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DEPARTMENT OF WATER SUPPLY

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),
WAIKAMILO, KUALANI, WAILUANUI,
WEST WAILUAIKI, EAST WAILUAIKI,
KOPILIULA, PUAKAA, WAIQHUE,
PAAKEA, WAIATAKA, KAPAULA,
HANAWI, and MAKAPIPI STREAMS

CASE NO. CCH-MA13-01

COUNTY OF MAUI, DEPARTMENT OF
WATER SUPPLY'S PROPOSED
FINDINGS OF FACT, CONCLUSIONS
OF LAW, AND DECISION AND ORDER;
CERTIFICATE OF SERVICE

**COUNTY OF MAUI, DEPARTMENT OF WATER SUPPLY'S PROPOSED
FINDINGS OF FACT, CONCLUSIONS OF LAW, AND DECISION AND ORDER**

Comes now, COUNTY OF MAUI, DEPARTMENT OF WATER SUPPLY ("MDWS"),
by and through its attorneys, PATRICK K. WONG, Corporation Counsel, and CALEB P. ROWE
and KRISTIN K TARNSTOM, Deputies Corporation Counsel and Hereby submits its Proposed

Findings of Fact, Conclusions of Law, and Decision and Order pursuant to Minute Order #24, filed on March 6, 2017.

MDWS' Proposed Findings of Facts, Conclusions of Law and Decision and Order will be submitted by way of supplementing relevant portions of the Hearings Officer's Proposed Findings of Fact, Conclusions of Law and Decision and Order as set forth in Minute Order 16. Proposed additions to those findings and conclusions will be italicized and double underlined, and proposed deletions will be italicized with the strike through feature to distinguish them from the Hearings Officer's earlier submission. MDWS will only be addressing findings and conclusions related to its water needs, use of surface water, and its position on the usage of the central Maui fields pursuant to Minute Order 19.

I. FINDINGS OF FACT

A. Sequence of Events Leading to the Contested Case

46. *By way of Minute Order No. 18, dated March 10, 2016, Chairperson Suzanne Case ordered the Contested Case Hearing reopened to address A&B's decision of January 6, 2016 to change HC&S's business operations from farming sugar to a diversified agricultural model. (Minute Order No. 18).*

47. *Minute Order No. 19 set forth the scope of the reopened hearing as follows:*

- "a. HC&S/A&B's current and future use of surface waters and the impact on the groundwater resources for its central Maui fields of HC&S's cessation of sugar operations;*
- b. the impact of HC&S's cessation of sugar operations on MDWS' use of surface water; and*
- c. Maui County's position on the future use of the central Maui fields; and*
- d. How EMI is managing the decrease in diversions, how it would manage the interim restorations, and any issues concerning the integrity of the EMI ditch system with the current and any future changes in offstream diversions."*

(Minute Order No. 19).

48. Briefing schedules on the reopened hearing were set by way of Minute Order No. 21 and amended by way of Minute Order No. 22. (Minute Order Nos. 21, 22).

49. Hearings commenced on February 6, 2017 and concluded on February 9, 2017, after which the evidentiary portion of the reopened hearing was closed.

50. Schedules for Proposed Findings of Fact, Conclusions of Law, and Decision and Order were set forth and by Minute Order No. 24, and subsequently amended by way of Minute Order No. 25. (Minute Order Nos. 24, 25).

51. Prior to submission of the parties' Proposed Findings of Fact, Conclusions of Law, and Decision and Order, MDWS sent a letter to the Hearings Officer and parties to this contested case on April 5, 2017. The letter requested either that parties stipulated to additional information being placed on the record regarding water quality in the Wailoa Ditch. The parties did not stipulate to supplement the record, and MDWS was instructed to petition the Commission to re-open the evidentiary hearing. (MDWS Letter dated April 5, 2017; Minute Order No. 26).

52. On April 13, 2017, MDWS filed a Motion to Reopen Evidence. HC&S filed a joinder to MDWS Motion Dated April 20, 2017. Maui Tomorrow Foundation, Inc., and Nā Moku Aupuni O Ko'olau Hui, Lurlyn Scott and Sanford Kekahuna filed Memorandums in Opposition on April 20, 2017. On May 10, 2017, the Hearings Officer recommended denial of MDWS' Motion. This Motion was denied by way of Order dated May 31, 2017. (MDWS Motion to Reopen Evidence; Order Denying County of Maui, Department of Water Supply's Motion to Reopen Evidence).

53. A revised schedule for submitting Proposed Findings of Fact, Conclusions of Law, and Decision and Order was set forth by way of Minute Order No. 27. (Minute Order 27).

D. Stream Diversions

2. MDWS (Page 15, ¶ 12 – Page 17, ¶ 83)

71. MDWS receives water from EMI through:
- a. groundwater from a development tunnel in the Ko'olau Ditch for the Nahiku community;
 - b. streams in EMI's Haiku Uka watershed through the upper and lower Waikamoi flumes that MDWS maintains to serve its Olinda/Upper Kula and Piiholo water treatment plants;
 - c. water from the Wailoa Ditch after it enters HC&S's lands to serve its Kamole water treatment plant; and
 - d. non-potable water from HC&S's Hamakua Ditch¹ at Reservoir 40 to serve the Kula Agricultural Park. (Garrett Hew, WDT, ¶ 20; Garrett Hew, Tr., March 18, 2015, pp. 192-193; David Taylor, WDT, ¶ 7; Exh. C-33.)
72. MDWS diverts stream water directly through its upper and lower Waikamoi flumes, and receives stream waters from EMI's Wailoa Ditch and its continuation as HC&S's Hamakua Ditch, *see* Exh. C-33, attached.
73. The upper Waikamoi flume diverts water from the Waikamoi, Puohokamoa, and Haipuena Streams to the Olinda/Upper Kula water treatment facility. Water for this facility is stored in the 30-million gallon Waikamoi reservoirs and the 100-million gallon Kahakapao reservoirs, *see* Exh. C-33, attached. The Olinda facility's average daily production is 1.6 mgd, with a capacity of 2 mgd. (David Taylor, WDT, ¶ 11; Exh. B-3, p. 25; David Taylor, Tr., March 11, 2015, pp. 47, 140.) [MDWS FOF 25.]
74. The lower Waikamoi flume diverts water from the Waikamoi, Puohokamoa, Haipuaena and Honomanu Streams to the Piiholo water treatment facility. Water for this facility is stored in the 50-million gallon Piiholo Reservoir, *see* Exh. C-33, attached. The Piiholo facility's average daily production is 2.5 mgd, with a capacity of 5 mgd. (David Taylor, WDT, ¶ 10; Exh. B-3, p. 25; David Taylor, Tr., March 11, 2015, p. 47.) [MDWS FOF 24.]
75. The stream flows are variable, so the reservoirs provide storage so that there is a relatively constant amount of water available to the treatment facilities, regardless of streamflow. (David Taylor, Tr., March 11, 2015, p. 49.)

¹ The source for the Hamakua Ditch is the Wailoa Ditch. *See* Exh. C-33, attached.

76. There are no gages on the Waikamoi flumes, so there is no way to measure the amount of water being diverted from the streams. Because the new upper Waikamoi flume isn't going to be leaking, MDWS assumes that everything that goes in will come out. MDWS measures the reservoir levels every day, so once the new flume is functional, MDWS will be able to calculate how much water is coming from the flume on days when the main intake from the dam is dry, which is most of the days. All of the water coming in will be from the flume. (David Taylor, Tr., March 11, 2015, pp. 59-60.)

77. EMI's Wailoa ditch, which diverts multiple streams (*see* Exh. C-33 and FOF 61, *supra*), is the source of water for MDWS's Kamole water treatment facility. The Kamole facility's average daily production is 3.6 mgd, with a capacity of 6 mgd. *This capacity could be expanded relatively quickly, however, should MDWS have assurances of greater access to water, as evidenced by recent upgrades to the Iao Surface Water Treatment Plant.* (David Taylor, WDT, ¶ 9; Exh. B-3, p. 24; David Taylor, Tr., March 11, 2015, p. 47.) [MDWS FOF 23.]; Supplemental Declaration of David Taylor on Reopening, ¶¶ 3 – 9; Exhibits “B-073”, “B-074.”

78. MDWS owns the upper and lower Waikamoi flumes and has a contract with EMI to service the diversions to keep them clear. MDWS takes water directly from the Wailoa ditch. (David Taylor, Tr., March 11, 2015, p. 53.)

79. HC&S's Hamakua ditch (the western extension of the Wailoa ditch), at reservoir 40 (*see* Exh. C-33, attached), is the source of water for Kula Agricultural Park, where two reservoirs have a total capacity of 5.4 million gallons. The Park consists of 31 farm lots which range in size from 7 to 29 acres, and which are owned by the County of Maui. Individual lots are metered and billed by MDWS. (David Taylor, WDT, ¶ 13; Exh. B-4.) [MDWS FOF 27.]

80. MDWS pays EMI \$0.06 per thousand gallons (\$60/million gallons). (Garrett Hew, WDT, ¶ 21.)

81. The original contract between MDWS and EMI was entered into in 1961, which was replaced by a 1973 "Memorandum of Understanding" with a term of 20 years. Since its expiration, there have been a total of 8 extensions. After the lapse of the most recent extension, EMI has continued to provide water to MDWS through a memorandum dated April 13, 2000. (David Taylor, WDT, ¶ 15; Exhs. B-5-15.) [MDWS FOF 29.]

82. The memorandum provides that MDWS will receive 12 mgd from the Wailoa ditch with an option for an additional 4 mgd, for a total of 16 MGD. During periods of low flow, no water will be diverted to lower-elevation ditches, and MDWS will receive a minimum allotment of 8.2 mgd and HC&S will also receive 8.2 mgd. If these minimum amounts cannot be delivered, MDWS and HC&S will receive prorated shares of the water available. (David Taylor, WDT, ¶ 15; Exh. B-5; David Taylor, Tr., March 11, 2015, pp. 53-54; Garrett Hew, Tr., March 18, 2015, pp. 146-147.) [MDWS FOF 30.]

83. Average daily use by MDWS from the Wailoa ditch is 7.1 mgd, which includes water for the Kamole facility, averaging 3.6 mgd (*see* FOF 77, *supra*), and the Kula Agricultural Park. (David Taylor, Tr., March 11, 2015, pp. 81-83.)

L. Noninstream Uses

2. MDWS (Page 83, ¶ 13 – Page 90, ¶ 19)

a. Uses

454. MDWS is the sole municipal water provider for the County of Maui. The MDWS Upcountry Water System serves the communities of Kula, Haiku, Makawao, Pukalani, Haliimaile, Waiakoa, Keokea, Waiohuli, Ulupalakua, Kanaio, Olinda, Omaopio, Kula Kai, and Pulehu. (David Taylor, WDT, David Taylor, Tr., March 11, 2015, p. 41.) [MDWS FOF 13.]

455. The population served by the MDWS upcountry system is projected at 35,251 people and includes several businesses, churches, Kamehameha Schools, Hawaiian Homelands, and government facilities. By 2030, the population is anticipated to grow by about 8,424 to a total of 43,675. (Michele McLean, WDT, ¶5; Exh. B- David Taylor, WDT, ¶ 6; David Taylor, Tr., March 11, 2015, p. 41; Michele McLean, Tr., March 12, 2015, pp. 120-127; Exhs. B-1, B-18, B-58.) [MDWS FOF 15, 34.]

456. Approximately 60 percent of MDWS's system is used domestically, and the remaining 40 percent for agricultural purposes. (David Taylor, WDT, ¶ 17; Exh. B-2, pp. 1-2; David Taylor, Tr., March 11, 2015, pp. 44-47.) [MDWS FOF 21.]

457. Approximately 80 to 90 percent of the water delivered within the upcountry system comes from surface water sources, either directly or by way of various raw water storage facilities. (David Taylor, WDT, ¶¶ 7-8, 18; Exh. B-2, Table 2; David Taylor, Tr., March 11, 2015, p. 44.) [MDWS FOF 20.]

458. MDWS relies on three surface water sources, one of which is delivered by EMI through the Wailoa Ditch, and the other two through two MDWS higher-elevation aqueducts maintained by EMI that transport water to Olinda and Kula, under a contractual agreement originated under the 1973 East Maui Water Agreement and subsequent agreements. (Exhs. B-5, B-6, B-7, C-3.) [Na Moku/MTF FOF 844.]

<u>Water Treatment Plant ("WTP")</u>	<u>Elevation</u>	<u>Conveyance System</u>	<u>Production Capacity</u>	<u>Average Production</u>
Olinda	4,200 feet	Upper Kula Flume	2.0 mgd	1.6 mgd
Piiholo	2,900 feet	Lower Kula Flume	5.0 mgd	2.5 mgd
Kamole-Weir	1,120 feet	Wailoa Ditch	6.0 mgd	3.6 mgd

(David Taylor, WDT, ¶ 9-11; David Taylor, Tr., March 11, 2015, p. 47; Exh. B-3, pp. 24-25; Exh. B-16, pp. 6-7.) [MDWS FOF 23-25; Nā Moku/MTF FOF 844.]

460. The Olinda facility diverts water from the Waikamoi, Puohokamoa, and Haipuaena streams. Water is stored in the 30-million gallon Waikamoi Reservoirs (two, at 15 million gallons each) and the 100-million gallon Kahakapao Reservoir. (David Taylor, WDT, ¶ 11; Exh. B-3, p. 25; David Taylor, Tr., March 11, 2015, p. 47.) [MDWS FOF 25.]

461. The Piiholo facility diverts water from the Waikamoi, Puohokamoa, Haipuaena, and Honomanu streams into the 50-million gallon Piiholo Reservoir. (David Taylor, WDT, ¶ 10; David Taylor, Tr., March 11, 2015, p. 47; Exh. B-3, p. 25.) [MDWS FOF 24.]

462. The Kamole-Weir facility, which has no reservoir, relies on water from the Wailoa Ditch, which diverts water from Honopou, Hanehoi, Puolua, Alo, Waikamoi, Puohokamoa, Haipuaena, Kolea, Punalau, Honomanu, Nuaailua, Piinaau, Paluhulu, East and West Wailuanui, West Wailuaiki, East Wailuaiki, Kopiliula, Puakaa, Waiohue, Paakea, Waiaaka, Kapaula, Hanawi, and Makapipi streams. (David Taylor, WDT, ¶ 9; David Taylor, Tr., March 11, 2015, p. 47; Exh. B-3, p. 24.) [MDWS FOF 23.]

463. Besides its customers on the Upcountry Water System, *supra*, FOF 454, MDWS also provides non-potable water to the Kula Agricultural Park ("KAP") through diversions from the same streams which serve the Kamole-Weir WTP through the Wailoa Ditch. Water is stored in two reservoirs with a total capacity of 5.4 million gallons. KAP consists of 31 farm lots ranging

in size from 7 to 29 acres, and which are owned by the County of Maui. The individual lots are metered and billed by MDWS. (David Taylor, WDT, ¶ 13; Exh. B-4.) [MDWS FOF 27.]

464. MDWS receives its surface water under a series of contracts with EMI. The original contract was entered into in 1961, and the "Master Water Agreement" was replaced by a 1973 "Memorandum of Understanding" as the primary contract, which had a term of 20 years. Since its expiration, there have been a total of 8 extensions, and after the lapse of the most recent extension, water has continued to be provided through a "Memorandum of Understanding Concerning Settlement of Water and Related Issues" dated April 13, 2000 ("MOU"). (David Taylor, WDT, ¶15; Exhs. B-5 to B-15.) [MDWS FOF 29.]

465. The MOU provides that MDWS will receive 12 mgd with an option for an additional 4 mgd, for a total of 16 MGD. During low-flow periods, the County and HC&S will both receive a minimum allotment of 8.2 mgd. If these minimum amounts cannot be delivered, MDWS and HC&S will receive prorated shares of the water that is available. (David Taylor, WDT, ¶ 15; David Taylor, Tr., March 11, 2015, pp. 53-54; Exh. B-15.) [MDWS FOF 30.]

466. Approximately 80 to 90 percent of the water delivered within the upcountry system comes from surface water sources, *supra*, FOF 457, with the remaining 10 to 20 percent coming from a series of basal aquifer wells. The Haiku Well can produce 0.5 mgd, the Pookela Well, 1.3 mgd, and the two Kaupakalua wells, 1.6 mgd, for a total of 3.4 mgd. (Exh. B-16, p. 8.) [Na Moku/MTF FOF 850.]

467. In times of emergency, MDWS may also draw 1.5 mgd from the Hamakuapoko Wells. This water, however, is only available during times of emergency due to concerns over pesticides from former pineapple production. (David Taylor, Tr., March 11, 2015, pp. 61-62.)

468. The combined surface and ground water sources have a production capacity of 17.9 mgd: 13.0 mgd from surface water, *supra*, FOF 459, and 4.9 mgd from ground water (including 1.5 mgd in emergencies from the Hamakuapoko wells), *supra*, FOF 466-467.

469. However, due to occasional maintenance requirements and limitations on the use of the Hamakuapoko Wells, reliable capacity stands at 9.1 mgd. This is premised on the following sources not being available: 1) the largest surface-water facility, the Kamole-Weir at 6.0 mgd production capacity; 2) the Pookela Well at 1.3 mgd production capacity; and 3) Hamakuapoko Wells at 1.5 mgd, which is only available at times of emergency. These three sources total 8.8

mgd, potentially reducing total production capacity of 17.9 mgd to 9.1 mgd. (David Taylor, Tr., March 12, 2015, pp. 68-69.)

470. Customer usage based on meter readings between 2004 and 2013 average 7.9 mgd, varying between 6 mgd and 10 mgd. (Exhs. B-2; B-16, p. 3, table 3; B-21, p. 14, figure 1.) [MDWS FOF 33.]

471. There are currently 9,865 water connections to the Upcountry System. As of June 30, 2014, there were 1,852 applicants on the County's waiting list for new water connections. MDWS contends that if all were connected to the Upcountry System, water demand would increase by approximately 7.5 mgd, or 95 percent of current usage of 7.9 mgd, *supra*, FOF 470. However, because of the high cost of these connections, approximately half of the applicants who have been offered new meters have declined.—~~and MDWS anticipates that this trend will continue, leaving demand at about 3.75 mgd. (David Taylor, WDT, ¶¶ 20-23.)~~ For the purposes of planning for the development of infrastructure, however, MDWS relies upon the full amount of this projected need due to uncertainties in anticipating future needs. (David Taylor, Tr., February 8, 2017, pp. 375, ¶ 13 – 376, ¶ 25.

472. MDWS explained that its current 9,865 water connections use an average of 7.9 mgd, and it expects that the additional 1,852 applicants, if meters are granted, would increase usage by 7.5 mgd, or 95 percent, because some of those applicants are asking for multiple meters for subdivisions. Therefore, 1,852 applicants represent many, many more actual meters. Staff engineers went through each of the applications, did an estimate for each one, and came up with the increased usage of 7.5 mgd. (David Taylor, Tr., March 11, 2015, p. 67-69.)

473. MDWS also expects that by 2030 the population of the area served by the Upcountry System is anticipated to grow by about 8,424, from 35,251 to 43,675, with a predicted additional need for water of 1.65 mgd. (Michele McLean, WDT, ¶ 5; Michele McLean, Tr., March 12, 2015, pp. 120-127; David Taylor, WDT, ¶ 24; David Taylor, Tr., March 11, 2015, pp. 76-78; Exhs. B-1; B-2, amended table 5; B-16, table 3; B-18; B-58.) [MDWS FOF 34-35.]

474. MDWS anticipates that it will need to develop between 4.2 mgd and 7.95 mgd to meet demands through 2030, including present use, expected increased demand due to population growth, and a percentage of new connections from the current priority list for meters. (David Taylor, WDT, ¶ 25.)

b. Losses

475. The 1.1-mile Waikamoi Flume transports surface water from the intakes at Waikamoi, Puohokamoa, and Haipuaena streams to the Olinda WTP. Water is stored in the 30-million gallon Waikamoi Reservoirs (two, at 15 million gallons each) and the 100-million gallon Kahakapao Reservoir, *supra*, FOF 460.

476. Over the years, the Waikamoi Flume became so leaky that MDWS estimated it lost as much as 40 percent of total flow through cracks and holes along its whole length. (Exh. B-54, pp. 27-29; Exh. E-114, p. 8.) [Nā Moku/MTF FOF 907-908.]

477. MDWS could not measure actual losses, because it had no mechanism for quantifying water levels at either the intake or discharge sites of the Waikamoi Flume. (David Taylor, First Supplemental Declaration, ¶ 5.) [Nā Moku/MTF FOF 911.]

478. If the reliable capacity of the Olinda WTP is the reported 1.6 mgd, *supra*, FOF 459, then the flume could have wasted as much as 0.64 mgd (1.6 mgd x 0.40) at that level of operation. (Nā Moku/MTF FOF 910.)

479. MDWS has just completed replacing the entire Waikamoi Flume. (David Taylor, Tr., March 11, 2015, pp. 55-59.)

480. Because the new flume isn't going to be leaking, MDWS assumes that everything going in will come out. They measure the reservoir levels every day, and also know how much water is taken out to the water treatment plant. So MDWS will be able to calculate how much water is coming from the flume on days when the main intake from the dam is dry, which is most of the days. All of the water coming in will be from the flume, so MDWS will be able to quantify how much water comes in from the flume most of the time. (David Taylor, Tr., March 11, 2015, p. 60.)

481. There is no way to accurately compare intake versus outtake of the Waikamoi Flume prior to versus completion of the replacement flume. (David Taylor, Tr., March 11, 2015, p. 60.)

482. Further, the two 15 million-gallon Waikamoi reservoirs as well as the 2 million-gallon on-site basin at the Olinda WTP have just been relined. (David Taylor, Tr., March 11, 2015, p. 54-55.)

c. Alternate Sources

483. MDWS has no plans to drill new production wells to serve the Upcountry areas at the present time. They are very expensive, use a lot of energy, and there are some legal and procedural difficulties:

1. Water is very heavy, so moving it to higher elevations takes a lot of energy. Because a lot of the Upcountry System is at 1,000 to 4,000 feet and the basal aquifer is roughly at sea level, moving water is projected to cost \$1.64 per thousand gallons for distribution from the Kamole-Weir WTP, \$4.07 per thousand gallons at the Piiholo WTP, and \$5.93 per thousand gallons at the Olinda WTP. On top of pumping costs, increased reliance on ground water sources would require substantial initial capital expenditures and on-going maintenance. Ground water development also involves risks due to the uncertainty of the quantity and quality of water that will be present. MDWS's current charges for water only average about \$4 per thousand gallons, so just the electrical costs is more than what MDWS charges overall for its entire operation. (David Taylor, Tr., March 11, 2015, pp. 62-65; David Taylor, Tr., March 12, 2015, pp. 17-19, 52; Exh. B-16, pp. 10, 14, 16.) [MDWS FOF 39-43.]

2. MDWS has entered into a Consent Decree in the case of Coalition to Protect East Maui Water Resources v. Board of Water Supply, County of Maui, Civil No. 03-1-0008(3), December 2003, which requires that MDWS conduct vigorous cost/benefit analyses of other water source options before developing ground water in the East Maui region. On several occasions, MDWS has tried but been unsuccessful in working within the framework of the consent decree to develop new ground water sources. (David Taylor, WDT, ¶¶ 29-30; David Taylor, Second Supplemental Declaration, ¶¶ 26-28; David Taylor, Tr., March 11, 2015, pp. 64-65; Exhs. B-19, B-20, B-52.)

484. New raw water storage facilities, which would be fed by streams in times of water surplus for use during times of low flows, are an additional means by which MDWS could mitigate the effects of stream flow restoration:

1. Currently, MDWS is considering construction of a 100- to 200-million gallon reservoir at the Kamole-Weir WTP, which has no reservoir, *supra*, FOF 462, and has allocated \$1.5 million in its FY2015 budget toward land acquisition for a possible reservoir. The total six-year estimated cost for the project is \$25.25 million. No money

has been allocated for design or construction. (David Taylor, First Supplemental Declaration, ¶¶ 10-11; David Taylor, Second Supplemental Declaration, ¶ 24; David Taylor, Tr., March 11, 2015, pp. 50-53; Exhs. B-16, p. 13 table 13; E-124.) [MDWS FOF 45-46.]

2. Like new basal groundwater source development, development of new raw water storage would require significant initial capital expenditures and on-going maintenance costs. (David Taylor, Tr., March 12, 2015, pp. 19-24; Exh. B-16, pp. 14, 16 table 4.) [MDWS FOF 47.]

485. Raw water storage at the Kamole WTP is more cost-effective than providing backup capacity by extensive additions of basal groundwater wells, which require high long-term energy expenditures. (Exh. E-147, p. 48.) [Nā Moku/MTF FOF 952-953.]

486. Reservoirs mitigate fluctuations in both stream flow and consumer demand, and mitigations in fluctuations in stream flow allow more of it to be used at the proper time; i.e., during drier times when it is most needed for irrigation, by making more water available without simultaneously taking directly from the water source being protected. (David Taylor, WDT, ¶ 10; Richard Mayer, Supplemental Declaration, ¶¶ 13-14.) [Nā Moku/MTF FOF 949-950.]

d. Economic Impact

487. A study conducted for the Draft "Maui Water Use and Development Plan ("WUDP") Upcountry Final Strategies Report" (July 25, 2009) examined the impacts of amended IIFS on drought period reliable capacity at the Kamole-Weir water treatment plant. (Exh. E-130.)

488. In 2014, MDWS also commissioned an engineering analysis of the impact to MDWS if the County's use of East Maui surface water were reduced or eliminated, based on documents provided by MDWS, including the July 25, 2009 Draft WUDP for MDWS's Upcountry System. (Exh. B-16.)

489. The 2014 review and analysis compared new groundwater sources versus construction of raw water storage reservoirs to mitigate Upcountry drought conditions. New reservoirs carry high capital costs but have lower operation and maintenance costs compared to groundwater wells. New wells carry relatively lower capital costs but also require transmission and storage improvements to be integrated into the existing water delivery systems, have risks associated with the uncertainty of the quantity and quality of water that will be present, and have higher

operational costs due to the costs of pumping ground water from basal aquifers at sea level to the Upcountry system. (Exh. B-16, p. 14.)

490. Life-cycle cost comparisons were made, with new ground water sources and construction of storage reservoirs carrying similar life-cycle costs. Life-cycle costs incorporate capital, operating, and maintenance costs over a defined planning period and include inflationary effects. Over a 25-year period, both new ground water wells and reservoirs would cost about \$33-\$35/thousand gallons, for a total of \$250 to \$260 million for each strategy. (Exh. B-16, p. 15.)

491. The Kamole-Weir WTP has no storage reservoir, while both the Olinda and Piihola WTPs have reservoirs, *supra*, FOF 460-462. The Kamole-Weir WTP has a production capacity of 6 mgd and an average production of 3.6 mgd, *supra*, FOF 459.

492. Under the MOU between EMI and MDWS, MDWS can receive 12 mgd with an option for an additional 4 mgd for a total of 16 MGD. During low-flow periods when ditch flows are greater than 16.4 mgd, both will receive a minimum allotment of 8.2 mgd. If these minimum amounts cannot be delivered, both will receive prorated shares of the water that is available, *supra*, FOF 464-465. In recent periods of low Wailoa Ditch flow, EMI has not restricted the allotment of water to MDWS according to the terms of the agreement, and MDWS withdrawals have been limited only by the amounts of water available in the ditch and the physical limitations of the existing Kamole-Weir WTP intake structures. During drought conditions, MDWS may withdraw 6 mgd, and what remains is used by HC&S for irrigation. (Exhs. E-130, p. 4; Exh. B-16, p. 10.)

493. For the period 1922 to 1987, flows in the Wailoa Ditch exceeded 40 mgd more than 90 percent of the time and exceeded 20 mgd more than 99 percent of the time. (Exh. E-130, p. 4.)

494. Assuming a drought period exists if water available to MDWS is less than the 6 mgd capacity of the Kamole-Weir WTP, recent existing reliability was 4.5 mgd drought period yield, with raw water requirements assumed to be 5.0 mgd to provide 4.5 mgd of potable water capacity.² (Exh. E-130, p.6.)

² The study uses 4.5 mgd or 4.6 mgd for various reasons. 4.6 mgd will be used to simplify the discussion.