Section 2: Land Use & Water Demand

Land use information is used to characterize existing water use patterns for different types of land use (single-family residential, multi-family residential, commercial, industrial, etc.). The Vallecitos Water District (VWD) keeps track of the water use patterns for each type of land use. These patterns can be expressed in terms of unit water demands, also known as water duty factors, which represent the average daily water demands for each type of land use. These are usually expressed in units of gallons per day per acre (gpd/ac).

Water duty factors are combined with land use data to generate future (typically ultimate build-out) water demand estimates. With this ultimate build-out demand information VWD can project the potable water supply quantities that it will need to plan for. VWD can also model its water distribution system to determine where deficiencies are likely to occur in the future as demands increase. This eventually leads to the composition of the comprehensive Capital Improvement Program (CIP).

This section will describe the land use coverage of VWD's service area, including a breakdown of the different land use categories and their respective areas. This section will then turn to water system planning criteria, including unit water demands and peaking factors, and how the criteria are used to project future water demands.

VWD's service area

2.1 Land Use Database

VWD's service area encompasses approximately 45 square miles and serves the City of San Marcos, and parts of the cities of Carlsbad, Escondido, Vista and the County of San Diego. Land uses within this service area are primarily residential with a mix of agricultural/rural, light industrial and commercial. Land use data is obtained through the San Diego Association of Governments (SANDAG), which serves as a regional clearinghouse for land use information in San Diego.

Every two to five years, SANDAG produces a new forecast to incorporate updated data, changing trends, and new policies. VWD will use two separate SANDAG forecasts in this Urban Water Management Plan (UWMP). SANDAG's 2008 forecast is known as the 2030 Regional Growth Forecast Update, which is based on the current, adopted general and community plans of the 18 cities within the region, and the most recent (June 2006) version of the County's General Plan. Related to this growth forecast is SANDAG's Series 11 land use data. The Series 11 data was utilized by VWD to establish agency-approved land use, except for the areas within the County of San Diego where SANDAG Series 11 utilized land uses that have not been formally adopted by the County. In this case, the older 1979 County General Plan is used instead of the 2006 Draft General Plan Amendment data that was used for SANDAG Series 11.

SANDAG's 2010 forecast is known as the 2050 Regional Growth Forecast. Related to this growth forecast is SANDAG's Series 12 residential population forecast, which was utilized by VWD to establish population estimates for this 2010 UWMP. Two key refinements of the 2050 Regional Growth Forecast include an economic outlook that factors in the current recession and local jurisdictions' general/specific plan updates not completed at the time of SANDAG's last forecast. Based on these updates, SANDAG population projections are on average about one percent higher than the 2005 UWMP estimates. Housing unit projections have also increased, with the additional housing more heavily weighted toward multi-family units in the 2050 Regional Growth Forecast.

The San Diego County Water Authority's (SDCWA's) 2010 UWMP includes water use associated with accelerated forecasted residential development in municipal and industrial demand projections. These housing units were identified by SANDAG in the course of its regional housing needs assessment, but are not yet included in existing general land use plans. Because these units are not yet included in local jurisdictions' general plans, their projected demands are incorporated at a regional level and not associated with specific member agencies, including VWD. The demands associated with accelerated forecasted growth are intended to account for SANDAG's land-use development currently projected to occur between 2035 and 2050, but has the potential to occur on an accelerated schedule. SANDAG estimates that general plan

amendments, allowing this accelerated residential development, could occur within the planning horizon of the SDCWA's 2010 UWMP.

2.1.1 Existing and Planned Land Uses

The existing and planned land use coverage for the study area, as presented in the SANDAG 2030 Regional Growth Forecast Update and the most recent (June 2006) version of the County's General Plan, are shown in Figures 2-1 and 2-2, respectively. The land use data for VWD was summarized and categorized to match VWD's standard land use categories. Table 2-1 presents a breakdown of the land uses categories by acreage for both existing and planned land uses.

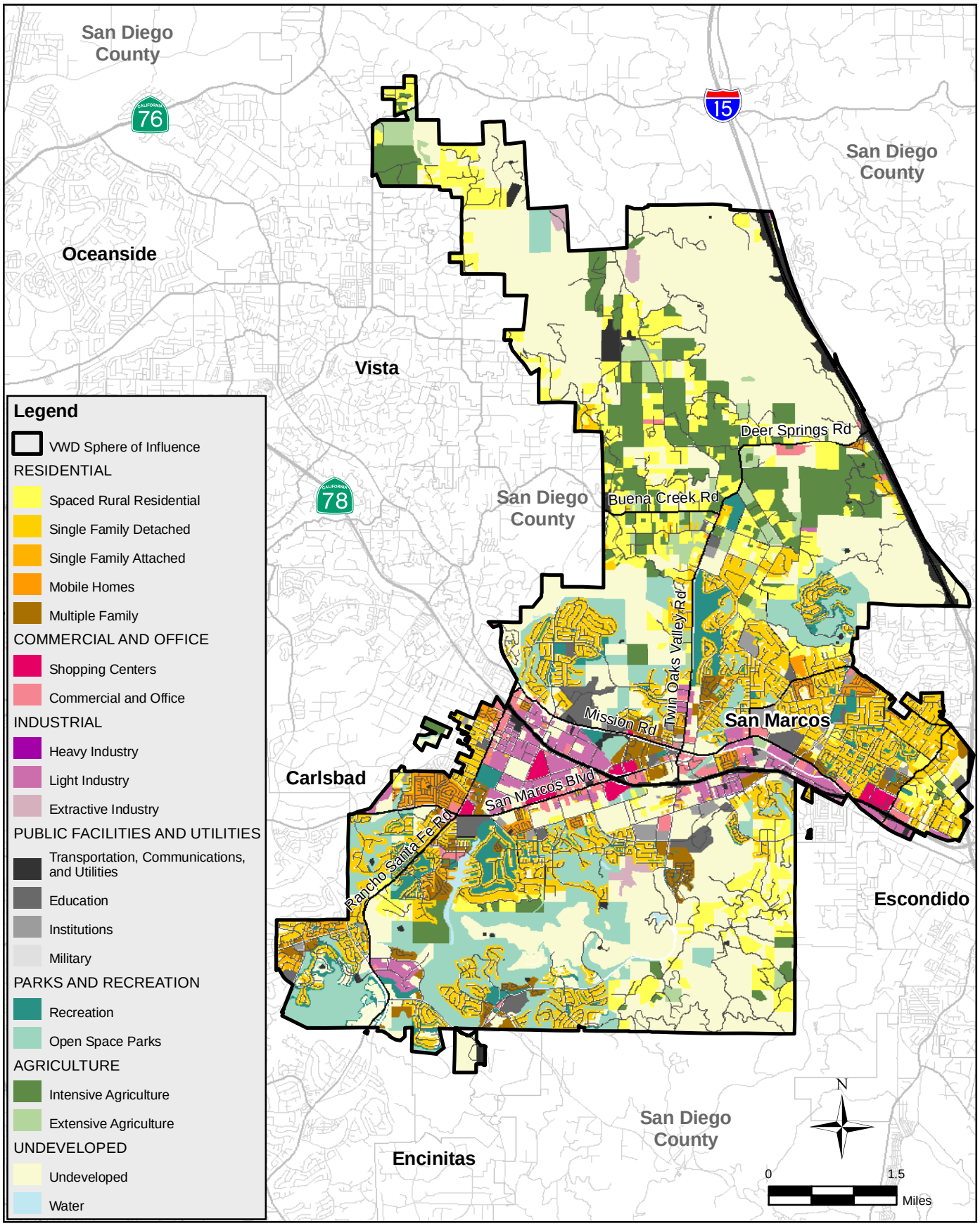
Table 2-1: Vallecitos Water District Land Use Acreages

Land Use	Type	Acres	
		Existing	Planned 2030[1]
Hillside Res. (0.05-0.25 du/ac)[2]	Single Family Residential	1,123	6,202
Rural Res. (0.125-1.0 du/ac)	Single Family Residential	2,495	4,835
Residential (1-2 du/ac)	Single Family Residential	531	1,096
Residential (2-4 du/ac)	Single Family Residential	856	1,471
Residential (4-8 du/ac)	Single Family Residential	1,879	2,131
Residential (8-12 du/ac)	Single Family Residential	512	637
Subtotal		**7,397**	**16,371**
Residential (12-15 du/ac)	Multi-Family Residential	114	130
Residential (15-20 du/ac)	Multi-Family Residential	176	152
Residential (20-30 du/ac)	Multi-Family Residential	145	147
Subtotal		**434**	**429**
Commercial	Commercial / Other	456	486
Office Professional	Commercial / Other	66	115
Light Industrial	Commercial / Other	338	367
Industrial	Commercial / Other	389	465
Schools & Public Facilities	Commercial / Other	321	468
Palomar College	Commercial / Other	103	103
San Marcos State University	Commercial / Other	66	113
Other	Commercial / Other	524	407
Subtotal		**2,262**	**2,525**
Agriculture (0.125-0.5 du/ac)	Outdoor Uses	2,732	775
Parks / Golf Courses	Outdoor Uses	3,605	3,041
Subtotal		**6,337**	**3,816**
Open Space / Vacant	Open Space / Vacant	9,962	3,488
Right-of-Way	Right-of-Way	2,647	2,410
Water	Water	76	76
Subtotal		**12,685**	**5,974**
Total		**29,115**	**29,115**

[1] Based on land use data within VWD's sphere of influence study area boundary

[2] du/ac = Dwelling units per acre

Source: VWD 2008 Water, Wastewater, and Recycled Water Master Plan



EXISTING LAND USE

FIGURE 2-1

5/05/2011 KC SD Z:\Projects\IS\VallecitosWaterDistrict\2010 UWMP\mxd\20411_Existing Land Use_F2-1.mxd

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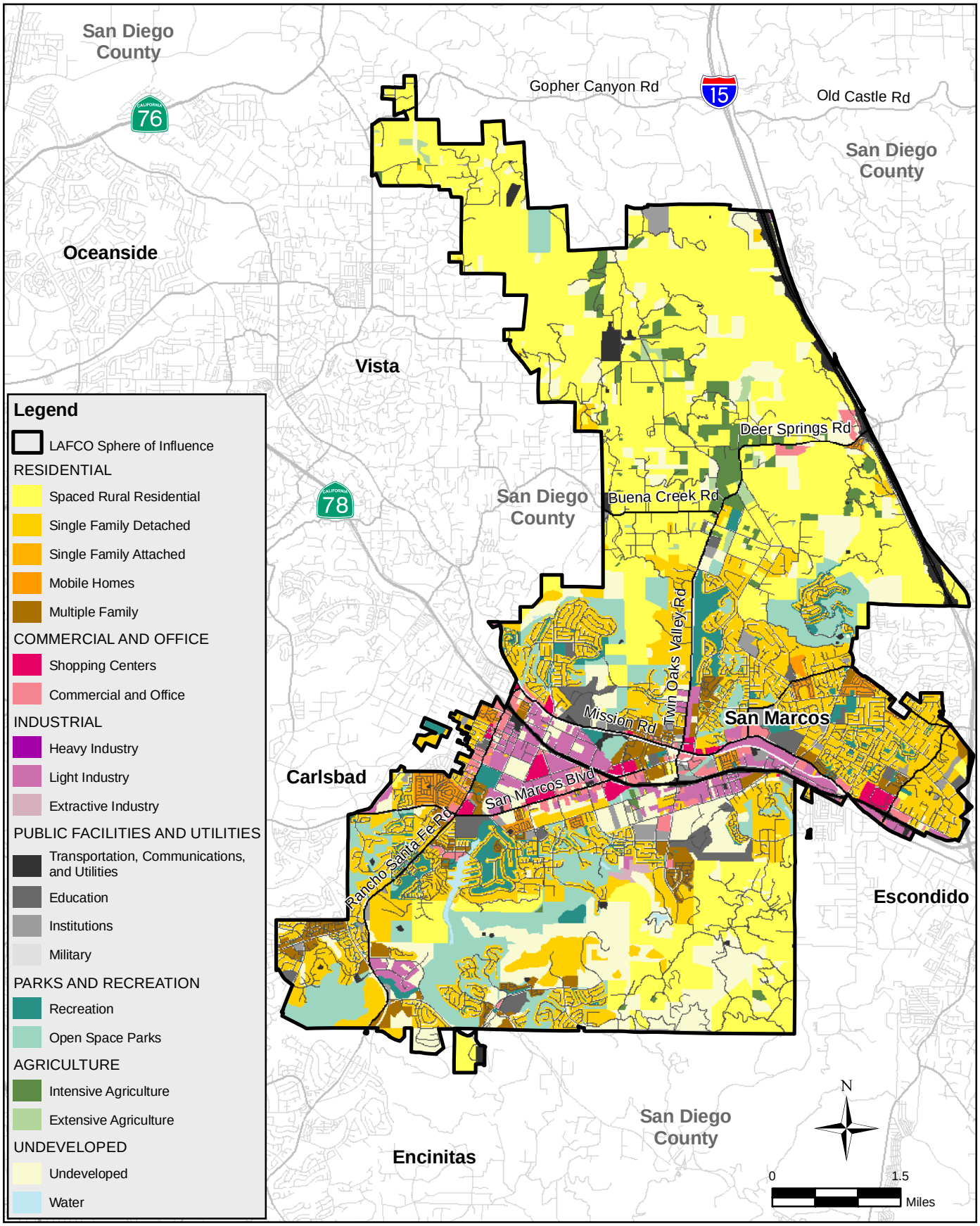

FUTURE LAND USE

FIGURE 2-2

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2.1.2 Population Forecast

The SANDAG Series 12 forecasted residential population growth for VWD's sphere of influence, as defined by the Local Agency Formation Commission (LAFCO). These figures were adjusted according to the results of the 2010 Census for the VWD water service area. The resulting population forecast is shown in Table 2-2. The data indicates that the population within the study area will increase by 27.7 percent from 2010 to 2035, at an average rate of 1.1 percent per year.

Table 2-2: SANDAG Series 12 Growth Forecast for VWD Study Area

	2010	2015	2020	2025	2030	2035
VWD Water Service Area Population	87,728	96,123	98,001	105,428	109,751	112,007

2.2 Water Duty Factors

2.2.1 Unit Water System Demands

The unit water demands represent the average daily water demands on a per acre basis for various approved land use categories within VWD. These unit water demands were created using several sources:

- VWD water meter records
- Comparisons between VWD water meter records and wastewater flow records
- Comparisons to unit water demands utilized in previous VWD master plans
- Comparisons to other water service agencies' duty factors

Calculating Water Demands for Standard Land Uses

Water unit demands were developed on a per acreage basis based on a detailed evaluation of actual water use for VWD's different land uses. Current demand data was also compared to previous planning study data, and local agency standards. Table 2-3 presents the VWD 2008 Water, Wastewater and Recycled Water (2008 Master Plan) unit demand factors and the factors used in the previous planning studies. The calculation is expressed as:

(Acres of Base Land Use) x (2008 Unit Demand, Table 2-3) = Gallons per Day (gpd)

Calculating Generation Rates for Mixed Land Uses

Mixed use developments typically blend commercial or office land uses with stacked, high density residential units. For water use estimation, the uses are additive. Therefore the calculation adds the base land use totals to the residential totals. For the residential element, a unit demand rate of 200 gallons per day per unit shall be used. This demand rate is consistent with the high-density residential land use average duty factor, on a per unit basis, as measured from VWD's water demand data. VWD, at its discretion, may require higher residential unit rates if deemed appropriate. The calculation is expressed as:

(Acres of Base Land Use) x (2008 Unit Rate, Table 2-3) + (200 gpd/unit) X (# Units)] = gpd

Calculating Water Demands for Schools and Hotels

Water demands at schools, including Palomar College and California State University – San Marcos, shall initially be calculated based on the area-based duty factor given in Table 2-3. These demands shall be compared to water demands based on student capacity at a demand factor of 5 gpd/student. If the water demand based on student count is higher compared to the area-based demand, VWD may utilize the higher demand figure.

California State University – San Marcos

The water demand for hotels and motels with commercial space will be based on the commercial area-based demand factor for the hotel's/motel's parcel area, plus 125 gpd/room. This figure is consistent with the hotel/motel demand factor utilized by other local water purveyors within the County. Without commercial space, only the 125 gpd/room demand factor applies.

Table 2-3: Unit Water Demands

Land Use Category	1991 Master Plan (gpd/ac)	1997 Master Plan (gpd/ac)	2002 Master Plan (gpd/ac)	2008 Master Plan (gpd/ac)
Hillside Res. (0.05-0.25 du/ac)	1,000	1,000	1,000	1,000
Rural Res. (0.125-1.0 du/ac)	1,000	1,000	600	600
Residential (1-2 du/ac)	1,500	1,300	1,200	1,200
Residential (2-4 du/ac)	1,750	1,900	2,100	1,800
Residential (4-6 du/ac)	2,000	1,800	2,200	2,200
Residential (4-8 du/ac)	2,000	1,900	2,400	2,500
Residential (8-12 du/ac)	2,250	2,800	2,500	2,800
Residential (12-15 du/ac)	3,750	3,400	2,800	3,300
Residential (15-20 du/ac)	3,750	3,600	3,200	3,700
Residential (20-30 du/ac)	4,000	3,800	4,100	5,000
Residential (30-40 du/ac)	-	-	-	7,000
Residential (40-50 du/ac)	-	-	-	9,000
Intensive Ag./Res. (0.125-0.5 du/ac)	2,000	2,000	600	1,400
Agriculture/Res. (0.125-0.5 du/ac)	1,000	1,000	700	800
Commercial	1,250	1,200	1,700	1,500
Hotel / Motel	-	-	-	125 gpd/room
Office Professional	1,500	1,500	2,000	1,500
Light Industrial	1,500	1,500	1,800	1,800
Industrial	2,000	2,000	1,000	1,000
Schools & Public Facilities	1,250	1,300	1,400	1,400
Palomar College	2,250	2,300	2,300	1,200
San Marcos State University	-	2,300	2,300	1,200
Parks/Golf Courses	1,250	1,300	1,700	1,700
Solid Waste Management	0	0	0	-
Open Space	0	200	200	200
Right-of-Way	0	0	200	200

du/ac = dwelling units per acre
gpd/ac = gallons per day per acre
Source: VWD 2008 Water, Wastewater, and Recycled Water Master Plan

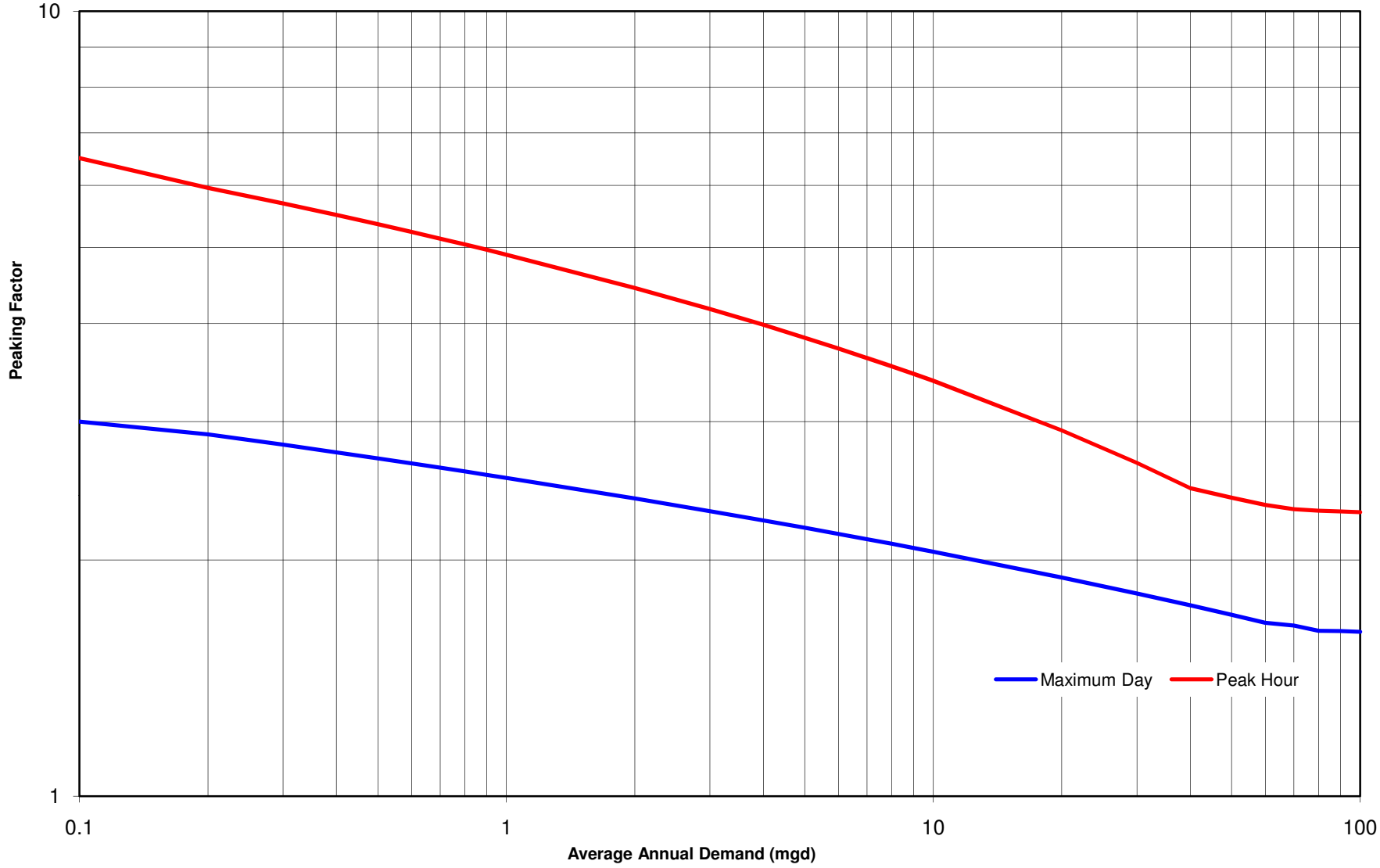
2.2.2 Water System Peaking Factors

Water demands vary throughout the day and throughout the year, being greatest during the warmer summer months and smallest during the cooler winter months. This phenomenon is known as "peaking". The amount of "peaking" is greatly dependent on the size of the study area ("peaking" amounts become smaller as study areas increase in size) and the local climate ("peaking" is usually greater inland where temperatures are higher in summer months). For a system having a size and local climate such as VWD's, the water demand during a hot summer day is approximately 1.9 times greater than an average day's demand. Therefore, VWD's district-wide "peaking factor" in this case is 1.9.

Figure 2-3 displays the peaking factor curves for both maximum day (i.e. the demand multiplier during a hot summer day vs. an average day) and peak hour (i.e. the demand multiplier for the highest water usage hour of the year vs. the average day demand) conditions. For a system of similar size as VWD's (a demand of 13.9 MGD), the maximum day peaking factor is 1.9 and the peak hour factor is 3.1. These corresponding peaking factors obtained from these curves are multiplied by the average water demands to determine the maximum day and peak hour demands, respectively.

To size improvements ranging in size from district-wide transmission infrastructure to individual development projects, VWD uses Figure 2-3 to determine the appropriate peaking factors. This figure gives the maximum day and peak hour demand curves utilized in the 2008 Master Plan. The peaking factors used for VWD's overall service area are lower than what would be appropriate for smaller study areas, such as specific development plans, or an individual pressure zone analysis.

Water System Peaking Curves
Figure 2-3



2.3 Water Demand

Past, current and projected water use in VWD is divided into seven categories: single-family residential, multi-family residential, commercial, industrial, institutional and governmental, landscape and agriculture.

2.3.1 Past Water Use

Past water use for VWD was evaluated by examining the monthly metered water deliveries during 2005. VWD experienced an average day demand of approximately 16.2 MGD during 2005. Table 2-4 summarizes the average demands by water meter type and by total volume.

Table 2-4: Water Demands – Actual, 2005

Water use sectors	# of accounts	Average Daily Demand[1]
Single-family	16,870	6,734,390
Multi-family	438	1,662,173
Commercial	725	1,455,071
Industrial	118	244,595
Institutional/Governmental	156	515,077
Landscape	687	2,743,318
Agriculture	213	1,988,895
Unaccounted/Unbilled Losses	-	859,653
Total	**19,207**	**16,202,172**

[1] *In units of gallons per day*

2.3.2 Current Water Use

Current water use for VWD was evaluated by examining the monthly metered water deliveries during the fiscal year ending in 2010. VWD experienced an average day demand of approximately 14.6 MGD during the fiscal year ending in 2010. It should be noted that this average day demand figure includes water consumption through temporary meters, as well as other end delivery facilities that are typically unbilled uses such as fire hydrant testing or system flushing. Such unbilled losses have been

between 4.5 percent and 6.5 percent of the annual volume of potable water delivered from the SDCWA since 2002.

VWD serves a predominantly residential community, where nearly 61 percent of the water use is single-family and multi-family residential. Table 2-5 summarizes the demands by water meter type and by average daily demand.

Table 2-5: Water Demands – Actual, 2010

Water use sectors	# of accounts	Average Daily Demand[1]
Single-family	18,226	7,754,267
Multi-family	429	953,140
Commercial	749	845,920
Industrial	116	175,080
Institutional/Governmental	109	403,464
Landscape	774	2,644,897
Agriculture	81	1,137,544
Unaccounted/Unbilled Losses	-	643,630
Total	**20,484**	**14,557,942**

[1] *In units of gallons per day*

VWD's 2010 average water demand, 14.6 MGD, is substantially less than its 2005 average water demand of 16.2 MGD. In the fiscal year ending in 2007, VWD's service area received an average of 19.5 MGD. However, conservation efforts due to the drought combined with the recent economic recession have reduced water use by over 25 percent. This includes a 48 percent reduction in agricultural water usage from fiscal year ending in 2007 to fiscal year ending in 2010.

2.3.3 Projected Water Use

Future water use projections were generated in the 2008 Master Plan through the planning horizon year 2030. The following steps were utilized in developing the future water demand projections:

- The approved land use coverage and zoning maps were provided by the land use agencies.

- In VWD's Geographic Information System (GIS) database, all parcels in VWD's service area were attributed with their approved land use condition and unit water demands.
- Vacant and un-served parcels were assigned likely connection points to the existing distribution system or were determined to be best served by another water agency through an exchange agreement.
- Ultimate demand projections were then estimated by applying the appropriate unit water demands to all parcels identified as being served by VWD, or another agency through an exchange agreement.
- 2030 Demand Projections were developed by applying the SANDAG '2030 Regional Growth Forecast Update' coverage to these ultimate demand projections.

Tables 2-6 and 2-7 present the projected future average water demands for VWD in 5-year increments up to the year 2030. Projected water demands for interim years 2015, 2020, and 2025 were estimated based upon SANDAG's growth forecasts for VWD. The ultimate future build-out average water demand projection for VWD is approximately 34.1 MGD.

Table 2-6: Water Deliveries – Projected, 2015 and 2020

Water use sectors	2015		2020	
	# of accounts	Average Daily Demand[1]	# of accounts	Average Daily Demand[1]
Single-family	18,741	16,394,371	20,039	18,523,787
Multi-family	429	1,073,070	479	1,193,000
Commercial	742	1,021,065	790	1,196,210
Industrial	120	312,960	124	450,840
Institutional/Governmental	120	447,623	130	491,782
Landscape	744	2,614,513	714	2,584,129
Agriculture	67	1,126,398	62	1,115,252
Unaccounted/Unbilled Losses		1,210,000		1,345,000
Total	**20,963**	**24,200,000**	**22,338**	**26,900,000**
[1]*In units of gallons per day*				

Table 2-7: Water Deliveries – Projected, 2025 and 2030

Water use sectors	2025		2030	
	# of accounts	Average Daily Demand[1]	# of accounts	Average Daily Demand[1]
Single-family	21,395	20,178,204	22,750	21,737,620
Multi-family	504	1,312,930	529	1,432,860
Commercial	810	1,371,355	830	1,546,500
Industrial	129	588,720	133	726,600
Institutional/Governmental	141	535,941	151	580,100
Landscape	683	2,553,744	653	2,523,360
Agriculture	52	1,104,106	42	1,092,960
Unaccounted/Unbilled Losses		1,455,000		1,560,000
Total	**23,714**	**29,100,000**	**25,088**	**31,200,000**
[1]*In units of gallons per day*				

Low-Income Projected Demands

Table 2-8 identifies the projected water use for affordable and lower income residential housing as identified in the housing elements of the land use agencies that have jurisdiction within VWD's service area.

Table 2-8: Low-Income Projected Water Demands

Low Income Water Demands[1]	2015	2020	2025	2030
Total Low Income Residential	160,960	178,950	196,940	214,930
Total	**160,960**	**178,950**	**196,940**	**214,930**
[1]*In units of gallons per day*				