

CHAPTER 6. WATER DEMAND

This chapter describes the following:

- Historical Water Production and Consumption
- Future Demand Projections
- Projected Urban Water Demands
- Sales to Other Agencies
- Additional Water Uses and Losses
- Total Water Use

HISTORICAL WATER PRODUCTION AND CONSUMPTION

Water production is the combined quantity of water produced by the City's groundwater wells and City's Surface Water Treatment Facility (SWTF), while water consumption is the quantity of water actually consumed or used. As will be discussed later, the difference between production and consumption is unaccounted-for water (UAFW).

The City currently tracks all of the water produced by its wells and the SWTF, which was completed in 2004. Although the City does not currently meter Single Family Residences, it does meter the consumption for its other customers: Multiple Family Residential, Commercial/Institutional, Industrial, and Landscape Irrigation. As discussed in Chapter 8, the City will be implementing a residential metering program for its single-family residential customers beginning in 2008 (see also Appendix I).

Consequently, the City tracks water use in two ways: water production records and meter (consumption) records. Both are discussed in more detail below, along with a discussion on UAFW.

Historical Water Production Records

The City currently meets its water demands using a combination of City-owned groundwater wells and treated surface water supplied from its SWTF. Table 6-1 presents the City's historical water production between 1990 and 2007 from all of its water supply sources.

Table 6-1. Historical Water Production

Calendar Year	Groundwater, af	Treated Surface Water, af	Total Production, af	Percent Groundwater	Percent Surface Water
1990	118,808	0	118,808	100%	0%
1991	117,562	0	117,562	100%	0%
1992	118,303	0	118,303	100%	0%
1993	119,521	0	119,521	100%	0%
1994	128,992	0	128,992	100%	0%
1995	130,389	0	130,389	100%	0%
1996	138,389	0	138,389	100%	0%
1997	148,670	0	148,670	100%	0%
1998	135,546	0	135,546	100%	0%
1999	151,806	0	151,806	100%	0%
2000	156,487	0	156,487	100%	0%
2001	164,049	0	164,049	100%	0%
2002	165,542	0	165,542	100%	0%
2003	165,177	0	165,177	100%	0%
2004	160,047	4,060	164,108	98%	2%
2005	141,471	15,807	157,278	90%	10%
2006	136,050	19,701	155,750	87%	13%
2007	145,148	20,650	165,798	88%	12%

As shown in Table 6-1, the City’s water production has increased from approximately 118,808 acre-feet (af) in 1990 to 165,798 af in 2007, representing a 40 percent increase over the last 17 years. The City’s Surface Water Treatment Facility came online in late 2004, and in 2007, the City was able to offset its groundwater use by approximately 12 percent by using the new Surface Water Treatment Facility throughout the year.

Per Capita Water Use

Historical Per Capita Water Use

Based on the estimated historical population served by the City from 1989 to 2007, historical per capita water production has been estimated and is illustrated on Figure 6-1. As shown in Figure 6-1, from 1989 to 2007, total per capita water production has varied from a low of 269 gallons per capita per day (gpcd) in 1993 to a high of 332 gpcd in 2001. In 2007, the total per capita water production was estimated to be 300 gpcd. The average total per capita water production was 300 gpcd from 1989 to 2007.

The City does not currently meter single-family residential water use. However, water uses by other customer classes are metered. Therefore, the total water use by single-family residential users can be estimated by subtracting all metered water use and estimated unaccounted for water (assumed to be 10 percent, see below) from the total water production. Using this methodology, it was determined that single-family residential water use ranged from 241 to 298 gpcd from 1998 to 2007, and averaged about 271 gpcd over the same period. Figure 6-1 shows the estimated single-family residential per capita water consumption from 1998 to 2007, based on historical water consumption.

Projected Future Per Capita Water Use

For projecting future demands, WYA has assumed that the baseline per capita water use (before residential metering is considered) will be equal to the average per capita water demand for the last nineteen years (1989 to 2007), or 300 gpcd. For purposes of projecting future water demands based on per capita water use, it has been assumed that beginning in 2009, single-family residential per capita water use will decrease by 2 percent per year for five years, for a total reduction of 10 percent by 2013 (to about 270 gpcd), to reflect the City’s single-family residential water metering program.

As described in Chapter 4, additional water conservation will be an important part of the City’s future water supply plan. To further decrease the overall per capita water use, additional water conservation measures are recommended as part of the City’s future water supply plan. An additional 5 percent overall conservation by all customers is recommended starting in 2010 (to reduce the per capita water use to 257 gpcd once all of the reductions due to residential metering are achieved), and an additional 5 percent (10 percent total) by all customers is recommended starting in 2020 (to reduce the per capita water use to 243 gpcd).

Based on these assumptions, the current total per capita water consumption will be reduced by about 20 percent by 2020, to a total per capita water use of about 243 gpcd. This projected reduction in per capita water use is summarized in Table 6-2 and shown on Figure 6-2.

Table 6-2. Reduction in Per Capita Water Demand as a Result of Additional Water Conservation

	2010	2015	2020	2025	2030
Current Per Capita Water Use (without residential water metering or additional conservation), gpcd	300	300	300	300	300
Projected Per Capita Water Use as a result of residential water metering (about 2 percent per year for five years starting in 2009), gpcd	288	270	270	270	270
Projected Per Capita Water Use as a result of 5 percent conservation by all customers starting in 2010, gpcd	274	257	257	257	257
Projected Per Capita Water Use as a result of 5 percent additional conservation by all customers starting in 2020, gpcd	--	--	243	243	243
Resulting Per Capita Water Use, gpcd	274	257	243	243	243

Unaccounted-For Water

The City's UAFW is the difference between the recorded water production and metered consumption; however, because the City does not meter its Single Family Residential customer class, the UAFW could not be specifically determined.

UAFW includes many uses, such as hydrant flushing/testing, construction, fire fighting, system leaks, and water main breaks. A city with the infrastructure age of Fresno likely has an UAFW rate of 10 percent or higher, depending on the condition of older pipelines in the system. For planning purposes in this UWMP, UAFW for the City's water system was assumed equal to 10 percent.

Historical Water Consumption

Historical water consumption for the City's water service area for 1995 through 2007 is shown on Table 6-3. As discussed above, the City does not currently meter single-family residential customers. However, the City does meter other customer classes, including multi-family residential, commercial/institutional, industrial, and landscape irrigation. Therefore, historical water consumption by single-family residential customers was estimated by WYA by subtracting all metered water use and estimated UAFW (assumed to be 10 percent of total water production) from the City's total water production.

In 2007, water use by single-family residential customers was estimated to be approximately 85,285 af, accounting for about 51 percent of the City's total water use, while multi-family residential was 23,529 af (14 percent), commercial/institutional was 24,554 af (15 percent), industrial was 6,334 af (4 percent), and landscape irrigation was 8,955 af (5 percent). Unaccounted for water was assumed to be 10 percent of total water production, or 16,580 af. As shown in Table 6-3, single-family residential water use decreased from 2003 to 2006, but then increased again in 2007. The initial decrease may have been a result of the City's water conservation efforts over the last several years (a check of the annual rainfall indicates that the City received about its historical annual average rainfall quantities over the past few years). Overall, water use in the City service area decreased since 2002, but then appears to have increased in 2007 (possibly due to dry conditions in 2007).

FUTURE DEMAND PROJECTIONS

Per Capita Based Potable Demand Projections

Based on the projected population of the City's water service area and the projected future per capita water use (assuming additional water conservation savings by all customers, and the metering of all single-family residential customers), per capita based potable water demand projections have been made for the City's water service area. Using the City Water Division service area population estimates with a 1.9 percent annual population increase (considered to be the "Low Population" estimate), the projected potable water demand in 2025 is estimated to be approximately 209,400 af. Using the population estimates from the City's 2025 General Plan (considered to be the "High Population" estimate), the projected potable water demand in 2025 is 239,200 af. The per capita based water use projections are shown in Figure 6-3.

Table 6-3. Historical Water Use by User Class, acre-feet^(f)

User Type	Calendar Year												
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Estimated Single-Family Residential (Unmetered) ^(a) , af	70,151	77,949	81,452	70,267	78,793	85,867	90,297	90,301	93,845	87,080	82,747	81,398	85,285
Single-Family Residential (Metered) ^(b) , af	2,142	2,578	3	-	-	-	-	-	0	0	0	-	0
Multi-Family Residential (Metered) ^(b) , af	20,207	17,086	21,715	21,453	23,987	21,792	22,649	23,342	22,902	23,587	22,651	22,471	23,529
Commercial/Institutional (Metered) ^(b,c) , af	17,041	18,165	21,239	21,996	24,594	24,242	23,940	23,984	20,781	26,143	25,731	24,928	24,554
Industrial (Metered) ^(b) , af	4,187	4,551	4,651	5,160	5,769	4,131	5,019	5,041	4,742	3,829	3,528	3,865	6,334
Landscape Irrigation (Metered) ^(b) , af	2,679	3,049	3,460	3,123	3,492	4,607	5,563	6,043	6,400	7,057	6,894	7,514	8,955
Other (Metered) ^(b,d) , af	951	1,179	1,292	-	-	208	186	287	-	-	-	-	562
Estimated Unaccounted For Water (10% of Total Production), af	13,040	13,840	14,868	13,555	15,182	15,650	16,406	16,555	16,519	16,411	15,728	15,575	16,580
Total Production (from Gold Book) ^(e) , af	130,398	138,398	148,680	135,555	151,816	156,498	164,060	165,554	165,189	164,108	157,278	155,750	165,798
Total Unmetered, af	70,151	77,949	81,452	70,267	78,793	85,867	90,297	90,301	93,845	87,080	82,747	81,398	85,285
Total Metered, af	47,207	46,609	52,360	51,732	57,842	54,981	57,357	58,697	54,825	60,617	58,804	58,777	63,934
Unaccounted For Water, af	13,040	13,840	14,868	13,555	15,182	15,650	16,406	16,555	16,519	16,411	15,728	15,575	16,580
Total, af	130,398	138,398	148,680	135,555	151,816	156,498	164,060	165,554	165,189	164,108	157,278	155,750	165,798

^(a) Unmetered single-family residential water use = Total Production - 10% Unaccounted For Water - Metered Water Use.

^(b) Source: DWR Public Water System Statistics Reports (1995-2005) and 2006 HTE Revenue Report.

^(c) "Institutional" includes schools and municipal uses. Except for 1995-1997, when municipal was included in "Other".

^(d) "Other" consists of municipal uses for 1995-1997. "Other" in 2000-2002 was not specified on the DWR Public Water System Statistics Reports.

^(e) Source: Gold Book "pumping stats.xls"

^(f) Metered water use data for July 2007 through December 2007 was not available for inclusion in this UWMP.

Land Use Based Potable Demand Projections

In addition to per capita based potable demand projections, future water demands for the City were also calculated using land use acreage and unit demand factors to develop future water demand projections by customer class. Subsequent sections describe the methodology used to develop unit demand factors by customer type, project water demands, and then compare the land use based demand projections to the per capita based demand projections.

Potable water demands were projected for the City by multiplying the unit demand factors developed for the City's Metro Plan Update Phase 1 Report by the projected future land use acres within the City's service area. Table 6-4 presents the projected water demands, by customer class, for years 2005, 2010, and 2025 using land use based unit demand factors. Projected water use or consumption presented in Table 6-4 accounts for metering of Single Family Residential connections, while projected water production includes UAFW at 10 percent.

As shown in Table 6-4, the City's projected water production in 2005 was approximately 157,600 af, while the actual production was 157,278 af (see Table 6-1), verifying the validity and accuracy of this methodology.

Table 6-4 also indicates that the City's lower water production needs (corresponding to the lower service population estimate) will increase from approximately 157,600 af in 2005 to 248,800 af in 2025 (buildout of the General Plan), or approximately 58 percent over the next 20 years. However, the City's water production need could also increase by approximately 55 percent (from 167,400 to 259,300 af) should the water supply contingency set aside for the Bakman, CSUF, Pinedale, and private groundwater users be requested (i.e., Bakman, CSUF, Pinedale, and private groundwater users request City service).

Figure 6-4 illustrates the City's low and high water production needs over the next 20 years using interpolation between 2005 and 2010, and between 2010 and 2025. As shown in Figure 6-4, the City's projected water demands can vary by approximately 10,000 af, depending on whether portions of the SOI currently served by others are served by the City in the future.

Comparison of Per Capita and Land Use Based Demand Projections

Figure 6-5 compares per capita demand projections to land use based demand projections. The low per capita based demand estimate in 2025 is likely the result of assumed growth rates associated with future population projections, and not exercising the water supply contingency set aside for Pinedale, Bakman, CSUF, and other private users to the City system. However, the per capita and land use based demand projections are sufficiently close for planning purposes in this UWMP.

Typically, per capita based water demand projections uniformly distribute water use over the entire service area and, therefore, do not account for specific land uses and locations. Additionally, per capita based water demand projections do not accurately account for changes in type of water demand over time (e.g., residential and commercial). Consequently, this UWMP will use land use based demand projections for planning future water supply needs.

Table 6-4. Land Use Based Demand Projections by Customer Class (with recent conservation and future metering)^(a)

Customer Class	Unit Factors, af/ac/yr			Low Demand Estimate						High Demand Estimate					
				2005 (estimated)		2010		2025 (Buildout of GP)		2005 (estimated)		2010		2025 (Buildout of GP)	
	2005	2010	2025	Area, acres	Water Demand, af/yr	Area, acres	Water Demand, af/yr	Area, acres	Water Demand, af/yr	Area, acres	Water Demand, af/yr	Area, acres	Water Demand, af/yr	Area, acres	Water Demand, af/yr
Single Family Residential	3.8	3.5	3.2	21,948	83,400	25,619	89,700	36,244	116,000	22,777	86,600	26,688	93,400	37,414	119,700
Multi-Family Residential	6.5	6.2	6.2	3,475	22,600	3,757	23,300	4,639	28,800	3,852	25,000	4,133	25,600	4,981	30,900
Commercial/Institutional	2.0	1.9	1.9	12,449	24,900	12,771	24,300	19,339	36,700	14,084	28,200	14,563	27,700	21,273	40,400
Industrial	2.0	1.9	1.9	1,994	4,000	1,994	3,800	4,098	7,800	1,994	4,000	1,994	3,800	4,098	7,800
Landscape Irrigation	3.0	2.9	2.9	2,304	6,900	2,376	6,900	2,675	7,800	2,310	6,900	2,391	6,900	2,705	7,800
South East Growth Area	3.4	3.2	3.2	0	0	2,094	6,700	8,376	26,800	0	0	2,094	6,700	8,376	26,800
Total Projected Consumption					141,800		154,700		223,900		150,700		164,100		233,400
UAFW (10%)					15,800		17,200		24,900		16,700		18,200		25,900
Total Projected Production					157,600		171,900		248,800		167,400		182,300		259,300

^(a) Demands do not account for recycled water supplies

ADDITIONAL WATER CONSERVATION

One of the components of the City's future water supply plan (discussed in Chapter 4) is additional water conservation. Together with additional future water supplies, additional water conservation will serve to reduce future projected water demands such that the use of available supplies can be optimized. The future supply plan through the year 2030 includes additional water conservation at two levels: an additional 5 percent and an additional 10 percent. The additional 5 percent savings is assumed for the 2010 and 2015 planning horizons, while the additional 10 percent savings (an additional 5 percent savings over that assumed for 2010 and 2015) is assumed for the 2020, 2025, and 2030 planning horizons.

As described above, the City's projected future demand already incorporates the planned residential metering program, for which an additional 10 percent of conservation was assumed for the City's single-family residential customers. Based on these assumptions, the overall future water use was assumed to equate to about 270 gpcd. With an additional 5 percent conservation for 2010 and 2015, the City's overall water use would be reduced to about 257 gpcd. With an additional 10 percent conservation, the City's overall water use would be reduced to about 243 gpcd for 2020, 2025, and 2030. These reductions in per capita water use are shown in Table 6-2 and Figure 6-2.

Chapter 8 describes the City's current water conservation programs, in addition to some of the future programs that the City is considering for future implementation. In order to achieve the additional conservation included in the City's future water supply plan, the City and its customers will need to work together to conserve water.

PROJECTED URBAN WATER DEMANDS

10631 (e)(1) Quantify, to the extent records are available, past and current water use, over the same five-year increments described in subdivision (a), and projected water use, identifying the uses among water use sectors including, but not necessarily limited to, all of the following uses:

- (A) Single-family residential*
- (B) Multi-family*
- (C) Commercial*
- (D) Industrial*
- (E) Institutional and governmental*
- (F) Landscape*
- (G) Sales to other agencies*
- (H) Saline water intrusion barriers, groundwater recharge, or conjunctive use, or any combination thereof.*

(2) Agricultural

(3) The water use projections shall be in the same five-year increments described in subdivision (a)

As discussed above, this 2008 UWMP uses land use based demand projections. For planning purposes, it was assumed that future water demands would follow the low land use based demand estimate until 2013 (when the residential water metering program is scheduled to be completed), then incrementally transition to the high land use based estimate by 2025.

Figure 6-6 presents the recommended water demand projection for the City (with and without the additional water conservation as described above). As shown in Figure 6-6, the City’s demands (including unaccounted for water but not including additional conservation) are projected to increase from 157,600 af/yr in 2005 to 276,700 af/yr by the year 2030; representing a 76 percent increase in water demands over the next 25 years. Assuming the 10 percent additional conservation by 2030, water demands would only increase to 249,000 af/yr by 2030, representing a 58 percent increase over the next 25 years.

Table 6-5 shows the projected water demands by land use designation through the year 2030. Table 6-6 provides a breakdown of the projected water demands by land use designation, and by metered and unmetered connections, through the year 2030. As shown, for 2010, it has been assumed that 40 percent of the single family residential connections are metered. By 2013, it has been assumed that 100 percent of the single family residential connections are metered.

Table 6-5. Projected Urban Water Demands through the Year 2030

Year	Projected Water Demands, af/yr						
	2000 (Actual)	2005 (Actual)	2010	2015	2020	2025	2030 ^(a)
Urban Demand ^(b)	140,900	141,800	154,700	179,400	206,400	233,400	249,000
UAFW ^(c) (see discussion below)	15,700	15,800	17,200	19,900	22,900	25,900	27,700
Total Demand (including UAFW)	156,600	157,600	171,900	199,300	229,300	259,300	276,700
Additional Water Conservation, %	--	--	5%	5%	10%	10%	10%
Reduced Urban Demand	140,900	141,800	147,000	170,400	185,800	210,100	224,100
UAFW ^(c) (see discussion below)	15,700	15,800	16,300	18,900	20,600	23,300	24,900
Total Demand (with Additional Conservation) (including UAFW)	156,600	157,600	163,300	189,300	206,400	233,400	249,000

(a) Year 2030 water demand projection based on interpolation of demand projections in 2025 and 2060 per Metro Plan Update Phase 1 Report dated December 2007.

(b) Does not include unaccounted for water (see Table 6-7).

(c) Assumed to be 10 percent of water production.

Table 6-6. Past, Current, and Projected Water Deliveries (DWR Table 12)

Year	Metered vs. Unmetered	Water Use Sector	Single Family		Multi-Family		Southeast Growth Area	Commercial/ Institutional	Industrial	Landscape Irrigation	Fire Protection	Total Accounts	Total Accounts	Without Additional Conservation		With Additional Conservation			
			Market Value	Lower Income ^(a)	Market Value	Lower Income ^(b)								Total Deliveries, af/yr ^(c)	Total Deliveries, af/yr ^(c)	Total Demand including Estimated UAFW, af/yr	Assumed Additional Conservation, percent	Reduced Deliveries including Additional Conservation, af/yr	Reduced Total Demand including Estimated UAFW, af/yr
2000	Metered	# of accounts			6,901	425	-	7,416	106	1,516	395	16,759	111,909	140,900	156,600	0%	140,900	156,600	
		Deliveries, af/yr			20,427	1,373	-	24,500	4,100	4,600	-	55,000							
	Unmetered	# of accounts	95,143	7								95,150							
		Deliveries, af/yr	83,409	2,491								85,900							
2005	Metered	# of accounts			7,088	436	-	7,882	96	2,243	2,568	20,313	123,826	141,800	157,600	0%	141,800	157,600	
		Deliveries, af/yr			21,176	1,424	-	24,900	4,000	6,900	-	58,400							
	Unmetered	# of accounts	103,506	7								103,513							
		Deliveries, af/yr	80,981	2,419								83,400							
2010 ^(d)	Metered	# of accounts	48,327	3	7,663	472	9,876	8,086	96	2,313	2,960	79,796	152,292	154,700	171,900	5%	147,000	163,300	
		Deliveries, af/yr	34,839	1,041	21,832	1,468	6,700	24,300	3,800	6,900	-	100,880							
	Unmetered	# of accounts	72,491	5								72,496							
		Deliveries, af/yr	52,259	1,561								53,820							
2015 ^(e)	Metered	# of accounts	137,520	10	8,262	509	19,752	9,472	130	2,410	3,503	181,568	181,568	179,400	199,300	5%	170,400	189,300	
		Deliveries, af/yr	96,032	2,868	23,987	1,613	13,300	29,400	5,100	7,100	-	179,400							
	Unmetered	# of accounts										-							
		Deliveries, af/yr										-							
2020	Metered	# of accounts	154,223	11	8,862	546	29,628	10,858	164	2,507	4,047	210,844	210,844	206,400	229,300	10%	185,800	206,400	
		Deliveries, af/yr	106,130	3,170	26,517	1,783	20,000	34,900	6,400	7,500	-	206,400							
	Unmetered	# of accounts										-							
		Deliveries, af/yr										-							
2025	Metered	# of accounts	170,925	12	9,462	583	39,504	12,244	197	2,604	4,590	240,121	240,121	233,400	259,300	10%	210,100	233,400	
		Deliveries, af/yr	116,229	3,471	28,953	1,947	26,800	40,400	7,800	7,800	-	233,400							
	Unmetered	# of accounts										-							
		Deliveries, af/yr										-							
2030	Metered	# of accounts	187,627	13	10,061	619	49,379	13,631	231	2,701	5,133	269,397	269,397	249,000	276,700	10%	224,100	249,000	
		Deliveries, af/yr	120,695	3,605	30,078	2,022	32,100	43,900	8,800	7,800	-	249,000							
	Unmetered	# of accounts										-							
		Deliveries, af/yr										-							

^(a) Based on estimated percentage of lower income single family dwelling units = 0.007 percent.
^(b) Based on estimated percentage of lower income multi family dwelling units = 5.8 percent.
^(c) Does not include unaccounted for water.
^(d) Assumes 40 percent of the single-family residential connections are metered by 2010.
^(e) Assumes 100 percent of the single-family residential connections are metered by 2015.

SALES TO OTHER AGENCIES

As described in Chapter 8, the City serves a small portion of the Pinedale County Water District (about 28 service connections in the portion east of Highway 41) and a small County area known as the Berans Tract (via two service connections). As shown in Table 6-7, the quantities of potable water sold to these agencies are quite small, constituting less than 0.1 percent of the City’s total water production. These quantities are anticipated to remain essentially the same into the future, therefore, the future projected water sales are based on the average water sales to each agency over the last 10 years.

Table 6-7. Water Sales to Other Agencies (DWR Table 13)

Agencies	Water Sales to Other Agencies, af/yr						
	2000 (Actual)	2005 (Actual)	2010	2015	2020	2025	2030
Pinedale County Water District (portion east of Highway 41) ^(a)	27	27	27	27	27	27	27
Berans Tract	102 ^(b)	87 ^(c)	98 ^(d)	98	98	98	98
Total	129	114	125	125	125	125	125

Only two of the 28 connections served are metered. The other 26 connections are billed on a monthly flat rate.

Estimated water use is 27 af/yr (300 gpcd for 2.9 people per connection for 28 connections).

- (d) Based on HTE Revenue Report. Data shown for FY00 ending 06/30/00.
- (e) Based on HTE Revenue Report. Data shown for FY05 ending 06/30/05.
- (f) Based on HTE Revenue Report average for FY98 to FY07.

The City tracks these water sales to other agencies as part of its overall water consumption. Therefore, the consumption numbers shown in Table 6-7 are included in the past, current, and projected water deliveries shown previously in Table 6-6.

ADDITIONAL WATER USES AND LOSSES

Groundwater Recharge

The City has an extensive groundwater recharge program to replenish the groundwater basin. In addition to sending treated wastewater effluent to percolation ponds (discussed further in Chapter 10 Recycled Water), the City is currently intentionally recharging the groundwater basin with surface water using numerous recharge facilities within its service area (including Leaky Acres, Woodward Park, Chestnut Basin¹, FMFCD basins, and several local creeks and rivers). This intentional groundwater recharge totaled about 38,100 af in 2007, and has averaged about 44,200 af/yr over the last 23 years. The maximum intentional recharge occurred in 2003, when approximately 62,000 af of surface water was recharged to the groundwater basin. From 2000 to 2006, intentional recharge averaged about 51,200 af/yr. The ability to operate these recharge

¹ The Chestnut Basin is a joint venture basin between the City and FID.

operations depends on a number of factors, including pond availability, limited water delivery season, pond maintenance, or long wet seasons. Also, many of the FMFCD basins are dual-use basins, serving both flood control and recreational purposes. For the purposes of this UWMP, it has been assumed that intentional groundwater recharge will increase in the future to help balance future groundwater operations, wherein groundwater recharge equals groundwater pumpage, by 2025.

Other Water Uses

As discussed above, the City’s current and future expanded intentional groundwater recharge program will allow the City to balance future groundwater operations. This balanced groundwater operation will, in turn, allow the City to conjunctively use available surface water supplies together with its groundwater supplies.

If surplus surface water supplies are available, they will be used for additional intentional recharge and/or groundwater banking.

The City has not and currently does not plan to utilize water for other uses such as saline water intrusion barriers or agricultural uses.

Unaccounted-For System Losses

Estimates of the City’s unaccounted-for water (UAFW) are discussed above. Unaccounted-for water is currently estimated to be 10 percent of the City’s total water production.

Table 6-8 provides a summary of the City’s additional water uses and losses.

Table 6-8. Additional Water Uses and Losses (DWR Table 14)

Water Use	Additional Water Uses and Losses, af/yr						
	2000 (Actual)	2005 (Actual)	2010	2015	2020	2025	2030 ^(a)
Saline Water Intrusion Barriers	0	0	0	0	0	0	0
Groundwater Recharge ^(a)	Included as part of Urban Water Consumption (see Table 6-5)						
Conjunctive Use ^(b)	Included as part of Groundwater Recharge Program (see discussion above)						
Agricultural	0	0	0	0	0	0	0
Unaccounted For System Losses ^(c)	15,700	15,800	16,300	18,900	20,600	23,300	24,900
Total	15,700	15,800	16,300	18,900	20,600	23,300	24,900

(a) Equals amount of total groundwater recharge which exceeds groundwater pumpage. Based on normal year supply conditions. Groundwater operations assumed to be balanced by 2025.

(b) As discussed above, the City’s intentional groundwater recharge program will allow the City to balance its groundwater operations and conjunctively use its available surface water supplies along with its groundwater supplies.

(c) Assumed to be 10 percent of total production.

TOTAL WATER USE

Table 6-9 summarizes the City’s total water use, based on the information presented above in Tables 6-5, 6-6, 6-7, and 6-8.

Table 6-9. Total Water Use (DWR Table 15)

Water Use	Total Water Use, af/yr						
	2000 (Actual)	2005 (Actual)	2010	2015	2020	2025	2030 ^(a)
Urban Water Consumption ^(a) (from Tables 6-5 and 6-6)	140,900	141,800	147,000	170,400	185,800	210,100	224,100
Sales to Other Agencies (from Table 6-7)	Included as part of Urban Water Consumption						
Saline Water Intrusion Barriers (from Table 6-8)	0	0	0	0	0	0	0
Groundwater Recharge (from Table 6-8)	Included as part of Urban Water Consumption						
Conjunctive Use ^(b) (from Table 6-8)	Included as part of Groundwater Recharge Program						
Agricultural (from Table 6-8)	0	0	0	0	0	0	0
Unaccounted For System Losses (from Table 6-8)	15,700	15,800	16,300	18,900	20,600	23,300	24,900
Total (Urban + UAFW)	156,600	157,600	163,300	189,300	206,400	233,400	249,000

^(a) Includes additional conservation.

^(b) As discussed above, the City’s intentional groundwater recharge program will allow the City to balance its groundwater operations by 2025 and conjunctively use its available surface water supplies along with its groundwater supplies.

Figure 6-1. City of Fresno Historical Per Capita Water Production and Consumption

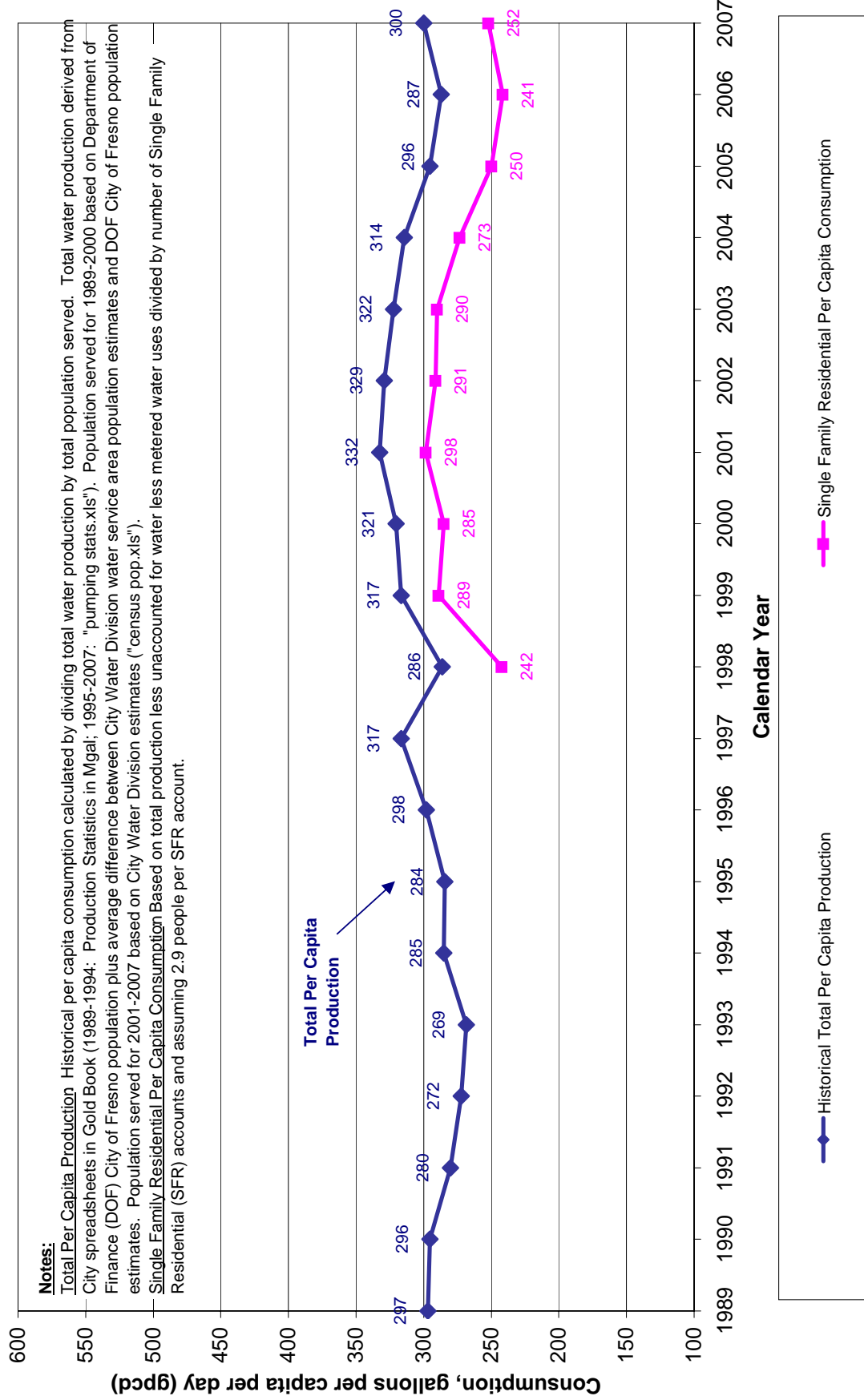


Figure 6-2. Projected Future Per Capita Water Use

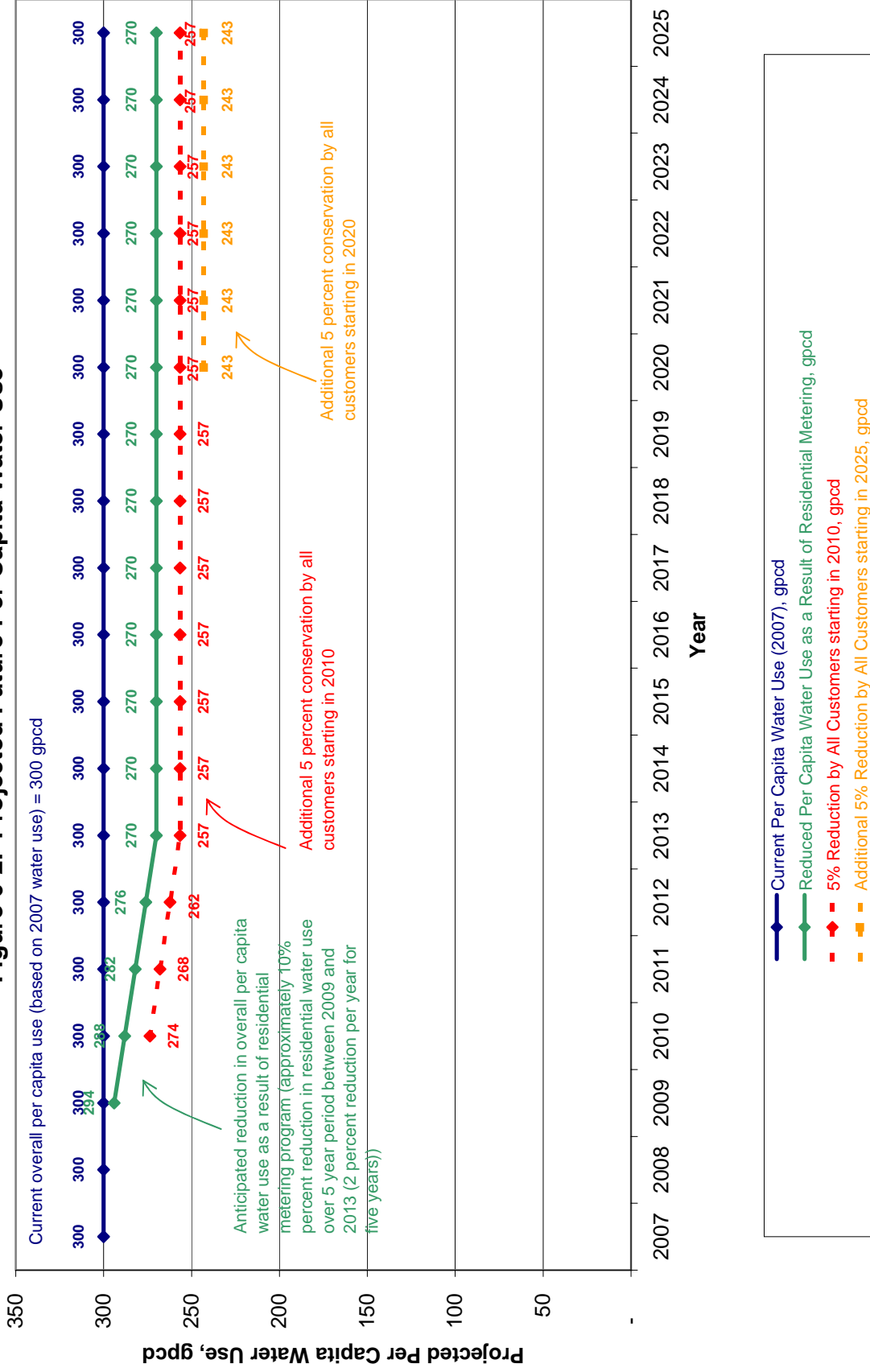


Figure 6-3. Per Capita Based Demand Projections

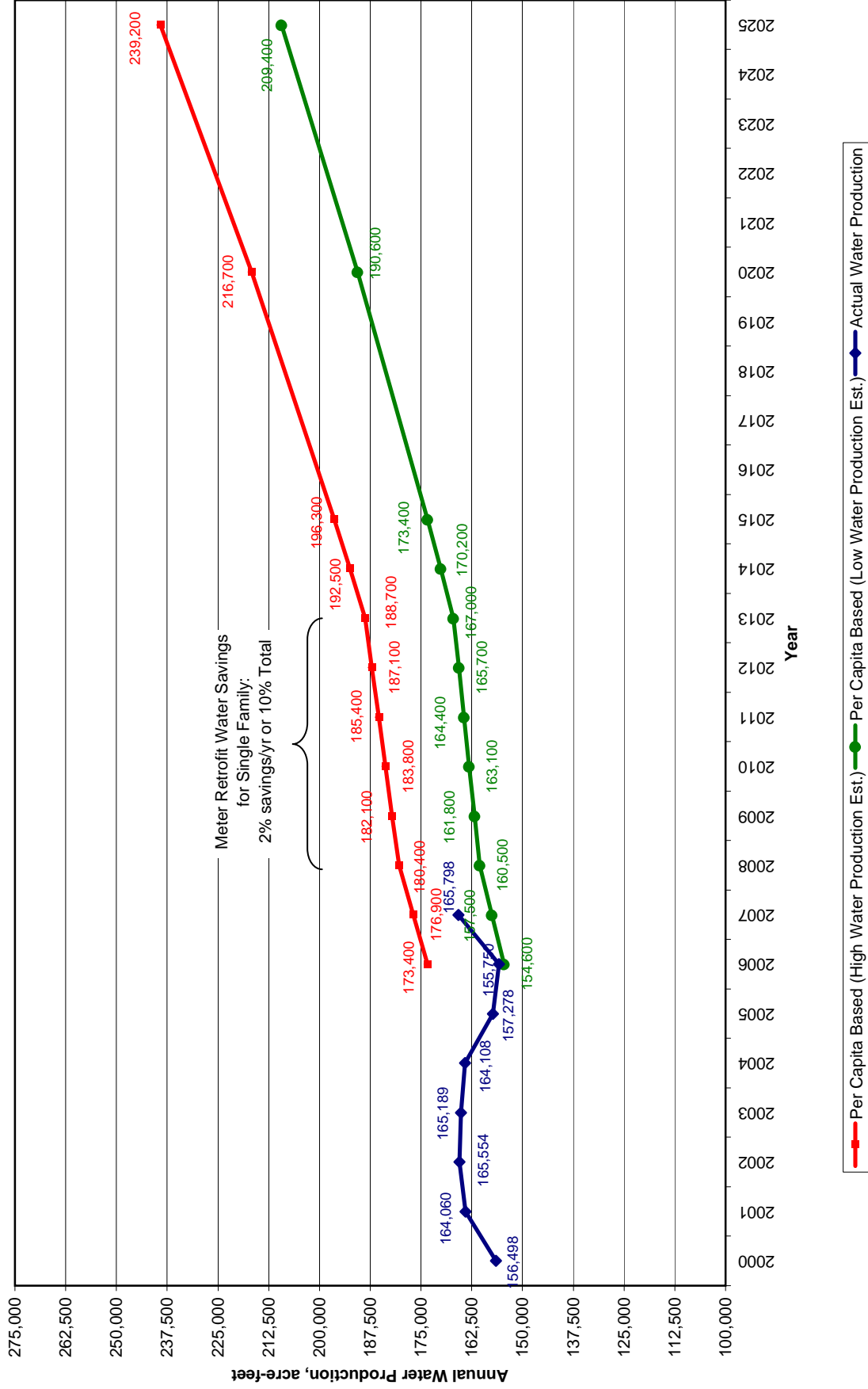


Figure 6-4. Land Use Based Demand Projections

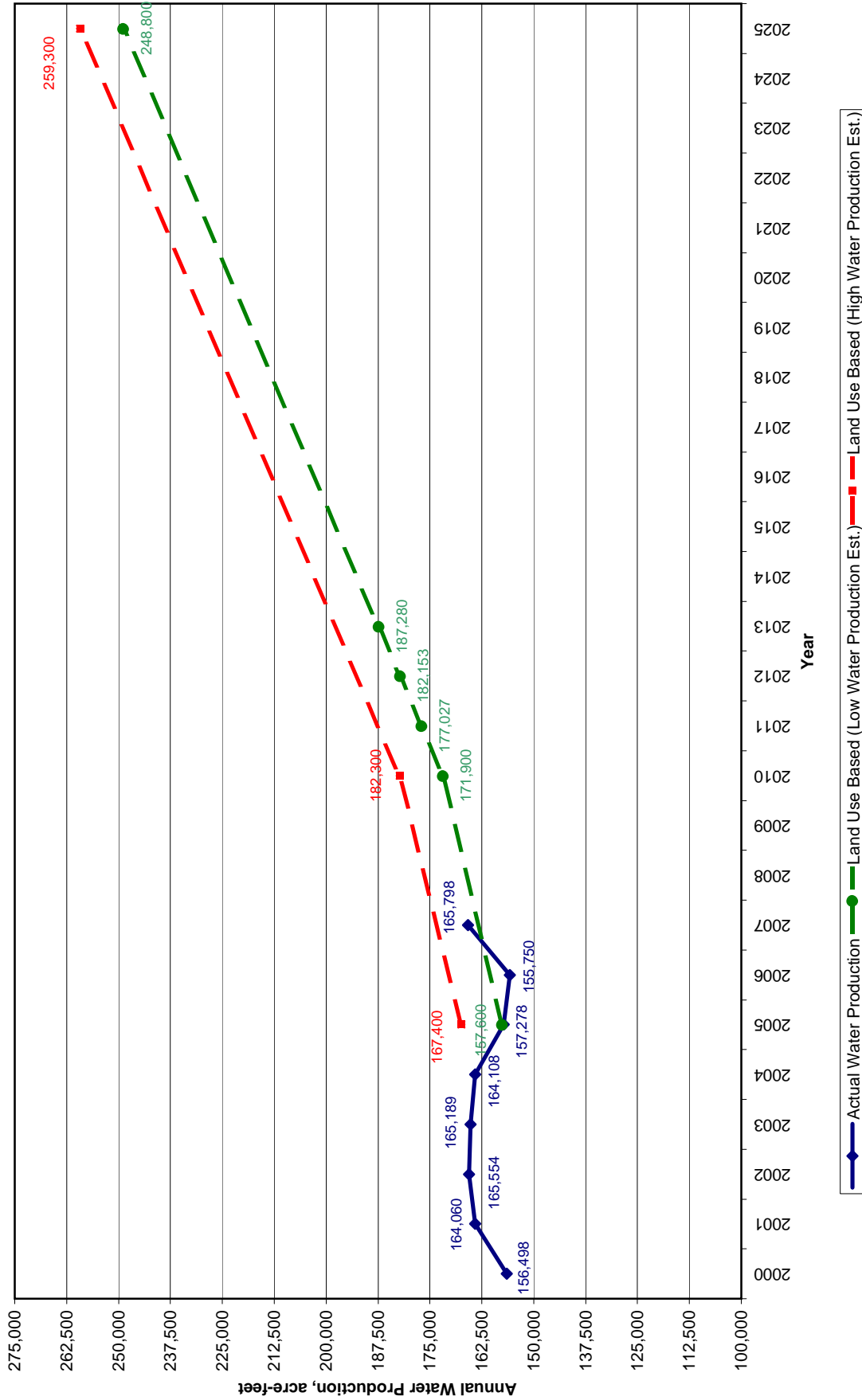


Figure 6-5. Comparison of Per Capita and Land Use Based Demand Projections

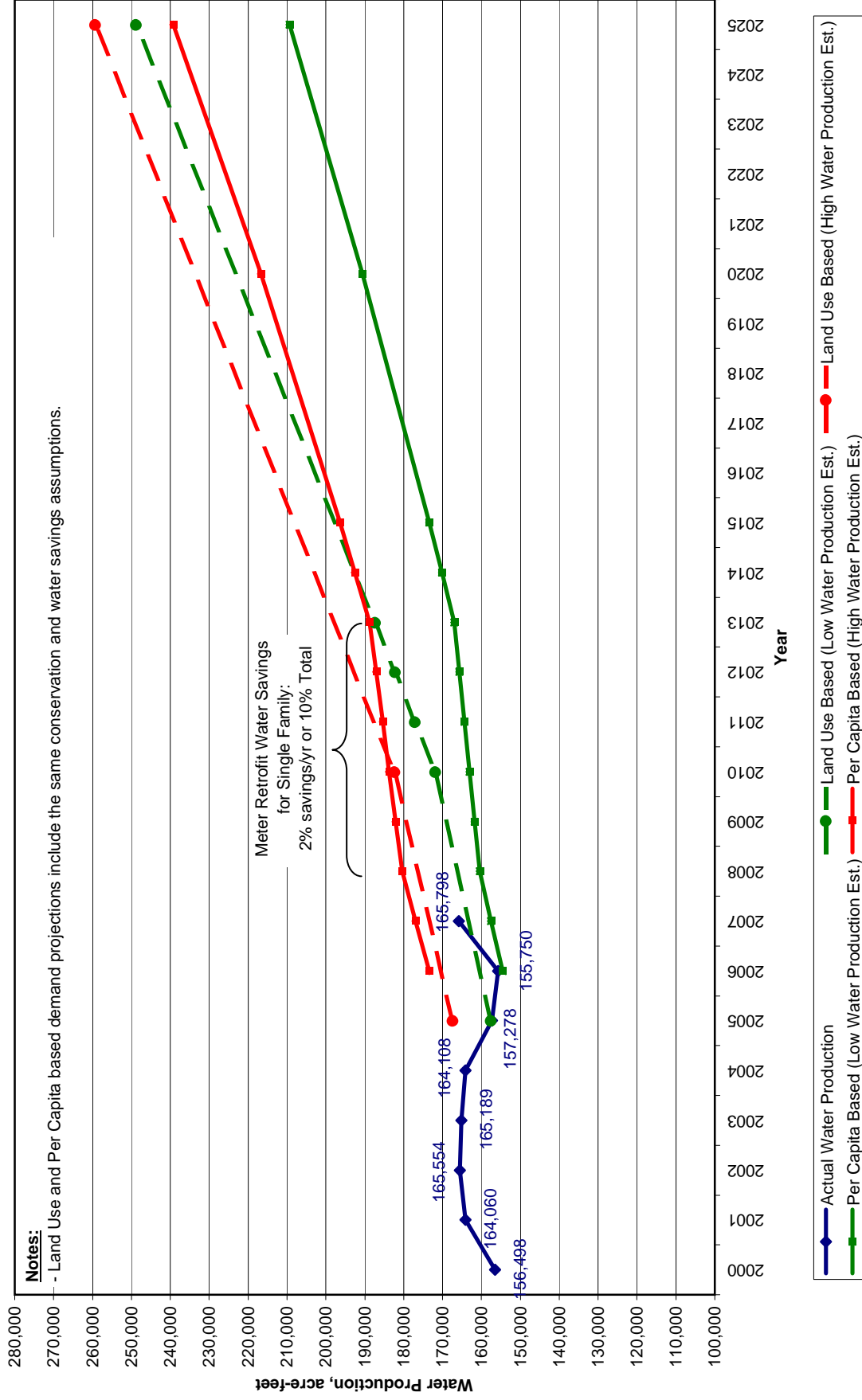


Figure 6-6. Projected Water Demand to 2030

