	Lowrie	2.80	1.81	0	0	4.20	2.71	0.7 (wet) 2.1 (dry)	0.45 (wet) 1.71 (wet)	$72,113[a] $217,139[a]
Alo	n/a	Lowrie	--	--	--	--	--	--	--	--	$0
Wahinepe'e	n/a	Lowrie	0.50	0.32	*(Annual)*		0.58	0.37	0.08	0.05	$8,013
Puohokamoa	3	Lowrie	0.40	0.26	*(Annual)*		5.40	3.49	5.00	3.23	$517,608
Haipua'ena	6	Lowrie	0.10	0.06	*(Annual)*		2.80	1.81	2.70	1.75	$280,438
Punalau	n/a	Lowrie	0.20	0.13	*(Annual)*		2.50	1.62	2.30	1.49	$238,773
Honomanū	n/a	Wailoa	0	0	*(Annual)*		1.80	1.16	1.80	1.16	$589,115
Nua'ailua	n/a	Wailoa	3.10	2.00	*(Annual)*		0.18	0.12	0	0	$0
Ohia	n/a	n/a	4.60	2.97	*(Annual)*		3.00	1.94	0	0	$0
W. Wailuaiki	2	Wailoa	3.80	2.46	0.40	0.26	1.70	1.10	0 (wet) 1.70 (dry)	0 (wet) 1.10 (dry)	$0 $558,644[b]
E. Wailuaiki	1	Wailoa	3.70	2.39	0.20	0.13	1.75	1.13	0 (wet) 1.75 (dry)	0 (wet) 1.13 (dry)	$0 $573,880[c]
Kopili'ula	5	Wailoa	0.50	0.32	*(Annual)*		3.20	2.07	1.70	1.10	$888,752
Puakaa	n/a	Wailoa	0.60	0.39	*(Annual)*		0.70	0.45	0.10	0.06	$30,471
Waiohue	7	Wailoa	3.20	2.07	0.10	0.06	1.55	1.01	0 (wet) 1.55 (dry)	0 (wet) 1.01 (dry)	$0 $510,397[d]
Pa'akea	n/a	Wailoa	1.50	0.97	*(Annual)*		0.58	0.37	0	0	$0
Waiaaka	n/a	Wailoa	0.00	0.00	*(Annual)*		0.49	0.32	0.49	0.32	$162,515
Kapaula	n/a	Wailoa	0.20	0.13	*(Annual)*		1.80	1.16	1.60	1.03	$523,094
Hanawi	8	Wailoa	0.10	0.06	*(Annual)*		2.90	1.87	2.80	1.81	$919,223
Makapipi	n/a	Wailoa	0.93	0.06	*(Annual)*		0.00	0.00	-0.93	-0.06	($304,715)
					TOTALS		**40.83**	**26.38**	**26.44**	**17.63**	**$5,785,457**

[a] Economic impact shown is based on replacing current seasonal IIFS with IIFS set at H_{90} year-round. If CWRM had set annual IIFS for Waikamoi based on H_{90} flow in 2010, the annual economic impact to HC&S would have been $290,053.

[b] Economic impact shown is based on replacing current seasonal IIFS with IIFS set at H_{90} year-round. If CWRM had set annual IIFS for West Wailuaiki based on H_{90} flow in 2010, the annual economic impact to HC&S would have been $1,249,331.

[c] Economic impact shown for East Wailuaiki is based on replacing current seasonal IIFS with IIFS set at H_{90} year-round. If CWRM had set annual IIFS for East Wailuaiki based on H_{90} flow in 2010, the annual economic impact to HC&S would have been $1,213,781.

[d] Economic impact shown for Waiohue is based on replacing the current seasonal IIFS with IIFS set at H_{90} year-round. If CWRM had set annual IIFS for Waiohue based on H_{90} flow in 2010, the annual economic impact to HC&S would have been $1,051,266.

To place the impact in perspective, the agribusiness segment of A&B, which includes HC&S, earned average annual operating profits of $2.6 million from 2006 to 2014. (FOF 687) However, that average is largely skewed by the profits earned in 2009 to 2012, when sugar prices were unusually high.[6] (FOF 687, 691) If the profits earned in those years were discounted, the agribusiness segment's average annual operating profits from 2006 to 2014 would likely have been negative (i.e., a loss). (FOF 687) Accordingly, the economic viability of HC&S would be seriously threatened if flow returns at H_{90} levels were implemented in all 19 streams.

In turn, this would put at risk the benefits to the County of Maui and the State of Hawai'i of continuing HC&S' operations. HC&S employs between 750-800 people and expends $115 million annually, a majority of which is spent on Maui. (FOF 698, 699) According to Leroy O. Laney, Ph.D., a Professor of Economics and Finance at Hawai'i Pacific University and the former Chief Economist and Senior Vice President of First Hawaiian Bank, HC&S injects over $100 million annually in direct contributions to the Maui economy. Applying a conservative multiplier of 1.5 to this sum would add about 50% more to that total, or $150 million a year. (FOF 700) Applying a conservative jobs multiplier of 1.87 means than if HC&S employs 800 people, there are almost 2,300 jobs on Maui that are dependent on HC&S in some fashion. This amounts to over 3% of Maui County employment in 2007 (76,190 people). The $150 million derived by applying the overall regional multiplier would also amount to over 3% of Maui County total personal income ($4,844 million in 2006). Dr. Laney estimates that if 3% were

[6] In 2010, 2011, and 2012—the years in which HC&S benefited most from the unprecedented spike in sugar prices—the agribusiness segment earned an operating profit of $6.1 million, $22.2 million, and $20.8 million, respectively. In the year preceding this period (2009), the agribusiness segment earned an operating profit of $6.1 million, of which $4.9 million was in disaster relief funds. In the years subsequent to this period, when sugar prices declined, HC&S earned an operating profit of $10.7 million in 2013 and lost $11.8 million in 2014. (FOF 681-687)

taken out of the Maui economy, the impact would be more damaging than if probably any other single private entity on Maui ceased to exist. (FOF 701)

In addition to economic impacts to the County and the State, the cessation of HC&S' operations would put in jeopardy a major supplier of the County's domestic water needs. MDWS relies on waters diverted by EMI's ditch system to fulfill its public trust mandate of providing domestic water supply. (FOF 702) MDWS' average annual usage of water taken from the EMI Ditch System is 1,034 mg. (FOF 712) The majority of the water used by MDWS is delivered by EMI from the streams of East Maui to the three Water Treatment Facilities of Kamole-Weir, Piiholo and Olinda. Additional water is left untreated and delivered to the Kula Agricultural Park for agricultural use. If EMI were to cease operations, MDWS would not be able to meet the demands of the Upcountry System. (FOF 702, 705) MDWS does not have the infrastructure to support the demands of the Upcountry System without the EMI system, and does not have the capital to create a new ditch system or take over the existing EMI ditch system. (FOF 709) MDWS also contracts with EMI to service the diversions used by MDWS. If HC&S were to cease operations, MDWS could not be able to operate the EMI Ditch System because it lacks the requisite operational expertise. (FOF 707, 708)

There are additional public benefits that would be lost if HC&S were to cease operating. The termination of HC&S sugar operations would result in the loss of a viable provider of renewable energy because HC&S sells power it produces by burning bagasse to Maui Electric Company. (FOF 713) Agricultural in Maui would be negatively impacted. HC&S supports Maui's agricultural sector in various ways, such as by taking advantage of quantity discounts to buy farm inputs that would otherwise be more expensive to small farmers on Maui, and by allowing Maui cattlemen to use canetops from seed operations as feedstock for free. (FOF 714)

The withdrawal of HC&S' lands from sugar cultivation would increase the amount of idle agricultural land in Maui and transform the green fields in the Central Maui plain into an arid landscape. Pressure would likely mount to urbanize the form sugar lands. (FOF 715)

B. A Pragmatic—Not Mechanical—Application of the H_{90} Flow Standard Reasonably Satisfies Instream Values.

1. Although the H_{90} flow standard is a useful guide for satisfying instream values, it should be applied pragmatically to maximize benefits to instream values while minimizing negative impacts on noninstream uses.

The best scientific information currently available to CWRM indicates that the minimum viable habitat flow, which corresponds to 64% of the median baseflow (BFQ_{50}), is generally representative of the flow necessary to restore 90% of the available habitat in a stream for native stream species. This is known as the H_{90} flow. (FOF 76) Generally speaking, meeting the H_{90} flow standard reasonably satisfies instream values that rely upon restoration of habitat and stream biota. Most directly, the H_{90} flow supports the maintenance of aquatic life and wildlife habitats. The Division of Aquatic Resources ("***DAR***") hypothesizes that H_{90} is the minimum flow necessary to provide suitable conditions for growth, reproduction, and recruitment of native stream species. Assuming DAR's hypothesis is correct, sustaining a healthy population of native stream animals would also protect traditional and customary Hawaiian rights to the extent the exercise of such rights involves the gathering of native species. Indirectly, maintaining H_{90} flow in a stream could enhance other instream values as well, including maintenance of ecosystems, outdoor recreational activities, and aesthetic values. (COL 36)

The H_{90} flow standard should not be applied mechanically, however. Consistent with CWRM's duty to weigh the relative importance of instream values and noninstream uses and determine, on a case-by-case basis, the balance among them that best effectuates the public trust doctrine's dual mandates of protection and maximum and beneficial use, flow restoration should

be undertaken in a pragmatic manner in order to maximize benefits to instream values while minimizing negative impacts on reasonable-beneficial noninstream uses. *See In re Water Use Permit Applications*, 94 Hawai'i 97, 140, 9 P.3d 409, 451 (2000) ("***Waiāhole I***") ("The state water resources trust thus embodies a dual mandate of 1) protection and 2) maximum reasonable and beneficial use."); *see also id.* at 142, 9 P.3d at 454 ("Contrary to the Commission's conclusion that the trust establishes resource protection as 'a categorical imperative and the precondition to all subsequent considerations,' we hold that the Commission inevitably must weigh competing public and private water uses on a case-by-case basis, according to any appropriate standards provided by law."). There are several ways to apply the foregoing principle.

First, CWRM should consider the number of Habitat Units restored per cfs / mgd of flow restored. This ensures that flow is returned to streams where the greatest ecological impact could be made. (COL 38)

Second, CWRM should seek to enhance stream biota and habitat on a regional basis rather than stream-by-stream. Individual amphidromous animals do not necessarily return to their natal stream; they move from stream to stream and exchange from a common inter-island oceanic larval pool. Nor do all streams in a region have the same ecological value. Some streams are "sources" in that they are prolific in producing propagules that eventually populate other streams in the region, and others are "sinks" in that they are not suitable to support reproducing stream animals due to geographical and geological characteristics of the watershed or other factors. *See* Higashi, Tr. 3/16/15, p. 159, l. 15 to p. 160, l. 8. Thus, the goal should be to ensure that a region has good "source" streams. Restoring flow to streams that are spread out geographically has the added benefit of providing greater protection against localized habitat

disruptions and producing a wider benefit to estuarine and nearshore marine species, thereby resulting in more comprehensive ecosystem function across the entire East Maui sector. (COL 42)

Third, IIFS should not be based on the H_{90} flow standard where contraindicating circumstances in a stream exist, such as the following.

- ***Physical barriers.*** The presence of a large waterfall in a stream is a circumstance that contraindicates restoring flow to the H_{90} standard. Waterfalls may impede upstream migration of certain amphidromous species, thereby attenuating the benefits of flow restoration to native stream animal populations. (FOF 19, COL 39)

- ***Losing stretches.*** Streams with stretches that lose water due to infiltration into the ground prevent connectivity between the ocean and upstream reaches. The importance of restoring a particular level of flow to streams with such losing stretches is diminished because the amount of water needed to achieve connectivity in East Maui streams with losing reaches, assuming connectivity is even possible, is unknown. Restoring flow to a losing stream also puts stream animals at risk because they might initiate recruitment in response to water returns to reaches below a losing stretch, only to be left stranded upon reaching the dry, losing stretch. (FOF 82; COL 40.)

- ***Commingled ditch and stream flows.*** DAR has recommended against co-mingling stream and ditch flows to limit the potential spread of invasive aquatic species. According to DAR, flow restoration of a stream should be undertaken with water from that stream rather than with water in ditches collected from other watersheds. Therefore, streams that are utilized to convey water from one ditch to another are not reasonable candidates for restoration. (FOF 53.C; COL 41)

Fourth, pursuant to the dual mandate of protection and maximum reasonable and beneficial use under the public trust doctrine, the H_{90} flow standard must be considered as a factor, but not an imperative, in setting IIFS. *See Waiāhole I*, 94 Hawai'i at 142, 9 P.3d 15 454.

2. The incremental benefits of restoring flow in excess of H_{90} are minimal.

While meeting the H_{90} flow standard to satisfy instream values is generally appropriate absent contraindicating circumstances, exceeding that standard is not. DAR has cautioned against treating flow level, available instream habitat, and native animal populations as being linearly related. According to the United States Geological Survey ("***USGS***"), the incremental recovery of habitat diminishes as the flow discharge rate increases. (FOF 79) And, since the availability of habitat is not linearly related to animal populations, it is not true that restoration of flow to achieve a specific percentage of habitat results in increase of stream animal populations of a corresponding percentage. In other words, a stream with H_{90} flow does not necessarily have 20% more stream animals than a stream with H_{70} flow just because H_{90} flow theoretically restores 20% more habitat than H_{70} flow. Similarly, just because H_{95} flow theoretically restores 5% more habitat in a stream than H_{90} does not mean it would result in 5% more animals than under H_{90} conditions. (FOF 79, 80) Restoring flow above H_{90} is therefore unwarranted given that the small incremental benefits to habitat and native animal populations that could be realized under such a flow regime are accompanied by the detriments of substantially restricting noninstream uses.

It also bears reminder that the benefits to be gained from achieving the H_{90} standard are not susceptible to precise estimation because the determination of the flow needed to meet the standard is based largely on the regression estimates calculated by USGS, the accuracy of which

is subject to inherent limitations.[7] The relative error of the regression equation for BFQ_{50} demonstrates why caution must be applied in relying on USGS's estimates of flow-duration values to predict whether restoration of a particular flow level would result in specified benefits. Relative error provides a benchmark of the accuracy of a regression equation by comparing a flow-duration value for a given stream site estimated using the equation with a measured value for the same site. (FOF 7) The regression equation for BFQ_{50} estimated that value within a relative error of ±25% at 18 of the continuous-record gaging stations. (FOF 10) In simple terms, this means a regression estimate of the BFQ_{50} flow could deviate from the actual value by up to 25%—hardly a negligible margin of error. Thus, while CWRM has little choice but to base its IIFS decisions on regression estimates because they constitute the best available information on flow-duration values for many of the East Maui stream sites, it should exercise caution in extrapolating the benefits to be gained from restoring flow of a specific amount.

C. The IIFS Adopted by CWRM in 2008 and 2010 Represent a Proper Balance Between Instream Values and Noninstream Uses.

As it is today, CWRM in 2008 and 2010 was faced with the daunting task of identifying and weighing the multiplicity of interests in the 27 East Maui streams. CWRM's IIFS decisions have withstood scrutiny in this contested case hearing. The 2008 and 2010 IIFS decisions

[7] Nā Moku and MT blame EMI for the inaccuracy of the regression model because EMI allegedly refused to allow controlled releases proposed by USGS which supposedly would have improved the accuracy of the model. However, EMI did not unequivocally decline to participate in the proposed controlled releases. Hew, Tr., 3/17/15, p. 97, ll. 13-15. Rather, EMI identified obstacles and concerns concerning USGS' proposal, including the inability of EMI to release precise amounts of water over sustained periods, the challenge of accounting for the impact of weather on the releases, and the long timeframe required to complete all the releases. *See* Exh. C-148. As an alternative, EMI proposed that USGS conduct seepage runs of twelve streams when flows in the streams reach the desired flow levels. *See* Exh. C-148 at 4. USGS did not respond favorably to the alternative proposal, but if it had, EMI would have cooperated. Hew, Tr., 3/17/15, p. 98, ll. 8-12. Ultimately, the lack of additional funding from CWRM for the proposal ended the discussions on the subject. Gingerich, Tr., 3/3/15, p. 89, l. 7 to p. 90, l. 5; Hew, Tr., 3/17/15, p. 97, ll. 1-7.

balanced instream values and noninstream uses in a manner consistent with CWRM's public trust duties. Accordingly, with one exception (Makapipi Stream), no amendments to the current IIFS are warranted.

1. The 2008 and 2010 IIFS decisions reasonably satisfied important instream values while limiting negative impacts to noninstream uses due to reductions in the availability of surface water for diversion.

The 2008 and 2010 IIFS decisions restored an aggregate of 21.62 cfs (13.97 mgd) to ten streams (Honopou, Hanehoi/Huelo, Waikamoi, Palauhulu, Wailuanui, West Wailuaiki, East Wailuaiki, Waiohue, Hanawī, and Makapipi). *See* Exh. HO-1. The 2008 IIFS decision focused primarily on flow to support kalo cultivation. The IIFS for five of the eight streams covered in the 8 Prioritized IIFS Petitions were amended upward. Such amendments provide sufficient water for taro farming, as discussed further in the next section. Moreover, the current IIFS for Palauhulu, Waiokamilo, and Wailuanui streams meet or exceed the H_{90} flow standard. (COL 66, 76, 80) Further upward amendment of the IIFS for those streams is thus unnecessary to satisfy instream values. In particular, further restoration to streams in the Waiokamilo hydrologic unit, including Waiokamilo and Kualani Stream, is unnecessary because EMI has ceased all diversions within the unit, and HC&S has stipulated to an IIFS that provides for no diversions in the unit. (COL 137) Restoration of Honopou Stream to H_{90} is impracticable because the estimated natural (undiverted) flow of the stream is unknown. Furthermore, EMI currently allows all low flows to pass into the stream. Further flow releases to support the offstream needs of Sanford Kekahuna and Lurlyn for kalo cultivation is unnecessary because the current flow in Honopou is adequate to support the Kekahuna lo'i system. (COL 44, 45,1 42)

The primary focus of the 2010 IIFS decision was on the needs of stream biota. As such, CWRM applied the H_{90} flow standard when doing so would reasonably benefit instream values.

For Nua'ailua, Ohia, and Pa'akea streams, the current flow in those streams already meet or exceed the H_{90} flow standard, so further releases into those streams is unnecessary to satisfy instream values. (COL 136)

CWRM acknowledged that certain circumstances in a stream diminish any benefit to instream values to be gained from restoring flow to H_{90}, including the presence of naturally occurring physical barriers (e.g., large waterfalls), losing stretches, and commingling of stream and ditch flows. For these reasons, CWRM determined that the following streams are not good candidates for restoration and accordingly did not amend the IIFS for those streams: Waikamoi, Wahinepe'e, Puohokamoa, Haipua'ena, Honomanū, Kopili'ula, and Makapipi. Further, restoration to these streams would result in an aggregate economic impact of $2.57 million to HC&S, or over 40% of the $5.79 million impact to HC&S if the IIFS for all 19 East Maui were set to H_{90}. On balance, restoration to the foregoing streams would not serve the public interest because the potential instream values enhanced by restoration would be questionable while the negative impact of restricting noninstream uses would be severe. (COL 138)

CWRM accepted the recommendations of DAR or CWRM staff that the following streams were not good candidates for restoration because of their low potential for biological return: Alo, Punalau, Puakaa, Waiaaka, and Kapaula. The economic impact to HC&S of restoration of these streams to H_{90} on an annual basis would be nearly $1 million. On balance, restoration to the foregoing streams would not serve the public interest because the potential instream values enhanced by restoration would be minimal while the negative impact of restricting noninstream uses would be disproportionately high. (COL 139)

Hanawī Stream had adequate flow to sustain a viable biota population even before amendment of the IIFS for the stream in 2010. The amendment further added 0.10 cfs (0.60

mgd) to provide connectivity in the dry reach immediately below the Ko'olau Ditch diversion. Accordingly, restoration of additional flow to Hanawī to meet the H_{90} flow standard would not materially benefit the public interest. (COL 140)

CWRM adopted seasonal IIFS for West Wailuaiki Stream, East Wailuaiki Stream, Waiohue Stream, and Waikamoi Stream. Departure from this decision is not warranted. Seasonal flows mimic the natural variability in flow conditions, a circumstance that DAR has observed and cited in the Monitoring Study as a factor potentially obscuring its findings as to changes relating to flow restoration. According to DAR, the monitoring period to date has been of too short a duration, which is borne out by the inconclusiveness of the data regarding the effectiveness of seasonal flows. Moreover, the combined economic impact of adopting annual IIFS for the four streams identified above is disproportionately high—$1.93 million or roughly one-third of the $5.79 million total impact to HC&S if the IIFS for the 19 East Maui streams were set to H_{90}. On balance, it is not in the public interest to amend the IIFS for the foregoing four streams to establish annual IIFS based on the H_{90} flow standard. (COL 141)

With regard to Makapipi, post-IIFS releases and monitoring conducted by CWRM staff and USGS have confirmed that Makapipi Stream has losing stretches upstream of Hana Highway. (FOF 144) Accordingly, no IIFS should be established for Makapipi Stream.

In sum, CWRM's IIFS decisions in 2008 and 2010 properly weighed the relative importance of present or potential instream values against the importance of present or potential noninstream uses and achieved a balance between the two that best served the public interest. The IIFS decisions resulted in the return of a total of 21.62 cfs (13.96 mgd) to East Maui streams during the wet season and 0.70 cfs (0.45 mgd) during the dry season. For the most part, restoration efforts were focused on streams where DAR determined that flow releases would

achieve the most "bang for the buck" in terms of Habitat Units restored per cfs of water returned. CWRM managed negative economic impacts on offstream users by selecting for restoration those streams in which the most benefits to instream values could be gained relative to the amount of flow returned. Restoration efforts were also spread out geographically, as streams east and west of Ke'anae Valley received return flows. (COL 145, Tables 1 and 2; Exh. HO-1.) Accordingly, with the exception of Makapipi Stream, no adjustments to the IIFS adopted by CWRM in 2008 and 2010 should be made.

2. <u>Additional flow releases are not needed to support taro cultivation.</u>

a. Honopou

In Table No. 1 at page 10 of Petitioner Nā Moku Aupuni O Ko'olau Hui' ("***Nā Moku***") Opening Brief, Na Moku claims 26.06 acres of cultivable area in Honopou and "Total Estimated Water Needs for Taro (in addition to 64% base flow)" of 2.61 – 7.82 mgd. This is said to be based on Exhibits A-137 (the "***Nā Moku TMK Spreadsheet***") and Exhibits A-138 and A-139 (tax maps with highlighted areas referencing certain parcels in Honopou). (FOF 110) The 26.06 acres is simply the sum of the total acreage of TMK Nos. 2-9-01-14, 2-9-01-23, 2-9-01-25, 2-9-14-13, and 2-9-14-23, which are described in the declaration of Lurlyn Scott ("***Scott***") as parcels in which her family has an interest. These appear to be the same properties referenced generally in the declarations of her cousins, Sanford Kekahuna, Jonah Jacintho, Juliana Jacintho and Lezley Jacintho. (FOF 111) The only information offered about the specific locations on these properties currently being used or planned to be used for taro cultivation is in Scott's declaration and Exhibit A-149, a schematic drawing she prepared to show the loi system on her family's properties in Honopou. She initially estimated this system to be approximately one acre in size, but later increased her estimate to two acres. (FOF 112)

Nā Moku has estimated the water need for taro on Honopou by simply multiplying the

total acreage of all the parcels in which Scott's family has an interest by Paul Reppun's ("***Reppun***") estimate of 100,000 to 300,000 gad as the irrigation requirement for taro, which resulted in the 2.61 mgd – 7.82 mgd (in addition to 64% baseflow) claimed by Nā Moku. (FOF 113) The median baseflow of Honopou at the level of the Haiku Ditch, according to USGS, is 2.3 mgd, with 50% being contributed by ground water above Wailoa Ditch and 50% between Wailoa Ditch and Haiku Ditch. This is the average amount estimated by USGS to be in the stream at the level of the Haiku Ditch in its natural condition when it is not raining. Nā Moku wants 1.472 mgd (64% of 2.3 mgd) to be left in the stream before calculating the amount to be restored to satisfy taro needs. This would only leave 0.828 mgd of average baseflow from which to meet Nā Moku's taro water claim of 2.61 mgd – 7.82 mgd. There is obviously not enough base flow in Honopou Stream, even in the absence of any diversions by EMI, to satisfy Nā Moku's claimed amounts for "restoration." (FOF 114)

Honopou Stream can, however, support cultivation by Scott's family of the entire one to two acre loi system (the "***Kekahuna lo'i system***") shown on A-149. Using the taro irrigation requirement of 130,000 to 150,000 gad previously established by CWRM in the Nā Wai 'Eha case, the flows needed would be 260,000 to 300,000 gad. At the current IIFS of 1.29 mgd below the Haiku Ditch, this irrigation requirement can easily be satisfied without dewatering the stream between the lo'i intake diversion and the outflow ditch. (FOF 115) The flow measurements recorded at USGS gage station 16595100 on Honopou Stream in the vicinity of the Kekahuna lo'i system consistently exceed 300,000 gpd. (FOF 123)

Nā Moku has complained that, notwithstanding the current availability of water at the Kekahua lo'i system intake, the water at times is too warm for taro and thus more water needs to be released into the stream. (FOF 116) Sometime between 2008 and 2010, USGS installed

gages in the Kekahuna lo'i system to measure water flow and temperature in the complex, among other things. The gages are no longer operational. (FOF 117) USGS gage 205548156143901 ("***Gage '3901***") was installed at the 'auwai at the top of the lo'i complex and it measured the inflow temperature of water. USGS gage 205549156143601 ("***Gage '3601***") was installed on the 'auwai near the bottom on the western boundary of the complex (Lo'i Outlet #1) and it measured the outflow temperature of water. USGS gage 205549156143602 ("***Gage '3602***") was installed on an 'auwai situated near the middle of the complex (Lo'i Outlet #2) and it also measured the outflow temperature of water. The locations of the gages are depicted on Exhibit A-149A. (FOF 118)

In general, the outflow temperatures recorded at Gage '3601 in Lo'i Outlet #1 tended to be lower and exhibited less variability than the outflow temperatures recorded at Gage '3602 in Lo'i Outlet #2. For example, during the period from July 2009 to July 2010, the daily mean inflow temperatures recorded at Gage '3901 ranged between 64°F and 76°F. During the same period, the daily mean outflow temperatures recorded at Gage '3601 ranged between 65°F and 77°F, whereas the daily mean outflow temperatures recorded at Gage '3602 ranged between 68°F and 82°F. (FOF 119) At the location of Gage '3602, the water in the 'auwai has passed through a series of taro patches above. (FOF 120) The 'auwai in which Gage '3601 was installed takes water directly from the intake and traverses along the western boundary of the lo'i complex, bypassing taro patches that are in cultivation. The cooler water from this 'auwai can be, but is not, used to irrigate those patches by diverting it to an 'auwai in the middle of the complex. (FOF 121) Reppun testified that the way each farmer manages his water is important to understanding how much and why outflow temperatures might exceed inflow temperatures. Reppun did not study and did not express an opinion on the Kekahuna lo'i system water

management practices as they may affect the higher temperature of the outflows measured by Gage '3602 versus Gage '3601. There was also no explanation offered by Nā Moku for this discrepancy. (FOF 122)

Nā Moku further alleges that EMI is in violation of the IIFS for Honopou Stream. Not only does this allegation concern an implementation issue that is irrelevant to the instant IIFS proceeding, but it lacks merit. EMI has implemented measures to achieve the 1.29 mgd IIFS at Site A on Honopou Stream in consultation and coordination with CWRM staff. As of the dates of the hearing, water was being passed through all four of EMI's ditch diversions on Honopou Stream such that, during periods of low stream flows, no water is being taken by EMI from Honopou Stream into its ditch system. (FOF 97)

Nevertheless, Nā Moku claims that EMI is diverting Honopou Stream while the 1.29 mgd IIFS at Site A of the stream is not being met. As support for this claim, Nā Moku produced a video purportedly taken on August 1, 2014 showing water passing water into the Haiku Ditch grating. According to the data produced by CWRM staff, the mean flow measured at IIFS Site A on Honopou Stream downstream of Haiku Ditch on August 1, 2014 was 0.77 cfs. Garret Hew, President of EMI, studied the video and concluded that the IIFS was met on the day that the video recording was made because excess water can be seen overtopping the berm on the bypass structure and flowing through the grate into Haiku ditch despite flow passing through the bypass channel and pipes. (Tr., 3/18/15, p. 123, ll. 16-25, p. 227, l. 8 to p. 228, l. 4; Exh. A-148; Uyeno, 12/18/14 written report, p. 10; CWRM Gage Data for Honopou Stream Downstream of Haiku Ditch (IIFS Site A) for 08/01/2014.) The explanation for the discrepancy between the flow measurements at Site A taken on August 1, 2014 and the video recording is simple. CWRM staff provided the flow measurements with the following caveat: "Note: There was a lack of

regular transducer data collections and streamflow measurements from September 2013 to September 2014. As a result, the chances of transducer failure and the amount of zero drift can increase. Zero drift is defined as an undesired change in zero over a period of time. CWRM staff is working to fully restore its quarterly monitoring schedule." In other words, the flow measurements taken on the day of the video recording were not accurate.

b. Hanehoi

It is unknown whether there is enough naturally occurring base flow in Hanehoi Stream to meet the current IIFS amount. The current IIFS, however, is already set high enough to provide adequate water to meet the needs of both Ernest Schupp, who is cultivating one acre of taro, and Solomon Lee, who is claiming the right to adequate water to open three acres of taro on his properties that abut Hanehoi Stream. Until it is known whether the current IIFS can be complied by further modifications to EMI's Wailoa, New Hamakua and Lowrie Ditch diversions, it would be premature to consider any change to the IIFS amounts for Hanehoi Stream. (COL 142)

c. Pi'ina'au

Based on the Nā Moku TMK Spreadsheet and Exhibit A-140, which is a tax map with highlighted areas referencing certain parcels in Ke'anae, Nā Moku claims 29.695 acres of cultivable area in Keanae and a total estimated water need for taro (in addition to 64% base flow) of 2.97 – 8.91 mgd. (FOF 316) The 29.695 acre estimate of cultivable area is the simple sum of the aggregate acreages for all the TMK parcels listed on A-137 from the 1-1-03 plat. No testimony or other information has been offered to quantify what percentage of each of these parcels actually contain lo'i as opposed to being house lots, constituting open space or being in other uses. (FOF 317) Palauhulu Stream is the sole water source for the taro cultivated in Ke'anae. There are a few lo'i in the Ke'anae Arboretum on land owned by the State of Hawai'i

that are irrigated directly from Pi'ina'au Stream above the elevation of the flume intake on Palauhulu Stream that serves Ke'anae. No person has come forward to assert a claim in this proceeding of appurtenant rights to use water from Pi'ina'au Stream. (FOF 318)

According to a 2007 USGS study entitled, "Water Use in Wetland Kalo Cultivation in Hawaii," the entire Ke'anae complex consists of 10.53 acres. (FOF 319) Application of the 130,000 to 150,000 gad irrigation requirement for taro from the Nā Wai 'Ehā case to the 10.53 acre Ke'anae lo'i complex results in a taro water need of from 1.37 to 1.58 mgd. This is less than half of the current IIFS of 5.50 cfs (3.56 mgd) for Palauhulu Stream. (FOF 321) The evidence submitted in this proceeding shows that there is generally enough water collected from the flume intake on Palauhulu Stream above Ke'anae to meet the needs of the Ke'anae taro farmers. While there was some testimony regarding shortages of water during low flow conditions, there was also testimony indicating that there has been enough water to recently reopen patches that had been fallow. (FOF 322)

Since at least September 15, 2010, EMI has been releasing water into Palauhulu Stream from the Ko'olau Ditch, but the water is lost in the leaky sections of the streambed between the release point and the origin of Store Spring, which is the source of the water in Palauhulu Stream that supplies the Ke'anae lo'i complex. This was documented in a site visit that took place on September 15, 2010 attended by CWRM staff, Isaac and Gladys Kanoa, and EMI personnel. During that site visit, the entire flow of the stream on that date was released. The sluice gate has remained open to the same setting ever since. (FOF 313) As a result of the loss into the streambed of the entire base flow of Palauhulu Stream between the Koolau Ditch and Store Spring, there is nothing more that can be done to increase the availability of water in the lower reaches during periods of low flows. At the current sluice gate setting, all of the low flows are

already being released, but they do not reach Store Spring. Increasing the IIFS will not produce any more water in Palauhulu Stream at the flume intake to Keanae during periods of low flows. (FOF 324)

d. Waiokamilo

To the extent Nā Moku is claiming that these parcels have appurtenant or riparian rights to receive water from Waiokamilo Stream and Kualani Stream, these streams are not being diverted by EMI. EMI has provided testimony and photographic evidence that, following the BLNR's 2007 ruling, EMI sealed all of its diversion works and structures that previously diverted water from this hydrologic unit into the Ko'olau Ditch. This has also been confirmed by CWRM staff following a series of field investigations. (FOF 365)

e. Wailuanui

According to the 2007 USGS Taro Water Report, the loi system that is irrigated solely with water from Wailuanui Stream comprised 2.80 acres as of the summer of 2006. This system was being cultivated at that time by Norman "Bush" Martin and Joseph "Kimo" Day with water drawn from the pond below Waikani Falls on Wailuanui Stream. (FOF 387)

The amount of water available from Waikani pond increased following the releases of stream flow to comply with the 2008 IIFS decision due to the closing of EMI's minor diversions and the opening of the sluice gates on the major diversions operated on East Wailuanui Stream and West Wailuanui Stream. EMI estimates that, since Wailuanui Stream is a gaining stream below the IIFS point, this has resulted in a consistent flow of from 2 to 3 mgd entering the pond below Waikani Falls (and much more during rain events). (FOF 388) In spite of this increased flow to Waikani Pond after 2008, the lo'i system that was previously being cultivated with water from Waikani Pond was no longer in operation as of the date of the hearings held herein. Mr. Day testified in paragraph 5 of his declaration that he stopped farming "about four years ago."

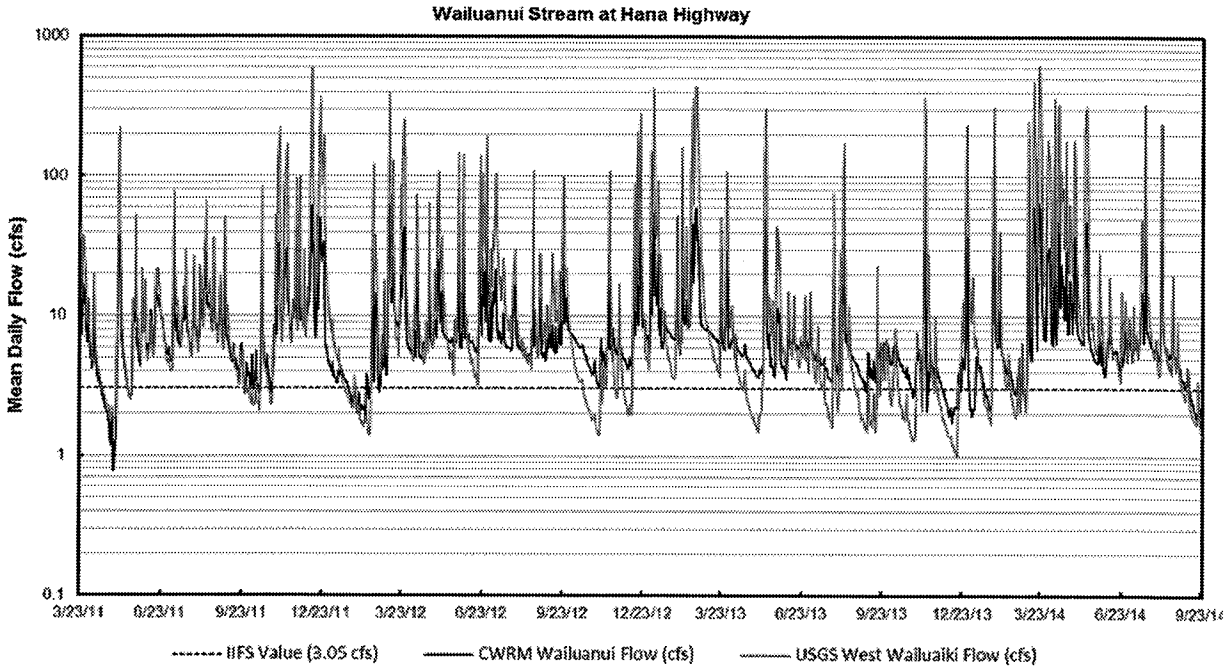
Mr. Martin testified that he has temporarily cut back on his taro cultivation while he works on addressing needed improvements to the pipe intake at the head of the 'auwai that brings water from Waikani pond to the Waikani lo'i complex. Mr. Clark testified that he has been assisting Mr. Martin in evaluating the needed repairs, which involve the removal of rocks that may have become lodged in a buried section of the pipe 'auwai 100 feet or more from the intake. From these photos, the area previously irrigated with Wailuanui Stream water appears to now be substantially, if not entirely, removed from taro production. (FOF 389)

Application of the 130,000 to 150,000 gad irrigation requirement for taro to the 2.80 acres that were being irrigated from Waikani Pond in 2006 results in a taro water need of from 0.36 to 0.42 mgd. Since this is far less than the 2-3 mgd that has been available for the past six years, it appears that the supply of irrigation water to the area served by Waikani Pond is much greater than needed. The current IIFS setting for Wailuanui Stream, therefore, allows more than enough stream flow to reach Waikani pond to service taro cultivation in the areas that have been irrigated with Wailuanui Stream water in the recent past. (FOF 390)

To the extent that Na Moku has identified parcels of land owned by its members in the vicinity of Wailuanui Stream that may have previously been irrigated with Wailuanui Stream water, and which may have appurtenant rights to claim some amount of water on that basis, the record does not include an adequate breakdown of the parcels and acreage involved to support any detailed findings to that effect. Under current conditions, however, if the infrastructure challenge of conveying water from Waikani Pond to the areas sought to be irrigated can be solved, there is enough water available to more than double the acreage that has recently been irrigated without dewatering the stretch between Waikani pond and the seaward terminus of Wailunanui Stream. (FOF 391) Further, since the current IIFS setting for Wailuanui Stream is

occasionally not met when stream flows are low, increasing the IIFS will not result in any greater amount of water being available during low flows since, during such periods, no water is being diverted by EMI. (FOF 392)

The adequacy of the IIFS to meet the needs for taro cultivation are demonstrated by the hydrograph for Wailuanui Stream for the period of March 23, 2011 to September 23, 2014, which shows that the flow in Wailuanui Stream exceeds the IIFS of 3.05 cfs (2.97 mgd) the vast majority of the time, often by a very large quantity. (FOF 393) The hydrograph is reproduced below:



This explains why, in the 2005 proceedings before the Board of Land and Natural Resources to determine the need for interim relief for persons asserting constitutional or legally protected water rights, no person came forward to assert a claim of insufficient water for taro growing purposes from Wailuanui and Palauhulu Streams. *See* Exh. C-83, p. 7 (¶ 12).

D. Nā Moku and MT Raise Issues that Are Irrelevant to CWRM's Task of Setting IIFS for the East Maui Streams.

1. Nā Moku's criticism of efforts to implement amended IIFS and Adaptive Management Strategy measures is flawed and immaterial to whether further amendments to the IIFS are necessary.

Throughout the evidentiary hearing, Nā Moku criticized the efforts of CWRM staff to implement the amended IIFS for the East Maui streams and the Adaptive Management Strategies adopted along with the amendments. Certain points of criticism are simply factually erroneous. For example, Nā Moku created the impression that CWRM staff failed to instruct EMI to open the sluice gates at East and West Wailuanui Streams to comply with the amended IIFS for Wailuanui Stream that was adopted in October 2008, thus precipitating a confrontation between Nā Moku members and the Water Monitor, Morris Atta, at a site visit in which Nā Moku members forcibly opened the gates without authorization. Nā Moku's witness, Bush Martin Jr., testified initially that this incident occurred in July 2009, but upon cross-examination he admitted that he was unsure if it occurred in 2008 or 2009. *See* Martin, Tr., 3/9/15, p. 141, l. 4 to 145, l. 15 and p. 192, l. 9 to p. 193, l. 13. Mr. Atta's report to the Board of Land and Natural Resources ("***BLNR***") indicates that the actual date of the incident was July 9, 2008—before CWRM amended the IIFS for Wailuanui Stream—and the purpose of the site visit was to investigate issues regarding implementation of the decision in BLNR contested case hearing releasing flow into Waiokamilo Stream, not Wailuanui Stream. *See* Exh. C-149, pp. 4-5.

Apart from being factually incorrect, Nā Moku wrongly assumes it is EMI's responsibility to guarantee that a specific amount of water will always be present in the stream to satisfy the IIFS. Offstream diverters have no control over the amount of water that flows naturally in a stream. If all flow is being let down a stream, and the natural stream flow falls below the IIFS, there is nothing more anyone can do to satisfy the IIFS. This is the case with

Wailuanui Stream, which was measured below the 3.05 mgd IIFS on December 8, 2008 with the sluice gates open on a dry day. *See* Tr., 3/2/15, p. 217, l. 10 to p. 218, l. 22. Another example is Waiokamilo Stream, which is not currently diverted by EMI, and yet, during a dry season, the natural flow of the stream is less than the IIFS. *See* Uyeno, Tr., 3/2/15, p. 203, l. 10 to p. 206, l. 23; Exh. C-147, p. 27. When stream flow is naturally below the IIFS amount, there is nothing EMI or anyone could do to put more water in the stream other than taking it from another stream. Nor would increasing the IIFS help to put more water back into the stream.

More generally, whether an IIFS is being met or not is an implementation issue beyond the scope of this proceeding. The purpose of this proceeding is to determine the petitions to amend the IIFS for certain East Maui streams. The logistics of complying with IIFS is a matter for CWRM staff to address.

2. The private agreements that MT claims provide protection for water rights of certain users have no bearing on the IIFS for the subject East Maui streams.

MT claims that certain of its members are beneficiaries to land grants to HC&S' predecessors-in-interest made subject to protection of the water rights of others. *See, e.g.*, Exhs. E-93, E-94. Assuming *arguendo* that the agreements provide the protections claimed by MT, they have no relevance in this proceeding. CWRM's sole task in this proceeding is to set IIFS for the subject streams, not adjudicate the property rights of individuals or the enforceability of private agreements.

III. CONCLUSION

For the foregoing reasons, the Hearings Officer should adopt HC&S' Proposed Findings of Fact and Conclusions of Law.

DATED: Honolulu, Hawai'i, October 2, 2015.

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COMMISSION ON WATER RESOURCE MANAGEMENT

STATE OF HAWAII

PETITION TO AMEND INTERIM INSTREAM FLOW STANDARDS FOR HONOPOU, HUELO (PUOLUA), HANEHOI, WAIKAMOI, ALO, WAHINEPEE, PUOHOKAMOA, HAIPUAENA, PUNALAU/KOLEA, HONOMANU, NUAAILUA, PIINAAU, PALAUHULU, OHIA (WAIANU), WAIOKAMILO, KUALANI, WAILUANUI, WEST WAILUAIKI, EAST WAILUAIKI, KOPILIULA, PUAKAA, WAIOHUE, PAAKEA, WAIAAKA, KAPAULA, HANAWI, AND MAKAPIPI STREAMS	Case No. CCH-MA13-01 **CERTIFICATE OF SERVICE**

CERTIFICATE OF SERVICE

The undersigned hereby certifies that, on this date, a true and correct copy of the foregoing document was duly served on the following parties as stated below:

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