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### TECHNICAL MEMORANDUM

**DATE:** March 4, 2013

**PROJECT:** 12-1320.401

**TO:** Mr. Terry Haugen, Public Works Director  
City of Grants Pass, Oregon

**FROM:** Brian Ginter, P.E.  
Michael McKillip, P.E., Ph.D.  
Murray, Smith & Associates, Inc.

**RE:** Long-Term Water Demand Projections



RENEWS 6-30-13



RENEWS 12-31-14

#### Introduction

The City of Grants Pass (City) authorized Murray, Smith & Associates, Inc (MSA) to prepare updated long-term water demand projections for the City's municipal drinking water supply. The purpose of this memorandum is to document the analysis, methodology and projections of water demand for both 20- and long-range planning horizons. The projections presented in this memorandum were developed considering the City's historical population, historical and present water demand characteristics, as well as other local and regional planning data. The water demand projections will be used as the basis for two water system planning projects: the Water Treatment Plant Facilities Plan Update, and an update of the City's Water Management and Conservation Plan. Long-range forecasting of demands will

also serve as the basis for the City's request for Extensions of Time to put water rights permits to beneficial use. It is anticipated that further refinement of these water demand projections needed to support the analysis of demands by pressure zone and the analysis of saturation development condition for the anticipated 2012 Urban Growth Boundary (UGB) expansion will be completed as part of the upcoming Water Distribution System Master Plan Update. These refined water demand projections are to be prepared under a separate memorandum.

## **Current and Future Service Area**

The City currently provides water service to a population of approximately 34,756 people primarily within the existing City limits. The City limits encompass an area of approximately 7,000 acres, and include most of the area within the existing City UGB. The City began a process to expand the UGB in 2006 and it is anticipating that the completion of the process will occur by the end of 2012. The proposed expansion plan will be reviewed and jointly approved by the City and the Josephine County Board of Commissioners and subsequently approved by the State of Oregon Department of Land Conservation and Development. Based on a current analysis by the City's Community Development Department, it is anticipated that approximately 1,200 acres will be added to the UGB providing a 20-year land supply.

The City also provides water service to approximately 105 residential and commercial acres in the North Valley area located north of the City limits along Interstate Highway 5, and southeast of the unincorporated community of Merlin. Long-term future growth in this area is anticipated to be served by the City.

There are some adjacent developed areas outside the City limits that are not served by the City. These areas include the Rogue Community College to the west and unincorporated County areas to the southeast of the City. There is a potential for these areas to be served by the City in the future.

There are no significant jurisdictional constraints that would prevent long-term continued expansion of the UGB as the City grows. The City is not adjacent to any other municipality and while there are some mountainous areas not ideally suited for development, there are no significant topographic restrictions to the City's ultimate expansion.

## **Historical and Future Population Estimates**

### ***General***

Estimates of the current and anticipated population within the water service area were developed through a review of existing City of Grants Pass planning data, previous water supply planning efforts, census data and Josephine County population forecasts. For planning purposes, the existing population within the City limits and the population of the water service area are assumed to be equal.

## ***Historical and Existing Population***

Historical City population data was obtained from the Portland State University’s Population Research Center certified population estimates. The Population Research Center produces the annual population estimates for the State of Oregon and its counties and cities. These estimates, made July 1 of each year, are widely used for planning purposes. Table 1 summarizes historical and current populations within the City and for all of Josephine County. Figure 1 graphically illustrates this historical population data. From the year 2000 through 2010, the population in the City grew at an average annual rate of 4.0 percent. For the same period, Josephine County grew at a lower annual average rate of 0.85 percent. The City grew from 23,170 to 34,533 people and Josephine County (including the City) grew from 76,050 to 82,775 people. As the entire County added fewer people than the City added during the 10-year period, the overall demographic trend within Josephine County indicates a net shift in population into the City from the rural areas of Josephine County.

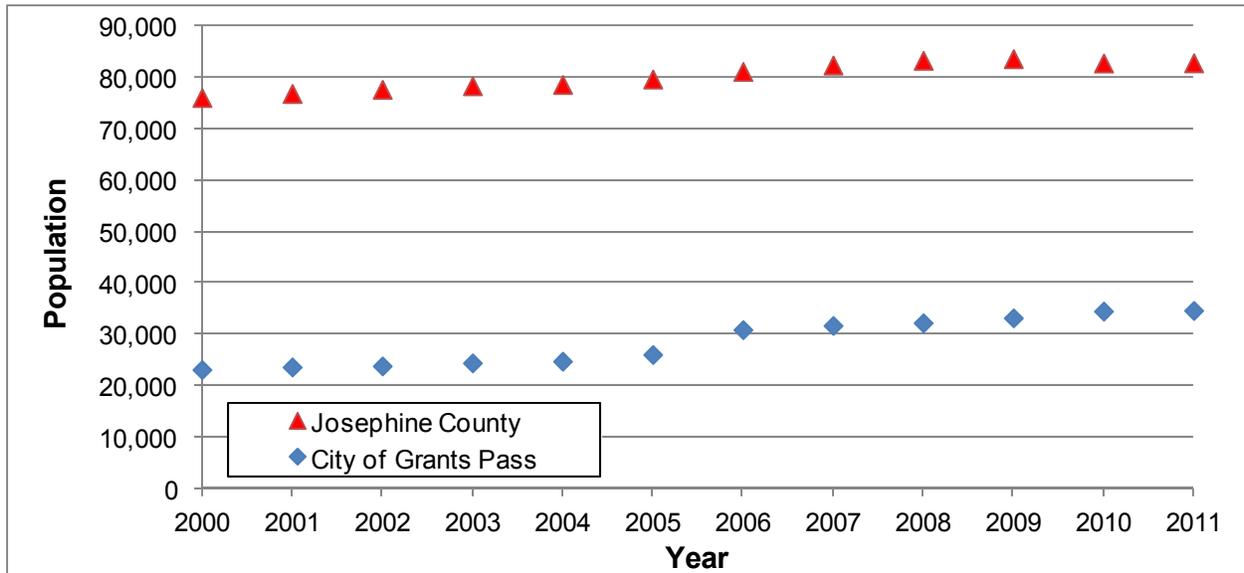
The City provided water to 36 residential properties in the North Valley area in 2011. At the City’s residential density of 2.68 people per dwelling unit, the North Valley area is estimated to contribute a population of 96 to the City’s service area.

**Table 1  
Historical City and County Population Summary**

Year	City of Grants Pass		Josephine County		Percent of County Population
	Population	Percent Annual Growth	Population	Percent Annual Growth	
2000	23,170		76,050		30%
2001	23,670	2.2%	76,850	1.1%	31%
2002	23,870	0.8%	77,650	1.0%	31%
2003	24,470	2.5%	78,350	0.9%	31%
2004	24,790	1.3%	78,600	0.3%	32%
2005	26,085	5.2%	79,645	1.3%	33%
2006	30,930	19%	81,125	1.9%	38%
2007	31,740	2.6%	82,390	1.6%	39%
2008	32,260	1.6%	83,290	1.1%	39%
2009	33,225	3.0%	83,600	0.4%	40%
2010 <sup>1</sup>	34,533	3.9%	82,775	-1.0%	42%
2011	34,660	0.4%	82,820	0.1%	42%

Note: 1. 2010 population estimates are adjusted to reflect 2010 Census data.

**Figure 1  
Historical City and County Population Summary**



***Population Forecast***

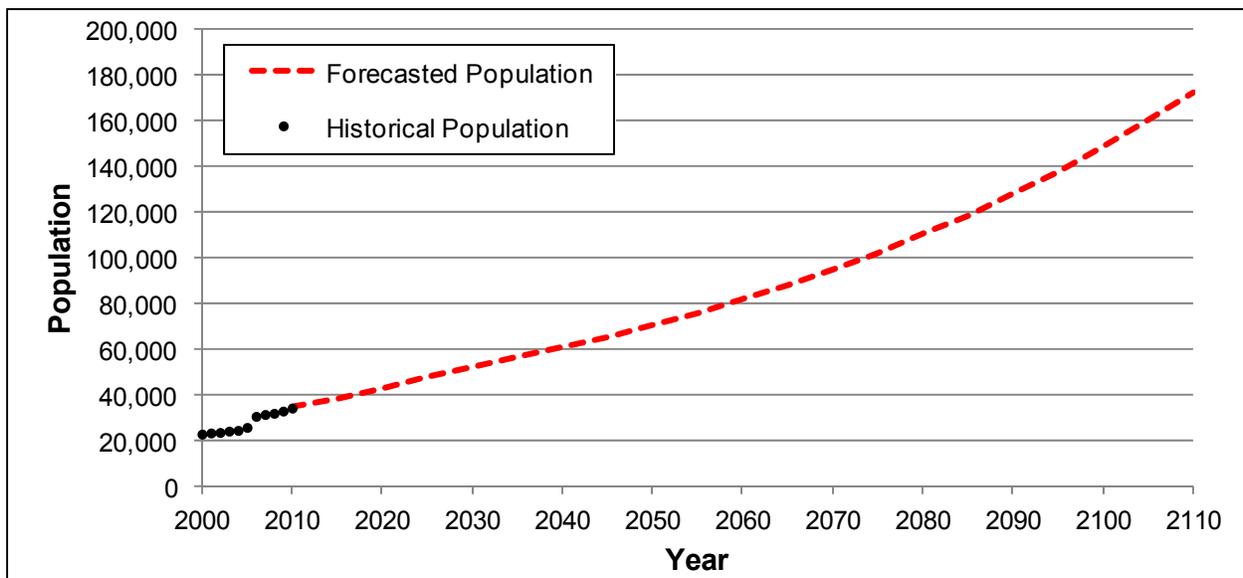
Planning studies have been prepared that forecast long-term population growth rates for Josephine County and the City. The Office of Economic Analysis reported a forecasted annual average growth rate for Josephine County from 2010 to 2040 of 1.1 percent. The relative historical growth rates of the City and Josephine County suggest that the 1.1 percent rate projected for the whole county is much lower than the recent and historical population growth rate of the City. The City’s current Comprehensive Plan contains forecasted annual average population growth rates of 2.2 percent for the period 2007 through 2027 and 1.51 percent for the period 2027 through 2057. These rates are below the 2000 through 2010 actual growth rate of 4.0 percent.

Given the historically high recent growth rates of the City, a 2.2 percent annual growth rate is assumed through 2014. Thereafter, the annual growth rate is assumed to decline at a rate of 0.1 percent every five (5) years until it reaches an annual rate of 1.5 percent in 40 years. This results in a 20-year average annual growth rate of approximately 2.05 percent and a 50-year average annual growth rate of approximately 1.78 percent. The population projections using this approach are generally consistent with those in the City’s Comprehensive Plan which projects a population of 54,540 in 2029 and 79,275 in 2057. The population forecast through a 100-year planning horizon to 2110 is reported in Table 2 and illustrated in Figure 2.

**Table 2  
Population Forecast Summary**

<b>Year</b>	<b>Service Area Population</b>	<b>Average Annual Growth Rate</b>
2010 (Census Estimate plus North Valley Estimate)	34,649	2.2%
2015	38,632	2.1%
2020	42,862	2.0%
2025	47,323	1.9%
2030	51,993	1.8%
2035	56,844	1.7%
2040	61,843	1.6%
2050	72,125	1.5%
2060	83,704	1.5%
2070	97,142	1.5%
2080	112,738	1.5%
2090	130,837	1.5%
2100	151,841	1.5%
2110	176,218	1.5%

**Figure 2  
Historical and Forecasted City Population**



The population forecasts presented in this memorandum are based on a review of historical population trends within the City and Josephine County and an extrapolation of population projections developed by the City for the purposes of land use and economic forecasting. The long-range forecasts presented do not consider potential future external influences on growth rates such as limitations on developable land, changing economic conditions, large shifts in demographic characteristics, and other factors. The projections provide an appropriate basis for long-term water system planning. It is expected that the accuracy of this forecast will decline significantly beyond a 20-year planning horizon as external influences not considered impact growth patterns.

## **Water Demand**

### ***General***

Existing and future water demand estimates were developed following a review of historical water demand data provided by the City and population forecasts presented above. The term “water demand” refers to all the water requirements of the system including domestic, commercial, municipal, institutional as well as unaccounted-for water. A given water demand at any one time includes the sum of production from the City’s Water Filtration Plant (WFP) plus the outflow from storage reservoirs. Demands are discussed in terms of gallons per unit time such as million gallons per day (mgd) or gallons per minute (gpm). Demands are also related to per capita use as gallons per capita per day (gpcd). Terminology used in this section to describe water usage characteristics are defined below:

Average Daily Demand (ADD): The Average Daily Demand is the total volume of water produced in a given year divided by 365 days. ADD is often used to forecast water volumes on an annual basis for estimating power costs, water revenue, and other considerations.

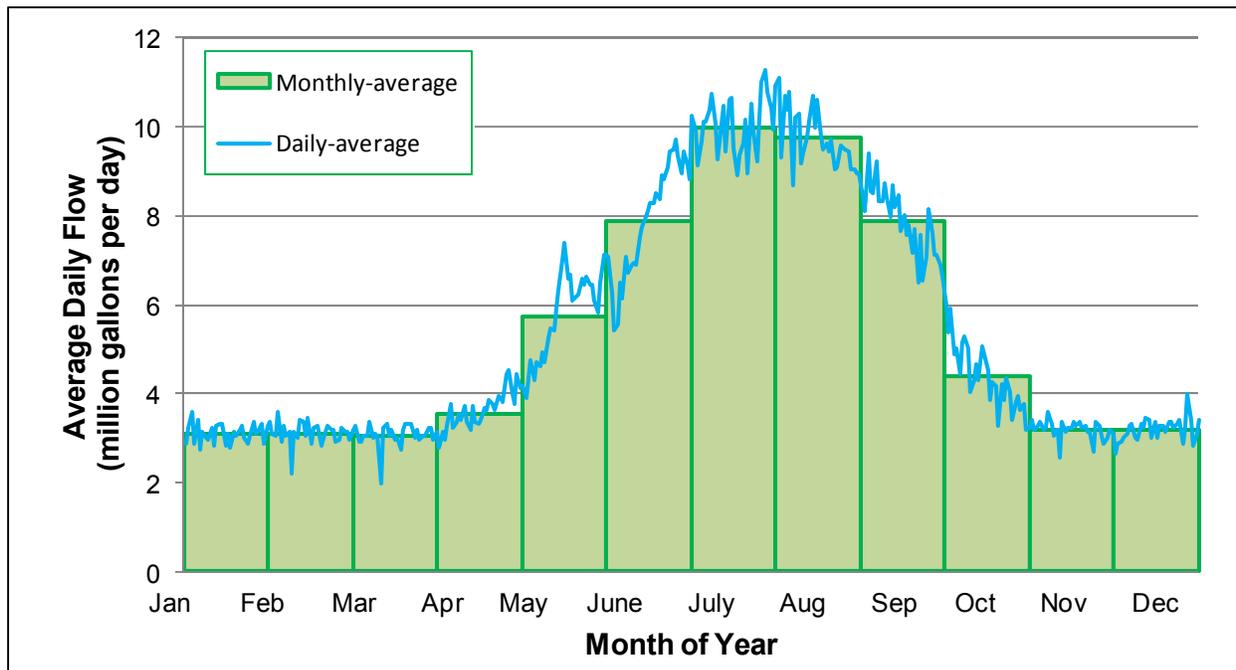
Peak Season Demand (PSD): Peak Season Demand is the average daily demand for the 122 days of the peak water use season; defined as June 1st to September 30th. The PSD reflects summer season outdoor water use patterns.

Maximum Day Demand (MDD): The Maximum Day Demand is the largest volume of water used, through production and changes in reservoir storage, in any single day of the calendar year. MDD is typically used to size the capacity of supply sources, treatment facilities, transmission piping, pumping facilities and finished water storage facilities. MDD usually occurs in the July to August months in the Pacific Northwest and is associated with increased outdoor water use on the hottest days of the year.

Peaking Factor: The ratio of the MDD to the ADD is commonly described as the peaking factor.

Figure 3 graphically presents both daily demand records and average monthly demands based on 5 years of production records. This figure illustrates the daily and seasonal variations in water demand for the water system.

**Figure 3  
Historical Average Demand**

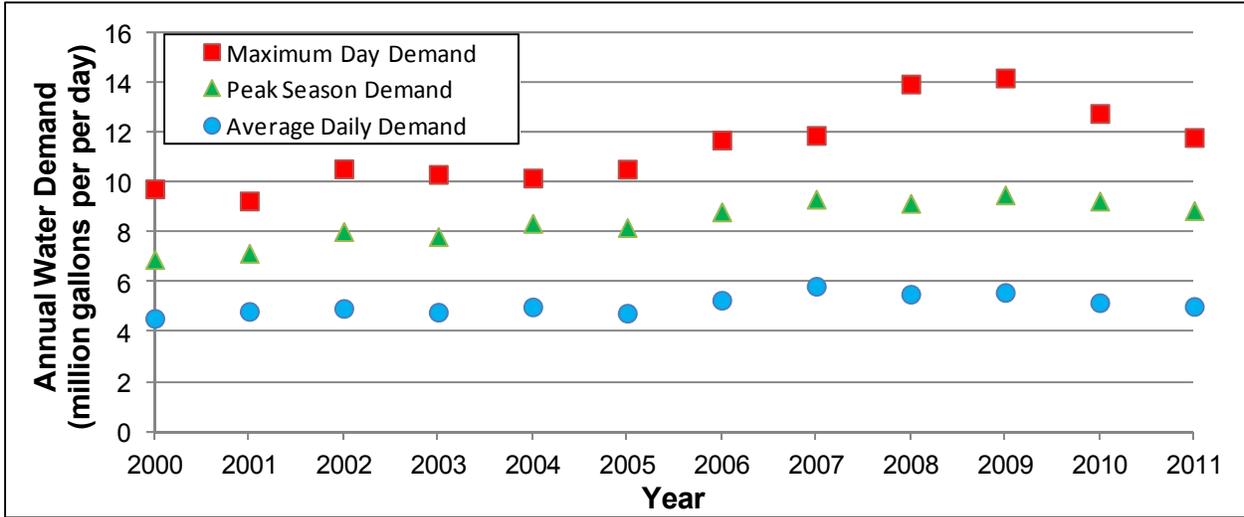


***Historical Water Demand***

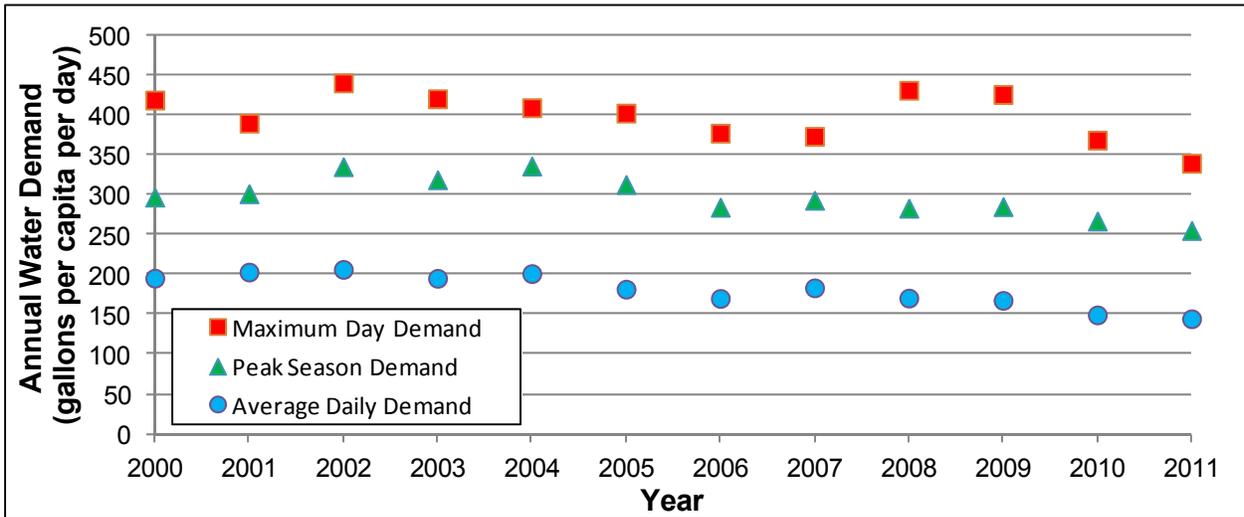
The City records daily production at the WFP which are used to generate historical water demand statistics. Based on the historical average population presented above and water usage patterns, the water service area’s average daily demand over the last five years has been between 5.0 and 5.8 mgd with an average day per capita consumption ranging between 145 gpcd and 184 gpcd. This is a typical range of average per capita daily demands for the region.

The historical MDD has been between 9.3 and 14.2 mgd with a maximum day per capita consumption ranging between 266 gpcd and 447 gpcd. The large range in maximum demand is due to the large number of variables that can influence summer season demand which include air temperature, precipitation, weekday versus weekend weather patterns, and other factors. Maximum day demands typically range from 250 to 450 gpcd using similar aggregate forecasting methods for similar sized communities in western Oregon and Washington. Table 3 summarizes historical water demand data for the years 2000 through 2011 by total production, per capita rates and peaking factor. The water demand characteristics for 2011 are anomalous in that the MDD is much smaller than the previous years. Figures 4 and 5 illustrate the historical water demand characteristic as both daily and per capita demands.

**Figure 4**  
**Historical Daily Water Demand Characteristics**



**Figure 5**  
**Historical Per Capita Water Demand Characteristics**



**Table 3  
Historical Water Demand Summary**

Year	Water Service Area Population	Water Demand (million gallons per day)			Per Capita Water Demand (gallons per capita per day)			Peaking Factor	
		ADD	PSD	MDD	ADD	PSD	MDD	PSD	MDD
2000	23,249	4.5	6.9	9.7	195	296	419	1.52	2.14
2001	23,750	4.8	7.1	9.2	203	300	389	1.48	1.92
2002	23,951	4.9	7.9	10.5	206	328	440	1.59	2.13
2003	24,552	4.8	7.9	10.3	195	322	420	1.65	2.15
2004	24,873	5.0	8.1	10.2	201	327	409	1.63	2.03
2005	26,169	4.8	7.6	10.5	182	291	402	1.60	2.22
2006	31,015	5.3	8.4	11.7	170	272	377	1.60	2.22
2007	31,826	5.8	9.4	11.9	183	296	373	1.61	2.04
2008	32,346	5.5	9.0	13.9	170	277	431	1.63	2.53
2009	33,318	5.6	9.1	14.2	167	273	425	1.63	2.54
2010	34,632	5.2	8.6	12.8	149	248	368	1.66	2.47
2011	34,756	5.0	8.3	11.8	144	240	339	1.66	2.35
<i>5-year average ('06-'10)</i>		<i>5.5</i>	<i>8.9</i>	<i>12.9</i>	<i>168</i>	<i>273</i>	<i>395</i>	<i>1.63</i>	<i>2.36</i>
<i>10-year average ('00-'10)</i>		<i>5.1</i>	<i>8.2</i>	<i>11.4</i>	<i>184</i>	<i>294</i>	<i>405</i>	<i>1.60</i>	<i>2.22</i>

- Notes:
1. Abbreviations: Average Daily Demand (ADD); Peak Season Demand (PSD); Maximum Daily Demand (MDD).
  2. The water demand characteristics for 2011 are anomalous, and are not used to calculate historical averages.
  3. Water service area population includes the North Valley area component.

## ***Projected Water Demands***

Projections of future water demands are determined based upon present and historical per capita water use characteristics and forecasted future population.

Water demand forecasts are used to ensure adequate supply and transmission capacity under a maximum day demand scenario. Major water infrastructure projects often take 5 to 10 years to complete as the City proceeds from identification of a deficiency through project planning, funding, design, bidding, award and construction. Based on a review of historical and current water use characteristics within the City's water service area, observation of regional and national water use trends, and anticipated future advances in water saving technology, the following water demand projection criteria are used:

### 20-Year Planning Horizon (~2035)

- Per capita average day demand assumed to be at the average rate over the 5 years from 2006 through 2010, 170 gpcd.
- Per capita maximum day demand assumed to be approximately 400 gpcd based on the average peaking factor of 2.35 over the 2006 through 2010 period.

### Beyond the 20-Year Planning Horizon

- Beyond the 20-year planning period, it is more probable that water demand growth will not increase at the same rate as assumed for the near term planning purposes.
- The per capita water demand rate was assumed to decrease from 170 gpcd by 5 gpcd after each 5-year block such that a demand of 140 gpcd is achieved by 2065.

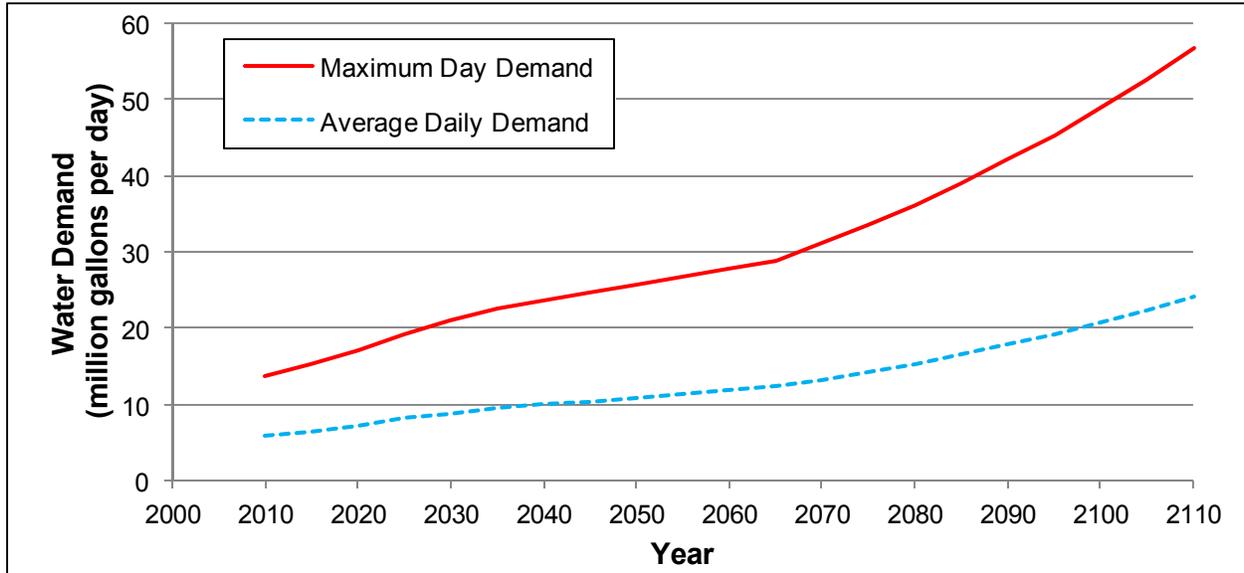
Table 4 presents a summary of population and water demand forecasts in five year increments through 2040 and in 10-year increments to the year 2110. The purpose of the forecasts presented in this memorandum is to provide a basis for planning of water supply and treatment needs. It is recommended that these projections be updated every 5 to 10 years to reflect current conditions and to support updates of capital infrastructure prioritization, funding and implementation.

**Table 4  
Population and Water Demand Forecasts Summary**

<b>Year</b>	<b>Service Area Population</b>	<b>AAGR (percent)</b>	<b>Per Capita Demand (gpcd)</b>	<b>ADD (mgd)</b>	<b>MDD (mgd)</b>
2015	38,632	2.1%	170	6.6	15.5
2020	42,862	2.0%	170	7.3	17.1
2025	47,323	1.9%	170	8.0	18.9
2030	51,993	1.8%	170	8.8	20.8
2035	56,844	1.7%	170	9.7	22.7
2040	61,843	1.6%	165	10.2	24.0
2045	66,951	1.5%	160	10.7	25.2
2050	72,125	1.5%	155	11.2	26.3
2055	77,700	1.5%	150	11.7	27.4
2060	83,704	1.5%	145	12.1	28.5
2065	90,173	1.5%	140	12.6	29.7
2070	97,142	1.5%	140	13.6	32.0
2075	104,650	1.5%	140	14.7	34.4
2080	112,738	1.5%	140	15.8	37.1
2085	121,451	1.5%	140	17.0	40.0
2090	130,837	1.5%	140	18.3	43.0
2095	140,948	1.5%	140	19.7	46.4
2100	151,841	1.5%	140	21.3	50.0
2105	163,576	1.5%	140	22.9	53.8
2110	176,218	1.5%	140	24.7	58.0

Note: 1. Abbreviations: Average Annual Population Growth Rate (AAGR); Average Daily Demand (ADD); Maximum Daily Demand (MDD); million gallons per day (mgd); gallons per capita per day (gpcd)

**Figure 6**  
**Projected Water Demand**



### Summary

This memorandum presents historical and forecasted population and water demands. The current service area population is approximately 34,756 and the planning level ADD of 5.9 mgd and MDD of 13.9 mgd. By 2030, the population is forecasted to be approximately 51,993 and the projected ADD is 8.8 and the MDD is 20.8 mgd. The City of Grants Pass is anticipated to continue to expand and grow well beyond the UGB expansion currently being adopted. By 2110, the population is forecasted to be approximately 176,218 and the projected ADD is 25 and the MDD is 58 mgd. These projections are generally consistent with the Josephine County and City's current Comprehensive Plan projections. It is recommended that these projections will be updated every five (5) to 10 years to reflect current conditions and to support updates of capital infrastructure prioritization, funding and implementation.

BMG:mlm