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City of Oxnard

Public Works Integrated Master Plan

WATER

PROJECT MEMORANDUM 2.2
WATER DEMAND PROJECTIONS

FINAL DRAFT
December 2015

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City of Oxnard

Public Works Integrated Master Plan

WATER

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WATER DEMAND PROJECTIONS

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WATER DEMAND PROJECTIONS

1.0 INTRODUCTION

This chapter describes the City's existing and projected future water demands. The existing water demand section consists of a discussion of the historical water consumption, historical water production, and the identification of water loss and peaking factors. The future water demand section consists of a description of water demand factors (WDF), the water demand projection through year 2040, and the anticipated phasing of demands.

1.1 Project Memoranda (PMs) Used for Reference

The estimates outlined in this PM are made in concert with recommendations and analyses from other related PMs:

- PM 1.1 - Overall - Master Planning Process Overview.
- PM 1.3 - Overall - Population and Land Use Estimates.
- PM 2.1 - Water System – Background Summary.

2.0 HISTORICAL DEMANDS

Water demands represent water that leaves the distribution system through metered or unmetered connections, or at pipe joints (leaks) or breaks. Water demands occur throughout the distribution system based on the number and type of consumers in each location.

This section includes a description of the historical water consumption, historical water production, and the estimated amount of water loss or unaccounted for water, which is defined as the difference between production and consumption. Peaking factors, which are indicators of the variation in demand on a seasonal and daily basis, are also discussed.

2.1 Historical Water Consumption

The City has provided historical customer billing records per account for the period 2002 through 2012.

The billing classifications include various land use types that can be summarized as follows:

Agriculture Accounts: This category includes Agriculture (A) meters.

Commercial Accounts: This category includes Commercial (C), Commercial Water High Use (C1), Commercial Restaurant (CC), and Commercial (CM) meters.

Government Accounts: This category includes Cesar Chavez School (CS), Government Buildings (GB),and School Commercial (SS) meters.

Industrial Accounts: This category includes Industrial (I), Industrial SCE (I2), and Industrial High Use (I3) meters.

Irrigation Accounts: This category includes Commercial Irrigation (CI), Government Irrigation (GI), and Industrial Irrigation (II) meters.

Multi-Family Residential (MFR) Accounts: This category includes Multiple Unit (M) and HSG Multiple Unit (MH) meters.

Proctor and Gamble: This category includes the Industrial Proctor and Gamble (I1) meter.

Single Family Residential (SFR) Accounts: This category includes Single-Family Larger Lot (LS), Single Family (S), and HSG Single Unit (SH) meters.

The historical metered water use for 2002 through 2012 are summarized by billing classification in Table 1 and presented on Figure 1.

The demand distribution by billing class for 2012 CY are illustrated on Figure 2.

As shown in Figure 2, residential demand including both SFR and MFR accounted for 53.2 percent of the City's demands in 2012. Commercial, Proctor and Gamble, and irrigation accounts were the three next largest consumers, representing roughly 14.8 percent, 8.5 percent, and 13.1 percent of the City's demand respectively. Agriculture, government, and industrial represented 4.2 percent, 0.4 percent, and 5.8 percent respectively.

As shown on Figure 1, the single largest category making up the City's demands are primarily residential. Commercial and multi-family residential (MFR) demands are fairly consistent throughout the year, as most commercial and MFR sites will also include a separate irrigation meter. Seasonal peaking is most pronounced in the single family residential (SFR), irrigation, and agricultural usage types. As the City's meters are read monthly, the seasonal variation observed on Figure 1 can only provide monthly peaking factors, including Maximum Month Demand (MMD) and Minimum Month Demand (MinMD). Daily peaking factors can only be derived from production and/or SCADA data. Single and multi-family water demand combined is 53 percent of total City demand. This percentage is relatively low due to substantial demand of industrial users with Proctor and Gamble alone generating 8.5 percent of demand and another 5.8 percent from other industrial users.

Table 1 **Historical Annual Consumption by Customer Class**
Public Works Integrated Master Plan
City of Oxnard

Calendar Year	Annual Demand by Customer Class (AFY)								Total Annual Demand (AFY)
	Single Family Residential	Multi Family Residential	Commercial	Industrial	Proctor & Gamble	Government	Irrigation	Agriculture	
2002	10,753	4,317	4,089	1,750	2,331	140	2,911	1	26,291
2003	10,694	4,274	3,904	1,791	2,370	152	2,712	1	25,898
2004	11,327	4,339	3,938	1,809	2,309	142	3,396	2	27,262
2005	10,886	4,212	4,040	1,704	2,386	141	3,003	2	26,373
2006	11,153	4,152	4,237	1,689	2,207	155	3,143	2	26,738
2007	11,478	4,114	4,216	1,708	1,618	146	3,529	2	26,811
2008	10,893	4,128	4,083	1,624	1,593	110	3,693	441	26,565
2009	10,608	4,097	3,654	1,225	1,481	88	3,458	1,155	25,766
2010	9,794	3,969	3,459	1,395	3,482	94	3,090	850	26,133
2011	9,679	3,918	3,582	1,319	2,142	95	3,037	1,069	24,842
2012	9,805	3,936	3,834	1,505	2,193	101	3,374	1,086	25,833

Note:
Source: Data for January 2002 through December 2012 provided by the City. Excludes recycled water demand. Meters are read on a monthly basis. Customer classification was consolidated from the 21 billing classifications the City uses for its billing system.

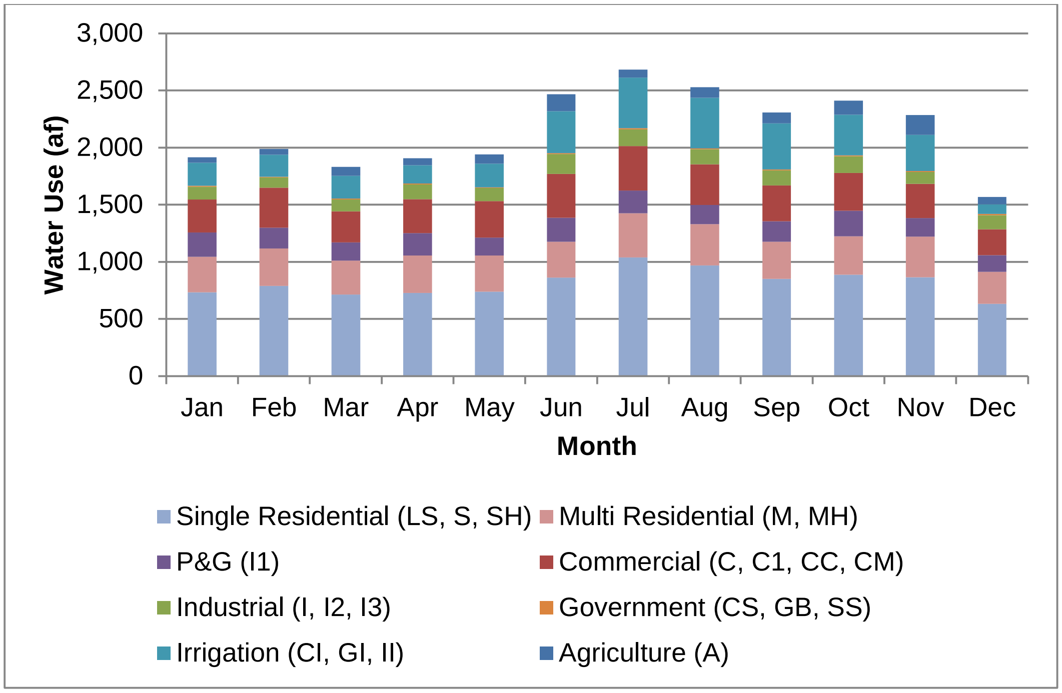

Figure 1 2012 Monthly Demand by Customer Class

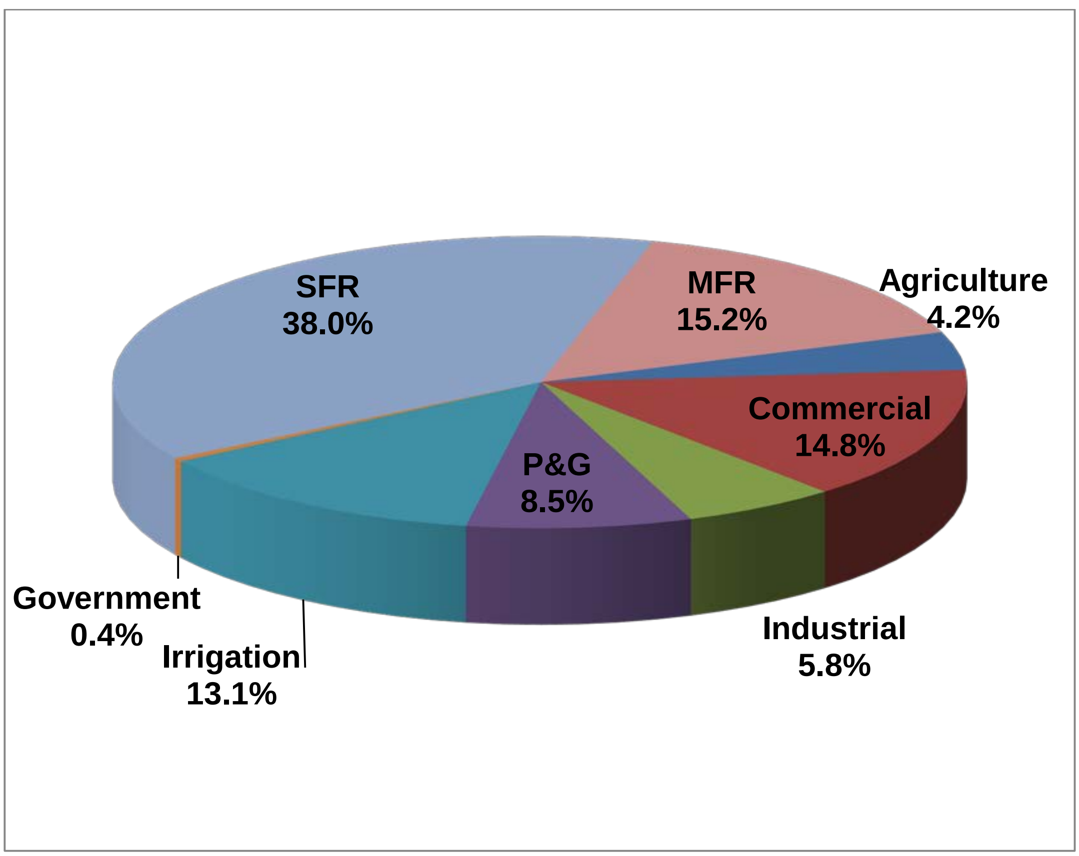

Figure 2 2012 Demand Breakdown by Customer Class

2.2 Number of Accounts

The City's historical customer billing records included a total of 40,011 meters. A breakdown of the number of customers by customer class from 2012 is included in Table 2.

Table 2 Number of Meters by Customer Class (2012)
Public Works Integrated Master Plan
City of Oxnard

Customer Class	Abbreviation	Class Grouping	Number of Meters	Demand (AF)
Single Family Residential	SFR	LS, S, SH	33,208	9,805
Multi-family Residential	MFR	M, MH	2,037	3,936
Commercial	Comm	C, C1, CC, CM	2,588	3,834
Industrial	Ind	I, I2, I3	149	1,505
Proctor and Gamble	P&G	I1	1	2,193
Irrigation	Irr	CI, GI, II	1,441	3,374
Government	Gov	CS, GB, SS	120	101
Agricultural	Agr	A	48	1,086
Total			**40,011**	**25,833**

Note:
Source: Data from 2012 billing data provided by the City.

2.3 Historical Water Supply

The City obtains water from three primary sources: local groundwater, groundwater from the United Water Conservation District (UWCD), and Imported water from the Calleguas Municipal Water District (CWMD). The historical water production from 2002 through 2013 is presented by water supply source in Table 3 and is illustrated on Figure 3.

Table 3 Historical Annual Water Supply by Source
Public Works Integrated Master Plan
City of Oxnard

Year(1)	Groundwater(1) (AFY)	UWCD Water (AFY)	CWMD Water (AFY)	System Total (AFY)
2002	6,971	7,067	13,170	**27,208**
2003	6,784	8,834	11,302	**26,919**
2004	12,743	3,820	11,717	**28,279**
2005	12,933	3,159	11,262	**27,354**
2006	14,056	4,001	9,964	**28,021**
2007	440	16,660	11,453	**28,552**
2008	4,245	9,863	13,573	**27,681**
2009	7,478	13,036	8,311	**28,826**
2010	7,172	10,852	9,769	**27,793**

Table 3	Historical Annual Water Supply by Source Public Works Integrated Master Plan City of Oxnard			
Year(1)	**Groundwater(1) (AFY)**	**UWCD Water (AFY)**	**CWMD Water (AFY)**	**System Total (AFY)**
2011	10,731	6,372	10,549	**27,652**
2012	5,174	9,828	12,538	**27,539**
2013	5,748	9,424	13,271	**28,443**

Note:
Source: Data from production data provided by the City.
(1) Includes water lost to brine from City desalter.

As shown on Figure 3, the City's total water supply has been relatively constant between 2002 and 2013, fluctuating between 26,919 and 28,826 AFY. The annual water supply in 2013 was 28,443 AFY or 25.4 million gallons per day (mgd).

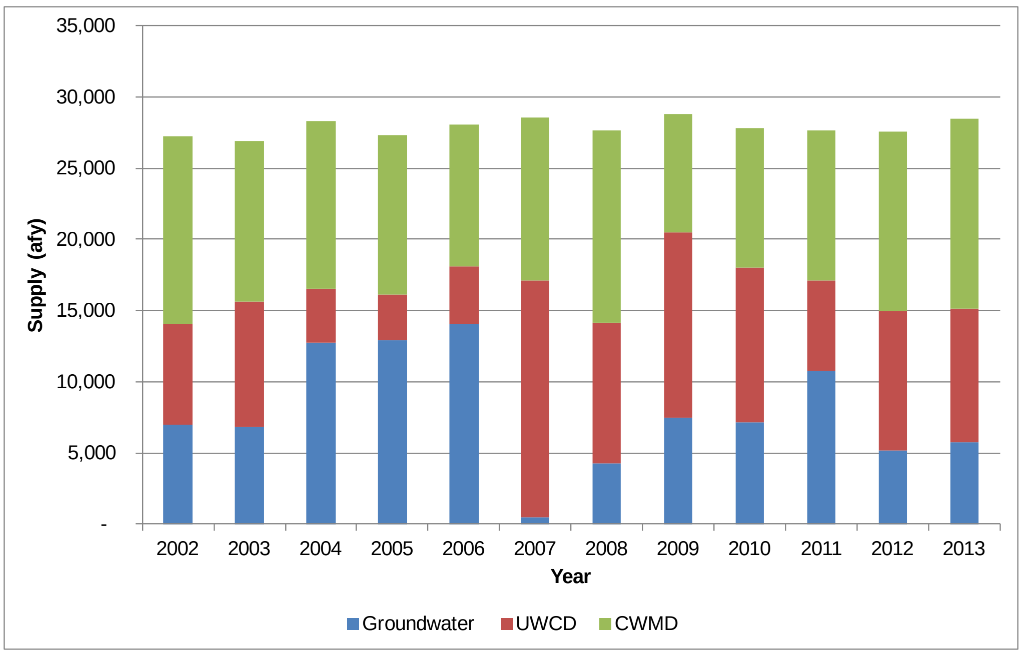

Figure 3 Annual Supply by Source

2.4 Unaccounted for Water

The difference between water production (or supply) and consumption (billed to customers) is defined as unaccounted-for-water, or water loss. Water loss may be attributed to leaking pipes, unmetered or unauthorized water use, inaccurate meters, treatment losses, or other events causing water to be withdrawn from the system and not measured. Specific events that cause water loss include tank overflows, hydrant flushing, street cleaning, system flushing, and fire-fighting. The City's estimated unaccounted for water is summarized in Table 4.

Table 4	Estimated Unaccounted for Water Public Works Integrated Master Plan City of Oxnard				
Year	Demand (AFY)	Brine Loss (AFY)	Supply (AFY)	Unaccounted for Water (AFY)	Unaccounted for Water (%)
2002	26,291	0	27,208	917	3.4%
2003	25,898	0	26,919	1,022	3.8%
2004	27,262	0	28,279	1,017	3.6%
2005	26,373	0	27,354	981	3.6%
2006	26,738	0	28,021	1,283	4.6%
2007	26,811	0	28,552	1,741	6.1%
2008	26,565	0	27,681	1,116	4.0%
2009	25,766	-1,398	28,826	1,661	6.1%
2010	26,133	-984	27,793	677	2.5%
2011	24,842	-977	27,652	1,832	6.9%
2012	25,833	-100	27,539	1,606	5.9%

Note:
Source: Billing data from Table 1 and supply data from Table 3.

The City blends treated CMWD water with local groundwater and UWCD water at City blending stations in order to meet water quality objectives. The groundwater desalter present at Blending Station No. 1 treats local groundwater and provides a second source of treated water for the system. As a result of the desalting process, a portion of the City well production is lost as brine discharge.

According to AWWA standards, the water loss for well-operated systems is typically less than 10 percent and many systems have water losses of less than 5 percent annually. As shown in Table 4, the City's unaccounted for water for years 2002 through 2013 is within the typical range of water losses of other water purveyors. Between 2002 and 2013, the average water loss was 5.6 percent.

3.0 WATER DEMAND FORECASTING METHODOLOGY

There are many different water demand forecasting methods that range in both detail and scope. Based on a review of the available data, it was determined that the most accurate demand forecasting method for this water master plan is a combination of a population and land use based demand forecasting method. To develop future residential demands, a per unit population based methodology was utilized, while a disaggregated land use based projection was used to project the City's increase in commercial and industrial water demand.

3.1 Residential Population-Based Forecast

Residential demand forecasting utilized population projections to project future water use. An average per capita water use expressed in gpcd was developed by examining historical demands and planning documents. The target gpcd of 132.4 from the 2010 Urban Water Management Plan (UWMP) was used to provide a consistent and conservative planning basis. The per capita water use was then combined with population projections from the population forecast to project the City's future water demand.

3.2 Commercial and Industrial Land-Use Based Forecast

The land use based method was utilized to estimate the commercial and industrial future demands of developments. This method requires the use of water demand factors (WDF) and land use plans, integrated into geographic information software (GIS).

A WDF is defined as the estimated amount of water usage per area for a certain land use type. WDFs are typically expressed in gallons per day per acre (gpd/ac). These factors are used to estimate the average day demand (ADD) for existing and potential development areas by multiplying the WDF with the total number of acres of each land use category. WDFs were developed as part of this Public Works Integrated Master Plan (PWIMP) to project demands for planned industrial and commercial development where land use details are known at this time (see Section 5.0).

WDFs are typically determined from a combination of geocoded billing records and land use information using spatial GIS routines. WDFs can also be verified against other agencies with similar land use and climate conditions.

Water demand factors for the existing system were derived from a total system average by using the geocoded billing records. The City's billing records from calendar year 2012 were geocoded to calculate WDFs by dividing the total system demand by land use category by the total area of each land use category. These WDFs for the existing system are presented in Table 5.

Table 5 Water Demand Factors
Public Works Integrated Master Plan
City of Oxnard

PWIMP Land Use	2030 General Plan Land Use Designation(1)	Calculated WDF (gpd/ac)	Recommended Demand Forecast WDF (gpd/ac)
Agriculture	AG	444	500
Open Space	OS, PRK, PR, REC, RP	503	750(2)
Industrial	CIA, IH, ILT, ILM, ICD, PUE	3,026	3,500
Commercial	AC, BRP, CBD, SG, SN, COF, CCM, CCV, CR, PSP, VSC	1,910	2,000
School	SCH	1,271	1,500

Table 5	Water Demand Factors Public Works Integrated Master Plan City of Oxnard		
PWIMP Land Use	**2030 General Plan Land Use Designation[(1)]**	**Calculated WDF (gpd/ac)**	**Recommended Demand Forecast WDF (gpd/ac)**
Residential-High	RHD, RH, RMH	5,855	6,000
Residential-Med	RLM, RM	4,028	4,250
Residential-Low	PUD, REX, RL	2,143	2,250
Mobile Home Park	MHP	2,047	2,250
Other	ESM, HCI, HUE	477	500

Notes:
(1) Land Use Categories are described in PM 1.3, Table 1.
(2) Due to the wide range of water demand in this category that depends on the presence of bathroom or recreational buildings, the calculated WDF of 500 gpd/ac was increased to 750 gpd/ac for conservative planning purposes.

As shown in Table 5, the calculated WDFs are highly dependent on land use type and ranged from 444 to 5,855 gpd/ac. For conservative planning purposes, the recommended WDFs used in the demand forecast are rounded up based on best professional judgment. Furthermore, while WDFs were computed for each land use type, only industrial and commercial WDFs were used in the demand forecast. Demand projections for residential developments were population based and did not rely on WDFs. However, the WDR's shown in Table 5 are reflective of the typical industry standards and provide confidence in the commercial and industrial WDRs. Furthermore, these factors may be utilized for other future planning studies.

4.0 PEAKING FACTORS

Peaking factors are typically used to determine the water demands for conditions other than ADD conditions. Peaking factors account for fluctuations in demands on a seasonal or hourly basis. For example, during hot summer days, water use is typically higher than on a cold winter day due to increased irrigation demands.

Common peaking factors include factors for maximum day demands (MDD), minimum day demands (MinDD), and peak hour demand (PHD) periods. Peaking factors are determined using the water system demands for a selected period and dividing the quantity by the ADDs. The MDD factor, for example, is determined by comparing the water demands for the day of the year with the highest daily water demand to the ADD. There are basically three types of peaking factors used in water master plans. These are:

- Monthly peaking factors.
- Daily peaking factors.
- Hourly peaking factors.

These peaking factors not only reflect a different time scale, but are often calculated using different data sources. The City's peaking factors and data used to establish these are discussed below.

4.1 Monthly Peaking Factors

Monthly peaking factors represent the seasonal demand variation on a monthly basis, such as the Maximum Month Demand (MMD) and Minimum Month Demand (MinMD) peaking factors. In absence of daily production data for an entire calendar year, these factors can often easily be established from monthly production (or supply) summaries or historical billing data. The City's monthly peaking factors are summarized in Table 6.

**Table 6 Monthly Peaking Factors
Public Works Integrated Master Plan
City of Oxnard**

Year	Average Annual Demand (mgd)	Maximum Month Demand (mgd)	Minimum Month Demand (mgd)	MMD Peaking Factor	MinMD Peaking Factor
2002	21.74	25.58	17.89	1.18	0.82
2003	21.38	26.96	15.92	1.26	0.74
2004	22.59	29.05	18.24	1.29	0.81
2005	21.78	26.04	15.92	1.20	0.73
2006	22.26	27.41	17.57	1.23	0.79
2007	22.88	28.21	18.31	1.23	0.80
2008	22.63	28.06	16.08	1.24	0.71
2009	22.08	28.27	16.90	1.28	0.77
2010	20.62	26.64	15.25	1.29	0.74
2011	20.67	25.60	16.80	1.24	0.81
2012	21.39	26.43	15.29	1.24	0.71
Average	**21.82**	**27.11**	**16.74**	**1.24**	**0.77**
Recommended	**N/A**	**N/A**	**N/A**	**1.3**	**0.7**

Note:
Source: Historical billing data for the period 2002-2012.

As shown in Table 6, the recommended peaking factors for MMD and MinMD conditions based on historical data from 2002 through 2012 are 1.3 and 0.7, respectively. MMD is rounded up, while MinDD is rounded down in order to provide the most conservative planning basis for both demand conditions. These factors represent typical values observed by many other similar water agencies in Southern California.

4.2 Daily Peaking Factors

Historical supply records are typically used to determine the seasonal demand factors, such as MDD/ADD or MinDD/ADD. Hourly data from Supervisory Control and Data Acquisition (SCADA) systems and other field recorders are typically used to create a 24-hour water usage curve or diurnal pattern. The maximum hour or peak hour demand (PHD) factor from this curve is used to determine the PHD peaking factors. The maximum day peaking factor represents the ratio of the largest daily demand observed in one year to the ADD for the same year. This factor can then be applied to the ADD of future planning years to project maximum day water demands. The estimated MDD is commonly used to establish water supply, storage, and pumping capacity requirements.

Daily historical water supply records from the City's SCADA system from 2005 through 2013 were used to establish the City's MDD peaking factor. As listed in Table 7, the MDD peaking factor was derived by dividing the MDD by the ADD of the same year.

Table 7 Maximum Day Demand Seasonal Peaking Factors
Public Works Integrated Master Plan
City of Oxnard

	Average Annual Demand		Day of Maximum Demand	Maximum Day Demand	
Year	**(AFY)**	**(mgd)**		**(mgd)**	**(PF)**
2005	27,354	23.8	September 6	36.1	**1.48**
2006	28,021	29.3	June 16	35.3	1.41
2007	28,597	29.8	July 9	34.5	1.35
2008	27,681	29.0	July 2	33.8	1.37
2009	26,040	22.6	July 22	31.8	1.37
2010	25,674	22.3	September 13	32.5	1.42
2011	25,521	22.2	August 17	33.2	1.46
2012	26,240	22.8	August 16	31.6	1.35
2013	26,892	23.4	May 3	32.7	1.36
Average	**26,891**	**23.4**	**N/A**	**33.5**	**1.40**
Recommended					**1.50**

Note:
(1) From production data provided from the City. For years prior to 2005, maximum day production was only available as total City production combined with production for PHWA and is not included in this analysis.

As shown in Table 7, the MDD PF varied between 1.48 in 2005 and 1.35 in 2007 and 2012. Although the average MDD peaking factor of the 9 year period is 1.40, it is recommended to use a MDD peaking factor of 1.5 for conservative planning purposes and to accommodate years with higher MDD peaking factors, such as 1.48 in 2005.

A detailed analysis of the MinDD peaking factor was not included in this report as it doesn't govern any infrastructure sizing. A MinDD of 0.7 was used in this report because this is a typical MinDD peaking factor seen in coastal communities throughout Southern California.

4.3 Hourly Peaking Factors

Hourly peaking factors are derived from diurnal patterns that are typically developed from SCADA data collected for model calibration. The diurnal patterns developed as part of the PWIMP are presented in PM 2.3. The maximum hourly peaking factors that were calculated using SCADA data obtained from March 24 through April 4 ranged from 1.18 to 1.32. The peak hour demands occurred between 7:00 a.m. and 9:00 a.m. For conservative planning purposes, the maximum PHD peaking factor of 1.5 was used in the PWIMP. The minimum hour demand peaking factor recorded in the same period ranged from 0.47 to 0.82. A minimum hour demand (MinHD) peaking factor of 0.5 was used in the PWIMP. A summary of recommended and aggregate peaking factors is presented in Table 8.

Table 8 Summary of Peaking Factors
Public Works Integrated Master Plan
City of Oxnard

Hourly Demand Condition	Daily Demand Condition				
	Minimum Day	Minimum Month	Average Day	Maximum Month	Maximum Day
Minimum Hour	0.35	0.35	**0.50**	0.65	0.75
Average Hour	**0.70**	**0.70**	**1.00**	**1.30**	**1.50**
Peak Hour	1.05	1.05	**1.50**	1.95	1.25

Note:
(1) Peaking Factors calculated using PFs listed in bold: 0.5 for minimum hour demand; 1.3 for PHD; 0.7 for MinDD; 0.7 for MinMD; 1.3 for MaxMD; and 1.5 for MDD.

5.0 FUTURE WATER DEMAND PROJECTIONS

Demand projections based on land use are typically developed using a combination of General Plan information, specific plans, vacant land information, aerial photography, and water demand factors.

In order to develop near- and long-term demand projections, each development project was geospatially located throughout the service area. The projects and land uses were phased based on the estimated timing of developments provided by the City's planning department. Each land use type in the study area was assigned a water demand factor expressed in gpd/acre. WDFs were applied to commercial and industrial developments to determine future demands.

For residential developments, future demand was estimated according to the projected population increase based on the number of new dwelling units (DU) as determined by the City's planning department. The 20x2020 water use target of 132.4 gpcd was applied to the estimated population of each residential development using 4 people per DU.

5.1 Near and Long-term Commercial and Industrial Demand Projections

The estimated near-term demands (demands through 2020) and estimated long-term demands (demands through 2040) are presented in Table 9. As shown, it is estimated that the study area will experience a total increase of nearly 3.3 mgd or about 3,700 AFY by 2020 and nearly 7.4 mgd or about 8,300 AFY by 2040. Under MDD conditions, these developments are estimated to add nearly 11.1 mgd of water demand to the system by 2040.

Table 9 Near-Term and Long-Term Demand Projections
Public Works Integrated Master Plan
City of Oxnard

Map ID	Development Name	Dev. Size units	Dev. Size acres	Estimated Population	Demand Factor GPCD	Demand Factor (gpd/ac)	ADD by 2020 (mgd)	ADD by 2040 (mgd)
1	Riverpark							
	1a - Residential	1,185		4,555	132.4		0.60	0.60
	1b - Commercial		76.7			2000	0.15	0.15
2	The Village	1,500		5,215	132.4		0.31	0.69
3	Devco	152		584	132.4		0.08	0.08
4	St. John Hospital Expansion		10.0			2000	0.02	0.02
5	East Village							
	5a - Residential	500		1,616	132.4		0.00	0.21
	5b - Commercial		6.325			2000	0.00	0.01
6	Sakioka Farms							
	6a - Commercial		136.8			2000	0.00	0.27
	6b - Industrial		280.5			3500	0.00	0.98

Table 9	Near-Term and Long-Term Demand Projections Public Works Integrated Master Plan City of Oxnard						
		Dev. Size			Demand Factor		ADD by 2020 (mgd)	ADD by 2040 (mgd)
Map ID	Development Name	units	acres	Estimated Population	GPCD	(gpd/ac)		
7	El Camino Ind		79.2			3500	0.00	0.28
8	Teal Club							
	8a - Residential	1,200		3,092	132.4		0.15	0.41
	8b - Commercial		22.7			2000	0.00	0.05
9	North Shore	292		1,005	132.4		0.05	0.13
10	Avalon	132		471	132.4		0.04	0.06
11	Seabridge	131		500	132.4		0.04	0.07
12	Edding Road	413		1,457	132.4		0.10	0.19
13	South Shore							
	13a - Residential	1,545		5,205	132.4		0.18	0.69
	13b - Industrial		31.63			3500	0.00	0.11
14	Mixed Use	1,702		6,107	132.4		0.42	0.81
15	Residential Infill	2,193		7,471	132.4		0.68	0.99
16	Industrial Infill		106			3500	0.36	0.37
17	Commercial Infill		90			2000	0.11	0.18
	Total						**3.28**	**7.36**

Notes:
(1) Acreage is based on digitized parcel area of lot.
(2) Based on a per capita demand target of 132.4 gpcd (2010 Oxnard UWMP) and an average household size of 4.0 (SCAG, 2013).

5.2 Near and Long-term Residential Demand Projections

As shown in Figure 4, the City's per capita demand has steadily decreased since 2004. This figure also shows the two different water use targets that are defined in the City's 2010 UWMP. The SBx7-7 target is 132.4 gpcd for year 2020 with an interim target of 135.6 gpcd for year 2015. In addition, the City is pursuing a water conservation approach for compliance with programmatic BMPs. The 2018 programmatic target is 112.6 gpcd, which was determined using the CUWCC's target calculator. These targets along with the historical per capita water use are depicted on Figure 4.

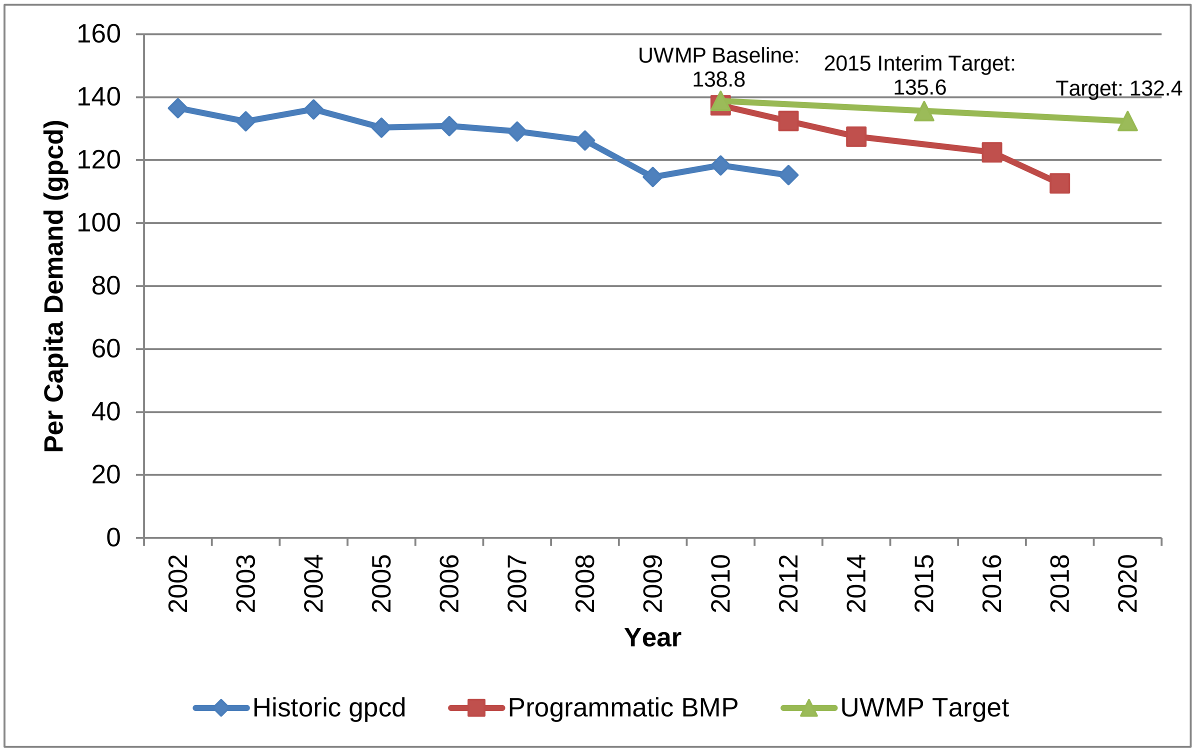

Figure 4 Historic and UWMP Per Capita Water Demand Targets

As shown on Figure 4, the City's per capita water use has steadily declined to 115.2 gpcd in year 2012, and has thus nearly reached the BMP target of 112 gpcd and is already substantially lower than the SBX7-7 target of 132 gpcd. However, the City may experience a potential rebound in water usage due to the end of the recession and statewide drought mandatory use restrictions. To account for both scenarios, a water demand forecasting envelope was developed using both water use targets. In addition, the three different population forecasts presented in PM 1.3, *Population and Land Use Estimates,* Table 3 were used to develop the future demand forecasting envelope that is shown on Figure 5.

5.3 Overall Water Demand Projections

As shown on Figure 5, in addition to the 2010 UWMP forecast, a total of six new demand forecasts were developed by using the three different population forecasts and two water use targets from the 2010 UWMP.

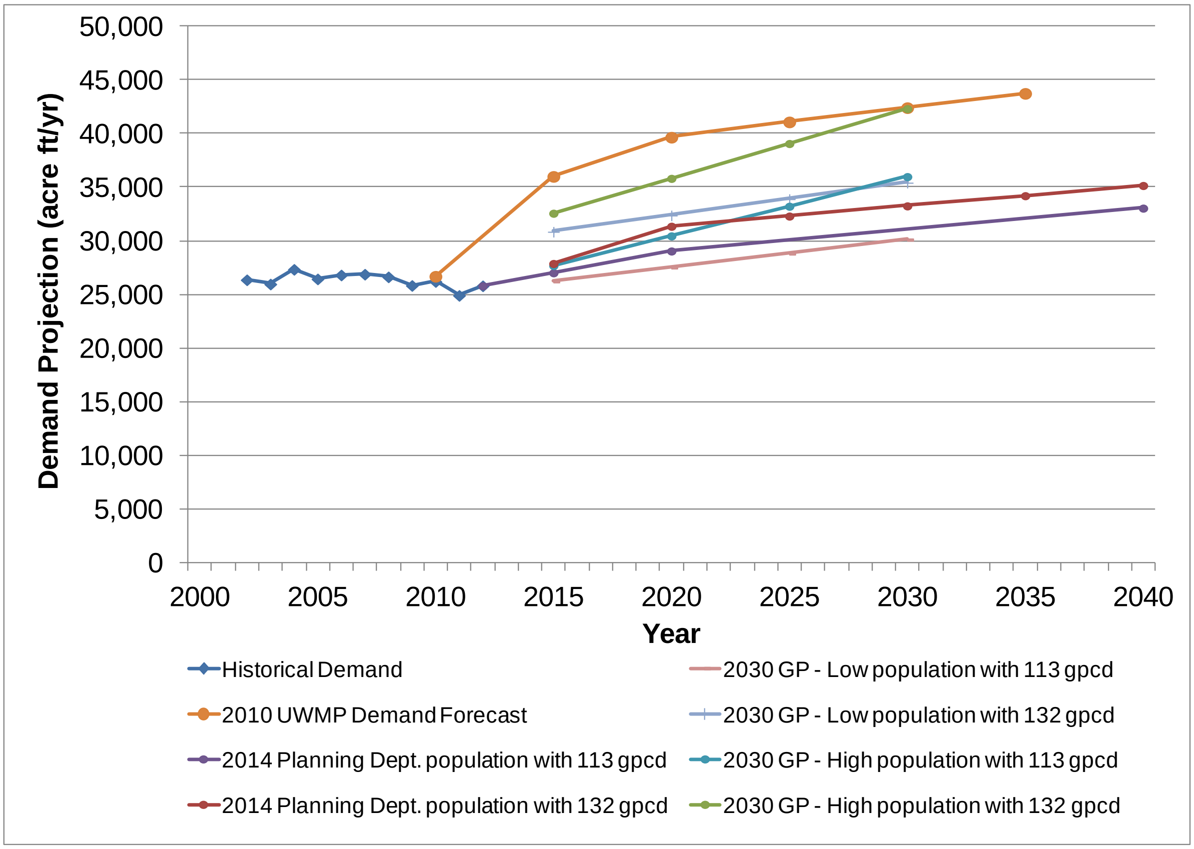

Figure 5 Water Demand Forecasting Envelope

As expected, the water demand forecast of the 2010 UWMP coincides with the 2030 General Plan forecast using the 2010 UWMP water use target of 132 gpcd. This reflects the most conservative demand estimate using the highest population forecast combined with the maximum per capita water usage. The least conservative estimate reflects the low GP population forecast combined with the BMP water use target of 113 gpcd. This forecast is very close to the forecast that combines the 2014 Planning Department Population forecast with 113 gpcd. This forecast is slightly higher as it accounts for non-residential growth identified with the planning department as a separate demand that is added to the population based demand.

As the City has adopted the 2010 UWMP with the water use target of 132 gpcd and to account for a potential rebound in per capita demand now that the economic recession appears to have ended, it was decided to use the 132 gpcd water use factor for the demand forecast instead of the more aggressive water target planning that is close to the City’s existing per capita water use. The demand forecasts using 132 gpcd are listed in Table 10.

Table 10	**Demand Projections Alternatives with 132 gpcd Public Works Integrated Master Plan City of Oxnard**			
Year	**2010 UWMP Demand (AFY)**	**2030 GP High population (AFY)**	**2030 GP Low population (AFY)**	**2014 City Planning Dept. (AFY)**
2015	36,029	32,999	31,274	27,914
2020	39,684	36,114	32,664	31,383
2025	41,109	39,229	34,054	32,333
2030	42,439	42,345	35,445	33,283
2035	43,769	45,460(1)	36,835(1)	34,233
2040	n/a	48,575(1)	38,225(1)	35,183

Note:
(1) Based on extrapolated population forecast and 132 gpcd for years 2035 and 2040.

As shown in Table 10, the projected water demands for year 2040 range roughly from 35,200 to 48,600 AFY. The lowest projection uses a combination of the 2014 City population forecast, 2010 Census, and recent land use based development information. The highest forecast is based on the 2030 GP high population forecast extrapolated from year 2030 through year 2040.

To avoid overly conservative planning where the highest population forecast is combined with the highest per capita water use, it is recommended that the water master plan be based on the low GP population forecast combined with the high water use factor of 132 gpcd. This forecast also represents approximately the middle of the water demand projection envelope shown in Figure 5. This forecast is also based on the values presented in 2030 GP and 2010 UWMP reports that were both were adopted by City Council.

Although it is beyond the scope of this master plan to do an extensive comparisons analysis with other agencies, it should be noted that most agencies that have recently updated their water demand forecasts for water master planning or in preparation of the 2015 UWMP update, are lowering the demand forecasts that were presented in the 2010 UWMP to account for the impacts of the recession and extensive water conservation efforts. The demand reduction is often significant and many water agencies in California had water demands in 2014 that were similar to water demands around 2005 after a steep decline from the demand peak in 2006-2008. By selecting the recommended demand forecast (38,225 AFY for year 2040), the City still maintains a reasonable level of conservatism as the population forecast is based on maintaining the relatively high household density of 4 people/du as well as the high per capita water use of 132 gpcd. This recommended forecast is therefore considered a balanced approach for infrastructure planning.

It should be noted that the demand forecast developed based on the City Planning Department's 2014 population projection and the 132 gpcd water use target was developed in GIS, while the 2030 GP based demand forecasts only have a city-wide total. To obtain a spatial distribution of the 2030 GP based demand forecast of 38,225 AFY, the 2014 based forecast of 35,183 AFY was therefore scaled by a factor 1.086 to account for the 3,000 AFY difference. The resulting demand projection for AAD, ADD, and MDD conditions is listed in Table 11.

Table 11 Water Demand Projections
Public Works Integrated Master Plan
City of Oxnard

Year	2030 GP Population(1)	Per Capita Water Use (gpcd)	AAD(2) (AFY)	ADD (mgd)	MDD(3) (mgd)
2015	210,873	132	31,274	27.9	41.9
2020	220,248	132	32,664	29.2	43.7
2025	229,622	132	34,054	30.4	45.6
2030	238,996	132	35,445	31.6	47.5
2035	248,370	132	36,835	32.9	49.3
2040	257,744	132	38,225	34.1	51.2

Notes:
(1) This is the 2030 General Plan low population projection.
(2) Based on demand forecast presented in Table 10.
(3) MDD estimated using an assumed MDD/ADD factor of 1.5.

The contribution of existing, near-term development, and long-term development customers to the total forecasted water demands is graphically shown on Figure 6. This figure illustrates that the majority of the future demand is associated with existing customers and that it is assumed that this demand remains constant, which is a conservative assumption as additional water conservation is likely to occur by year 2040. Approximately 11 mgd is associated with new developments, which equates to about 30 percent of the total 2040 demand.

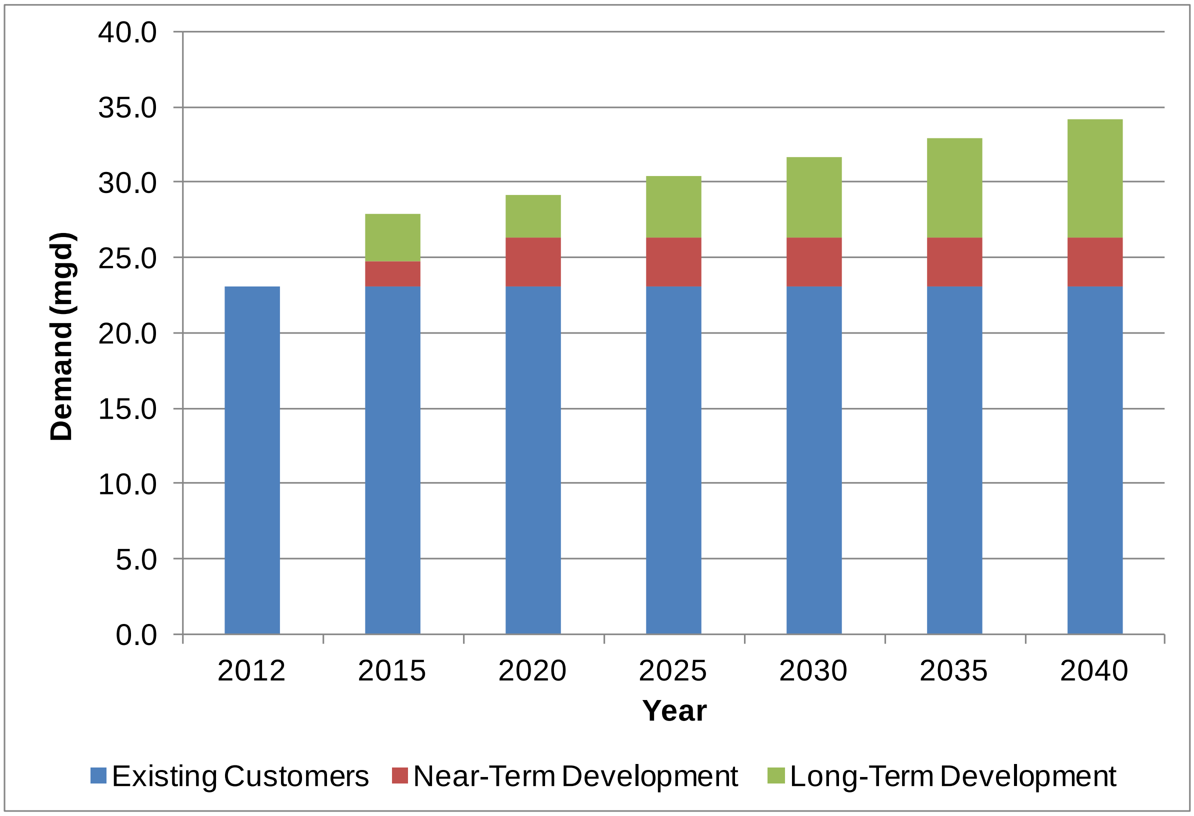

Figure 6 Near and Long Term Demands

Based on the methods outlined in this chapter, the City's water demand is projected to increase from approximately 27,500 AFY in 2012 to approximately 38,200 AFY in 2040. This represents an average annual growth of about 1.2 percent. As listed in Table 11, the City's ADD and MDD are projected to increase accordingly to approximately 34 mgd and 51 mgd respectively.