

CHAPTER 2

PAST, CURRENT AND FUTURE WATER USE

This chapter provides an overview of historical and current water use in the District, as well as a summary of future projected water demands.

2.1 WATER USE CATEGORIES

Water use in the ACWD service area is divided into two categories: 1) distribution system use, and 2) groundwater system use. The distribution system use includes all water uses supplied by ACWD's treatment and production facilities, and this use is further subdivided into the categories of single family residential (SFR), multi-family residential (MFR), commercial, industrial, institutional, landscape and other use.

Groundwater system use includes private (non-ACWD) groundwater pumping (primarily for industrial, agricultural and municipal landscape irrigation uses), ACWD's Aquifer Reclamation Program pumping, and saline groundwater outflow to San Francisco Bay. The Aquifer Reclamation Program (ARP) pumping is an ongoing ACWD program to pump saline groundwater out of the aquifer system and replace it with fresh water recharged at the District's groundwater recharge facilities. Saline groundwater outflow to San Francisco Bay represents the groundwater outflow required to maintain a bayward groundwater flow direction to prevent seawater intrusion into the local aquifer system and to flush saline groundwater back to San Francisco Bay.

The District's groundwater system use is not anticipated to change significantly in the future. Therefore, the following discussions of water use are focused on the District's distribution system water use.

2.2 HISTORICAL AND CURRENT WATER USE

Table 2-1 provides a summary of the last ten years of water use within the District. Table 2-2 provides a summary of the active water accounts by customer classification in the ACWD service area. Figure 2-1 provides a summary of water consumption by customer classification. As indicated in Figure 2-1, residential water use comprises approximately 70% of District water use, with the remaining 30% used by commercial, industrial and institutional customers.

Water consumption patterns are a function of many independent factors including growth, weather conditions, economic conditions and water conservation behaviors. The District saw dramatic declines in consumption during the 1987-1992 drought due to voluntary and District-sponsored demand management efforts. However, during the drought recovery period since 1992, several significant consumption-influencing factors have occurred. From 1993-2001 accelerated growth of both residential and business customers (including the high technology industry) occurred due to a strong economy. During this period, vacancy rates decreased and water consumption rose. From 2001 to 2005 the overall consumption in the District has been relatively flat, attributed primarily to weak local economic conditions and mild weather.

As indicated in Figure 2-2, average residential water use from 1993 - 2005 has not rebounded to pre-drought conditions (1986-87), indicating that a water efficiency "ethic" has been retained by the District's residential customers. In addition, beginning in January 1992, California legislation required all new construction to be done with low-flow plumbing devices. Also, starting in 1994 all new toilets sold in the State of California were required to be low-flow models. Therefore, the District anticipates water savings will continue to occur via "natural conservation" (as older plumbing fixtures are replaced with water efficient fixtures).

**Table 2-1
ACWD Past and Current Water Use (Acre-Feet)**

<i>Water Use Category</i>	<i>Fiscal Year</i>										
	<i>94-95</i>	<i>95-96</i>	<i>96-97</i>	<i>97-98</i>	<i>98-99</i>	<i>99-00</i>	<i>00-01</i>	<i>01-02</i>	<i>02-03</i>	<i>03-04</i>	<i>04-05</i>
<i>Distribution System</i>											
Single Family Residential	21,000	23,100	24,700	22,900	24,100	25,000	25,700	25,200	25,300	26,000	23,700
Multi-Family Residential	7,700	8,300	8,600	8,300	8,500	8,600	8,900	8,200	8,500	8,100	8,200
Commercial	4,400	4,900	5,100	5,300	5,600	5,800	5,600	5,200	5,000	5,200	5,300
Industrial	4,000	4,800	5,200	4,700	4,600	4,700	4,600	4,300	4,100	4,100	3,400
Institutional	1,700	1,900	2,200	2,000	2,000	2,100	2,300	2,200	2,200	2,300	2,000
Landscape	3,200	3,800	4,600	3,900	4,500	5,200	5,300	5,600	5,600	6,300	5,700
Other	200	200	300	300	200	200	200	200	200	200	100
Total Consumption	42,300	46,900	50,900	47,400	49,400	51,700	52,600	50,800	50,700	52,300	48,400
System Losses	2,900	4,100	4,200	4,100	4,200	4,200	3,600	4,300	3,700	4,100	3,200
Distribution System Total	45,200	51,000	55,100	51,500	53,600	55,900	56,200	55,100	54,400	56,400	51,600
<i>Groundwater System</i>											
Private Groundwater	4,200	5,700	5,000	3,900	3,200	3,100	3,800	3,100	3,400	3,600	--
Groundwater Reclamation											
-ARP Pumping	9,400	17,000	7,800	3,800	10,600	6,300	4,300	7,400	7,700	11,100	--
-Saline Outflow	7,800	2,400	2,300	3,900	6,100	7,400	6,600	6,300	5,800	7,200	--
Groundwater System Total	21,400	25,100	15,100	11,600	19,900	16,800	14,700	16,800	16,900	21,900	--
<i>Grand Total</i>	66,600	76,100	70,200	63,100	73,500	72,700	70,900	71,900	71,300	78,300	--

Notes:

1. Annual consumption is based on units billed during the Fiscal Year (July 1 to June 30). ACWD uses a bi-monthly billing cycle.
2. All values rounded to the nearest 100.
3. Total Consumption values may not equal sum of individual components due to rounding.
4. Multi-Family Residential, Commercial, Industrial, and Institutional categories do not include dedicated landscape irrigation water use within these categories.
5. Landscape water use includes all dedicated landscape accounts for Multi-Family Residential, Commercial, Industrial and Institutional customers.
6. Distribution System Total represents total water production, as reported in ACWD's Annual Groundwater Survey Reports.
7. System Losses are calculated as the difference between Distribution System Total (total production) and Total Measured Consumption.
8. Groundwater System demands are based on annual reported values in ACWD's Annual Survey Report on Groundwater Conditions.
9. Groundwater Reclamation demands represents groundwater system demands to protect and reclaim the groundwater system from seawater intrusion.
10. Groundwater System demands do not include "Other Outflows" as reported in ACWD's Annual Survey Report on Groundwater Conditions.
11. Groundwater System demand for FY2004/05 was not available at the time of preparation of this UWMP Update.

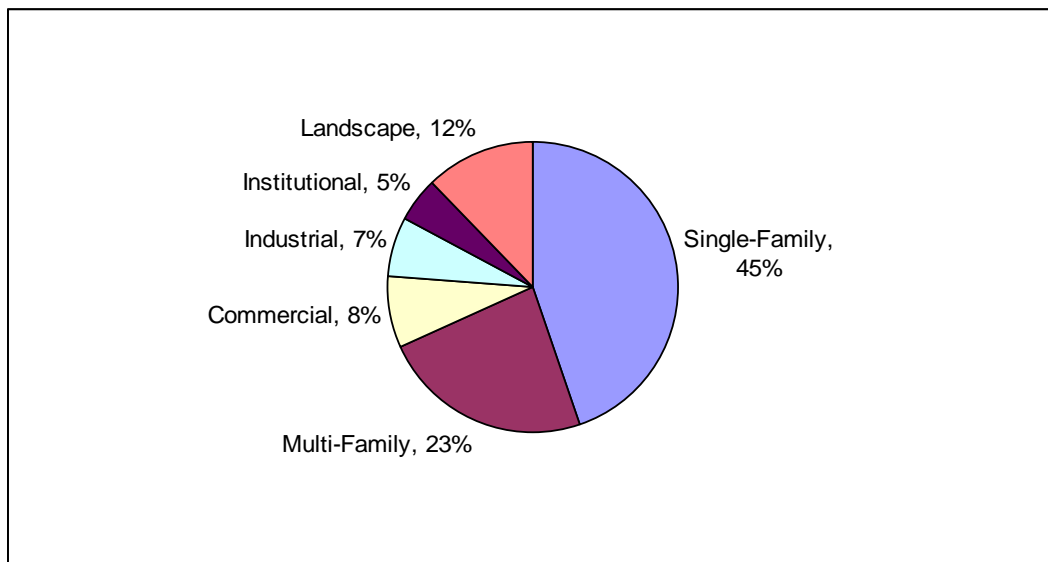
**Table 2-2
ACWD Water Accounts by Customer Classification
(Number of Accounts)**

<i>Water Use Category</i>	<i>Historical (Fiscal Year)</i>						<i>Projected</i>			
	<i>99-00</i>	<i>00-01</i>	<i>01-02</i>	<i>02-03</i>	<i>03-04</i>	<i>04-05</i>	<i>2010</i>	<i>2015</i>	<i>2020</i>	<i>2025</i>
Single Family Residential	67,061	67,820	68,365	68,623	68,805	68,994	72,679	74,992	75,439	75,439
Multi-Family Residential	2,012	2,013	2,016	2,017	2,017	2,020	2,265	3,226	4,832	6,306
Commercial	2,317	2,317	2,337	2,348	2,314	2,310	2,368	2,396	2,421	2,432
Industrial	667	696	718	715	716	726	767	862	903	939
Institutional	429	431	439	446	447	448	456	467	472	476
Landscape	1,649	1,704	1,773	1,804	1,816	1,833	1,915	2,172	2,543	2,882
Other	1,648	1,722	1,789	1,795	1,792	1,823	1,947	2,338	2,941	3,489
Grand Total	75,783	76,703	77,437	77,748	77,907	78,154	82,396	86,453	89,551	91,963

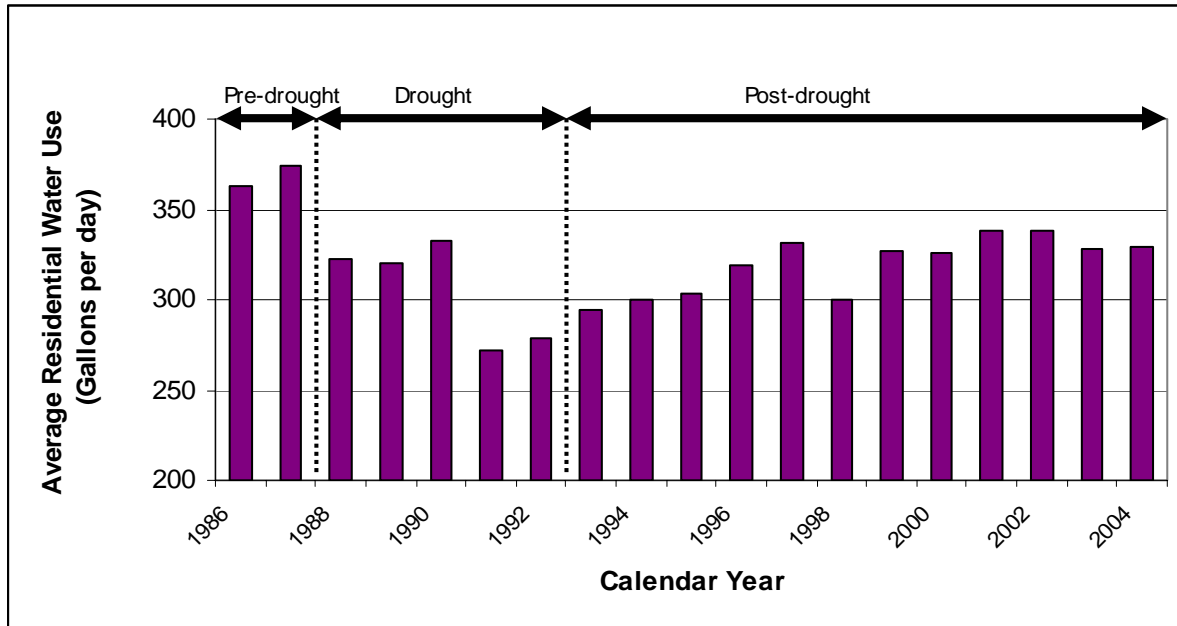
Notes:

1. Number of historical accounts represents accounts at mid-point of fiscal year.
2. Multi-Family Residential, Commercial, Industrial, and Institutional categories do not include dedicated landscape irrigation accounts within these categories
3. Landscape includes all dedicated landscape accounts for Multi-Family Residential, Commercial, Industrial and Institutional customers.
4. Other accounts include fire lines and hydrant meters.
5. Assumptions for projected future accounts are include: (a) current ratio of equivalent 2" meter per acre of development for non-residential use; (b) current ratio of landscape to non-landscape accounts for Multi-Family Residential, Commercial, Industrial and Institutional customers; (c) one account per 1.25 residential dwelling units forecast; and (d) current ratio of Other accounts to sum of Multi-Family Residential, Commercial and Industrial accounts.

**Figure 2-1
Relative Water Consumption by Customer Classification, FY04/05**



**Figure 2-2
Water Use Trends - Single Family Residential**



2.3 PROJECTED FUTURE WATER DEMANDS

The forecast of future water demands is an integral part of ACWD planning for water supplies and water production facilities. In 1993, ACWD completed a comprehensive investigation of projected water demands to the year 2030 (1993 Forecast). The water demand projections from this investigation served as the basis for the District's Integrated Resources Plan which was completed in 1995. In 1999, District staff refined the 1993 Forecast with updated information on land use and water use trends (1999 Forecast).

The 1999 Forecast utilized a similar methodology to develop demand projections as was developed in the 1993 Forecast. These water demand forecasts were developed by first analyzing and relating current and historical land and water use trends. From this analysis, unit water use equations were developed that relate water use to the specific land use (i.e., gallons per day per housing unit for residential land use, and gallons per day per building square footage for commercial and industrial land uses). Unit water use equations were developed for each of the District's customer classifications. The demand forecast was then developed by relating these unit water use equations to the projected buildout conditions for each of the cities in ACWD's service area - Newark, Union City and Fremont. Buildout conditions were based on each of the three cities' General Plans.

2004 Demand Forecast

The Tri-City area is rapidly approaching build-out of existing undeveloped land. State level and regional planning objectives are now influencing local government general plans through the implementation of Smart Growth policies. These policies are expected to result in reclassification of some undeveloped land from non-residential to residential uses. More significantly, Smart Growth will likely see the reclassification and redevelopment of existing developed lands to create more housing. This will result in replacing an existing water demand (typically non-residential) with a new demand (residential) as existing developed areas are replaced with new residential housing. Smart Growth projections anticipate accelerated growth in housing beyond city planning levels beginning in around the year 2015.

To address these issues as well as to develop a means of serving ACWD's engineering and financial planning needs, ACWD again updated the demand forecast analysis in 2004 (2004 Demand Forecast). A new forecast method was developed for the 2004 Demand Forecast that uses an additive approach, one that considers future demand on-top of existing demands. This approach utilized a GIS database of available and developable lands as well as direct input of city-planned development. Through the GIS, this model allows tracking of development and more frequent revision to the demand forecast as needed.

The 2004 Demand Forecast projected future water use is based on planned future land usage in the service area. This future land use is based on vacant, undeveloped lands which are zoned for development. Additional potential future land use was also included in the 2004 Demand Forecast and is based on city-approved plans for redevelopment and/or intensification of specific areas. Future water demands associated with proposed, but not city-approved, development projects on lands currently zoned for agriculture and open space, such as Patterson Ranch in Fremont, are not included in this 2004 Demand Forecast.

For all three cities, general plans, amendments and planned redevelopments were reviewed, including:

City of Union City

- o 2002 General Plan Policy Document
- o 2002 DEIR for the General Plan Update

Newark City

- o General Plan Update 1992 (governing planning document)
- o Area Two Specific Plan, 1999
- o Redevelopment Plan for the Newark 2001 Redevelopment Project
- o Housing Element of the General Plan 2002

City of Fremont

- o General Plan, 1991
- o Housing Element 2001-2006

Close coordination with city planning staff from Fremont, Newark, and Union City was maintained throughout this process including an initial and final meeting to review all potential areas for development and new water demands. Details for all large new and redevelopment plans (e.g. Area Two in Newark, Pacific States Steel in Union City, and Pacific Commons in Fremont) were provided during these meetings in order to capture the most up-to-date planning information available. Additional details on land use assumptions provided by the cities are included in ACWD's documentation of the 2004 Demand Forecast (ACWD, 2004).

The 2004 Demand Forecast also considers future demands associated with the Association of Bay Area Government Smart Growth projections (ABAG, 2003). These ABAG projections are based on appreciably higher new development than is currently included in the cities' existing plans. The ABAG projections begin to diverge from city projections between the years 2015 and 2020. The 2004 Demand Forecast assumes that 50% of the difference between city and ABAG projections will occur in housing, starting in

the year 2015. It is assumed that this new housing is only multi-family residential and thus adds a relatively small incremental water demand. It is also assumed that, given the limited availability of land, this additional housing will be more in the form of redevelopment and will thus replace a portion of existing water demands.

Results of the 2004 Demand Forecast form the basis for this Urban Water Management Plan Update, and are summarized in Table 2-3 (for the years 2010, 2015, 2020, 2025 and 2030) and in Figure 2-3. This forecast is provided for the single-family residential, multi-family residential, commercial, industrial, institutional and other water use categories. Landscape water use is included within the multifamily, commercial, industrial and institutional categories, and is not estimated separately. The water demand forecast also includes projected savings due to “natural” water conservation (i.e., savings due to the replacement of non-conserving plumbing fixtures with low flow fixtures). Water savings attributed to new, District-sponsored conservation programs are considered separately in Chapter 8 of this report.

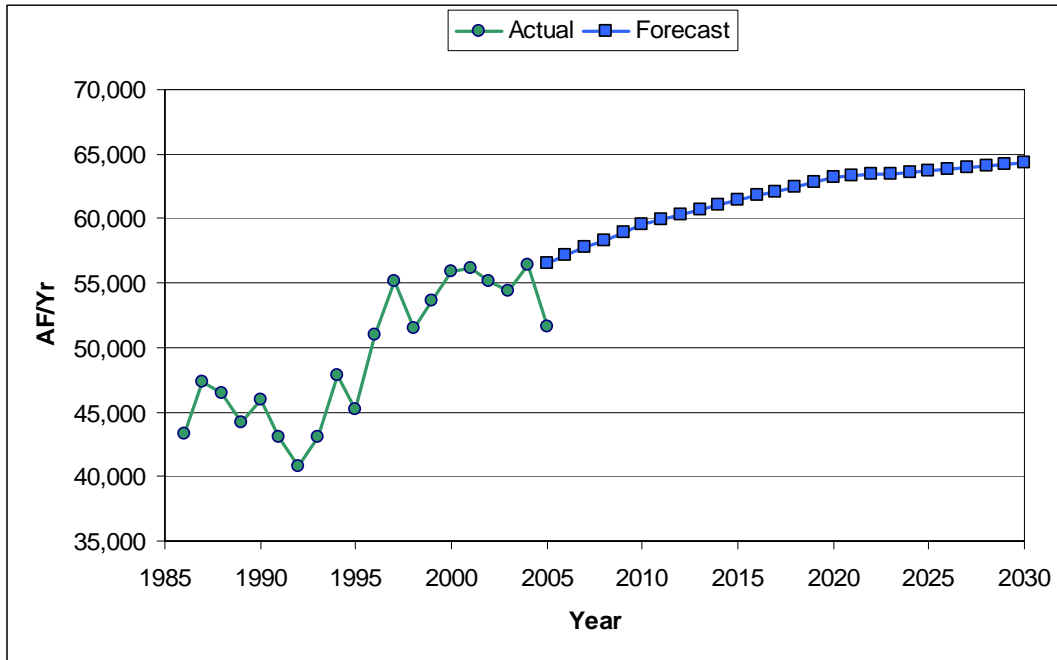
**Table 2-3
ACWD Estimated Future Water Demands from the 2004 Demand Forecast (AF/Yr)**

<i>Water Use Category</i>	<i>Year</i>				
	<i>2010</i>	<i>2015</i>	<i>2020</i>	<i>2025</i>	<i>2030</i>
<i>Distribution System</i>					
Single Family Residential	27,300	28,300	28,600	28,600	28,600
Multi-Family Residential	9,800	10,100	10,500	10,900	11,200
Commercial	6,500	6,600	6,800	6,900	7,000
Industrial	7,700	8,400	8,700	9,000	9,200
Institutional	3,800	3,900	4,700	4,700	4,700
Other	300	300	300	300	300
Sub-Total	55,400	57,600	59,600	60,400	61,000
Adjustment for natural conservation	(700)	(1,100)	(1,500)	(1,700)	(1,900)
Total Distribution System Demand (without losses)	54,800	56,500	58,100	58,600	59,100
Total Distribution Sytem Demand (with losses)	59,500	61,400	63,200	63,700	64,300
<i>Groundwater System Demand</i>					
	14,800	14,800	14,800	14,800	14,800
Grand Total	74,300	76,200	78,000	78,500	79,100

Notes:

1. All values rounded to the nearest 100.
2. Total values may not equal sum of individual components due to rounding errors.
3. Landscape Irrigation included within Multi-Family Residential, Commercial, Industrial, and Institutional categories.
4. Adjustment for natural conservation represents estimated savings due to retrofit of pre-1994 plumbing fixtures (showerheads, toilets) with water efficient models.
5. Total Distribution System Demand (with losses) includes estimated system losses of 8%.
6. Groundwater System demands include: (1) private pumping, (2) ARP pumping and (3) saline groundwater outflows.

**Figure 2-3
Historical and Projected Distribution System Demands (with System Losses)**



SFPUC Wholesale Customer Water Demand Projections

In addition to the 2004 Demand Forecast prepared by ACWD, water demand projections for the ACWD service area were also developed as part of a series of technical studies performed in support of the Capital Improvement Program for the SFPUC Regional Water System: SFPUC Wholesale Customer Water Demand Projections (URS 2004); SFPUC Wholesale Customer Water Conservation Potential (URS 2004); SFPUC Wholesale Customer Recycled Water Potential (RMC 2004); and SFPUC 2030 Purchase Estimates (URS 2004).

The SFPUC’s water demand projections (“SFPUC Projections”) for the ACWD service area were developed independently of, and prior to, ACWD’s 2004 Demand Forecast. The SFPUC Projections are based on the development and use of an “End Use” model to forecast future demands. Two main steps are involved in developing an End Use model: (1) establishing base-year water demand at the end-use level (such as toilets, showers) and calibrating the model to initial conditions; and (2) forecasting future water demand based on future demands of existing water service accounts and future growth in the number of water service accounts.

Establishing the base-year water demand at the end-use level was accomplished by breaking down total historical water use for each type of water service account (single family, multifamily, commercial, irrigation, etc.) to specific end uses (such as toilets, faucets, showers, and irrigation).

Forecasting future water demand was accomplished by determining the growth in the number of water service accounts in the ACWD service area. Once these rates of change were determined, they were incorporated into the model and applied to those accounts and their end water uses. The SFPUC forecast also incorporates the effects of the plumbing and appliance codes on fixtures and appliances including toilets (1.6 gal/flush), showerheads (2.5 gal/minute), and washing machines (lower water use) on existing and future accounts.

A comparison of the 2004 Demand Forecast and SFPUC Projections is provided in Table 2-4. In general, the two approaches provided similar results. For instance, the ACWD 2004 Demand Forecast is within 3% of the SFPUC's projections under 2030 conditions. The differences are attributed to the differences in methodologies and assumptions regarding the implementation of ABAG's "Smart Growth" projections. However, for the purpose of this UWMP, ACWD's 2004 Demand Forecast results are utilized for all supply/demand comparisons (see Chapter 8).

Table 2-4
Comparison of ACWD's 2004 Demand Forecast and SFPUC Forecast for ACWD service area
(Distribution Demands only)

<i>Water Demand Forecast (Distribution System Demands)</i>	<i>Year</i>				
	<i>2010</i>	<i>2015</i>	<i>2020</i>	<i>2025</i>	<i>2030</i>
ACWD 2004 Demand Forecast	59,500	61,400	63,200	63,700	64,300
SFPUC Forecast for ACWD Service Area	61,000	62,100	63,300	64,400	66,400
Difference (%)	(2.5%)	(1.1%)	0%	(1.1%)	(3.2%)