CITY OF VACAVILLE

2015 Urban Water Management Plan Update

JULY 2016

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City of Vacaville 2015 Urban Water Management Plan Contact Sheet

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The water supplier is a: Municipality

The water supplier is a: Retailer

Utility services provided by the water supplier include: water treatment, storage, and distribution; wastewater treatment

Is this agency a bureau of reclamation contractor? Yes

Is this agency a state water project contractor? Yes

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1.0 INTRODUCTION AND OVERVIEW

The following plan has been prepared in accordance with State of California Assembly Bill No. 797. The bill, adopted in 1983, required all water suppliers in California with more than 3,000 customers or a demand exceeding 3,000 acre-feet annually to prepare and adopt an urban water management plan (UWMP) by 1985. The legislation also required the suppliers to adopt follow-up plans by December 31, 1990. Since originally adopted in 1983, the UWMP Act has been modified by several bills:

1. Assembly Bill 2661, adopted in July 1990, formally extended the process of requiring suppliers to update their plans every five years.

2. Subsequently, Senate Bill 553 (SB 553) was signed into law on September 28, 2000, revising the Urban Water Management Planning Act by replacing the 16 Demand Management Measures (DMMs) with the 14 Best Management Practices (BMPs) currently being implemented by Group 1 signatories to the Memorandum of Understanding Regarding Urban Water Conservation in California.

3. AB 2552 was signed into law on September 28, 2000, and requires each urban water supplier to notify any city or county within which the supplier provides water supplies that the urban water supplier will be reviewing its UWMP and considering changes to the plan.

4. AB 1420 was adopted in 2007 and requires water suppliers to implement the water Demand Management Measures to be eligible for water management grants or loans administered by the Department of Water Resources (DWR).

5. SBx7-7, adopted in 2009 and was passed with the goal of reducing municipal water use by 20 percent by the year 2020. SBx7-7 requires water suppliers to report baseline per capita water use, 2015 interim per capita water use target, 2020 per capita water use targets, and the basis for determining the estimates.

6. AB 2409 was adopted in 2010 and requires urban water suppliers to analyze and define water features that are artificially supplied with water, including ponds, lakes, waterfalls, and fountains, separately from swimming pools and spas.

7. SB 1036, adopted in 2010 and provides for an urban water supplier to include certain energy related information, including, but not limited to, an estimate of the amount of energy used to extract or divert water supplies.

8. SB 1420 was adopted in 2014 and provides for water use projections to display and account for the water savings estimated to result from adopted codes, standards, ordinances, or transportation and land use plans, when that information is available and applicable to an urban water supplier. This bill will also require the plan, or amendments to the plan, to be submitted electronically to the department, to include any standardized form, tables, or displays specified by the department, and requires a plan to quantify and report on distribution water loss.

9. AB 2067, adopted in 2014 and requires water suppliers to provide narratives describing their water demand management measures, as provided. Requires retail water suppliers to address the nature and extent of each water demand management measure implemented over the past 5 years and describe the water demand management measures that the supplier plans to implement to achieve its water use targets. The Bill also requires each urban water supplier to submit its 2015 plan to the Department of Water Resources by July 1, 2016.

1.1. UWMP Organization

Section 1.0 – Introduction and Overview: This section provides the contact sheet and a review of the plan contents.

Section 2.0 – Plan Preparation: Section 2.0 provides a basis for preparing the UWMP and a summary of public outreach activities and agency coordination.

Section 3.0 – System Description: This section provides background information on the City of Vacaville and a general description of the service area, climate, population and demographics.

Section 4.0 –System Water Use: Past, current, and projected water use and demand are provided in this section in five-year increments through the year 2040 for uses such as single-family residential, industrial, commercial, etc.

Section 5.0 –SBx7-7 Water Use Targets: The calculation of baseline per capita water use and per capita water use targets are presented in this section as required by SBx7-7.

Section 6.0 – System Supplies: This section reviews the past, current, and future sources for water in the City of Vacaville, including groundwater, surface water, and imported water.

Section 7.0 – Water Supply Reliability Assessment: This section assesses the reliability of the City's sources in the various type of rainfall years.

Section 8.0 –Water Shortage Contingency Planning: The City of Vacaville's enforcement prohibitions, methods, and ordinances as outlined in the Urban Water Shortage Contingency Plan (UWSCP) to ensure adequate water supply during drought years or other shortage situations.

Section 9. 0 –Water Demand Management Measures: Section 9.0 provides a description of each water DMM that is currently being implemented, or scheduled for implementation, including the steps necessary to implement any proposed measures.

Section 10.0 Plan Adoption, Submittal, and Implementation: This section details the UWMP public hearing, adoption, and submittal process.

APPENDIX A Urban Water Management Plan Checklist

APPENDIX B Public Hearing and Notification Material

APPENDIX C Resolution to Adopt the City of Vacaville 2015 Urban Water Management Plan Update

APPENDIX D UWMP Update Participants

APPENDIX E Groundwater Source Sufficiency Technical Memorandum

APPENDIX F 2011 Groundwater Management Plan Update

APPENDIX G 2014 Urban Water Shortage Contingency Plan

APPENDIX H Water Supply Reliability Technical Memorandum

APPENDIX I SBX7-7 Verification Forms

APPENDIX J Ordinance No.1891 Adopting State Model Water Efficient Landscape Ordinance Division 14.27

APPENDIX K 2014 Drinking Water Quality Consumer Confidence Report

The Department of Water Resources Urban Water Management Plan Checklist is used to confirm that the required information is included in the UWMP. A Checklist for the 2015 UWMP Update is included in Appendix A.

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2.0 PLAN PREPARATION

2.1. Basis for Plan Implementation

This UWMP provides a comparison of water supplies available to the City of Vacaville (City) with the projected water demand through the year 2040, as well as discusses conservation measures the City has implemented to ensure a safe and reliable water supply is available to the City. As with previous UWMP Updates prepared by the City, this plan will be used to provide the basis for determining that sufficient water supply is available for future proposed development.

This UWMP also provides the per capita water use baseline and target required by SBx7-7. The City will compare the per capita water use in upcoming years with the SBx7-7 targets to ensure the City continues to meet the 2020 per capita water use target.

2.2. Regional Planning

In response to assembly Bill 797, the City prepared and submitted its first UWMP in 1985. The follow-up plan in 1990 was prepared and submitted in January 1991 as part of a county-wide effort. The water agencies in Solano County with which the City cooperated for the 1990 plan were the City of Benicia, City of Fairfield, Solano County Water Agency (SCWA), City of Suisun, and the City of Vallejo. Subsequent updates to the 1990 plan including the 2010 plan update were produced as individual plans by the City. The 2015 UWMP incorporated the June 2013 revisions as well as addressing the latest legislative bill requirements.

2.3. Public Outreach

The City has actively encouraged community participation in its urban water management planning efforts since the first plan was developed in 1985. Advertisements were placed in the Vacaville Reporter (the local newspaper) and the draft Plan was made available to the public for review and comment before City Council approval. Copies of the draft Plan were available at City offices. Additionally, community input was sought during the development of the UWMP Workshop, which was held during the City Council meeting on June 28, 2016. Copies of the newspaper advertisement are included as Appendix B.

2.4. Agency Coordination

City Utilities Department staff coordinated the development of this plan with the City Finance Department. The Utilities Department is responsible for utility billing and maintains statistical data regarding water consumption. See Appendix D for a list of people contacted in the development of this plan.

The City also continues participation with SCWA as part of a Water Conservation Committee (WCC). This county-wide committee allows for broader distribution of materials and information as well as reduced costs to individual cities by sharing resources. Specific projects are highlighted in Section 9.0 of this plan.

SCWA is a wholesaler who supplies surface water to the City. SCWA is also instrumental in generating water source reliability factors used later in this report to determine the reliability of water sources. Water demand projections developed as part of this plan have been shared with SCWA. A copy of the UWMP will be provided to SCWA after adoption of the plan.

The City recently adopted the General Plan on August 11, 2015. The City referenced the General Plan to ensure that information provided in the UWMP is consistent with the adopted General Plan.

3.0 SYSTEM DESCRIPTION

This section presents history and population growth information for the City, as well as a description of the City's existing water supply system facilities, service area, climate, and demographics.

3.1. City Background

History and Growth

The City of Vacaville, founded in 1850, is nestled at the base of the Vaca Mountains. Vacaville is located centrally between Sacramento and San Francisco on Interstate 80. City limits encompass over 33 square miles with a population of approximately 95,000, which makes Vacaville the third largest city in Solano County.

The population of Vacaville increased by 63 percent from 1980 to 1990 and increased an additional 24 percent from 1990 to 2000. The growth rate from 2000 to 2010 was approximately 10 percent. A slower growth rate was seen in the last five years with only 2.5 percent which is likely attributed to the economic downturn. It is anticipated that the population will grow by an additional 20 percent from 2015 to 2040. This population projection is based on the current general plan which is consistent with the projections from the Association of Bay Area Governments, Projections 2013.

Population projections for Solano County published in the Vacaville General Plan's 2015-2023 Housing Element are summarized in Table 3-1.

Table 3-1 Retail: Population - Current and Projected

Population Served	2015	2020	2025	2030	2035	2040*(opt)*
	89,627	92,464	95,964	99,764	103,964	108,264

NOTES: Adjusted values of ABAG Population projections to exclude the prison population that is served by Solano County Water Agency (SCWA)

The population projections in Table 3-1 include the population of California State Prison – Solano (CSP-Solano) and the California Medical Facility (CMF). A portion of the water demand for these facilities is met by the Solano County Water Agency (SCWA). Therefore, the total population for the City is adjusted to remove the portion of the prison population that is served by SCWA. To determine the fraction of CSP-Solano and CMF population that is served by the City, the total population of the prison is adjusted by the proportion of water served by the City to the total amount of water delivered to the facilities, using the following equation:

$$Pop_{City} = (Pop_{tot}) \frac{(V_{City})}{(V_{City} + V_{SID})}$$

Where Pop_{City} is the portion of the prison population that is served by the City, Pop_{tot} is the total population of the facilities, V_{City} is the volume of water delivered by the City, and V_{SID} is the volume of water delivered by Solano Irrigation District (SID). The total amount of water supplied to the prison is $V_{City} + V_{SID}$.

The population of the City used to determine per capita baseline and targets is the total population of the City, plus the difference between the total and adjusted prison populations. The calculation of the adjusted City population from 1999 to 2015 is provided in Table 3-A.

Table 3-A
Determination of Adjusted City Population

Year	Total Prison Population	Water Delivered by City, MG	Water Delivered by SCWA, MG	Adjusted Prison Population[a]	Total City Population	Adjusted City Population[b]
1999	8,863	55	447	971	85,817	77,925
2000	8,810	159	374	2,628	87,551	81,376
2001	9,031	148	388	2,494	90,262	83,720
2002	9,071	272	404	3,650	91,817	86,393
2003	9,049	123	410	2,088	92,807	85,840
2004	9,230	167	391	2,766	93,350	86,886
2005	9,112	186	362	3,098	93,954	87,940
2006	9,039	227	336	3,645	93,129	87,735
2007	9,110	91	378	1,768	92,980	85,638
2008	8,580	66	333	1,422	93,069	85,911
2009	7,698	51	288	1,164	92,493	85,959
2010	7,683	63	245	1,587	92,428	86,317
2011	7,740	124	181	3,145	92,310	87,715
2012	6,660	78	133	2,465	92,887	88,692
2013	6,247	193	88	4,296	93,232	91,281
2014	6,076	103	175	2,249	93,815	89,988
2015	6,189	43	196	1,114	94,702	89,627

[a] The Adjusted Prison Population is determined by multiplying the Total Prison Population by the Water Delivered by City and dividing by the sum of Water Delivered by City and Water Delivered by SCWA.

[b] The Adjusted City Population is determined by subtracting the Total Prison Population from the Total City Population and then adding the Adjusted Prison Population.

Prison population and water supply data is available for 1999 through 2015. The methodology described above was used to determine the adjusted City population for this period. The prison population prior to 1999 is assumed to be the average prison population between 1999 and 2010 (8,701). To determine the portion of the prison population served by the City during years prior to 1999, the average amount of water supplied to the prison was multiplied by the average percentage of the water supplied to the prison that is supplied by the City (27 percent). Using this methodology, the prison population receiving water supplied by the City is estimated to be 2,353 from 1995 through 1998. The estimated total prison population of 8,701 and the estimated population that received City water of 2,353, is used to determine the adjusted City population from 1995 through 1998.

3.2. Description of Existing Facilities

The water utility system is a self-supporting City enterprise that provides water to the residences of the City. The City's water supply service area is coaligned with the city limits. The water utility is responsible for operation, maintenance, and repair of the City's water treatment and distribution system, as well as water quality. It is also responsible for meter installation and meter reading. Vacaville's water utility system was purchased from Pacific Gas and Electric (PG&E) Company in 1959 by issuing voter-approved water revenue bonds. Since purchasing the system, the City has systematically improved and upgraded it.

The Vacaville water system consists of surface water treatment facilities, wells, pumping facilities, distribution and transmission pipelines, and storage reservoirs. The system receives water from several sources, including Solano Project water from the Lake Berryessa reservoir, State Water Project water and Settlement Water from the North Bay Aqueduct (NBA), and groundwater from local city wells. Within Vacaville's water entitlements, the percentage of water used from each supply source varies due to conjunctive use. If any one source has limited water availability or poor water quality, use from other sources can increase. Likewise, if unscheduled water becomes available it can be utilized to the City's advantage.

Surface water from Lake Berryessa is provided by contract between the U.S. Bureau of Reclamation and the SCWA and delivered by the SID. This water is treated at either the North Bay Regional Water Treatment Plant (NBR) or at the City's diatomaceous earth water treatment plant (DE Plant). The DE Plant has a rated capacity of 12 million gallons per day (mgd) and a firm capacity of 10 mgd. Wells 1, 6, and 13 also supply water directly to the DE Plant clearwell. From the clearwell, a booster pump station pumps the water into the distribution system. Water from the remaining wells (2, 3, 5, 8, 9, 14, 15, 16, and De Mello) is treated at the wellhead and pumped directly to the distribution system. Well 7 was put out of service due to a damaged casing in 2009 but has not been abandoned through the county process. The De Mello Well is currently being used as a standby well. The City is evaluating locations for the construction of a new well that will meet water quality requirements. The locations of the City wells and DE Plant are shown in Figure 1 (pg. 3-5).

The NBR plant provides a capacity of 13.3 mgd for Vacaville and supplies water directly to the City's distribution system. The NBR plant draws water from the Sacramento River Delta via the NBA, as well as Solano Project water from the Putah South Canal. The location of the NBA and Putah South Canal can be seen in Figure 2 (pg. 3-6).

Climate

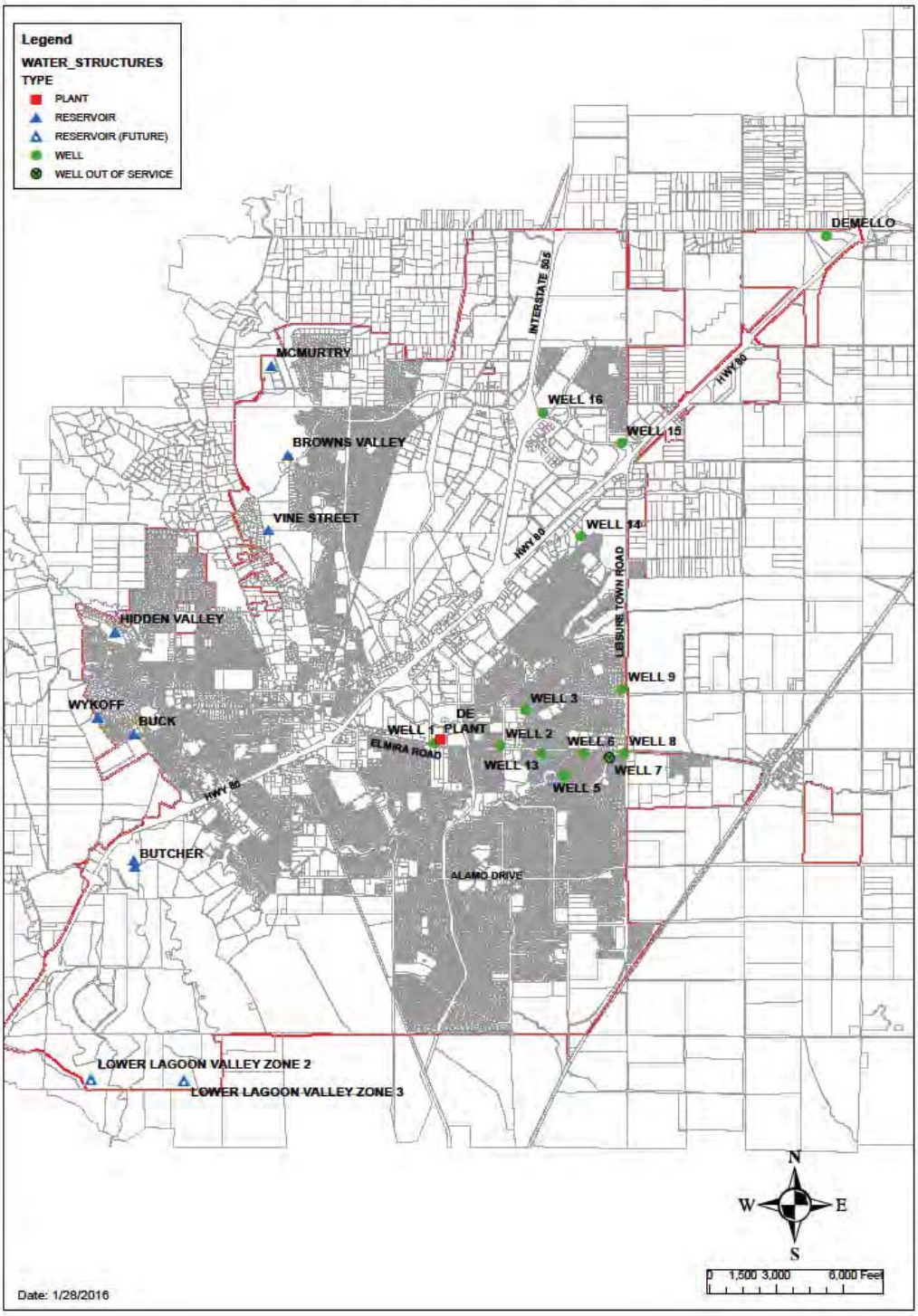
The climate in Vacaville is characterized by mild winters and hot summers. The Western Regional Climate Center reports that the annual average precipitation is 24.55 inches, 85 percent of which occurs from December through March. Temperatures during the winter usually drop into the forties at night and occasionally drop below the freezing point. Snow is extremely rare. In the summer, temperatures often rise above 100 degrees. The days are

typically hottest between four and five P.M. and temperatures cool off noticeably in the evenings.

The climate has significant influence on the water demands in Vacaville. Winters are characterized by relatively low water demand, while the summers have substantially higher demand. Lawn watering in the summer is a major contributor to the higher summer demand.

FIGURE 1

CITY OF VACAVILLE
MUNICIPAL WELLS, DE PLANT AND RESERVOIRS



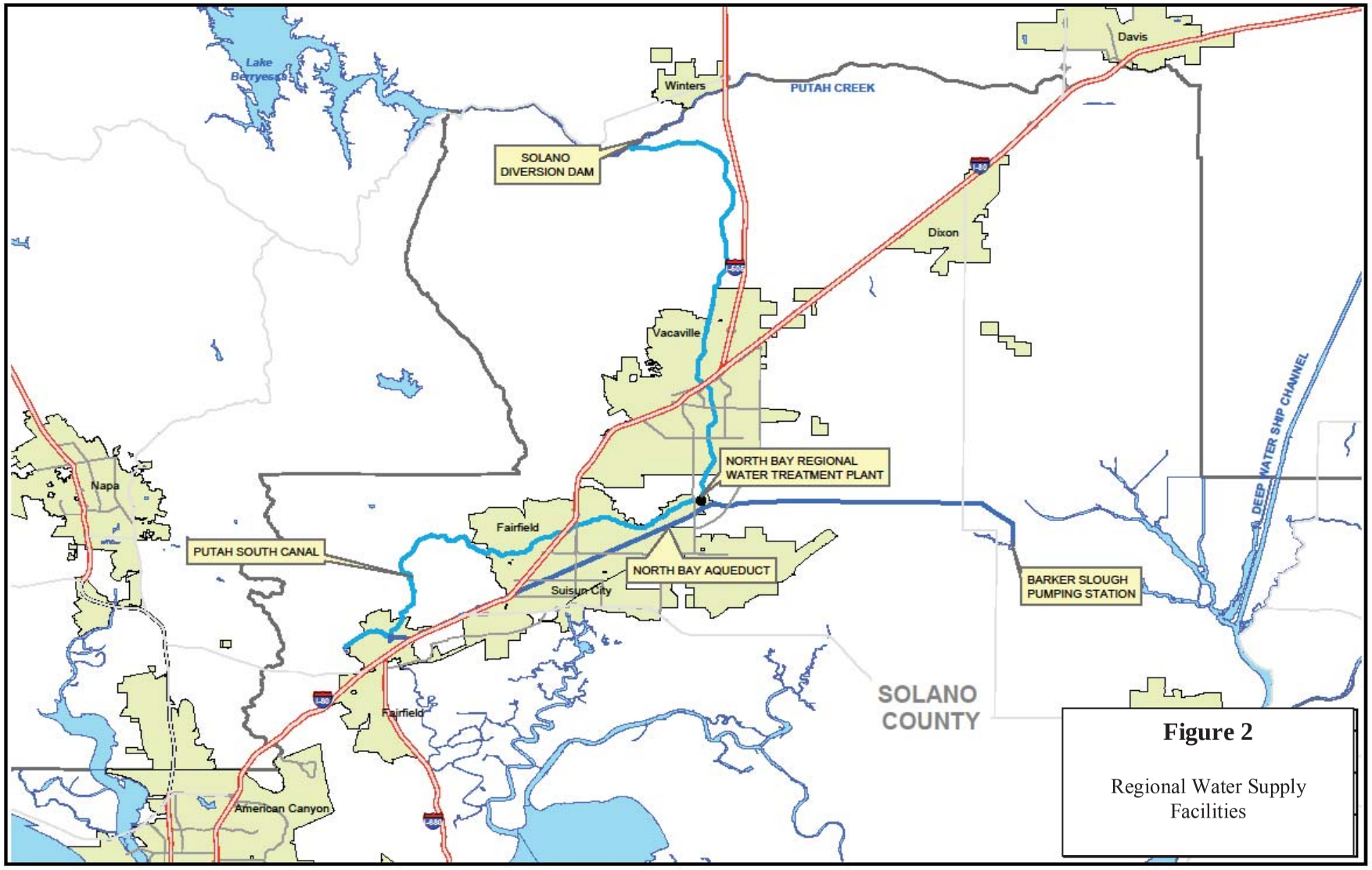


Figure 2

Regional Water Supply Facilities

4.0 SYSTEM WATER USE

4.1. Water Uses by Sector

Vacaville is mostly comprised of single-family residential neighborhoods. On average over the last five years, 70 percent of the City's total water consumption occurs in the residential sector. For this reason, the City has chosen to focus water conservation efforts on residential household and landscape usage.

Table 4-1 Retail: Demands for Potable and Raw Water - Actual

Use Type *(Add additional rows as needed)*	2015 Actual		
Drop down list May select each use multiple times These are the only Use Types that will be recognized by the WUEdata online submittal tool	Additional Description *(as needed)*	Level of Treatment When Delivered *Drop down list*	Volume
Single Family		Drinking Water	7,303
Multi-Family		Drinking Water	1,540
Commercial		Drinking Water	1,066
Industrial		Drinking Water	773
Institutional/Governmental		Drinking Water	565
Landscape		Drinking Water	1,325
Other		Drinking Water	78
Losses		Drinking Water	555
		TOTAL	13,205

4.2. Distribution System Water Losses

The City has been reporting Water Loss in the system since 2005. The 2015 unaccounted quantity is less than 5 percent of the City's total water production. Water is lost both through leaks in the water distribution system and in the reduced accuracy of water consumption recording as a result of deterioration in accuracy and/or failure of water meters. The City replaced over 14,000 conventional water meters to automatic meter read (AMR) meters for residential customers which reduced the amount of unaccounted water. The Meter Replacement Program is an ongoing program that will convert all remaining conventional meters to automatic read meters and establish a ten-year cycle to maintain accuracy.

4.3. Low Income Water Demand

The projected water demand for low income housing is described in this section. A low income household is defined as a household whose income is 80 percent or less of the median income in the City.

The *Vacaville General Plan 2015-2023 Housing Element*, adopted on May 12, 2015, shows the number of units needed per the ABAG Housing Need Determination during the period of January 31, 2015, through January 31, 2023, totals 1,084. Low income housing units

make up 39 percent (421 units) of the total units needed. The City established a goal of 472 units with Affordability Restrictions that fall below the 80 percent of median household incomes. The water demand of low income housing was calculated by scaling the single-family residential water demand from the average volume per connection from 2010 to 2014 resulting in 0.38ac-ft/yr per unit. This is thought to be conservative because larger housing types that are not typically associated with low income housing, such as residential estates, typically have higher water demands.

The Housing Element states, as New Construction Implementing Policy H.1- I22, that the City will grant priority for service allocation to proposed developments that include housing units affordable to lower-income households. The 2023 Total Demand in ac-ft/yr for Low Income Housing comes out to 160 ac-ft/yr.

5.0 SBX7-7 BASELINES AND TARGETS

In February 2008 Governor Arnold Schwarzenegger introduced a plan for improving the Sacramento-San Joaquin Delta, a component of which is to achieve a 20 percent reduction in per capita water use statewide by the year 2020. In November 2009 Senate Bill 7-7 (SBx7-7) was signed into law, addressing urban and agricultural water conservation. SBx7-7 requires water suppliers to calculate baseline per capita water use and per capita water use targets for 2015 and 2020 in the 2010 UWMP.

Beginning in 2016 retail water suppliers are required to comply with the water conservation requirements in SB X7-7 in order to be eligible for State water grants or loans.

5.1. Updating Calculations from 2010 UWMP

The water use target for 2020 was calculated in the 2010 UWMP based on the assumption that the Vacaville city limits were completely contained within the Sacramento River Hydrologic Region. Using the latest online tool provided by the DWR, a small percentage of the City's area was found to be in the San Francisco Bay Hydraulic Region. Per the 2015 Guidebook, the 2020 urban water use target was proportionally calculated to be 164 as shown in SB X7-7 Table 7-E in Section 5.6. This was a reduction from the 167 target calculated in the 2010 UWMP.

5.2. Baseline Period

The baseline period is the average annual per capita water use calculated over a period of ten years ending between 2004 and 2010. The City's ten year period was taken from 2000 to 2009. The determination of baseline per capita water use for the City is summarized in SB X7-7 Table 5 in Section 5.5.

The 5-year baseline period to confirm the selected 2020 target was calculated using a continuous 5-year period ending no earlier than 2007 and no later than 2010. The City's 5-year period was taken from 2004 to 2008 as shown in SB X7-7 Table 5.

5.3. Service Area Population

Vacaville city limits correspond to the service area boundary during the baseline period and the compliance year of 2015. Therefore, the City has used the City Finance Department's population tables for estimating population.

5.4. Gross Water Use

The City has continued to track the volume of water entering the distribution system for the last 15 years from all 3 sources as detailed in Chapter 6, System Supplies.

5.5. Baseline Daily Per Capita Water Use

As seen in SB X7-7 Table 5, the Daily per Capita Water Use is reported in gallons and is referred to as Gallons per Capita per Day (GPCD). The City's baseline per capita water use is 188 GPCD for the 10- year period ending in 2009.

SB X7-7 Table 5: Gallons Per Capita Per Day (GPCD)				
Baseline Year *Fm SB X7-7 Table 3*		Service Area Population *Fm SB X7-7 Table 3*	Annual Gross Water Use *Fm SB X7-7 Table 4*	Daily Per Capita Water Use (GPCD)
10 to 15 Year Baseline GPCD				
Year 1	2000	82,460	16,804	182
Year 2	2001	83,725	17,658	188
Year 3	2002	86,396	17,577	182
Year 4	2003	85,846	17,461	182
Year 5	2004	86,882	18,456	190
Year 6	2005	87,935	17,985	183
Year 7	2006	87,734	18,555	189
Year 8	2007	85,638	19,336	202
Year 9	2008	85,908	19,390	202
Year 10	2009	85,953	17,690	184
Year 11	0	-	-	
Year 12	0	-	-	
Year 13	0	-	-	
Year 14	0	-	-	
Year 15	0	-	-	
10-15 Year Average Baseline GPCD				188
5 Year Baseline GPCD				
Baseline Year *Fm SB X7-7 Table 3*		Service Area Population *Fm SB X7-7 Table 3*	Gross Water Use *Fm SB X7-7 Table 4*	Daily Per Capita Water Use
Year 1	2004	86,882	18,456	190
Year 2	2005	87,935	17,985	183
Year 3	2006	87,734	18,555	189
Year 4	2007	85,638	19,336	202
Year 5	2008	85,908	19,390	202
5 Year Average Baseline GPCD				193
2015 Compliance Year GPCD				
2015		89,627	13,204	**132**

5.6. 2015 and 2020 Per Capita Water Use Target

SBx7-7 requires cities to achieve a minimum amount of conservation regardless of the 2020 Per Capita Water Use Targets calculated by the four methods. This minimum amount of conservation is described in Section 10608.22 of SBx7-7. A water supplier may not use a per capita water use target greater than the water use target described in Section 10608.22.

The per capita water use target, which must be met by 2020, must be calculated using one of four methods described in the *Guidebook for Urban Water Suppliers to Prepare a 2015 Urban Water Management Plan* (UWMP Guidebook). The four methods are, in brief:

Method 1: 80 percent of Baseline Per Capita Water Use.

Method 2: Performance standard based on actual and estimated water use data including indoor residential water use; landscaping area; commercial, industrial, and institutional water use.

Method 3: 95 percent of the State Hydrologic Regional Target Water Use.

Method 4: Subtract water savings based on identified practices from Baseline Per Capita Water Use.

The City evaluated all four methods and determined that Methods 1 and 3 are the most appropriate methods to determine Vacaville's 2020 Per Capita Water Use Target. It is in the City's interest to use the highest target calculated by the four methods in order to minimize impacts to the water users of the City while still meeting established water use goals. The City used Methods 1 and 3 to determine potential per capita water use targets. Using Method 1, the per capita water use target is 80 percent of the baseline per capita water use. The City's per capita water use target would be 151 gpcd using Method 1 as shown in SB X7-7 Table 7-A.

SB X7-7 Table 7-A: Target Method 1
20% Reduction

10-15 Year Baseline GPCD	2020 Target GPCD
188	151

Using Method 3, the per capita water use target is 95 percent of the applicable state hydrologic region target as defined in the draft 20x2020 Water Conservation Plan. The majority of the City is located in hydrologic region 5 at 94 percent with 6 percent of the City within region 2. Region 5 has a hydrologic region target of 176 gpcd and region 2 has a target of 131. The City's per capita water use target, based on Method 3, is therefore 164 gpcd as calculated in SB X7-7 Table 7-E.

SB X7-7 Table 7-E: Target Method 3

Agency May Select More Than One as Applicable	Percentage of Service Area in This Hydrological Region	Hydrologic Region	"2020 Plan" Regional Targets	Method 3 Regional Targets (95%)
–		North Coast	137	130
–		North Lahontan	173	164
X	94%	Sacramento River	176	167
X	6%	San Francisco Bay	131	124
		San Joaquin River	174	165
–		Central Coast	123	117
–		Tulare Lake	188	179
–		South Lahontan	170	162
		South Coast	149	142
		Colorado River	211	200
Target *(If more than one region is selected, this value is calculated.)*				164

The 2020 Per Capita Water Use Target of 164 gpcd calculated by Method 3 is the preferred target, however further comparison to a maximum target figure is required. As seen in SB X7-7 Table 5, the average maximum water use target is determined using a baseline per capita water use calculated by averaging per capita water use over a 5-year period ending between 2007 and 2010. For the City, this period was from 2004 to 2008 and produced an average maximum water use of 193 gpcd. The maximum per capita water use target is 95 percent of this baseline per capita water use which corresponds to a maximum per capita water use target of 183 gpcd (95 percent of 193 gpcd). Because the maximum per capita water use target (183 gpcd) is greater than the per capita water use target calculated for 2020 using Method 3 (164 gpcd), the City is required to use the per capita water use target calculated with Method 3. The maximum per capita water use target calculation for the City is summarized in SB X7-7 Table 7-F.

SB X7-7 Table 7-F: Confirm Minimum Reduction for 2020 Target			
5 Year Baseline GPCD *From SB X7-7 Table 5*	Maximum 2020 Target[1]	Calculated 2020 Target[2]	Confirmed 2020 Target
193	183	164	164
[1] *Maximum 2020 Target is 95% of the 5 Year Baseline GPCD* [2] *2020 Target is calculated based on the selected Target Method, see SB X7-7 Table 7 and corresponding tables for agency's calculated target.*			

5.7. 2015 Compliance Daily Per Capita Water Use (gpcd)

The interim per capita water use target, which must be met in 2015, is defined as the midpoint between the baseline per capita water use and the 2020 per capita water use target. The City's 2015 interim per capita water use target is 176 gpcd as shown in SB X7-7 Table 8.

SB X7-7 Table 8: 2015 Interim Target GPCD		
Confirmed 2020 Target *Fm SB X7-7 Table 7-F*	10-15 year Baseline GPCD *Fm SB X7-7 Table 5*	2015 Interim Target GPCD
164	188	176

The City's 2015 actual gpcd fell to 132 which is well below the 2015 and 2020 targets. The per capita water use in the City is expected to slightly increase when the drought subsides but continue to stay below the 2020 target as a result of permanent landscaping modifications and more stringent building requirements for new development, such as mandatory measures of the 2013 California Green Building Standards Code. The City also plans to continue water conservation education and measures described in Chapter 9, Demand Management Measures.

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6.0 SYSTEM SUPPLIES

This chapter describes and quantifies the City's existing and future water portfolio including the purchase contracts and various sources of water.

6.1. Purchased or Imported Water

The City has three separate sources for surface water including Solano Project, State Water Project, and Settlement Water. Each surface water source is described below.

Solano Project (Vacaville Supply, SID Agreement)

The Solano Project was constructed by the Bureau of Reclamation in 1958. The water rights permits for the Solano Project are held by the Bureau of Reclamation in trust for the Solano water users that currently expires in 2025 but is renewable. The water rights permits further state that when the permits are converted to a license, the license will be issued in the name of Solano water users. Unlike most federal water projects, the water rights to the Solano Project "belong" to the Solano water users. The main feature of the Solano Project is Monticello Dam, which provides for storage of 1.6 million ac-ft of water in Lake Berryessa (Lake). Water from the Lake is diverted through the Putah Diversion Dam to the 33-mile Putah South Canal, which transports water to the eight SCWA-member unit contractors for Solano Project water.

SCWA has entered into agreements with cities, districts, and state agencies to provide water from the Solano Project. The Solano Project contracting agencies are: Fairfield, Suisun City, Vacaville, Vallejo, SID, Maine Prairie Water District, University of California at Davis, and CSP- Solano. The annual entitlement to each agency is described in Table 6-A.

TABLE 6-A
SUMMARY OF SOLANO PROJECT WATER CONTRACTS (AC-FT/YR)

Agency	Annual Entitlement
Fairfield	9,200
Suisun City	1,600
Vacaville	5,750
Vallejo	14,600
SID	141,000
Maine Prairie Water District	15,000
UC Davis	4,000
California State Prison – Solano	1,200
Project Operating Loss (average estimated)	15,000
Total	**207,350** [a]

[a]Value approximates a firm yield during the driest hydrologic period on record (1916-1934).

In addition to its entitlement from SCWA, Vacaville entered into a 1995 Master Water Agreement with SID, which was amended in 2010. Pursuant to the agreement, Vacaville receives an increasing supply from SID through the year 2039 and a consistent supply thereafter until the year 2050. The annual water schedule for SID water available to Vacaville is contained in Table 6-B.

Table 6-B
Annual Water Schedule for the SID Water Agreement (ac-ft/yr)

Year	Annual Entitlement	Year	Annual Entitlement
2010	2,500	2026	5,925
2011	2,625	2027	6,225
2012	2,750	2028	6,525
2013	2,875	2029	6,825
2014	3,000	2030	7,125
2015	3,125	2031	7,425
2016	3,325	2032	7,725
2017	3,525	2033	8,025
2018	3,725	2034	8,325
2019	3,925	2035	8,625
2020	4,125	2036	8,925
2021	4,425	2037	9,225
2022	4,725	2038	9,525
2023	5,025	2039	9,825
2024	5,325	2040 - 2050	10,050
2025	5,625		

State Water Project (North Bay Aqueduct)

Vacaville receives water allocations from the State Water Project through SCWA (termed Table A water) that currently expires in 2035 but is renewable and water from a Year 2001 purchase agreement from the Kern County Water Agency (KCWA). Surface water received pursuant to these agreements is delivered through the NBA, a State Water Project facility. The City supply from the State Water Project is 6,100 ac-ft/yr, while KCWA Agreement water totals 2,878 ac-ft/yr. The Solano County branch of the NBA was completed in 1988. The Aqueduct is 28 miles long starting from Barker Slough in the Delta and ending in Napa County. The location of the NBA can be seen in Figure 2 (pg. 3-6). DWR is the owner and operator of the NBA.

The water supply for the NBA is less reliable than the Solano Project. Supply from the NBA comes from the State Water Project which provides water to a total of 29 contractors. A list of these contractors and their respective allocations is shown in Table 6-C. Because the NBA is part of the entire State Water Project, any shortages occurring in the State Water Project impact the NBA.

Table 6-C
State Water Project 2016
Water Allocations (ac-ft/yr)

Agency	Maximum Allocations
Upper Feather River Area	
City of Yuba City	9,600
County of Butte	27,500
Plumas County Flood Control and Water Conservation District	2,700
Subtotal	39,800
North Bay Area	
Napa County Flood Control and Water Conservation District	29,025
Solano County Water Agency	47,756
Subtotal	76,781
South Bay Area	
Alameda County Flood Control and Water Conservation District	80,619
Alameda County Water District	42,000
Santa Clara Valley Water District	100,000
Subtotal	222,619
San Joaquin Valley Area	
County of Kings	9,305
Dudley Ridge Water District	45,350
Empire West Side Irrigation District	3,000
Kern County Water Agency	982,730
Oak Flat Water District	5,700
Tulare Lake Basin Water Storage District	87,471
Subtotal	1,133,556
Central Coastal Area	
San Luis Obispo County Flood Control & Water Conservation Distr	25,000
Santa Barbara County Flood Control & Water Conservation District	45,486
Subtotal	70,486
Southern California Area	
Antelope Valley-East Kern Water Agency	144,844
Castaic Lake Water Agency	95,200
Coachella Valley Water District	138,350
Crestline-Lake Arrowhead Water Agency	5,800
Desert Water Agency	55,750
Littlerock Creek Irrigation District	2,300
Metropolitan Water District of Southern California	1,911,500
Mojave Water Agency	85,800
Palmdale Water District	21,300
San Bernardino Valley Municipal Water District	102,600
San Gabriel Valley Municipal Water District	28,800
San Gorgonio Pass Water Agency	17,300
Ventura County Flood Control District	20,000
Subtotal	2,629,544
Total	4,172,786

Within Solano County there are currently seven agencies with NBA water allocations. These include Benicia, Dixon, Fairfield, Rio Vista, Suisun City, Vacaville, and Vallejo. The annual increase in SCWA's contract is described in Table 6-D. Member units using the NBA and their allocations are described in Table 6-E. Shortages during dry years are proportional to their share of the overall contract with DWR.

TABLE 6-D
SUMMARY OF STATE WATER PROJECT ALLOCATIONS TO THE SOLANO COUNTY WATER AGENCY THROUGH THE NORTH BAY AQUEDUCT (AC-FT/YR)

Year	Annual Allocations	Year	Annual Allocations
2001	45,836	2009	47,456
2002	46,296	2010	47,506
2003	46,756	2011	47,556
2004	47,206	2012	47,606
2005	47,256	2013	47,656
2006	47,306	2014	47,706
2007	47,356	2015	47,756
2008	47,406	2016[a]	47,756

[a]Each year thereafter will have an annual allocation of 47,756 ac-ft/yr.

TABLE 6-E
STATE WATER PROJECT ALLOCATION TO SOLANO COUNTY CITIES SERVED BY THE NORTH BAY AQUEDUCT (AC-FT/YR) IN YEAR 2040

City	Annual Allocations
Benicia	17,200
Dixon	0[a]
Fairfield	14,678
Rio Vista	0[a]
Suisun City	1,300
Vacaville	8,978[b]
Vallejo	5,600
Total	**47,756**

[a]Dixon and Rio Vista currently do not use their individual allocation of 1,500 ac-ft/yr. If Dixon and/or Rio Vista decide to use the NBA water supply, supplies to Benicia, Fairfield and Vallejo are reduced com-mensurately.
[b]Vacaville allocations from State Water Project (including KCWA Agreement).

North of Delta Allocation (DWR Agreement)

DWR issued the North of Delta Settlement in December 2013 for SCWA, Napa, and Yuba City which increases the annual allocation an incremental amount without going over the annual Table A amount. The actual differential varies each year and being less in drier years. Table 6-F shows the additional allocation percentage for the previous three years.

TABLE 6-F
NORTH OF DELTA ALLOCATION

Year	Additional Percent
2014	0%
2015	5%
2016	15%

Settlement Water (DWR Agreement)

Settlement Water consists of surface water from the Sacramento River and Sacramento-San Joaquin Delta Estuary. Settlement Water is diverted under water rights held by DWR but is not considered State Water Project water. The water is made available by DWR in settlement of area-of-origin water right applications by the cities of Fairfield, Benicia, and Vacaville. The agreement was executed in May 2003 for delivery up to 31,620 ac-ft/yr. The City has used less than 5 percent of the Settlement Water in the last three years as a result of the four year drought. Typically, only 20 to 25 percent is used by the City in an average year which is attributed to water quality issues and delivery challenges. The Agreement provides an allocation to each of the three cities as shown in Table 6-G.

TABLE 6-G
SUMMARY OF SETTLEMENT WATER FOR THE CITIES OF FAIRFIELD, BENICIA, AND VACAVILLE (AC-FT/YR)

Agency	Annual Allocations
Fairfield	11,800
Benicia	10,500
Vacaville	9,320
Total	**31,620**

6.2. Groundwater

The City currently operates 11 active wells, 10 of which withdraw water from the deep aquifer in the basal zone of the Tehama Formation located in the Solano Subbasin of the Sacramento Valley Basin of the Sacramento River Hydrologic Region. Well 1 is the only well in operation that extracts water from a different formation, the Markley Formation, located west of the English Hills fault. Currently, approximately 5,500 ac-ft/yr of groundwater is withdrawn. The City adopted a Groundwater Management Plan Update, prepared by Ludhorff and Scalmanini Consulting Engineers, on March 8, 2011. The Groundwater Management Plan provides the framework and related actions required to maintain a high quality, reliable, and sustainable groundwater supply. A discussion of the groundwater basin and historic groundwater pumping follows.

6.2.1 Groundwater Basin Descriptions

The City overlies portions of two DWR-designated groundwater basins. The City primarily overlies the northwestern portion of the Solano Subbasin, which is one of 18 subbasins in the Sacramento Valley Basin of the Sacramento River Hydrologic Region. A small area in the southern portion of the City overlies the Suisun-Fairfield Valley Basin in the San Francisco Bay Hydrologic Region but the City does not own or operate any wells within this area. The western portion of the City, west of the Solano Subbasin boundary, is located in the Sacramento River Hydrologic Study Area but does not overlie any area currently designated by DWR as a groundwater basin or subbasin. All of the City's existing and proposed municipal wells are located exclusively in the Solano Subbasin. For a detailed description of the basins, the LSCE Groundwater Source Sufficiency Technical Memo is included as Appendix E.

The primary source of groundwater supply for municipal use is the basal zone of the Tehama Formation, which is a highly confined aquifer. The overlying Quaternary alluvial deposits and upper and middle zones of the Tehama Formation are not suitable for high production municipal water supply. However, they are used for some domestic and agricultural purposes in unincorporated areas of Vacaville. East of the Vacaville area, these aquifers are utilized by SID to supplement surface water supplies and for shallow groundwater pumping for drainage purposes.

6.2.2 Groundwater Management

In September 2014 the California Legislature passed the Sustainable Groundwater Management Act (SGMA). SGMA applies to basins or subbasins that DWR designates as medium- or high-priority basins. The Solano Subbasin was ranked medium priority and the Suisun-Fairfield Valley Basin was ranked as very low-priority. Solano County is currently conducting outreach to stakeholders and impacted agencies to meet the June 30, 2017, deadline for the designation of groundwater sustainability agencies (GSA) and the adoption of groundwater sustainability plans (GSP) by January 31, 2022.

The City cooperates with SCWA (the designated Monitoring Entity for the Solano Subbasin) by coordinating and reporting water level data for a network of 11 monitoring wells within the City on a semi-annual basis. This network of wells includes 7 monitoring wells screened in the Basal Tehama, 2 monitoring wells in the Upper Tehama, and 2 monitoring wells in the Quaternary Alluvium/Upper Tehama.

6.2.3 Overdraft Conditions

Historically, the City has successfully managed its surface water and groundwater supplies. Through managed utilization of both surface water and groundwater resources, including the planned distribution of groundwater pumping in the basal zone of the Tehama Formation, groundwater levels associated with local pumping depressions have been managed and have remained stable relative to "base year" groundwater conditions established in 1992-1993 for the Elmira well field area.

Groundwater monitoring efforts are a critical component of managing water resources in and around the City. Monitoring land subsidence paired with groundwater level measurements leads to a deeper understanding about the water resource and the general conditions of the aquifer underlying the City. There is land subsidence occurring in and around Solano County, though at relatively low rates (between 0.00195 to 0.03238 ft/year, or 0.594 to 9.869 mm/year) over previous 11 years.

The Solano Subbasin was not listed as in a "critical condition of overdraft" in the 1980 Bulletin 118: Groundwater Conditions in California. Based on information provided in the Groundwater Supply Sufficiency and Groundwater Management Plan (see Appendix E and F), the sub-basin is not projected to become overdrafted if current management conditions continue.

6.2.4 Historic Groundwater Pumping

The City is the primary groundwater user within the Vacaville area. Unmeasured agricultural and domestic groundwater extractions in unincorporated areas of the Vacaville area, Rural North Vacaville Water District (RNVWD) production wells, and SID are the other groundwater usages. Since 1968, the City's annual groundwater pumping has varied from a low of 2,862 ac-ft in year 1968 to a high of 8,156 ac-ft in year 1983. Annual groundwater production, including all wells, is summarized in Table 6-H from year 1990 to year 2015. The majority of groundwater production in previous years was obtained from wells located at the Elmira Road well field. The newer northeast sector well field located near I-80 now contributes to the groundwater production. In the future, groundwater pumpage will be more widely distributed in the study area rather than concentrated in the Elmira Road well field.

TABLE 6-H
CITY OF VACAVILLE
HISTORICAL GROUNDWATER PUMPING

Year	Basal Zone (Wells 2-16)	Non-Basal Zone (Well 1 & DeMello)	Total
1995	3,856	30	3,885
1996	3,128	102	3,230
1997	3,372	14	3,386
1998	3,871	34	3,905
1999	4,063	33	4,096
2000	5,089	52	5,070
2001	6,101	113	6,214
2002	6,536	101	6,638
2003	6,374	253	6,628
2004	6,455	167	6,562
2005	6,584	96	6,680
2006	6,541	95	6,635
2007	6,511	101	6,612
2008	5,692	93	5,784
2009	4,593	54	4,647
2010	4,985	69	5,054
2011	4,986	63	5,049
2012	5,059	82	5,142
2013	5,160	77	5,236
2014	5,287	59	5,345
2015	5,151	72	5,222

6.3. Wastewater and Recycled Water

The City owns and operates the Easterly Wastewater Treatment Plant (EWWTP) located southeast of the town of Elmira, which serves the City of Vacaville. The EWWTP is a tertiary treatment and blending elimination facility with a rated dry weather flow capacity of 15 mgd.

Currently, treated effluent from the Easterly facility is discharged into Alamo Creek, which flows into Cache Slough. A portion is used for irrigation by the Solano and Maine Prairie Irrigation Districts and offered to construction firms free of charge for use in dust control and other construction activities outside of the City limits. The use of reclaimed water for urban irrigational purposes is an important and viable resource. If reclaimed water were used for watering City parks or meeting industrial and other demands, reductions in the demand for domestic water supply could be realized.

A preliminary planning study performed in 2003 identified a potential use for recycled water for urban irrigation but this alternative required a significant amount of infrastructure such as a network of recycled water pipelines, pumping structures, and storage facilities. This distribution system could deliver recycled water mainly for the irrigation of public parks, green belts, golf courses, business parks, and schools. Additional customers could be added as they become viable. The City is looking at additional alternatives for the use of treated effluent.

6.4. Exchanges or Transfers

Vacaville works closely through SCWA to purchase water for short-term and long-term use. One example is the purchase of additional entitlements of State Water Project water from the KCWA, outlined in Section 4. As a wholesaler, SCWA keeps the City appraised of any unscheduled water that may become available for short-term use. Vacaville has a good working relationship with the SID and is notified of supply changes through its Master Water Agreement.

6.5. Future Water Projects

On January, 12, 2016, Vacaville City Council adopted a series of water service rate increases that are designed to generate an annual increase in revenues over the next five years. Through the combined use of increased water rates, capital replacement funds, water connection fees (impact fees), direct developer construction, and various long-term financing options, the City has the ability to raise the necessary revenue to fund and implement the construction of the needed water production, treatment, and transmission facilities defined in the CIP and Master Plan.

Implementation of the CIP and Master Plan will provide needed upgrades to the existing water system and facilities and continue to provide an adequate water supply for the currently planned new developments within the City's sphere of influence.

6.6. Summary of Existing and Planned Sources of Water

While the sources of water for the City will remain the same, the volume of water allocations will continue to increase over the years per the existing agreements to accommodate the projected growth in the City. The actual water supplied to the City as well as the total allocated amounts are provided below in Table 6-8.

Table 6-8 Retail: Water Supplies — Actual

Water Supply	Additional Detail on Water Supply	2015		
Drop down list May use each category multiple times. These are the only water supply categories that will be recognized by the WUEdata online submittal tool		Actual Volume	Water Quality *Drop Down List*	Total Right or Safe Yield *(optional)*
Add additional rows as needed				
Purchased or Imported Water	Solano Project	6,214	Raw Water	8,875
Purchased or Imported Water	State Project Water	1,769	Raw Water	18,298
Groundwater	City of Vacaville	5,222	Drinking Water	7,000
	Total	13,205		34,173

Projected water supplies for the City by the various sources through 2040 are provided below in Table 6-9.

Table 6-9 Retail: Water Supplies — Projected

Water Supply	Additional Detail on Water Supply	Projected Water Supply *Report To the Extent Practicable*									
Drop down list *May use each category multiple times. These are the only water supply categories that will be recognized by the WUEdata online submittal tool*		2020		2025		2030		2035		2040 *(opt)*	
		Reasonably Available Volume	Total Right or Safe Yield *(optional)*	Reasonably Available Volume	Total Right or Safe Yield *(optional)*	Reasonably Available Volume	Total Right or Safe Yield *(optional)*	Reasonably Available Volume	Total Right or Safe Yield *(optional)*	Reasonably Available Volume	Total Right or Safe Yield *(optional)*
Add additional rows as needed											
Purchased or Imported Water	Solano Project, Vacaville Entitlement	5,693	5,750	5,693	5,750	5,693	5,750	5,693	5,750	5,693	5,750
Purchased or Imported Water	Solano Project, SID Agreement	4,084	4,125	5,569	5,625	7,054	7,125	8,539	8,625	9,950	10,050
Purchased or Imported Water	State Water Project, Vacaville Entitlement	7,452	8,978	7,452	8,978	7,452	8,978	7,452	8,978	7,452	8,978
Purchased or Imported Water	State Water Project, Settlement Water	1,864	9,320	1,864	9,320	1,864	9,320	1,864	9,320	1,864	9,320
Groundwater	Municipal Wells in the Sacramento Valley Groundwater Basin, Solano Subbasin	7,000	7,000	7,300	7,300	7,700	7,700	8,100	8,100	8,100	8,100
	Total	26,092	35,173	27,877	36,973	29,762	38,873	31,647	40,773	33,058	42,198

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7.0 SYSTEM SUPPLIES

This chapter assesses the City's water supply reliability under various conditions.

7.1. Constraints on Water Sources

State Water Project (SCWA and Kern Agreement)

The City's operational constraints are regulated by the restrictions on the State Water Project, capacity of the NBA, and water quality limits of the NBR plant. The Solano County Water Agency (SCWA) Water Supply Reliability Technical Memorandum incorporates the 2015 California Department of Water (DWR) State Water Project (SWP) Delivery Capability Report (DCR) for applicable delivery reliability assumptions as they relate to the SCWA, see Appendix H. The numerous factors considered in the DCR include hydrologic conditions, environmental, water quality, and legal constraints.

Settlement Water (DWR Agreement)

In lieu of an Area of Origin Water Rights filing by the City, DWR and the City entered into a settlement agreement for water. An analysis on the expected reliability of the water to be provided to the City in accordance with the settlement agreement concluded that the City can anticipate receiving 100 percent of the allocation during normal, single-dry, and multiple-dry years. However, as described in Section 6.1, there are hydrologic factors that may limit the availability of the full allocation.

Solano Project Water (Vacaville Supply, SID Agreement)

The contracts with the public entities that use Solano Project water provide for the sale and distribution of water made available by the Bureau of Reclamation each year. The Bureau of Reclamation is contractually committed to delivering the full contract amount of water supply from the Solano Project unless the water supply does not physically exist (e.g. an empty reservoir). All Solano Project contractors, whether they are municipal or agricultural, are impacted by water supply reductions on an equal basis.

The Solano Project differs from other reservoir projects in California due to the reservoir storage size relative to the watershed yield. This means it may take a relatively long time to deplete the reservoir, but in turn, it takes a relatively long time to fill the reservoir. Due to the size of the reservoir as a function of its yield, the long-term reliability for the Solano project is excellent.

Because of the high degree of reliability and historical records, the City anticipates receiving 99 percent of the entitlement (and SID agreement water) during normal years, 98 percent of the entitlement during a single-dry year, and 89 percent during multiple-dry years. SCWA developed a year type index similar to Sacramento Valley to model hydraulic records from 1906 to 2007 for the Solano Project Reliability Assessment. Assumptions were similar to Sacramento Valley Index (SVI) to assign year types by wet, above normal, below normal, dry, and critically dry to determine the Average Year, Single-Dry Year and

Multi-Dry Year reliabilities. The data results presented in the 2010 UWMP were assumed to remain true for 2015 since the allocations from the Solano Project have been consistent with the projections.

Groundwater

Groundwater is closely monitored by the member agencies of the SCWA that withdraw from the basal zone of the Tehama Formation to maintain groundwater levels and prevent any overdrafts. The City has been conjunctively managing the water operations in a flexible manner using both surface water and groundwater depending on the different water year types. The City's average annual groundwater production is about 5,500 AF.

A groundwater source sufficiency report was prepared in 2011 by Luhdorff and Scalmanini, Consulting Engineers to describe the use and sufficiency of groundwater supplies beneath the City (see Appendix F). As part of the groundwater source sufficiency report, an analytical groundwater flow model was used to provide a preliminary assessment of water level impacts from future increases in groundwater pumping by the City to meet future water demands. The modeling effort included simulations of ten future pumping scenarios in which pumping would be increased and/or redistributed within the study area. Details regarding the model simulations and suggested pumping practices are found in Appendix F.

Quality of Water Supply

High quality water is supplied to customers in the City, as illustrated in the City's annual Drinking Water Quality Consumer Confidence Reports. The 2014 Drinking Water Quality Consumer Confidence Report is provided in Appendix K. Groundwater is typically higher in hardness and mineral content than surface water sources. Surface water is treated either at the City DE Water Treatment Plant or the NBR Water Treatment Plant. The quality of surface water varies seasonally, typically being more turbid during the winter months. Groundwater treatment includes chlorination and fluoridation at the wellhead. The chlorination of groundwater is to ensure a sufficient chlorine residual in the distribution system to prevent proliferation of harmful organisms. The quality of the City water supply is not expected to change through 2040.

7.2. Reliability by Type of Year

In this section, the reliability of the City's groundwater and surface water supplies are analyzed. The sources are identified for their availability during normal, single-dry, and multiple-dry years as determined by the DWR Sacramento Valley Water Hydrologic Classifications. The three separate hydrologic conditions considered are described as follows:

Normal year: A year, or an averaged range of years, that most closely represents the median water supply available to the agency. The UWMP act uses the term "normal" conditions.

Single-dry year: The single-dry year is the year that represents the lowest water supply available to the agency.

Multiple-dry years: The multiple-dry year period is the period that represents the lowest average water supply availability to the agency for a consecutive multiple year period (three or more). This is generally considered to be the lowest average runoff for a consecutive multiple year period for a watershed since 1903.

As previously described, the amount of water entitled to the City is increasing until the maximum entitlement is reached by year 2040. Furthermore, each source has a different availability under normal, single-dry, and multiple-dry years. Information on supply entitlement and availability is shown in Tables 7-1 for each source below.

Solano Water Project

Table 7-1 Retail: Basis of Water Year Data

Year Type	Base Year *If not using a calendar year, type in the last year of the fiscal, water year, or range of years, for example, water year 1999-2000, use 2000*	Available Supplies if Year Type Repeats	
		☐ Quantification of available supplies is not compatible with this table and is provided elsewhere in the UWMP. Location _____	
		☐ Quantification of available supplies is provided in this table as either volume only, percent only, or both.	
		Volume Available	% of Average Supply
Average Year	1998	8786	99%
Single-Dry Year	1977	8698	98%
Multiple-Dry Years 1st Year	1931	7899	89%
Multiple-Dry Years 2nd Year	1932	7899	89%
Multiple-Dry Years 3rd Year	1933	7899	89%
Multiple-Dry Years 4th Year *Optional*	1934	7899	89%
Multiple-Dry Years 5th Year *Optional*			
Multiple-Dry Years 6th Year *Optional*			

Agency may use multiple versions of Table 7-1 if different water sources have different base years and the supplier chooses to report the base years for each water source separately. If an agency uses multiple versions of Table 7-1, in the "Note" section of each table, state that multiple versions of Table 7-1 are being used and identify the particular water source that is being reported in each table.

NOTES:Multiple versions of Table 7-1 are being used. This table reflects the surface water from the Solano Water Project.

State Water Project

The Early Long Term (ELT) scenario of the State Water Project CalSim model was determined through a collaboration of the SWP Contractors for long term planning purposes. The DWR prepared the 2015 SWP Delivery Capability Report (DCR) to assist SWP contractors in the assessment of supply availability from the SWP.

SCWA Contract

The reliability of Table A allocations with the additional North of Delta (NOD) allocation through the SWP for the SCWA contract is provided in Table 7-1 below.

State Water Project (SCWA)

Table 7-1 Retail: Basis of Water Year Data

Year Type	Base Year *If not using a calendar year, type in the last year of the fiscal, water year, or range of years, for example, water year 1999-2000, use 2000*	Available Supplies if Year Type Repeats	
		☐ Quantification of available supplies is not compatible with this table and is provided elsewhere in the UWMP. Location _____	
		☑ Quantification of available supplies is provided in this table as either volume only, percent only, or both.	
		Volume Available	% of Average Supply
Average Year	1998	7452	83%
Single-Dry Year	1977	1975	22%
Multiple-Dry Years 1st Year	1931	2424	27%
Multiple-Dry Years 2nd Year	1932	2424	27%
Multiple-Dry Years 3rd Year	1933	2424	27%
Multiple-Dry Years 4th Year *Optional*	1934	2424	27%
Multiple-Dry Years 5th Year *Optional*			
Multiple-Dry Years 6th Year *Optional*			

Agency may use multiple versions of Table 7-1 if different water sources have different base years and the supplier chooses to report the base years for each water source separately. If an agency uses multiple versions of Table 7-1, in the "Note" section of each table, state that multiple versions of Table 7-1 are being used and identify the particular water source that is being reported in each table.

NOTES: Multiple versions of Table 7-1 are being used. This table reflects the surface water from the State Water Project for Solano County Water Agency (SCWA) Allocation

Settlement Water

Settlement Water is additional non-project water that is delivered through the NBA per the agreement with DWR that was executed in 2003. Reliability is based on the averaged percent allocation over the last twelve years and is provided in Table 7-1 below.

Settlement Water

Table 7-1 Retail: Basis of Water Year Data

Year Type	Base Year *If not using a calendar year, type in the last year of the fiscal, water year, or range of years, for example, water year 1999-2000, use 2000*	Available Supplies if Year Type Repeats	
		☐ Quantification of available supplies is not compatible with this table and is provided elsewhere in the UWMP. Location _____	
		☑ Quantification of available supplies is provided in this table as either volume only, percent only, or both.	
		Volume Available	% of Average Supply
Average Year	1998	1864	20%
Single-Dry Year	1977	0	0%
Multiple-Dry Years 1st Year	1931	466	5%
Multiple-Dry Years 2nd Year	1932	466	5%
Multiple-Dry Years 3rd Year	1933	466	5%
Multiple-Dry Years 4th Year *Optional*	1934	466	5%
Multiple-Dry Years 5th Year *Optional*			
Multiple-Dry Years 6th Year *Optional*			

Agency may use multiple versions of Table 7-1 if different water sources have different base years and the supplier chooses to report the base years for each water source separately. If an agency uses multiple versions of Table 7-1, in the "Note" section of each table, state that multiple versions of Table 7-1 are being used and identify the particular water source that is being reported in each table.

NOTES: Multiple versions of Table 7-1 are being used. This table reflects an additional allocation for settlement water at 20% average, 0% single-dry, and 5% multiple-dry years.

Groundwater

Luhdorff & Scalmanini, Consulting Engineers (LSCE) prepared a Groundwater Supply Sufficiency Technical Memorandum (Attachment E) for the 2015 Urban Water Management Plan Update based on the 2011 Groundwater Management Plan Update. The 2015 Technical Memorandum summarizes the analysis on groundwater supply sufficiency and reliability with historical and projected maximum volumes. Increased pumping during dry years will cause groundwater levels to decrease but based on the results of the groundwater model, groundwater levels will return to normal levels once pumping decreases to normal year rates.

The reliability volumes are provided in Table 7-1 (next page).

Groundwater

Table 7-1 Retail: Basis of Water Year Data			
Year Type	Base Year *If not using a calendar year, type in the last year of the fiscal, water year, or range of years, for example, water year 1999-2000, use 2000*	Available Supplies if Year Type Repeats	
		☐ Quantification of available supplies is not compatible with this table and is provided elsewhere in the UWMP. Location _____	
		☑ Quantification of available supplies is provided in this table as either volume only, percent only, or both.	
		Volume Available	% of Average Supply
Average Year		7000	100%
Single-Dry Year	1977	8320	119%
Multiple-Dry Years 1st Year	1931	8320	119%
Multiple-Dry Years 2nd Year	1932	8320	119%
Multiple-Dry Years 3rd Year	1933	8320	119%
Multiple-Dry Years 4th Year *Optional*	1934	8320	119%
Multiple-Dry Years 5th Year *Optional*			
Multiple-Dry Years 6th Year *Optional*			
Agency may use multiple versions of Table 7-1 if different water sources have different base years and the supplier chooses to report the base years for each water source separately. If an agency uses multiple versions of Table 7-1, in the "Note" section of each table, state that multiple versions of Table 7-1 are being used and identify the particular water source that is being reported in each table.			
NOTES: Multiple versions of Table 7-1 are being used. This table reflects Groundwater from the City wells.			

Summary

With the various water sources, reliabilities and increased supply over time, additional tables have been provided below to summarize the current and projected available water supply for average year (Table 7-A), single-dry year (Table 7-B) and multi-dry years (Table 7-C) below.

TABLE 7-A
CITY OF VACAVILLE
AVAILABLE WATER SUPPLY, AVERAGE YEAR

Sources of Supply	2015	2020	2025	2030	2035	2040
Solano Project						
Vacaville Entitlement	5,750	5,750	5,750	5,750	5,750	5,750
99% Reliability	5,693	5,693	5,693	5,693	5,693	5,693
SID Agreement	3,125	4,125	5,625	7,125	8,625	10,050
99% Reliability	3,094	4,084	5,569	7,054	8,539	9,950
Total	**8,786**	**9,776**	**11,261**	**12,746**	**14,231**	**15,642**
State Water Project						
Solano County Water Agency	8,978	8,978	8,978	8,978	8,978	8,978
83% Reliability	**7,452**	**7,452**	**7,452**	**7,452**	**7,452**	**7,452**
Settlement Water	9,320	9,320	9,320	9,320	9,320	9,320
20% Reliability	**1,864**	**1,864**	**1,864**	**1,864**	**1,864**	**1,864**
Groundwater						
Quantity (af/yr)	7,000	7,000	7,300	7,700	8,100	8,100
100% Reliability	**7,000**	**7,000**	**7,300**	**7,700**	**8,100**	**8,100**
Water Supply Totals						
Acre-feet/year (af/yr)	**25,102**	**26,092**	**27,877**	**29,762**	**31,647**	**33,058**

TABLE 7-B
CITY OF VACAVILLE
AVAILABLE WATER SUPPLY, SINGLE-DRY YEAR

Sources of Supply	2015	2020	2025	2030	2035	2040
Solano Project						
Vacaville Entitlement	5,750	5,750	5,750	5,750	5,750	5,750
98% Reliability	5,635	5,635	5,635	5,635	5,635	5,635
SID Agreement	3,125	4,125	5,625	7,125	8,625	10,050
98% Reliability	3,063	4,043	5,513	6,983	8,453	9,849
Total	**8,698**	**9,678**	**11,148**	**12,618**	**14,088**	**15,484**
State Water Project						
Solano County Water Agency	8,978	8,978	8,978	8,978	8,978	8,978
22% Reliability	**1,975**	**1,975**	**1,975**	**1,975**	**1,975**	**1,975**
Settlement Water	9,320	9,320	9,320	9,320	9,320	9,320
0% Reliability	**0**	**0**	**0**	**0**	**0**	**0**
Groundwater						
Quantity (af/yr)	7,000	7,000	7,300	7,700	8,100	8,100
119% Reliability	**8,320**	**8,320**	**8,740**	**9,160**	**9,700**	**9,700**
Water Supply Totals						
Acre-feet/year (af/yr)	**18,993**	**19,973**	**21,863**	**23,753**	**25,763**	**27,159**

TABLE 7-C
CITY OF VACAVILLE
AVAILABLE WATER SUPPLY, MULTI-DRY YEARS

Sources of Supply	2015	2020	2025	2030	2035	2040
Solano Project						
Vacaville Entitlement	5,750	5,750	5,750	5,750	5,750	5,750
89% Reliability	5,118	5,118	5,118	5,118	5,118	5,118
SID Agreement	3,125	4,125	5,625	7,125	8,625	10,050
89% Reliability	2,781	3,671	5,006	6,341	7,676	8,945
Total	**7,899**	**8,789**	**10,124**	**11,459**	**12,794**	**14,062**
State Water Project						
Solano County Water Agency	8,978	8,978	8,978	8,978	8,978	8,978
27% Reliability	**2,424**	**2,424**	**2,424**	**2,424**	**2,424**	**2,424**
Settlement Water	9,320	9,320	9,320	9,320	9,320	9,320
5% Reliability	**466**	**466**	**466**	**466**	**466**	**466**
Groundwater						
Quantity (af/yr)	7,000	7,000	7,300	7,700	8,100	8,100
120% Reliability	**8,320**	**8,320**	**8,740**	**9,160**	**9,700**	**9,700**
Water Supply Totals						
Acre-feet/year (af/yr)	**19,109**	**19,999**	**21,754**	**23,509**	**25,384**	**26,652**

7.3. Supply and Demand Assessment

This section compares projected water demand to available water supply during normal, single-dry, and multiple-dry years. It also provides a summary of the projected water demand at buildout.

Demand

Baseline City demand is based on 2020 gpcd target. Water demands for the year 2040 were based on the growth projected in the most recent land use database prepared by the City's Community Development Department and population projects by the Association of Bay Area Governments (ABAG). The 5-year incremental demands were estimated using the 2020 target per capita per day usage and applying that to the future population projections between 2020 and 2040. This projections assume growth by customer type is consistent with existing with the existing ratio as shown in Table 7-D below.

TABLE 7-D
CITY OF VACAVILLE
WATER DEMAND TOTAL (AC-FT/YR)

	Water Demand Totals (ac-ft/yr)							
	Past		Current	Projected				
Customer Type [a]	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**	**2035**	**2040**
Single-Family Residential	9,438	9,191	7,303	9,597	9,960	10,355	10,791	11,237
Multi-Family Residential [c]	1,765	1,909	1,540	2,038	2,115	2,199	2,292	2,387
Commercial	822	1,051	1,066	1,189	1,234	1,283	1,337	1,392
Industrial	499	763	773	849	881	916	955	994
Public Agency/Institutional	795	684	565	679	705	733	764	796
Public Landscaping [d]	1,872	1592	1,325	1,699	1,763	1,833	1,910	1,989
General Other	215	81	78	85	88	92	95	99
Unaccounted for Water Loss [e]	2,584	1,066	555	849	881	916	955	994
TOTAL	**17,990**	**16,337**	**13,205**	**16,985**	**17,627**	**18,327**	**19,099**	**19,888**

[a] The City does not supply water for saline water intrusion barrier, groundwater recharge, or agriculture. The City also does not sell water to other agencies.

[b] Projected water use is based on the Total Amount increasing by population growth with similar usage ratio as 2010.

[c] Single Family and Multi-Family Residential include water demand of low income units.

[d] The decrease in public landscape demand from 2005 to 2010 is attributed to the installation of evapotranspiration based irrigation controllers and the retrofit of irrigation heads at City parks and set-back landscaping.

[e] The increase in unaccounted for water loss from 2005 and 2010 is attributed to a change of the City's utility billing system software during the 2004/2005 fiscal year. The system change-out increased accuracy of consumption data and sales figures.

Although the demand for 2015 was 25 percent below the 2020 target, the assumption for future demands maintained the 2020 target rate of 164 gpcd to account for consumption during normal conditions. The City is currently in Stage 3 Drought restrictions due to the multi-year drought. Although it is unlikely that water demands will return to pre-drought

conditions, assuming the maximum allowable usage will provide additional protection to ensure adequate supply.

Supply

Groundwater and surface water supplies are projected to meet or exceed projected water demands even during extended drought conditions. This was demonstrated during a previous drought that lasted for seven years and continues to hold true during the current drought conditions. In planning for dry years, the City is fortunate to have as reliable a water source as the Solano Project. Based on storage volume and annual yield, the Solano Project has an approximate seven year return period. This water coupled with the City's groundwater aquifer provides for a consistent supply in single- and multiple-dry years. In view of this demonstrated reliability of the City's conjunctive water supply strategy, future water supply will be adequate to offset future water demands during normal, single-dry, and multi-dry years as illustrated in Table 7-2, 7-3 and 7-4 below.

Table 7-2 Retail: Normal Year Supply and Demand Comparison

	2020	2025	2030	2035	2040 *(Opt)*
Supply totals *(autofill from Table 6-9)*	26,092	27,877	29,762	31,647	33,058
Demand totals *(autofill from Table 4-3)*	16,985	17,627	18,327	19,099	19,888
Difference	9,107	10,250	11,435	12,548	13,170

Table 7-3 Retail: Single Dry Year Supply and Demand Comparison

	2020	2025	2030	2035	2040 (Opt)
Supply totals	19,973	21,863	23,753	25,763	27,159
Demand totals	16,985	17,627	18,327	19,099	19,888
Difference	2,988	4,236	5,426	6,664	7,271

NOTES: Supply for Single-Dry Year is more than 35% reduction from the normal year which constitutes a Stage 1 Drought, 20% voluntary reduction, therefore the demand values remain at normal levels for this scenario.

Table 7-4 Retail: Multiple Dry Years Supply and Demand Comparison						
		2020	2025	2030	2035	2040 (Opt)
First year	Supply totals	19,999	21,754	23,509	25,384	26,652
	Demand totals	16,985	17,627	18,327	19,099	19,888
	Difference	3,014	4,127	5,182	6,285	6,764
Second year	Supply totals	19,999	21,754	23,509	25,384	26,652
	Demand totals	16,985	17,627	18,327	19,099	19,888
	Difference	3,014	4,127	5,182	6,285	6,764
Third year	Supply totals	19,999	21,754	23,509	25,384	26,652
	Demand totals	16,985	17,627	18,327	19,099	19,888
	Difference	3,014	4,127	5,182	6,285	6,764
Fourth year *(optional)*	Supply totals	19,999	21,754	23,509	25,384	26,652
	Demand totals	16,985	17,627	18,327	19,099	19,888
	Difference	3,014	4,127	5,182	6,285	6,764
Fifth year *(optional)*	Supply totals					
	Demand totals					
	Difference	0	0	0	0	0
Sixth year *(optional)*	Supply totals					
	Demand totals					
	Difference	0	0	0	0	0
NOTES: Supply for Multiple-Dry Year is more than 35% reduction from the normal year which constitutes a Stage 1 Drought, 20% voluntary reduction, therefore the demand values remain at normal levels for this scenario.						

In 2002 the California legislature passed Senate Bill (SB) 610, which requires new development projects to assess the sufficiency of water supply. SB 610 requires the local public water system to prepare a Water Supply Assessment for large development projects, which are defined in the legislation. A Water Supply Assessment must document water supply sources, quantify existing and future demand for water, evaluate potential impacts of short or prolonged droughts, and compare water supply and demand in order to evaluate water supply sufficiency. Per the Cities policy UPB-P10.2, new developments are required to construct water source or storage facilities if the project's Water Supply Assessment indicated a deficiency in the water source.

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8.0 WATER SHORTAGE CONTINGENCY PLANNING

In February 1992 the City, in cooperation with the SCWA, also adopted the "Urban Water Shortage Contingency Plan." This document was revised in August 2014 which led to the adoption of the Drought Ordinance No. 1877 that established water conservation requirement and a water rate structure to address Normal, Drought, and Emergency Conditions. The Urban Water Shortage Contingency Plan includes all information necessary to meet the requirements of California Water Code Section 10632. The Urban Water Shortage Contingency Plan was last amended on June 23, 2015. Both the Urban Water Shortage Contingency Plan and the ordinance are attached to this plan as part of Appendix G.

8.1. Stages of Action

The *Urban Water Shortage Contingency Plan* (Appendix G) establishes a Water Conservation Ordinance which defines one voluntary and three mandatory water conservation stages. The contingency plan addresses water conservation during normal, drought, and emergency conditions as defined below.

Normal Conditions
The normal conservation condition is in effect any time when drought or emergency conditions are not in effect. Normal conditions will prevail when there is not a water shortage. Conservation practices, including compliance with the *City Water Efficient Landscape Requirements* (WELR) will be required during normal conditions in accordance with the Municipal Code.

During normal conditions the goal is to maximize beneficial use of water through specific provisions of this ordinance, public education, voluntary water conservation, and the *Water Efficient Landscape Requirements*.

Implementation Methods: Under the Normal condition, water rates shall be established and modified from time to time with the objective of fully compensating for the acquisition, treatment, and distribution of water through revenues collected from customers and promoting beneficial use of the water. There are no penalties for high water use under the Normal condition.

Drought Conditions
Drought conditions will be in effect when there is a water shortage necessitating a reduction in water use, either city-wide or in a sub-area or land-use category within the City.

Stage 1 – Mild Drought

This stage will be declared when a reduction in total available water supply sources of 35 percent resulting from one or more single-dry years occurs. At this stage water customers shall be asked to conserve water through a voluntary reduction in water use of 20 percent. Customers are also requested to limit the use of outdoor irrigation to no more than 3 days

per week while in this stage. Additionally, the prohibitions on water use described in the City Urban Water Shortage Contingency Plan, Section 4 shall apply.

Stage 2 – Moderate Drought

This stage will be declared when a reduction in total available water supply sources of 50 percent resulting from one or more single-dry years occurs. At this stage water customers shall be required to conserve water through a mandatory reduction in water use of 20 percent. Customers are also required to limit the use of outdoor irrigation to no more than 4 days per week while in this stage. Additionally, the prohibitions on water use described in the City Urban Water Shortage Contingency Plan, Section 4 shall apply.

Stage 3 – Severe Drought

This stage will be declared when a reduction in total available water supply sources of 65 percent resulting from one or more single-dry years occurs. At this stage water customers shall be required to conserve water through a mandatory reduction in water use of 35 percent. Customers are also required to limit the use of outdoor irrigation to no more than 3 days per week while in this stage. Additionally, the prohibitions on water use described in the City Urban Water Shortage Contingency Plan, Section 4 shall apply.

Implementation Methods: Under drought conditions in which a water conservation stage is declared and conservation goals set, penalties, in the form of surcharges on the water bill, may be assessed for water use in excess of the conservation goal and/or water use allocation. For any instance in which the customer's use exceeds the conservation goal and/or the water use allocation, that customer will be assessed a surcharge of 25 percent of the variable water charges for that billing period as a penalty for excessive water use.

Stage 4 - Emergency Conditions

Emergency conditions will be in effect whenever there is a water shortage necessitating a reduction in water use of 50 percent or greater from the normal condition, either city-wide or in a sub-area or land-use category within the City.

Implementation Methods: Under emergency conditions, water prices may be further adjusted as set forth under drought conditions.

Table 8-1 Retail Stages of Water Shortage Contingency Plan		
Stage	Complete Both	
	Percent Supply Reduction[1] *Numerical value as a percent*	Water Supply Condition *(Narrative description)*
Add additional rows as needed		
Drought -S 1	20%	Mild Drought when a reduction in total available water supply sources of 35% occurs.
Drought -S 2	20%	Moderate Drought when a reduction in total available water supply sources of 50% occurs.
Drought -S 3	35%	Severe Drought when a reduction in total available water supply sources of 65% occurs.
Emergency	50%	Emergency when a reduction in total available water supply sources of 75% or more occurs.
[1] One stage in the Water Shortage Contingency Plan must address a water shortage of 50%.		

8.2. Prohibitions on End Uses

Normal Conditions
Section 13.20 of the Municipal Code includes specific water use restrictions. Accordingly, no user of the City's water system may knowingly make, cause, use, or permit the use of water from the system in a manner that violates the Municipal Code as cited below:

1. Excessive water runoff due to landscape irrigation activities.
2. Washing of sidewalks, driveways, walkways, parking lots, and all other hard-surfaced areas by direct hosing except for removal of hazardous materials for protection of public health and safety.
3. Washing of vehicles, equipment, structures, and other items without the use of a shutoff nozzle.
4. The escape of water through breaks or leaks within the water users' plumbing or system that is not repaired within 24 hours of discovery.
5. Fire hydrants used for purposes other than firefighting, water quality, maintenance, sanitation, and construction.

Drought Conditions
During Drought stages, the City Council can require additional water use restrictions as appropriate to achieve the desired level of conservation. Potential and additional restrictions include:

1. Watering and irrigation of plants, trees and landscaping will be allowed only during specified hours of the day, pursuant to regulations promulgated by the Director of Utilities.
2. Fountains and water using ornamental structures shall be prohibited from using water unless equipped with a recirculating pump.
3. Drought notices shall be posted in hotels, motels, and all public establishments offering lodging.
4. Restaurants will serve water to customers only upon request of their patrons.
5. No landscaping, other than turf, may be installed unless irrigated with a drip irrigation system or a similar system with the equivalent savings in water usage.
6. Defer construction of new City parks unless specific factors determined by the City Council authorize such construction.
7. Prohibit new set-back landscaping at commercial and industrial sites. Deferred installation agreements may be required to ensure construction of the set-back landscaping when the water drought or emergency is over.

Stage 4 - Emergency Conditions

In addition to normal and drought restrictions, the following additional restrictions may be enacted under emergency conditions. The City Council may also establish other water use restrictions to be in effect during an emergency condition.

1. Depending upon the severity of the water shortage, limit landscape watering to specified days only, or limit water utilization only for trees and plants watered by drip irrigation or hand-held buckets/hoses, or prohibit all irrigation completely.
2. Depending upon the severity of the water shortage, limit other outdoor water use such as, but not limited to, the washing of equipment or vehicles to specified times during the day, on specified days only, at commercial washes only where recycling of water is maintained, or prohibit all outdoor uses of water altogether.
3. Depending upon the severity of the water shortage, require all swimming pools and spas to have a cover, limit refilling of pools and spas to certain days, or prohibit the issuance of any new building permits for a pool or spa.
4. Prohibit the operation of fountains or ornamental water-using structures.
5. Prohibit the installation of turf grass.
6. Depending upon the severity of the water shortage, prohibit the construction of new golf courses and reduce or prohibit new residential construction.

Table 8-2 Retail Only: Restrictions and Prohibitions on End Uses			
Stage	Restrictions and Prohibitions on End Users *Drop down list* *These are the only categories that will be accepted by the WUEdata online submittal tool*	Additional Explanation or Reference *(optional)*	Penalty, Charge, or Other Enforcement? *Drop Down List*
Add additional rows as needed			
Normal	Landscape - Restrict or prohibit runoff from landscape irrigation	City of Vacaville Municipal Code Section 13.20.040	Yes
Normal	Other - Prohibit use of potable water for washing hard surfaces	City of Vacaville Municipal Code Section 13.20.040	Yes
Normal	Other - Require automatic shut of hoses	City of Vacaville Municipal Code Section 13.20.040	Yes
Normal	Other - Customers must repair leaks, breaks, and malfunctions in a timely manner	City of Vacaville Municipal Code Section 13.20.040	Yes
Drought -S 1	Landscape - Limit landscape irrigation to specific days	City of Vacaville Municipal Code Section 13.20.050	Yes
Drought -S 1	CII - Restaurants may only serve water upon request	City of Vacaville Municipal Code Section 13.20.050	Yes
Drought -S 1	Water Features - Restrict water use for decorative water features, such as fountains	City of Vacaville Municipal Code Section 13.20.050	Yes
Drought -S 1	Other	20% water use reduction - voluntary	Yes
Drought -S 2	Other	20% water use reduction - required	Yes
Drought -S 3	Other	35% water use reduction - required	Yes
Emergency	Other	50% water use reduction - required	Yes
Emergency	Landscape - Limit landscape irrigation to specific times	City of Vacaville Municipal Code Section 13.20.060	Yes
Emergency	Landscape - Prohibit all landscape irrigation	City of Vacaville Municipal Code Section 13.20.060	Yes
Emergency	Pools and Spas - Require covers for pools and spas	City of Vacaville Municipal Code Section 13.20.060	Yes
Emergency	Other - Prohibit vehicle washing except at facilities using recycled or recirculating water	City of Vacaville Municipal Code Section 13.20.060	Yes
Emergency	Other	Prohibit issuance of permits for new construction of pools or spas	Yes
Emergency	Other	Prohibit installation of turf grass	Yes

8.3. Penalties, Charges, Other Enforcement of Prohibitions

The City adopted Ordinance No. 1877 on November 18, 2014, to amend Chapter 13.20 of the Vacaville Municipal Code relating to Water Conservation in Normal, Drought, and Emergency Conditions. Subsection 13.20.030, Violations, enforcement, and remedies is included as an attachment to the 2014 Urban Water Shortage Contingency Plan (see Appendix G).

Violations of Ordinance 1877 could result in administrative fines, penalties, and/or notice of violations. The maximum administrative fine per violations is $500 to the property owner per violation. Additional remedies could be placed on the violator which could include the installation of flow restrictors for up to a year or service disconnection up to 60 days. Penalties may be approved by Council resolution to implement surcharges for water use in excess of water conservation goals that would be in addition to previously assessed fines, fees, penalties, and other related expenses.

8.4. Consumption Reduction Methods

With the recent adoptions of the Vacaville Municipal Code Chapter 13.20, Water Conservation Ordinance update and the Urban Water Shortage Contingency Plan, the City is equipped to legally enforce regulations and restrictions as outlined in the code.

8.5. Determining Water Shortage Reductions

Normal Conditions Monitoring
In normal stage water supply conditions, production figures are recorded daily and reviewed by the Water Operations Section. Totals are reported monthly and incorporated into the water supply report.

Drought Conditions Monitoring
During drought stage water supply conditions, daily production figures are provided to the Water Operations Section of the Utility Department. The Water Operations Section provides the weekly production figures to the Water Conservation Coordinator. The Water Conservation Coordinator compares the weekly production to the 2013 base year data to verify reduction goals are being met. Weekly and monthly reports are generated and provided to the Director of Utilities. The Director of Utilities will notify the City Manager and City Council if water reduction goals are not met and corrective action can be taken.

Emergency Conditions Monitoring
During an emergency conditions shortage or interruption of service, drought stage procedures will be followed, with the addition of a daily production report to the Director of Utilities. During a disaster shortage the emergency stage applies.

8.6. Revenue and Expenditure Impacts

The City retained Bartle Wells Associates (BWA) to develop a long-term water rate study through FY 2019/20 that addressed the recent drought and decline in water sales

with proposed water conservation surcharges during droughts and water shortages. The financial impact of the water conservations due to the drought have led to significant decreases in the Water Fund Revenues. On January 12, 2016, City Council approved a resolution to adjust water rates in accordance with proposition 218 requirements that increases charges annually for five years. A one-year water conservation surcharge was implemented to recover a $2.5 million dollar revenue shortfall in FY 2015/16 due to State-mandated water conservation measures.

8.7. Resolution and Ordinance

The Urban Water Shortage Contingency Plan was originally adopted in January 1991, updated in August 2014, and most recently revised in June 2015 to meet the requirements of the California Water Code Section 10632. Chapter 13.20, Water Conservation in Normal, Drought, and Emergency Conditions, of the Vacaville Municipal Code includes specific water use restrictions during normal, drought, and emergency conditions. Section 13.20.030, Violations, enforcement, remedies, outlines the enforcement procedures and methods to enforce the code during the various conditions.

8.8. Catastrophic Supply Interruption

The City developed a Utilities Department Emergency Response Plan in August 1991 and has maintained and updated the plan on a regular basis, with the most recent update occurring in April 2014. The comprehensive plan outlines the water system response plan in the event of a disaster such as an earthquake, a City-wide power outage, or a bio-terrorism attack on the City's water treatment and distribution system. The City has an emergency operations center for the Utilities Department, which when activated, coordinates damage surveys, gathers information, and conducts responses to the damaged processes and system. The Plan includes the following elements:

- List of water system components (wells, distribution system, storage tanks).
- Measures to be taken prior to and following an emergency event.
- List of City emergency operation personnel.
- Information regarding coordination with police and fire department personnel.
- List of water testing laboratories, water system contractors, and pipe repair and installation contractors.
- Utility service numbers for traffic signal repairs, gas and electrical repairs, and water works suppliers.

8.9. Minimum Supply Next Three Years

The table below provides an estimate of the minimum water supply available during the next 3 years of 2016, 2017 and 2018 based on the driest 3 year historic sequence for the City and the known values for 2016.

TABLE 8-A
CITY OF VACAVILLE
WATER SUPPLY FOR NEXT THREE YEARS

		2016		2017*		2018**	
Sources of Supply	**Entitlement**	**% Available**	**ac-ft/yr**	**% Available**	**ac-ft/yr**	**% Available**	**ac-ft/yr**
Solano Project							
Vacaville Entitlement	5,750	100%	5,750	100%	5,750	100%	5,750
SID Agreement	3,325-3,725	100%	3,325	100%	3,525	100%	3,725
Carryover	20,154	10%	1,963	27%	5,355	37%	1,965
State Water Project							
North Bay Aqueduct	8,978	75%	6,734	35%	3,142	5%	449
Settlement Water	9,320	10%	932	0%	0	0%	0
Groundwater							
Quantity (af/yr)	6,500	100%	6,500	100%	6,500	100%	6,500
Water Supply Totals							
Acre-feet/year (af/yr)	33,873-34,273		25,204		24,272		18,389

9.0 WATER DEMAND MANAGEMENT MEASURES

This section provides brief descriptions of the City's Demand Management Measures (DMMs) that the City has implemented or is in the process of implementing. The City has been actively engaging in measures and initiatives to conserve water since 1991, including participation in a regional Water Conservation Committee (WCC) that includes other cities and agencies in Solano County, as well as the City's water wholesaler, the Solano County Water Agency (SCWA).

The DMMs are administered in conjunction with the five Best Management Practices (BMPs) as outlined by the California Urban Water Conservation Council (CUWCC).

9.1. Demand Management Measures for Retail Agencies

9.1.1 Water Waste Prohibition

Program Description

The City identifies and prohibits the waste of water through Municipal Code 13.20 (Water Conservation in Normal, Drought, and Emergency Conditions), Ordinance 1877, and Section 4 of the Urban Water Shortage Contingency Plan (Appendix G).

Specifically, the following uses of water are prohibited by the above regulations:

- Excessive water runoff due to landscape irrigation activities.
- Washing of sidewalks, driveways, walkways, parking lots, and all other hard-surfaced areas by direct hosing except for removal of hazardous materials for protection of public health and safety.
- Washing of vehicles, equipment, or structures without the use of a shutoff nozzle.
- The escape of water through breaks or leaks within the water users' plumbing or distribution system that is not repaired within 24 hours of discovery.
- The use of a water fountain without a circulating pump.
- Outdoor irrigation 48 hours before or after significant precipitation.

Any customer violating the regulations and/or restrictions on water use set forth in the ordinance is subject to enforcement ranging from a written warning for the first violation to increasing fines in $50 increments for each subsequent violation to a maximum fine of $500. In the event of multiple violations, additional measures may include flow restriction and/or temporary disconnection of water service.

During Drought and Emergency stages, City Council may also add supplemental water use restrictions, as appropriate, to achieve the desired level of conservation.

These regulations are monitored and enforced by the City's Code Compliance section.

Method to Evaluate Effectiveness

The City maintains a data base of the number of customers contacted and cited for violations as a method for determining the effectiveness of this DMM.

9.1.2 Metering

Program Description

The City is fully metered and therefore usage for all new and existing water connections is tracked and all customers are billed based on their volume of use. Since the City does not have any unmetered connections it does not have a program for retrofitting unmetered connections.

Table 9-A provides a summary of the number of meter connections per account classification.

TABLE 9-A
WATER CONNECTIONS - METER INFORMATION

Account Classification	Number of Potable Connections Metered
Single Family	24,582
Multi-Dwelling	606
Commercial	1,009
Industrial	77
Institutional	231
Landscape	536
Total Urban Connections (2015)	**27,041**

Method to Evaluate Effectiveness

The City maintains a data base to ensure every new and existing connection is metered and billed for water use.

9.1.3 Conservation Pricing

Program Description

The City had maintained a two tiered inclining block pricing structure since 1991 as a means to promote water conservation. However, in accordance with State Proposition 218 and recent case law stemming from *Capistrano Taxpayers Association, Inc. vs. the City of San Juan Capistrano*, in 2016 the City converted from an inclining block structure to a uniform block pricing structure for all customer categories. Existing rates (2015) for water services are structured as shown in Table 9-B.

TABLE 9-B
CURRENT CITY RATE STRUCTURE

Customer Classification	Fixed [a]	Uniform [b]
Single Family Residential	√	√
Multi-Family Residential	√	√
Commercial	√	√
Industrial	√	√
Institutional	√	√
Landscape	√	√

[a] Fixed = Price per fraction of diameter of meter is constant.
[b] Uniform = Price per unit of water used is constant.

At the same time that the City amended its rate structure, it implemented a 5.5 percent rate increase that assumes an ongoing water consumption reduction of 20 percent in large part due to the water rate and a temporary water conservation surcharge.

Method to Evaluate Effectiveness

The City will be compiling and evaluating water consumption data from 2016 to determine the impact of a uniform rate structure on water usage while continuing to target 20 percent overall water consumption throughout the City.

9.1.4 Public Education and Outreach

Program Description

The City's public information program includes the following components:

- Maintaining a dedicated water conservation webpage on the City's website to educate the public on the City's water conservation practices, policies, and procedures as well as provide tips and resources for promoting water conservation;
- Providing educational displays, information booths, and speakers at public events;
- Public service announcements on local media including public television, radio, newspapers, webpage; and social media;
- Providing speakers to employees, community groups, and the media;
- Providing current and comparative water use information on water bills;
- Providing billing samples with easy to follow instructions;
- Providing water conservation education and information through water billing inserts or printing directly on bills.

As a member of the WCC, Vacaville participates in and promotes the following programs:

- Maintaining a link to www.solanosaveswater.org, the SCWA website that promotes water conservation, education, and gardening county-wide while providing resources and water conservation tools including rebates and free fixtures and devices;
- Supporting the Planet Water demonstration garden display at Six Flags Discovery Kingdom in Vallejo;

- Supporting the Putah Creek Discovery Corridor (PCDC) partnership, a "place of discovery" demonstration/activity site that promotes environmental and water conservation;
- Water efficient landscaping workshops;
- Water Efficient Landscaping rebates in which residents can qualify for rebates of up to $1000 for converting their existing lawns to water efficient landscapes;
- High Efficiency Washing Machine rebates of up to $150;
- Distribution of complimentary water conservation tools including shower timers, moisture meters, fixtures, spray nozzles; and water conservation informational handouts.

The City also partners with the cities of Vacaville, Suisun, Dixon, and Fairfield to implement the Solano Water Education Program (SWEP), administered through the Solano Irrigation District (SID) to provide in-school and off-site water conservation education workshops and activities to K-12 students, teachers, and parents. The program focuses on educating participants on the water cycle, local water sources, water and wastewater treatment, and water conservation. Partner programs include large scale water conservation assembly presentations by the Zun Zun and Rock Steady water education programs.

Project W.E.T. (Water Education for Teachers) focuses on providing workshops specifically for teachers. This year's workshops provided six hours of water conservation training for participating educators. Finally, the City also participates in an annual water conservation video contest in which students from throughout the county compete to have their original videos featured on the SCWA website and Youtube. Cash prizes are given to the top student winners and their teachers on behalf of their schools.

The City also financially supports the California Water Awareness Campaign through its participation in the WCC.

Method to Evaluate Effectiveness

The City annually collects, assesses, and reports relevant data to determine program effectiveness, including, but not limited to:

- number of visits to conservation websites.
- number of programs, materials, and publications distributed.
- number of participants at workshops and public events.
- annual budget for program.

9.1.5 Programs to Assess and Manage Distribution System Real Loss

Program Description

The City conducts distribution system water audits annually in order to reconcile water production figures with consumption records. After accounting for unmetered uses, the City estimates its system losses and performs distribution system leak detection in an attempt to minimize those losses. The City's system audit program consists of the following:

Annually complete a pre-screening system audit as follows:

- Determination of metered sales;
- Determination of other system verifiable uses;
- Determination of total supply into system;
- Determination of estimated loss based on the above data. In the event this quantity is greater than 10 percent, a full-scale system audit is initiated.

In addition to the above, the City conducts annual line and hydrant flushing in order to maintain water quality, appropriate system pressure, and assure proper working conditions.

Method to Evaluate Effectiveness

The City collects the following information to determine the effectiveness of this DMM:

- Prescreening audit results and supporting documentation.
- In-house records of audit results or the completed AWWA Audit Worksheets for each completed audit period.

9.1.6 Water Conservation Program Coordination and Staffing Support

Program Description

The City has maintained a Water Conservation Program and coordinator since 1989. Under the Water Conservation Coordinator, the City promotes residential and commercial, industrial, and institutional water conservation in order to achieve regular and mandated water consumption targets. Programs include water systems management, public and school education, regional water conservation programs, workshops, and rebate programs. The current water conservation coordinator is Ramiro Jimenez, Utilities Administrative Manager with the Utilities Department. He is supported by four administrative and technical support staff members. He can be contacted at:

Ramiro Jimenez
Utilities Administrative Manager/Water Conservation Coordinator
Utilities Department
City of Vacaville
P.O. Box 220
Elmira, CA 95625
(707) 469-4123
Email: ramiro.jimenez@cityofvacaville.com

Budget

In 2015 the City budgeted $110,000.00 of the Water Conservation Coordinator position towards implementation of the various DMMs for the City.

9.1.7 Other Demand Management Measures

Implementation Description

The City currently employs or plans to employ additional demand management measures not discussed in the preceding sections that include, but are not limited to:

- Indoor/outdoor residential water use surveys which provide detailed histories of water consumption; check for leaks; evaluate fixture and landscape conditions; measure flow rates; provide high-efficiency fixtures as requested/required; and provide free literature, water savings devices, and materials to help promote water efficient use and landscaping.

- Establishment of water budgets for approximately 95 large landscape accounts primarily consisting of parks, schools, and community and private facilities. To date the City has installed smart weather-based irrigation controllers at all 15 City parks and one business park. The controllers receive data from one of the three California Irrigation Management Information System (CIMIS) stations located in the region.

- Recently updating the *Water Efficient Landscape Requirement* program that requires a water budget for all landscape areas (except single-family backyards). The regulations establish a budget based on the season and the ratio of high, medium, low, and hardscape areas contained within the designated landscape area. A copy of the *Water Efficient Landscape Requirements* is provided in Appendix J.

9.2. Implementation Over the Previous Five Years

Since 2010, the City has maintained and implemented its DMMs as follows:

Water Waste Ordinances

The City's Municipal Code and Water Conservation Ordinances have been in effect since 1991 and are regularly enforced through proactive and responsive enforcement via the City's Code Compliance section. In 2014 Ordinance 1877 was adopted updating the Water Conservation regulations outlined in Municipal Code 14.020.40. Additionally, in June of 2015 two Code Compliance Technicians and an Administrative Clerk were added to the Code Compliance section specifically to address and enforce the water waste prohibition regulations.

In 2015, 807 notices were issued to residents in violation of the regulations.

Metering

The City has required meters for all new connections since the inception of the utility in 1959.

In 2013 the City replaced 14,300 existing analog meters with newer and more accurate Automatic Meter Reading (AMR) meters.

Conservation Pricing

From 2010 through January of 2016 the City utilized a two tier inclining block rate structure as a method for promoting water conservation. With the change to a single uniform rate structure commencing in February 2016 to comply with state mandates and case law, the City has implemented a 5.5 percent rate increase that incorporates and plans for ongoing water conservation of 20 percent as a result of continued water conservation measures and an annual increase in water rates.

The City also implemented residential water use allocations in 2015 to promote water conservation. Each household is presently limited to a specified number of units (1 unit = 748 gallons) each month as shown in table 9-C:

TABLE 9-C
RESIDENTIAL WATER USE ALLOCATIONS

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Units	12	12	18	18	24	24	24	24	18	18	12	12
GPHD	300	300	450	450	600	600	600	600	450	450	300	300

Households are limited to 300 units per month in the winter months, with the allocations being seasonally adjusted to 450 units per month in the spring/fall months, and 600 units per month during summer to allow for some outdoor irrigation. Based on an average estimated household of 5 people, this equates to approximately 60 gpcd per household per day in the winter, 90 gpcd in the spring/fall, and 120 gpcd in the summer.

Although the inclining block pricing has been eliminated, Municipal Code 13.20.040 maintains the City's ability to modify prices in order to fully compensate for the acquisition, treatment, and distribution of water including promoting the beneficial use of that water. This section of the code further confirms that water efficient landscape requirements and state mandated water conservation measures, including SB 7x7, will continue under normal conditions as well as drought and emergency conditions.

In 2015 the City reduced its water consumption by 29 percent over the same period in 2010.

Public Education and Outreach

The City continued to regularly participate in its public education and outreach programs in the last 5 years:

- Water conservation education and information through water billing inserts and direct messaging on bills and emails were sent out quarterly to 27,000 customers.
- Public service announcements on local media including public television, radio, newspapers, webpage, and social media were sent out quarterly each year.
- Staff provided information at over a dozen public and private regional events including Earth Day, Fiesta Days, Kid's Fest, City Health Faire, and the Solano County Fair, contacting and disseminating information and resources to over 800 visitors annually.
- Planet Water at Six Flags Discovery Kingdom was viewed by an estimated 2 million visitors annually.
- The City annually participated in 2 public water education workshops through the WCC.
- Approximately 2,500 water efficient fixtures and 5,000 tools and handouts were distributed to residents and water customers.
- 225 Water Efficient Landscaping rebates were awarded in 2015.
- 226 High Efficiency Washing Machine rebates were awarded in 2015.
- On average, 8 assemblies, 35 class room presentations, and 3,000 materials and resources were provided and/or distributed to 3,500 Vacaville students and teachers annually. In addition, over 150 students county-wide participated in the high school water conservation video contest in 2015.
- The dedicated water conservation webpage on the City's website was significantly updated to facilitate finding water conservation regulations, tips, and resources.

Distribution System Loss

Approximately 10 percent of the City's water distribution system was evaluated annually over the past 5 years.

In 2013 the City replaced 14,300 existing analog meters with radio read meters to increase reporting efficiency and mitigate system loss.

Based on the system water supply and verifiable metered usage data, water loss for 2015 was estimated at 4 percent, a savings of 490 acre feet over the same period in 2010.

Water Conservation Program Coordination

The Water Conservation Coordinator and support staff spent up to 25 percent of their time annually on water conservation programs (higher percentage in the last two years due to drought related activities).

Other Measures

Since 2010, 17,610 residential survey letters and 831 surveys have been performed.

9.3. Planned Implementation to Achieve Water Use Targets

The City plans to continue to administer its existing DMMs in order to achieve the 20 percent water conservation target as established in SB7X7.

Specifically, the City will continue to maintain and implement the following programs:

- Maintenance and enforcement of Water Waste Prohibitions;
- Replacement of existing meters as required and installation of new meters on all City water connections;
- The use of water pricing and when warranted, penalties for excessive use, to promote conservation;
- Voluntary and mandatory water conservation measures, including irrigation restrictions and water use allocations, to promote and/or mandate conservation;
- Public education and outreach including regional media, the City's billing system, local school districts, the City's website, and our regional Water Conservation group, to promote conservation;
- Maintenance of our system leak detection and loss prevention program to identify and repair leaks in order to maintain and improve upon the current system loss amount;
- Continued support and administration of a Water Conservation program with dedicated administrative and support staff;
- Promotion and implementation of residential surveys;
- Establishment of Large Landscape program water budgets; and
- Continued implementation and maintenance of the City's Water Efficient Landscape Requirements.

9.4. Member of the California Urban Water Conservation Council

As a member of the California Urban Water Conservation Council (CUWCC), the City complies with all CUWCC requirements of the *2008 Memorandum of Understanding Regarding Urban Water Conservation in California* and submits it annual BMP reports as required by the memorandum. The DMMs in the UWMP are submitted in addition to the BMPs that have been electronically submitted to the CUWCC for 2013-2014.

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10.0 PLAN ADOPTION, SUBMITTAL, AND IMPLEMENTATION

This chapter provides details regarding the public hearing, adoption process, implementation and amendments.

10.1. Notice of Public Hearing

The City mailed out notifications to 19 nearby agencies and districts on March 29, 2016, for the June 14, 2016, Public Hearing. The letter and list of recipients are included in Attachment B.

10.2. Public Hearing and Adoption

This 2015 update of the UWMP was prepared from December 2015 through April 2016. The updated plan was adopted by City Council and submitted to the Department of Water Resources (DWR) in July 2016. See Appendix C for a copy of the Resolution approving the filing of the 2015 Urban Water Management Plan Update. This plan includes all information necessary to meet the requirements of California Water Code Division 6, Part 2.6 (Urban Water Management Planning).

A copy of the adopted UWMP was submitted to the California Department of Water Resources, the California State Library, and is available to the public at the following locations in the City:

City Manager's Office (Front Counter)
Vacaville City Hall
650 Merchant Street
Vacaville, CA 95688

Utilities Department (Front Counter)
Utilities Administration and Control Building
6040 Vaca Station Road
Elmira, CA 95625