Chapter 2: Basic Planning Data

2.1 Introduction

Water demand projections are necessary evaluate water resource needs, and to plan for capital improvements. This section reviews historical population growth and summarizes current water production and demands for the City as well as presenting the methodology and results of water demand projections. The basic planning data provided in this section is the foundation of the WSP and will be utilized in subsequent sections to assess the current system and anticipated future needs.

2.2 Population

For the past thirteen years the City of Sunnyside has grown at slightly over an average of 1% per year. The City's Planning Department projects a 2% annual growth which is consistent with the existing City Comprehensive plan.

Table 2-1 Historical Population Growth

Year	Population	Percent Change
2003	14,300	
2004	14,520	1.5%
2005	14,710	1.3%
2006	14,930	1.5%
2007	15,130	1.3%
2008	15,210	0.5%
2009	15,340	3.4%
2010	15,858	3.2%
2011	16,010	1.0%
2012	16,130	0.7%
2013	16,200	0.4%
2014	16,230	0.2%
2015	16,280	0.5%

As part of their recent Comprehensive Plan update Yakima County identifies a higher existing population and has adopted revised population growth projections for Sunnyside at an annual growth rate of 0.83%. Table 2-2 shows both growth projections

Table 2-2 Projected Population Growth

Year	City Projection (2%)	Yakima County Projection (0.83%)
2015	16,280	16,365
2016	16,606	16,499
2017	16,938	16,633
2018	17,277	16,766
2019	17,623	16,898
2020	17,975	17,030
2021	18,335	17,160
2022	18,701	17,289
2023	19,075	17,417
2024	19,457	17,543
2025	19,847	17,668
2026	20,244	17,791
2027	20,649	17,913
2028	21,062	18,034
2029	21,483	18,153
2030	21,913	18,271
2031	22,351	18,388
2032	22,798	18,505
2033	23,254	18,621
2034	23,719	18,736
2035	24,193	18,850

The current City Growth Projections will be used to forecast Equivalent Residential Unit (ERU) growth in order to accommodate potential commercial and industrial growth, and to insure that the water system is prepared for all types of growth as it occurs. If actual water demand in the future is less than forecasted, the City will delay source and storage improvements accordingly.

2.3 EXISTING WATER CONSUMPTION

Water consumption is the amount of water used by all customers of the system as measured by the customer's meters. The City has divided all water users into four classes for billing purposes – single family residential, multi-use (multiple family), commercial, and irrigation (seasonal). The commercial category includes all business, commercial, industrial and public users, except for City irrigation. The data shown in Table 2-3 was obtained from the City's billing system. The City began using the current billing system software (BIAS) in the fall of 2014. Data from the previous software is no longer available due to changes in City staff, and the lack of support from previous software company. There is a discrepancy of about 0.8% between the service meter readings obtained by the Water Division and the amount of water billed by the Finance Department's Utility Billing Division. This difference may be attributed to the billing program rounding off the readings for billing purposes. Other factors that may account for the slight difference include new replacement meters, meters "rolling over" (exceeding the register capacity and starting over), and the billing division's counting water as sold when the bill is paid, not necessarily when the bill was originally sent. The Billing Division's numbers will be used because they can be sorted buy customer class and not just by the Water Division's meter number.

Although the water department staff scans the raw service meter readings on a monthly basis for abnormal readings, they rely on the billing system to produce a list of unusual readings (zero, very low, very high) which they then follow-up with a second reading to verify the amount. The City is transitioning to a fixed ready metering system which will provide daily service meter data summaries which will alert water staff to abnormal readings, which will allow for a more timely follow-up.

Currently, distribution system losses are calculated every few months. With the new data collection system, DSL will be calculated monthly using the water division numbers for metered water usage.

As expected water use varies throughout the year with the highest use occurring between May and October as shown in Table 2-3. The impact of residential irrigation can be seen in the increase in the residential class during the warmer months. The commercial class also shows a large increase due to the seasonal processing of various crops.

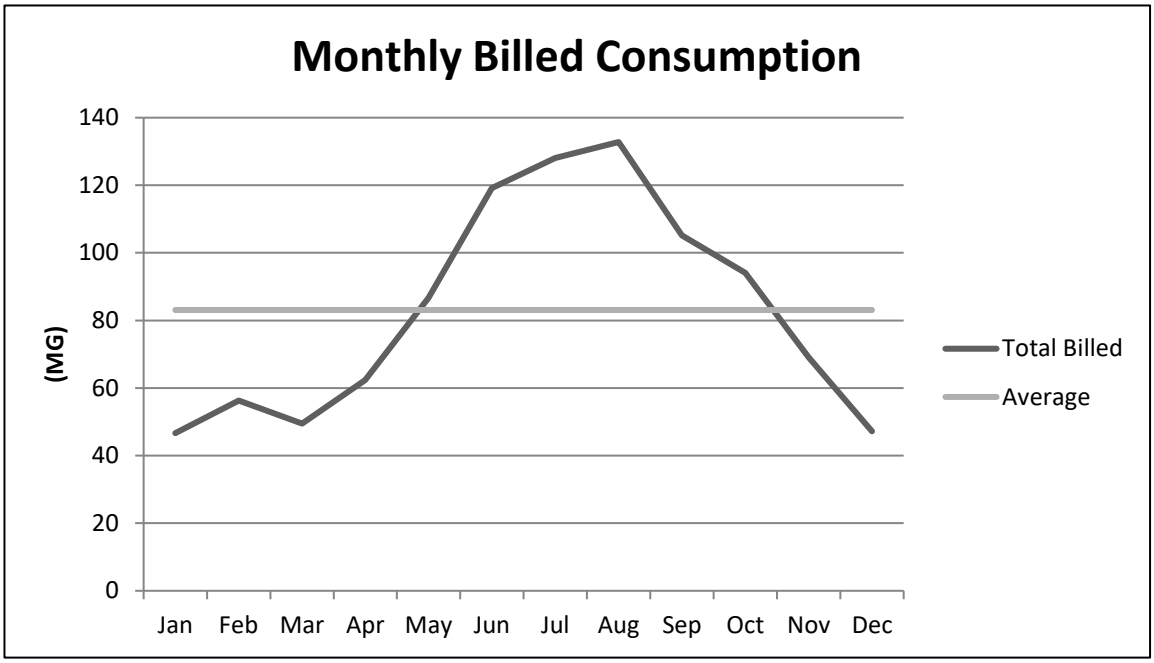
The use of just the 2015 billing system data will be sufficient to base future demands since the 2015 demands were the highest since 2006. The 2015 total production was just 1% less than the 2006 total production. Since that time, the Water Use Efficiency Rule has been implemented by the City and the Irrigation District has continued to provide more residential services with irrigation water

Table 2-3 Consumption by Customer Class (MG)

2015 Year	Single Family	Multi-family	Commercial	Irrigation	Total Billed	Service Meter Readings	Billing Discrepancy	% Billing Discrepancy
Jan	13.852	8.864	23.933	0.000	46.649	48.289	-1.640	-3.516%
Feb	14.878	10.034	31.366	0.000	56.279	58.074	-1.795	-3.190%
Mar	12.464	8.096	28.891	0.000	49.450	49.513	-0.063	-0.127%
Apr	17.814	9.908	34.675	0.000	62.397	64.229	-1.832	-2.936%
May	29.866	13.374	43.470	0.000	86.710	86.981	-0.271	-0.312%
Jun	41.224	18.514	59.444	0.000	119.182	119.593	-0.411	-0.345%
Jul	44.721	19.247	64.110	0.023	128.100	128.492	-0.392	-0.306%
Aug	45.081	21.667	66.038	0.010	132.797	133.122	-0.325	-0.245%
Sep	30.453	15.457	59.115	0.009	105.115	102.216	2.899	2.758%
Oct	23.336	12.524	58.210	0.026	94.096	94.003	0.093	0.099%
Nov	17.324	11.240	40.497	0.000	69.061	70.744	-1.683	-2.436%
Dec	12.928	8.651	25.656	0.000	47.235	49.901	-2.666	-5.643%
Total	**303.941**	**157.576**	**535.405**	**0.069**	**996.991**	**1,005.157**	**-8.166**	**-0.812%**

Figure 2-1 shows the total monthly billed consumption relative to the average monthly total and illustrates the seasonal impact of both irrigation and food processing.

Figure 2-1 Monthly Billed Consumption



As shown in Table 2-4 and Figure 2-2, Commercial consumption accounts for approximately 54% of the total water used. The commercial consumption share of water billed has increased over the years. Figure 2-3 shows each customer class proportion of the total billing for 2015 and the 2006-2010 average.

Table 2-4 Demand by Customer Class

	Single Family	Multi-Family	Commercial	Irrigation	Total
2015 (MG)	303.941	157.576	535.405	0.069	996.991
2015 (%)	30.5%	15.8%	53.7%	<.1%	100%

Figure 2-2 Demand By Customer Class

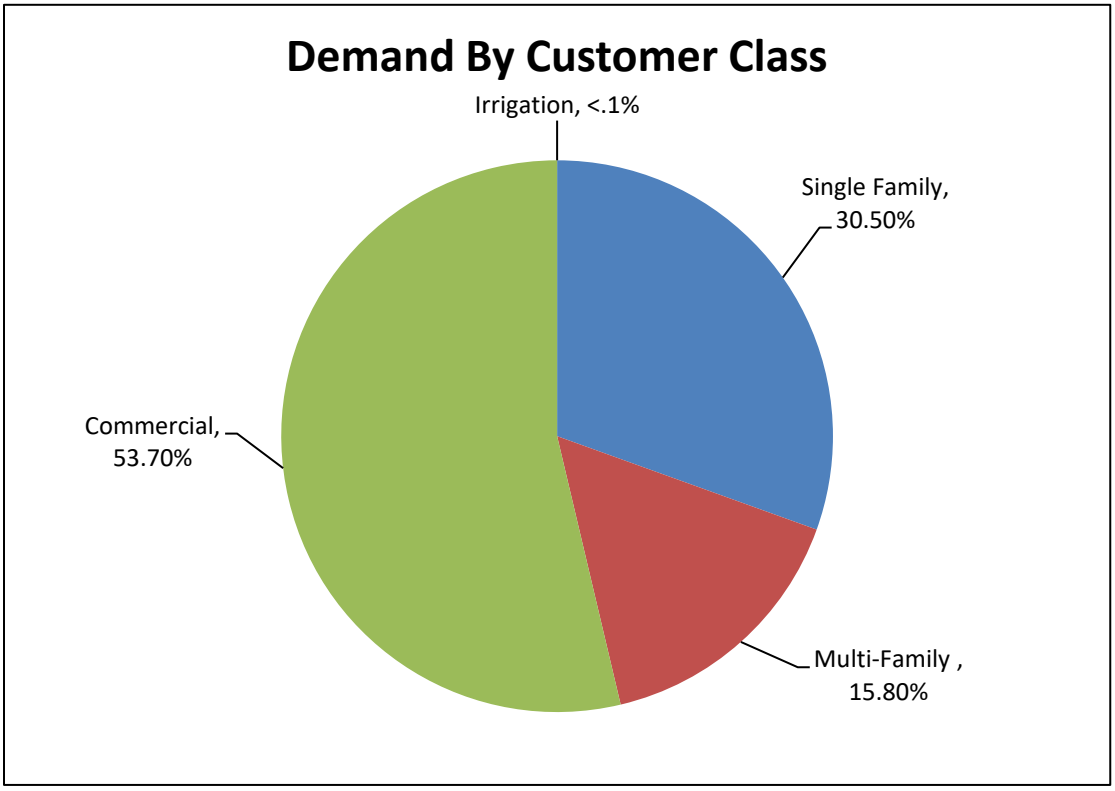
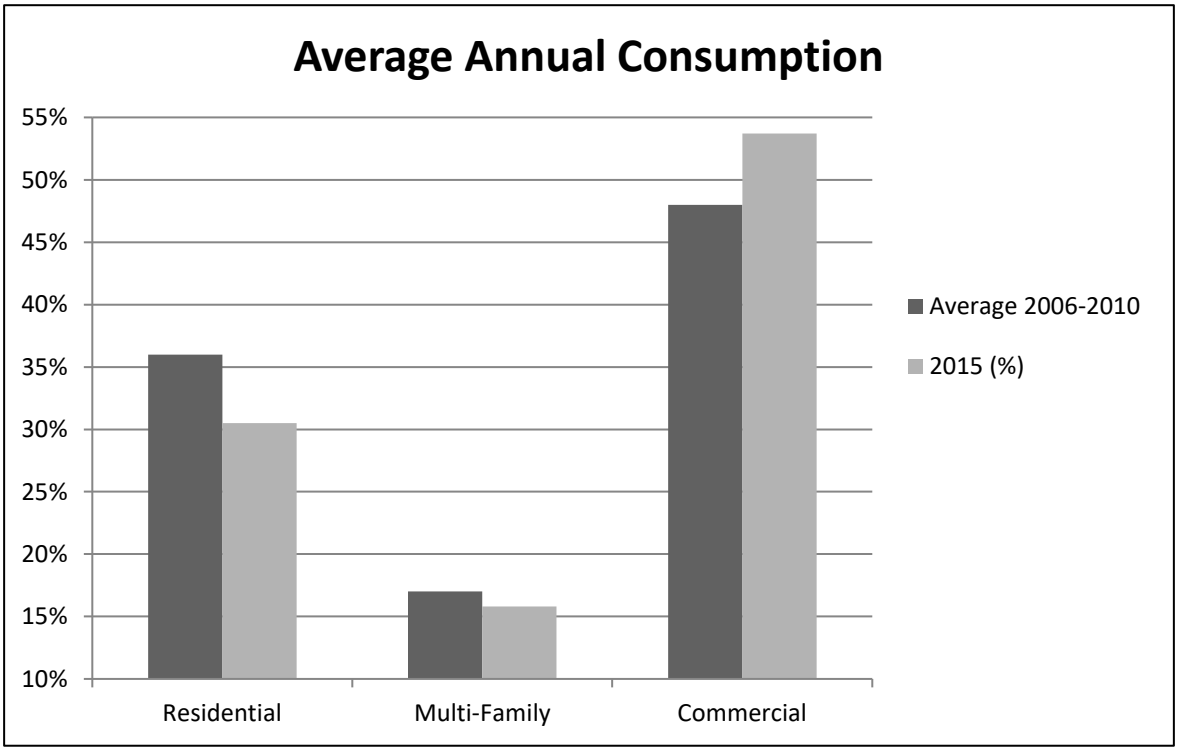


Figure 2-3 Average Annual Consumption by Customer Class



*2006-2010 average data from 2011 HDR Draft WSP Update.

A review of the 2015 Commercial accounts show that the ten largest water users account for about 60% of the total commercial billing and 32% of total water billed. The ten largest users are shown in Table 2-5.

Table 2-5 Top Ten Water Users

Name	Total Annual Consumption (MG)	Percent of Commercial Billing	Percent of Total Billing
Darigold 355 Alexander Rd	118,038,100	22%	11.8%
Seneca Foods LLC 1525 4th	45,361,712	8.5%	4.5%
Valley Processing 201 Blaine Ave	44,206,800	8.3%	4.4%
Valley Processing 108 Blaine Ave	36,422,364	6.8%	3.7%
Johnson Foods Inc. 332 Blaine Ave	15,924,172	3.0%	1.6%
1700 Cascade Way	14,404,984	2.7%	1.4%
1521 1St	12,742,180	2.4%	1.3%
Valley Processing 115 Blaine Ave	10,722,580	2.0%	1.1%
705 Alexander Rd	10,551,288	2.0%	1.1%
131 Parkland Drive, #B	9,581,880	1.8%	1.0%
Total	317,956,060	59.5%	32%

2.4 EQUIVALENT RESIDENTIAL UNITS (ERUS)

The demand of each customer class can be expressed in terms of equivalent residential units (ERUs) for demand forecasting and planning purposes. One ERU is equivalent to the amount of water used by a single family (sf) residence. The number of ERUs represented by the demand of the other customer classes is determined from the total demand for that class divided by the demand per single family residential.

1 ERU = Average daily single family residential use / Number of sf connections

1 ERU = 303.941 MG annual demand / 365 days / 2800 connections = 297.4 gpd

The ERU value of 297.4 gpd will be used for future demand projections and system analysis.

Table 2-6 applies the ERU value of 297.4 gpd to the various customer classes to determine their equivalent number of ERUs. Distribution System Leakage from the 2015 Water Use Efficiency Report is also included to account for it and show its value.

Table 2-6 Equivalent Residential Units (ERUs)

Customer Class	Annual Demand Per Customer Class (MG)	No. Connections	Percent of Total Demand (%)	Total Equivalent Residential Units (ERU)
Average Demand Per Single-Family Residence = 297.4 gpd				
Single-family	303.941	2800	29.8%	2,800
Multi-Use (Multi-Family)	157.576	152	15.4%	1,452
Commercial	535.405	585	52.5%	4,932
Irrigation	0.069	9	.07%	.6
Distribution System Leakage (DSL)*	15.716		1.5%	145
Total	1,012.707*	3,546	100%	9,330

* 1,012.707 MG – 15.717 MG = 996.991 MG total billed water (Table 2-3)

The same 2% annual growth that was used in future population projections in Section 2.2 will be used to forecast future total ERU. Table 2-7 shows the estimated ERUs by year.

Table 2-7 Total ERU Projection

Year	Total ERUs
2015	9,330
2016	9,517
2017	9,707
2018	9,901
2019	10,099
2020	10,301
2021	10,507
2022	10,717
2023	10,932
2024	11,150
2025	11,373
2026	11,601
2027	11,833
2028	12,069
2029	12,311
2030	12,557
2031	12,808
2032	13,064
2033	13,326
2034	13,592
2035	13,864

2.5 WATER PRODUCTION

The total monthly production from all wells is shown in Table 2-8 for the years 2009-2015. Complete data is not available for five months in this time period due to the installation of new Supervisory Control and Data Acquisition system, meter failures and upgrades, and in the case of 2009 just missing. In order to have a more representative annual total production for evaluation and forecasting purposes, the average of the months with data was used to develop an adjusted total value. Except for 2013, the adjusted total shows as steady growth. The average increase in water produced is about 1.8%. It should be noted there was two months of missing data in 2013, including the typical peak month of August. Figure 2-4 shows the annual increase in water production.

The data for Table 2-8 was obtained directly from the source meters. The 2015 total (1,020.873 MG) varies from the Table 2-6 total billed water demand by class (1,012.707 MG including DSL) by 8.166 MG which is the billing inaccuracy discussed in Section 2.3.

Table 2-8 Well Production

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total (WUE Report)	Adjusted Total[4]
2009[1]	-	-	54.000	59.494	78.826	130.037	121.408	156.177	112.074	89.200	72.535	47.210	920.960	1,020.474
2010	46.076	59.134	44.878	58.399	80.699	89.064	106.992	152.617	99.224	79.051	74.690	50.116	940.940	940.940
2011	45.023	60.828	46.407	52.921	83.456	94.031	112.396	141.490	114.956	95.948	65.170	51.901	964.527	964.527
2012	53.151	43.394	45.205	55.123	78.447	88.810	123.823	139.199	105.985	102.988	63.208	55.317	984.650	984.650
2013[1]	42.147	48.906	40.417	59.389	95.635	93.843	91.037	-	121.082	79.896	68.487	-	740.838	932.582
2014[1]	-	51.096	45.306	68.521	85.453	119.899	126.561	116.546	123.320	94.614	64.797	53.340	948.453	995.203
2015	47.355	58.747	50.899	67.910	88.615	125.551	127.769	135.936	101.462	95.397	70.620	50.612	1,020.873	1,020.873
Average[2]	46.919	52.594	45.647	60.773	86.321	104.427	116.317	133.361	113.361	93.769	66.456	52.793	972.670[3]	965.676

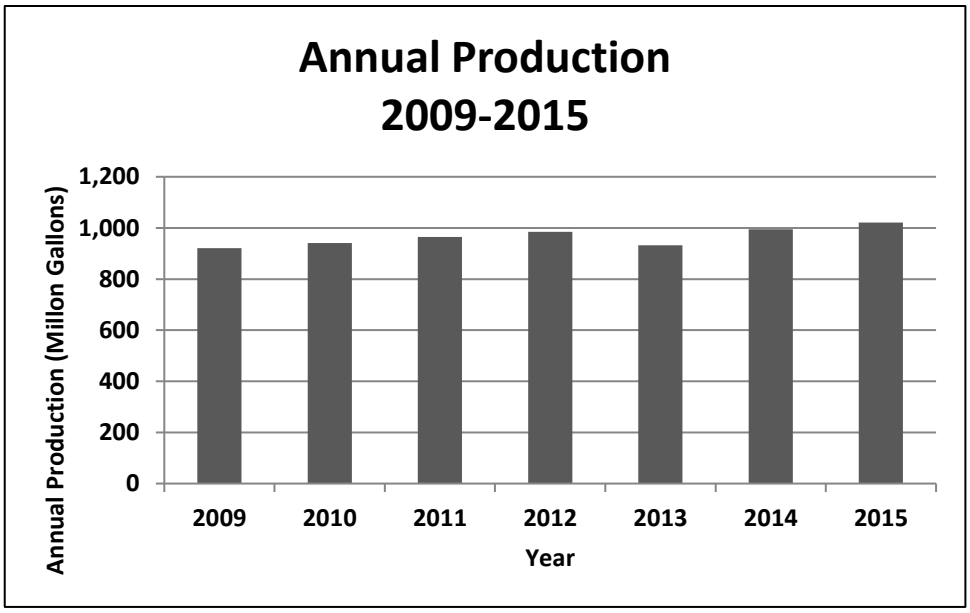
[1] 2009 data is missing; 2013 & 2014 data is not complete due to lack of data while making source meter and SCADA changes

[2] Averages based on number of years of available data

[3] Total of monthly averages

[4] Adjusted Total includes adding the average monthly total for those months of missing data

Figure 2-4 Annual Production



In order to minimize confusion regarding annual water demand and production Table 2-10 shows the source of the various numbers discussed above.

Table 2-9 Annual Demand and Production Summary

Location	Description	Value (MG)	How Value is Used
Table 2-4	Billing Annual Demand	966.991	
	Actual Service Meter Reading	1,005.157	
Table 2-6	Distribution System Leakage (DSL) (total water produced-actual service meter reading)	15.716	
	Total Annual Demand (billed demand + DLS)	1,012.707*	ERU Determination Demand Forecast Base
Table 2-8	Total Water Production	1,020.873	MDD:ADD Calculation

***** 1,020.873 -1,012.707 = .8% variance

Table 2-10 shows the total production from 2009-2015 as obtained by the source meters. The total production was divided by the number of days in the year to generate the Annual Average Day (ADD). The daily source meter records were reviewed to determine the actual Maximum Day Demand (MDD) for the years 2011-2015. As can be seen in Table 2-10, the month of the MDD varies from year to year depending on the various processing plants' timetable. It should be noted that although there is only one maximum day per year, several other days' production approached the MDD at various times.

For analysis and forecasting purposes, a MDD:ADD ratio of 2.0 production data will be used for forecasting purposes .

Table 2-10 Maximum Day Demand and MDD:ADD

Year	Total Annual Production (MG)[1]	Annual Average Day (ADD) MG (Production)	Actual Maximum Day (MDD) MG (Date/Production)[1]	MDD:ADD
2009	1,020.474	2.80		
2010	940.940	2.58		
2011	964.527	2.64	Aug. 5 /5.28	2.0
2012	984.650	2.69	Oct. 4 / 6.51	2.4
2013	932.582	2.56	July 25 / 4.43	1.7
2014	995.203	2.73	July 11 / 5.05	1.8
2015	1,020.873	2.80	June 30 / 5.36	1.9
			Average	1.96

[1] 2011-2015 City's Annual Water Report spreadsheet

Peak hour demand (PHD) is the calculated maximum rate of water use produced, excluding fire flow, that can be expected to occur over a continuous 60-minute time period. The following equations from the DOH water System Design Manual was used to calculate PHDs.

$$PHD = \frac{MDD}{1440} \times (C \times N + F) + 18$$

Where:
PHD = Peak Hour Demand
MDD = MDD/ERU = ADD/ERU x MDD:ADD ratio
C = 1.6 for ERUs > 500
N = Number of ERUs
F = 225 for ERUs >500

Peak hour demand is useful in determining the volume of equalizing storage needed to meet peak system demands that may exceed supply capacity. The calculated peak hour demand for both the 2015 Average Day and Maximum Day Demands are shown on Table 2-11.

2.6 SERVICE AREA DEMAND PROJECTIONS

Future demands are calculated based on the City's projected number of ERUs and using the 2015 ERU value of 297.4 gpd/ERU. Future demands were also computed using the current Water Use Efficiency goal of reducing residential consumption by 25 gallons per day (272.4) by December 31, 2020. Table 2-11 shows the various forecasts for each year 2016-2021, and then every 5 years until 2035 for both 297.4 and 272.4 gpd/ERU. The values for 2015 annual demand, average day demand and maximum day demand shown are calculated, but closely correspond to actual readings as noted in the table notes. Figure 2-5 shows the water demand projections with and without meeting the WUE goal.

Table 2-11 System Water Demand Projections

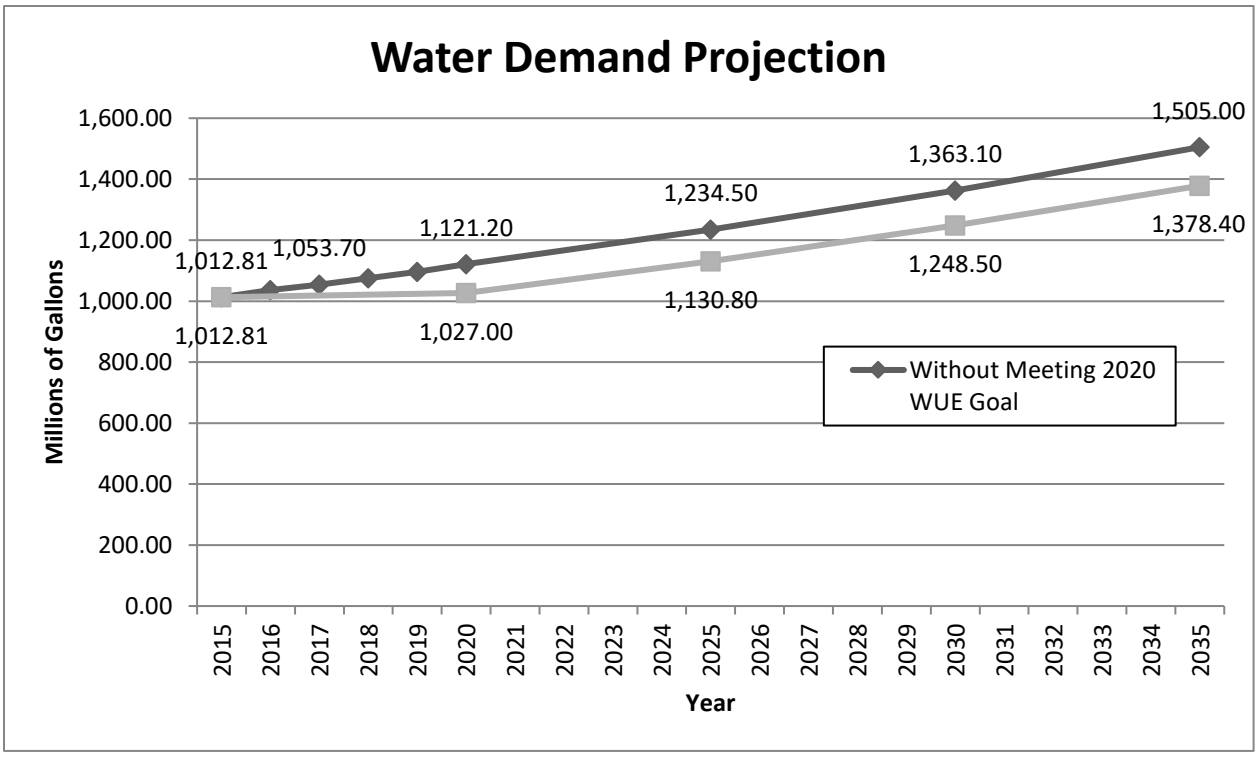
	2015	2016	2017	2018	2019	2021	2020	2025	2030	2035
Total ERUs	9,330	9,517	9,707	9,901	10,099	10,507	10,301	11,373	12,557	13,864
Annual Demand (MG) (297.4gpd/ERU)	1,012.8[1]	1,035.9	1,053.7	1,074.8	1,096.3	1,140.5	1,121.2	1,234.5	1,363.1	1,5175.0
Annual Demand (MG) (272.4 gpd/ERU)	--	-	-	-	-	1,045	1,027.0	1,130.8	1,248.5	1,378.4
Avg. Day (MG) (297.4 gpd/ERU)	2.8	2.8	2.9	2.9	3.0	3.1	3.1	3.4	3.7	4.1
Avg. Day (MG) (272.4 gpd/ERU)[2]	-	-	-	-	-	2.9	2.8	3.1	3.4	3.8
Max. Day (MG) (297.4 gpd/ERU)	5.6[2]	5.7	5.8	5.9	6.0	6.2	6.1	6.8	7.5	8.2
Max. Day (GPM) (297.4 gpd/ERU)	3,889	3,958	4,028	4,097	4,167	4,306	4,236	4,722	5,208	5,694
Max. Day (MG) (272.4 gpd/ERU)	-	-	-	-	-	5.7	5.6	6.2	6.8	7.6
Max. Day (GPM) (727.4 gpd/ERU)	-	-	-	-	-	3,975	3,889	4,306	4,722	5,278
Peak Hour (GPM) (297.4 gpd/ERU)	6,334	6,445	6,555	6,666	6,778	7,054	6,888	7,649	8,445	9,221
Peak Hour (GPM) (272.4gpd/ERU)	-	-	-	-	-	6,458	6,318	6,992	7,670	8,548

[1] Calculated Annual Demand of 1,012.8 MG corresponds to the actual annual demand of 1,020.8 within the .8% billing inaccuracy previously discussed.

[2] Calculated MDD of 5.6 corresponds well to actual MDD of 5.36MGD

[3] WUE Goal; Reduce single family and multi-family connections by 25 gpd by 12-31-20

Figure 2-5 Water Demand Projections



The ERU calculations, and resulting service area demand projections utilized the annual billing demand plus the DSL volume rather than total water production demand in order to more accurately track future customer class and DSL demands. If the total water produced volume was used to calculate the ERU value the result would have been 297.7 g/ERU. The total ERUs/year would be increased by 18 for 2015 and 55 for 2035. This minor change would not affect the projected average day demand of 4.1 MG 2035: 4,143,686 Gallons - 2015: 4,123,153 Gallons = 20,533 Gallons.

2.6.1 PRESSURE ZONES 2 AND 3 PROJECTIONS

Table 2-12 Zone 2 and 3 Projection

	2015	2016	2017	2018	2019	2020	2021	2025	2030	2035
Total ERUs	434	443	452	461	470	479	489	529	584	645
Annual Demand (MG) (297.4gpd/ERU)	47.1	48.1	49.1	50.0	51.0	52.0	53.0	57.4	63.4	70.0
Annual Demand (MG) (272.4 gpd/ERU)						47.6	48.6	52.6	58.1	64.1
Avg. Day (MG) (297.4 gpd/ERU)	.129	.132	.134	.137	.140	.142	.145	.157	.174	.192
Avg. Day (MG) (272.4 gpd/ERU)[2]						.130	.133	.144	.159	.176
Max. Day (MG) (297.4 gpd/ERU)	.258	.263	.269	.274	.280	.285	.291	.315	.347	.384
Max. Day (GPM) (297.4 gpd/ERU)	179.3	183	186.7	190.4	194.1	197.9	201.9	218.54	241.2	266.4
Max. Day (MG) (272.4 gpd/ERU)						.261	.266	.288	.318	.351
Max. Day (GPM) (727.4 gpd/ERU)						181.2	184.7	200.1	220.9	224.0
Peak Hour (GPM) (297.4 gpd/ERU)						932	950	957	1045	1143
Peak Hour (GPM) (272.4gpd/ERU)						927	945	949	1037	1135

The City's retail service area is comprised of three pressure zones. The low zone provides service to the majority of the customer, while zones 2 and 3 service single family residences at higher elevations. Water is pumped from the lower zone to the high zone reservoir. The middle zone receives its water from the high zone through pressure reducing valves. The population and water demands of zones 2 and 3 must be projected in order to evaluate the adequacy of the booster pumps and the high level reservoir.

The 2011 HDR draft plan reported that zones 2 and 3 served about 15.5% of the total single family services. Using that percentage, the current number of residences in these zones is estimate to be 434. Water Division staff agree that this is a reasonable estimation. Table 2-12 projects these ERUs and calculated water demands using the same 2% growth rate and gpd/ERU as used for the whole system.