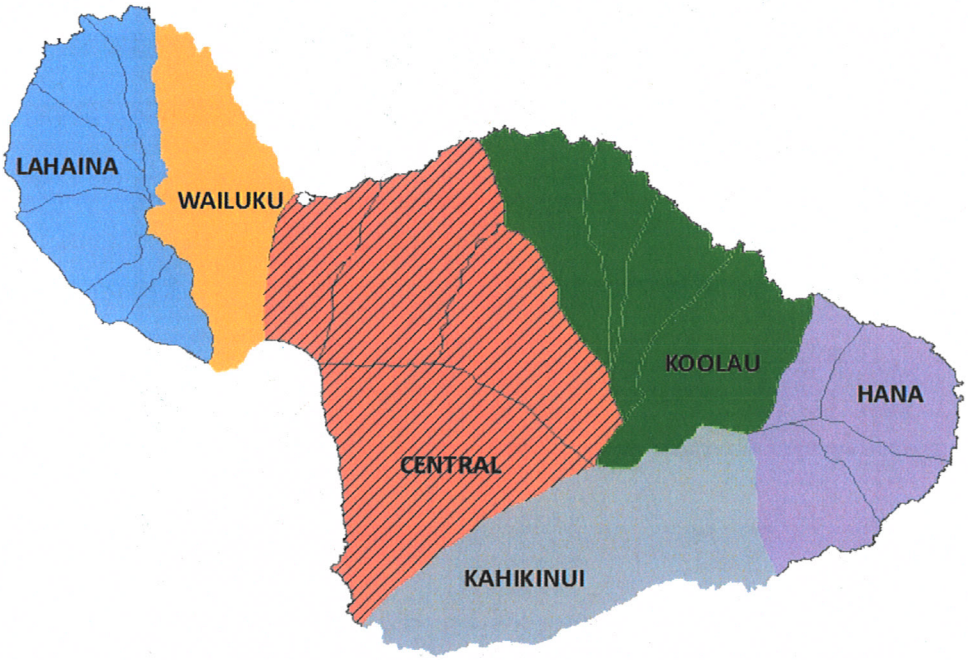


MAUI ISLAND WATER USE AND DEVELOPMENT PLAN DRAFT

PART III REGIONAL PLANS

CENTRAL AQUIFER SECTOR AREA

The figure below shows the MDWS systems and HC&S lands overlying the three aquifer sectors.

Figure 15-1 Wailuku, Central and Ko`olau Aquifer Sectors, HC&S Lands, Maui Department of Water Supply Central System and Upcountry System

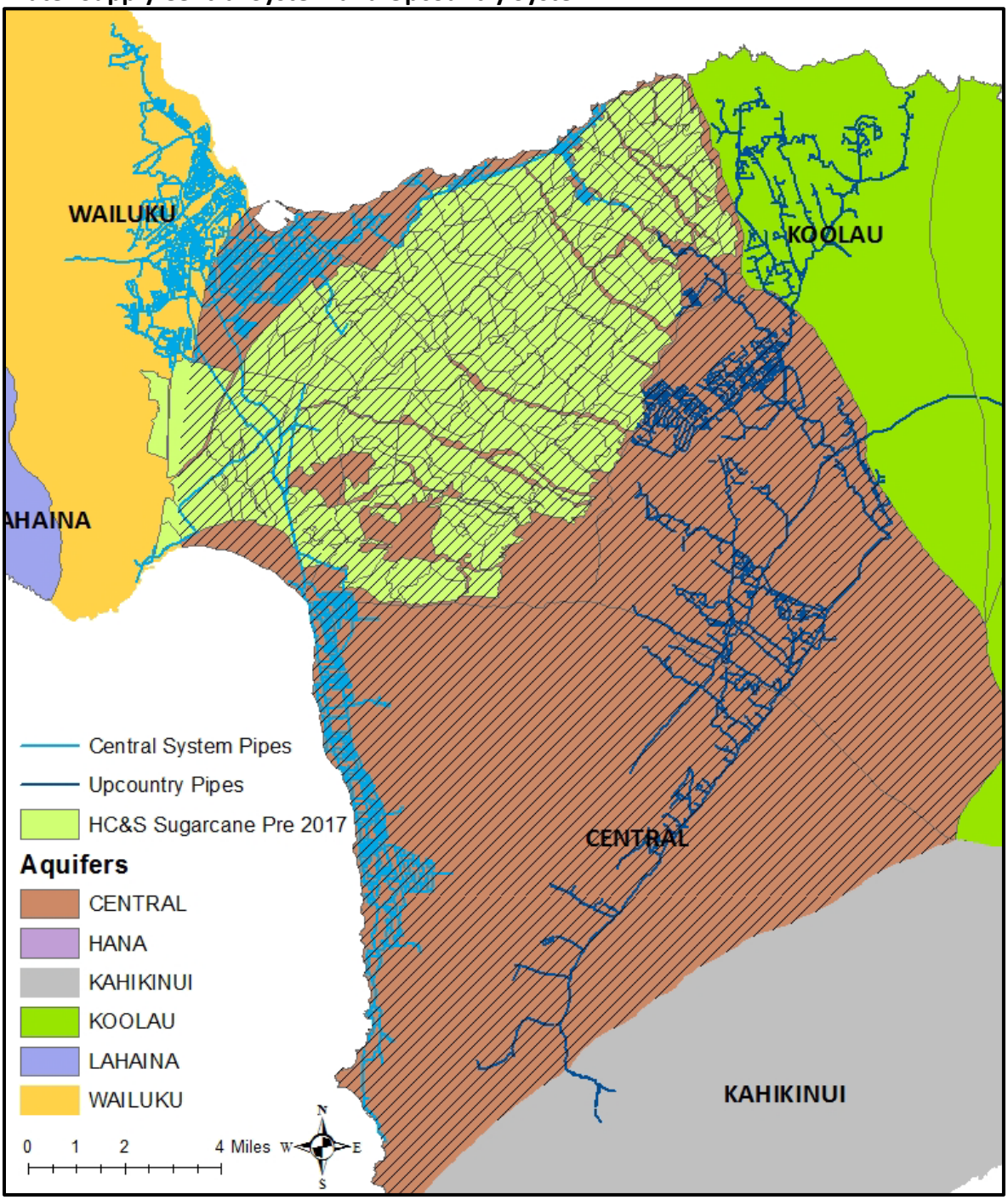


Table 15-14 Wastewater Reclamation Facility Capacity, Production and Use, 2014 (mgd)

WWRF	Treatment Level	WWRF Design Capacity	Recycled Water Produced	Recycled Water Used	% of Total Produced Used	% of Design Capacity Used	Application
Wailuku -Kahului	R-2	7.9	4.7	0.25	5.3%	3.2%	None
Kīhei	R-1	8	3.6	1.5	41.5%	18.7%	Golf Course, Agriculture, Dust Control, Landscape, Fire Protection
Mākena (Private)	R-1	0.75	0.08	0.08	10.6%	10.6%	Golf Course
Pukalani (Private)	R-1	0.29	0.19	0.19	100%	65.5%	Landscape

Source: Department of Environmental Management, Wastewater Reclamation Division, Central Maui Recycled Water Verification Study, December 2010

Mākena Resort Wastewater Reclamation System

The Mākena area is predominantly served by cesspools. There is no publicly owned treatment works operating in the area. Mākena Resort is served by a privately owned individual wastewater system with effluent treated to R-1 quality. The Mākena Wastewater Reclamation Facility encompasses an area of approximately 13 acres, mauka of the Mākena North Golf Course. The reclaimed water is pumped up to a larger reservoir within the golf course irrigation system, mixed with non-potable ground water from nearby wells, and used to irrigate portions of the North and South courses. Its average daily capacity is approximately 0.72 mgd and is designed to be expanded to 1.5 mgd in the future. The current average daily flow is approximately 80,000 gallons. The primary reuse is golf course irrigation. Additional reuse is for wastewater facility uses such as landscape irrigation, washdown and dilution water.

Pukalani Wastewater Reclamation System

Hawai`i Water Service Company treats 200,000 gpd of wastewater using membrane bio-reactor technology used to irrigate the adjacent Pukalani golf course. About 190,000 gpd are used and no recycled water expansion plans are identified.

Stormwater Reuse

Capture and reuse of stormwater runoff is an under-utilized water resource that provides an opportunity to reduce reliance on groundwater and surface water for landscape irrigation, especially when incorporated into the design of development projects in order to minimize infrastructure costs. There is no reported stormwater reuse in the Central ASEA, although some development projects may have stormwater controls incorporated into project design to reduce runoff and its effects. The *Hawai'i Stormwater Reclamation Appraisal Report, 2005, and*

State Department of Hawaiian Home Lands (DHHL) Water Demand Projections

The DHHL maintains land use jurisdiction over Hawaiian Homes and is not subject to county zoning designations. Water rates used by the State Water Projects Plan Update, DHHL, May 2017, and projected demand based on the DHHL Maui Island and regional land use plans are described in the table below.

Table 15-16 DHHL Land Use, Central ASEA Acreage, and Water Standards for Maui

Land Use	Acres or Residential Units Central ASEA	Potable Water Standard	Non-potable (gal/acre)
Residential	1,286 acres: Kēōkea (386 units [66 Subsistence Agriculture 3-ac lots, 320 Residential 1-acre lots]), Waiohuli (768 units = 768 acres)	600 gal/unit	None
Subsistence Ag	100 acres: Kēōkea-Waiohuli (ranching/grazing)*	600 gal/unit	3400 gal/acre
Supplemental Agriculture	0	None	3400 gal/acre
Pastoral	0	600 gal/unit	20 gal/acre
General Ag	546 acres: Pu`unēnē	None	3400 gal/acre
Special District		Varies	Varies
Community Use acres	109 acres: Kēōkea (69 ac) + Waiohuli (40 ac)	1,700 gal/acre or 60 gal/student	None
Conservation	0	None	None
Commercial	0	3,000 gal/acre	None
Industrial	100 acres: Pu`unēnē	6,000 gal/acre	None

Table prepared by MDWS, Water Resources & Planning Division. Figures are estimates based on DHHL Maui Island Plan and Regional Plans.
*State of Hawai`i, Department of Hawaiian Homelands, Kēōkea-Waiohuli DHHL Regional Plan, 2011, page 18

The 2017 State Water Projects Plan (SWPP) has been updated to address DHHL's project needs from 2016 to 2031.[55] There are three major DHHL project areas in the Central ASEA (Pu`unēnē, Kēōkea, and Waiohuli). Planned projects by aquifer system area are summarized below. Projected water demand and strategies for build-out of the Central ASEA DHHL projects over the WUDP planning period are discussed below. Build out of the two projects are not included in directed growth areas, or appear accounted for in the MIP. Therefore, projected demand

[55] State of Hawai`i Department of Hawaiian Homelands, State Water Projects Plan Update, 2017

Figure 15-25 Important Agricultural Lands, EMI Ditches and Service Areas, and Rainfall for HC&S Lands

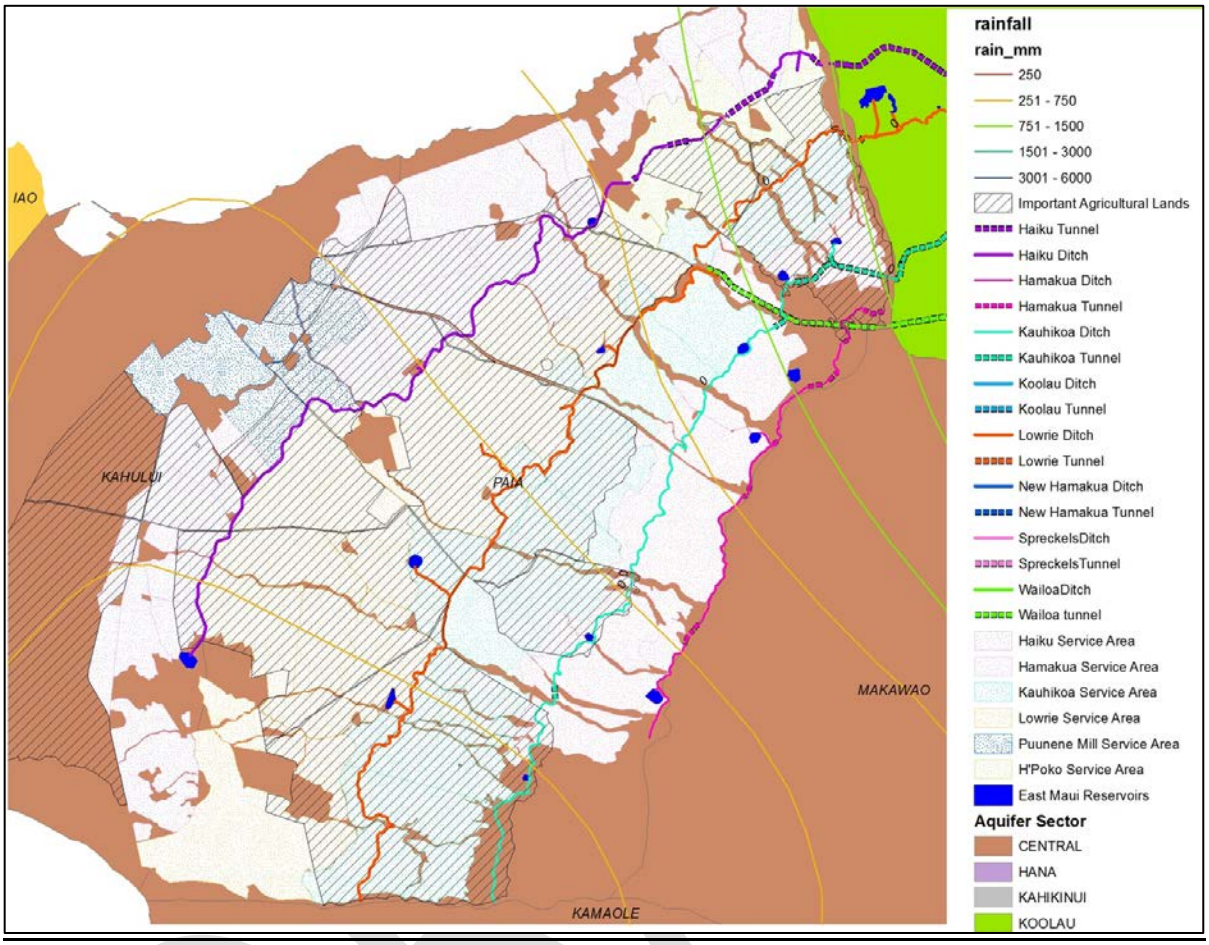


Table 15-31 Projected Low to High Agricultural Demand for A&B/HC&S Lands within EMI Service Area 2017 - 2035

	Low-Growth Scenario 25% of IAL Farmed	Mid-Growth Scenario 50% of IAL Farmed	High-Growth Scenario: 100% of Plantation Served by EMI and/or Brackish Water per HC&S Diversified Agriculture Plan
Time Frame	2020	2030	2035
Irrigated Acres	6,823	13,647	26,996
Irrigation Demand (mgd)	23.20	46.40	89.23

The extent to which brackish water from Pā`ia and Kahului Aquifers can and will be used is highly uncertain and probably directly related to the amount of irrigation return recharge over the same aquifers. It is anticipated that decreased irrigation return recharge will increase salinity and the

The following tables are revised to reflect Mahi Pono's projected irrigation demand.

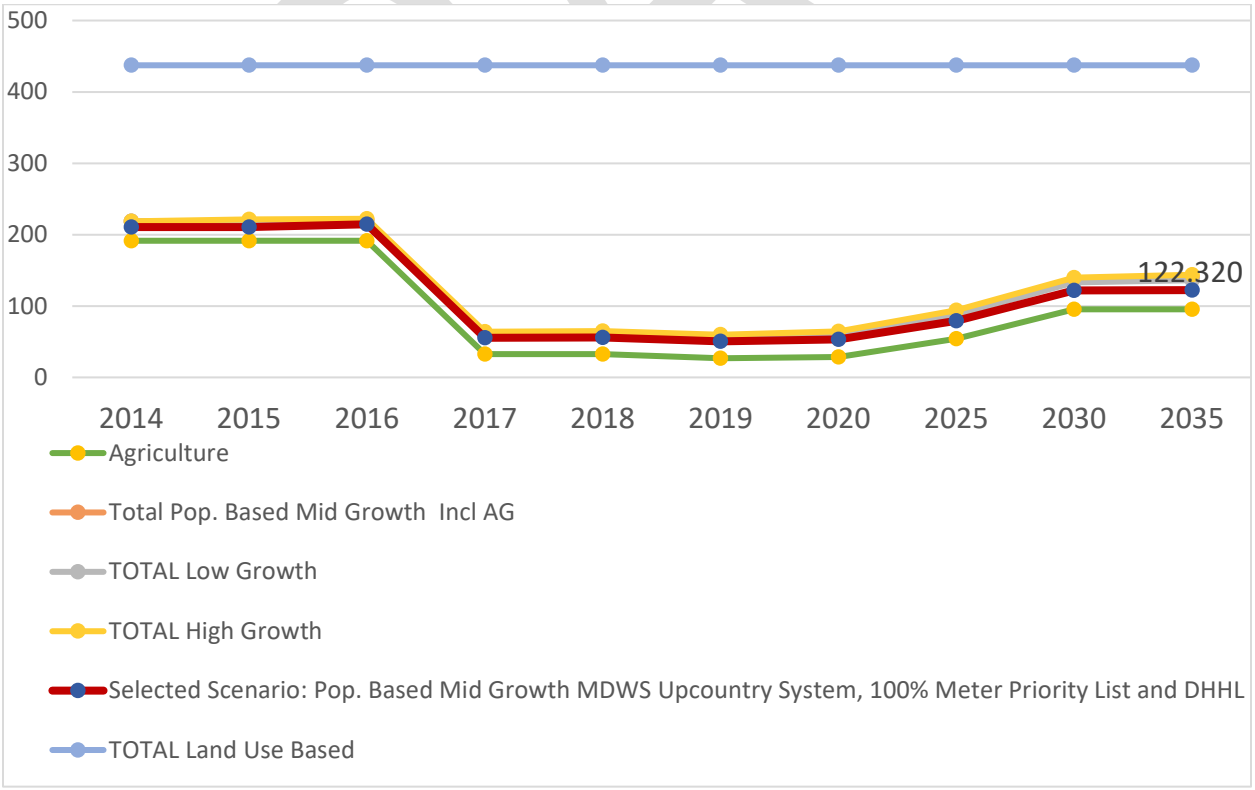
Page 80, Table 15-31 Projected Low to High Agricultural Demand for Mahi Pono Farm Plan 2019 - 2035

	Low-Growth Scenario 2019 Crop Plans	Mid-Growth Scenario 50% of Farm Plan	High-Growth Scenario: 100% of Farm Plan
Time Frame	2020	2030	2035
Irrigated Acres	3,868	10,325	20,650
Irrigation Demand (mgd)	15.58	41.16	82.33

Page 83, 15.6.7 Population Growth-Based Water Demand Projections Analysis

The selected 20-year projected demand scenario for the Central ASEA is population mid-growth based, that account for the MDWS Upcountry system as a whole, with the addition of DHHL needs and the Upcountry Meter Priority List. Substituting the HC&S Diversified Agriculture Plan with Mahi Pono Farm Plan, total 2035 demand is projected to **122.32 mgd**, a decrease from 128.105 mgd.

Page 86, Figure 15-26 Projected Water Use to 2035, Population Growth Based (Low, Medium, High) Central ASEA + MDWS Upcountry System + Upcountry Meter Priority List + DHHL (mgd)



sustainable level of groundwater use, compared to historic levels. The tolerance of various crops to brackish water quality further adds to uncertainty in use.

Diversified Agriculture Outside the HC&S Plantation

Upcountry Maui has a range of actively cultivated crops while the dry slopes between Kula and the coastal area of Kama`ole Aquifer is primarily unirrigated pasture. Based on the 2015 Agricultural Baseline and applying irrigation water duty in accordance with Hawai`i Department of Agriculture guidelines, water demand outside the HC&S plantation of the Central ASEA would be 9.9 mgd. Use includes the Kula Ag Park, the Maui Pineapple Company and Monsanto seed production on the Central isthmus. Projecting a potential 20 percent increase in agricultural use, and accounting for the planned expansion of the Kula Ag Park represents a high growth scenario. Adjustments to projected demand are anticipated once the the Agricultural Water Use & Development Plan is updated. Until then, the high growth scenario 11.8 mgd is conservatively selected as the 2035 demand projection. Table 15-32 below shows breakdown by crop, acreage and water duty over the planning period.

Table 15-32 Central ASEA Agricultural Water Demand (mgd), 2015 Agricultural Baseline (acreage), Agricultural Water Use Based on Crop, Water Use Rates - HDOA Guidelines

Crop	Acreage	Water Use Rate (gpd per acre)	Estimated Water Demand 2015 (mgd)	Estimated Demand 2035 (2015 + 20%)
Banana	16.70	3,400	0.057	0.068
Coffee	10.58	2,900.00	0.031	0.037
Diversified Crop	1,197.22	3,400.00	4.071	4.885
Flowers / Foliage / Landscape	97.97	4,000-6,000	0.490	0.588
Pasture	53,720.04	0-6,700	0.000	0.000
Pineapple	1,093.52	1,350.00	1.476	1.772
Seed Production	754.41	3,400.00	2.565	3.078
Taro	0.23	100,000-300,000*	0.035*	0.041*
Tropical Fruits	21.69	4,400-10,000	0.156	0.187
Kula Ag Park Expansion	302.00		1.027	1.232
CENTRAL Total	**57,214.35**		**9.908**	**11.888**

Coffee: per Brian Kau, HDOA, personal communication 10/12/2016.
Wetland taro: Per CWRM CC D&O, Nā Wai `Ehā and East Maui Streams

Page 84, Table 15-33 Projected Water Use by CWRM Category to 2035 (mgd) Central ASEA

	2014	2015	2016	2017	2018	2019	2020	2025	2030	2035
POPULATION BASED										
Domestic	0.000	0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Industrial	0.208	0.211	0.217	0.222	0.227	0.232	0.237	0.261	0.290	0.316
Agriculture	191.452	191.452	191.452	32.434	32.534	26.829	28.495	54.075	95.245	95.245
Irrigation	3.683	3.744	3.836	3.927	4.018	4.110	4.201	4.627	5.133	5.591
R-1 Irrigation	1.008	1.025	1.050	1.075	1.100	1.125	1.150	1.267	1.405	1.531
Municipal MDWS	*22.235*	*22.609*	*23.160*	*23.712*	*24.263*	*24.814*	*25.366*	*27.939*	*30.995*	*33.761*
Municipal Private	*0.235*	*0.239*	*0.245*	*0.250*	*0.256*	*0.262*	*0.268*	*0.295*	*0.327*	*0.356*
Municipal CENTRAL ASEA Only	**22.470**	**22.899**	**23.423**	**23.960**	**24.509**	**25.070**	**27.928**	**30.871**	**34.303**	**37.501**
MDWS Upcountry System Only	**7.610**	**7.693**	**7.785**	**7.879**	**7.973**	**8.069**	**8.155**	**8.292**	**8.432**	**8.530**
Military	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
TOTAL CENTRAL ASEA Pop. Based Mid Growth excl. AG	**27.368**	**27.880**	**28.526**	**29.184**	**29.854**	**30.537**	**33.517**	**37.026**	**41.132**	**44.939**
Total Central ASEA Pop. Based Mid Growth Incl. AG	**218.820**	**219.332**	**219.978**	**61.618**	**62.388**	**57.366**	**62.012**	**91.101**	**136.377**	**140.184**
Total Central ASEA Low Growth	218.820	216.948	217.539	59.122	59.835	54.755	59.146	87.936	132.860	136.341
Total Central ASEA High Growth	218.820	221.529	222.226	63.917	64.740	59.772	64.653	94.019	139.618	143.725
DHHL Additional to Pop. Growth Puunene Potable Kahului Aquifer			1.734	1.734	1.734	1.734	1.734	1.734	1.734	1.734
DHHL Additional to Pop. Growth Keokea/Waiohuli, Ulupalakua Potable Kamaole Aquifer			0.096	0.096	0.096	0.096	0.3489	0.3489	0.8097	0.8131
DHHL Additional to Pop. Growth Keokea/Waiohuli, Ulupalakua Non Potable Kamaole Aquifer							0.578	0.578	0.578	0.578
DHHL Additional to Pop. Growth Puunene Non Potable			1.8564	1.8564	1.8564	1.8564	1.8564	1.8564	1.8564	1.8564
SELECTED SCENARIO: Pop. Based Mid Growth MDWS Upcountry System, 100% Meter Priority List, DHHL	**210.487**	**210.640**	**214.521**	**55.698**	**55.995**	**50.488**	**53.174**	**79.368**	**121.706**	**122.320**
LAND USE BASED										
County Zoning	433.259	433.259	433.259	433.259	433.259	433.259	433.259	433.259	433.259	433.259
DHHL	4.011	4.011	4.011	4.011	4.011	4.011	4.011	4.011	4.011	4.011
TOTAL Land Use Based	**437.27**	**437.27**	**437.27**	**437.27**	**437.27**	**437.27**	**437.27**	**437.27**	**437.27**	**437.27**

Page 133, Table 15-39 Summary of Recommended Strategies Central ASEA

	STRATEGY	PLANNING OBJECTIVES	ESTIMATED COST	IMPLEMENTATION 1: Short-term 1 – 5 years 2: Long-term 5 – 20 years	
				AGENCY	TIME-FRAME
	RESOURCE MANAGEMENT				
1	Explore funding and conduct a cost benefit analysis of improvements to the EMI non-potable conveyance system to mitigate losses and preserve existing reservoirs at risk of decommissioning. Priority components and associated costs TBD.	Maintain sustainable resources Protect water resources Protect and restore streams Maximize efficiency of water use	N/A	Maui County A&B Properties/ EMI	1,2
	CONVENTIONAL WATER SOURCE STRATEGIES				
2	Assess alternative options to restructure and process the existing Upcountry Meter Priority List to improve processing rate and adequate source development.	Provide adequate volume of water supply Maximize reliability of water service	N/A	MDWS	1,2
3	Explore new basal well development in the Makawao Aquifer to accommodate growth Upcountry and add reliable new source. Potential yield is up to 3 mgd.	Provide adequate volume of water supply Maximize reliability of water service Minimize adverse environmental impacts	$4.5 – 6.0 /1000 gallons	MDWS DLNR Public/ private partnerships	1,2
4	Explore East Maui well development in combination with Makawao Aquifer basal groundwater to meet projected demand on the MDWS Upcountry System. Initiate a hydrologic study to determine any negative impact on existing ground and surface water sources, stream flow and influences from dikes. Potential yield is > 6 mgd.	Provide adequate volume of water supply Maximize reliability of water service Minimize adverse environmental impacts	$3.71* /1000 gallons	CWRM USGS MDWS	1,2
5	Explore Pā`ia Aquifer for non-potable demand, and potable use with additional treatment as necessary to serve projects included in the Maui Island Plan that cannot feasibly be serviced by MDWS source and infrastructure. Estimated demand for the Maui High School Campus is about 0.75 mgd.	Provide adequate volume of water supply Maximize reliability of water service	N/A	Maui County	1,2

	STRATEGY	PLANNING OBJECTIVES	ESTIMATED COST	AGENCY	TIME FRAME
6	Execute a long-term source agreement for use and maintenance of the Wailoa Ditch that ensures adequate non-potable supply for the Kula Agricultural Park expansion and potable supply for projected MDWS Upcountry System needs over the planning period.	Provide adequate volume of water supply Maximize reliability of water service	N/A	Maui County MDWS A&B Properties	
7	Pursue hydrologic studies needed to explore the Ha`ikū Aquifer **and** an updated ditch flow analysis to optimize raw water storage and treatment plant capacity at Kamole Weir in order to expedite the most feasible new source. Surface water strategies are contingent on a long-term agreement with A&B Properties allocating adequate surface water for the MDWS Upcountry System.	Minimize cost of water supply Provide adequate volume of water supply Maximize reliability of water service Maintain consistency with General and Community Plans	Surface water $5.15 /1000 gal (20 yr) (construction cost $50M, Operational $1.47/1000 gal) Groundwater $3.71/1000 gal	MDWS	1,2
ALTERNATIVE WATER SOURCE STRATEGIES					
8	Consider alternative sources of irrigation water including wastewater reuse, recycled stormwater runoff, and brackish well water in land use permitting to mitigate low flow stream conditions. Require alternative sources for irrigation when reasonably available in county discretionary land use permitting.	Maintain sustainable resources Protect and restore streams Minimize adverse environmental impacts Maximize efficiency of water use Maintain consistency with General and Community Plans	N/A	Maui County DEM HC&S	1,2
9	Expand distribution from the Kahului WWTF for commercial, landscape and other non-potable irrigation applications. Potential available recycled water is 4.2 mgd.	Maximize efficiency of water use Maintain consistency with General and Community Plans	$6.7M	MDEM	1,2
10	MDWS and MDEM collaborate to identify private-public partnerships, state and federal funding sources to maximize utilization of recycled water produced at the Kīhei WWTF and supplemental non-potable sources for seasonal use of R-1 water.	Maximize efficiency of water use Maintain consistency with General and Community Plans	(Transmission South Kīhei to Wailea $21M)	MDEM MDWS	1,2

APPENDIX 15A East Maui Streams Assessment
Based on June 20, 2018 Findings of Facts, Conclusion of Law, and Decision & Order

Unit	Unit Name	BFQ50 at IIFS (cfs)	BFQ50 at IIFS (mgd)	IIFS (cfs)	IIFS (mgd)	BF Avail. to divert at Q50	BF Avail. to divert at Q90	TFQ50 (cfs)	TFQ50 (mgd)
6027	Maliko								
6028	Kuiaha								
6029	Kaupakulua								
6030	Manawaiiao								
6031	Uaoa								
6032	Keali`i								
6033	Kakipi								
6034	Honopou	6.50	4.20	0.00		0.00	0.00		
6035	Ho`olawa								
6036	Waipio								
6037	Hanehoi	2.54	1.64	0.00	0.00	0.00	0.00		
	Puolua (Huelo) Stream	1.47	0.95	0.00	0.00	0.00	0.00		
6038	Hoalua								
6039	Hanawana								
6040	Kailua								
6041	Naili'ilihaele								
6042	Puehu								
6043	O`opuola								
6044	Ka`aiea								
6045	Punalu`u								
6046	Kolea								
	Alo								
	Wahinepe`e	0.90	0.58	0.90	0.58				
6048	Puohokamoa	8.40	5.43	1.10	0.71	4.72	-0.59	13.00	8.40
6049	Haipuaena	4.90	3.17	1.36	0.88	2.29	-0.88	6.60	4.27
6050	Punalau	4.50	2.91	2.90	1.87	1.03		3.60	2.33
6051	Honomanū	4.20	2.71	4.20	2.71	3.17	0.71	6.20	4.01
6052	Nua'ailua	0.28	0.18	2.20	1.42	-1.24	-1.42	0.56	0.36
6053	Pi`ina`au	14.00	9.05	0.00	0.00	0.00	0.00	21.00	13.57
	Palauhulu Stream	11.00	7.11	0.00	0.00	0.00	0.00	6.10	3.94
6054	Ohia	4.70	3.04	0.00	0.00	3.04			0.00
6055	Waiokamilo	3.90	2.52	0.00	0.00	0.00	0.00	7.00	4.52
6056	Wailuanui	6.10	3.94	0.00	0.00	0.00	0.00		0.00
6057	West Wailuaiki	6.00	3.88	0.00	0.00	0.00		8.50	5.49
6047	Waikamoi	6.70	4.33	3.80	2.46	1.87	-2.44	6.60	4.27

	Waikamoi								0.00
6058	East Wailuaiki	5.80	3.75	3.70	2.39	1.36	-0.58	8.00	5.17
6059	Kopiliula	5.00	3.23	3.20	2.07	1.16	-0.52	8.00	5.17
	Puaka`a Stream	1.10	0.71	0.20	0.13	0.58	-0.13	1.90	1.23
6060	Waiohue	5.00	3.23	0.00	0.00	0.00	0.00	6.20	4.01
6061	Pa`akea	0.90	0.58	0.18	0.12	0.47	-0.12	1.50	0.97
6062	Waia`aka	0.77	0.50	0.77	0.50	0.00	-0.15		0.00
6063	Kapaula	2.80	1.81	0.56	0.36	1.45	1.12	4.90	3.17
6064	Hanawi	4.60	2.97	0.92	0.59	2.38	1.08	7.70	4.98
6065	Makapipi	1.30	0.84	0.00	0.00	0.00	0.00	7.40	4.78
Wailoa Ditch Available to Divert			73.26		16.80	20.35	2.21	62.36	40.30
Petitioned Streams								124.76	80.63
Fully Restored TFQ50								70.31	45.44
IIFS					13.50				
Wailoa Ditch Flow at Honopou 2011 -15 TFQ50								135.26	87.42
New Hamakua Ditch at Honopou 2011 -15 TFQ50								19.34	12.50
Lowrie Ditch at Honopou 2011 -15 TFQ50								16.85	10.89
Haiku Ditch at Honopou 2011 -15 TFQ50								6.46	4.18
Ditch gain between Honopou and Maliko								13.30	8.60
Total Flow diverted prior to IIFS								191.21	123.58
IIFS Restored Streams TFQ50								70.31	**45.44**
Remains to Divert:								120.90	**78.14**
DWS Kamole Weir Average 2014									3.60
Kula Ag Park								2.50	1.62
Remains for HC&S (Est.)									**72.92**
Restoration Status Full									
Restoration Status Connectivity									