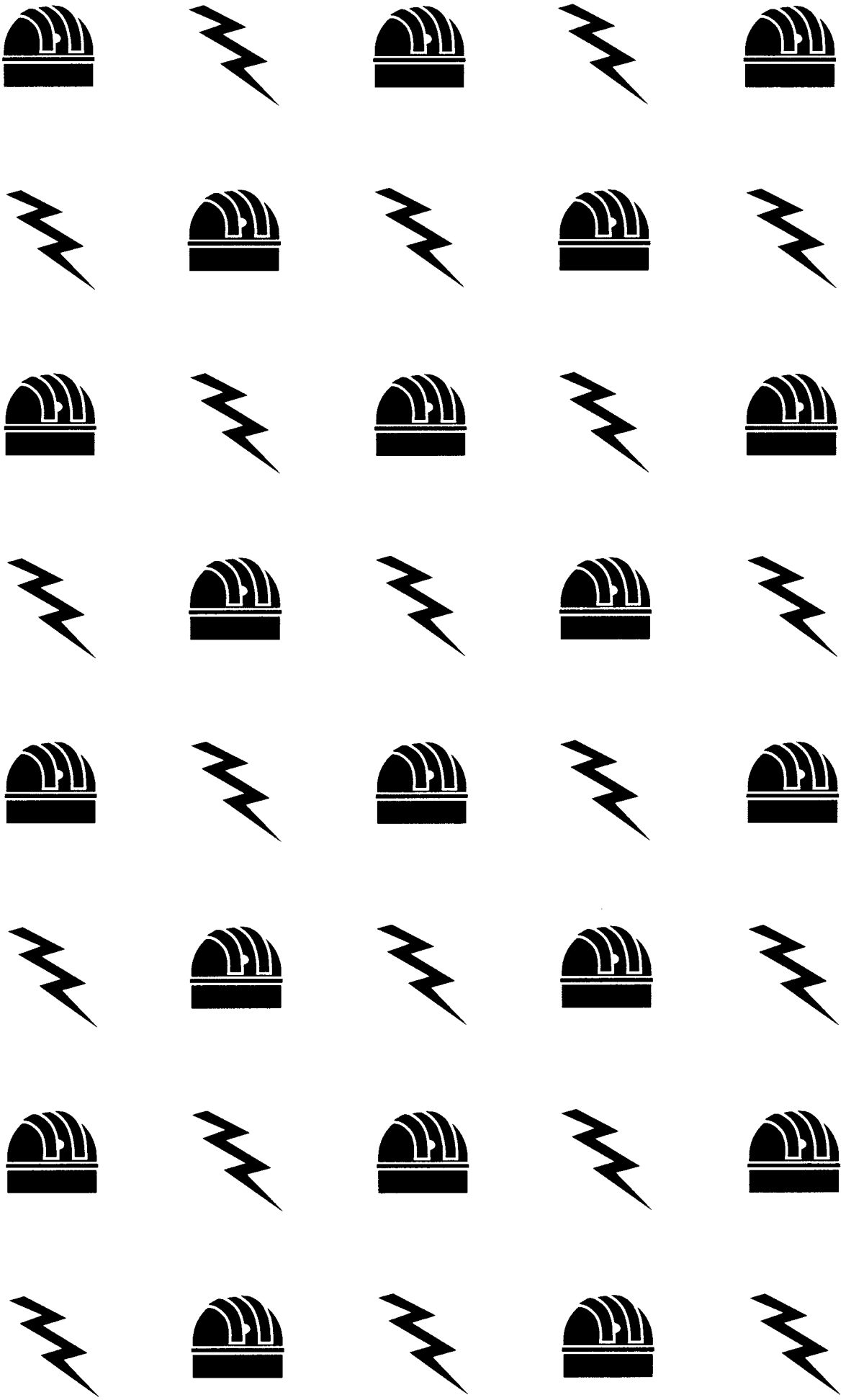


Energy & Science



Section 7

ENERGY & SCIENCE

The growth in Maui County's population is reflected in the utilities. Consumption and use of electricity, gas, utilities, and water have all increased dramatically over the last decade. This section details those statistics on electricity, gas, water production and consumption.

Ongoing scientific endeavors include observation of astronomical and man-made space objects from the summit of Mt. Haleakalā.

7.1.1

TELESCOPES AT THE SUMMITS OF MAUNA KEA AND HALEAKALĀ

Facility (mirror diameter in meters)	Capital Cost (\$ mil) ¹	Annual Operating Cost (\$ mil)	County Based Staff	Operational
Mauna Kea Observatories:				
UH 2.2-m (Optical/Infrared)	5	1.0	6	1970
Canada-France-Hawai'i 3.6-m (Optical/Infrared)	30	7.4	45	1979
NASA IRTF 3.0-m (Infrared)	10	5.1	19	1979
UKIRT 3.8-m (Infrared)	5	2.2	6	1979
James Clerk Maxwell 15-m Submillimeter	32	4.7	35	1986
VLBA Antenna 25-m (Radio)	7	0.4	2	1992
W.M. Keck Observatory (Keck I & II)				
10-m x 2 (Optical/Infrared)	170	13.5	120	1992/1996
Subaru (Japan National Large Telescope)				
8-m (Optical/Infrared)	170	17.0	101	1999
Fredrick C. Gillett Gemini 8m (Optical/Infrared)	92	13.7	83	1999
Submillimeter Array 8x6-m	80	5.5	23	2003
Mauna Kea Observatories Support Services	X	5.6 ²	44	1980
Total	601	72.5	484	
Haleakalā Observatories:				
Mees Solar Observatory	1	0.2	1	1963
Haleakalā Observatories Projects	NA	0.2	2	NA
Maui Space Surveillance Site (MSSS)	250	26.3	117	1965
Ground-Based Electro-Optical Deep Space				
Surveillance (GEODSS)	25	6.1	16	1983
Faulkes 2-m Telescope	10	0.6	2	2003
Transportable Laser Ranging System (TLRS4)	1	0.5	5	2005
Panoramic Survey Telescope And Rapid				
Response System (Pan-STARRS)	110	5.6	11	2009
Haleakalā Support Facilities	9	1.2	13	1962/2008
Daniel K. Inouye Solar Telescope (DKIST) ³	344	18.0 ⁴	35	
Total	749	40.7	202	

NA Not available. X Not applicable. Note: 2016 data.

1. Historical cost, not adjusted for inflation, and not including subsequent capital improvements for Mauna Kea Observation.

2. Only \$2.0 million of this included in total as the other \$3.6 million are part of facility operating costs.

3. Daniel K. Inouye Solar Telescope scheduled to be operational by 2019.

4. Operational cost of \$18 million not included in the total.

SOURCE: UNIVERSITY OF HAWAII AT MANOA, INSTITUTE FOR ASTRONOMY.

7.1.2

ELECTRIC UTILITIES MAUI COUNTY

	2012	2013	2014	2015	2016
Customers, Dec 31					
Total					
Maui Island	64,047	64,657	65,124	65,603	65,922
Moloka'i	3,198	3,211	3,186	3,212	3,212
Lāna'i	1,677	1,709	1,732	1,718	1,738
Maui County	68,922	69,577	70,042	70,533	70,872
Residential					
Maui Island	54,785	55,301	55,670	56,085	56,318
Moloka'i	2,643	2,649	2,648	2,672	2,671
Lāna'i	1,451	1,469	1,484	1,474	1,486
Maui County	58,879	59,419	59,802	60,231	60,475
Other					
Maui Island	9,262	9,356	9,454	9,518	9,604
Moloka'i	555	562	538	540	541
Lāna'i	226	240	248	244	252
Maui County	10,043	10,158	10,240	10,302	10,397
Peak Demand (mW)¹					
Maui Island	194.8	194.8	190.3	194.7	222.0
Moloka'i	5.5	5.5	5.4	5.3	6.0
Lāna'i	4.6	4.6	5.0	4.8	5.0
Power Sold (1,000 kWh)					
Total					
Maui Island	1,090,179	1,079,935	1,076,321	1,083,129	1,059,576
Moloka'i	29,942	29,380	29,207	28,685	28,169
Lāna'i	24,712	25,558	26,529	25,817	29,997
Maui County	1,144,833	1,134,873	1,132,056	1,137,630	1,117,742
Residential					
Maui Island	377,209	369,877	364,174	363,863	348,787
Moloka'i	10,951	10,459	9,915	9,811	10,000
Lāna'i	7,186	7,572	7,890	7,492	7,569
Maui County	395,346	387,908	381,979	381,167	366,356
Other					
Maui Island	712,970	710,058	712,146	719,265	710,789
Moloka'i	18,991	18,921	19,292	18,873	18,169
Lāna'i	17,526	17,985	18,639	18,325	22,428
Maui County	749,487	746,964	750,077	756,464	751,386

7.1.2

CONTINUED

	2012	2013	2014	2015	2016
Average Annual Use, Dec 31 (kWh)					
Residential					
Maui Island	6,885	6,688	6,542	6,488	6,193
Moloka'i	4,143	3,948	3,744	3,672	3,744
Lāna'i	4,952	5,155	5,317	5,083	5,094
Other					
Maui Island	76,978	75,893	75,327	75,569	74,010
Moloka'i	34,217	33,667	35,858	34,951	33,584
Lāna'i	77,549	74,938	75,156	75,103	89,000
Average Rate (dollars per kWh)					
Residential					
Maui Island	0.38709	0.37824	0.37827	0.31048	0.28485
Moloka'i	0.46129	0.46435	0.47062	0.37597	0.32700
Lāna'i	0.46612	0.46344	0.45848	0.37630	0.33518
Other					
Maui Island	0.37238	0.36193	0.36142	0.29260	0.26509
Moloka'i	0.45633	0.45530	0.45366	0.35837	0.31042
Lāna'i	0.47129	0.46317	0.45907	0.38325	0.33645
Revenues (\$1,000)					
Total					
Maui Island	411,509	396,894	395,142	323,427	287,774
Moloka'i	13,718	13,471	13,418	10,452	8,910
Lāna'i	11,609	11,840	12,174	9,842	10,083
Maui County	436,836	422,205	420,734	343,722	306,767
Residential					
Maui Island	146,013	139,902	137,757	112,973	99,352
Moloka'i	5,052	4,856	4,666	3,689	3,270
Lāna'i	3,349	3,509	3,617	2,819	2,537
Maui County	154,414	148,267	146,040	119,481	105,159
Other					
Maui Island	265,496	256,991	257,385	210,455	188,422
Moloka'i	8,666	8,615	8,752	6,764	5,640
Lāna'i	8,260	8,330	8,557	7,023	7,546
Maui County	282,422	273,936	274,694	224,241	201,608

mW: Megawatts

kWh: Kilowatt hours

1. Peak demand is the maximum amount of energy required from the electrical system. The islands' electrical systems are not interconnected, so no peaks are reported for Maui County as a whole.

SOURCE: MONTHLY FINANCIAL REPORTS ISSUED BY MAUI ELECTRIC COMPANY, CALCULATIONS BY HAWAII STATE DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT AND TOURISM.

7.1.3

GAS UTILITIES MAUI COUNTY

Excludes bottled gas

	2012	2013	2014	2015	2016
Island of Maui					
Customers, Dec. 31					
Residential	428	420	423	423	417
Other	88	90	88	89	89
Total	516	510	511	512	506
Gas Sold (1,000 therms)					
Residential	111	107	104	100	98
Other	777	770	798	740	710
Total	888	876	902	840	809
Average Annual Use (therms)					
Residential	259	254	246	237	236
Other	8,825	8,551	9,065	8,314	7,982
Average Rate (dollar per therm)					
Residential	4.12958	3.90245	4.26276	3.88384	3.47193
Other	2.78814	2.54380	2.86278	2.43153	2.03090
Revenues (\$1,000)					
Residential	458	417	443	390	341
Other	2,165	1,958	2,284	1,799	1,443
Total	2,624	2,374	2,727	2,189	1,784
Islands of Moloka'i and Lāna'i¹					
Customers, Dec. 31					
Moloka'i	85	91	84	82	84
Lāna'i	20	21	22	22	22
Gas Sold (1,000 therms)					
Moloka'i	16	15	15	14	16
Lāna'i	2	3	3	3	4
Average Annual Use (therms)					
Moloka'i	184	165	181	175	192
Lāna'i	115	136	129	136	169
Average Rate (dollar per therm)					
Moloka'i	4.74503	4.52344	4.85508	4.37824	3.87047
Lāna'i	5.66075	5.17527	5.54700	5.07402	4.48074
Revenues (\$1,000)					
Moloka'i	74	68	74	63	62
Lāna'i	13	15	16	15	17

1. All Moloka'i and Lāna'i customers are residential.

SOURCE: HAWAII GAS THE CLEAN ENERGY COMPANY, HAWAII GAS UTILITY MONTHLY FINANCIAL REPORTS,
CALCULATIONS BY HAWAII STATE DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT AND TOURISM.

7.1.4

ENERGY CONSUMPTION ESTIMATES BY SOURCE HAWAI'I STATE ENERGY REPORT

In trillion BTU

	2011	2012	2013	2014	2015
Coal	16.1	16.6	15.3	17.2	15.6
Natural Gas	0.2	0.2	0.2	0.2	0.2
Petroleum					
Distillate fuel oil	36.5	35.2	33.0	25.2	27.3
Jet fuel	62.1	64.1	64.2	73.3	76.1
Liquefied petroleum gas	3.4	3.4	3.2	3.2	2.7
Motor gasoline	53.3	50.7	51.0	51.5	51.5
Residual fuel oil	73.6	67.4	65.2	62.1	61.3
Other	16.7	17.0	16.3	0.0	0.0
Total Petroleum	245.5	237.9	233.0	234.2	218.9
Renewable Energy					
Hydroelectric	0.9	1.1	0.7	0.9	1.1
Biomass	10.6	9.6	11.2	11.4	11.5
Wood and waste	7.3	6.7	8.2	7.5	7.5
Ethanol fuel	3.2	2.9	3.0	3.9	3.9
Geothermal	2.2	2.5	2.6	2.2	2.2
Solar / Photovoltaic	4.6	6.7	9.3	8.4	8.4
Wind	3.3	3.6	4.8	5.7	5.7
Total Renewable Energy	21.6	23.5	28.6	28.6	28.8
Total Energy Consumption	283.4	278.2	277.1	280.2	263.5

Note: Totals may not equal sum of components due to independent rounding.

SOURCE: U.S. DEPARTMENT OF ENERGY, ENERGY INFORMATION ADMINISTRATION, STATE ENERGY DATA SYSTEM.

7.1.5

WATER SERVICES AND CONSUMPTION MAUI COUNTY

Years ending June 30

	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
	Number of Services									
Maui County	35,444	35,540	35,611	35,698	35,753	35,866	36,040	36,104	36,211	36,365
Maui	33,789	33,876	33,947	34,038	34,090	34,200	34,373	34,439	34,552	34,692
Moloka'i	1,655	1,664	1,664	1,660	1,663	1,666	1,667	1,665	1,659	1,673
	Consumption (million gallons)									
Maui County	12,797	12,074	12,214	12,371	12,675	13,253	11,851	11,684	11,785	11,624
Maui	12,510	11,794	11,916	12,089	12,410	12,958	11,592	11,427	11,523	11,376
Moloka'i	287	280	298	282	265	295	259	257	262	248

SOURCE: HAWAII STATE DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT AND TOURISM, DATA COMPILED FROM COUNTY OF MAUI DEPARTMENT OF WATER SUPPLY.

7.1.6

**DAILY AVERAGES FOR WATER PRODUCTION
BY AREA, MAUI COUNTY, 2017**

In thousands of gallons

Area	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Previous 12 Months
Central Maui													
Groundwater-Īao	14,263	13,523	12,342	14,690	13,774	15,695	16,904	16,790	16,926	15,517	15,082	14,614	15,010
Īao Tunnel	0	892	1,219	1,213	1,080	1,096	1,108	1,086	1,118	1,118	1,095	1,396	1,035
Groundwater-Waihe'e	5,564	6,101	6,056	6,307	6,091	5,152	5,223	5,563	5,765	5,416	5,211	3,632	5,507
Kepaniwai	719	719	720	719	713	720	714	720	720	712	720	720	718
Maui Lani	1,098	1,047	1,079	1,100	1,093	1,100	1,099	1,105	1,105	1,060	1,097	1,081	1,089
Surface water	516	399	505	428	778	446	463	604	520	311	175	116	438
Upcountry Maui													
Surface water	5,772	4,586	3,785	6,157	5,502	6,055	6,781	6,996	7,779	6,371	5,615	4,711	5,843
Groundwater	754	1,539	2,080	1,656	794	818	1,012	782	1,241	841	698	681	1,075
West Maui													
Surface water	3,446	3,320	3,396	3,593	3,454	3,562	3,753	3,636	3,431	3,343	3,144	3,315	3,449
Groundwater	1,789	1,833	1,877	2,126	2,100	2,404	2,588	2,613	2,866	2,431	2,097	1,614	2,195
East Maui													
Groundwater	449	385	396	386	424	414	336	291	284	287	261	261	348
Moloka'i													
Groundwater	797	827	829	896	913	1,039	997	1,020	1,007	926	821	708	898
Total Water Production	35,167	35,171	34,283	39,272	36,716	38,501	40,978	41,206	42,762	38,333	36,016	32,849	37,605

SOURCE: COUNTY OF MAUI, DEPARTMENT OF WATER SUPPLY, MONTHLY WATER PRODUCTION.

7.1.7

**WATER SYSTEM SERVICE CHARGES AND
DEVELOPMENT FEE SCHEDULES**

In \$ per 1,000 gallons

Water Service Charges (Fiscal Year 2017)

Schedule A		Schedule B (Meter Size)	Per meter/ per month
Family Dwellings, 5/8" meters			
0 - 5,000 gal	\$2.00	5/8 inch	\$19.25
5,001 - 15,000	\$3.80	3/4 inch	\$31.00
15,001 - 35,000	\$5.70	1 inch	\$46.00
Over 35,000	\$6.35	1 1/2 inch	\$88.00
Rates (All Others)			
0 - 5,000 gal	\$2.00	2 inch	\$137.00
5,001 - 15,000	\$3.80	3 inch	\$242.00
Over 15,000	\$5.70	4 inch	\$420.00
Agricultural Rates			
Over 15,000	\$1.10	6 inch	\$770.00
Non-Potable Agricultural Rates			
All usage	\$1.00	8 inch	\$1,215.00

**Water System
Development Fee Schedule**

Meter Size	Fee*
5/8 inch	\$6,030
3/4 inch	\$18,884
1 inch	\$33,356
1 1/2 inch	\$71,948
2 inch	\$125,012
3 inch	\$279,380
4 inch	\$496,460
6 inch	\$1,113,932
8 inch	\$1,977,428
10 inch	\$3,089,360
12 inch	\$4,447,436

* Plus installation charges.

SOURCE: COUNTY OF MAUI, DEPARTMENT OF WATER SUPPLY.

7.1.8

**WATER SERVICE BY METER SIZE
MAUI COUNTY**

Fiscal year ending June 30, 2017

District	5/8"	3/4"	1"	1 1/2"	2"	3"	4"	6"	8"	Total
Regular Rates										
Wailuku	17,364	1,673	586	434	421	58	34	6	1	20,577
Makawao	8,925	341	186	78	33	11	2	1	0	9,577
Lahaina	2,672	275	140	128	122	28	10	2	0	3,377
Hāna	456	45	9	6	4	0	0	0	0	520
Moloka'i	1,553	45	33	15	17	2	0	1	0	1,666
Subtotal	30,970	2,379	954	661	597	99	46	10	1	35,717
Agricultural Meters										
Wailuku	25	14	10	3	1	2	1	0	0	56
Makawao	301	54	69	85	33	0	0	0	0	542
Lahaina	4	3	5	0	1	0	1	0	0	14
Hāna	27	0	2	0	0	0	0	0	0	29
Moloka'i	4	1	2	0	0	0	0	0	0	7
Subtotal	361	72	88	88	35	2	2	0	0	648
Total	31,331	2,451	1,042	749	632	101	48	10	1	36,365

SOURCE: COUNTY OF MAUI, DEPARTMENT OF WATER SUPPLY, ANNUAL REPORT FY 2017.

7.1.9

**OUTSIDE WATER DELIVERIES TO
DEPARTMENT OF WATER SUPPLY
MAUI COUNTY**

Fiscal year ending June 30, 2017

	1,000 Gallons	Amount	Cost per 1,000 Gallons
Purchased from			
East Maui Irrigation	2,140,671	128,440	0.060
Wailuku Water Co.	166,574	85,986	0.516
Maui Land & Pine	689,065	187,535	0.272
Hawaiian Home Lands*	8,151	51,966	6.375
Total	3,004,461	453,928	0.151
District			
Wailuku	166,574	85,986	0.516
Kula	190,244	11,415	0.060
Makawao	1,936,864	116,212	0.060
Lahaina	689,065	187,535	0.272
Hāna	13,563	814	0.060
Moloka'i	6,592	42,313	6.419
Total	3,002,902	444,274	0.148

* Billed bi-monthly.

SOURCE: COUNTY OF MAUI, DEPARTMENT OF WATER SUPPLY, ANNUAL REPORT FY 2017.

7.1.10

**WATER SALES TO
GENERAL AND AGRICULTURAL CONSUMERS
BY DISTRICT, MAUI COUNTY**

Fiscal year ending June 30, 2017

District	Services	Change from FY 2016	Consumption (1,000 gal)	Change from FY 2016 (1,000 gal)
Wailuku District				
Wailuku	6,289	5	1,273,053	17,985
Waihe'e	195	2	21,760	933
Waikapū	969	0	121,427	2,799
Wailuku Heights	496	0	66,633	(6,127)
Kahului	5,304	54	1,439,259	(13,444)
Pu'unēnē	11	0	22,723	(3,051)
Kīhei	6,008	11	3,893,460	(61,130)
Mā'alaea	45	0	87,870	23,401
Mākena	203	1	216,684	(39,377)
Pā'ia-Kū'au	908	3	144,229	(4,266)
Spreckelsville	205	1	62,173	(1,431)
Subtotal	20,633	77	7,349,271	(83,708)
Makawao District				
Kokomo-Kaupakalua	1,145	2	141,670	(7,376)
Kuiaha	302	1	44,291	(2,614)
Ha'ikū-Pa'uwela	849	6	107,794	(1,047)
Makawao	2,015	19	262,318	(23,022)
Pukalani	2,074	2	293,194	(1,220)
Hāli'imaile	199	0	34,214	(722)
Upper Kula	2,309	1	442,231	13,441
Lower Kula	1,105	0	605,642	7,454
'Ulupalakua-Kanaio	82	0	46,673	(2,034)
Kula Ag. Park	39	0	144,379	(578)
Subtotal	10,119	31	2,122,406	(17,718)
Lahaina District				
Lahaina	2,127	28	796,532	(18,727)
Honokōwai	449	0	506,836	2,881
'Alaelo	802	3	539,009	(27,280)
Honokōhau	13	0	1,225	111
Subtotal	3,391	31	1,843,602	(43,015)
Moloka'i District				
Kawela-Kaunakakai	1,162	(5)	189,189	(5,713)
'Ualapu'e	392	13	51,003	(7,033)
Kala'e	113	0	7,858	(710)
Hālawa	6	6	1,006	1,006
Subtotal	1,673	14	249,056	(12,450)
Hāna District				
Hāna	403	1	48,017	(1,581)
Nāhiku	39	0	3,331	(108)
Ke'anae	86	0	7,348	(2,039)
Kaupō	21	0	1,679	(165)
Subtotal	549	1	60,375	(3,893)

SOURCE: COUNTY OF MAUI, DEPARTMENT OF WATER SUPPLY, ANNUAL REPORT FY 2017.

7.1.11

WATER CONSUMPTION BY DISTRICT MAUI COUNTY

Fiscal year ending June 30, 2017; In 1,000 gallons

Months	Total	Wailuku	Makawao	Kula	Lahaina	Moloka'i	Hāna
General							
July	973,547	652,666	79,204	48,737	172,651	20,280	9
August	884,249	589,455	66,848	41,919	153,083	22,983	9,961
September	989,011	667,806	78,986	39,004	179,235	19,896	4,084
October	884,815	603,746	67,343	46,541	143,630	19,669	3,886
November	949,692	643,210	71,927	55,221	153,503	21,086	4,745
December	809,292	530,698	66,081	34,398	156,890	17,583	3,642
January	824,945	575,716	67,656	42,644	133,109	1,780	4,040
February	798,135	531,903	66,105	37,648	138,478	20,566	3,435
March	743,316	483,403	58,912	33,083	126,746	36,186	4,986
April	942,615	637,620	75,808	47,431	158,085	19,665	4,006
May	798,696	528,345	64,363	35,576	140,646	25,418	4,348
June	962,138	646,709	77,092	46,134	168,281	18,971	4,951
Total	10,560,451	7,091,277	840,325	508,336	1,824,337	244,083	52,093
Agricultural							
July	93,676	23,020	4,827	63,627	1,739	463	0
August	108,360	29,752	3,466	71,154	1,530	448	2,010
September	84,278	19,599	3,621	57,932	2,054	295	777
October	92,693	13,649	3,074	73,478	1,505	369	618
November	124,942	27,665	3,462	90,931	2,066	355	463
December	66,775	21,170	3,070	39,353	2,093	240	849
January	80,953	21,280	3,301	54,297	1,310	-67	832
February	78,139	23,045	3,111	49,752	1,347	239	645
March	62,573	13,003	3,448	44,131	1,000	526	465
April	99,566	23,394	4,132	69,955	1,312	337	436
May	68,648	14,920	3,279	48,111	1,554	343	441
June	102,824	27,497	4,365	67,991	1,755	419	797
Total	1,063,427	257,994	43,156	730,712	19,265	3,967	8,333
Grand Total	11,623,878	7,349,271	883,481	1,239,048	1,843,602	248,050	60,426

SOURCE: COUNTY OF MAUI, DEPARTMENT OF WATER SUPPLY, ANNUAL REPORT FY 2017.