CHAPTER 6. PAST, PRESENT, AND PROJECTED WATER DEMANDS

The City currently serves as both a water retailer and water wholesaler. The City also treats and wheels (delivers) water to other entities. The purpose of this Chapter is to describe the City's past and present water demands, present total projected water demands, then discuss the methodology used to develop demands by customer type.

PAST AND PRESENT WATER DEMANDS

The City meets its water demands using a combination of surface water supplied by two existing surface water treatment plants, and City owned groundwater wells. Table 6-1 presents the City's historical water production between 1985 and 2005 from all of its water supply sources, which includes water produced between 1986 and 1989 from a water treatment plant that is no longer in operation (Riverside Water Treatment Plant).

As shown in Table 6-1, the City's water demand has increased from 105,861 af in 1985 to 139,000 af in 2005, representing a 31 percent increase over the last 20 years. Table 6-1 also indicates that historically, the City has maintained approximately an 82 percent to 18 percent surface water to groundwater ratio.

Figure 6-1 compares the City's per capita demand to water use from 1985 through 2005. As shown on Figure 6-1, the average per capita demand over the past 20 years is approximately 282 gallons per capita per day (gpcd), and ranged from a low of 252 gpcd in 1993 to a high of 304 gpcd in 1987. Figure 6-1 also indicates that per capita demands dropped well below the average between 1989 and 1995, likely due to drought conditions that existed between 1987 and 1992, and returned to historic averages between 1996 and 2004.

From 2004 to 2005, the City's per capita demand decreased by approximately 7 percent. This decrease may be attributable to the City's water conservation measures (see Chapter 8) and/or higher than average rainfall in 2005 (22.17 inches of rainfall in 2005 versus a historical average of 17.24 inches of rainfall).[1]

Unaccounted-for water (UAFW) includes many uses, such as street sweepers, hydrant testing, construction, fires, and leaks. A city the age of Sacramento typically has an UAFW rate of 10 percent or higher depending on the condition of older pipelines in the system.

PROJECTED WATER DEMANDS

Water demands were projected for the City through buildout of its water service area for both its retail and wholesale/wheeling customers. The methodology used and actual water demand projections by customer type are described below.

Table 6-1. Historical Water Production[a] (DWR Table 6)

Calendar Year	SRWTP, afa	FWTP, afa	RWTP, afa	Total Surface Water, afa	Total Groundwater, afa	Total Production, afa [b]	% Surface Water	% Groundwater
1985	39,441	49,158	0	88,599	18,774	105,861	84%	18%
1986	49,938	40,253	138	90,330	19,139	109,446	83%	17%
1987	45,320	50,113	978	96,411	19,451	115,831	83%	17%
1988	34,615	61,683	857	97,155	19,922	117,175	83%	17%
1989	33,308	52,857	316	86,480	23,387	109,894	79%	21%
1990	50,298	42,568	0	92,866	20,948	113,814	82%	18%
1991	46,265	40,552	0	86,817	20,276	107,093	81%	19%
1992	48,618	43,240	0	91,858	22,292	114,150	80%	20%
1993	35,623	48,954	0	84,577	23,861	108,437	78%	22%
1994	41,336	48,618	0	89,954	23,413	113,366	79%	21%
1995	42,520	47,329	0	89,849	24,225	114,074	79%	21%
1996	55,659	41,480	0	97,139	23,263	120,402	81%	19%
1997	36,884	64,175	0	101,059	24,710	125,769	80%	20%
1998	41,289	51,841	0	93,131	22,692	115,822	80%	20%
1999	54,863	54,832	0	109,695	23,694	133,389	82%	18%
2000	44,990	65,160	0	110,150	24,130	134,280	82%	18%
2001	58,153	57,831	0	115,984	24,156	140,140	83%	17%
2002	53,783	61,845	0	115,628	23,236	138,864	83%	17%
2003	55,716	58,957	0	114,674	25,607	140,281	82%	18%
2004	80,335	48,568	0	128,903	17,924	146,827	88%	12%
2005	64,044	52,408	0	116,452	22,521	138,974	84%	16%
Average							82%	18%
Minimum							78%	12%
Maximum							88%	22%

[a] Surface water and groundwater data obtained from City Operational Statistics Reports

[b] Includes water delivered through wholesale and wheeling agreements

SRWTP = Sacramento River Water Treatment Plant

FWTP = Fairbairn Water Treatment Plant

RWTP = Riverside Water Treatment Plant

Retail Water Demand Projections

Future water demands for the City's retail customers were calculated using land use acreage and an aggregate water demand factor developed by the Water Forum. Available acreage data was provided for those areas with a land use designation, and those areas located outside the City's existing service area, but that may eventually be annexed at buildout. Land use and the unit demand factors are discussed in more detail below.

Land Use for the City's Future Retail Customers

Acreage within the City's existing service area, by land use designation, was downloaded from the City's Geographic Information System (GIS), then re-classified into each of the City's retail customer type designations. Table 6-2 summarizes the City's projected acreage by customer type for those areas with land use information, and by development area for those future annexation areas. Figure 6-2 illustrates the location of the future annexation areas that will eventually become the City's retail customers.

As shown in Table 6-2, the City's water service area in 2030 will be approximately 42 percent single family, followed by commercial at 19.5 percent, Landscape at 13.1 percent, the Natomas Joint Vision at 9.5 percent, multiple family at 5.4 percent, Institutional at 4.7 percent, Industrial at 2.6 percent, the Panhandle at 1.9 percent, and Freeport at 1 percent.

Table 6-2. Total Future Area of the City's Retail Customers

Customer Type	Area, acres[(a)]	Percent of Total Area
Single Family	30,500	42.3%
Multiple Family	3,900	5.4%
Commercial	14,070	19.5%
Industrial	1,840	2.6%
Institutional	3,380	4.7%
Landscape	9,420	13.1%
Annexation: Freeport	740	1.0%
Annexation: Natomas Joint Vision	6,830	9.5%
Annexation: Panhandle	1,370	1.9%
Total	72,050	100.0%

[(a)] Area obtained from data provided by the City.

Aggregate Unit Demand Factors

This UWMP adopted the same aggregate unit demand factor used in the Water Forum Agreement to project water demands for areas where land use is undefined, such as areas outside the City, but could be annexed to the City. As will be discussed later in Chapter 8, the City has

already achieved some water conservation savings, estimated to be in the range of perhaps 0 to 15 percent since 1986. It is unclear what long term conservation rates may be, and more data and analysis would need to be collected to determine the long term effectiveness of conservation measures currently used by the City, or measures currently undefined, but adopted in the future.

The Water Forum adopted an overall conservation rate goal of 25.6 percent by the year 2030 with the implementation of selected best management practices. Components of these goals may be found on pages 345 and 348 of the Water Forum Agreement.

To "bookend" the range of future conservation levels that might occur, this UWMP examines rates between 0 percent and 25.6 percent although it is recognized that the 25.6 percent figure may or may not be feasible to achieve. The most recent water conservation data suggest that existing water conservation savings is about 7.5 percent, which is mid-range of the yearly water conservation savings observed since 1986, and close to water conservation savings observed in 2005. Water conservation is further discussed in Chapters 8 and 9.

For planning purposes, based on the foregoing discussion, water demands were projected assuming the following three conditions or scenarios:

- No long term conservation is achieved,
- The City maintains its recently observed rate of conservation of 7.5 percent through 2030; and
- The City achieves the Water Forum goal of 25.6 percent total conservation savings by 2030 in its water service area.

These three scenarios were generated by adjusting the aggregate unit demand factor (3.32 af/acre without conservation) to account for the various conservation conditions. Table 6-3- summarizes the unit demand factors used to project retail water demands.

Table 6-3. Aggregate Unit Demand Factors Used to Calculate Water Demands

Conservation Condition	Unit Demand Factor
No Conservation	3.32
Maintain Recently Observed 7.5% Rate of Conservation	3.07
Achieve Total of 25.6% Conservation	2.47

Projected Water Demands for the City's Retail Customers

The acreage estimates provided in Table 6-2 were multiplied by the aggregate unit demand factors provided in Table 6-3 to calculate the City's future retail water demands presented in Table 6-4 (the City's retail water demands in 2030).

Table 6-4. Projected Retail Water Demands at Buildout, acre-feet

Location	Land Use Designation or Annexation	Acreage at Buildout[a]	No Conservation[b,c]	7.5% Conservation[b,d,e]	25.6% Conservation[b,f,g]	% of Subtotal[j]
City Limits	Single Family	30,506	101,300	93,700	75,300	48.3%
	Multiple Family	3,904	13,000	12,000	9,600	6.2%
	Commercial	14,069	46,700	43,200	34,800	22.3%
	Industrial	1,837	6,100	5,600	4,500	2.9%
	Institutional	3,384	11,200	10,400	8,400	5.4%
	Landscape	9,414	31,300	28,900	23,300	14.9%
	Subtotal	*63,114*	*209,600*	*193,800*	*155,900*	*100.0%*
Future Annexation	Freeport	742	2,500	2,300	1,800	8%
	Natomas Joint Vision	6,829	22,700	21,000	16,900	76%
	Panhandle	1,370	4,500	4,200	3,400	15%
	Subtotal	*8,941*	*29,700*	*27,500*	*22,100*	*100.0%*
Grand Total [h]		72,100	239,300	221,300	178,000	
2005 Retail Water Demand[i]			131,200	131,200	131,200	
% Increase			82%	69%	36%	

[a] Obtained from land use data provided by the City.

[b] Rounded to the nearest 10 acre-feet.

[c] Water demand calculated using the Water Forum unit water use factor of 2.47 with conservation removed, or 3.32 af/acre (2.47 / (1-.256)).

[d] This assumes that the City is able to maintain its existing 7.5% conservation savings through year 2030 throughout its service area.

[e] Water demand calculated using the no conservation unit factor (3.32 af/acre) with 7.5% conservation added, or 3.07 af/acre (3.32*.925).

[f] This assumes the City is able to achieve an additional 18.1% conservation savings by 2030 in its service area.

[g] Water demand calculated using the Water Forum unit water use factor of 2.47 af/acre, which includes 25.6% conservation.

[h] Rounded to the nearest 100 acre-feet.

[i] Existing retail water demand calculated by taking total 2005 production (138,974 af, see Table 6-1), and subtracting existing total wholesale demand (7,806 af, see Table 6-5).

[j] The percentage breakdown among the three conservation scenarios is identical due to the use of an aggregate demand factor.

As shown in Table 6-4, under the no conservation alternative, the City's retail water demands are projected to increase by 82 percent over existing water demands. If the City is able to maintain a water conservation savings of 7.5 percent, then retail demands are projected to increase by 69 percent. Retail demands are projected to increase by 36 percent if a total of 25.6 percent water conservation savings is achieved.

Table 6-4 also indicates that within the present City Limits, Single Family accounts will make-up a majority of the water use (48 percent), followed by Commercial at 22 percent, and Landscape at 15 percent; the remainder of future demands within the City Limits will consist of Multiple Family, Industrial, and Institutional customers.

Wholesale/Wheeling Water Demand Projections

Table 6-5 presents the future demands for the City's existing and potential future wholesale/wheeling customers. As shown in Table 6-5, the City's wholesale/wheeling demands are projected to increase from approximately 7,800 af to 120,100 af if the City does not maintain existing conservation savings (no conservation alternative), to 112,000 af if it does maintain existing conservation savings, and to 93,000 af if it achieves a total water conservation savings of 25.6 percent.

Total Projected Water Demands at Buildout 2030

Table 6-6 presents the City's total projected water demands at buildout under each conservation scenario through the year 2030. Figure 6-3 illustrates the City's projected water demands under all three conservation scenarios. As shown in Table 6-6 and Figure 6-3, the City's total water demands, will increase from 131,200 af in 2005 to 359,400 af in 2030 if no long term water conservation savings is realized. If a water conservation level of 7.5 percent is maintained, these demands will increase to 333,300 af by 2030. If a conservation savings of 25.6 percent is achieved, total water demands will increase to 271,000 af by 2030.

Table 6-5. Projected Wholesale/Wheeling Water Demands in 2030, af (DWR Table 13)

Customer	Existing Demand [a]	25.6% Conservation					Projected Demand Without Conservation	7.5% Existing Conservation Maintained
		2010	2015	2020	2025	2030	2030	2030
Airport/Metro Air Park	0	1,450	2,900	4,350	5,800	7,280[c]	9,780	9,050
Area D Customers	0	1,450	2,900	4,350	5,800	7,340[b]	9,870	9,130
California American Water Company - Parkway	2,679	4,230	5,780	7,330	8,880	10,520[b]	14,140	13,080
California American Water Company - Rosemont	0	2,450	4,900	7,350	9,800	12,140[b]	16,320	15,100
Florin County Water District	0	450	900	1,350	1,800	2,300[b]	3,090	2,860
Fruitridge Vista Water Company	0	950	1,900	2,850	3,800	4,730[b]	6,360	5,880
Sacramento County Zone 40 - Wheeling	5,127	6,580	8,030	9,480	10,930	12,350[d]	12,350	12,350
Sacramento County Zone 40 – Wholesale	0	2,350	4,700	7,050	9,400	11,820[e]	15,890	14,700
Sacramento Suburban Water District - Arcade	0	3,750	7,500	11,250	15,000	18,670[f]	25,090	23,210
Sacramento Suburban Water District - Northridge	0	1,050	2,100	3,150	4,200	5,350[b]	7,190	6,650
Total	7,806	25,000	42,000	59,000	75,000	93,000	120,100	112,000

[a] Obtained from data included in the City's Operational and Statistics Reports.

[b] Based on unit demand factors from page 344 of the Water Forum Agreement. Factors include a conservation rate of 25.6 percent.

[c] Demand from the Airport/Metro Air Park Wholesale/Wheeling Agreement and was assumed to have 25.6% conservation savings.

[d] Demand from the Zone 40 Wheeling Agreement and was assumed to have 25.6% conservation savings.

[e] Projected demand based on estimates provided by the County of Sacramento and was assumed to have 25.6% conservation savings.

[f] Demand is from the Sacramento Suburban Water District Wholesale Agreement and was assumed to have 25.6% conservation savings.

Table 6-6. Total Existing and Projected Water Demands

Year	No Conservation			Existing 7.5% Conservation Maintained			Total of 25.6% Conservation Achieved		
	Retail Water Demand, af[a]	Wholesale Water Demand, af	Total Water Demand, af	Retail Water Demand, af	Wholesale Water Demand, af	Total Water Demand, af	Retail Water Demand, af	Wholesale Water Demand, af	Total Water Demand, af
2005	131,200[b]	7,806	139,000	131,200	7,806	139,000	131,200	7,806	139,000
2010	152,700	30,300	183,000	149,200	28,800	178,000	140,700	24,800	165,500
2015	174,200	52,800	227,000	167,200	49,800	217,000	150,200	41,800	192,000
2020	195,700	75,300	271,000	185,200	70,800	256,000	159,700	58,800	218,500
2025	217,200	97,800	315,000	203,200	91,800	295,000	169,200	75,800	245,000
2030	239,300	120,100	359,400	221,300	112,000	333,300	178,000	93,000	271,000

[a] 7.5% existing conservation removed from 2006-2030 demands.

[b] Existing demands already include an estimated 7.5% conservation savings. Under the No Conservation alternative, it is assumed that this savings would not be achieved in years 2010-2030.

EXISTING AND FUTURE WATER DEMANDS BY CUSTOMER TYPE

As discussed previously, meters are not in place for all of the City's customers and therefore, actual total water demands by customer type are not available. However, work completed as part of the City's 2005 Water Distribution System Master Plan included estimating existing water demands in 2003 using available maps of existing land use. Table 6-7 presents 2003 water demands by customer type as determined in the City's 2005 Water Distribution System Master Plan.

Table 6-7. 2003 Water Demands by Customer Type

Location	Land Use Designation or Wholesale/Wheeler	Demand, acre-feet	Percent of Subtotal
City Limits	Single Family	64,984	47.8%
	Multiple Family	10,073	7.4%
	Commercial	27,761	20.4%
	Industrial	4,699	3.4%
	Institutional[(a)]	2,248	1.7%
	Landscape	26,236	19.3%
	Subtotal	136,000	100%
Wholesale/Wheeling		4,281	
Grand Total		140,300	

(a) The City does not maintain separate records for "governmental" water use, or estimate the water use for "governmental" purposes. Water demands for this "governmental" purposes are included in institutional demands.

Comparing Table 6-7 to Table 6-4 indicates that the portion of total demand within the current City Limits consisting of Single Family customers is expected to grow by 0.5 percent between 2003 and 2030 (i.e., from 47.8 percent in 2003 to 48.3 percent in 2030). Similarly, the portion of total demand within the current City Limits consisting of Multiple Family, Commercial, Industrial, and Institutional customers is also expected to grow. The portion of demand consisting of Landscape customers is expected to decrease.

For those retail customer classes within the current City Limits, the difference between the portion of total demand in 2003 and the portion of total demand in 2030 was used to estimate demands for years between 2003 and 2030. Demands for potential annexation areas and Wholesale/Wheeling Customers were estimated by interpolating between existing demands in 2005 and the projected demand in 2030. Table 6-8 summarizes the City's existing and future water demands by customer type (under the 25.9 percent conservation alternative). The total demands presented in this chapter are used in Chapter 7 to compare with the City's projected water supplies.

Table 6-8. Future Water Demands by Customer Type - 25.6% Conservation Achieved by City Retail Customers by 2030, af (DWR Table 12)

Year	Single Family	Multiple Family	Commercial	Industrial	Institutional	Landscape	Annexation Areas	Wholesale/ Wheeling	Total
2000	64,160	9,950	27,410	4,640	2,220	25,900	0	0	134,300
2005	62,740	9,600	26,970	4,480	2,530	24,890	0	7,810	139,000
2010	65,300	9,650	28,490	4,510	3,570	24,750	4,420	24,800	165,500
2015	67,870	9,690	30,050	4,530	4,680	24,540	8,840	41,800	192,000
2020	70,450	9,690	31,650	4,540	5,860	24,240	13,260	58,800	218,500
2025	73,040	9,680	33,290	4,530	7,120	23,860	17,680	75,800	245,000
2030	75,300	9,600	34,800	4,500	8,400	23,300	22,100	93,000	271,000

There are no current or projected water demands (or water required) for saline water intrusion barriers, groundwater recharge, or other forms of conjunctive use not defined in this Urban Water Management Plan. There are no existing or proposed agricultural demands in the City.

Additionally, future accounts were projected by adding the incremental number of accounts due to an increase in water demand (without conservation) to the previous year's number of accounts. For example, the incremental increase in water demand (without conservation) for the Single Family customer class between 2005 and 2010 is approximately 7,585 af; hence, the projected number of additional accounts is 13,790 (7,585 af/year divided by 0.55 af/account/yr), for a total of 127,640 accounts in 2010 after rounding.

The unit factor used to calculate the projected number of accounts was developed using estimated 2005 water use without conservation (see Table 6-6) and total number of existing accounts in 2005. Table 6-9 presents the unit factors calculated for 2005, while Table 6-10 presents the projected number of accounts by customer class. As shown in Table 6-10, the number of accounts within each customer class is projected to increase.

Projected Water Demands for Lower Income Households

The total number of existing low-income housing units within the City at the end of 2005 is approximately 14,830 units. Additionally, the City adopted an Inclusionary Housing Ordinance (Ordinance) on October 3, 2000; provisions of the ordinance are included in the Sacramento City Code, Chapter 17.190 Mixed Income Housing. The Ordinance generally requires that at least 15 percent of new units within residential developments in new growth areas consist of affordable housing.

Consequently, it was assumed that for years 2010 to 2030, 15 percent of the Single Family and Multiple Family units reported in Table 6-10 would be affordable housing units. The water demands for these units were estimated by using the unit factors previously presented in Table 6-9. Table 6-11 presents the projected number of affordable housing units along with their projected water demand.

Table 6-11. Projected Water Demands for Lower Income Households

Type	2005	2010	2015	2020	2025	2030
Accounts[(a)]	14,830	17,000	19,200	21,400	23,600	25,900
Water Demand, af[(b)]	8,600	9,900	11,100	12,400	13,700	15,000

(a) Projected accounts that are for affordable housing were based on the City's existing Ordinance, which requires that any new development project ensure that 15% of its new residential units are affordable.
(b) Water demand based on the unit factors presented in Table 6-9.

Table 6-9. Unit Factors for Projecting Accounts

	Single Family	Multiple Family	Commercial	Industrial	Institutional	CII[a]	Landscape
Use, af	62,740	9,600	26,970	4,480	2,530	33,980	24,890
Accounts	113,850	10,800	10,078			10,078	1,619
Unit Factor	0.55	0.89	2.68			3.37	15.37

[a] CII means commercial, industrial, and institutional; the City does not keep track of these accounts separately.

Table 6-10. Future Accounts by Customer Type[a] (DWR Table 12)

Year	Single Family	Multiple Family	CII[b]	Landscape	Total
2000	99,632	10,446	9,455	1,236	120,769
2005	113,850	10,800	10,078	1,619	136,347
2010	127,640	11,698	11,684	1,734	152,756
2015	141,479	12,514	13,375	1,833	169,202
2020	155,373	13,250	15,154	1,916	185,693
2025	169,320	13,905	17,020	1,982	202,227
2030	183,849	14,520	19,026	2,038	219,434

[a] Future accounts based on unit factors (af/account) calculated for 2005: SF = 0.55 af/a, MF = 0.89 af/a, CII = 3.37 af/a, and Landscape = 15.37 af/a and water use before conservation.

[b] CII means commercial, industrial, and institutional; the City does not keep track of these accounts separately.

Projected Water Losses

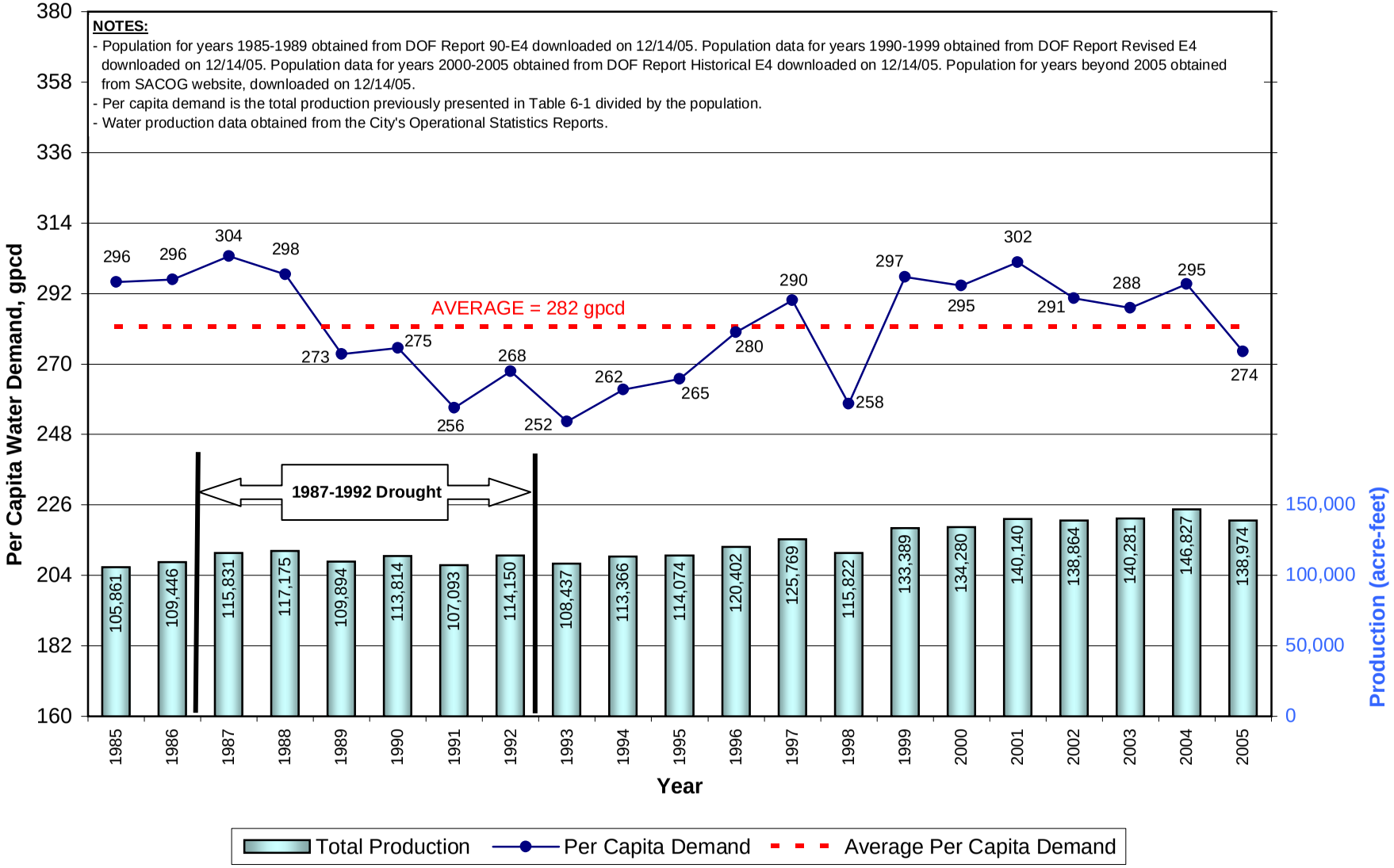
As discussed previously in this chapter, UAFW within the City of Sacramento typically has an UAFW rate of 10 percent or higher depending on the condition of older pipelines in the system. It is difficult to determine the amount of UAFW since most residential properties do not have meters. Table 6-12 presents an estimate of UAFW.

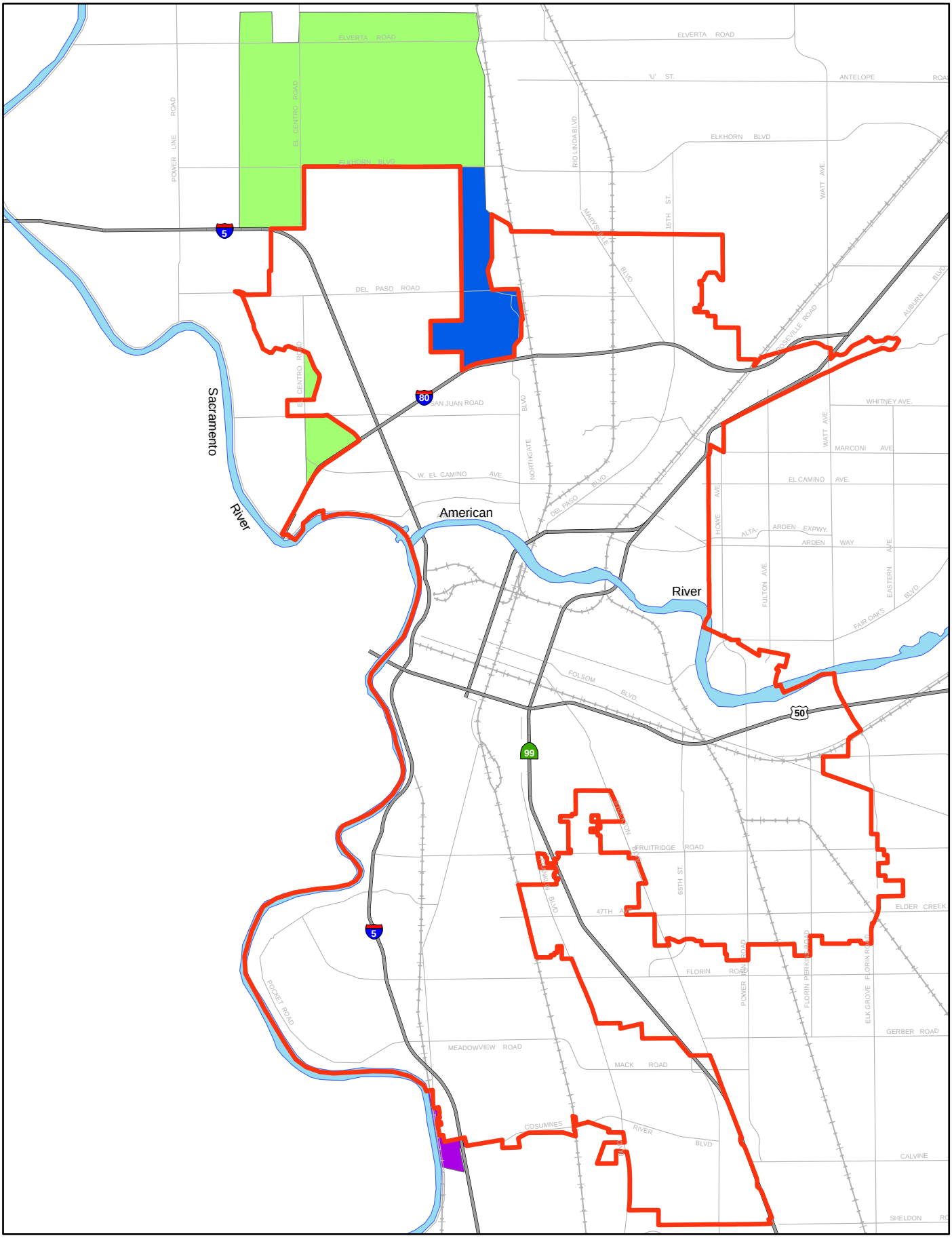
Table 6-12. Unaccounted-for System Losses, acre-feet (DWR Table 14)

	2000	2005	2010	2015	2020	2025	2030
Total Water Produced, acre-feet	134,280	138,974	165,500	192,000	218,500	245,000	271,000
Unaccounted-for System Losses, acre-feet[(a)]	13,428	13,897	16,550	19,200	21,850	24,500	27,100

(a) Assumes 10% system losses. See Past and Present Water Demands, page 6-1.

Figure 6-1. Historical Per Capita Water Demand





LEGEND:

- City Limits (Existing & Future Retail Customers)
- Freeport
- Natomas Joint Vision
- Panhandle
- River
- Freeway
- Railroad
- Streets

N

0 0.45 0.9 1.8
Scale in Miles

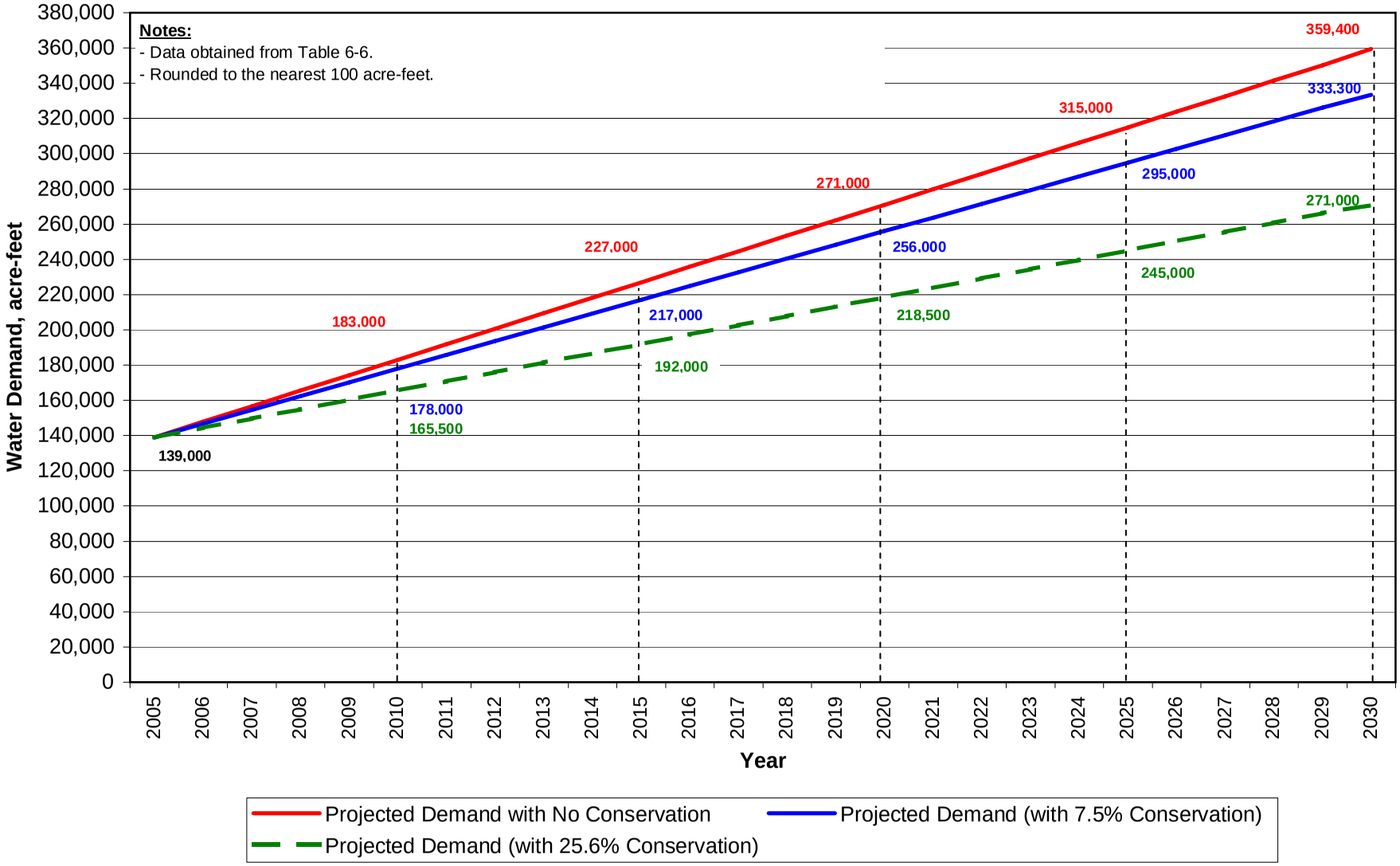
FIGURE 6-2

City of Sacramento
FUTURE RETAIL CUSTOMERS
POTENTIAL ANNEXATION AREAS

WEST YOST ASSOCIATES
Consulting Engineers

o:\clients\038\02-05-27\GIS\Fig6-2.mxd

Figure 6-3. Projected Water Demands



REFERENCES

[1] Historical average rainfall was previously presented in Table 3-1, while the annual average rainfall in 2005 was obtained from the WRCC website (www.wrcc.dri.edu).