Section 6

Existing and Future Demands

6. EXISTING AND FUTURE DEMANDS

This section of the WRPP focuses on data available on existing and future water demands statewide, as well as the issues that are associated with quantifying water use and projecting water demand. Available data on existing ground water use and surface water use are presented, followed by a summary of water demand projections through 2030, as prepared by each county. The section concludes with a discussion of county-level water planning and the status of each county's planning efforts.

6.1. CWRM Goals for Assessing Water Demands

The following CWRM goals and objectives are intended to guide the assessment of existing and future water demands:

- Identify potential "hot spots" where water demands approach or exceed available supply.
- Provide State guidance, advice, and oversight in the preparation of the County WUDPs.
- Ensure equitable water allocation for all users in accordance with the State Water Code.
- Utilize the best available information on water resources to make wise decisions about reasonable and beneficial use and protection of the resource.
- Provide the regulatory and internal framework, including the best use of information technology, for efficient ground and surface water management.
- Support community-based management of water resources and develop short- and long-range plans to avoid judicial and quasi-judicial disputes.
- Develop, implement, and update comprehensive short- and long-range plans protecting, conserving, and managing water resources.
- Foster comprehensive resource planning for the development, use, protection, and conservation of water.
- Promote sustainable resource management.
- Encourage and assist with the development and execution of drought planning and mitigation projects.
- Promote coordination and collaboration among agencies and private entities.

6.2. CWRM Water Use Categories

CWRM classifies water use information based on six broad categories of water use (see Figure 6-1). Within each category, sub-categories identify more specific applications.

CWRM water use categories reflect common water uses occurring in the State of Hawaii, and are based on the types of uses identified in the State Water Code and in the County Water System Standards.

Well Operator	Category	Sub-Category
Individual Operator	**Agriculture**	• Aquatic plants and animals • Crop irrigation and processing • Livestock water, pasture irrigation, and processing • Ornamental and nursery plants • Taro • Other agricultural applications
	Domestic Residential Domestic, includes potable and non-potable water needs	• Single- and multi-family households, including non-commercial gardening
	Non-residential Domestic, includes potable (and non-potable) water needs	• Commercial businesses • Office buildings • Hospitals • Churches • Hotels • Schools
	Industrial	• Fire protection • Mining, dust control • Geothermal, thermoelectric cooling, power development, hydroelectric power • Other industrial applications
	Irrigation	• Golf course • Hotel • Landscape and water features • Parks • Schools • Habitat maintenance
Agency Operator	**Military**	• All military use
	Municipal	• State • County • Private

Figure 6-1. Water Use Categories and Sub-Categories

Figures 6-2 to 6-5 show the locations of production wells on each of the major Hawaiian Islands. Each well is coded according to one of the six CWRM water use categories. The primary use of each well was determined based upon available records.

6.3. CWRM Water Use Reporting Requirements

The collection and analysis of water use information is essential to understand the behavior and response of water resources to stresses from water withdrawals. Such information also ensures that demand is managed effectively within the sustainable limits of supply. Water use information can also be used to: evaluate the effectiveness of alternative water management policies, regulations, and conservation activities; assess the impacts of population growth and corresponding increases in water demands; develop trends in water use; and make projections of future demands.

In 1987, the State Water Code was enacted and HRS §174C-26 required water users to file a declaration of water use with CWRM, in compliance with the rules subsequently adopted for that chapter. The Hawaii Administrative Rules, §13-168-5(c), specify that declarations of water use shall at a minimum include information on the following:

> *"[T]he location of the water sources and all usage-related facts, or information within his knowledge or possession…the manner, purposes, and time in which the water source is being used and operated, the rate and volume of water being withdrawn or diverted therefrom, and the method or means of measuring and controlling the water taken or used."*

In 1989, CWRM began the process of registering declarations of water use and stream diversion works in accordance with the State Water Code and administrative rules. By 1990, the declaration of water use program identified approximately 1,550 users statewide who were using water from wells, stream diversions, and water systems. Approximately 250 declarants were identified by CWRM as having "medium-to-large" uses. The remaining 1,300 water use declarations were for small uses, identified by CWRM to include individual domestic supplies, water systems involving small water capacities (pump motors less than five horsepower, or gravity-fed pipes less than two inches in diameter), and agricultural irrigation of fewer than three acres.

The Hawaii Administrative Rules of the State Water Code require owners or operators of wells and stream diversion works to measure their water use and submit regular monthly reports of the use. In particular, HAR §13-168-7(a) and (c) provide that:

> *(a) The owner or operator of any well or stream diversion works from which water is being used shall provide and maintain an approved meter or other appropriate device or means for measuring and reporting total water usage on a monthly (calendar or work schedule) basis. If a well or stream diversion works is one of a battery of interconnected water sources, a centralized measuring device or facility may be approved by the commission.*

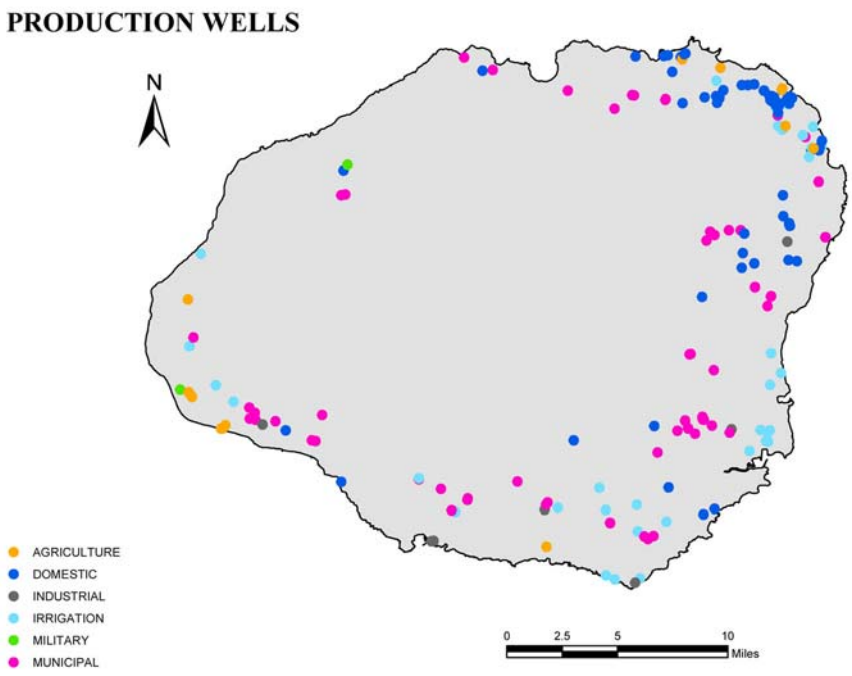

Figure 6-2: Island of Kauai Production Wells

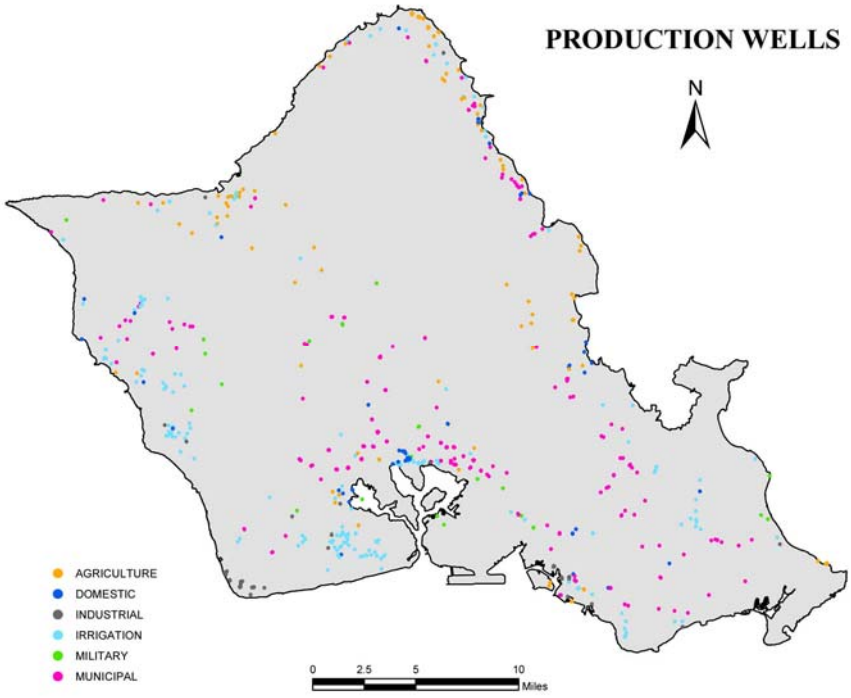

Figure 6-3: Island of Oahu Production Wells

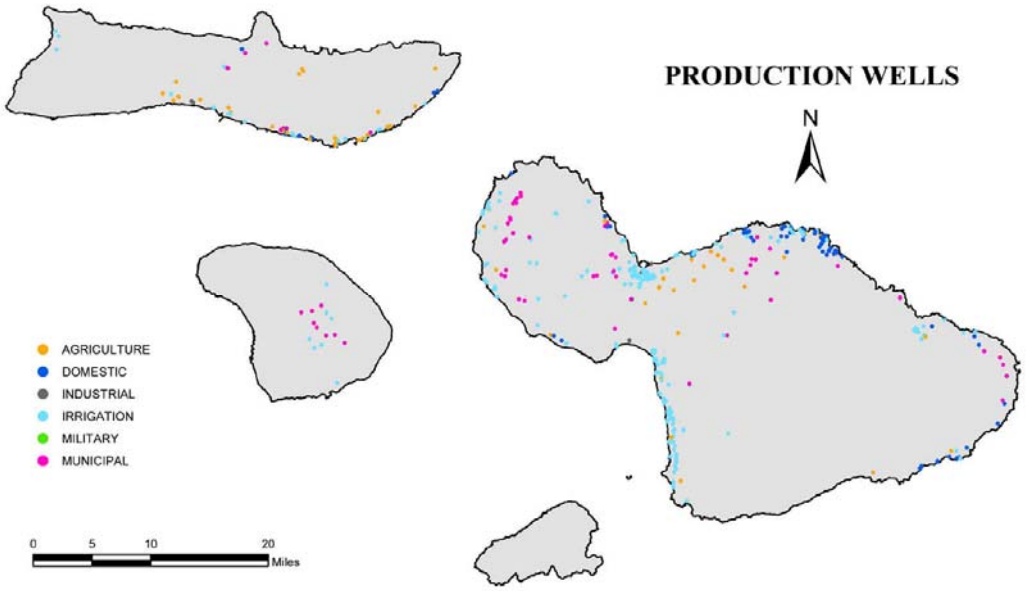

Figure 6-4: County of Maui Production Wells

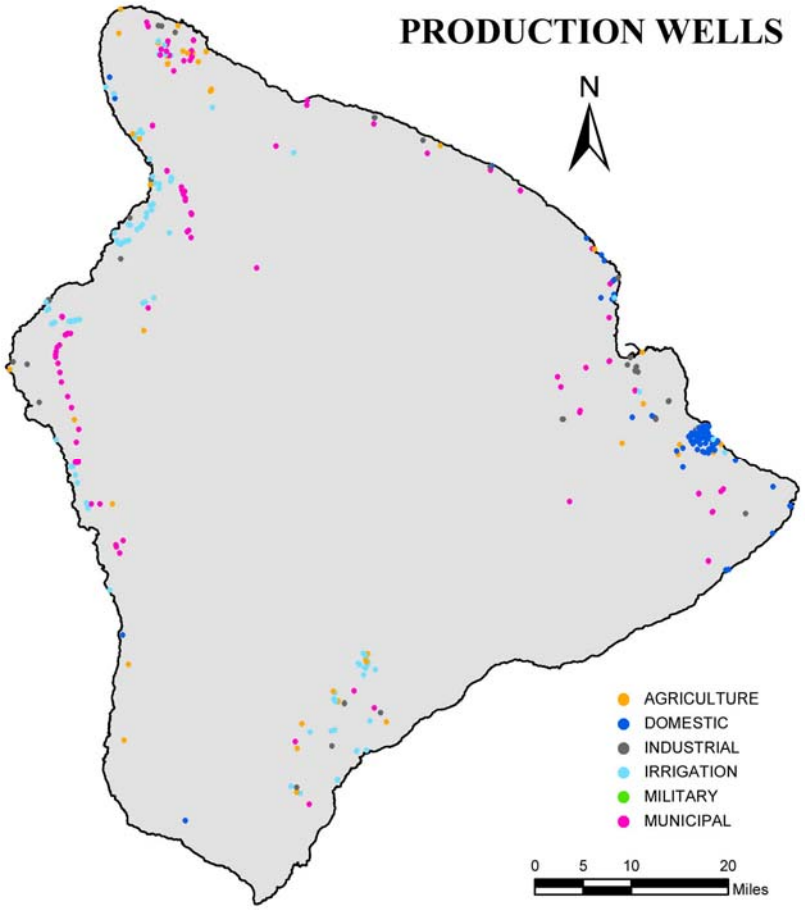

Figure 6-5: Island of Hawaii Production Wells

> *(c) At the discretion of the commission, requirements for measuring and reporting monthly water usage may be lessened, modified, or exempted for owners or operators of small individual wells or stream diversion works. The lessening, modification, or exemption of such requirements shall be approved, disapproved, or otherwise decided by the commission on a case-by-case basis.*

Monthly water use reporting requirements were difficult to implement and enforce. Enforcement of the water-use reporting requirements began in 1988, with the monthly collection of water use reports from major users, including county departments of water supply and large plantations. Water purveyors and large plantations already had monitoring equipment in place to measure and record water usage. However, the monthly reporting requirement specified in HAR §13-168-7(a) proved burdensome on other users, as evidenced by the requests for reporting exemptions received by CWRM.

By August 1992, approximately 140 medium and large users of water from well sources were submitting regular reports of their monthly water use to CWRM. CWRM continued to pursue approximately 20 other users who did not responded to the request for water use reports, and also followed up on requests from some of the medium and large well users to be exempted from reporting, or to be approved for modified reporting requirements.

Meanwhile, CWRM had not attempted to enforce reporting requirements for the 1,300 water use declarants identified as "small users," or for approximately 100 medium-to-large users who indicated water use from stream sources and third-party distribution systems. At the time, CWRM anticipated that the majority of these 1,400 users would find the reporting requirements to be burdensome. CWRM further anticipated that these users would request exemption from, or modification of the reporting requirements.

Therefore, in August and September 1992, CWRM staff submitted to the Water Commission a request for authority to exempt certain cases of water use from reporting requirements and to modify the reporting requirements in other cases.[1] The Water Commission action during the September 16, 1992 meeting was to unanimously approve the staff request, effectively creating policies regarding measurement and reporting of water use. These CWRM policies are listed below:

Policy: The following cases of water use are exempt from the requirements for measuring and reporting monthly water use, unless CWRM determines a specific need for these data for purposes such as resolving disputes, establishing instream flow standards, or quantifying the amount of water use for a water use permit in a water management area:

- Individual end uses of water on multi-user distribution systems, where the end user does not control or operate the water supply source(s) to the system, providing that the operator of the system reports the total usage from the system and also maintains records which are available to CWRM upon request to describe the specific location, type, and quantity of individual end uses;

[1] Commission on Water Resource Management, 1992, Staff Submittal, Approval to Allow Exemptions from Requirements or Measuring and Reporting Monthly Water Use.

- Water uses from individual water systems where the quantity of use averaged over a one-year period does not exceed 50,000 gallons per month (1,700 gallons per day);

- Passive agricultural consumption, such as when crops are planted in or adjacent to springs and natural wetland areas; and

- Livestock drinking from dug wells or stream channels.

Policy: The following cases of water use are allowed to report monthly water use on an appropriate quarterly, semi-annual, or annual basis, as determined by CWRM staff, unless a specific need is determined for monthly reporting:

- Water uses from individual water systems where the quantity of use averaged over a one-year period does not exceed five million gallons per month;

- Water uses from saltwater or brackish water sources; and

- Water uses from surface water sources.

Policy: The requirement for monthly measurement and reporting of water use from gravity-flow, open-ditch stream diversion works which are not already being measured and which are not in designated surface water management areas is deferred until CWRM adopts guidelines regarding appropriate devices and means for measuring water use which are not unduly burdensome on water users.

The three policies listed above had the effect of focusing water use monitoring and reporting where it was most needed at the time: ground water sources and drinking-water wells. These policies allowed for more effective allocation of staff resources and prioritization of water use monitoring and tracking. Enforcement of the ground water use reporting requirement currently remains focused on large water users (e.g. municipal purveyors), and uses in designated water management areas[2], where competition for water is greatest and aquifers may be pumping close to their sustainable yields. Unfortunately, the focus on ground water sources has resulted in a lack of historical surface water use data. To date, very few users report surface water use to CWRM.

6.3.1. Water Use Reporting for Ground Water Sources

In 2005, CWRM collected ground water pumpage data from 133 well owners/water users statewide. These ground water users report for about 600 individual wells. Table 6-1 summarizes the status of ground water use reporting by island.

[2] CWRM Internal Enforcement Guideline.

Table 6-1 shows that for all islands except Lanai, the major portion of most ground water use reports is submitted by the county water departments. Better reporting is needed for non-municipal wells. The use of Internet technology could provide well owners and water users the option of submitting pumpage reports electronically. This would increase convenience and efficiency, and should also reduce data input errors.

Table 6-1: Status of Ground Water Use Reporting by Island

Island	Total # of Production Wells[1]	# Reporters/ # Wells Reported	Largest Reporter/ # Wells Reported
Kauai	228	6/59	DWS[2]/47
Oahu	948	59/237	BWS[3]/97
Molokai	99	7/17	DWS[2]/4
Lanai	16	1/11	Lanai Co. [4]/11
Maui	450	32/119	DWS[2]/32
Hawaii	400	27/130	DWS[2]/55

1. Production Wells are defined as all wells that are not abandoned, observation, or unused wells.
2. County Department of Water Supply
3. County Board of Water Supply
4. Lanai Company

The coverage for ground water pumpage data varies by island, and pumpage reporting is not complete on any island. Water use data is reported for only 573 of the 2,141 existing production wells in the state, a compliance rate of 29%. However, this is a conservative estimate, because it includes individual water systems that are exempt from the reporting requirement (less than 1,700 gpd). If it is assumed that all productions wells with installed pump capacities of less than 25 gallons per minute (gpm) are individual water systems that are exempt, then the reporting percentage increases substantially, as shown in Table 6-2.

This assumption was tested against the known reporting compliance rate for water use permits issued on Oahu. Comparing current water use permits with the number of water use reports received for water use permitted wells, there is a compliance rate of about 75%.[3] Because the Waianae Aquifer Sector Area is not a designated water management area (water use permits are therefore not required for wells in this aquifer sector area), it is reasonable to expect that the island-wide compliance rate would decrease slightly from 75% to some lower percentage when Waianae wells are included. Table 6-2 shows that island-wide, the compliance rate for Oahu water use reports jumps to 63% when small-capacity wells are excluded from the calculations. Therefore, the number of small-capacity wells appears to be significant.

[3] Water use permits are not required for individual domestic users.

Table 6-2: Percent of Wells Reporting Water Use

Island	# Wells Reported	Total # Production Wells	Percent Reporting	Total # Production Wells >25 gpm	Percent Reporting
Kauai	59	228	**26%**	130	**45%**
Oahu	237	948	**25%**	379	**63%**
Molokai	17	99	**17%**	34	**50%**
Lanai	11	16	**69%**	12	**92%**
Maui	119	450	**26%**	191	**62%**
Hawaii	130	400	**33%**	204	**64%**
TOTAL	**573**	**2141**		**950**	

Due to staff constraints, enforcement of the ground water use reporting requirement is focused on large water users (e.g. municipal purveyors) and uses in designated water management areas, where competition for water is greatest and water development may be close to the aquifer sustainable yields. However, as shown in Table 6-2, small capacity-wells, which include individual water system wells, comprise a significant amount of total production wells (1,191 wells or about 44%). The cumulative impact of withdrawals from small-capacity wells could be substantial. Assuming that each production well with a 25 gpm pump capacity or less is pumping 1,700 gpd, the statewide withdrawal rate is 2.025 mgd. The cumulative impacts of small, domestic wells are particularly important to assess for areas where municipal water is unavailable.

6.3.1.1. Reported Ground Water Use by Island and Category

Table 6-3 summarizes reported total ground water use as of July 31, 2005 for six of the major Hawaiian islands by ground water use category:

Table 6-3: Summary of 2005 Reported Ground Water Use[1]

Island	Use Category (mgd)						Island Total
	Agriculture	Domestic	Industrial	Irrigation	Military	Municipal	
Kauai	0	0	0	0.094	0	11.454[2]	11.548
Oahu[3]	6.099	0.289	4.893	6.740	26.352	149.389	193.762
Molokai	0.108	0	0	0.856	0	1.878	2.842
Lanai	0	0	0	0.717	0	1.073	1.79
Maui[4]	48.134	0.001	1.683	9.611	0	30.172	89.601
Hawaii	0.770	0.174	46.364	7.505	0	37.818	92.631
Use Total	**55.111**	**0.464**	**52.94**	**25.523**	**26.352**	**231.784**	**392.174**

1. For all ground water sources, including saltwater and caprock sources.
2. Kekaha Aquifer System Area pumpage as of 11/04.
3. Ewa Caprock Aquifer Sector Area pumpage as of 12/04.
4. Pumpage data period varies (see footnotes for Table 6-7: Existing Demands by Aquifer System, Island of Maui).

Based on reported water use, Oahu uses the most ground water, withdrawing over 193 mgd primarily for municipal purposes (which includes many categories and subcategories of use). By contrast, ground water use is lowest on Lanai, with less than 2 mgd of ground water being withdrawn. Municipal uses account for about 60% of total reported water use statewide. This is partly a reflection of the high reporting compliance rate of the municipalities, relative to other ground water users. Statewide, total reported ground water use exceeds 392 mgd.

The water use categories were developed in 2005, and each well is assigned a category and sub-category, based on the primary use of the well. The 1990 WRPP did not include a section on existing demands. Therefore, a trend analysis of water use based on CWRM categories is not possible at this time, but could be conducted in subsequent updates of the WRPP using the above figures as a base.

6.3.1.2. Gaps in Ground Water Use Reporting

Better reporting is needed for all islands, except Lanai. Ground water pumpage reporting on Kauai and Molokai are not adequate to supply a reasonable representation of water usage. Oahu, Maui, and Hawaii have adequate reporting but all three islands have significant gaps in data.

6.3.1.3. Recommendations for Ground Water Use Reporting

The following actions are recommended for improving ground water use reporting:

- CWRM should continue development of the ground water use database to implement an automatic notification system that will flag delinquent reports, and send notices to well owners/water users that have neglected to send in pumpage reports.

- CWRM should utilize Internet technology to provide well owners and water users the option of submitting pumpage reports online. This will be far more efficient for ground water users and should also reduce data input errors.

- CWRM should obtain additional funding and staff resources for the water use reporting program and amend its current policy to instead require currently-exempt individual water systems using less that 1,700 gpd to report water use.

- CWRM should consider resurrecting the monthly newsletter (see Section 5.2) to provide up-to-date information on deep monitor well, chloride, water-level, and/or water use information currently collected by CWRM.

6.3.2. Water Use Reporting for Surface Water Sources

As stated previously, CWRM policy effectively exempts most surface water users from water use reporting requirements, until CWRM adopts guidelines regarding appropriate devices and means for measuring water use. To date, very few users report surface water use to CWRM.

6.3.2.1. Reported Surface Water Use by Island and Category

Table 6-4 summarizes reported surface water use as of July 31, 2005, for six of the major Hawaiian islands, by water use category:

Table 6-4: Summary of Reported Surface Water Use

Island	Total (mgd)[1]
Kauai	0.000
Oahu	0.000
Molokai[2]	0.660
Lanai	0.000
Maui[3]	70.282
Hawaii	0.000

[1] Total of computed 12-month moving average for August 2004 to July 2005.
[2] Includes Molokai Ranch.
3 Includes Wailuku Water Company and Launiupoko Water Company.

6.3.2.2. Gaps in Surface Water Use Reporting

Surface water use data: There is a deficit of surface water use data statewide. Water use reporting is needed for stream diversions, particularly those providing water to large irrigation systems. For specific regions, water use studies have been conducted either by the USGS or other government agencies. However, water use data has not been collected by CWRM on a broad scale, largely due to policies that

emphasize reporting requirements on ground water uses. With the exception of a few users that were required to report as part of a dispute resolution, surface water use reporting is very limited.

Currently, CWRM does not have a program for surface water use reporting or a system to store and manage surface water use data, similar to that of the Ground Water Regulation Branch's database for ground water use data. CWRM is developing a Surface Water Information Management (SWIM) System database to store and manage the wide range of data related to the regulation and management of surface water in general. One key component of the SWIM System will involve the collection and management of water use data. In conjunction with the establishment of a surface water use reporting program, CWRM policies should be amended to provide for, at a minimum, a reliable, annual sampling of data on public and private surface water use statewide.

Guidelines for measuring water use: The policy regarding the deferral of reporting requirements for stream diversions without monitoring devices is important, in that it directs CWRM to create and adopt guidelines for appropriate measuring devices and methods for measuring diverted flow. CWRM should pursue the development of such guidelines for diverted-flow measurement, including methods and approved devices, to facilitate the implementation of a surface water use reporting program.

Field Verification of Declared Stream Diversions: When CWRM conducted the Registration/Declaration process in 1990, many of the Registration of Stream Diversion Works and Declaration of Water Use applications were not field verified. Much of the information has also not been maintained (e.g., change of recorded ownership). In addition to CWRM's efforts to verify surface water diversions (see section 4.3.3.1), a regular field-investigation schedule should be established to enable CWRM staff to inspect surface water diversions and monitor water use.

Plantation-Ditch Systems: Formerly, surface water use was tied primarily to sugar cane and other plantation crops. Many plantation-ditch operators monitored streams and ditch systems for flow volumes and kept detailed records of rainfall conditions and diverted flows. The remaining plantation-ditch systems are typically underutilized, as former sugar cane lands are no longer in crop production or have been converted to other uses. Different portions of a ditch system may be under the ownership of several different entities, and maintenance and monitoring efforts may vary considerably between owners. Also, flow monitoring gages for these systems may no longer be in existence or may no longer be useful for monitoring the total diverted flow.

6.3.2.3. Recommendations for Surface Water Use Reporting

The following actions are recommended for improving surface water use reporting:

- Due to the wide variety of existing surface water diversion structures, CWRM should develop protocols and make equipment recommendations for the standard measurement of surface water use.

- CWRM should complete the development of the SWIM System and begin implementing a monthly surface water use reporting program. The program should first focus on large irrigation systems and should include broad notification of water users, development of a reporting form, and the distribution of the form and information reporting via the Internet.

- Upon completion of statewide field verification of surface water diversions, CWRM should utilize the information to identify key surface water users to focus implementation of surface water use reporting requirements.

- CWRM should revise surface water use reporting policies, in conjunction with the development of a surface water use reporting program.

6.4. Assessing Existing Water Demands

Existing water demands are recorded and archived to varying degrees by several entities statewide. However, water demand data provided by different sources may not represent the same water users or water demand categories, as each agency or entity produces demand information in the form most useful for their respective purpose.

CWRM examines water demands in terms of hydrologic units. CWRM demand data is regional in scale and dependent upon the accuracy and completeness of water use reports provided to the agency by users.

In contrast, municipal water agencies can monitor water demand by looking at customer service areas and billing categories. This data provides an excellent picture of water use by customer distribution, but typically does not provide information on water use outside of the system service area.

The USGS also compiles water demand from public and private water systems, including military bases. Water demand data as assessed by CWRM, county water agencies, and the USGS are provided in the following sections.

6.4.1. CWRM Assessment of Existing Water Demands

CWRM relies on reported water use data to quantify ground water and surface water demands. While CWRM receives considerable information on statewide ground water demand, surface water demand data is lacking.

6.4.1.1. Summary of Existing Ground Water Demands

CWRM is able to track and quantify ground water demand through its water use reporting program. To protect ground water resources, CWRM must continually monitor water use, to ensure that the total withdrawal from an aquifer does not exceed its sustainable yield. Pumping an aquifer above its sustainable yield can result in seawater intrusion and negative impacts to the resource. CWRM uses a twelve-month moving average to assess water use (see Section 5.2).

As discussed in Section 5, when actual ground water withdrawals or authorized planned uses may cause the maximum rate of withdrawal to exceed 90% of the

aquifer's sustainable yield, CWRM may designate the area as a water management area and regulate water use through the issuance of water use permits. Once an area has been designated, CWRM continues to monitor water use for compliance with allocation limits.

Tables 6-5 to 6-10 summarize existing demands in relation to aquifer system area sustainable yields (as of July 2005) for each of the six major Hawaiian Islands. Water use is based on reported pumpage as of July 31, 2005, unless otherwise noted. Likewise, aquifer sustainable yields are those that were established as of July 31, 2005. Because caprock and saltwater withdrawals do not count against aquifer sustainable yields, water withdrawn from caprock and saltwater sources are excluded from the tables. The only exception is the inclusion of the Ewa Caprock Aquifer Sector Area on Oahu, consisting of the Malakole, Kapolei, and Puuloa Aquifer System Areas, which overlies portions of the Pearl Harbor Sector Area. The Ewa Caprock Aquifer Sector Area has been designated as a separate ground water management area.[4] For the islands of Oahu and Molokai, where most or all of the aquifer system areas have been designated as ground water management areas, a comparison of total allocations to sustainable yields established as of July 31, 2005 is also presented.

Table 6-5 shows that total reported pumpage on Kauai is within the sustainable yield for all aquifer system areas. Islandwide, reported water use is only 3% of the island's total sustainable yield. Unlike Oahu, Kauai does not have an extensive municipal distribution system. Residents in many areas rely on individual, domestic wells. For the most part, water used by individual, domestic users is not reflected in Table 6-5, due to exemptions from water use reporting, and lack of compliance and enforcement of reporting requirements for small-capacity, domestic wells.

Table 6-6 shows that total reported pumpage on Oahu is within the sustainable yield for all aquifer system areas. The table also shows that the total existing ground water withdrawals are over 100 mgd less than total water use permit allocations. A portion of the unused allocation is earmarked to provide for future demands. There is also a significant volume of water allocated to agricultural water use permits that remains unused due to the closure of plantation agriculture, particularly in the North Sector Area. CWRM may revoke permitted allocations due to non-use.

Existing ground water demand on Maui is summarized in Table 6-7. The table indicates that the Kahului Aquifer System Area within the Central Aquifer Sector Area is being overpumped by over 2,500%. Pumpage in the Paia Aquifer System Area also appears to exceed permitted allocations. However, it is noted that the substantial quantity of return irrigation recharge in the Central Aquifer Sector Area has not been factored into the established sustainable yields of these two aquifers. Further discussion on sustainable yields is contained in Section 3 of the WRPP.

[4] The Ewa Caprock Aquifer Sector has been declared a non-potable aquifer by CWRM. This brackish resource support mainly irrigation and industrial uses. CWRM has adopted a chloride limit of 1,000 mg/l for individual irrigation wells in lieu of an aggregate sustainable yield figure. No chloride limit has been set for industrial wells.

Another noteworthy statistic on Maui is the pumpage of the Iao Aquifer System Area at 95% of its sustainable yield. CWRM designated the Iao Aquifer System Area as a ground water management area, effective July 21, 2003. Water use permits are now required for all non-individual domestic ground water uses.

Water use permit allocations on Molokai are only about 11% of the island's total sustainable yield. Existing withdrawals are even less, at 3% of total sustainable yield (see Table 6-8). The Kualapuu Aquifer System Area is the most heavily utilized, with reported water use at about 41% of the aquifer's sustainable yield.

Lanai is mostly privately owned and is the least populated island. Ground water pumpage is reported for two of its nine aquifer system areas. Existing withdrawals, shown in Table 6-9, total about 26% of total sustainable yield for the island.

The island of Hawaii has the greatest amount of ground water resources, with over 2,431 mgd estimated to be available for development. Pumpage from all aquifers systems is less than 40%, as shown in Table 6-10. Islandwide, only 4% of ground water is reportedly being used. Like Kauai, the municipal water distribution system does not cover large parts of the island. There are many private domestic wells that serve residential needs. For the most part, these uses are not reflected in the table.

Table 6-5: Existing Demands by Aquifer System Area, Island of Kauai, July 2005

Aquifer Sector Aquifer System	Sustainable Yield (SY) (mgd)	Existing Water Use (mgd) 12 MAV July 2005	SY minus pumpage (mgd)	Existing Water Use as a Percent of SY
Hanalei	**95**	**1.300**	**93.700**	**1%**
Napali	20	0.000	20.000	0%
Wainiha	24	0.300	23.700	1%
Hanalei	35	0.000	35.000	0%
Kalihiwai	16	1.000	15.000	7%
Lihue	**183**	**7.000**	**176.000**	**4%**
Kilauea	17	0.400	16.600	2%
Anahola	36	1.400	34.600	4%
Wailua	60	0.900	59.100	2%
Hanamaulu	40	2.000	38.000	5%
Koloa	30	2.300	27.700	8%
Waimea	**110**	**3.154**	**106.846**	**3%**
Hanapepe	26	0.000	26.000	0%
Makaweli	30	1.330	28.670	5%
Waimea	42	0.000	42.000	0%
Kekaha	12	1.824[1]	10.176	18%
KAUAI TOTAL	**388**	**11.454**	**376.546**	**3%**

1. Pumpage as of November 2004.

Table 6-6: Existing Demands by Aquifer System Area, Island of Oahu, July 2005

Aquifer Sector / Aquifer System	Sustainable Yield (SY) (mgd)	Existing Permit Allocations (mgd)	Unallocated SY (mgd)	Existing Water Use (mgd) 12 MAV July 2005	SY minus pumpage (mgd)
Honolulu	**53**	**53.226**	**-0.224**	**44.116**	**8.884**
Waialae-East	2	0.79	1.21	0.193	1.807
Waialae-West	4	2.797	1.203	0.385	3.615
Palolo	5	5.6461	-0.646	4.431	0.569
Nuuanu	15	15.2711	-0.270	13.351	1.649
Kalihi	9	8.7611	0.239	8.416	0.584
Moanalua	18	19.9611	-1.960	17.340	0.660
Pearl Harbor	**165**	**146.3**	**18.7**	**103.457**	**61.543**
Waimalu	45	46.951	-1.951[1]	39.011	5.989
Waipahu-Waiawa	104	83.892	20.108	53.354	50.646
Ewa-Kunia	16	15.457	0.543	11.092	4.908
Makaiwa[2]		0	0	0.000	0.000
Central	**23**	**20.386**	**2.614**	**9.245**	**13.755**
Wahiawa	23	20.386	2.614	9.245	13.755
Waianae	**15**	**0**	**15**	**3.57**	**11.430**
Nanakuli[3]	1	0	1	0.000	1.000
Lualualei[3]	3	0	3	0.112	2.888
Waianae[3]	3	0	3	2.515	0.485
Makaha[3]	4	0	4	0.943	3.057
Keaau[3]	4	0	4	0.000	4.000
North	**91**	**40.161**	**50.839**	**4.189**	**86.811**
Mokuleia	12	8.301	3.699	0.401	11.599
Waialua	40	30.311	9.689	3.106	36.894
Kawailoa	39	1.549	37.451	0.682	38.318
Total Windward	**99**	**34.577**	**64.423**	**23.371**	**75.629**
Koolauloa	35	21.508	13.492	9.738	25.262
Kahana	13	1.101	11.899	0.085	12.915
Koolaupoko	43	10.312	32.688	12.828	30.172
Waimanalo	8	1.656	6.344	0.72	7.280
Total Ewa Caprock		**22.778**		**8.688**	
Malakole[4]	1,000 mg/l	5.928		5.8005	
Kapolei[4]	1,000 mg/l	2.033		0.471	
Puuloa[4]	1,000 mg/l	14.817		2.417	
OAHU TOTAL[6]	**446**	**294.648**	**151.352**	**187.948**	**258.052**

1. For the Palolo, Nuuanu, Moanalua, and Waimalu Aquifer System Areas, total water use permit allocations exceed the aquifers' sustainable yield because declared existing uses at the time of designation exceeded the subsequent establishment of sustainable yields for these aquifers. The Commission is monitoring the conditions in these over-allocated aquifers to determine whether the sustainable yields can be adjusted based on operational experience or water use permit allocations may be reduced due to nonuse as land use changes or new sources come online.
2. The Commission has not established a sustainable yield for the Makaiwa Aquifer System Area in the Pearl Harbor Sector Area.
3. None of the aquifer systems in the Waianae Sector Area have been designated as ground water management areas.

4. The aquifer system areas within the Ewa Caprock Sector Area are managed by a chloride limit of 1,000 mg/l for individual irrigation wells rather than an aggregate sustainable yield number. The Commission has not yet established a chloride limit for individual industrial wells.
5. Pumpage as of 12/04.
6. Excludes Ewa Caprock Aquifer Sector Area.

Table 6-7. Existing Demands by Aquifer System, Island of Maui, July 2005

Aquifer Sector / Aquifer System	Sustainable Yield (SY) (mgd)	Existing Water Use (mgd) 12 MAV July 2005	SY minus pumpage (mgd)	Existing Water Use as a Percent of SY
Lahaina	**40**	**5.900**	**34.100**	**15%**
Honokohau	10	0.000	10.000	0%
Honolua	8	2.125	5.875	27%
Honokowai	8	3.053	4.947	38%
Launiupoko	8	0.689	7.311	9%
Olowalu	3	0.033	2.967	1%
Ukumehame	3	0.000	3.000	0%
Wailuku	**38**	**23.222**	**14.778**	**61%**
Waikapu	2	0.000	2.000	0%
Iao	20	18.940	1.060	95%
Waihee	8	4.282	3.718	54%
Kahakuloa	8	0.000	8.000	0%
Central	**27**	**45.334**[3]	**-18.334**	**168%**[3]
Kahului	1	25.978[1,3]	-24.978	2,598%[3]
Paia	8	17.208[1,3]	-9.208	215%[3]
Makawao	7	0.289[2]	6.711	4%
Kamaole	11	1.859	9.141	17%
Koolau	**202**	**2.136**	**199.864**	**1%**
Haiku	31	1.962	29.038	6%
Honopou	29	0.012[1]	28.988	0%
Waikamoi	46	0.000	46.000	0%
Keanae	96	0.162	95.838	0%
Hana	**133**	**0.309**	**132.691**	**0%**
Kuhiwa	16	0.003[1]	15.997	0%
Kawaipapa	48	0.306	47.694	1%
Waihoi	20	0.000	20.000	0%
Kipahulu	49	0.000	49.000	0%
Kahikinui	**36**	**0.000**	**36.000**	**0%**
Kaupo	18	0.000	18.000	0%
Nakula	7	0.000	7.000	0%
Lualailua	11	0.000	11.000	0%
MAUI TOTAL	**476**	**76.901**	**399.099**	**16%**

1. Pumpage as of 12/04.
2. Pumpage as of 6/05.
3. Sustainable yield does not include return irrigation recharge.

Table 6-8: Existing Demands by Aquifer System Area, Island of Molokai, July 2005

Aquifer Sector / Aquifer System	Sustainable Yield (SY) (mgd)	Existing Permit Allocations (mgd)	Unallocated SY (mgd)	Existing Water Use (mgd) 12 MAV July 2005	SY minus pumpage (mgd)
West	**4**	**0**	**4.000**	**0.000**	**4.000**
Kaluakoi	2	0	2.000	0.000	2.000
Punakou	2	0	2.000	0.000	2.000
Central	**9**	**5.505**	**3.495**	**2.070**	**6.930**
Hoolehua	2	0	2.000	0.000	2.000
Kualapuu	5	4.842	0.158	2.069	2.931
Manawainui	2	0.663	1.337	0.001	1.999
Northeast	**44**	**0.947**	**43.053**	**0.000**	**44.000**
Kalaupapa	2	0	2.000	0.000	2.000
Kahanui	3	0.094	2.906	0.000	3.000
Waikolu	5	0.853	4.147	0.000	5.000
Haupu	2	0	2.000	0.000	2.000
Pelekunu	9	0	9.000	0.000	9.000
Wailau	15	0	15.000	0.000	15.000
Halawa	8	0	8.000	0.000	8.000
Southeast	**24**	**2.615**	**21.385**	**0.718**	**23.282**
Waialua	8	0.437	7.563	0.000	8.000
Ualapue	8	0.243	7.757	0.232	7.768
Kawela	5	1.068	3.932	0.432	4.568
Kamiloloa	3	0.867	2.133	0.054	2.946
MOLOKAI TOTAL	**81**	**9.067**	**71.933**	**2.788**	**78.212**

Table 6-9: Existing Demands by Aquifer System Area, Island of Lanai, July 2005

Aquifer Sector / Aquifer System	Sustainable Yield (SY) (mgd)	Existing Water Use (mgd) 12 MAV July 2005	SY minus pumpage (mgd)	Existing Water Use as a Percent of SY
Mahana	**0**	**0.000**	**0.000**	**0%**
Paomai	0	0.000	0.000	0%
Maunalei	0	0.000	0.000	0%
Hauola	0	0.000	0.000	0%
Kamao	**0**	**0.000**	**0.000**	**0%**
Manele	0	0.000	0.000	0%
Kealia	0	0.000	0.000	0%
Kaa	**0**	**0.000**	**0.000**	**0%**
Kaumalapau	0	0.000	0.000	0%
Honopu	0	0.000	0.000	0%
Central	**6**	**1.548**	**4.452**	**26%**
Windward	3	0.468	2.532	16%
Leeward	3	1.080	1.920	36%
LANAI TOTAL	**6**	**1.548**	**4.452**	**26%**

Table 6-10: Existing Demands by Aquifer System Area, Island of Hawaii, July 2005

Aquifer Sector / Aquifer System	Sustainable Yield (SY) (mgd)	Existing Water Use (mgd) 12 MAV July 2005	SY minus pumpage (mgd)	Existing Water Use as a Percent of SY
Kohala	**154**	**1.389**	**152.611**	**1%**
Mahukona	17	0.660	16.340	4%
Hawi	27	0.582	26.418	2%
Waimanu	110	0.147	109.853	0%
E. Mauna Kea	**388**	**1.977**	**386.023**	**1%**
Honokaa	31	1.348	29.652	4%
Paauilo	60	0.131	59.869	0%
Hakalau	150	0.126	149.874	0%
Onomea	147	0.372	146.628	0%
N.E. Mauna Loa	**740**	**56.312**	**683.688**	**8%**
Hilo	347	42.228		12%
Keaau	393	14.084	378.916	4%
Kilauea	**618**	**1.502**	**616.498**	**0%**
Pahoa	435	1.455	433.545	0%
Kalapana	157	0.047	156.953	0%
Hilina	9	0.000	9.000	0%
Keaiwa	17	0.000	17.000	0%
S.E. Mauna Loa	**291**	**0.059**	**290.941**	**0%**
Olaa	124	0.000	124.000	0%
Kapapala	19	0.000		0%
Naalehu	117	0.059	116.941	0%
Ka Lae	31	0.000	31.000	0%
S.W. Mauna Loa	**130**	**2.144**	**127.856**	**2%**
Manuka	42	0.079	41.921	0%
Kaapuna	50	0.008	49.992	0%
Kealakekua	38	2.057	35.943	5%
Hualalai	**56**	**14.426**	**41.574**	**26%**
Kiholo	18	3.703	14.297	21%
Keauhou	38	10.723	27.277	28%
N.W. Mauna Loa	**30**	**4.900**	**25.100**	**16%**
Anaehoomalu	30	4.900	25.100	16%
W. Mauna Kea	**24**	**9.173**	**14.827**	**38%**
Waimea	24	9.173	14.827	38%
HAWAII TOTAL	**2431**	**91.882**	**1933.845**	**4%**

6.4.1.2. Summary of Existing Surface Water Demands

Surface water demands are difficult to quantify for numerous reasons. Presently, there is a deficiency in surface water use data. In addition to policy issues regarding surface water use reporting (see Section 6.3), quantification of surface water demand is hindered by the lack of information on stream diversions (field verification information), changes in water use by large-scale agricultural systems, and the difficulties associated with measuring diverted flow. The types of diversion structures range widely from PVC pipes, or large concrete structures set within the stream bed, to hand-built rock walls for taro *loi*. As a result, diversion amounts may also vary widely with rainfall freshets, as well as the relative ease with which some diversions can be installed, removed, or altered. Another difficulty in measuring surface water use is the utilization, cost and location of accurate and appropriate water measurement devices. For many large irrigation systems, the practicality in measuring every stream diversion is nearly impossible, therefore only a handful of gaging stations may exist at key locations along the length of the system to provide cumulative flow amounts. For smaller water users, the cost, operation and maintenance of installing a gaging device is a prohibitive factor. CWRM data on surface water demand is limited to information on reported water use, as shown in Table 6-4.

CWRM has limited information to contribute to the quantification of historical surface water use and demand. Section 6.3 discusses CWRM's 1989 efforts to register declarations of water use and stream diversion works in accordance with the State Water Code and administrative rules. Through the registration process, CWRM collected information on stream diversions and surface water use at that time. Appendix C is a summary of the 1989 declared surface water use for each Surface Water Hydrologic Unit. Field verifications of declared stream diversions and surface water use were conducted for diversions on Molokai and in parts of Oahu. Most of the quantities listed in Appendix C are, therefore, unverified, and may represent the declarant's desire to reserve or claim water for intended future use. Many water use declarations indicate volumes of water that do not correlate with the declared use, while other declarations claim use of all available stream flow. Furthermore, some declared water use volumes are omitted from Appendix C because the declarant provided cumulative use amounts across several Surface Water Hydrologic Units; these volumes could not be assigned to specific hydrologic units. Thus, much of the information in Appendix C is based on unverified and dated user declarations and the information is included in this document for reference purposes only.

6.4.2. County Assessments of Existing Water Demands

For the purposes of this report, county water departments provided municipal water use data to characterize existing water demands in terms of the agency's customer billing categories. This data represents existing water use only from county water systems, and is intended to provide information on the relative distribution of demands across various use categories. County assessments of existing water demand data are presented in the tables below.

Table 6-11: County of Kauai
2005 and 2006 Municipal Water Use (mgd)

Water Use Category Department of Water Premise Type	**2005**	**2006**
Agriculture		
Agriculture	0.148	0.137
Domestic – Residential		
Single-Family Dwelling	2.433	2.477
Multi Family Dwelling	0.671	0.684
Housing – State	0.002	0.002
Domestic – Non-Residential		
Commercial	0.354	0.344
Hotel	0.676	0.643
Religious	0.030	0.034
Schools – State	0.011	0.009
Industrial		
Industrial	0.020	0.022
Irrigation		
Golf Course – Private	0.000[1]	0.000[2]
Irrigation – Private	0.050	0.054
Parks – County	0.003	0.004
Military		
United States Military Facility	0.021	0.014
Municipal		
County of Kauai	0.118	0.137
State Facility	0.219	0.199
United States Non-Military Facility	0.002	0.002
Total	**4.758**	**4.762**

[1] Private golf course water use for 2005 was 13,360 gallons.

[2] Private golf course water use for 2006 was 13,550 gallons.

Note: Consumption rounded to the nearest thousandth of a unit.

Source: Staff communication, Kauai Department of Water, June 26, 2007.

Table 6-12: City and County of Honolulu
2005 and 2006 Municipal Water Use (mgd)

Water Use Category Honolulu BWS Metered User Type	2005	2006
Agriculture		
BWS Agriculture	3.08	3.13
Domestic – Residential[1]		
BWS Residential		
Mixed Residential	0.46	0.48
Multi-Family High Rise	1.41	1.40
Multi-Family Low Rise	2.63	2.58
Single-Family Dwelling	54.41	50.34
Multi-Family Dwelling	24.46	23.01
Domestic – Non-Residential[1]		
BWS Commercial		
Commercial	20.69	19.79
Hotel	5.90	5.19
Mixed Use	2.16	2.06
Private Schools	0.46	0.44
Religious	0.51	0.45
BWS Government		
City	1.20	1.04
United States Military	2.76	2.52
United States Non-Military	0.14	0.13
State	3.51	3.25
State Schools	3.36	3.48
Industrial		
BWS Industrial	2.85	2.62
Irrigation		
BWS Commercial		
City Golf Courses	0.00	0.00
Irrigation – Private	1.72	1.60
Private Golf Courses	0.86	0.84
BWS Government		
City Parks	3.22	3.01
Irrigation – City	0.08	0.06
Irrigation – State	0.24	0.29
State Parks	0.02	0.02
Other		
Unknown	0.02	0.02
Total	**136.11**	**127.74**

[1] Includes potable and non-potable water needs.

Source: Staff communication, Honolulu BWS, February 9, 2007.

Table 6-13: County of Maui
2006 Municipal Water Use (mgd)

Billing Class	2006
Single Family	15.780
Multi-Family	5.966
Commercial	3.157
Hotel	2.994
Industrial	1.415
Government	2.777
Agriculture	3.386
Religious Inst.	0.234
Total	**35.707**

Notes: Projections include Molokai Island DWS system demands, but do not include the private system demands for Lanai Island.

Source: Staff communication, Maui Department of Water Supply, August 21, 2008.

Table 6-14: County of Hawaii
2005 Municipal Water Use (mgd)

Water Use Category DWS Category	2005
Agriculture	
AG Agriculture Rate	2.084
AO Agriculture-Other	0.043
Domestic – Residential	
RM Residential – Multi	2.148
RO Residential – Other	0.032
RS Residential – Single	12.109
Domestic – Non-Residential	
SK Schools – K/12	0.026
SO Schools – Other	0.033
SU Schools – Univ	0.000
CH Comm – Hotel	2.241
CO Comm – Other	4.227
CR Comm – Restaurants	0.000
CS Comm – Stores	0.000
CV Comm – Service Station	0.001
CY Comm – Laundry	0.000
F TD Flat Rate	0.000
MH Medical – Hospital	0.003
MO Medical – Other	0.059
NC Nonprofit – Church	0.287
NO Nonprofit – Other	0.006
Industrial	
DC DC Meters	0.012
IG Industrial – General	0.000
IL Industrial – Limited	0.000
IO Industrial – Other	0.000
SP Standpipe	0.002
Irrigation	
IC Irrigation – Comm	0.031
IR Irrigation – Res	0.203
Military	0.00
Municipal	
GC Gov't – County	0.402
GF Gov't – Federal	0.031
GS Gov't – State	1.275
Total	**25.257**

Note: Consumption rounded to the nearest thousandth of a unit.

Source: Staff communication, Fukunaga & Associates, Inc., February 10, 2006.

Hawaii County estimates the 2005 domestic water use from privately-owned public water systems and catchment water systems at 8.40 mgd and 4.97 mgd, respectively. These estimates provide additional perspective as to total domestic water use throughout Hawaii County.

6.4.3. USGS Assessment of Existing Water Demands

Freshwater use data is compiled by the USGS and is updated approximately every five years. The data includes water use from public and private water systems serving cities and military bases. Water used for domestic, commercial, recreational, industrial, and thermoelectric purposes is included, as well as water used in water and wastewater treatment, pools, parks, and other facilities.

Table 6-15: 2000 Freshwater Demand by Type and by County

Use	State Total	Hawaii	Honolulu	Kalawao	Kauai	Maui
	(Million gallons per day)					
Ground Water	428.00	44.55	208.84	0.09	25.83	148.69
Public Supply	242.83	31.16	164.81	0.09	14.94	31.83
Industrial[1]	14.50	0.04	12.93	-	0.27	1.26
Thermoelectric	-	-	-	-	-	-
Irrigation	170.67	13.35	31.10	-	10.62	115.60
Surface Water	200.43	8.86	8.07	-	19.37	164.13
Public Supply[1]	7.60	2.50	-	-	-	5.10
Industrial	-	-	-	-	-	-
Thermoelectric	-	-	-	-	-	-
Irrigation	192.83	6.36	8.07	-	19.37	159.03
Total	**628.43**	**53.41**	**216.91**	**0.09**	**45.20**	**312.82**

1. Includes water withdrawn by public and private water systems for use by cities and military bases. Water withdrawn by these facilities may be delivered to users for domestic, commercial, industrial, and thermoelectric purposes, or may be used for water and wastewater treatment, pools, parks and city buildings.

Source: *2005 State of Hawaii Data Book*, Table 5.22, Department of Business, Economic Development, and Tourism (http://www.hawaii.gov/dbedt/).

6.5. Estimating Future Water Demands

Projections of future water use over a long-term planning period are subject to many influences on water demand, including economic conditions, population growth, land use policies, and conservation practices. There are several methods that can be used to derive demand projections and increase the accuracy of estimates.

Land use-based water demand projections can be used to plan for future water needs. These projections are intended to evaluate the water demands of an area, relative to a certain density level based on zoning and/or land use type. Land use-based demand projections indicate the water needs anticipated with current land use policies. This method, however, can produce overly conservative water demand projections in the full build-out scenario at maximum allowable density. Projections based on more moderate development densities may be more useful.

Future water demand can also be estimated based on population growth projections. These projections assume a per-capita water demand, to provide estimates over planning horizon increments of 5, 10, 15, or 20 years. Multiple growth scenarios are usually evaluated for each time increment to provide a range of projected demand, with the most conservative projection derived from the “high population growth” scenario.

Regional population growth rates for various land use categories can also be applied to predict future residential water demand. Additionally, recent consumption rates by region and land use type can help to improve predictions of future water demand.

Demand projections, whether derived from land use or population, can be refined using information contained in other State and county plans, information on federal and private water systems, and historical water use data. The SWPP identifies future water demands for State of Hawaii projects. The AWUDP identifies both State and private agricultural water demands.

6.5.1. Projected Future County Water Demands

According to county water agency projections, by the year 2030, water demands will approach 430 mgd statewide. This translates to an approximate 34% increase in demand from year 2010 to year 2030.

Tables 6-16 through 6-20 describe the water demands projected by the county water agencies, in terms of water demand categories or billing classes (as designated by the water departments). The tables are useful in comparing demands associated with potable and non-potable water uses. Notwithstanding the discussion of land use and population-based projections in Section 6.4, it is noted that the demand forecasts in the tables below were prepared independently by each county; therefore, assumptions and forecast methods vary between counties. Figures 6-7 to 6-10 are provided to illustrate the data in the tables.

Lanai water demand information, beyond that which is shown in Table 6-17, was not available from the County of Maui Department of Water Supply at the time of this writing.

Table 6-16: Projected Water Demand for All Counties, 2010 to 2030 (mgd)

County	2010	2015	2020	2025	2030
Kauai[1]	16.160	16.997*	17.794	18.744*	19.695*
C&C of Honolulu[2]	164.280	176.840	185.210	195.680	206.150
Maui[3] (DWS system)	36.468	39.936	43.310	46.942	50.692
Maui	35.610	39.045	42.391	45.990	49.703
Molokai	0.858	0.891	0.919	0.952	0.989
Lanai[4] (private system)	1.669	1.857	2.046	2.235	2.423
Hawaii[5]	97.794	108.890	121.570	135.981	148.709**
Total	**316.371**	**344.520**	**369.930**	**399.582**	**427.669**

* Data interpolated from county demand projections through 2050 published in Tables 4.5 and 4.6 of the County of Kauai's *Water Plan 2020 (*Kauai Department of Water, March 21, 2001).

**Data interpolated from county demand projections from 2005 to 2025 provided by Fukunaga & Associates, Inc., on behalf of the County of Hawaii Department of Water Supply.

1 Source: Kauai Department of Water, *Water Plan 2020,* March 21, 2001.

2 Source: Staff communication, Honolulu BWS, March 20, 2007.

3 Source: Maui Department of Water Supply, Figure 28: Base Case Econometric DWS Water Demand Projections by DWS District by Use Classification, *Maui County Water Use and Development Plan, Water Use and Demand, Department of Water Supply Systems, Draft,* May 1, 2007.

4 Source: Staff communication, Maui Department of Water Supply, August 8, 2007.

5 Source: Staff communication, Fukunaga & Associates, Inc., June 22, 2007.

Table 6-17: Kauai County Projected Water Demand, 2010 to 2030 (mgd)

Use Category	2010	2015*	2020	2025*	2030*
Single Family	8.565	8.998	9.431	9.934	10.438
Multi Family/Resort	4.040	4.244	4.449	4.686	4.924
Commercial	1.293	1.358	1.424	1.500	1.576
Industrial	0.162	0.170	0.178	0.187	0.197
Government	1.454	1.528	1.601	1.687	1.773
Agriculture	0.646	0.679	0.712	0.750	0.788
Total	**16.160**	**16.977**	**17.794**	**18.744**	**19.695**

* Data interpolated from County historical water use for 1998-99 and County demand projections for 2005-2050 published in Figure 4.1 and Tables 4.5 to 4.6 of the County of Kauai's *Water Plan 2020* (Kauai Department of Water, March 21, 2001).

Source: Kauai Department of Water, *Water Plan 2020,* March 21, 2001.

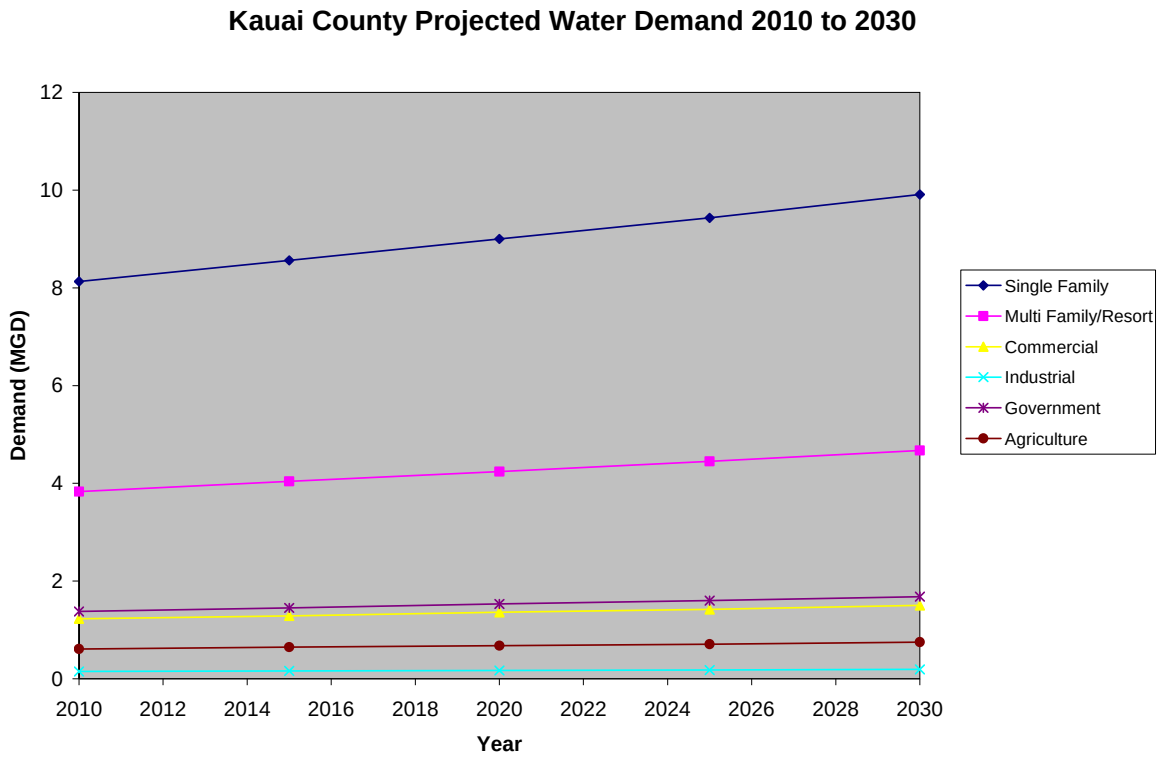

Figure 6-7. Kauai County Projected Water Demand 2010 to 2030

Table 6-18: City and County of Honolulu Projected Water Demand, 2010 to 2030 (mgd)

Use Category	2010	2015	2020	2025	2030
Agriculture	3.720	4.00	4.190	4.430	4.660
Domestic Residential[1]	100.620	108.310	113.440	119.850	126.260
Domestic Non-Residential[1]	49.090	52.840	55.340	58.480	61.600
Industrial	3.440	3.700	3.870	4.090	4.310
Irrigation	7.400	7.960	8.340	8.810	9.290
Other	0.020	0.020	0.020	0.020	0.020
Total	**164.280**	**176.840**	**185.210**	**195.680**	**206.150**

[1] Includes potable and non-potable water needs.

Source: Staff communication, Honolulu BWS, March 20, 2007.

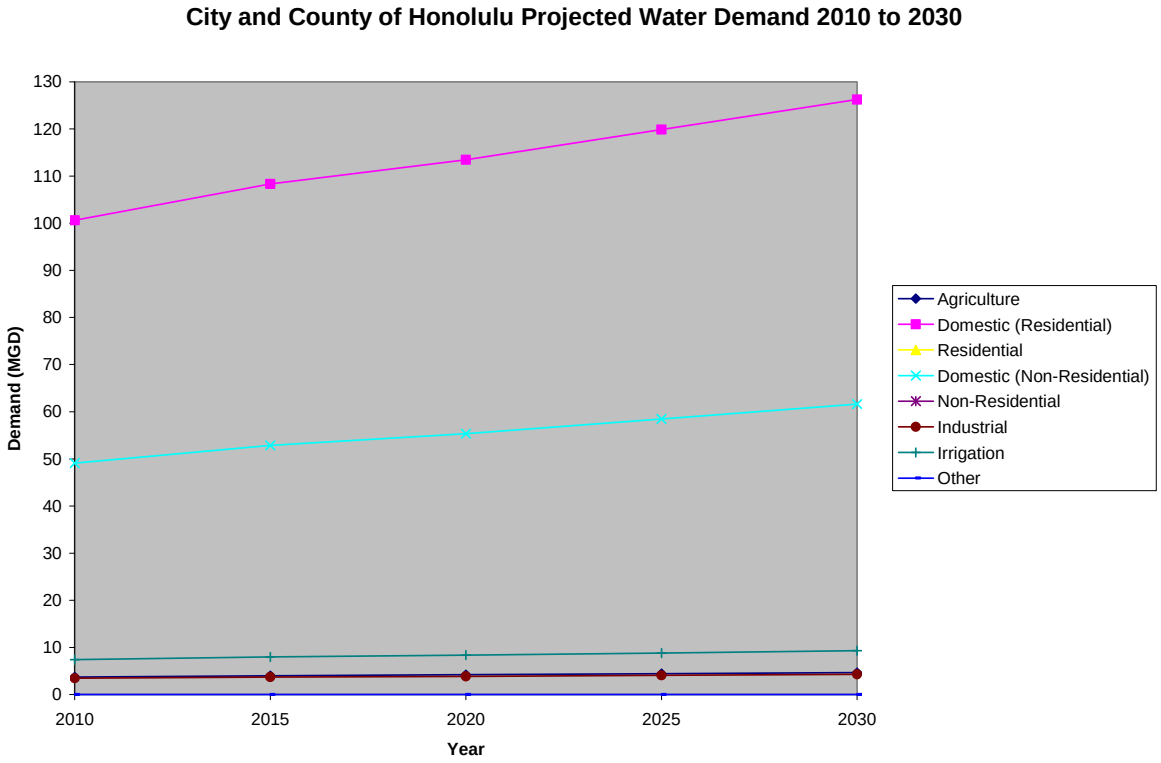

Figure 6-8. City and County of Honolulu Projected Water Demand 2010 to 2030

Table 6-19: Maui County Projected Water Demand for Maui Island and Molokai Island, 2010 to 2030 (mgd)

Use Category	2010	2015	2020	2025	2030
General	33.046	36.417	39.688	43.213	46.849
Agriculture – Potable	2.83	2.907	2.989	3.075	3.167
Total Potable	35.876	39.324	42.677	46.288	50.016
Agriculture – Non-Potable	0.592	0.612	0.633	0.654	0.676
Total	**36.468**	**39.936**	**43.31**	**46.942**	**50.692**

Notes: "Use Category" corresponds to the Maui Department of Water Supply billing class.

Source: Maui Department of Water Supply, Figure 28: Base Case Econometric DWS Water Demand Projections by DWS District by Use Classification, *Maui County Water Use and Development Plan, Water Use and Demand, Department of Water Supply Systems, Draft,* May 1, 2007.

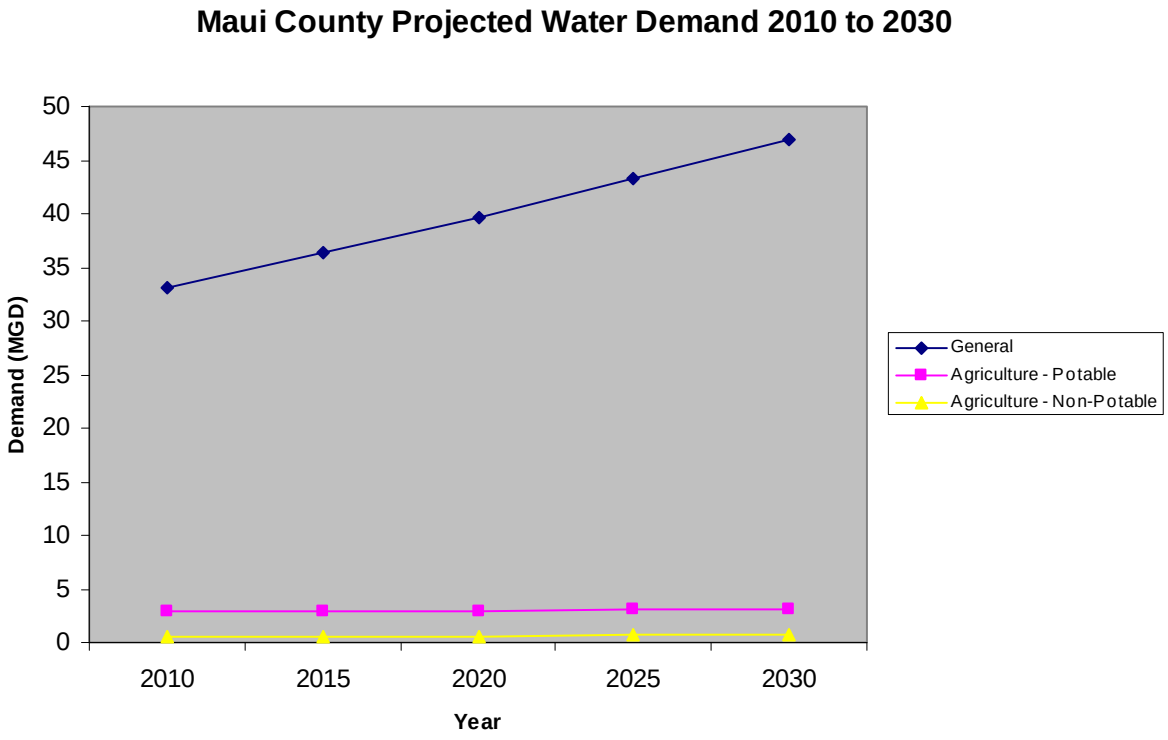

Figure 6-9. County of Maui Projected Water Demand 2010 to 2030

As reflected in Table 6-20, Maui County has projected non-potable water demand for agricultural purposes separately from potable water demand for agriculture. As freshwater sources are committed to residential, commercial, sanitary and other human consumptive uses, it will be necessary for the counties to incorporate use of alternative water sources and service appropriate use categories with non-potable water.

Table 6-20: Hawaii County Projected Water Demand, 2010 to 2030 (mgd)

Use Category	2010	2015	2020	2025	2030*
Catchment (domestic)	5.658	6.435	7.334	8.369	9.273
Industrial	9.668	10.105	10.588	11.096	11.572
Irrigation	13.018	14.856	16.958	19.365	21.481
Agriculture	31.784	35.337	39.404	44.034	48.118
Military	0.035	0.040	0.047	0.054	0.061
Municipal[1]	37.631	42.117	47.239	53.062	58.205
Total	**97.794**	**108.890**	**121.570**	**135.981**	**148.709**

[1] Includes private-public water system demands and DWS system demands for domestic, industrial, irrigation, agriculture, military, and other municipal uses.

* 2030 projected demand interpolated from county demand projections from 2005 to 2025 provided by Fukunaga & Associates, Inc. on behalf of the County of Hawaii Department of Water Supply.

Source: Staff communication, Fukunaga & Associates, Inc., June 22, 2007.

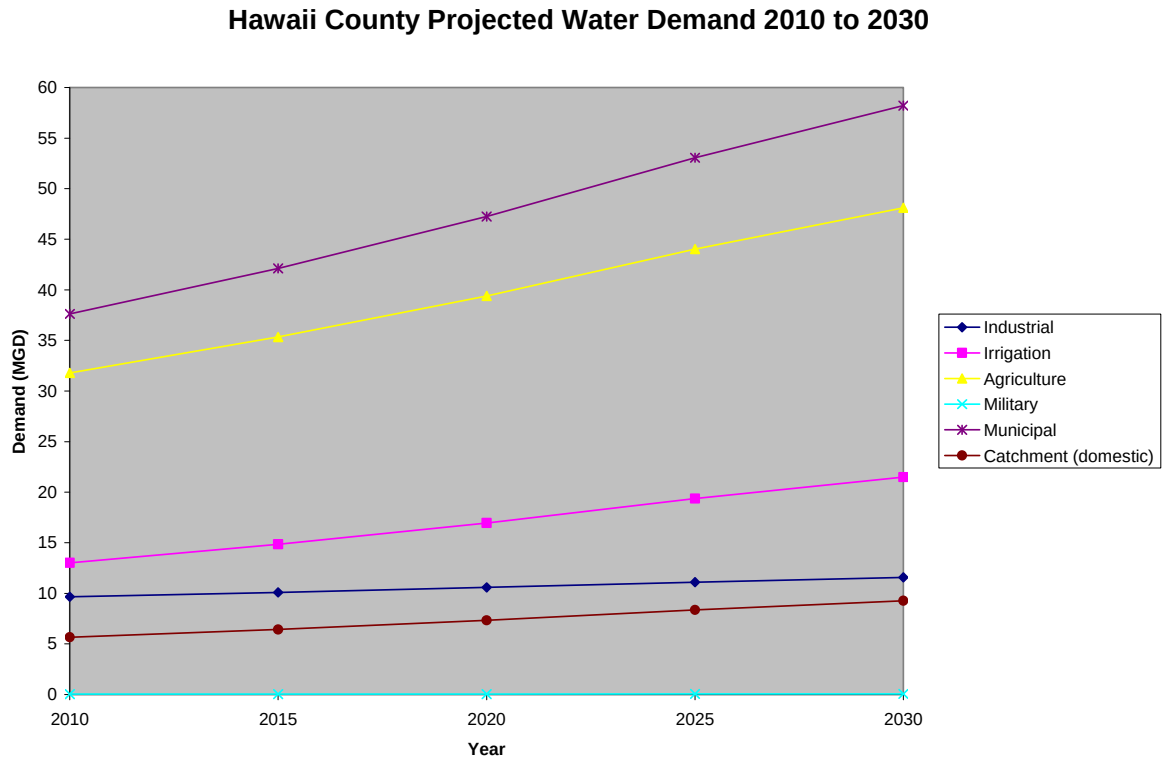

Figure 6-10. County of Hawaii Projected Water Demand 2010 to 2030

6.6. Water Planning at the County Level

One of the primary objectives of the State Water Code is the development of a program of comprehensive water resource planning to address the supply and conservation of water. A major component of this program is the Water Use and Development Plan that must be prepared by each county. The Water Code also provides for planning consistency across government levels by requiring the County WUDPs to be adopted by CWRM, and integrated into the Hawaii Water Plan.

The initial County WUDPs were prepared in 1990 to meet the deadline set by the State Water Code legislation, but the County WUDPs were adopted by the Water Commission with the condition that the plans be updated with more information on certain plan elements. In 1992, the Water Commission was briefed on draft updates to the County WUDPs, but the Water Commission deferred adoption of the updates, pending the refinement of the plans. The following describes the purpose and contents of the County WUDPs, the process for updating the plans, and the status of each county's planning efforts.

6.6.1. The County WUDP Update Process

The State Water Code requires each county to prepare and regularly update its County WUDP to address future water demands and to set forth the "allocation of water to land use in that county." It is important to note that the WUDPs are the instruments by which all other Hawaii Water Plan components are integrated, and are used to implement comprehensive water resource planning at the county level.

The County WUDP objectives include the following planning activities:

- Assess existing and future land uses and associated municipal water demands;
- Incorporate agriculture, military, private, State, and other non-municipal water demand projections; and
- Evaluate the cost and adequacy of proposed development plans and identify preferred and alternative water development plans to meet projected demands.

Requirements, recommendations, and guidance for preparing the County WUDPs are found in the State Water Code and the Statewide Framework for Updating the Hawaii Water Plan. The pertinent sections of the State Water Code and the Framework are summarized below.

6.6.1.1. State Water Code and Administrative Rule Requirements

The purpose of the County Water Use and Development Plans is to inventory all projected water demands and ensure that the future water needs of the county are met. The plans allocate water to land use, and provide additional guidance to CWRM for decision-making regarding water management area designation, water use, and water reservation requests.

The State Water Code mandates that each county update and modify its WUDP as necessary, to maintain consistency with zoning and land use policies. It also specifies that County WUDPs must be adopted by county ordinance.

HRS §174C-31(f) states that the County WUDPs must include, but are not limited to the following information:

> *(1) Status of water and related land development including an inventory of existing water uses for domestic, municipal, and industrial users, agriculture, aquaculture, hydropower development, drainage, reuse, reclamation, recharge, and resulting problems and constraints;*
> *(2) Future land uses and related water needs; and*
> *(3) Regional plans for water developments including recommended and alternative plans, costs, adequacy of plans, and relationship to the water resource protection and water quality plans.*

Hawaii Administrative Rules §13-170-32 provides additional guidelines for preparation of the County WUDPs:

> *(b) All water use and development plans shall be prepared in a manner consistent with the following conditions:*
> *(1) Each water use and development plan shall be consistent with the water resource protection plan and the water quality plan.*
> *(2) Each water use and development plan and the state water projects plan shall be consistent with the respective county land use plans and policies, including general plan and zoning as determined by each respective county.*
> *(3) Each water use and development plan shall consider a twenty-year projection period for analysis purposes.*
> *(4) The water use and development plan for each county shall also be consistent with the state land use classification and policies.*
> *(5) The cost of maintaining the water use and development plan shall be borne by the counties; state water capital improvement funds appropriated to the counties shall be deemed to satisfy Article VIII, section 5 of the State Constitution.*

6.6.1.2. Framework Requirements

The Statewide Framework for Updating the Hawaii Water Plan is intended to help integrate and update the components of the Hawaii Water Plan. With respect to the County WUDPs, several key Framework objectives are listed below:

- To achieve integration of land use and water planning efforts that are undertaken by federal, State, county, and private entities so that a consistent and coordinated plan for the protection, conservation and management of water resources is achieved;

- To recommend guidelines for the HWP update so that the plan and its component parts are useful to CWRM, other State agencies, the counties, and the general public;

- To develop a dynamic planning process that results in a "living document" for each component of the HWP which will provide county and State decision-makers with well formulated options and strategies for addressing future water resource management and development issues;

- To better define roles and responsibilities of all State and county agencies with respect to the development and updating of the HWP components; and

- To describe and outline the techniques and methodologies of integrated resource planning as the basic approach that should be utilized in developing and updating the County WUDPs.

The County WUDPs respond to the need for integration of resource development strategies at the county level. It is emphasized that the County WUDPs are required to encompass all water usage and water development plans projected throughout the county. Since the various State agencies ultimately build their projects within one of the four counties, State agency water use demands and proposals for development of various resources to meet those demands must be factored into the overall water demands and development strategies of each of the counties. The responsibility for preparation of the County WUDP rests with the specific entities charged with water planning within that county, as may be enumerated by county ordinance.

As provided by the Framework, a county-specific project description is to be prepared by each county to initiate the County WUDP update process. The project description should present specific issues, planning activities, project scope, and objectives to be met by the county in its planned update of the County WUDP. It should also include the roles and responsibilities of the various county agencies involved in the development and preparation of the WUDP, as well as the specific steps and projected timetable for updating and adopting the WUDP. The project description should be submitted for review and approval by CWRM, prior to the county's undertaking of the update process.

6.6.2. Status of County WUDP Updates

The four counties are at various stages of their respective WUDP update processes. Since the deferral of adoption of the 1992 draft updates, the Framework was adopted in 2000 to provide guidance to agencies responsible for preparing HWP components. That same year, the Hawaii Supreme Court's decision in the Waiahole Ditch Combined Contested Case imparted and reaffirmed the application of the Public Trust Doctrine and the precautionary principle in Hawaii's water resource planning efforts.

Both the City and County of Honolulu and the County of Maui had begun the WUDP update process as the HWP Framework and the Waiahole case were developing. Therefore, these counties have adapted and adjusted their programs to incorporate policy developments and

to formulate planning mechanisms best suited to them. The sections below provide information on the current WUDP update activities in each county, and summarize the status of planning efforts.

6.6.2.1. County of Maui WUDP Status

The County of Maui Department of Water Supply (DWS) submitted the project description for the County WUDP update for CWRM review in January 2004. The Maui DWS developed the WUDP project description in consultation with CWRM, who approved the DWS's regional planning approach in February 2004.

Maui County's regional WUDP update process incorporates planning and public input that had been accomplished since 1992 on Lanai, and to a lesser degree in West Maui. The scope involves regional planning efforts on a staggered schedule for the following districts:

- Central Maui and Upcountry
- West Maui
- East Maui
- Molokai
- Lanai

The scope of the WUDP also includes the means to resolve inter-regional issues and policy conflicts. Public and stakeholder input will be gathered through district Water Advisory Committees and possibly through surveys.

As of December 2005, Maui DWS and the Lanai Water Advisory Committee are working on finalizing the Lanai WUDP. A preliminary draft plan was distributed in August 2004, followed by an updated draft in September 2005. Maui DWS anticipates finalizing the plan as soon as possible, following the completion of district advisory committee revision and review.

Efforts in support of the Central Maui and Upcountry WUDP were initiated with an introductory public meeting held on November 30, 2004. As of December 2005, five meetings had been held in each district, and revision and review of draft sections of the WUDP was underway. Maui DWS anticipates proceeding with district committee meetings to complete a draft plan, but the project completion schedule is being revised.

In December 2005, the Maui DWS provided the following information regarding the progress of the remaining planning district WUDPs:

West Maui: The Maui DWS had completed six community meetings for the West Maui area WUDP update before efforts were put on hold after CWRM adopted the Framework. The DWS plans to re-initiate the planning process with the formation of a new community advisory committee, and the project schedule remains to be determined.

East Maui: Some preliminary research regarding demand forecasts and potential ground water contaminant sites has been completed for the East Maui district. The project schedule remains to be determined.

Molokai: As with the East Maui planning district, preliminary research has been conducted for the Molokai WUDP. The project schedule is to be determined.

6.6.2.2. City and County of Honolulu WUDP Status

To update the WUDP for the City and County of Honolulu, the Honolulu BWS proposed the development of regional "watershed management plans" that would together comprise the Oahu Water Management Plan (OWMP), which by City and County of Honolulu ordinance would also serve as the County WUDP. CWRM approved the OWMP Framework, along with the scopes of work for the first two regional watershed management plans, the Koolauloa Watershed Management Plan and the Waianae Watershed Management Plan, in March 2004.

The goal of the OWMP, via the watershed management plans, is to provide short-, mid-, and long-range guidance for the sustainable management and use of Oahu's surface and ground water resources. Such guidance will be consistent with City land use plans and State water plans. The watershed management plans for each of Oahu's eight planning districts will be developed through a planning process emphasizing:

- Community participation and consultation;
- Holistic management of watershed resources;
- Alignment with important State and City policies and programs;
- An action orientation: implementation of important watershed management programs; and
- Ahupuaa management principles.

The Honolulu BWS completed public review drafts of the Koolauloa and Waianae plans in 2007, and the schedule for the remaining plans has yet to be determined.

6.6.2.3. County of Hawaii WUDP Status

In September 2005, CWRM approved the County of Hawaii Department of Water Supply (DWS) project description for the technical approach to updating the Hawaii County Water Use and Development Plan. The County seeks to accomplish the following tasks through the technical approach:

- Take inventory of existing sources;
- Take inventory of existing uses;
- Identify existing water systems;
- Coordinate water use with land use plans and policies;
- Project future water demands;
- Identify supply-side and demand-side options; and
- Encourage public and stakeholder participation.

The relationship between land use plans, policies, infrastructure, and resource availability will be addressed with respect to the County General Plan and County zoning ordinance. The sustainability of current land use policies will be addressed by modeling the "infill" of un-developed or under-developed lands and calculating water demands. Three scenarios for water demands will be evaluated: low growth, medium growth, and high growth. Incremental water needs at 5-, 10-, 15- and 20-year intervals will be based on population and growth rate projections for the next 20 years.

The Hawaii DWS completed a public review draft of the Hawaii WUDP in 2007. The County is currently developing a long-range Water Master Plan and an implementation strategy for infrastructure upgrades that also includes a financial plan and a 5- and 20-year CIP program.

6.6.2.4. County of Kauai WUDP Status

The Kauai Department of Water (DOW) is planning to initiate work on the Water Use and Development Plan update in 2008. Infrastructure and system planning work has already been accomplished through other County plans. In 2001, the Kauai DOW and members of the Kauai Water Board completed the Water Plan 2020. The plan provides an inventory and evaluation of existing facilities, examines service standards, and includes plans for new and replacement facilities. Water Plan 2020 includes a capital improvement program, a financial plan, and a rate study and is focused on potable water for drinking and fire protection.

6.7. Recommendations for County Water Planning

The State Water Code mandates that the County WUDPs "be prepared by each separate county…setting forth the allocation of water to land use in the county." To achieve this objective, water planning efforts related to municipal and non-municipal water demands should be coordinated and integrated at the county level. The responsible county agency will need to bring the many other water planning agencies at the State and federal levels, stakeholders, and representatives from the private sector into a collaborative process.

Water allocation planning must be accomplished in accordance with State and county policies, and be in line with county-specific strategies for sustainable development. In addition to addressing the availability of water resources, planning activities must also relate to the community's desires for development, economic growth, environmental protection, and competing uses in managing the relationship between water demand and water supply.

Demand projections for the planning horizon must account for and reflect the cumulative effects of consumptive use. Consumptive uses reduce the source water level or flow; water is not returned to its source (for example, water used for irrigation or urban supply). Typically, all water use in Hawaii is consumptive, with the exception of stream diversions for ornamental ponds or taro *loi* that return water to the stream over the course of a short period of time and at a point relatively near the initial diversion. Water loss due to evaporation, seepage, and evapotranspiration in such diversion scenarios can be considered as negligible, due to the relatively small displacement in location and limited time frame.

While the Framework provides overall guidance and recommended elements for the County WUDPs, the following list of recommendations is provided to help guide the counties in their allocation of water to land use and to encourage the assessment of cumulative impacts to the resource. Recommendations for measuring existing consumptive uses and assessing future demand are presented, along with recommendations for associated land use planning issues.

Recommendations for county water planning are as follows:

- Promote coordination and collaboration among agencies, private entities, and users to account for the cumulative effects of water use and to mitigate negative impacts to the resource.

- Establish strategies for increasing system efficiency and for managing higher water demand associated with land use and planned development.*

- Compare the total water demand projection associated with land use plans and zoning, to assess the need to evaluate/revise of land use policies (e.g., a total build-out scenario).

- Seek the optimization of infrastructure to minimize local stress on aquifers and increase confidence in ground water modeling of sustainable yields.

- Increase drought preparedness and awareness, and implement Hawaii Drought Plan recommendations for county actions.

- Implement economic incentives for resource stewardship, conservation, and reuse.

- Use alternative sources wherever possible and monitor agricultural demand for potable water and encourage the development and use of alternate non-potable agricultural water supply.

- Gather information on community values and expectations for water use.*
- Encourage local stakeholder partnerships to implement County WUDP recommendations.

* Denotes recommendations adapted from the *Guidance Notes for Planning for Water Allocation* prepared in August 2003 by Ton Snelder, NIWA and Richard Keys, Marlborough District Council for the Quality Planning Project, a partnership between the New Zealand Planning Institute, the Resource Management Law Association, Local Government New Zealand, the NZ Institute of Surveyors and the Ministry for the Environment.