California Water Service

2015 Urban Water Management Plan

Redwood Valley District

June 2016

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List of Acronyms

AB	Assembly Bill
AF	Acre-Foot
AMI	Advanced Metering Infrastructure
AMR	Automatic Meter Reading
BCR	Benefit-Cost Ratio
BMP	Best Management Practice
CEHTP	California Environmental Health Tracking Program
CASGEM	California Statewide Groundwater Elevation Monitoring Program
CII	Commercial, Industrial, Institutional, water use sectors
CIMIS	California Irrigation Management Information System
CPUC	California Public Utilities Commission
CUWCC	California Urban Water Conservation Council
CVP	Central Valley Project
CWC	California Water Code
DMMs	Demand Management Measures
DOF	Department of Finance
DWR	Department of Water Resources
eARDWP	Electronic Annual Reports to the Drinking Water Program (SWRCB)
ETo	Reference Evapotranspiration
GIS	Geographic Information System
GPCD	Gallons per Capita per Day
IOU	Investor-Owned Utility
IRWM	Integrated Regional Water Management
LAFCO	Local Agency Formation Commission
MGD	Million Gallons Per Day
MOU	Memorandum of Understanding Regarding Urban Water Conservation
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
PWS	Public Water System
RWQCB	Regional Water Quality Control Board
SB	Senate Bill
SB X7-7	Senate Bill Seven of the Senate's Seventh Extraordinary Session of 2009
SGMA	Sustainable Groundwater Management Act
SWP	State Water Project
SWRCB	State Water Resources Control Board
RUWMP	Regional Urban Water Management Plan
USBR	United States Bureau of Reclamation
UWMP	Urban Water Management Plan
WARN	Water/Wastewater Agency Response Network
WDR	Waste Discharge Requirement
WRR	Water Recycling Requirement
WSCP	Water Shortage Contingency Plan

Chapter 1
Introduction and Overview

This chapter discusses the importance and uses of this Urban Water Management Plan (UWMP), the relationship of this plan to the California Water Code (CWC), the relationship of this plan to other local and regional planning efforts, and how this plan is organized.

This chapter contains the following sections:

1.1 Background and Purpose

California Water Service Company (Cal Water) is an investor-owned public utility supplying water service to 1.7 million Californians through 435,000 connections. Its 24 separate water systems serve 63 communities from Chico in the North to the Palos Verdes Peninsula in Southern California. California Water Service Group, Cal Water's parent company, is also serving water to communities in Washington, New Mexico and Hawaii. Rates and operations for districts located in California are regulated by the California Public Utilities Commission (CPUC). Rates are set separately for each of the systems.

Cal Water incorporated in 1926 and has provided water service to communities served by the Redwood Valley District since 2000. The District comprises six separate water systems and service communities in Lucerne, Duncans Mills, Guerneville, Dillon Beach, and a portion of Santa Rosa.

The UWMP is a foundational document and source of information about Redwood Valley District's historical and projected water demands, water supplies, supply reliability and vulnerabilities, water shortage contingency planning, and demand management programs. Among other things, it is used as:

- A long-range planning document by Cal Water for water supply and system planning
- Source data on population, housing, water demands, water supplies, and capital improvement projects used in
    - Regional water resource management plans prepared by wholesale water suppliers and other regional planning authorities,

- General Plans prepared by cities and counties,
- Statewide and broad regional water resource plans prepared by the California Department of Water Resources (DWR), State Water Resources Control Board (State Board or Board), or other state agencies.

UWMPs are updated every five years. The last update was completed in 2010. This document is an update to the 2010 UWMP and carries forward information from that plan that remains current and is relevant to this plan. Although this plan is an update to the 2010 UWMP, it was developed to be a self-contained, stand-alone document and does not require readers to reference information contained in previous updates.

1.2 Urban Water Management Planning and the California Water Code

The UWMP Act requires urban water suppliers to prepare an UWMP every five years and to file this plan with the DWR, the California State Library, and any city or county within which the supplier provides water supplies. All urban water suppliers, either publicly or privately owned, providing water for municipal purposes either directly or indirectly to more than 3,000 customers or supplying more than 3,000 acre-feet annually are required to prepare an UWMP (CWC §10617).

The UWMP Act was enacted in 1983. Over the years it has been amended in response to water resource challenges and planning imperatives confronting California. A significant amendment was made in 2009 as a result of the governor's call for a statewide 20 percent reduction in urban water use by 2020. Colloquially known as 20x2020, the Water Conservation Act of 2009 (also referred to as SB X7-7) required urban retail water suppliers to establish water use targets for 2015 and 2020 that would result in statewide water savings of 20 percent by 2020. Beginning in 2016, urban 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. Chapter 5 of this plan contains the data and calculations used to determine compliance with these requirements.

The UWMP Act contains numerous other requirements that an UWMP must satisfy. Appendix A to this plan lists each of these requirements and where in the plan they are addressed.

1.3 Relation to Other Planning Efforts

This plan provides information specific to water management and planning by the Redwood Valley District. However, water management does not happen in isolation; there are other planning processes that integrate with the UWMP to accomplish urban planning. Some of these plans include city and county General Plans, Water Master Plans,

Recycled Water Master Plans, Integrated Regional Water Management Plans, Groundwater Management Plans, and others.

This plan is informed by and helps to inform these other planning efforts. In particular, this plan utilizes information contained in city and county General Plans and local and regional water resource plans to the extent data from these plans is applicable and available.

1.4 Plan Organization

The organization of this Plan follows the same sequence as outlined in 2015 UWMP Guidebook.

Chapter 1 - Introduction and Overview

Chapter 2- Plan Preparation

Chapter 3 - System Description

Chapter 4 - System Water Use

Chapter 5- Baselines and Targets

Chapter 6 - System Supplies

Chapter 7— Water Supply Reliability

Chapter 8 – Water Shortage Contingency Planning

Chapter 9 — Demand Management Measures

Chapter 10 — Plan Adoption, Submittal, and Implementation

In addition to these ten chapters, this plan includes a number of appendices providing supporting documentation and supplemental information. Pursuant to CWC §10644(a)(2), this plan utilizes the standardized forms, tables, and displays developed by DWR for the reporting of water use and supply information required by the UWMP Act. This plan also includes other tables, figures, and maps, to augment the set developed by DWR. The plan notes if a table, figure, or map is part of DWR's standardized set or supplemental to it.

Chapter 2
Plan Preparation

This chapter discusses the type of UWMP Redwood Valley District is preparing and includes information that will apply throughout the plan. Coordination and outreach during the development of the plan is also discussed.

This chapter includes the following sections:

2.1 Basis for Preparing a Plan

2.2 Regional Planning and Reporting

2.3 Units of Measure

2.4 Coordination and Outreach

2.1 Basis for Preparing a Plan

Per CWC §10617, only urban water suppliers with 3,000 or more customers or supplying 3,000 or more acre-feet of water annually are required to complete an UWMP. Redwood Valley District is presently below both thresholds. However, Cal Water has elected to prepare plans for all the districts it operates regardless of their size because these plans are integral to Cal Water planning initiatives at both the enterprise-level and district-level, as well as important sources of information for broader regional planning efforts.

Redwood Valley District is an urban retail water supplier, as defined by CWC §10608.12. Redwood Valley District does not provide water at wholesale.

Redwood Valley District operates the Public Water Systems (PWS) listed in Table 2-1. Public Water Systems are the systems that provide drinking water for human consumption and these systems are regulated by the State Water Resources Control Board (Board), Division of Drinking Water. The Board requires that water agencies report water usage and other information via the electronic Annual Reports to the Drinking Water Program (eARDWP). The information provided in this UWMP is consistent with the data reported in the eARDWP. PWS data reported to the Board is used by the state to determine whether or not a retail supplier has reached the threshold (3,000 or more connections or 3,000 acre-feet of water supplied) for submitting an UWMP.

Table 2-1: Public Water Systems			
Public Water System Number	Public Water System Name	Number of Municipal Connections 2015	Volume of Water Supplied 2015 (AF)
4910018	Armstrong Valley Water	268	54
2110007	Coast Springs Water	250	20
4900546	Hawkins Water	50	8
1710005	Lucerne Water	1190	196
4900785	Noel Heights	48	7
4900514	Rancho del Paradiso	58	5
	Total	**1,864**	**290**

2.2 Regional Planning

Regional planning can deliver mutually beneficial solutions to all agencies involved by reducing costs for the individual agency, assessing water resources at the appropriate geographic scale, and allowing for solutions that cross jurisdictional boundaries. Cal Water participates in regional water resources planning initiatives throughout California in the regions in which its 25 water districts are located.

2.3 Individual or Regional Planning and Compliance

Urban water suppliers may elect to prepare individual or regional UWMPs (CWC §10620(d)(1)). Redwood Valley District is preparing an individual UWMP.

Urban retail water suppliers may report on the requirements of SB X7-7 (2009 California Conservation Act) individually or as a member of a "Regional Alliance." As described in Chapter 5, Redwood Valley District is a member of a Regional Alliance and this UWMP provides information on the District's progress towards meeting its SB X7-7 water conservation targets both as an individual urban retail water supplier and as a member of a Regional Alliance.

Table 2-2: Plan Identification	
☑	Individual UWMP
☐	Regional UWMP
Notes: Redwood Valley District is a member of a Regional Alliance. Chapter 5 provides information on the District's progress towards meeting its water conservation targets under SB X7-7 both as an individual urban retail water supplier and as a member of its Regional Alliance.	

2.4 Fiscal or Calendar Year and Units of Measure

Annual volumes of water reported in this UWMP are measured in acre-feet (AF) and are reported on a calendar year basis. Water use and planning data reported in this UWMP for calendar year 2015 cover the full twelve months of the year, as required by the UWMP Guidelines. Table 2-3 summarizes the units of measure used throughout this UWMP.

Table 2-3: Agency Identification	
Name of Agency	California Water Service: Redwood Valley District
Select one or both	
☐	Agency is a wholesaler
☑	Agency is a retailer
Fiscal or Calendar Year	
☑	UWMP Tables Are in Calendar Years
☐	UWMP Tables Are in Fiscal Years
Units of Measure	
☑	Acre Feet (AF)
☐	Million Gallons (MG)
☐	Hundred Cubic Feet (CCF)

2.5 Coordination and Outreach

Coordination with other water suppliers, cities, counties, and other community organizations in the region is an important part of preparing an UWMP (CWC §10620; CWC §10642). This section identifies the agencies and organizations Redwood Valley District sought to coordinate with during preparation of this plan.

2.5.1 Wholesale and Retail Coordination

Urban retail water suppliers relying on one or more wholesalers for water supply are required to provide these wholesalers with information regarding projected water supply and demand. Redwood Valley District provided information regarding projected water supply and demand to the wholesale water suppliers listed in Table 2-4.

Table 2-4: Retail: Water Supplier Information Exchange
Redwood Valley District has informed the following wholesale supplier(s) of projected water use in accordance with CWC 10631.
Wholesale Water Supplier Name
Sweetwater Springs Water District
Yolo County Flood Control and Water Conservation District

2.5.2 Coordination with Other Agencies and the Community

Redwood Valley District coordinated with cities, counties, and other community organizations during preparation of this UWMP. Cal Water provided notice to these entities and the communities it serves 60 days prior to the public hearing it held on May 18, 2016, to present the draft of the UWMP, address questions, and receive comments. Cities and counties receiving the public hearing notification from Redwood Valley District as required per CWC §10621 (b) are listed in Table 10-1 in Chapter 10 of this plan.

Chapter 3
System Description

This chapter provides a description of Redwood Valley District's water system and the service area, including climate, population, and demographics, to help in understanding various elements of water supply and demand.

This chapter includes the following sections:

3.1 Service Area General Description

3.2 Service Area Map(s)

3.3 Service Area Climate

3.4 Service Area Population and Demographics

3.1 Service Area General Description

The Redwood Valley District is a collection of six individual water systems spread throughout northern California in Marin, Sonoma, and Lake Counties. Figure 3-1 shows a general location map of the District in relation to other cities in the area.

- The Coast Springs system serves a portion of the coastal community of Dillon Beach on the southern end of Bodega Bay in northwest Marin County. The service area consists primarily of single family residential homes and a few commercial services. Land use in the surrounding area is mainly pasture and single family homes with large lots. Water served by the District in the Coast Springs system comes from local groundwater produced by eight wells. Groundwater served to customers in Dillon Beach is under the influence of surface water.

- The Armstrong Valley, Noel Heights, and Rancho del Paradiso systems serve rural communities surrounding Guerneville along State Highway 116 in Sonoma County. These communities have historically consisted mostly of seasonal vacation homes and supporting commercial properties. But more recently there has been a shift towards an increasingly permanent population. This trend will likely continue because of the relative affordability of housing in these areas compared to the rest of Sonoma County. Rancho del Paradiso customers receive surface water purchased from and processed by the Sweetwater Springs Water District. The other two districts deliver local groundwater produced from three wells. Groundwater delivered to Noel Heights customers is under the influence of local surface water.

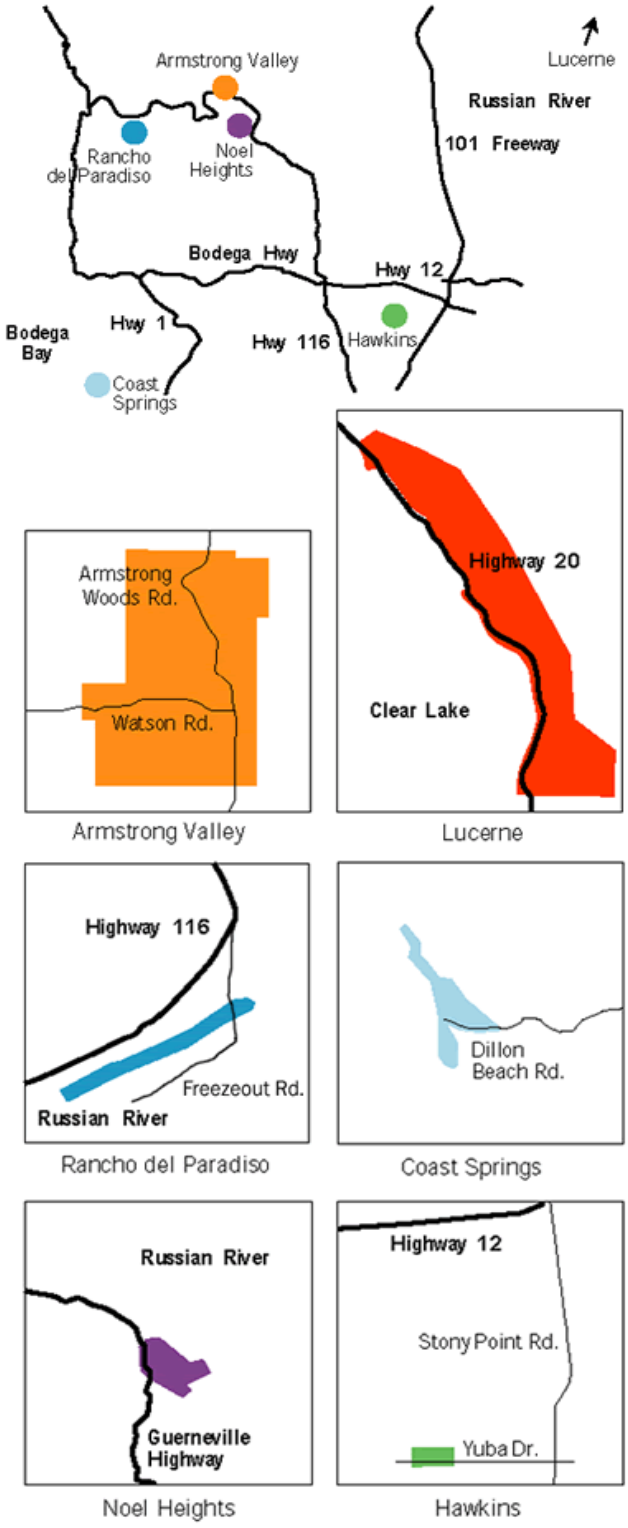
- The Hawkins system is located in the southern portion of the City of Santa Rosa. It serves a subdivision of approximately 50 single family residential services with local groundwater produced by a single well.

- The Lucerne system serves the community of Lucerne along State Highway 20 adjacent to Clear Lake in Lake County. Lucerne is the largest water system in the Redwood Valley District and shows a more typical distribution of service connection types including single and multifamily residential, commercial, and governmental services. Water delivered by the District is purchased from the Yolo County Flood Control and Water Conservation District and comes from Clear Lake.

The Redwood Valley District water systems are spread over a large area and some are located near significant geologic features. Coast Springs is within several miles of the San Andreas Fault Zone, which runs southeast to northwest through Bodega Bay. The Rogers Creek Fault is located just east of the Hawkins system in Santa Rosa and the Mt. Konocti and Collayomi Faults line the west side of Clear Lake near Lucerne. A major earthquake on any of these faults has the potential to disrupt water service in the District.

The Redwood Valley District was formed in 2000 with the purchase of the Redwood Valley Water Company. Over the last five years, the District delivered and average of 0.5 million gallons of water per day to more than 1,800 service connections.

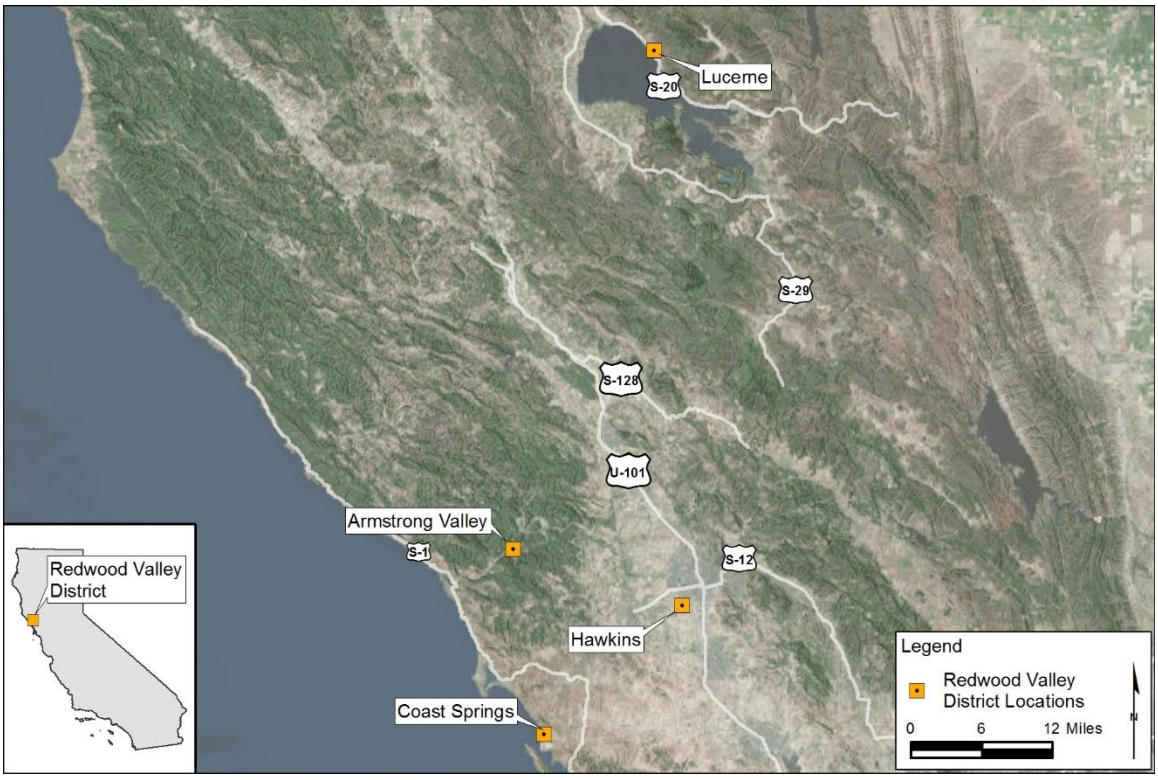
Figure 3-1. General Location of Redwood Valley District Systems



3.2 Service Area Maps

Detailed service area maps are provided in Appendix E. Figure 3-2 shows the District's service areas.

Figure 3-2. Redwood Valley District Service Areas



3.3 Service Area Climate

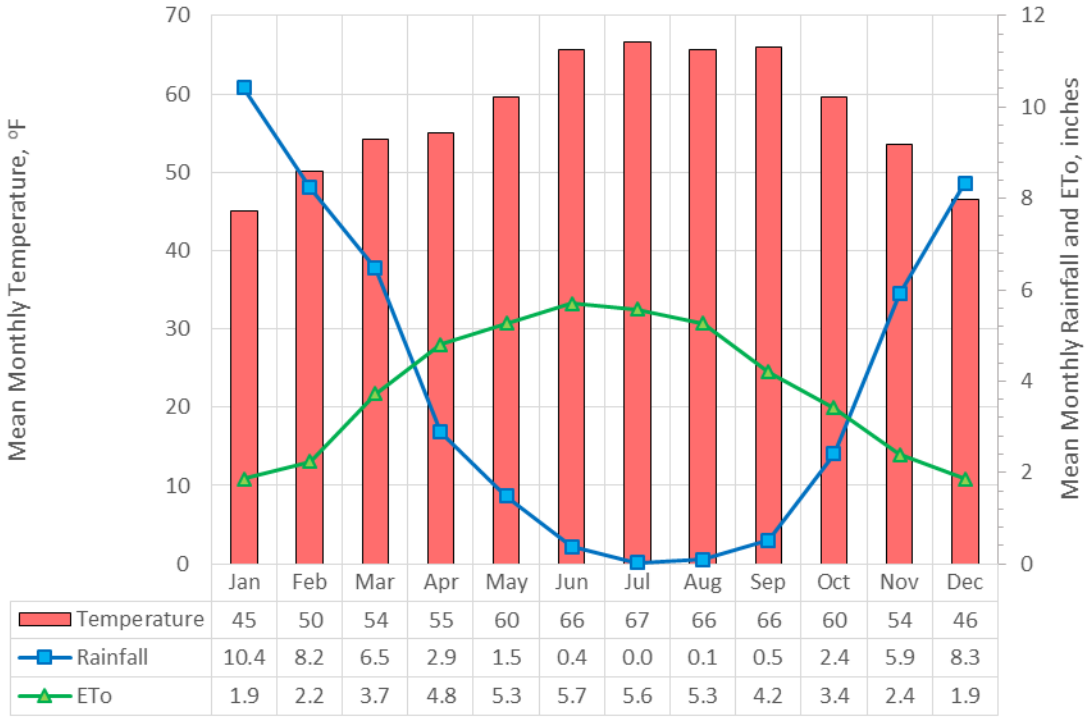
The climate for the Redwood Valley District is moderate with warm dry summers and cool wet winters. The majority of precipitation falls during late autumn, winter, and spring. Figure 3-3 displays monthly averages for rainfall, reference evapotranspiration (ETo), and daily air temperature. Additional climate data is provided in Appendix F, worksheet 13. Rainfall and temperature data are obtained from the PRISM Climate Group.[1] ETo values are from the California Irrigation Management Information System (CIMIS).[2]

On average, the District receives about 47 inches of rainfall, annually. ETo averages 46 inches, annually. Annual rainfall is 102 percent of ETo, on average. Nearly all irrigation requirements during the summer months are met with District water sources due to the

[1] www.prism.oregonstate.edu.
[2] CIMIS Zones Map, Zone 3.

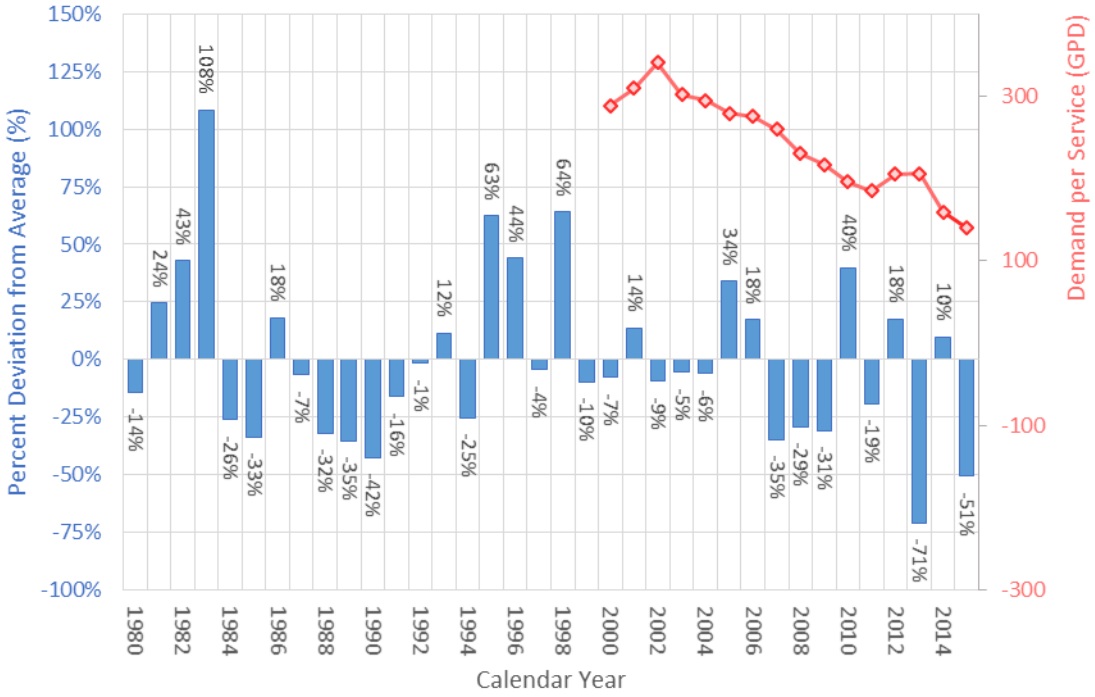
lack of rainfall in the region. Annual rainfall in Redwood Valley District also is highly variable, as shown in Figure 3-4, and has been below average in six of the last ten years. Calendar year 2013 was the driest year on record, receiving just 29 percent of average rainfall.

Figure 3-3. Average Monthly Temperature, Rainfall, and ETo



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Temperature	45	50	54	55	60	66	67	66	66	60	54	46
Rainfall	10.4	8.2	6.5	2.9	1.5	0.4	0.0	0.1	0.5	2.4	5.9	8.3
ETo	1.9	2.2	3.7	4.8	5.3	5.7	5.6	5.3	4.2	3.4	2.4	1.9

Figure 3-4. Annual Rainfall Deviation from Average



3.3.1 Climate Change

Potential impacts of climate change on District water demands and supplies are discussed in Chapters 4 (System Water Use), 6 (System Supplies), and 7 (Water Supply Reliability Assessment). Here it is noted that climate change is expected to bring higher average temperatures and greater variability in weather, with the potential for more frequent and deeper droughts.

The National Climatic Data Center (NCDC) has established 11 climate regions within California. Each region is defined by unique characteristics, and is shown in Figure 3-5. The Redwood Valley District is located in the North Coast Region (region A on the map). The North Coast Region has experienced a general warming trend in the last several decades, as shown in Figure 3-6. Since 1895, maximum and minimum temperatures have increased at a rate of 1.00 °F and 0.90 °F per 100 years, respectively. More recently, since 1975, maximum and minimum temperatures have increased at a rate of 0.17 °F and 0.31 °F per 100 years, respectively.

Figure 3-5. Climate Regions of California

A. North Coast Region
B. North Central Region
C. Northeast Region
D. Sierra Region
E. Sacramento-Delta Region
F. Central Coast Region
G. San Joaquin Valley Region
H. South Coast Region
I. South Interior Region
J. Mojave Desert Region
K. Sonoran Desert Region

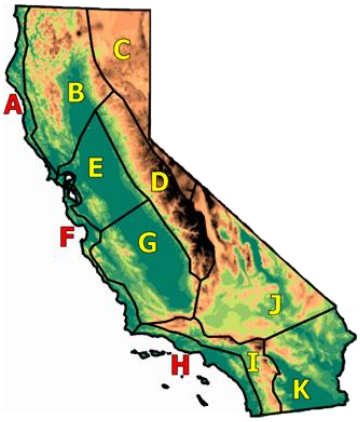
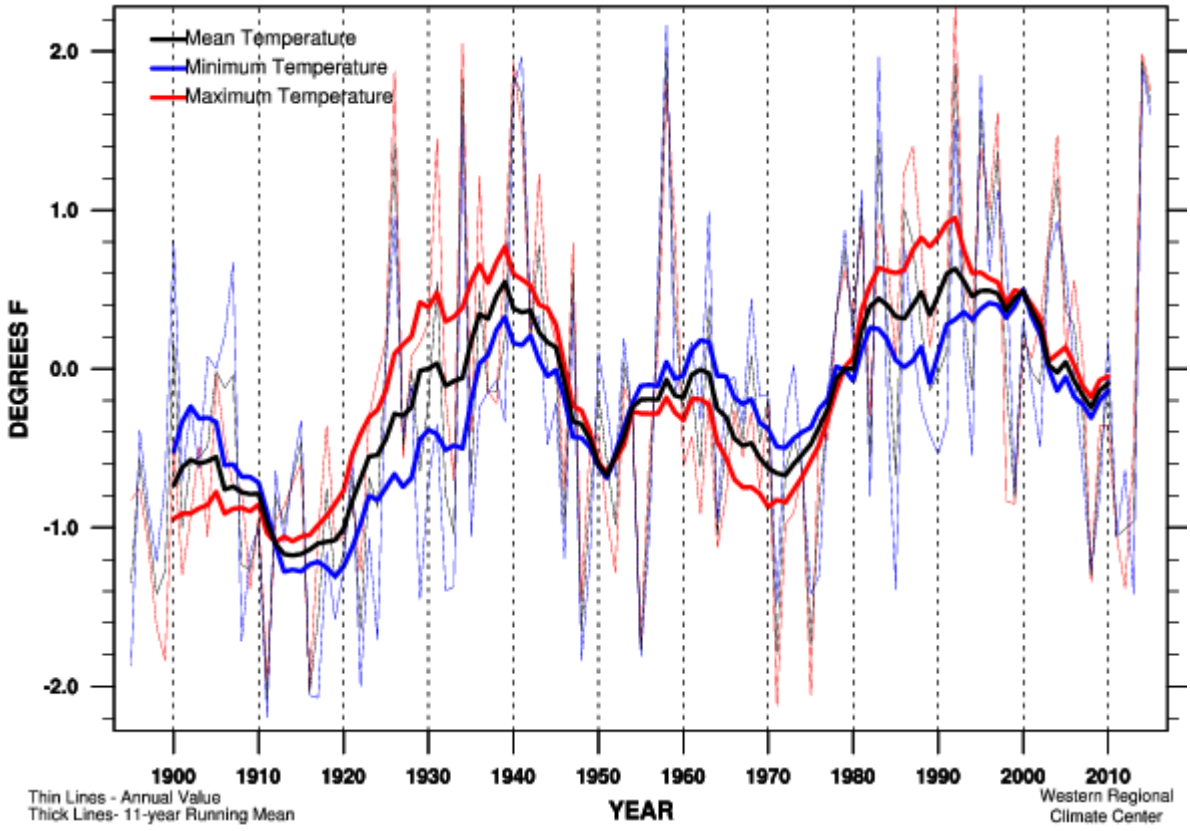


Figure 3-6. Temperature Departure, North Coast Region



	Maximum Temperature	Minimum Temperature
Linear Trend 1895-present	+ 1.00 (± 0.48) °F/100yr	+ 0.90 (± 0.47) °F/100yr
Linear Trend 1949-present	+ 1.65 (± 1.19) °F/100yr	+ 0.67 (± 1.13) °F/100yr
Linear Trend 1975-present	- 0.17 (± 2.66) °F/100yr	+ 0.31 (± 2.58) °F/100yr

3.4 Service Area Population and Demographics

Cal Water's Redwood Valley District growth rate has seen moderate fluctuations in the past but remains relatively stable. Because it is a smaller district, sudden increases or decreases in service counts have a larger impact on observed growth rates. Over the previous five years, service area population has decreased by about 3 percent. Going forward, service area population is projected to grow at a rate of 0.4 percent annually through the 2040 planning horizon. This is primarily attributed to infill development within the existing service areas and mostly associated with multi-family housing development.

To estimate current service area population, Cal Water uses MARPLOT and LandView 5 software to intersect District service area boundaries with Census Blocks from the 2000 and 2010 Censuses. This yields estimates of the number of housing units and population within each Census Block in the District for 2000 and 2010. From these data, Cal Water estimates the total population and the average number of persons per housing unit in the District. Cal Water applies the average number of persons per housing unit to the number of housing units served to calculate service area population in non-Census years.

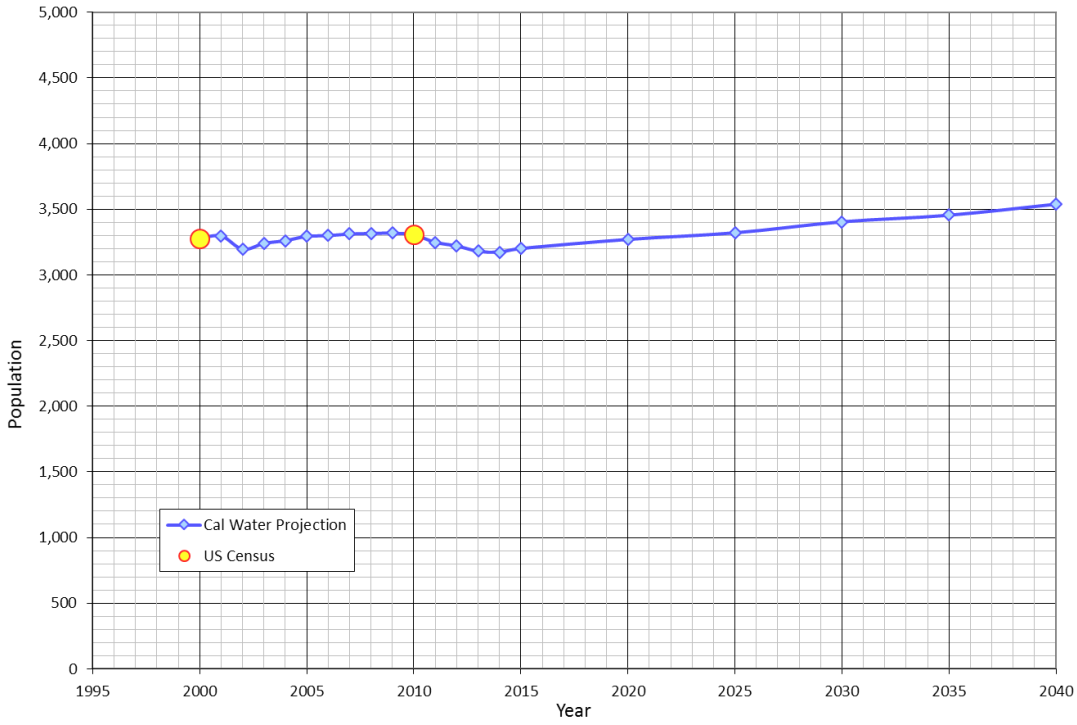
Between the 2000 and 2010 Censuses, the average number of persons per household decreased slightly from 1.60 to 1.58. The projection of future population is based on the lower housing unit density. Projected service area population is given in Table 3-1.

Table 3-1: Population - Current and Projected

	2015	2020	2025	2030	2035	2040
Population Served	3,201	3,270	3,321	3,404	3,455	3,539

Cal Water's current population projection for Redwood Valley District is compared in Figure 3-7 to population estimates developed with 2000 and 2010 Census Block data.

Figure 3-7. Population Projection Comparison



Chapter 4
System Water Use

This chapter provides a description and quantifies the Redwood Valley District's current water use and the projected uses through the year 2040. For purposes of the UWMP, the terms "water use" and "water demand" are used interchangeably.

This chapter is divided into the following subsections:

4.1 Recycled vs Potable and Raw Water Demand

4.2 Water Uses by Sector

4.3 Distribution System Water Losses

4.4 Estimating Future Water Savings

4.5 Water Use for Lower Income Households

4.6 Climate Change

4.1 Recycled versus Potable and Raw Water Demand

This plan maintains a clear distinction between recycled, potable, and raw water uses and supplies. Recycled water is addressed comprehensively in Chapter 6, but a summary of recycled water demand is included in Table 4-3 of this chapter. The primary focus of this chapter is historical and projected potable and raw water uses in the district.

4.2 Water Uses by Sector

4.2.1 Historical Potable and Raw Water Uses

Actual water use in 2015 by customer category is shown in Table 4-1. Total system demand in 2015 was 290 AF. District water use in 2015 was strongly affected by the Drought Emergency Regulation adopted by the State Water Resources Control Board in May of 2015 (SWRCB Resolution No. 2015-0032). Among other things, the Drought Emergency Regulation mandated urban retail water suppliers reduce potable water use between June of 2015 and February of 2016 by percentage amounts specified by the State Water Resources Control Board. The Redwood Valley District was ordered to reduce potable water use by 16 percent over this period relative to use over the same period in 2013. Between June and December 2015, water use in Redwood Valley was 32.2 percent less than water use over the same period in 2013.

Table 4-1: Retail: Demands for Potable and Raw Water - Actual		
Use Type	2015 Actual	
	Level of Treatment When Delivered	Volume (AF)
Single Family	Drinking Water	184
Multi-Family	Drinking Water	24
Commercial	Drinking Water	13
Industrial	Drinking Water	0
Institutional/Governmental	Drinking Water	3
Other	Drinking Water	0
Losses	Drinking Water	66
	Total	**290**

Residential customers account for approximately 96 percent of services and 66 percent of water use in the District, most of which is associated with single-family water use. Figure 4-1 shows the distribution of services in 2015. Figure 4-2 shows historical water sales by customer category.

Figure 4-1. Distribution of Services in 2015

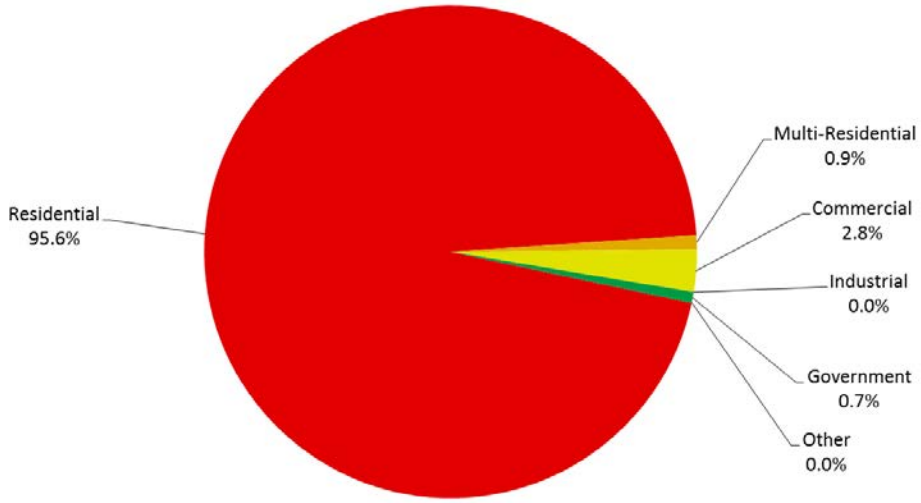
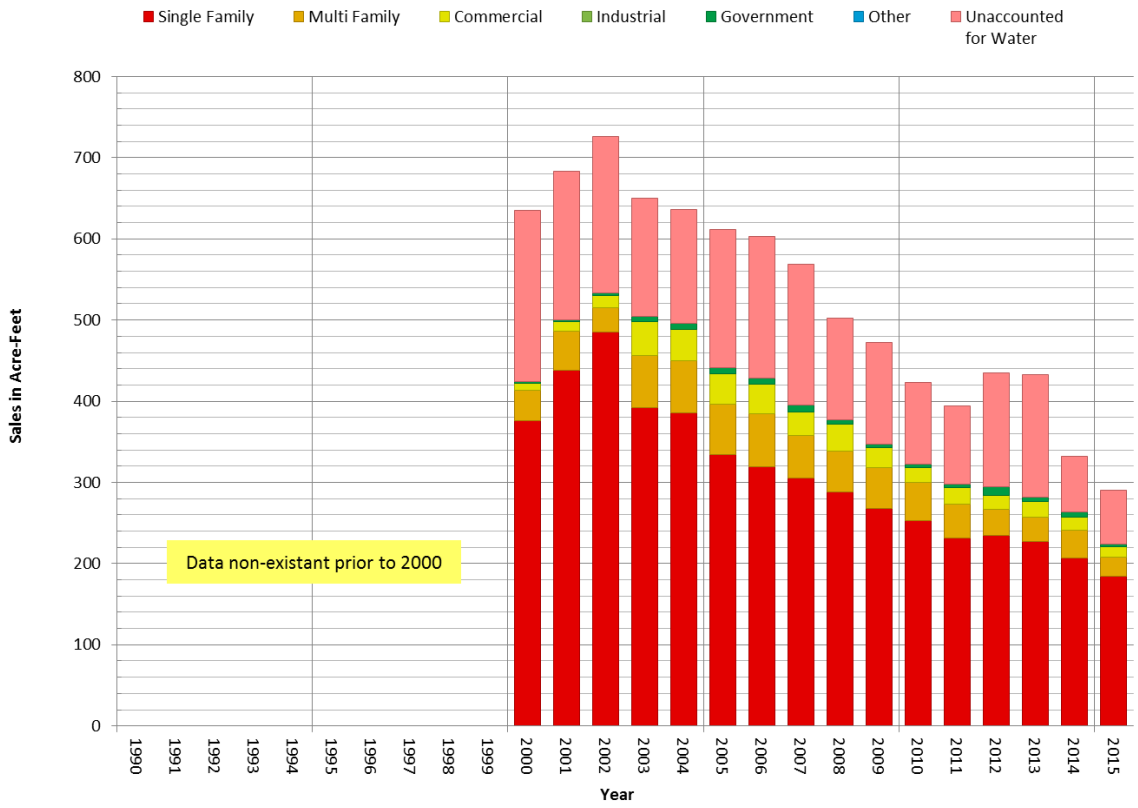


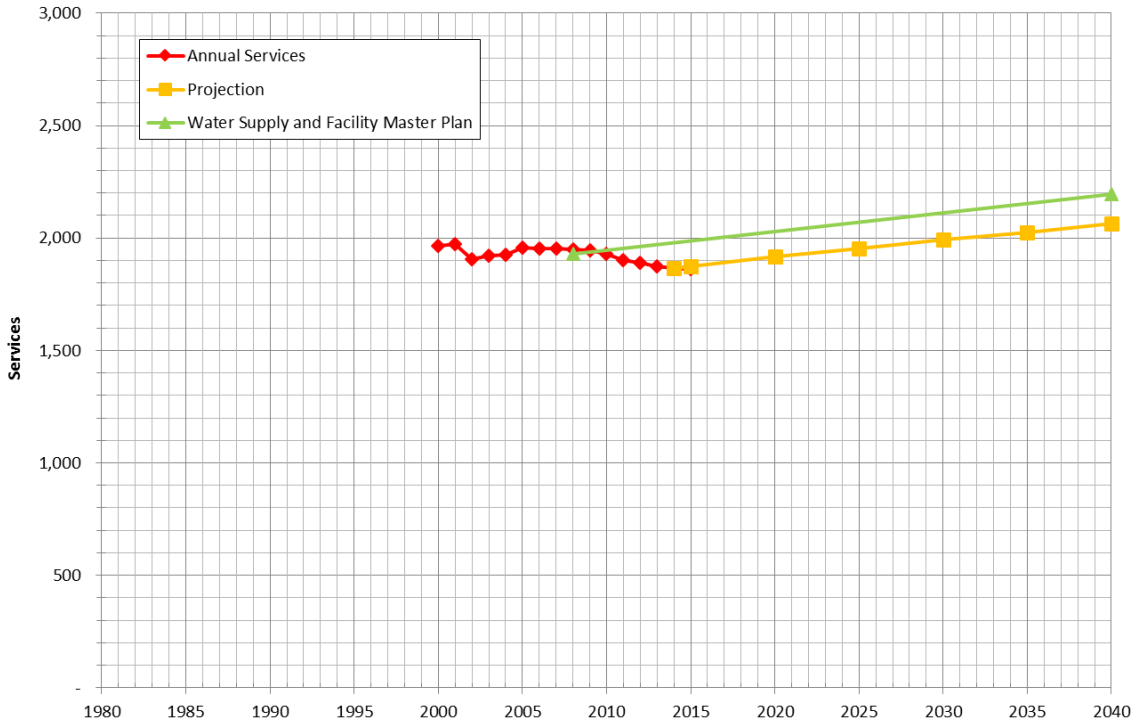
Figure 4-2. Historical Sales by Customer Category



4.2.2 Projected Potable and Raw Water Uses

Projected water demands by customer category through 2040 are shown in Tables 4-2. Future demands are estimated as the product of future services and expected water use per service. Residential and non-residential services are projected forward using the service growth rate forecasts in Cal Water's 2009 Water Supply and Facility Master Plan. The projected average annual growth rate in services across all customer categories is approximately 0.4 percent. Historical and projected services are shown in Figure 4-3. Also shown in the figure is the services projection from the Water Supply and Facility Master Plan.

Figure 4-3. Historical and Projected Services



Expected water use per service, shown in Figure 4-4, is based on weather-normalized historical use, adjusted for future expected water savings from plumbing codes and District conservation programs. Weather normalization of historical use was done econometrically using the California Urban Water Conservation Council GPCD Weather Normalization Methodology. Expected water savings from plumbing codes are presented in Section 4.4. Expected water savings from District conservation programs and projected compliance with the District's SB X7-7 2020 per capita water use target are discussed in Chapter 9. The projected trend in average use per service shown in Figure 4-4 does not account for possible effects of climate change on future demand. The potential effects of climate change on demand are discussed in Section 4.6.

Projected water uses in Table 4-2 and Figure 4-4 are predicated on unrestricted demands under normal weather conditions. Demands are assumed to partially rebound by 2020 from 2015 levels on the assumption that the State Water Resources Control Board's mandatory water use reductions end by October 2016, as currently scheduled. The difference between actual and projected demands in 2020 will critically depend on the accuracy of this assumption. If the Emergency Drought Regulations are continued beyond October 2016, then the likelihood of actual demands being less than projected demands in 2020 would be significantly increased.

Figure 4-4. Historical and Projected Average Use per Service in Gallons per Day

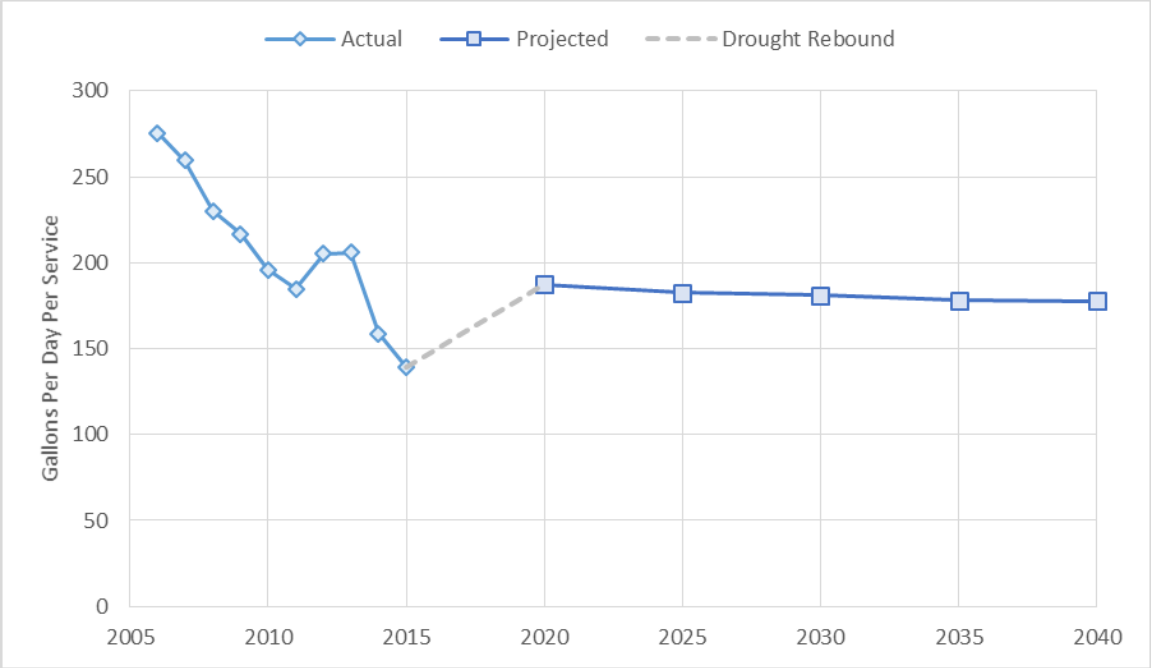


Table 4-2: Retail: Demands for Potable and Raw Water - Projected					
Use Type	Projected Water Use (AF)				
	2020	2025	2030	2035	2040
Single Family	264	261	260	261	262
Multi-Family	50	50	52	52	54
Commercial	23	21	21	19	19
Industrial	0	0	0	0	0
Institutional/Governmental	7	7	7	6	6
Other	0	0	0	0	0
Losses	58	61	64	67	69
Total	**403**	**399**	**404**	**405**	**412**

4.2.3 Total Water Demand Including Recycled Water

Total water demands, including recycled water uses, are shown in Table 4-3. Current and projected recycled water use is discussed in Chapter 6, Section 6.5.

Table 4-3: Retail: Total Water Demands						
	2015	2020	2025	2030	2035	2040
Potable and Raw Water *From Tables 4-1 and 4-2*	290	403	399	404	405	412
Recycled Water Demand *From Table 6-4*	0	0	0	0	0	0
Total Water Demand	**290**	**403**	**399**	**404**	**405**	**412**

4.3 Distribution System Water Losses

For the 2015 UWMP, urban retail water suppliers are required to quantify distribution system water losses for the most recent 12-month period available. For the Redwood Valley District, this period is January 1 to December 31 2014. System water loss was calculated using the DWR Water Audit Method, as described in Appendix L of the UWMP Guidelines. Distribution system water loss is reported in Table 4-4. The DWR Water Audit Method calculates two types of water losses: (1) apparent losses and (2) real losses. Apparent losses include unauthorized consumption, metering errors, and data errors. Apparent losses represent unauthorized or unrecorded water delivered to customers. Real losses include distribution system discharges, spills, and leaks of water. Real losses represent a physical loss of water to the system. Table 4-4 reports combined apparent and real distribution system water loss. A copy of the completed water balance worksheet for the Redwood Valley District is provided in Appendix M. Actions the Redwood Valley District is taking to reduce real and apparent distribution system water losses are discussed in Chapter 9.

Table 4-4: Retail: Water Loss Summary Most Recent 12 Month Period Available	
Reporting Period Start Date	Volume of Water Loss*
01/2014	65
*Taken from the field "Water Losses" (a combination of apparent losses and real losses) from the AWWA worksheet.	

4.4 Estimating Future Water Savings

The projections of future water use in Table 4-2 incorporate expected water savings from plumbing codes and appliance standards for residential and commercial toilets, urinals, clothes washers, dishwashers, and showerheads. These savings are commonly referred to as *passive water savings* to differentiate them from water savings resulting from water supplier conservation programs, which are termed *active water savings*. Active water savings resulting from the Redwood Valley District's implementation of demand

management measures are discussed in Chapter 9 of this plan. The estimates of passive water savings presented in this chapter were developed with the Alliance for Water Efficiency's *Water Conservation Tracking Tool* using data on the vintage, number, and water using characteristics of residences and businesses within Redwood Valley District's service area.

Confirmation that the water use projections contained in this plan incorporate projected future water savings from plumbing codes and appliance standards is provided in Table 4-5. The estimated volume of future water savings from plumbing codes and standards is summarized in Table 4-6.

Table 4-5: Retail Only: Inclusion in Water Use Projections	
Future Water Savings Included Y/N	Yes
If "Yes" to above, state the section or page number where citations of the codes, ordinances, etc… utilized in demand projections are found.	Location in UWMP: Section 4.4 of Chapter 4
Lower Income Residential Demands Included	Yes

Table 4-6: Retail Only: Future Passive Savings						
	2015	2020	2025	2030	2035	2040
Passive Savings (AF)	1	15	25	34	40	45

The following codes and standards form the basis for the estimated volume of future passive water savings:

- AB 715, enacted in 2007, requires that any toilet or urinal sold or installed in California on or after January 1, 2014 cannot have a flush rating exceeding 1.28 and 0.5 gallons per flush, respectively. AB 715 superseded the state's previous standards for toilet and urinal water use set in 1991 of 1.6 and 1.0 gallons per flush, respectively. On April 8, 2015, in response to the Governor's Emergency Drought Response Executive Order (EO B-29-15), the California Energy Commission approved new standards for urinals requiring that they not consume more than 0.125 gallons per flush, 75% less than the standard set by AB 715.

- Water use standards for residential and commercial clothes washers and dishwashers are established by the U.S. Department of Energy through its authority under the

federal Energy Policy and Conservation Act. Water use efficiency is summarized by the water factor for the appliance which measures the gallons of water used per cycle per cubic foot of capacity. A typical top-loading residential clothes washer manufactured in the 1990s had a water factor of around 12. In 2015, the allowable water factor for top- and front-loading residential clothes was reduced to 8.4 and 4.7, respectively. In 2018, water factor standard for top-loading residential clothes washers will be reduced to 6.5. In 2010 the allowable water factor for top- and front-loading commercial clothes washers was reduced to 8.5 and 5.5, respectively. The maximum water factor for Energy Star compliant top- and front-loading washers is 3.7 and 4.3, respectively. EPA estimates that Energy Star washers comprised at least 60 percent of the residential market and 30 percent of the commercial market in 2011.[3] An Energy Star compliant washer uses about two-thirds less water per cycle than washers manufactured in the 1990s. Federal dishwasher water use efficiency standards were last updated in 2013. The maximum water use for standard and compact sized dishwashers is 5.0 and 3.5 gallons per cycle, respectively.

- New construction and renovations in California are now subject to CalGreen Code requirements. CalGreen includes prescriptive indoor provisions for maximum water consumption of plumbing fixtures and fittings in new and renovated properties. CalGreen also allows for an optional performance path to compliance, which requires an overall aggregate 20% reduction in indoor water use from a calculated baseline using a set of worksheets provided with the CalGreen guidelines.

- SB 407, enacted in 2009, mandates that all buildings in California come up to current State plumbing fixture standards within this decade. This law establishes requirements that residential and commercial property built and available for use on or before January 1, 1994 replace plumbing fixtures that are not water conserving, defined as “noncompliant plumbing fixtures” as follows:
    - any toilet manufactured to use more than 1.6 gallons of water per flush;
    - any urinal manufactured to use more than one gallon of water per flush;
    - any showerhead manufactured to have a flow capacity of more than 2.5 gallons of water per minute; and
    - any interior faucet that emits more than 2.2 gallons of water per minute.

  For single-family residential property, the compliance date is January 1, 2017. For multi-family and commercial property, it is January 1, 2019. In advance of these dates, the law requires effective January 1, 2014 for building alterations and improvements to all residential and commercial property that water-conserving plumbing fixtures replace all noncompliant plumbing fixtures as a condition for issuance of a certificate

[3] EPA Energy Star Unit Shipment and Market Penetration Report Calendar Year 2011 Summary.

of final completion and occupancy or final permit approval by the local building department.

SB 407 also requires effective January 1, 2017 that a seller or transferor of single-family residential property disclose to the purchaser or transferee, in writing, the specified requirements for replacing plumbing fixtures and whether the real property includes noncompliant plumbing. Similar disclosure requirements go into effect for multi-family and commercial transactions January 1, 2019. SB 837, passed in 2011, reinforces the disclosure requirement by amending the statutorily required transfer disclosure statement to include disclosure about whether the property is in compliance with SB 407 requirements. If enforced, these two laws will require retrofit of non-compliant plumbing fixtures upon resale or major remodeling for single-family residential properties effective January 1, 2017 and for multi-family and commercial properties effective January 1, 2019.

California has also adopted regulations governing the future use of landscape water use.

- The California Water Commission approved the State's updated Model Water Efficient Landscape Ordinance (MWELO) on July 15, 2015. The updated MWELO supersedes the State's MWELO developed pursuant to AB 1881. Local agencies have until December 1, 2015 to adopt the MWELO or to adopt a Local Ordinance which must be at least as effective in conserving water as MWELO. Local agencies working together to develop a Regional Ordinance have until February 1, 2016 to adopt. The size of landscapes subject to MWELO has been lowered from 2500 sq. ft. to 500 sq. ft. The size threshold applies to residential, commercial, industrial and institutional projects that require a permit, plan check or design review. Additionally, the maximum applied water allowance (MAWA) has been lowered from 70% of the reference evapotranspiration (ETo) to 55% for residential landscape projects, and to 45% of ETo for non-residential projects. This water allowance reduces the landscape area that can be planted with high water use plants such as cool season turf. For typical residential projects, the reduction in the MAWA reduces the percentage of landscape area that can be planted to high water use plants from 33% to 25%. In typical non-residential landscapes, the reduction in MAWA limits the planting of high water use plants to special landscape areas. The revised MWELO allows the irrigation efficiency to be entered for each area of the landscape. The site-wide irrigation efficiency of the previous ordinance (2010) was 0.71; for the purposes of estimating total water use, the revised MWELO defines the irrigation efficiency (IE) of drip irrigation as 0.81 and overhead irrigation and other technologies must meet a minimum IE of 0.75.

- CalGreen requires that automatic irrigation system controllers for new landscaping provided by a builder and installed at the time of final inspection must be weather- or

soil moisture-based controllers that automatically adjust irrigation in response to changes in plant water needs as weather or soil conditions change.

The estimates of future water savings in Table 4-6 do not include potential landscape water savings from implementation of MWELO or CalGreen because estimating these savings required data that was not available to the District at the time this plan was prepared, including data on existing and future landscape areas, plant materials, irrigation equipment, and probable enforcement of and compliance with the landscape design and irrigation equipment requirements.

4.5 Water Use for Lower Income Households

California Senate Bill No. 1087 (SB 1087), Chapter 727, was passed in 2005 and amended Government Code Section 65589.7 and Water Code Section 10631.1. SB 1087 requires local governments to provide a copy of their adopted housing element to water and sewer providers. In addition, it requires water providers to grant priority for service allocations to proposed developments that include housing units for lower income families and workers. Subsequent revisions to the UWMP Act require water providers to develop water demand projections for lower income single and multi-family households.

Cal Water does not maintain records of the income level of its customers and does not discriminate in terms of supplying water to any development. Cal Water is required to serve any development that occurs within its service area, regardless of the income level of the future residents. It is ultimately the City's or County's responsibility to approve or not approve developments within the service area.

As a benefit to its customers, Cal Water offers a Low Income Rate Assistance Program (LIRA) in all of its service districts. Under the LIRA Program lower income customers that qualify are able to receive a discount on their monthly bills.

For the purposes of estimating projected demand of lower income households, Cal Water used the General Plan Housing Elements for Lake, Marin, and Sonoma Counties to estimate the average percentage of households in the unincorporated parts of these counties that qualify as lower income.[4] Based on these data, it is estimated that 34 percent of the households in the District are lower income. Lower income households are defined as households with income that is less than or equal to 80 percent of the median income for the area. Projected residential water demand for lower income households is

[4] Lake County General Plan Housing Element, April 2012, Table 2-15; Sonoma County Housing Element Technical Background Report, December 2, 2014, Table 4-38; Marin County Housing Element 2015-2023, December 9, 2014, Figure II-17.

shown in Table 4-7. These demands are incorporated into the service area demand projection given in Table 4-2.

Table 4-7. Residential Demand of Lower Income Households						
	2015 (actual)	2020	2025	2030	2035	2040
Demand (AF)	70	106	105	106	106	107

4.6 Climate Change

A hotter and dryer climate is expected to increase demand for outdoor water use. Cal Water has econometrically estimated the sensitivity of class-level water demand to deviations in precipitation and temperature from their long-term averages using historical data on monthly water sales and weather for the District.[5] The weather effect is measured as predicted sales conditional on observed weather versus predicted sales conditional on long-term average weather. The predicted weather effect is then summed on an annual basis and expressed as a percentage of annual weather-normalized sales. An estimate of the variance in annual water sales caused by departures in precipitation and temperature from their long term averages was developed for each customer class. The variance estimates of class-level water sales were weighted and summed across classes for an aggregate district-level estimate of the standard deviation of water demand induced by variation in precipitation and temperature. The standard deviation in District demand due to weather variability is 3.4 percent. The maximum deviation, based on historical weather data, is 5.5 percent.

A selection of climate change scenarios for 2040 for the Southwest United States contained in the Regional Climate Trends and Scenarios for the U.S. National Climate Assessment, Part 5, is shown in Table 4-8, along with the expected effect on District water demand.[6] Based on the scenarios in the table, temperature increases by 2040 associated with climate change imply a 2 to 3 percent increase in demand relative to weather-normalized demand. This expected effect is solely due to predicted changes in temperature. While the climate change scenarios also include predicted changes in the

[5] A&N Technical Services, Inc., Cal Water Long Term Water Demand Forecast Model, December 2014.
[6] Kunkel, K.E, L.E. Stevens, S.E. Stevens, L. Sun, E. Janssen, D. Wuebbles, K.T. Redmond, and J.G. Dobson, 2013: Regional Climate Trends and Scenarios for the U.S. National Climate Assessment. Part 5. Climate of the Southwest U.S., NOAA Technical Report NESDIS 142-5.

pattern and amount of precipitation, this has not been included in Cal Water's demand modeling at this time due to the large uncertainty associated with these estimates.[7]

The predicted effect of climate change on demand is based on current patterns of outdoor water use. It does not account for changes households and businesses may make in the way they use water in the future given a warming climate. For example, social norms and economic incentives regarding the type and extent of residential and non-residential landscaping may change over time which could lead to outdoor water use having a lower share of total demand compared to what is currently observed. In this case, the predicted effect of climate change would be offset to some extent by changes in the way households and businesses use water.

Table 4-8. Climate Change Effect on Demand

Climate Scenario	Year 2040 degree C	Year 2040 degree F	% Change from mean Temperature	Effect on Demand
B1	1.4	2.5	3.4%	2.0%
A1B	1.6	2.9	3.9%	2.3%
A2	1.5	2.7	3.7%	2.1%
80%ile	2.0	3.6	4.9%	2.8%

[7] Ibid. A discussion and depiction of the uncertainty around the precipitation forecasts is found on pages 55-56, Table 7, and Figure 27 of the cited report.

Chapter 5
Baselines and Targets

With the adoption of the Water Conservation Act of 2009, also known as SB X7-7, the state is required to reduce urban water use by 20 percent by the year 2020. Each urban retail water supplier must determine baseline per capita water use during their baseline period and also target water use for the years 2015 and 2020 in order to help the state achieve the 20 percent reduction.

SB X7-7 defines an urban retail water supplier as "a water supplier, either publicly or privately owned, that directly provides potable municipal water to more than 3,000 end users or that supplies more than 3,000 acre-feet of potable water annually at retail for municipal purposes." (CWC 10608.12) As shown in Chapter 2, the Redwood Valley District does not meet either threshold and therefore is not subject to SB X7-7. Cal Water has voluntarily elected to present information on the Redwood Valley District's per capita water use because it provides important planning information that may be useful to DWR in gauging the state's progress towards achieving the 20 percent urban water use reduction.

In this Chapter, the Redwood Valley District demonstrates compliance with its per capita water use target for the year 2015. This will also demonstrate whether or not the District is currently on track to achieve its 2020 target. Compliance will be verified by DWR's review of the SB X7-7 Verification Tables submitted with this plan. These tables are included with this plan in Appendix I.

This chapter includes the following sections:

5.1 Wholesale Agencies

5.2 Updating Calculations from 2010 UWMP

5.3 Baseline Periods

5.4 Service Area Population

5.5 Gross Water Use

5.6 Baseline Daily per Capita Water Use

5.7 2015 and 2020 Targets

5.8 2015 Compliance Daily per Capita Water Use

5.9 Regional Alliance

5.1 Wholesale Agencies

Wholesale water suppliers are not required to establish and meet baseline and targets for daily per capita water use. However, they can provide important support to their retail water suppliers through adopted policies and programs to encourage demand reduction in their service area. Wholesale water suppliers can also participate in a Regional Alliance established to meet the region's daily per capita water use targets.

The Redwood Valley District coordinated its demand reduction policies and programs with the wholesale water suppliers listed in Table 2-4.

5.2 Updating Calculations from 2010 UWMP

The District reported base period population and water use, selected the 2020 target method, and calculated its 2020 water use target in its 2010 UWMP. SB X7-7 allows the District to update these estimates, change the target methodology, and revise its 2020 urban water use target in its 2015 UWMP (CWC 10608.20).

Per the UWMP Guideline requirements, Cal Water has updated District population estimates to incorporate information from the 2010 Census that was not available at the time the 2010 UWMP was prepared. A comparison between the two sets of population estimates is provided in Appendix I. The District has also changed the 10-year base period from 1999-2008 to 2000-2009. This was done because reliable population and production estimates for the District are not available before 2000. These changes did not result in a change in the District's 2020 water use target reported in its 2010 UWMP.

5.3 Baseline Periods

Under SB X7-7 urban retail water suppliers must establish two baseline periods for historical water use and population in the District. The first of these is either a 10- or 15-year continuous period ending between 2004 and 2010. The second is a 5-year continuous period ending between 2007 and 2010. The 10-15 year period is used to establish the 2020 water use target under Method 1 (CWC 10608.20). The 5-year period is used to confirm that the selected 2020 target meets SB X7-7's minimum water use reduction requirements (CWC 10608.22). The baseline periods the District is using are summarized in SB X7-7 Table 1.

SB X7-7 Table 1: Baseline Period Ranges			
Baseline	**Parameter**	**Value**	**Units**
10- to 15-year baseline period	2008 total water deliveries	503	Acre Feet
	2008 total volume of delivered recycled water	0	Acre Feet
	2008 recycled water as a percent of total deliveries	0.00%	percent
	Number of years in baseline period[1]	10	years
	Year beginning baseline period range	2000	
	Year ending baseline period range[2]	2009	
5-year baseline period	Number of years in baseline period	5	years
	Year beginning baseline period range	2003	
	Year ending baseline period range[3]	2007	
[1]If the 2008 recycled water percent is less than 10 percent, then the first baseline period is a continuous 10-year period. If the amount of recycled water delivered in 2008 is 10 percent or greater, the first baseline period is a continuous 10- to 15-year period.			
[2]The ending year must be between December 31, 2004 and December 31, 2010.			
[3]The ending year must be between December 31, 2007 and December 31, 2010.			

5.3.1 Determination of the 10-15 Year Baseline Period

The 10-15 year baseline period must be a continuous period ending between 2004 and 2010. It can be up to 15 years in length if recycled water comprised 10 percent or more of the retail urban water supplier's 2008 deliveries. Otherwise, the baseline period is set to 10 years.

The Redwood Valley District did not have recycled water deliveries in 2008. Therefore it is using a 10-year baseline period commencing January 1, 2000 and running through December 31, 2009. The District has changed the 10-year base period from 1999-2008 reported in its 2010 UWMP to 2000-2009. This was done because reliable population and production estimates for the District are not available before 2000.

5.3.2 Determination of the 5-Year Baseline

The 5-year baseline period must be a continuous period ending between 2007 and 2010. The Redwood Valley District's 5-year baseline period commences January 1, 2003 and runs through December 31, 2007. The 5-year baseline period is unchanged from the 2010 UWMP.

5.4 Service Area Population

As noted above, Cal Water has updated the baseline period population estimates to incorporate information from the 2010 Census that was not available at the time the 2010 UWMP was prepared. Updating resulted in a small change in the original population estimates.

Urban retail water suppliers must estimate their service area population in a manner that is consistent with DWR requirements. For water suppliers whose boundaries correspond by 95 percent or more with a city or census designated place, population estimates prepared by the Department of Finance may be used. Where this is not the case, water suppliers may use the DWR Population Tool or estimate their population using other methods, provided these methods comply with Methodology 2 – Service Area Population – of DWR's *Methodologies for Calculating Baseline and Compliance Urban Per Capita Water Use*.

Cal Water uses a population estimation methodology based on overlaying Census Block data from the 2000 and 2010 Censuses with the District's service area. LandView 5 and MARPLOT software are used with these data to estimate population per dwelling unit for 2000 and 2010. The per dwelling unit population estimates are then combined with Cal Water data on number of dwelling units served to estimate service area population for non-Census years.

Cal Water also estimated service area population using DWR's Population Tool. The estimates prepared using Cal Water's methodology and DWR's Population Tool differed by about ten percent. A comparison of the estimates generated by the two approaches is provided in Appendix I. Cal Water is electing to use the population estimates produced by its methodology because the Population Tool may not be an accurate method for rural and sparsely populated areas, according to DWR documentation.

The population methodology and estimates used to calculate baseline and 2015 daily per capita water use are summarized in SB X7-7 Tables 2 and 3.

SB X7-7 Table 2: Method for Population Estimates	
Method Used to Determine Population (may check more than one)	
☐	1. **Department of Finance** (DOF) DOF Table E-8 (1990 - 2000) and (2000-2010) and DOF Table E-5 (2011 - 2015) when available
☐	**2. DWR Population Tool**
☑	**3. Other** DWR recommends pre-review

SB X7-7 Table 3: Service Area Population		
Year		**Population**
10 to 15 Year Baseline Population		
Year 1	2000	3,277
Year 2	2001	3,297
Year 3	2002	3,196
Year 4	2003	3,240
Year 5	2004	3,261
Year 6	2005	3,294
Year 7	2006	3,299
Year 8	2007	3,312
Year 9	2008	3,315
Year 10	2009	3,318
5 Year Baseline Population		
Year 1	2003	3,240
Year 2	2004	3,261
Year 3	2005	3,294
Year 4	2006	3,299
Year 5	2007	3,312
2015 Compliance Year Population		
2015		3,201

5.5 Gross Water Use

Annual gross water use is defined as the amount of water entering the District's distribution system over a 12-month period, excluding:

- Recycled water delivered within the service area
- Indirect recycled water
- Water placed in long-term storage
- Water conveyed to another urban supplier
- Water delivered for agricultural use

Gross water use must be reported for each year in the baseline periods as well as 2015. The Redwood Valley District's annual gross water use is summarized in SB X7-7 Table 4. Volumes are in acre-feet. No water delivery exclusions are taken.

SB X7-7 Table 4: Annual Gross Water Use

	Baseline Year	**Volume Into Distrib. System**	**Deductions**						**Annual Gross Water Use**
			Recycled Water	Exported Water	Change in Dist. System Storage (+/-)	Indirect Recycled Water	Water Delivered for Agricultural Use	Process Water	
10 to 15 Year Baseline - Gross Water Use									
Year 1	2000	635	0	0	0	0	0	0	635
Year 2	2001	684	0	0	0	0	0	0	684
Year 3	2002	726	0	0	0	0	0	0	726
Year 4	2003	650	0	0	0	0	0	0	650
Year 5	2004	636	0	0	0	0	0	0	636
Year 6	2005	612	0	0	0	0	0	0	612
Year 7	2006	603	0	0	0	0	0	0	603
Year 8	2007	568	0	0	0	0	0	0	568
Year 9	2008	503	0	0	0	0	0	0	503
Year 10	2009	472	0	0	0	0	0	0	472
10 - 15 year baseline average gross water use									**609**
5 Year Baseline - Gross Water Use									
Year 1	2003	650	0	0	0	0	0	0	650
Year 2	2004	636	0	0	0	0	0	0	636
Year 3	2005	612	0	0	0	0	0	0	612
Year 4	2006	603	0	0	0	0	0	0	603
Year 5	2007	568	0	0	0	0	0	0	568
5 year baseline average gross water use									**614**
2015 Compliance Year - Gross Water Use									
2015		290	0	0	0	0	0		**290**

5.6 Baseline Daily Per Capita Water Use

Baseline daily per capita water use is calculated by converting annual gross water use to gallons per day and dividing by service area population. Daily per capita water use for each baseline year and 2015 are summarized in SB X7-7 Table 5.

SB X7-7 Table 5: Gallons Per Capita Per Day (GPCD)				
Baseline Year		Service Area Population	Annual Gross Water Use (AF)	Daily Per Capita Water Use (GPCD)
10 to 15 Year Baseline GPCD				
Year 1	2000	3,277	635	173
Year 2	2001	3,297	684	185
Year 3	2002	3,196	726	203
Year 4	2003	3,240	650	179
Year 5	2004	3,261	636	174
Year 6	2005	3,294	612	166
Year 7	2006	3,299	603	163
Year 8	2007	3,312	568	153
Year 9	2008	3,315	503	135
Year 10	2009	3,318	472	127
10-15 Year Average Baseline GPCD				**166**
5 Year Baseline GPCD				
Baseline Year		Service Area Population	Annual Gross Water Use (AF)	Daily Per Capita Water Use (GPCD)
Year 1	2003	3,240	650	179
Year 2	2004	3,261	636	174
Year 3	2005	3,294	612	166
Year 4	2006	3,299	603	163
Year 5	2007	3,312	568	153
5 Year Average Baseline GPCD				**167**
2015 Compliance Year GPCD				
2015		3,201	290	**81**

5.7 2015 and 2020 Targets

Urban retail water suppliers may select from four GPCD target methods (CWC 10608.20).

- Target Method 1: 20% reduction from 10-year baseline GPCD
- Target Method 2: Water use efficiency performance standards
- Target Method 3: 95% of Hydrologic Region Target
- Target Method 4: Savings by water sector, DWR Method 4

Regardless of target method selected, the final target cannot exceed 95 percent of the 5-year baseline period average GPCD (CWC 10608.22).

The Redwood Valley District has selected Target Method 3, which sets the 2020 target to either 95 percent of the area-weighted average Hydrologic Regional Targets for the North Coast and Sacramento River Hydrologic Regions or 95 percent of the 5-year baseline average GPCD, whichever is less. This results in a 2020 target of 157 GPCD. The 2015 interim target of 161 GPCD is the midpoint between the 10-year baseline average GPCD and the 2020 target.

The District's GPCD baselines and targets are summarized in Table 5-1.

Table 5-1: Baselines and Targets Summary

Baseline Period	Start Years	End Years	Average GPCD	2015 Interim Target	Confirmed 2020 Target
10-15 year	2000	2009	166	161	157
5 Year	2003	2007	167		

5.8 2015 Compliance Daily per Capita Water Use

Compliance daily per capita water use in 2015 is summarized in Table 5-2. In reporting their compliance daily per capita water use, urban retail water suppliers may elect to consider the following factors and adjust the estimate accordingly (CWC 10608.24):

- Differences in evapotranspiration and rainfall in the baseline period compared to the compliance reporting period.
- Substantial changes to commercial or industrial water use resulting from increased business output and economic development that have occurred during the reporting period.
- Substantial changes to institutional water use resulting from fire suppression services or other extraordinary events, or from new or expanded operations, that have occurred during the reporting period.

Cal Water is not electing to make any adjustments to the District's compliance daily per capita water use in 2015. The Redwood Valley District's 2015 compliance daily per capita

water use is 81 gallons compared to its 2015 interim target of 161 gallons. The Redwood Valley District is in compliance with its 2015 interim target.

The low per capita water use in 2015 partially reflects the impacts of the Drought Emergency Regulation adopted by the State Water Resources Control Board in May of 2015 (SWRCB Resolution No. 2015-0032). Among other things, the Drought Emergency Regulation mandated urban retail water suppliers reduce potable water use between June of 2015 and February of 2016 by percentage amounts specified by the State Water Resources Control Board. The Redwood Valley District was ordered to reduce potable water use by 16 percent over this period relative to use over the same period in 2013.

However, the Drought Emergency Regulation does not explain all of the decline in per capita water use, which has been trending downward since 2002 when it reached its zenith of 203 gallons per person per day. By 2014 this had fallen by 54 percent, to 93 GPCD. Between 2014 and the end of 2015, per capita water use had fallen an additional 13 percent, to 81 GPCD.

Table 5-2: 2015 SB X7-7 Compliance

2015 Actual GPCD	2015 Interim Target	Optional Adjustments to 2015 GPCD *From Methodology 8*				Actual as Percent of Target	In Compliance? Y/N
		Extraordinary Events	Economic Adjust	Weather Adjust	Adjusted Actual 2015 GPCD		
81	161	0	0	0	81	50%	YES

5.9 Regional Alliance

Urban retail water suppliers may report on the requirements of SB X7-7 individually or as a member of a "Regional Alliance." The Redwood Valley District is not a member of a Regional Alliance and this UWMP provides information on the District's progress towards meeting its SB X7-7 water conservation targets as an individual urban retail water supplier only.

Chapter 6
System Supplies

The water supply for the customers of the Redwood Valley District is a combination of groundwater and purchased water. The projected water supply sources and amounts are summarized in Table 6-9.

6.1 Purchased Water

Cal Water purchases water from two different sources to supply the Redwood Valley District—the Sweetwater Springs Water District and the Yolo County Flood Control and Water Conservation District.

In November of 2005 Cal Water began purchasing water for the Rancho del Paradiso system from the Sweetwater Springs Water District. Sweetwater Springs operates two wells in its Monte Rio water system and supplies the Rancho del Paradiso system through an interconnection at the southern end of its service area. These wells pump groundwater that is under the influence of the Russian River. All of the supply for the Rancho del Paradiso system comes from this source. Cal Water has been purchasing approximately 7 acre-feet annually from Sweetwater Springs. Growth in the Rancho del Paradiso service area is expected to be minimal with only minor increases in services as vacant lots are developed as infill or as seasonal homes are converted to year-round residences. Because of this, total demands on this source are not expected to increase significantly over time.

The Lucerne system purchases surface water from the Yolo County Flood Control and Water Conservation District (Yolo County). This water is pumped from Clear Lake and is treated in the Lucerne Water Treatment Plant before entering the distribution system. This source accounts for 100 percent of the supply in Lucerne and 75 percent of the total water supply for the Redwood Valley District. However, this source is only available to Lucerne customers. Total demands on this source are expected to be approximately 300 AF/yr by 2040.

Although Clear Lake is located in Lake County, Yolo County holds the water rights to excess flows leaving the Lake through Cache Creek. Clear Lake Dam flows are regulated by the Gopcevic Decree of 1920 and the Solano Decree of 1978. Winter Lake levels are controlled by the schedule outlined in the Gopcevic Decree, which is designed to prevent flooding by allowing releases from the dam as storage increases due to winter storms. The schedule defines specific dates and corresponding maximum lake levels. If these levels are exceeded then the water must be released by the Dam.

Lake levels are measured in units of feet Rumsey, named for Captain DeWitt Rumsey, an important historical figure in the area. Zero Rumsey is the natural low lake level under which there are no releases to Cache Creek and is equivalent to 1318.256 feet (1929 NGVD). Before construction of the Dam the Lake level was controlled by the Grigsby Riffle, which is a rock sill located at the junction of Cache Creek and Seigler Creeks. The Lake is now considered full when it reaches 7.56 feet Rumsey. Yolo County has rights to all the water stored in the Lake between 0 and 7.56 Rumsey.

The Solano Decree defines the amount of water available to Yolo County. If the Lake is at 7.56 feet Rumsey on May 1 then 150,000 acre-feet can be released over the summer months. If winter rains fail to fill the Lake to a level of 3.22 feet Rumsey by May 1, no releases are available to Yolo County. The Solano Decree also outlines a schedule of lake levels with corresponding dates that is designed to maintain storage at safe levels and ensure that the Lake stays above zero Rumsey.

The 1912 court decision that granted Yolo County rights to water in Clear Lake recognized that communities already existing along Clear Lake had prescriptive rights to a certain quantity of water. These prescriptive rights are still available to these communities at no cost. Lucerne's portion is subtracted from the total withdrawals from the Lake and Cal Water only pays for water used above this amount. The schedule of prescriptive rights usage for Lucerne is outlined in Table 6-A.

Table 6-A: Monthly Prescriptive Credit

Month	Cubic Feet	Acre Feet
October	175,800	4.05
November	80,500	1.85
December	73,200	1.68
January	49,000	1.12
February	41,000	0.94
March	62,000	1.42
April	85,000	1.95
May	97,000	2.23
June	211,000	4.84
July	286,000	6.57
August	392,000	9.00
September	271,000	6.27
Total	**1,823,500**	**41.92**

6.2 Groundwater

The Coast Springs, Armstrong Valley, Noel Heights, and Hawkins water systems are completely reliant on locally pumped groundwater as a source of supply. Each is supplied by wells owned and operated by Cal Water. Several of these wells are located along creeks and are considered under the influence of surface water by the California Department of Public Health.

The Redwood Valley District uses between 100 and 150 AF/yr of groundwater to meet demand. Growth in these systems is expected to be slow and demand met by this source will increase at the same pace as development. The communities served by these systems exhibit an overall slow growth rate and are located in areas that have many seasonal residential services.

6.2.1 Basin Description

Coast Springs: Bodega Bay Area Groundwater Basin, No. 1-57

The Coast Springs system is located on the border of the Bodega Bay Area, Sand Point Area, and Wilson Grove Highlands Groundwater Basins. For the purposes of this plan the Bodega Bay Area Groundwater Basin is described because it best represents geologic conditions in Coast Springs. The Bodega Bay Area extends approximately 4 miles along the mainland from the area of Salmon Creek to the north to below Cheney gulch on the south. This extends inland up to about a mile from Bodega Harbor. The Bodega Bay Area Groundwater Basin is defined by the areal extent of Quaternary alluvium, sand dunes, and terrace deposits, but also contains some Cretaceous granitic rocks exposed on Bodega Head. On the mainland side, the groundwater basin is bounded by bedrock of the Franciscan Complex. This basin is bounded on the north by the fort Ross Terrace Area Groundwater Basin near Salmon Creek. The San Andreas Fault Rift Zone trends northwest through the area of Bodega Bay.

Lucerne: Long Valley Groundwater Basin, No. 5-31

Long Valley Groundwater Basin is located within a narrow elongated valley northeast of Clear Lake. The basin is bounded on most sides by the Franciscan Formation. A small portion of the southern boundary consists of Quaternary volcanic rocks. The valley is drained by Long valley Creek which is tributary to North Fork Cache Creek.

Armstrong Valley, Noel Heights, Rancho Del Paradiso: Lower Russian River Valley Groundwater Basin, No. 1-60

The Lower Russian River Valley Groundwater Basin is a narrow, meandering river canyon located in the Mendocino Range within west-central Sonoma County. The valley begins approximately 2.5 miles east of Mirabell Heights and extends west and southwest for

approximately 23 miles until it exits into the Pacific Ocean near Jenner. The canyon ranges in width from about 0.1 to 0.5 miles and has an average width of 0.25 miles. The valley is defined by the areal extent of alluvial and river-channel deposits that are bounded by bedrock of the Franciscan Complex.

Mark West Creek discharges into the upper reaches of the lower Russian River Valley near Mirabell Heights. Other significant tributaries to the lower Russian River include: Green Valley near Rio Dell; Fife Creek and Pocket Canyon near Guerneville; Dutch Bill Creek near Monte Rio; Austin Creek near St. Joseph Camp; and Willow and Sheephouse Creeks east of the river mouth near Jenner.

The principal water-bearing units in the lower Russian River Valley are the alluvium and river channel deposits. The Franciscan Complex that underlies the lower Russian River Valley is considered essentially non water-bearing and therefore, does not yield significant quantities of water to wells.

The wells in Armstrong Valley are not considered under the influence of surface water but are located near Fife Creek. Well 1 is an older well that is shallow and pumps from the alluvial sediments of the creek. Well 2 is a deep well that pulls water both from the alluvial sedimentary deposits of the Creek and also from deeper aquifer zones. These deeper zones are recharged by deep infiltration from the Fife Creek and from inflow from aquifers in the surrounding hills. As a result they exhibit a slower response to climatic conditions.

The Noel Heights system is supplied by one well that is located in a depression along Pocket Canyon Creek. This area remains wet and water levels in the well are consistent. The well is shallow and pulls water from alluvial deposits of the Creek. The California Department of Public Health considers this well to be under the influence of surface water. Water produced by this well is treated as surface water for turbidity.

The groundwater used in Coast Springs comes from two sources. Approximately 75 percent of the total supply comes from Well 4-01, which is a gallery infiltration well and is under the influence of surface water from Dillon Creek, which drains the local Dillon Creek Watershed. Well 4-01 is located in an alluvial aquifer at the mouth of Dillon Creek. The second source is a series of “Hill” wells, which are deep bedrock wells in the nearby Mesa Watershed. Water from the hill wells is also considered under the influence of surface water and is regulated by the Surface Water Treatment Rule. These wells are low producing and are used more often in the summer months when demand is greatest. All raw water produced in Coast Springs is pumped to a storage tank and treated with membrane filtration before entering the distribution system.

Dillon Creek is a small perennial stream with year-round flows. The flow rate at Well 4-01 is highly dependent on weather conditions and upstream diversions. The rate of recharge is dependent on the flow rate in the Creek, and aquifer storage is a function of the recharge rate and the pumping rate in Well 4-01.

Hawkins: Santa Rosa Valley, Santa Rosa Plain Sub basin, No. 1-55.01

The Santa Rosa Valley occupies a northwest-trending structural depression in the southern part of the Coast Ranges of northern California. This depression divides the Mendocino Range on the west from the Mayacamas and Sonoma Mountains on the east. The Santa Rosa Plain sub basin is approximately 22 miles long and 0.2 miles wide at the northern end; approximately 9 miles wide through the Santa Rosa area; and about 6 miles wide at the southern end of the valley near the city of Cotati. The Santa Rosa Plain Sub Basin is bounded on the northwest by the Russian River plain approximately one mile south of the City of Healdsburg and the Healdsburg Sub basin; mountains of the Mendocino Range flank the remaining western boundary. The southern end of the sub basin is marked by a series of low hills, which form a drainage divide that separates the Santa Rosa Valley from the Petaluma Valley basin south of Cotati. The eastern sub basin boundary is flanked by the Sonoma Mountains south of Santa Rosa and the Mayacamas Mountains north of Santa Rosa. The Rincon Valley sub basin is situated east of the City of Santa Rosa and is separated from the Santa Rosa plain sub basin by a narrow constriction formed in the rocks of the Sonoma Volcanics.

The Hawkins system relies entirely on groundwater supply in the Santa Rosa sub basin. The Santa Rosa Plain sub basin is drained principally by the Santa Rosa and Mark West Creeks that flow westward and collect into the Laguna de Santa Rosa. The Laguna de Santa Rosa flows northward and discharges into the Russian River. Hawkins is served by Well 1-02 that is treated with membrane filtration before entering the distribution system.

The above descriptions and additional details of the basins are given in the DWR's Groundwater Bulletin 118 in Appendix G.

6.2.2 Groundwater Management

The groundwater basins that Cal Water pumps from in the Redwood Valley District are unadjudicated and are spread throughout northern California. Most of the communities served by these systems are small and have minimal impact on local groundwater resources. Because of this, groundwater management plans for the District have not been developed.

6.2.3 Overdraft Conditions

None of the basins from which the District pumps are overdrafted.

6.2.4 Historical Pumping

Table 6-1 lists the amount of groundwater pumped by the Redwood Valley District from 2011-2015.

Table 6-1 Retail: Groundwater Volume Pumped (AF)						
Groundwater Type	Location or Basin Name	2011	2012	2013	2014	2015
Alluvial Basin	Bodega Bay, Lower Russian River Valley, Long Valley, Santa Rosa Plain Sub-basins	106	108	116	97	90
Total		**106**	**108**	**116**	**97**	**90**

6.3 Surface Water

Aside from purchased water, the Redwood Valley District does not impound or divert surface water as a means to meet supply requirements.

6.4 Stormwater

There are no plans to divert stormwater for beneficial uses in the Redwood Valley District.

6.5 Wastewater and Recycled Water

The recycling of wastewater offers several potential benefits to Cal Water and its customers. Perhaps the greatest of these benefits is to help maintain a sustainable groundwater supply either through direct recharge, or by reducing potable supply needs by utilizing recycled water for appropriate uses (e.g., landscape, irrigation) now being served by potable water.

Currently, no wastewater is recycled for direct reuse by retail customers in the District.

6.5.1 Recycled Water Coordination

Currently, no wastewater is recycled for direct reuse by retail customers in the District. However, a small portion of backwash water from the Lucerne Water Treatment Plant is used to irrigate Cal Water's property. The majority of service connections in the Redwood Valley District are single family residential homes, and not larger industrial or irrigation

customers that would be more likely to use recycled water. The potential amount of recycled water that can be produced is proportional to the amount of wastewater that is generated by District.

In Hawkins, wastewater is collected by the City of Santa Rosa's wastewater system and delivered to the Santa Rosa Subregional Water Reuse Plant for recycling. The Subregional System produces approximately 11 MGD of tertiary treated water, about half of which is used to generate geothermal electricity in underground steam fields in The Geysers electric power facility. The remaining amount is used for landscaping, industrial processes, and fire suppression systems.

In Lucerne, a large portion of the wastewater from the Lake County Sanitation District's Northwest Regional Wastewater Collection and Treatment System is also reused and is sent to the Geysers. The Lake County Sanitation District also has constructed wetlands where recycled wastewater is used for ecological restoration.

Table 6-2 includes the names of the wastewater agencies that the Redwood Valley District relies on for wastewater treatment.

6.5.2 Wastewater Collection, Treatment, and Disposal

Wastewater service is available to all of Cal Water's Hawkins, most of its Lucerne, a portion of its Coast Springs customers, and about half of its Armstrong customers. The City of Santa Rosa operates a Sewer System with two treatment plants. The Laguna Wastewater Treatment Plant provides tertiary treatment and has an average dry weather flow of 17.5 MGD. The Laguna Plant provides recycled water to the Subregional Water Reuse Plant. Santa Rosa's Oakmont Treatment Plant operates between April and October with an average flow of 0.5-0.6 MGD.

The Northwest Regional Wastewater Collection and Treatment System provides wastewater service to Lucerne and several surrounding communities. The Northwest System is old and in need of several infrastructure improvements. Because it is located adjacent to Clear Lake it is susceptible to seasonal inflow and infiltration, which leads to overuse of lift stations and frequent spills. A Master Plan including an aggressive infrastructure improvement plan was completed in 2005 and the Northwest System is moving to address these problems.

In the Armstrong system, the Russian River County Sanitation District, which is operated by Sonoma County, provides sewer and wastewater treatment to approximately half of Cal Water customers.

In Coast Springs, the Oceana Marin subdivision and part of the old Dillon Beach community have wastewater service provided by the Oceana Marin Wastewater system.

The remaining properties use septic systems for disposal of wastewater. The wastewater system is a pressurized subsurface irrigation disposal system that was constructed by the North Marin Water District in 1981. The wastewater is treated in an aerated treatment pond before entering the disposal system.

Estimates of the District wastewater quantity in 2015 are shown in Table 6-2. These were calculated by annualizing 90 percent of January water use in Cal Water's service area, then taking the proportion that is used in the three systems that have treated wastewater services: Hawkins, Lucerne, and Coast Springs. All of Hawkins system wastewater is treated by the City of Santa Rosa. It is assumed that 75% of wastewater in Lucerne, 25% of wastewater in Coast Springs, and 50% of the wastewater in Armstrong is treated.

Table 6-2 Retail: Wastewater Collected Within Service Area in 2015						
Percentage of 2015 service area covered by wastewater collection system *(optional)*						
Percentage of 2015 service area population covered by wastewater collection system *(optional)*						
			Receiving Wastewater Treatment			
Name of Wastewater Collection Agency	Wastewater Volume Metered or Estimated?	Volume of Wastewater Collected in 2015 (AF)	Name of Wastewater Treatment Agency Receiving Collected Wastewater	Treatment Plant Name	Is WWTP Located Within UWMP Area?	Is WWTP Operation Contracted to a Third Party?
City of Santa Rosa	Estimated	3	City of Santa Rosa	Laguna Wastewater Treatment Plant	No	
City of Santa Rosa	Estimated	3	City of Santa Rosa	Santa Rosa Subregional Water Reuse Plant	No	
Lake County Sanitation District	Estimated	107	Lake County Sanitation District	Northwest Regional Wastewater Collection and Treatment System	No	
North Marin Water District	Estimated	4	North Marin Water District	Oceana Marin treatment station	No	
Russian River County Sanitation District	Estimated	20	Russian River County Sanitation District	Guerneville treatment plant	No	
Total Wastewater Collected from Service Area in 2015:		**137**				

6.5.3 Recycled Water System

According to the Lake County Sanitation District, approximately 85 percent of the effluent produced at the Northwest Regional Treatment Plant is recycled. And it is assumed that 100 percent of the wastewater produced in Hawkins is recycled.

6.5.4 Recycled Water Beneficial Uses

The recycling of wastewater offers several potential benefits to Cal Water and its customers. Perhaps the greatest of these benefits is to help maintain a sustainable groundwater supply either through direct recharge, or by reducing potable supply needs by utilizing recycled water for appropriate uses (e.g., landscape, irrigation) now being served by potable water. Currently, no wastewater is recycled for direct reuse from the domestic or industrial wastewater streams in the District.

The recycling of wastewater offers several potential benefits to Cal Water and its customers. Perhaps the greatest of these benefits is to help maintain a sustainable groundwater supply either through direct recharge, or by reducing potable supply needs by utilizing recycled water for appropriate uses (e.g., landscape, irrigation) now being served by potable water. Currently, no wastewater is recycled for direct reuse from the domestic or industrial wastewater streams in the District.

Table 6-3 Retail: Wastewater Treatment and Discharge Within Service Area in 2015										
✓	No wastewater is treated or disposed of within the UWMP service area. The supplier will not complete the table below.									
							2015 volumes			
Wastewater Treatment Plant Name	Discharge Location Name or Identifier	Discharge Location Description	Wastewater Discharge ID Number *(optional)*	Method of Disposal	Does This Plant Treat Wastewater Generated Outside the Service Area?	Treat-ment Level	Waste water Treated	Discharged Treated Waste water	Recycled Within Service Area	Recycled Outside of Service Area
						Total				

Table 6-4 Retail: Current and Projected Recycled Water Direct Beneficial Uses Within Service Area								
✓	Recycled water is not used and is not planned for use within the service area of the supplier. The supplier will not complete the table below.							
Name of Agency Producing (Treating) the Recycled Water:								
Name of Agency Operating the Recycled Water Distribution System:								
Supplemental Water Added in 2015								
Source of 2015 Supplemental Water								
Beneficial Use Type	General Description of 2015 Uses	Level of Treatment	2015	2020	2025	2030	2035	2040 (opt)
Agricultural irrigation								
Landscape irrigation (exc golf courses)								
Golf course irrigation								
Commercial use								
Industrial use								
Geothermal and other energy production								
Seawater intrusion barrier								
Recreational impoundment								
Wetlands or wildlife habitat								
Groundwater recharge (IPR)								
Surface water augmentation (IPR)								
Direct potable reuse								
		Total:	**0**	**0**	**0**	**0**	**0**	**0**
IPR - Indirect Potable Reuse								

Table 6-5 Retail: 2010 UWMP Recycled Water Use Projection Compared to 2015 Actual		
✓	Recycled water was not used in 2010 nor projected for use in 2015. The supplier will not complete the table below.	
Use Type	2010 Projection for 2015	2015 actual use
Agricultural irrigation		
Landscape irrigation (exc golf courses)		
Golf course irrigation		
Commercial use		
Industrial use		
Geothermal and other energy production		
Seawater intrusion barrier		
Recreational impoundment		
Wetlands or wildlife habitat		
Groundwater recharge (IPR)		
Surface water augmentation (IPR)		
Direct potable reuse		
Total		

6.5.5 Actions to Encourage and Optimize Future Recycled Water Use

The development of recycled water to offset potable supply is not likely in the Redwood Valley District. Using recycled water is not considered economically viable given the anticipated extra costs for treatment and distribution, given the limited demand for this type of service. Therefore, the projected recycled water supply for Cal Water's Redwood Valley service area through the year 2040 is 0 acre-feet per year. Cal Water has not implemented any incentive programs to encourage recycled water use because Cal Water does not own or operate the wastewater system.

Cal Water's supply portfolio in some districts already includes recycled water; elsewhere, the Company is participating in studies of the possibility of adding this supply source. Cal Water is eager to expand its portfolio to provide recycled water to its customers wherever possible, and to form partnerships with other agencies and jurisdictions to accomplish this. Any such project must be economically feasible. Approval of such an investment by the CPUC is contingent on a demonstration that it is beneficial to ratepayers.

Table 6-6 Retail: Methods to Expand Future Recycled Water Use			
✓	Supplier does not plan to expand recycled water use in the future. Supplier will not complete the table below but will provide narrative explanation.		
Name of Action	Description	Planned Implementation Year	Expected Increase in Recycled Water Use
NA	NA	NA	NA

6.6 Desalinated Water Opportunities

There are no plans for the development of desalinated water in the District. The Coast Springs system is located in close proximity to the Pacific Ocean but because of the low demand and high cost it is unlikely to develop desalination as a source of supply.

6.7 Exchanges or Transfers

There are few transfer or exchange opportunities in the Redwood Valley District. With the exception of the Lucerne system each individual water system is small and isolated, which limits the use of transfers or exchanges. Future Water Projects

The source of the water supply delivered to the customers of Cal Water's Redwood Valley District is not likely to change. The future water demand will be satisfied by well production and surface water treatment. Based on the projected demands in Chapter 4, it is anticipated that future demand within the District could require production of more than 400 acre-feet per year. As needed, Cal Water will construct additional wells and distribution facilities to meet the anticipated increases in future demand and to offset losses in supply sources resulting from water quality constraints.

Table 6-7 Retail: Expected Future Water Supply Projects or Programs						
✓	No expected future water supply projects or programs that provide a quantifiable increase to the agency's water supply. Supplier will not complete the table below.					
	Some or all of the supplier's future water supply projects or programs are not compatible with this table and are described in a narrative format. LOCATION OF THE NARRATIVE___________________________					
Name of Future Projects or Programs	Joint Project with other agencies?		Description (if needed)	Planned Implementation Year	Planned for Use in Year Type	Expected Increase in Water Supply to Agency
		If Yes, Agency Name				*This may be a range*

6.8 Summary of Existing and Planned Sources of Water

Table 6-8 shows the actual volumes of purchased water for calendar year 2015. Table 6-9 shows the projected supply volumes through 2040.

Table 6-8 Retail: Water Supplies — Actual (AF)				
Water Supply	Additional Detail on Water Supply	2015		
		Actual Volume	Water Quality	Total Right or Safe Yield *(optional)*
Purchased or Imported Water		200	Drinking Water	
Groundwater		90	Drinking Water	
Total		**290**		

Table 6-9 Retail: Water Supplies — Projected (AF)										
Water Supply	**Projected Water Supply** *Report To the Extent Practicable*									
	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)*
Purchased or Imported Water	303		300		304		304		310	
Groundwater	100		99		100		100		102	
Total	**403**		**399**		**404**		**405**		**412**	

6.9 Climate Change Impacts to Supply

Cal Water recently completed an initial study of climate change impacts for a sample of its districts.[8] The sample districts account for 85% of Cal Water's total 2014 production and reflect the diversity of all Cal Water districts, including geographic, hydrologic, and climatic conditions and primary and secondary supply sources. Redwood Valley was not among the districts studied. The study was undertaken because it is critical for Cal Water to gain a better understanding of the potential impacts of climate change on the availability of its diverse supplies. The impacts are inherently uncertain, but Cal Water believes that the only responsible course is to carefully incorporate climate change into its ongoing water supply planning.

The initial study represents a first step in that path. In order for Cal Water to determine how its long-term water supply planning should reflect climate change impacts, it must first have an understanding of what the impacts of climate change on its supply sources might be. That was the purpose of the study.

Changes in climate can affect the availability of local groundwater and surface water supplies, as well as purchased imported supplies. This study separately addressed the impacts on each of these for each sample district. It relied on the best available projections of changes in climate (temperature and precipitation) through the end of the century, and then used the climate projections to examine how surface water flows and groundwater recharge rates may change. The study generally relied on studies done by or data provided by wholesale suppliers.

The study results provide an integrated view of how projected climate changes may affect water supply availability for Cal Water's service districts, and represent a first step in integrating potential future climate change impacts into Cal Water's ongoing supply planning.

6.9.1 Estimating Changes in Climate

Climate change is primarily driven by increased concentrations of greenhouse gases (GHGs) in the atmosphere. The trajectory of future climate change is a function of the rate at which those concentrations are projected to increase and the manner in which the atmosphere and oceans respond to increased concentrations. Both are difficult to model. Thus, while the scientific community overwhelmingly agrees that climate change will occur (and indeed may already have begun), the trajectory of those changes is very uncertain.

[8] California Water Service Company, *Potential Climate Change Impacts on the Water Supplies of California Water Service*. January 2016.

The projections of temperature and precipitation that underlie this study are based on 40 of the latest Global Circulation Models (GCMs) run as part of the Coupled Model Intercomparison Project Phase 5 (CMIP5). Generally speaking, this type of approach is termed an ensemble analysis, for which the downscaled climate projections for any particular Cal Water Service District were based on the median of the 40 downscaled GCM datasets. The GCMs used by the analysis are driven by two GHG emission pathways that bound the possible trajectories of GHG concentrations.

6.9.2 Impacts of Climate Change on Water Supplies

Since the supplies for each district consist of a mix of local surface water, local groundwater, and/or purchased imports, climate change impacts were estimated for each of these components. Based on the breakdown of district production among the supply sources, Table 6-10 shows the ranges of projected overall climate change impacts on available supply, relative to the historic average.

Table 6-10 Projected Changes in Average Available Supply due to Climate Change				
District	Percentage Change in Supply			
		2020	2050	2100
BK	Minimum	-10%	-10%	-12%
	Maximum	-12%	-16%	-20%
VIS	Minimum	-7%	-8%	-8%
	Maximum	-9%	-10%	-14%
KRV	Minimum	-13%	-16%	-19%
	Maximum	-16%	-21%	-31%
MPS/SSF/BG	Minimum	0%	-2%	-6%
	Maximum	0%	-7%	-15%
LAS	Minimum	-3%	-3%	-10%
	Maximum	-4%	-18%	-28%
CH	Minimum	2%	2%	0%
	Maximum	3%	1%	-3%
ORO	Minimum	0%	8%	5%
	Maximum	0%	-8%	-7%
DOM/HR/PV	Minimum	0%	0%	-1%
	Maximum	0%	-2%	-3%
STK	Minimum	0%	0%	-8%
	Maximum	0%	-14%	-17%
SLN	Minimum	-6%	-6%	-6%
	Maximum	-7%	-7%	-7%

6.9.3 Next Steps and Key Conclusions

Possible next steps for Cal Water's study of climate change include:

- Methodological enhancements to reduce some of the uncertainties in the results;
- Development and acquisition of better and more complete data;
- Extending the study to other Cal Water districts;
- Developing a plan to mitigate anticipated climate change impacts on supply; and

- Integrating climate change into the Company's ongoing water supply planning.

Three critical messages emerged from the study:

- Cal Water supplies in the 21st century are likely to be adversely affected by climate change.

- These impacts will vary considerably across districts, depending on geography and source mix. For some districts, the impacts can be significant; for others, little or no impacts are projected.

- The impacts will generally increase over time. Anticipated late-century impacts are forecast to be significantly higher in some districts than impacts at mid-century. Moreover, during the period that climate change is forecast to increasingly constrain supplies, demands are also generally forecast to increase, further exacerbating the adverse impacts on water supply reliability.

Chapter 7
Water Supply Reliability Assessment

This chapter addresses the reliability of the Redwood Valley District's water supplies. Assessment of water supply reliability is complex and dependent upon a number of factors, such as the number of water sources, regulatory and legal constraints, hydrological and environmental conditions, climate change, and expected growth, among others. Based on available historical information and projections of future water uses, regulatory and legal constraints, and hydrological and environmental conditions, including climate change, Cal Water has made its best determination of the future reliability of Redwood Valley District's water supplies.

7.1 Constraints on Water Sources

Because the local climate and source of supply vary significantly throughout the Redwood Valley District, following are brief discussions of the supply reliability for each water system.

Lucerne

The water supply in Lucerne has been mostly reliable. Total supply is dependent on annual rainfall and inflows into Clear Lake. Because of the operational schedule of the Clear Lake Dam, an adequate supply is available in all but the most severe droughts. In 1976 and 1977 the Clear Lake area experienced the equivalent of two 50-year droughts in successive years. In 1977 the Lake level reached a low of -3.39 and a high of -0.30 Rumsey, and Yolo County did not receive discharges from the Lake. Cal Water did not own the Lucerne system at this time and does not know how demand was served in 1977.

In November 2014, the Lake level reached a low of -.083 feet and a high of 2.48 feet Rumsey. In order to ensure that water could still be pulled from the lake, in January 2015 the treatment plant's intake structure was lowered to a depth of -4.5 feet below 0.0 feet Rumsey Lake level. In 2015, designs were completed for a floating intake pump 200 feet farther into the lake from the end of the existing 340 foot long pier, to allow for water to be pumped from a depth of -6.0 feet below 0.0 feet Rumsey lake level. This floating intake and piping system will allow for flows to continue to enter the treatment plant even in severe drought scenarios.

According to Cal Water's purchase agreement, in the event of a water shortage, municipal customers will be given priority over other users.

Armstrong Valley, Noel Heights, Rancho Del Paradiso

Although water level data for the Armstrong Valley wells is not recorded, there has never been a supply shortage due to natural conditions in these wells. Cal Water is confident that a reliable supply exists in Armstrong Valley with its two wells.

There also have been no known water supply shortages in Noel Heights. However, there is only one source of supply and if the well is out of service for any reason water would need to be trucked in.

Rancho del Paradiso is supplied by wells that are under the influence of surface water and are more directly impacted by annual variation in rainfall amounts. But these wells are located along the Russian River, which is a large perennial river that has flows even during prolonged droughts. Therefore the supply is considered reliable.

Coast Springs

Cal Water performed a water supply investigation to determine the sustainable yield of this aquifer at the Well 4-01 location. The results of this investigation showed that the long term average sustainable pumping rate is between 11-16 gpm. From 2000-2005 the average production required in the peak demand month of July was approximately 12 gpm, indicating that some excess capacity may exist, even in dry months. Peak pumping capacity in the well is 23 gpm. The study showed that peak pumping capacity could be maintained over the short term for up to 8 days, at which time aquifer storage was completely depleted. The recharge rate was measured at 13 gpm during this investigation.

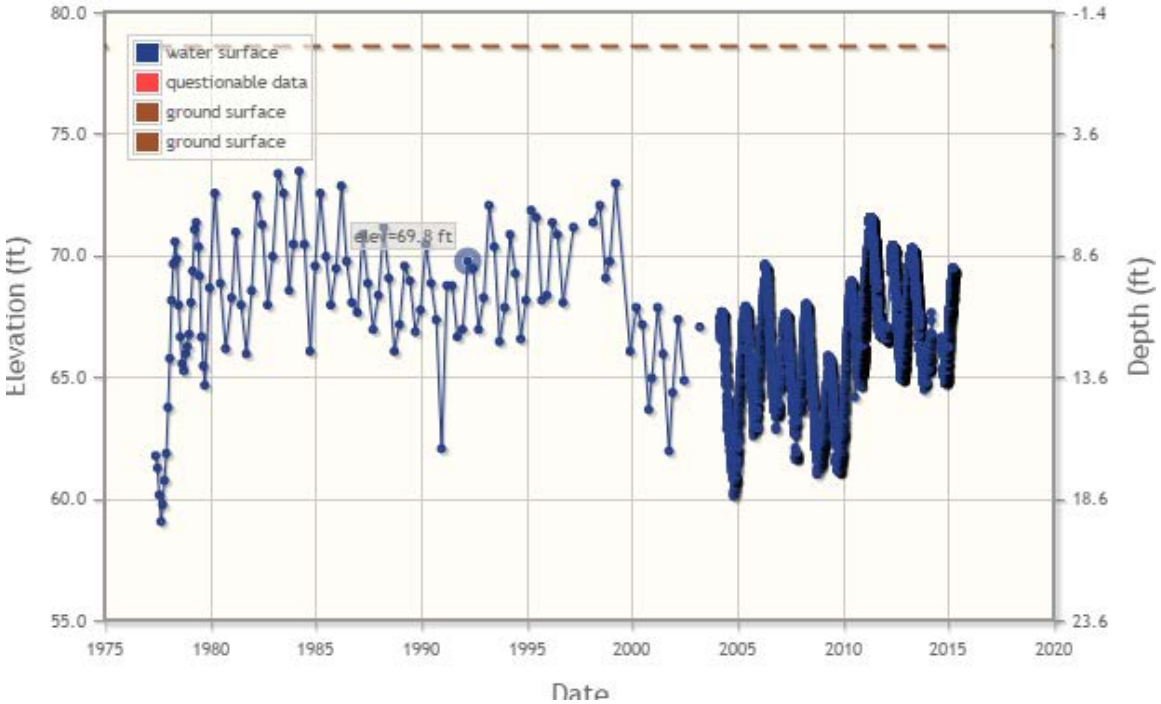
In 2000 Cal Water performed pump tests on the bedrock Hill Wells. The capacities ranged between 0.5 and 2.6 gpm and had an overall combined capacity of 10.6 gpm. Together, the two supply sources offer approximately 20-25 gpm in sustainable production and a peak production capacity of 33 gpm. This is an adequate margin of supply over demand provided all sources are available. However, if Well 4-01 was out of service for any reason peak demand could not be met by the Hill Wells alone. Cal Water is currently exploring options for adding an additional source of supply to prevent water shortages due to drought events or equipment failure.

Hawkins

The wells in the Hawkins system produce water from the Santa Rosa Valley SubBasin of the Santa Rosa Plain Groundwater Basin. In 2006 the City of Santa Rosa performed a Water Supply Assessment (WSA) for its Downtown Station Area Specific Plan. According to the WSA, a water budget analysis performed in 1982 showed that the Basin was in a

state of balance or minimal overdraft. Since then Santa Rosa has switched its primary water source from locally pumped groundwater to the Sonoma County Water Agency's (SCWA) imported supply from the Russian River, which mostly comes from surface water. As a result, total pumping from the Basin has decreased in the Santa Rosa area. The data from Monitoring Well 383855N1227777W001, which was the closest well to the Hawkins system included in the WSA supports this. As Figure 7-1 shows, the groundwater level has been steady since 1980. This indicates that a reliable source is available to the Hawkins system.

Figure 7-1 Groundwater Level Trend at Monitoring Well 383855N1227777W001



Source: California Department of Water Resources, http://www.water.ca.gov/waterdatalibrary/groundwater/hydrographs/brr_hydro.cfm?CFGRIDKEY=48761

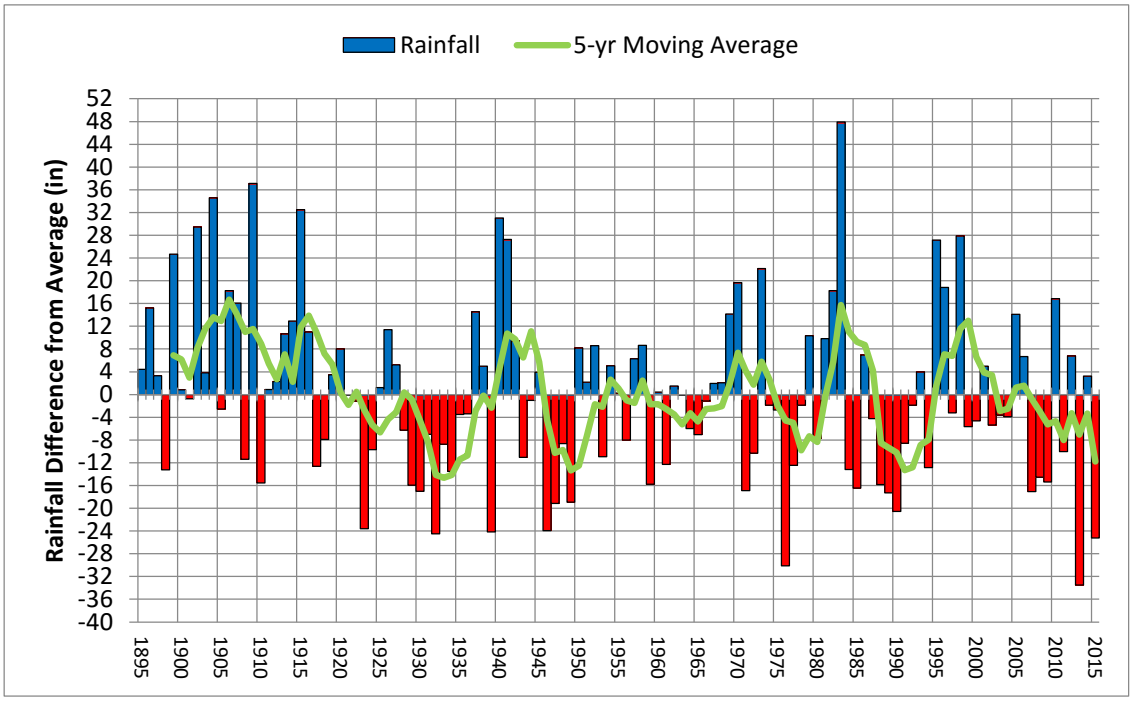
Although the quantity of water available in Hawkins is adequate, there are water quality issues that reduce the reliability of this groundwater source. Wells in Hawkins produce water that is high in iron and manganese, causing one of the two wells to be placed on standby status. In the winter of 2010/2011, Cal Water installed a 50 gallon per minute treatment plant at the existing well site. It is able to treat water from either well 1 or well 2. The plant removes iron and manganese. The water from the plant flows into a concrete clearwell tank and then is pumped to the distribution system. As a result of this treatment, water produced by the active well meets MCLs for iron and manganese.

7.2 Reliability by Type of Year

Despite the fact that the systems are not hydraulically connected, for the purposes of this UWMP the supplies of each have been combined. Figure 7-2 compares annual rainfall to the historic average (46.71 inches). The data has been interpolated to estimate rainfall for the center of the District, located between Lucerne and the other small systems. The designation of Base Years for drought planning shown in Table 7-1 below comes from the data underlying this chart.

A normal hydrologic year occurred in 1921 when precipitation was approximately 0.1 percent below the historic average for the period from 1903 to 2015. The driest year occurred in 2013 when the rainfall was approximately 72% percent below average (13.19 inches). This is taken as the single dry year shown in Table 7-1. The multiple dry-water years used are 2011 through 2013.

Figure 7-2 Groundwater Level Trend at Monitoring Well 383855N1227777W001



Source: PRISM Climate Group, Oregon State University, http://prism.oregonstate.edu

The Redwood Valley District's groundwater sources are from unadjudicated basins. Cal Water does not anticipate any legal issues dealing with adjudication of the basins. Cal Water has a long term agreement with Yolo County for the purchase of surface water from Clear Lake and no interruptions of this source are anticipated.

Water quality concerns will continue to be an issue for the groundwater produced by a few of the wells in the Redwood Valley District

The drinking water delivered to customers in the Redwood Valley District meets or surpasses all federal and state regulations. The U.S. Environmental Protection Agency as authorized by the Federal Safe Drinking Water Act of 1974 sets drinking water standards. A state can either adopt the USEPA standard or set state standards that are more stringent than those set by the federal government.

There are two types of drinking water standards: Primary and Secondary. Primary Standards are designed to protect public health by establishing Maximum Contamination Levels (MCL) for substances in water that may be harmful to humans. MCLs are established very conservatively for each contaminant and are generally based on health effects which may occur if a person were to drink three liters of the water per day for 70 years. Secondary Standards are based on the aesthetic qualities of the water such as taste, odor, color, and certain mineral content. These standards, established by the State of California, specify limits for substances that may affect consumer acceptance of the water.

The Lucerne surface water treatment plant operates at optimal performance with potential water quality concerns varying based on surface water supply conditions. In the summer season when Clearlake algae blooms are evident, there is a higher occurrence of taste and odor issues identified by customer complaints. Subsequently, the increased amount of Total Organic Carbon (TOC) resulting from the algae blooms coupled with chlorination in the treatment plant result in historically high concentrations of Total Trihalomethanes (TTHM) in the distribution system.

Currently Lucerne is under Stage 1 Disinfection Byproducts Rule (DBP) which cites that the average of the sum of total distribution system compliance sites meet compliance for TTHM. Consequently the Stage 2 Disinfection Byproducts Rule will be implemented in Fall 2012 and will depend on an average of DBP's for each site to achieve compliance. It is suspected (based on historic TTHM data) that the distribution system sites will be out of compliance.

In an effort to address the Stage 2 DBP issue for TTHM's Cal Water is working with to resolve the issue within the treatment operations. Options will include a study of TOC reduction at the source and generation / removal of TTHM's in the clarifier. Application of treatment technologies is scheduled for early 2012.

Noel Heights treatment operations have been expanded to include a finished water aeration system. The aeration system was installed to address the low pH issue which had an effect on the Lead and Copper compliance in the customer's piping. The California

Division of Drinking Water (DDW) has recognized the benefit of this installation as 2010 Lead and Copper Rule sampling has resulted in compliance. It is possible that the operations will discontinue the use of SeaQuest Corrosion Control Inhibitor injection, as the aeration system has resolved the overall Lead and Copper compliance issue.

Hawkins completed the installation of an ATEC Iron and Manganese treatment plant in October 2010 and is operating to the distribution system with 100% removal of Iron and Manganese. An added benefit of this treatment operation is the reduction of background Arsenic to levels approximately ½ of the 10 ug/L Maximum Contaminant Level (MCL). The short duration of operation of this system has so far been successful, and properly maintained should have consistent compliance.

Coast Springs has expanded the water production provided to the treatment plant with the addition of the Cline well, which is adjacent to well 4. Although there is background Manganese in the Cline well, the ATEC Iron and Manganese treatment unit is equipped to remove the manganese prior to introduction into the distribution system.

The Coast Springs operations are evaluating potential production expansion by accessing existing privately owned wells. At this point the water quality issues and production capacity are unknown. In the event of production expansion using additional sources, treatment plant effectiveness and capacity will need to be evaluated.

Table 7-1 Retail: Basis of Water Year Data

Year Type	Base Year	Available supplies if year type repeats	
		Agency may complete these columns for volume only, percent only, or both	
		Volume available (AF)	% of avg supply
Average Year	1921	412	100%
Single-Dry Year	2013	434	
Multiple-Dry Years 1st Year	2011	434	
Multiple-Dry Years 2nd Year	2012	409	
Multiple-Dry Years 3rd Year	2013	434	

NOTES: Available volumes are the maximum volumes across all forecast years in Tables 7-2, 7-3, and 7-4.

7.3 Supply and Demand Assessment

Water supply and demand patterns change during normal, single dry, and multi dry years. To analyze these changes, Cal Water relies on historical usage to document expected

changes in future usage in water demand, such as assuming increasing demand due to increased irrigation needs. (This excludes usage reductions that are not directly a function of Cal Water supplies, but are externally-imposed by other entities, such as the 2015 state-mandated cutbacks.)

The Redwood Valley District is made up of several hydraulically disconnected systems, and not all systems have access to both supply sources. The tables below combine the systems. Moreover, with the anticipated upgrades of the Clear Lake intake described in Chapter 6 and with minor capital improvements for redundancy and future growth laid out in Cal Water's Water Supply and Facilities Master Plan, supplies for all systems are forecast to be sufficient to meet all expected demands.

Table 7-2 shows the projected supply and demand totals for a normal year. The supply totals match those in Table 6-9; the demand totals match Table 4-3.

Table 7-2 Retail: Normal Year Supply and Demand Comparison (AF)					
	2020	2025	2030	2035	2040 *(Opt)*
Supply totals *(autofill fm Table 6-9)*	403	399	404	405	412
Demand totals *(autofill fm Table 4-3)*	403	399	404	405	412
Difference	**0**	**0**	**0**	**0**	**0**

Table 7-3 shows the projected supply and demand totals for the single dry year.

Table 7-3 Retail: Single Dry Year Supply and Demand Comparison (AF)					
	2020	2025	2030	2035	2040 (Opt)
Supply totals	425	421	426	427	434
Demand totals	425	421	426	427	434
Difference	**0**	**0**	**0**	**0**	**0**

Table 7-4 shows the projected supply and demand totals for the multiple dry years.

Table 7-4 Retail: Multiple Dry Years Supply and Demand Comparison (AF)						
		2020	2025	2030	2035	2040 (Opt)
First year	Supply totals	425	421	426	427	434
	Demand totals	425	421	426	427	434
	Difference	**0**	**0**	**0**	**0**	**0**
Second year	Supply totals	400	396	401	402	409
	Demand totals	400	396	401	402	409
	Difference	**0**	**0**	**0**	**0**	**0**
Third year	Supply totals	425	421	426	427	434
	Demand totals	425	421	426	427	434
	Difference	**0**	**0**	**0**	**0**	**0**

7.4 Regional Supply Reliability

Cal Water coordinates on an ongoing basis with all relevant agencies in the region to optimize the use of regional water supplies. This includes SEWD, the San Joaquin County Groundwater Baking Authority, the City of Stockton Municipal Area water retailers, the City of Stockton, and other public and private entities with which Cal Water can collaborate to protect and enhance local groundwater and surface water resources.

Cal Water also has its own aggressive conservation program that has and will continue to reduce per-capita usage and therefore demands on critical water sources. Cal Water is committed to helping its customers use water efficiently and has developed a range of water conservation programs to support this goal. To ensure that it is providing the right mix of programs in the most cost-effective manner possible, Cal Water routinely conducts comprehensive conservation program analysis and planning. This is done on a five-year cycle in tandem with the UWMP. Cal Water's current Conservation Master Plan provides the basis for the information on the implementation of and expected water savings from Demand Management Measures (DMMs) presented in Chapter 9. A copy of the Conservation Master Plan is provided in Appendix L.Cal Water also monitors and supports the goals of the Bay Area IRWMP. These goals include:

- Providing adequate water supplies to meet demands
- Providing clean, safe, reliable drinking water
- Minimizing vulnerability of infrastructure to catastrophes and security breaches
- Implementing water use efficiency to meet or exceed state and federal requirements
- Increasing opportunities for recycled water use

- Expanding water storage and conjunctive management of surface and groundwater
- Providing for groundwater recharge while protecting groundwater resources from overdraft
- Protecting groundwater resources from contamination

Chapter 8
Water Shortage Contingency Planning

This chapter describes the water shortage contingency plan for the Redwood Valley District. The water shortage contingency plan includes the stages of response to a water shortage, such as a drought, that occur over a period of time, as well as catastrophic supply interruptions which occur suddenly. The primary objective of the water shortage contingency plan is to ensure that the District has in place the necessary resources and management responses needed to protect health and human safety, minimize economic disruption, and preserve environmental and community assets during water supply shortages and interruptions.

Rule 14.1, as filed with the California Public Utilities Commission (CPUC), serves as Cal Water's Water Shortage Contingency Plan (WSCP) and includes Mandatory Staged Restrictions of Water Use. In the event that more stringent measures are required, Cal Water may request the addition of Schedule 14.1 which includes Staged Mandatory Water Use Reductions.

On April 1, 2016, Cal Water filed its current Schedule 14.1 with the California Public Utilities Commission (CPUC).[9] The Schedule lays out the staged mandatory reductions and drought surcharges associated with Cal Water's Water Shortage Contingency Plan. This filing is consistent with Resolution W-5034, adopted by the Commission on April 9, 2015, ordering compliance with requirements of the State Water Resources Control Board (SWRCB).

Schedule 14.1 is an extension of the Water Shortage Contingency Plan provided in Rule 14.1. The information presented in this chapter, is based on the current versions of both Rule 14.1 and Schedule 14.1 which are based, in part, on the specific SWRCB requirements associated with the Governor's Executive Order requiring statewide cutbacks to address the unprecedented drought.

8.1 Stages of Action

Table 8-1 defines the four stages of action in Cal Water's WSCP.

[9] Schedule 14.1, along with the underlying Cal Water Rule 14.1 are included as Appendix J.

Table 8-1 Retail: Stages of WSCP		
Stage	Complete One or Both	
	Percent Supply Reduction[1]	Water Supply Condition
	numerical value as percent	*narrative description*
1	Up to 10%	Minimal shortage
2	Up to 20%	Moderate shortage
3	Up to 35%	Severe shortage
4	Greater than 35%	Critical shortage
[1] One stage in the WSCP must address a water shortage of 50%.		

8.2 Prohibitions on End Uses

Except where necessary, to address an immediate health or safety need, or to comply with a term or condition in a permit issued by a state or federal agency, customers are prohibited, at all times, from using potable water for the following actions, as each is declared a non-essential, wasteful use of water:

1. Use of potable water through a broken or defective plumbing fixture or irrigation system when Cal Water has notified the customer in writing to repair the broken or defective plumbing fixture or irrigation system, and the customer has failed to effect such repairs within seven (7) business days of receipt of such notice;

2. The application of potable water to landscapes in a manner that causes runoff such that water flows onto adjacent property, non-irrigated areas, private and public walkways, roadways, parking lots, or structures; and,

3. The use of a hose that dispenses potable water to wash vehicles, including cars, trucks, buses, boats, aircraft, and trailers, whether motorized or not, except where the hose is fitted with a shut-off nozzle or device attached to it that causes it to cease dispensing water immediately when not in use.

Restrictions of water use by Stage of the Water Shortage Contingency Plan are included in Table 8-2.

Table 8-2 Retail: Restrictions and Prohibitions on End Uses			
Stage	Restrictions and Prohibitions on End Users	Additional Explanation or Reference *(optional)*	Penalty, Charge, or Other Enforcement?
1	Landscape - Limit landscape irrigation to specific days	Limited to no more than 3 days per week	Yes
1	Landscape - Limit landscape irrigation to specific times	Limited to 8 am and 6pm	Yes
1	Other - Customers must repair leaks, breaks, and malfunctions in a timely manner	Must be repaired within 5 business days	Yes
1	Landscape - Restrict or prohibit runoff from landscape irrigation		Yes
1	Landscape - Other landscape restriction or prohibition	Prohibit application of potable water to outdoor landscapes within 48 hours of measurable rainfall.	Yes
1	Other - Require automatic shut off hoses		Yes
1	Other - Prohibit use of potable water for washing hard surfaces		Yes
1	Other	Limits filling ornamental lakes or ponds; prohibit use of potable water in a water feature except where the water is recirculated	Yes
2	Landscape - Limit landscape irrigation to specific days	Limited to no more than 3 days per week	Yes
2	Landscape - Limit landscape irrigation to specific times	Limited to 8 am and 6pm	Yes
2	Other - Customers must repair leaks, breaks, and malfunctions in a timely manner	Must be repaired within 3 business days	Yes
2	Landscape - Restrict or prohibit runoff from landscape irrigation		Yes
2	Landscape - Other landscape restriction or prohibition	Prohibits irrigation of ornamental turf on public street medians with potable water; prohibit application of potable	Yes

Table 8-2 Retail: Restrictions and Prohibitions on End Uses			
Stage	Restrictions and Prohibitions on End Users	Additional Explanation or Reference *(optional)*	Penalty, Charge, or Other Enforcement?
		water to outdoor landscapes within 48 hours of measurable rainfall.	
2	CII - Lodging establishment must offer opt out of linen service		Yes
2	CII - Restaurants may only serve water upon request		Yes
2	Other - Require automatic shut off hoses		Yes
2	Other - Prohibit use of potable water for washing hard surfaces		Yes
2	Other	Limits filling ornamental lakes or ponds; prohibit use of potable water in a water feature except where the water is recirculated	Yes
3	Landscape - Limit landscape irrigation to specific days	Limited to no more than 2 days per week	Yes
3	Landscape - Limit landscape irrigation to specific times	Limited to 8 am and 6pm	Yes
3	Other - Customers must repair leaks, breaks, and malfunctions in a timely manner	Must be repaired within 2 business days	Yes
3	Landscape - Restrict or prohibit runoff from landscape irrigation		Yes
3	Landscape - Other landscape restriction or prohibition	Prohibits irrigation of ornamental turf on public street medians with potable water; prohibit application of potable water to outdoor landscapes within 48 hours of measurable rainfall.	Yes
3	CII - Lodging establishment must offer opt out of linen service		Yes

Table 8-2 Retail: Restrictions and Prohibitions on End Uses			
Stage	Restrictions and Prohibitions on End Users	Additional Explanation or Reference *(optional)*	Penalty, Charge, or Other Enforcement?
3	CII - Restaurants may only serve water upon request		Yes
3	Other - Require automatic shut off hoses		Yes
3	Other - Prohibit use of potable water for washing hard surfaces	Prohibits use of potable water for street cleaning with trucks except for initial wash-down for construction purposes if street sweeping is not feasible	Yes
3	Other	Limits filling ornamental lakes or ponds; prohibit use of potable water in a water feature except where the water is recirculated	Yes
3	Other - Prohibit use of potable water for construction and dust control	Prohibited unless no other method or source of water can be used	Yes
4	Landscape - Prohibit all landscape irrigation	Prohibited except with hand-held bucket nozzle to maintain trees and shrubs.	Yes
4	Other - Customers must repair leaks, breaks, and malfunctions in a timely manner	Must be repaired within 1 business day	Yes
4	Landscape - Restrict or prohibit runoff from landscape irrigation		Yes
4	CII - Lodging establishment must offer opt out of linen service		Yes
4	CII - Restaurants may only serve water upon request		Yes
4	Other - Require automatic shut off hoses		Yes
4	Other - Prohibit use of potable water for washing hard surfaces	Prohibits use of potable water for street cleaning with trucks	Yes

Table 8-2 Retail: Restrictions and Prohibitions on End Uses			
Stage	Restrictions and Prohibitions on End Users	Additional Explanation or Reference *(optional)*	Penalty, Charge, or Other Enforcement?
4	Other	Limits filling ornamental lakes or ponds; prohibit use of potable water in a water feature except where the water is recirculated	Yes
4	Other - Prohibit use of potable water for construction and dust control	No exceptions	Yes

8.3 Penalties, Charges, Other Enforcement of Prohibitions

In accordance with Rule 14.1, Cal Water is authorized to take the following actions to enforce restrictions of water use that are in effect:

First Violation: Cal Water shall provide the customer with a written notice of violation.

Second Violation: If Cal Water verifies that the customer has used potable water for non-essential, wasteful uses after having been notified of the first violation, Cal Water shall provide the customer with a second written notice of violation and is authorized to install a flow-restricting device on the customer's service line.

If Schedule 14.1 is implemented, Cal Water is authorized to take the following actions when its personnel verify a customer is using potable water for non-essential, wasteful uses.

First Violation: Cal Water shall provide the customer with a written notice of violation. In addition, Cal Water is authorized to take the following actions:

A. If the customer currently receives service through a metered connection, install a real-time water measurement device on the customer's service line and provide the customer with access to information from the device. The cost of the device, including installation and ongoing operating costs, may be billed to the customer, and nonpayment may result in discontinuance of service.

B. If the customer does not currently receive service through a metered connection, install a water meter on the customer's service line, charge the customer for water

use pursuant to Cal Water's metered service tariffs and rules, and install a real-time water measurement device on the customer's service line and provide the customer with access to information from the device. The cost of the device, including installation and ongoing operating costs, may be billed to the customer, and nonpayment may result in discontinuance of service.

Second Violation: If Cal Water verifies that the customer has used potable water for non-essential, wasteful uses after having been notified of the first violation, Cal Water shall provide the customer with a second written notice of violation. In addition to the actions prescribed under the first violation above, Cal Water is authorized to take the following actions:

A. Apply the following waste of water penalties, which are in addition to any other charges authorized by this Schedule or other Cal Water tariffs.

   i. If Stage 1 is in effect, $25
   ii. If Stage 2 is in effect, $50
   iii. If Stage 3 is in effect, $100
   iv. If Stage 4 is in effect, $200

B. At its sole discretion, waive the waste of water penalty if the customer participates in a water use evaluation provided by Cal Water and/or provides documentation to Cal Water proving that a drip irrigation system, micro spray irrigation system, high-efficiency sprinkler system, or properly programmed smart irrigation controller has been installed, after a notice of violation was delivered, and is in use at the customer's service address.

Third Violation: If Cal Water verifies that the customer has used potable water for non-essential, wasteful uses after having been notified of the second violation, Cal Water shall provide the first and second violations above, Cal Water is authorized to take the following actions:

A. Apply the following waste of water penalties, which are in addition to any other charges authorized by this Schedule or other Cal Water tariffs.

   i. If Stage 1 is in effect, $50
   ii. If Stage 2 is in effect, $100
   iii. If Stage 3 is in effect, $200
   iv. If Stage 4 is in effect, $400

B. At its sole discretion, waive the waste of water surcharge if the customer participates in a water use evaluation provided by Cal Water and/or provides documentation to

Cal Water proving that a drip irrigation system, micro spray irrigation system, high-efficiency sprinkler system, or properly programmed smart irrigation controller has been installed, after notice of violations have been delivered, and is in use at the customer's service address.

Fourth Violation: If Cal Water verifies that the customer has used potable water for non-essential, wasteful uses after having been notified of the third violation, Cal Water shall provide the customer with a fourth written notice of violation. In addition to actions set forth in previous violations prescribed above, Cal Water is authorized to install a flow-restricting device on the customer's service line.

Egregious Violation: Notwithstanding the foregoing framework for penalties, customers who Cal Water has verified are egregiously using potable water for non-essential, wasteful uses are subject to having a flow- restricting device installed on their service line. After providing the customer with one notice of egregious violation, either by direct mail or door hanger, which documents the egregious use of potable water for non-essential, wasteful uses and explains that failure to correct the violation may result in the installation of a flow-restricting device on the customer's service line, Cal Water is authorized to install a flow-restricting device on the customer's service line.

DROUGHT SURCHARGES

Cal Water may elect to implement actions such as water budgets with associated surcharges through the implementation of Schedule 14.1. An example of such a program is included in Appendix J.

8.4 Consumption Reduction Methods by Agencies

Table 8-3 Retail: Stages of WSCP - Consumption Reduction Methods		
Stage	Consumption Reduction Methods by Water Supplier	Additional Explanation or Reference *(optional)*
2	Expand Public Information Campaign	
2	Offer Water Use Surveys	Offered as part of standard conservation program. Will expand as needed to achieve additional savings.
2	Provide Rebates or Giveaways of Plumbing Fixtures and Devices	Offered as part of standard conservation program. Will expand as needed to achieve additional savings.
2	Provide Rebates for Landscape Irrigation Efficiency	Offered as part of standard conservation program. Will expand as needed to achieve additional savings.

Table 8-3 Retail: Stages of WSCP - Consumption Reduction Methods		
Stage	Consumption Reduction Methods by Water Supplier	Additional Explanation or Reference *(optional)*
2	Decrease Line Flushing	
2	Reduce System Water Loss	
2	Increase Water Waste Patrols	
2	Other	Mandatory water budgets and banking-- Water budgets will be based on a customer's consumption during a historical base period and will include a percentage reduction designed to meet necessary water-use reductions.
2	Implement or Modify Drought Rate Structure or Surcharge	Drought surcharges charged to customers for each unit of water used over the established water budget for the billing period. For Stage 2 surcharges are two times the highest residential tier rate, with exceptions discussed in Section 8.3
3	Expand Public Information Campaign	
3	Offer Water Use Surveys	Offered as part of standard conservation program. Will expand as needed to achieve additional savings.
3	Provide Rebates or Giveaways of Plumbing Fixtures and Devices	Offered as part of standard conservation program. Will expand as needed to achieve additional savings.
3	Provide Rebates for Landscape Irrigation Efficiency	Offered as part of standard conservation program. Will expand as needed to achieve additional savings.
3	Decrease Line Flushing	
3	Reduce System Water Loss	
3	Increase Water Waste Patrols	
3	Other	Mandatory water budgets and banking
3	Implement or Modify Drought Rate Structure or Surcharge	Drought surcharges charged to customers for each unit of water used over the established water budget for the billing period.
4	Expand Public Information Campaign	
4	Offer Water Use Surveys	Offered as part of standard conservation program. Will expand as needed to achieve additional savings.

Table 8-3 Retail: Stages of WSCP - Consumption Reduction Methods		
Stage	Consumption Reduction Methods by Water Supplier	Additional Explanation or Reference *(optional)*
4	Provide Rebates or Giveaways of Plumbing Fixtures and Devices	Offered as part of standard conservation program. Will expand as needed to achieve additional savings.
4	Provide Rebates for Landscape Irrigation Efficiency	Offered as part of standard conservation program. Will expand as needed to achieve additional savings.
4	Decrease Line Flushing	
4	Reduce System Water Loss	
4	Increase Water Waste Patrols	
4	Other	Mandatory water budgets and banking
4	Other	Mandatory water budgets and banking
4	Implement or Modify Drought Rate Structure or Surcharge	Drought surcharges charged to customers for each unit of water used over the established water budget for the billing period.
NOTES: The actions included may be implemented through a combination of Rule 14.1 and Schedule 14.1 and would be evaluated based on specific need.		

8.5 Determining Water Shortage Reductions

All customers in the District are metered. The metered demands will be used to monitor reductions that result from actions taken by Cal Water when implementing its WSCP.

8.6 Revenue and Expenditure Impacts

In 2008 the CPUC allowed for the creation of a Water Revenue Adjustment Mechanism (WRAM) and Modified Cost Balancing Accounts (MCBA). The goals of the WRAM and MCBA are to sever the relationship between sales and revenue to remove the disincentive to reduce water use. The WRAM and MCBA are designed to be revenue neutral in order to ensure that both the utility and ratepayers are neither harmed nor benefitted.

During the current drought, the CPUC authorized a memorandum account through Resolution W-4976 to track incremental drought-related costs and waste of water penalties which may be recovered through rates if deemed appropriate by the Commission.

8.7 Resolution or Ordinance

Cal Water is an investor-owned water utility that is regulated by the California Public Utilities Commission (CPUC). As such, it does not have the authority to adopt resolutions or ordinances. As described above, Rule 14.1, as filed with the California Public Utilities Commission (CPUC), serves as Cal Water's Water Shortage Contingency Plan and includes Mandatory Staged Restrictions of Water Use. In the event that more stringent measures are required, Cal Water may request the addition of Schedule 14.1 which includes Staged Mandatory Water Use Reductions. Cal Water will work with local planning and enforcement departments to ensure consistency with local resolutions and ordinances.

8.8 Catastrophic Supply Interruption

Cal Water has an Emergency Response Plan (ERP) in place that coordinates the overall company response to a disaster in any or all of its districts. In addition, the ERP requires each District to have a local disaster plan that coordinates emergency responses with other agencies in the area.

Cal Water also inspects its facilities annually for earthquake safety. To prevent loss of these facilities during an earthquake, auxiliary generators and improvements to the water storage facilities have been installed as part of Cal Water's annual budgeting and improvement process.

During an emergency situation, the District must rely mainly on its own production facilities to serve its customers. Most of the water systems in the Redwood Valley District are small and are isolated from neighboring communities, and only Rancho del Paradiso has an intertie with a neighboring system.

Rancho del Paradiso abandoned its primary production well when it began purchasing water from the Sweetwater Springs Water District. In Noel Heights, the closest potential water system is 2-3 miles away. The Armstrong Valley system has a neighboring system near the end of its main, and could be tied in during an emergency, but a supply interruption would occur until the necessary equipment could be installed. The Hawkins system is not tied into the City of Santa Rosa's distribution system and must rely on its own facilities during an emergency. Cal Water is in the process of installing a backup generator at the Hawkins pump station. The Estero Mutual Water Company is located close to the Coast Springs system and could be tied into temporarily, but the necessary equipment would need to be installed. The Lucerne system is also isolated from neighboring communities. The closest system is the Nice Water Company in the town to the west.

8.9 Minimum Supply Next Three Years

Table 8-4 provides estimates of total supply volumes that would be produced if the hydrology of the multi-year drought period discussed in Chapter 7 were to occur in the immediate future. These volumes are equal to the projected 2020 supplies in Table 7-4. Since District near-term supplies over a multi-year dry period are projected to be at least sufficient to serve demands, it is likely that current supply sources could produce more water. Cal Water does not have sufficient information to estimate how much more.

Table 8-4 Retail: Minimum Supply Next Three Years (AF)

	2016	2017	2018
Available Water Supply	425	400	425

Chapter 9
Demand Management Measures

This chapter provides a summary of past and planned demand management measure (DMM) implementation in the Redwood Valley District, as well as an overview of the expected water savings and projected compliance with the Water Conservation Act of 2009 (SB X7-7).

This chapter contains the following sections:

9.1 Demand Management Measures for Wholesale Agencies

9.2 Demand Management Measures for Retail Agencies

9.3 Implementation over the Past Five Years

9.4 Planned Implementation to Achieve Water Use Targets

9.5 Members of the California Urban Water Conservation Council

9.1 Demand Management Measures for Wholesale Agencies

Because the Redwood Valley District is a retail water supplier, this section does not apply.

9.2 Demand Management Measures for Retail Agencies

Cal Water centrally administers its conservation programs for its 24 districts. For purposes of this section, these programs have been grouped in accordance with the DMM categories in Section 10631(f) of the UWMP Act. These categories are:

(i) Water waste prevention ordinances
(ii) Metering
(iii) Conservation pricing
(iv) Public education and outreach
(v) Distribution system water loss management
(vi) Water conservation program coordination and staffing support, and
(vii) Other demand management measures

Following are descriptions of the conservation programs Cal Water operates within each of these DMM categories.

9.2.1 Water Waste Prevention Ordinances

Because of its investor owned status Cal Water enforcement of water use restrictions is authorized by the CPUC through Rule 14.1 or Schedule 14.1. Restrictions may also be regulated by ordinances passed by the local governments in each community served. Cal Water has worked with municipalities to pass ordinances and coordinate activities. Cal Water will continue this effort on an ongoing basis. In the Redwood Valley District the City of Lucerne and the County of Sonoma have passed water conservation ordinances, which are included in Appendix J.

Due to worsening drought conditions, Cal Water filed Schedule 14.1 with the CPUC in the spring of 2015 which went into effect on June 1, 2015. Cal Water's Schedule 14.1 filing, which applies to both residential and non-residential customers, is responsive to Governor Brown's emergency drought declaration and executive order requiring a statewide 25% reduction in urban potable water use. It also complies with regulations adopted by the State Water Resources Control Board (State Board) and the CPUC to achieve that reduction by the end of February 2016. Schedule 14.1 puts measures in place to enable Cal Water to enforce the water-use prohibitions set by the State Board, including:

- Applying water to outdoor landscapes that causes runoff onto adjacent property, non-irrigated areas, private and public walkways, roadways, parking lots, or structures
- Using a hose to wash motor vehicles unless the hose is fitted with a shut-off nozzle or device that causes it to cease dispensing water immediately when not in use
- Applying water to driveways and sidewalks
- Using water in a fountain or other decorative water feature, except where the water is part of a recirculating system
- Applying water to outdoor landscapes during and within 48 hours after measurable rainfall
- Using potable water to irrigate outside of new construction without drip or microspray systems
- Using potable water on street medians
- Filling or refilling ornamental lakes or ponds except to sustain existing aquatic life

Additionally, Schedule 14.1 requires that:

- Customers must fix leaks within their control within five business days of notification
- Hotel/motel operators must provide option to not have towels or linens laundered daily during a guest's stay, and must provide clear notice of this option in easy-to-understand language

- Restaurants and other eating and drinking establishments may only serve drinking water upon request

With the approval of the Schedule 14.1 filing, beginning June 1, 2015, individual customers in each Cal Water district were provided water budgets based upon their water use each month in 2013 minus the state-mandated reduction for the Redwood Valley District of 16%. If a customer used less than his or her water budget, the unused water was carried forward, similar to rollover minutes on a cell phone plan. Water used in excess of the monthly budget was subject to a drought surcharge. The surcharge was discounted for customers on Cal Water's Low-Income Rate Assistance (LIRA) program. To help with compliance, the customer's monthly bill showed his or her water budget for the following month. Customers' water use history back to 2011 and their water budgets were also available online beginning in June of 2015.

Cal Water's Schedule 14.1 filing is included as Appendix J of this UWMP.

9.2.2 Metering

All service connections within the Redwood Valley District are metered. Meters are read monthly and routinely maintained and calibrated. Customers are billed monthly based on their metered water use.

Cal Water is also piloting automatic meter reading (AMR) and advanced metering infrastructure (AMI) in several of its districts. AMI may be used by Cal Water in the future to detect and alert households of leaks and other possible problems as well as to provide customers with tailored water use information to help them use water more efficiently.

9.2.3 Conservation pricing

As an investor owned utility, Cal Water rates and charges are reviewed and authorized by the CPUC every three years. Starting in 2008 Cal Water adopted tiered rate designs for single family residential service. Uniform volumetric rate designs are employed by Cal Water for other water service classes. For various reasons, in some service areas, including Redwood Valley District, tiered rates for single family customers were not considered appropriate and these service areas continue to rely on uniform rate designs. Current volumetric rates by class of service within Redwood Valley District are provided in Table 9-1.

Customers in Redwood Valley District are eligible for a discounted water rate on a base level of consumption. The discounted rate is funded by the Rate Support Fund (RSF) program. Coast Springs customers are charged a discounted RSF rate of $4.52 per CCF on the first 4 CCF of consumption per month. Consumption in excess of 4 CCF is charged at the rate shown in Table 9-1 for Coast Springs. Customers served by the other sub-systems

are charged a discounted RSF rate of $4.52 per CCF on the first 10 CCF of consumption per month. Consumption in excess of 10 CCF is charged at the rates shown in Table 9-1.

Table 9-1: Volumetric Water Rates by Class of Service ($/CCF)

Class of Service	Price for All Units of Water by Service Region					
	Hawkins	Rancho Del Paridiso	Noel Heights	Armstrong	Lucerne	Coast Springs
Single Family	$13.58	$13.58	$13.58	$13.58	$16.14	$41.39
Non Residential	$13.58	$13.58	$13.58	$13.58	$16.14	$41.39

Per the Memorandum of Understanding Regarding Urban Water Conservation in California (MOU), conservation pricing provides economic incentives to customers to use water efficiently via a volumetric water rate. The MOU considers uniform, seasonal, tiered (block), and allocation-based rate designs as each being potentially consistent with conservation pricing, provided that either (1) 70% or more of total annual revenue is derived from the volumetric component of the rate design or (2) the proportion of total revenue from the volumetric component of the rate design equals or exceeds the long-run incremental cost of providing water service, or (3) the utility's metering technology, rate structure, and customer communication programs satisfy various requirements specified by the MOU.

The Redwood Valley District's rate structure is not currently in compliance with any of the three compliance options of the Urban MOU's definition of conservation pricing. Urban MOU BMP compliance reports are provided in Appendix L. The District's rates are established by the California Public Utilities Commission (CPUC) through General Rate Cases every three years. The District is bound by the General Rate Case decisions and cannot make changes to its rate design or level without CPUC approval.

9.2.4 Public Education and Outreach

Cal Water's public outreach program is divided into four components, as follows:

Residential Customer Assistance – This category provides tailored assistance to residential customers through home water surveys and monthly water use reports. It provides assistance to residential customers wanting to reduce their indoor and outdoor water uses. While available to all residential customers, marketing of home water surveys is generally focused on high use residential customers.

Non-Residential Customer Assistance – This category provides tailored assistance to commercial customers through commercial water surveys, monthly landscape reports to

large landscape customers, and large landscape water use surveys. It provides assistance to commercial customers wanting to reduce their use of water for sanitation, hygiene, process, and landscape purposes.

Public Information and School Education – Cal Water's public information program provides general information on the need for and value and methods of water conservation through multiple media outlets, including its website, direct mail, external print media, and radio. Cal Water's school education program includes the Cal Water H2O Challenge, a project-based learning competition for grades 4-6, Cal Water Town, an interactive online learning tool, and general information and learning materials for students and teachers.

Rebate Program Information and Marketing – Through its website, bill inserts, newsletters, and radio and print media, Cal Water advertises and markets a variety of conservation rebate programs, including rebate programs for high-efficiency toilets, urinals, and clothes washers, and irrigation equipment and landscape efficiency improvements.

9.2.5 Programs to Assess and Manage Distribution System Real Loss

Per the MOU, Cal Water annually quantifies the District's volume of apparent and real water loss. Cal Water's conservation staff have received training in the AWWA water audit method and component analysis process and have completed water balances for each Cal Water district using AWWA's water audit software. For the five-year period 2011-2015, apparent and real water loss in the Redwood Valley District averaged 104 AF, or approximately 28 percent of total production.

In addition to its routine and planned system maintenance and water loss reporting, Cal Water is planning to implement a lift-and-shift sonic data logger leak detection program in the District starting in 2017. The lift-and-shift program will survey up to one-third of main miles annually in three shifts. Each leak detection shift will last approximately 80 days. Lift-and-shift sonic data logging technology will enable Cal Water to quickly and efficiently locate leaks in one part of the water distribution network and then redeploy the equipment to another part of the network. Staff will review sound files from the loggers for potential leak warnings and discuss this information with District management, who can then assign work orders for repair crews to investigate and repair leaks. Cal Water conservatively estimates the lift-and-shift program will reduce real water loss in the District by up to 79 AFY – enough water for about 250 households. Additional potential benefits of the program include reduced excavation of streets, less staff overtime spent responding to and repairing catastrophic main breaks, and improvement to the best management practices of the valve maintenance program. This program was

submitted as part of Cal Water's 2015 General Rate Case with the CPUC and is subject to CPUC approval prior to implementing.

9.2.6 Water Conservation Program Coordination and Staffing Support

Because of its status as an investor owned utility, conservation program staffing positions must be approved by the CPUC through its General Rate Case every three years. Currently authorized conservation program staffing consists of five full-time positions, which include:

- One Conservation Program Manager
- One Conservation Program Analyst
- One Landscape Program Analyst
- Two Conservation Program Coordinators

These five staff positions manage all aspects of Cal Water's conservation programs deployed across 24 separate districts serving a combined population of about 2 million through 470,000 service connections. Staffing constraints have been one of the primary challenges Cal Water has faced in expanding the scope and reach of its conservation programs throughout its service districts. To ensure adequate management and oversight of the expansion and utilization of its conservation programs, Cal Water is proposing in its current General Rate Case to add three additional Conservation Program Coordinator positions. Proposed staffing is summarized in Table 9-2. If approved, total staffing level would increase from 5 to 8 FTE positions. While this would still be below the average for conservation programs of similar size and scope operated by other water utilities, it would be a substantial improvement over Cal Water's current conservation program staffing levels.

Table 9-2: Planned Conservation Program Staffing		
Staff Position	Responsibilities	Position Status
Conservation Program Manager	Long-term program planning and implementation; program budgeting and oversight; staff oversight and management; contracting and oversight of outside services	Existing
Conservation Program Coordinator	Management and oversight of conservation programs in Cal Water districts	2 Existing 3 Proposed
Conservation Program Analyst	Program analysis and reporting, including but not limited to preparation of reports related to CPUC requirements, urban water management plans, BMP compliance reports, and SB X7-7 compliance reports	Existing
Landscape Program Analyst	Analysis and tracking of landscape program implementation and performance; coordination of landscape program rollouts; GIS/GPS management; assist regional conservation program coordinators with management/oversight of landscape programs	Existing

9.2.7 Other Demand Management Measures

In addition to the DMM programs described above, Cal Water operates rebate, give-away, and direct installation programs aimed at plumbing fixture replacement and irrigation equipment and landscape efficiency improvements. Following are brief descriptions of each of these DMMs.

MaP Premium and Non-Premium Toilet Replacement – This program replaces old toilets with MaP certified high-efficiency toilets. Financial rebates, direct installation, and direct distribution are used to deliver toilets to customers. For residential customers, MaP premium certified toilets which have greater water savings potential are eligible for a $100 rebate while the rebate for MaP non-premium toilets is $50. For commercial customers, a rebate of $100 is available for valve-type toilets flushing 1.28 gallons or less and EPA WaterSense labeled tank-type toilets. Cal Water centrally administers the program. This program is available to all residential and non-residential customers. Cal Water markets the program through direct mail, print media, bill stuffers, and its website.

Where advantageous, Cal Water partners with local or regional agencies and community organizations to offer the program.

Urinal Valve and Bowl Replacement – This program replaces old urinals with high-efficiency urinals meeting the new 0.125 gallon per flush water use standard adopted by the California Energy Commission in April 2015. Financial rebates of up to $150 are available to customers. The program targets offices and public buildings receiving significant foot traffic. Cal Water centrally administers the program. While this program is available to all non-residential customers, marketing focuses on prime targets, such as restaurants and high-density office buildings. Cal Water markets the program through direct mail, print media, bill stuffers, and its website.

Clothes Washer Replacement – This program provides customer rebates up to $150 for residential and up to $200 for non-residential high-efficiency clothes washers. The program targets single-family households, multi-family units, multi-family common laundry areas, and commercial coin-op laundries. Cal Water centrally administers the program, and markets the program through direct mail, print media, bill stuffers, and its website. This program is available to all residential and non-residential customers. Where advantageous, Cal Water partners with local or regional agencies to offer the program.

Residential Conservation Kit Distribution – This program offers Cal Water residential customers conservation kits featuring a range of water-saving plumbing retrofit fixtures. Kits are available at no charge to customers, who can request them via Cal Water's website, via mail, or by contacting or visiting their district. Each kit includes the following items: high-efficiency showerheads, kitchen faucet aerator, bathroom faucet aerators, full-stop hose nozzle, and toilet leak detection tablets. Cal Water centrally administers this program as part of a company-wide program operated in each of its districts. This program is available to all residential customers. Cal Water markets the program through direct mail, print media, bill stuffers, and through its website.

Smart Controllers Rebates/Vouchers – This program targets residential and non-residential customers with high landscape water use. The program offers financial incentives up to $125 for residential controllers and up to $25 per station for commercial-grade controllers to either the customer or contractor for proper installation of the Smart Controller at customer sites. The landscape contractor has the direct relationship with customers and is typically the entity customers listen to when making landscape and irrigation decisions. The program educates contractors about the customer benefits of Smart Controllers along with proper installation of the devices. This program is offered to all residential and non-residential customers. Cal Water markets the program through direct mail, print media, bill stuffers, and its website.

High Efficiency Irrigation Nozzle Web Vouchers/Rebates – Water efficient sprinkler nozzles (popup and rotating) and integrated pressure-regulated spray bodies use significantly less water than a standard sprinkler head by distributing water more slowly and uniformly to the landscape. In addition to reducing water use, water directed from these nozzles reduces run-off onto streets and sidewalks with a more directed flow. Customers are able to obtain the nozzles and spray bodies either directly through Cal Water or via a web-voucher program. Restrictions on the number of nozzles individual customers may receive vary by customer class and/or landscape size. Cal Water centrally administers this program as part of a company-wide program operated in most of its districts.

Turf Buy-Back – This program offers customers a $1 per square foot rebate to replace turf with qualified drought-tolerant landscaping. Customer applications are screened to ensure program requirements are met, including before and after photos of the retrofitted landscape area. Turf replacement rebates were offered in a subset of Cal Water districts starting in 2014 and offered across all districts starting in 2015 as a drought response measure. Governor Brown's Executive Order B-29-15 calls on the Department of Water Resources to lead a statewide initiative, in partnership with local agencies, to replace 50 million square feet of lawns and ornamental turf with drought tolerant landscapes.

Table 9-3 summarizes the DMMs currently available to Redwood Valley District customers.

Table 9-3: Cal Water DMMs Available to Redwood Valley District Customers			
1. Plumbing Fixture Replacement	Customer Class Eligibility		
Rebates	SFR	MFR	COM
MaP Premium Toilet	✓	✓	✓
MaP Non-Premium Toilet	✓	✓	✓
Urinal Bowl & Valve (< 0.125 gal)			✓
Clothes Washer (In Unit)	✓	✓	
Clothes Washer (Commercial)		✓	✓
Direct Install			
MaP Premium Toilet	✓	✓	
MaP Non-Premium Toilet			
Urinal Valve (< 0.125 gal)			
Direct Distribution			
MaP Premium Toilet	✓	✓	
Conservation Kits (showerheads, aerators)	✓		✓
2. Irrigation Equipment/Landscape Upgrades			
Rebates/Vouchers			
Smart Irrigation Controller	✓	✓	✓
High Efficiency Irrigation Popup Nozzle	✓	✓	✓
High Efficiency Irrigation Rotating Nozzle	✓	✓	✓
High Efficiency Irrigation Spray Body		✓	✓
Turf Buy-Back	✓	✓	✓
Direct Distribution			
Smart Irrigation Controller		✓	✓
3. Residential Customer Assistance			
Residential Water Survey	✓	✓	
4. Non-Residential Customer Assistance			
Commercial Water Use Surveys			✓
Monthly Water Use Report			✓
Large Landscape Water Use Survey			✓
Note: MaP Premium toilets: flush vol <= 1.1 gallons; MaP Non-Premium: flush vol <= 1.28 gallons.			

9.3 Implementation over the Past Five Years

Implementation of customer DMMs over the past five years is summarized in Table 9-4. Estimated annual and cumulative water savings from customer DMM implementation is shown in the last row of the table. The water savings estimates are only for the customer DMMs listed in Table 9-3. They do not include water savings from water waste prevention ordinances, conservation pricing, general public information, or distribution system water loss management DMMs. Estimated water savings shown in Table 9-4 were calculated with the Alliance for Water Efficiency's Water Conservation Tracking Model.

Significant additional reductions in water demand were achieved in 2015 in response to the District's drought response measures, including its public information campaigns to save water and its Schedule 14.1 water use restrictions, water budgets, and drought surcharges that went into effect June 1, 2015. Relative to its 2013 reference year under the State Board's Emergency Regulation for Statewide Urban Water Conservation, water demand between June and December 2015 decreased by 32.2 percent. Per capita potable water use in 2015 was 81 GPCD compared to the District's SB X7-7 2015 interim water use target of 161 GPCD.

Table 9-4: Implementation of Customer DMMs: 2011-2015

1. Plumbing Fixture Replacement	2011 – 2015 Total	Average Annual
Toilets & Urinals (number distributed)	30	6
Clothes Washers (number distributed)	31	6
Conservation Kits (number distributed)	244	49
2. Irrigation Equipment/Landscape Upgrades		
Smart Controllers (number distributed)	2	< 1
3. Residential Customer Assistance		
Surveys/Audits (homes receiving)	2	< 1
Estimated Water Savings (AF)	**11**	**2**

Note: Estimated water savings shown in the table are only for the 2011-2015 period. Water savings from customer DMMs implemented between 2011 and 2015 will continue after 2015 and last for the useful life of each DMM.

Annual expenditure for implementation of customer DMMs over the past five years is summarized in Table 9-5. The table highlights expenditures from 2011 through 2015 for administrative, research, planning, program, and public information and school education.

Table 9-5: Annual DMM Expenditure: 2011-2015		
Expenditure Category	2011 – 2015 Total	Average Annual
Admin, R&D, planning	$21,867	$4,373
Program expenditures & incentives	$60,404	$12,081
Public information & school education	$10,048	$2,010
Total	**$92,319**	**$18,464**

9.4 Planned Implementation to Achieve Water Use Targets

Planned implementation of customer and water loss management DMMs for the period 2016 to 2020 are summarized in Table 9-6. Estimated annual and cumulative water savings from customer and water loss management DMM implementation is shown in the last two rows of the table. The water savings estimates are only for the customer DMMs listed in Table 9-3 plus the leak detection program Cal Water has proposed to start in 2017. They do not include potential water savings from water waste prevention ordinances, conservation pricing, or general public information and school education DMMs. Estimated water savings shown in Table 9-6 were calculated with the Alliance for Water Efficiency's Water Conservation Tracking Model.

In addition to the DMMs shown in Table 9-6, Cal Water will continue to fully implement the water loss ordinance, metering, conservation pricing, public outreach, and conservation program coordination and staffing support DMMs described previously.

Annual expenditure for DMM implementation in the Redwood Valley District, including pro-rated staffing costs, is expected to average $29,400. Cumulative expenditure for DMM implementation for the period 2016-2020 is expected to total $147,100. Of this total, approximately 10% is earmarked for plumbing fixture, irrigation equipment, and landscape efficiency upgrades; 24% is earmarked for public information and school education programs; 44% is earmarked for distribution system water loss management; 6% is earmarked for site surveys/audits and customer water use reports; and 16% is earmarked for administrative and labor costs.

Because Cal Water is an investor-owned utility, the planned programs and corresponding expenditures for the next five years are subject to CPUC review and approval. The amount of program implementation for 2016 shown in Table 9-6 is what was approved in Cal Water's last General Rate Case. The amounts of program implementation for 2017-2019 are what Cal Water has proposed in its current General Rate Case. Conservation programs and budgets for 2020 will be determined by the subsequent General Rate Case. However, the amounts shown for 2020 in Table 9-6 are consistent with the amounts recommended in Cal Water's current Conservation Master Plan (see Appendix L).

Table 9-6: Planned Implementation of Customer and Water Loss Management DMMs: 2016-2020					
1. Plumbing Fixture Replacement	2016	2017	2018	2019	2020
Toilets & Urinals (number distributed)	4	4	4	4	4
Clothes Washers (number distributed)	1	1	1	1	1
Conservation Kits (number distributed)	11	50	50	50	50
2. Irrigation Equipment/Landscape Upgrades					
Smart Controllers (number distributed)	0	0	0	0	0
Nozzles & Spray Bodies (number distributed)	50	0	0	0	0
Turf Buy-Back (sq ft removed)	1,000	1,000	1,000	1,000	1,000
3. Residential Customer Assistance					
Monthly home water reports (homes receiving)	446	446	446	446	446
Surveys/Audits (homes receiving)	10	2	2	2	2
4. Non-Residential Customer Assistance					
Surveys/Audits (sites receiving)	0	0	0	0	0
Large Landscape Reports (sites receiving)	0	0	0	0	0
5. Water Loss Management					
Leak Detection (miles of main)	0	6	8	11	11
Estimated Annual Water Savings (AFY)	**3**	**44**	**65**	**85**	**86**
Cumulative Water Savings (AF)	**3**	**48**	**112**	**197**	**283**

Cal Water puts all proposed conservation programs through a rigorous benefit-cost analysis as part of a comprehensive program review and assessment process. The benefit-cost analysis yields information on expected water savings over the useful life of each DMM, cost of water savings, and avoided water supply cost of water savings. Results are used to rank programs in terms of cost-effectiveness, calculate the overall program unit cost of saved water and program benefit-cost ratio for each district, and develop district conservation budgets. The proposed DMMs for the Redwood Valley District have an overall program unit cost of saved water of $230/AF (in 2015 dollars) and a benefit-cost ratio of 3.1. The unit cost of saved water includes all direct program costs associated with implementation of the proposed conservation programs.

Projected SB X7-7 compliance water use for Redwood Valley District in 2020 under planned levels of DMM implementation is 110 GPCD compared to its target water use of 157 GPCD. Therefore, the District is projected to be in compliance with SB X7-7 in 2020.

9.5 Members of the California Urban Water Conservation Council

Cal Water is a member of the California Urban Water Conservation Council (CUWCC). CUWCC members have the option of submitting their 2013–2014 Best Management Practice (BMP) annual reports in lieu of, or in addition to, describing the DMMs in their UWMP (CWC 10631). The BMP annual reports for the Redwood Valley District are provided in Appendix L.

Chapter 10
Plan Adoption, Submittal, and Implementation

This Chapter provides information on a public hearing, the adoption process for the UWMP, the adopted UWMP submittal process, plan implementation, and the process for amending the adopted UWMP.

This chapter includes the following sections:

10.1 Inclusion of All 2015 Data

This UWMP includes the water use and planning data for the entire calendar year of 2015, per DWR UWMP Guidelines (pg. 2-11).

10.2 Notice of Public Hearing

Prior to adopting the Plan, Cal Water held a formal public hearing to present information on its Redwood Valley District UWMP on May 18, 2016, 10:00 AM at the following location:

Marysville District Customer Center
131 D Street
Marysville, CA, 95901

Two audiences were notified of the UWMP review at least 60 days prior to the public hearing: cities and counties, and the public. These audiences were noticed again with the specific date, time and location of the hearing at least two weeks prior to the public hearing. The notice to the public, as specified in Government Code 6066, can be found in Appendix D. Table 10-1 lists the cities and counties notified.

10.2.1 Notice to Cities and Counties

Table 10-1 Retail: Notification to Cities and Counties		
City Name	60 Day Notice	Notice of Public Hearing
City of Santa Rosa	✓	✓
County Name	60 Day Notice	Notice of Public Hearing
Marin County	✓	✓
Sonoma County	✓	✓

10.2.2 Notice to the Public

Notification to the public and to cities and counties also provided instructions on how to view the 2015 UWMP prior to the hearing, the revision schedule, and contact information of the UWMP preparer. A copy of this notice is included in Appendix D.

10.3 Public Hearing and Adoption

The deadline for public comments was May 25, 2016, one week after the public hearing. The final plan was formally adopted by Cal Water's Vice President of Engineering on June 20, 2016, and was submitted to California Department of Water Resources within 30 days of approval. Appendix B presents a copy of the signed Resolution of Plan Adoption. Appendix C contains the following:

- Letters sent to and received from various agencies regarding this plan
- Correspondence between Cal Water and participating agencies

10.4 Plan Submittal

This UWMP was submitted to DWR within 30 days of adoption and by the July 1, 2016 deadline. The submittal was done electronically through WUEdata, an online submittal tool. The adopted Plan was also sent to the California State Library and to the cities and counties listed in Table 10-1.

10.5 Public Availability

On or about May 4, 2016, a printed hard-copy of the Draft 2015 Urban Water Management Plan and the Conservation Master Plan were made available for review during normal business hours at the Redwood Valley District's Customer Centers, located at 14034 Armstrong Woods Road, Guerneville, CA 95446, or 6125 East Highway 20,

Lucerne, CA 95458. An electronic version was also made available by visiting Cal Water's website: https://www.calwater.com/conservation/uwmp.

10.6 Amending an Adopted UWMP

If the Plan is amended, each of the steps for notification, public hearing, adoption and submittal will also be followed for the amended plan.

Appendix A: UWMP Act Checklist

Appendix B: Resolution to Adopt UWMP

Appendix C: Correspondences

Appendix D: Public Meeting Notice

Appendix E: Service Area Map

Appendix F: Projection Analysis Worksheets (PAWS)

Appendix G: Supplemental Water Supply Information

Appendix H: DWR UWMP Tables Worksheets

Appendix I: DWR SB X7-7 Verification Forms

Appendix J: Schedule 14.1 and Local Conservation Ordinances

Appendix K: Water Efficient Landscape Guidelines

Appendix L: Conservation Master Plan

Appendix M: DWR/AWWA Water Balance Worksheet