BELLA VISTA WATER DISTRICT

URBAN WATER MANAGEMENT PLAN 2020 UPDATE

June 2021

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Bella Vista Water District

June 2021

Date signed: 6-24-21

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Bella Vista Water District

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Abbreviations

AB ..... State Assembly Bill
ACID ..... Anderson-Cottonwood Irrigation District
AF ..... acre-feet
AFY ..... acre-feet per year
AMR ..... automatic meter read
ASR ..... Aquifer Storage and Recovery
AWWA ..... American Water Works Association
BMP ..... Best Management Practice
BVWD ..... Bella Vista Water District
CASGEM ..... California Statewide Groundwater Elevation Monitoring Program
CCR ..... California Code of Regulations
CDPH ..... California Department of Public Health
CII ..... Commercial, Industrial, and Institutional
CIMIS ..... California Irrigation Management Information System
CSA ..... County Service Area
CSD ..... Community Services District
CUWCC ..... California Urban Water Conservation Council
CVP ..... Central Valley Project
CVPIA ..... Central Valley Project Improvement Act
CWC ..... California Water Code
DDW ..... Division of Drinking Water
DMM ..... Demand Management Measures
DOF ..... Department of Finance
DTW ..... depth to water
DWR ..... Department of Water Resources
EC ..... electrical conductivity
EOMR ..... Extraordinary Operations, Maintenance, and Replacement
ETo ..... evapotranspiration
FWMP ..... Federal Water Management Plan
ft ..... feet
GIS ..... Geographic Information System
GMP ..... Groundwater Management Plan
GPCD ..... gallons per capita per day
IRWM ..... Integrated Regional Water Management
IRWMP ..... Integrated Regional Water Management Plan
M&I ..... municipal and industrial
MFR ..... multi-family residential
MGD ..... million gallons per day
PG&E ..... Pacific Gas & Electric
PHS ..... public health and safety
PWS ..... Public Water System
RAWC ..... Redding Area Water Council

RHNA ..... Regional Housing Needs Assessment
RWQCB ..... Regional Water Quality Control Board
SB ..... State Senate Bill
SBX7-7 ..... Water Conservation Act of 2009
SCWA ..... Shasta County Water Agency
SFR ..... single-family residential
SGMA ..... Sustainable Groundwater Management Act
SWRCB ..... State Water Resources Control Board
TCRCD ..... Tehama County Resource Conservation District
USBR ..... United States Bureau of Reclamation
UWMP ..... Urban Water Management Plan
UWMPA ..... Urban Water Management Planning Act
WEF ..... Water Education Foundation
WRR ..... Water Recycling Requirement
WSCP ..... Water Shortage Contingency Plan
WTP ..... Water Treatment Plant
WWTP ..... Wastewater Treatment Plant

Definitions of terms used throughout the report are included below[1]:

COMMERCIAL WATER USE - Water used for motels, hotels, restaurants, office buildings, other commercial facilities, and institutions.

DOMESTIC (or RESIDENTIAL) WATER USE - Water for household purposes, such as drinking, food preparation, bathing, washing clothes and dishes, flushing toilets, and watering lawns and gardens or watering of pasture for animals (e.g., horses) which are kept for personal enjoyment.

INDUSTRIAL WATER USE - Water used for industrial purposes such as fabrication, processing, washing, and cooling, and includes such industries as steel, chemical and allied products, paper and allied products, mining, and petroleum refining.

IRRIGATION WATER (aka AGRICULTURAL WATER) - Water delivered to consumers for use primarily in the commercial production of agricultural crops or livestock including domestic use incidental thereto, and watering of livestock.

MUNICIPAL AND INDUSTRIAL (M&I) WATER - Water used for domestic, commercial, industrial, and human use for purposes such as the drinking, cooking, bathing and the watering of landscaping.

Reclamation - The United States Bureau of Reclamation

[1] See 2015 Urban Water Management Plans, *Guidebook for Urban Water Suppliers*, for additional terms and definitions.

RURAL WATER SERVICE - Water service available to developed residential parcels of land which do not meet agricultural, public/institutional, or commercial service requirement, are two (2) acres or more in size and have a one-inch or larger meter.

URBAN RETAIL WATER SUPPLIER - 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.

URBAN WHOLESALE WATER SUPPLIER - a water supplier, either publicly or privately owned, that provides more than 3,000 acre-feet of potable water for municipal purposes annually at wholesale to agencies for distribution to end users.

Lay Description of Urban Water Management in the Bella Vista Water District

This 2020 Urban Water Management Plan (UWMP or Plan) has been prepared for the Bella Vista Water District in Shasta County, California. This document describes the District's water supply, water demands, water reliability, and water conservation efforts. This document provides estimated population growth and water demand through the year 2045 and serves as a long-range planning document for the District. This document is an update to the District's 2015 UWMP.

In 2020, the District had an estimated population of 18,378 and served water to 6,273 residences, businesses, schools, agricultural properties and other facilities. Currently, the District obtains their water from two sources: surface water pumped from the Sacramento River just downstream of the Turtle Bay Arboretum in Redding, and groundwater that is pumped from five wells located near the southern border of the District. In an average year surface water makes up more than ninety-five percent of the District's water supply.

In 2009 the State of California set a goal for all water agencies to reduce their water use by 20% and to achieve this goal by the year 2020. To reach this goal, the District needs to limit water use to 758 gallons per day for each person. In 2020, the District met this goal with a per person use of 546 gallons per person per day and will continue water conservation programs to keep meeting the state's goals in the future.

The District has special water conservation programs that can be implemented in the event of drought or other water supply issues. The District is also prepared to respond to a water supply interruption from an emergency. These measures are documented in an updated Water Shortage Contingency Plan, which is included in this document.

Executive Summary

This 2020 Urban Water Management Plan (UWMP) describes current and future water uses, reliability of water sources, and existing and planned water conservation measures for the Bella Vista Water District (BVWD). Water resources and demographic data are provided for the years 2016-2020, and water supplies and demands are projected through 2045. This document is an update to the District's 2015 UWMP.

This UWMP complies with the Urban Water Management Planning Act (UWMPA) established by Assembly Bill 797 (AB797), September 21, 1983. UWMPs must be prepared by any water supplier that provides water for 3,000 or more connections or delivers more than 3,000 acre-feet (AF) per year. UWMPs must be updated every five years. This UWMP satisfies new guidelines established by the State in 2021.

The District uses surface water from the Central Valley Project (CVP). They have a contract in place with the U.S. Bureau of Reclamation which provides them up to 24,578 acre-feet of water annually. They also have a long-term transfer agreement with the Anderson-Cottonwood Irrigation District. All other inter-district transfer agreements are subject to supply availability. The District's CVP water supply also faces several issues that impact long-term reliability, and, as a result, the District is seeking long-term solutions to their water supply shortages, including additional water transfers. The District may also seek to expand their groundwater use in order to supplement their water supplies.

Bella Vista Water District is a retail agency, providing water directly to customers. In 2020 they served 6,273 active residential, rural, commercial, institutional/public, and agricultural customers and provided 11,268 AF of water. Average water usage over the past 8 years has been around 9,500 acre-feet per year (AFY).

This UWMP must address requirements of the Water Conservation Act of 2009 Senate Bill x7-7 (SBX7-7). SBX7-7 requires statewide per capita water use reduction of 20 percent by the year 2020. The District's 10-year baseline per capita water use is 947 gallons/capita/day (GPCD), with goals of 853 GPCD by 2015 and 758 GPCD by 2020. The actual per capita consumption in 2020 was 546 GPCD, which is 72% of the 2020 target. The District's per capita demands are calculated using all municipal and agricultural water uses in the District.

This UWMP provides a comprehensive overview of the District's water system and supply sources. In addition to complying with the UWMPA and SBX7-7, it also serves as a short-term and long-range planning document, a data source for the development of a regional water plan, a source document for preparing General Plans, and a key component to an Integrated Regional Water Management Plan. The UWMP also allows the District to maintain eligibility for certain State grants and loans.

1 Introduction and Overview

1.1 Overview

This document presents the 2020 Urban Water Management Plan (Plan or UWMP) for the Bella Vista Water District (BVWD or District) service area. This chapter describes the general purpose of the Plan and background information on UWMP requirements and changes. This Plan satisfies requirements for retail UWMP and covers the years 2016 to 2020. It is an update to the 2015 UWMP submitted by the District in 2016.

The California Water Code (CWC)§10644(a) requires urban water suppliers to file with the Department of Water Resources (DWR), the California State Library, and any city or county within which the supplier provides water, a copy of its Urban Water Management Plan. UWMP's are to be prepared every five years by urban retail water suppliers, either publicly or privately owned, that directly provide potable municipal water to more than 3,000 end users or supply more than 3,000 acre-feet of potable water annually, at retail, for municipal purposes.

1.2 Purpose

The UWMP is a planning tool that generally guides the actions of water suppliers. It provides managers and the public with a broad perspective on a number of water supply issues. It is not a substitute for project-specific planning documents, nor was it intended to be, when mandated by the State Legislature. For example, the Legislature mandated that a plan include a section which "describes the opportunities for exchanges or water transfers on a short-term or long-term basis." (California Urban Water Management Planning Act, Article 2, Section 10630(d).) The identification of such opportunities, and the inclusion of those opportunities in a general water service reliability analysis, neither commits a water supplier to pursue a particular water exchange/transfer opportunity, nor precludes a water supplier from exploring exchange/transfer opportunities not identified in the Plan. When specific projects are chosen to be implemented, detailed project plans are developed, an environmental analysis, if required, is prepared, and financial and operational plans are detailed.

In short, this Plan is a management tool, providing a framework for action, but not functioning as a detailed project development for action. Water management in California is not a matter of certainty; and planning projections may change in response to a number of factors.

The California Urban Water Management Planning Act (UWMPA or Act) requires preparation of a plan that:

- Accomplishes water supply planning over a 20-year period in five-year increments with an option to include an additional five years.
- Identifies and quantifies adequate water supplies for existing and future demands, in normal, single-dry, and multiple-dry years.

- Implements conservation and efficient use of urban water supplies.

The UWMP is a requirement of the state in an effort to assist resource planning and to ensure adequate water supplies are available for future use. It is also required to qualify for certain state grants, loans, and drought assistance.

The purpose of this UWMP is to serve as a baseline document and source of information for DWR, and to serve the District as:

- A short- and long-range planning document for water supply;
- A data source for the development of a regional water supply plan;
- A source document for cities and counties, within which the District provides water, in preparing their General Plans; and
- A key component of an Integrated Regional Water Management Plan (IRWMP).

A secondary purpose of the UWMP is to provide for a plan or series of plans during water drought situations.

1.3 Background

1.3.1 Urban Water Management Planning Act (UWMPA)

In 1983, State Senate Bill (SB) 797 altered Division 6 of the CWC by establishing the UWMPA. The UWMP is a requirement of the UWMPA (Division 6, Part 2.6 of the CWC §10610-10656). The UWMPs must be updated every five years and submitted to the Department of Water Resources. Every entity that becomes an urban water supplier shall adopt an UWMP within one year after it has become an urban water supplier. The submittal must meet all requirements of the Act, including the most current amendments. The Act applies to urban water suppliers with 3,000 or more service connections or those delivering more than 3,000 acre-feet (AF) of potable water annually at retail for municipal purposes. As of the end of 2020, the District had 6,273 active water connections and produced 11,268 AF of water (8,029 AF for municipal purposes). Because Bella Vista Water District fulfills both of these parameters it is required to prepare an UWMP. UWMP requirements differ for retail and wholesale water agencies; BVWD is a retail water agency because it supplies water directly to end users. This UWMP satisfies the retail agency requirements.

1.3.2 Amendments to UWMPA

Since 1983, several amendments to the original document have increased the requirements of UWMPs. One such amendment required projections for water use to extend 20 years at 5-year intervals. Recently, this has been increased to an optional 25-year projection, which provides for the typical minimum 20-year projections required by many planning documents up until the subsequent UWMP is completed. This plan includes water projections for 25 years, up until the year 2045.

Various other amendments have increased requirements to include sections on recycled water use, demand management measures (DMMs), and water shortage contingency plans (WSCP). Recycled water use sections were added to assist in evaluation of alternate water supplies for future use when projections exceed the existing water supplies. Demand management measures must be clearly described including which measures are being implemented and which are scheduled for future implementation. Water shortage contingency plans are to be prepared and coordinated with other water suppliers in the area for use during droughts. Pertinent bills that have passed are noted in **Table 1-1** below.

Table 1-1: Changes to the Water Code

Bill	Requirements
SB 610 and AB 901	Consideration of water availability when reviewing new large developments
SB 318	Investigate possibilities of developing desalinated water
AB 105	Submit UWMP to State Library
Water Conservation Bill (2009) SB x7-7	Urban water suppliers to reduce the statewide average per capita daily water consumption by 20% by December 31, 2020
AB 2067	Revises requirements on Demand Management Measures
SB 1420	Requires electronic submittal, standard forms and tables, and a report on distribution system losses
SB 1036	Urban suppliers to include energy-related information (optional) and analyze and define artificial water features
AB 1465	Requires water suppliers to identify and describe opportunities to utilize recycled water and storm water
SB 1087	Require suppliers to report single-family and multi-family residential water projections for low-income households separately
SB 606	Requires the SWRCB and the DWR to adopt water efficiency regulations, outlines requirements for urban water suppliers, and specifies penalties for violations. The bill also requires annual calculation of the urban water use objective and annual reporting of the previous year's water use that is consistent with the urban water use objective, This bill added several new requirements including, changes to the stages required by the Water Shortage Contingency Plan from four to six, preparation of a drought risk assessment to be included in the UWMP, and addition of a Lay Description to the UWMP.

1.3.3 Previous Urban Water Management Plan

The Bella Vista Water District's 2015 UWMP was adopted by the Board of Directors on April 27, 2015, by Resolution 15-06. Following adoption, the 2015 UWMP was submitted to DWR. A

copy of the 2010 UWMP resides in the State Library. This 2020 UWMP serves to update the existing 2015 UWMP and complies with all new requirements and regulations.

Additionally, the District prepared a 2016 Federal Water Management Plan (FWMP), dated July 1, 2015, for the United States Bureau of Reclamation (USBR). A "Notice of Availability" for the District's FWMP was published in the Federal Register on November 27, 2015. The FWMP contains components similar to the UWMP and is referenced in this document. Updates to the FWMP are required every five years under the Central Valley Project Improvement Act of 1992 and Section 201(b) of the Reclamation Reform Act of 1982. The FWMP is also being updated for the District in 2020.

1.3.4 Other Planning Documents in Relation to UWMP

The Bella Vista Water District used information from several existing planning documents and reports to aid in the preparation of the UWMP. These documents are listed below:

- BVWD Drought Contingency Plan - 2020
- 2015 Bella Vista Federal Water Management Plan
- Central Valley Project Municipal and Industrial Water Shortage Policy Guidelines and Procedures - effective date: February 1, 2017
- BVWD's Policy for Water Services for Affordable Housing
- Regional Housing Need Determination and Plan for the Fifth Housing Element Update
- 2020 Urban Water Management Plans Guidebook for Urban Water Suppliers

1.3.5 UWMP Tables

As a requirement of the UWMP, the Department of Water Resources has developed standardized tables to assist water managers in calculating per capita consumption, baseline consumption, and water reduction targets. These tables are a required attachment to the UWMP document. However, they are not required in the body of the text and can be altered as needed to better reflect the water system. It should be noted that the tables in the body of this document are not identical to the tables provided in the attachments required by DWR; some have been modified to better reflect conditions in the District. As a result, titles and substance may vary. Standardized Tables required by DWR are located in

Appendix E and SBX 7-7 Tables are located in Appendix F.

1.3.6 UWMP Organization

This 2020 UWMP is organized into the following chapters.

- Chapter 1: Introduction and Overview

  This chapter provides a discussion of the purpose and content of the 2020 UWMP and the extent of the District's water management planning efforts.

- Chapter 2: Plan Preparation

  This chapter provides information on the District's development of the 2020 UWMP including the basis for plan preparation, UWMP characteristics, data format and coordination and outreach to nearby agencies. This chapter also details the steps taken by the District to adopt the UWMP and make it available to the public.

- Chapter 3: District Description

  This chapter provides a description of the District's water system including service area maps, climate information and service population and demographic information.

- Chapter 4: System Water Use Characterization

  This chapter describes the District's current and historic water uses, system losses, estimated water savings, and water use by lower income households.

- Chapter 5: Baselines and Targets

  This chapter includes a description of the District's chosen method for calculating their baseline, calculated baseline water use, 2015 interim and 2020 ultimate targets, and compliance with 2020 target.

- Chapter 6: System Water Supply Characterization

  This chapter includes a discussion of the District's water system supplies including groundwater and surface water, energy consumption, the District's future water projects, and a summary of existing and future water sources.

- Chapter 7: Water Supply Reliability and Drought Risk Assessment

  This chapter describes the reliability of the District's water supply including a supply and demand assessment and regional reliability and drought risk assessment.

- Chapter 8: Water Shortage Contingency Planning

  This chapter provides a description of the District's Water Shortage Contingency Plan including stages of action, prohibitions, penalties, reduction methods, and catastrophic supply interruption.

- Chapter 9: Demand Management Measures

This chapter explains the District's existing and historic efforts to promote water conservation and the District's plans to use Demand Management Measures to maintain their 2020 water use targets.

- Chapter 10: Completed UWMP Checklist

  Detailed UWMP checklist showing where each required topic is addressed in the UWMP.

- Chapter 11: Bibliography/References

  List of relevant reports, studies, references, and data sources used in preparing the UWMP.

2 Plan Preparation

2.1 Plan Characteristics

The Bella Vista Water District manages and operates the Bella Vista Public Water System (PWS), as defined by the California Health and Safety Code. The PWS number and the number of connections and water delivered in 2020 are shown in the table below. As of December 31, 2020, the District had a total of 6,273 active connections and 147 that were inactive. The number of active connections includes 172 agricultural customer connections.

The Bella Vista Water District provides water to a diverse range of water users, including urban, rural, commercial, institutional, and agricultural customers. All water delivered by the District to its customers is treated to the same standards, regardless of whether the water is used for domestic or agricultural purposes. Therefore, this UWMP includes water used for agricultural purposes in all calculations and projections. Agricultural water use is permitted in calculations for gross water use in UWMPs, pursuant to CWC Section 10608.24(f)(1). Data in this UWMP is presented in acre-feet (AF) for each calendar year.

Table 2-1: Public Water Systems

Public Water System Number	Public Water System Name	Number of Municipal Connections 2020	Volume of Water Produced 2020
4510014	Bella Vista Water District	6,273	11,268

An individual UWMP was prepared for the District despite close proximity to the City of Redding, City of Shasta Lake, and Mountain Gate Community Service District (CSD). Since the Bella Vista Water District owns and operates an independent water system, an individual UWMP was considered a logical choice. However, BVWD coordinates regularly with surrounding communities, water suppliers, and irrigation districts, to actively assist in meeting the goals and objectives of local and regional efforts.

Table 2-2: Plan Identification

Type of Plan	
☑	**Individual UWMP**
No	Water Supplier is also a member of a RUWMP
No	Water Supplier is also a member of a Regional Alliance
No	Regional Urban Water Management Plan (RUWMP)

BVWD directly delivers water to customers and is therefore considered a retail water agency. As stated previously, data in this UWMP is presented in acre-feet for each calendar year, unless otherwise noted, which is consistent with the previous UWMP and the District's standard reporting procedures. It should be noted that water suppliers maintain water years which vary between agencies. Normally, the water year for Reclamation begins on March 1 and ends at midnight on the last day of February the following year. ACID starts their water year in April and ends it in March of the following year. The U.S. Geological Survey defines their "water year" as the 12-month period from October 1, of any given year, through September 30 of the following year. For reporting purposes, BVWD keeps records in a variety of formats including calendar year, Reclamation water year, and fiscal year (July 1 through June 30).

Table 2-3: Supplier Identification

Name of Supplier	Bella Vista Water 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 used in UWMP	
Unit	Acre-feet (AF)

2.2 Coordination

Legal Requirements:

CWC 10620(d)(2) Each urban water supplier shall coordinate the preparation of its plan with other appropriate agencies in the area, including other water suppliers that share a common source, water management agencies, and relevant public agencies, to the extent practicable.

CWC 10621(b) Every urban water supplier required to prepare a plan pursuant to this part shall, at least 60 days prior to the public hearing on the plan required by CWC 10642, notify any city or county within which the supplier provides water supplies that the urban water supplier will be reviewing the plan and considering amendments or changes to the plan. The urban water supplier may consult with, and obtain comments from, any District or county that receives notice pursuant to this subdivision.

CWC 10635(b) The urban water supplier shall provide that portion of its urban water management plan prepared pursuant to this article to any city or county within which it provides water supplies no later than 60 days After the submission of its urban water management plan.

The public, the local government, and adjacent water agency authorities were encouraged to participate in the planning and drafting of the 2020 UWMP. BVWD resides partially within the City of Redding and entirely in the County of Shasta, which they coordinate with regularly in

regard to planning and development. BVWD sent out 60-day notices on March 9, 2021, to the County of Shasta, the City of Redding, Mountain Gate CSD, City of Shasta Lake, and the Anderson-Cottonwood Irrigation District (ACID). **Table 2-4**, Coordination with Appropriate Agencies, gives a complete list of coordination actions.

Public outreach has been conducted using multiple mediums. The Bella Vista Water District website[2] contains notices about the drafting of the UWMP as well as other upcoming projects. Interested parties were sent a Notice of Public Hearing and a link to an electronic draft copy of the Final Draft UWMP. A downloadable copy was made available on the BVWD website, and a hard copy was available for review at the District's office. A public notice was published in the local newspaper to establish intent to adopt the 2020 UWMP. There were no public comments on the draft UWMP. The Final 2020 UWMP was adopted on June 21, 2021.

Refer to Appendix B for copies of outreach and coordination documentation.

Table 2-4: Coordination with Appropriate Agencies

Coordinating Agencies	Was sent Notice of Intent to Develop UWMP	Participated in Developing the Plan	Commented on the Draft	Was Sent a Link to the Draft Plan	Was Sent a Notice of Intention to Adopt	Wholesale Agency contacted by Retail Agency
Bella Vista Water District – Staff and Board		X				
Mountain Gate Community Services District	X			X	X	
Anderson-Cottonwood Irrigation District (ACID)	X			X	X	X
City of Shasta Lake	X			X	X	
City of Redding	X			X	X	
Department of Water Resources (DWR)						
United States Bureau of Reclamation (USBR)	X			X	X	X
County of Shasta (Public Works Department)	X			X	X	
General Public				X	X	
(Website and Publication/Posting)	X			X	X	

[2] http://www.bvwd.org/current-projects

2.3 Plan Adoption, Submittal, and Implementation

2.3.1 Notice of Public Hearing

Legal Requirements:

CWC 10621
(b)Every urban water supplier required to prepare a plan… shall, at least 60 days prior to the public hearing on the plan … notify any District or county within which the supplier provides waters supplies that the urban water supplier will be reviewing the plan and considering amendments or changes to the plan.

CWC 10642
The urban water supplier shall provide notice of the time and place of hearing to any city or county within which the supplier provides water supplies.

Prior to the public hearing, held on June 21, 2021, a notice was published in the local newspaper, the Redding Record Searchlight, on June 7, 2021, and June 14, 2021, informing the public of the pending hearing located at the Bella Vista Water District Office on 11368 E. Stillwater Way, Redding, CA at 5:30 PM.

Additional notice was given to the County of Shasta, nearby cities, and other agencies regarding the development, Public Hearing, and availability of UWMP Plan documents. See **Table 2-4** for further information on coordination efforts. Refer to **Appendix C** for copies of public hearing announcements.

Table 2-5: Notification to Cities and Counties

Names of Cities and Counties	60 Day Notice (CWC 10621 (b))	Notice of Public Hearing (CWC 10642)
City of Shasta Lake	☒	☒
City of Redding	☒	☒
County of Shasta	☒	☒

2.3.2 Public Hearing and Adoption

Legal Requirements:

CWC 10642
Prior to adopting a plan, the urban water supplier …shall hold a public hearing thereon.

CWC 10608.26
(a) In complying with this part, an urban retail water supplier shall conduct at least one public hearing to accomplish all of the following:
(1) Allow community input regarding the urban retail water supplier's implementation plan for complying with this part.
(2) Consider the economic impacts of the urban retail water supplier's implementation plan for complying with this part.
(3) Adopt a method, pursuant to subdivision (b) of Section 10608.20 for determining its urban water use target.

CWC 10642
After the hearing or hearings, the plan or water shortage contingency plan shall be adopted as prepared or as modified after the hearing or hearings.

The District held a public hearing and adopted the 2020 UWMP on June 21, 2021. A copy of the adoption resolution is included in **Appendix A**. Prior to the public hearing, a notice was published in the local newspaper, the Redding Record Searchlight, on June 7, 2021 and June 14, 2021, informing the public of the pending hearing.

2.3.3 Plan Submittal

Legal Requirements:

CWC 10621
(f) Each urban water supplier shall update and submit its 2020 plan to the department by July 1, 2021.

CWC 10644
(a)An urban water supplier shall submit to the department, the California State Library, and any city or county within which the supplier provides water supplies a copy of its plan no later than 30 days after adoption.

CWC 10635
(b)The urban water supplier shall provide that portion of its urban water management plan prepared pursuant to this article to any city or county within which it provides water supplies no later than 60 days after the submission of its urban water management plan.

The UWMP was adopted on June 21, 2021. It was submitted to DWR on July 1, 2021 and subsequently submitted to the California State Library, City of Redding, City of Shasta Lake, and Shasta County. Access to the BVWD UWMP was made available to the municipalities and districts electronically as described in **Table 2-4**. Verification of submittals and document access to districts and the public is available for review in **Appendix P**.

2.3.4 Public Availability

Legal Requirements:

CWC 10645
(a)Not later than 30 days after filing a copy of its plan with the department, the urban water supplier and the department shall make the plan available for public review during normal business hours.

Access to the Urban Water Management Plan is available online at the Bella Vista Water District website bvwd.org and a paper copy is available in the District office during business hours located at 11368 East Stillwater Way, Redding, CA 96003.

3 District Description

Bella Vista Water District (District or BVWD) is a California Water District pursuant to Division 13 of the California Water Code, operating under the governance of an elected Board of Directors. The District supplies agricultural, municipal, commercial, and institutional/public water to individual customers within the District, and owns and operates a surface water treatment plant, water storage tanks, and portions of the distribution system. The United States Bureau of Reclamation (USBR) owns the Wintu Pump Station, Surge Tank, 4MG Tank, Regulating Station, and the main aqueduct and laterals that were constructed as the Cow Creek Unit of the Trinity River Division of the Central Valley Project (CVP). The District water system is supplied primarily from the Sacramento River, with ten pump stations, five water storage tanks, and five groundwater wells serving ten pressure zones.

3.1 Service Area and Climate Description

Legal Requirements:

CWC 10631(a) Describe the service area of the supplier.
CWC 10631(a) (Describe the service area) climate.

3.1.1 Location

The Bella Vista Water District is located in western Shasta County (County). Approximately one-third of the District is located within the northeastern portion of the City of Redding and serves a number of their residents. The District encompasses approximately 34,360 acres (54 square miles) generally extending from Churn Creek Road on the west, the community of Palo Cedro on the southeast, the community of Mountain Gate on the northwest, and Salt Creek at Highway 299 on the northeast (see **Figure 3-1**).

The BVWD is situated in the northern end of the Sacramento Valley on generally level to slightly undulating terrain. The main streams, Cow Creek, Dry Creek, Stillwater Creek, Clough Creek, and Churn Creek drain in a southerly direction. The topography is characterized by a series of alternate, narrow stream valleys and relatively smooth terraces. The northern portion of the area has uneven terrain. The wooded, rolling hills in the north gradually give way to gently sloping treeless plains to the south. To the east of these plains, Cow Creek has entrenched, forming a long, narrow valley some 100 feet below the surface of the plains. East of Cow Creek, the plateau continues at about the same elevation. Elevations in the District range from approximately 430 feet in the southeast (Cow Creek) to 760 feet above sea level in the north (Bear Creek Road).

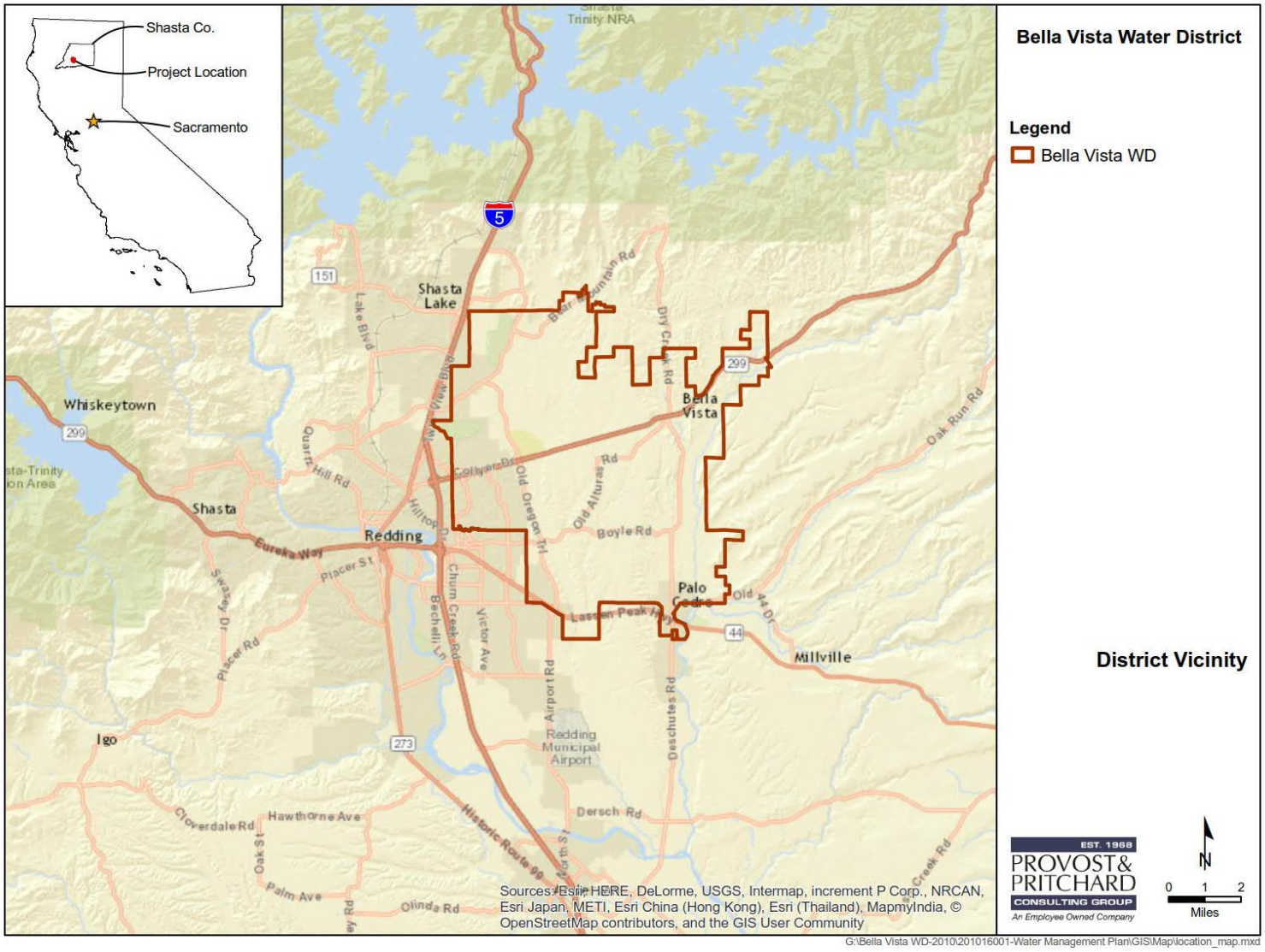


Figure 3-1: District Vicinity Map

3.1.2 Facility Description

BVWD was formed on June 4, 1957, to provide agricultural and domestic water to the area northeast of the City of Redding. The District's water supply comes from two main sources, the Sacramento River (under a water service contract with the United States Bureau of Reclamation) and five deep groundwater wells located along the southern boundary of the District that draw from the Enterprise Sub-Basin of the Redding Groundwater Basin. The District also purchases surface water from other water agencies when necessary. **Figure 3-2** shows the District water service area. and the main water transmission system components (pipelines, pump stations, wells, and water tanks). The water system consists of five water storage tanks, ten pumping plants, the main treatment plant, five wells, and over 200 miles of pipeline from 4-inch to 54-inch in diameter. All of the water is pumped at least once, and much of it is pumped through at least two pumping stations.

BVWD utilizes a pressurized pipeline distribution system with variable speed pumps and pressure/regulation tanks to provide water at service points with varying elevations. The District currently has ten pressure zones. Refer to **Figure 3-3** for a map of pressure zones.

Surface water is pumped from the Sacramento River at the Wintu Pumping Plant, which is outside of the District boundary on the north side of the river below Hilltop Drive. From the Wintu Pumping Plant water is sent to a surge tank at Hilltop Drive and then to the Water Treatment Plant (WTP) located on Canby Road northeast of the Mount Shasta Mall. River water is first treated with chlorine at the Wintu Pumping Plant and then filtered at the WTP utilizing in-line pressure filters. Polymer is used at the WTP to aid the filtration process.

All water delivered by BVWD to its customers is treated to the same standards, regardless of whether the water is used for domestic or agricultural purposes. The District currently operates under Domestic Water Supply Permit No. 01-02-08(P)002 through the California Division of Drinking Water (DDW), formerly California Department of Public Health (CDPH). Treatment of groundwater at the District's five wells consists of oxidation of iron and manganese using chlorine, followed by absorption of the iron and manganese oxides in pressure filters.

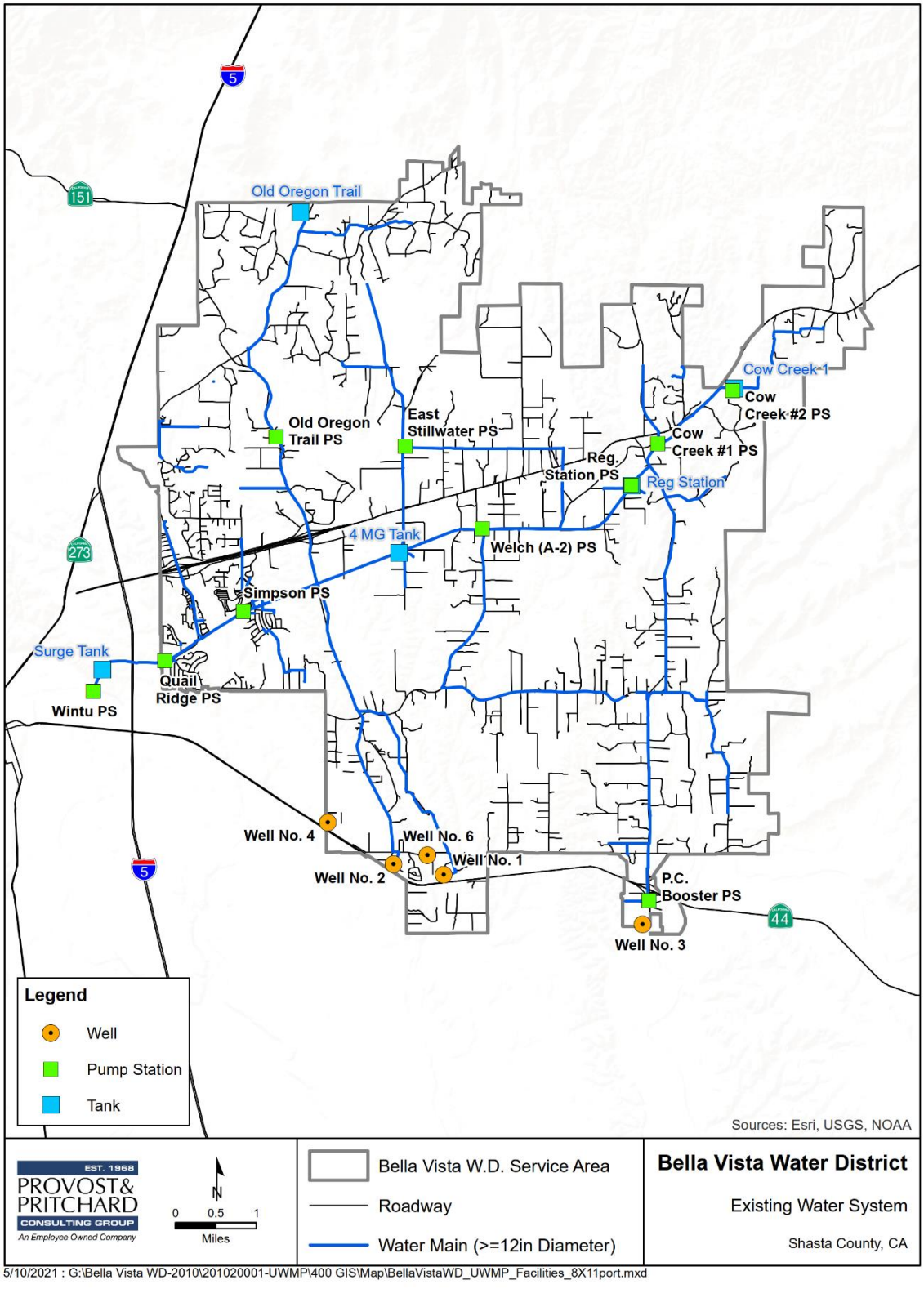


Figure 3-2: Existing Water System

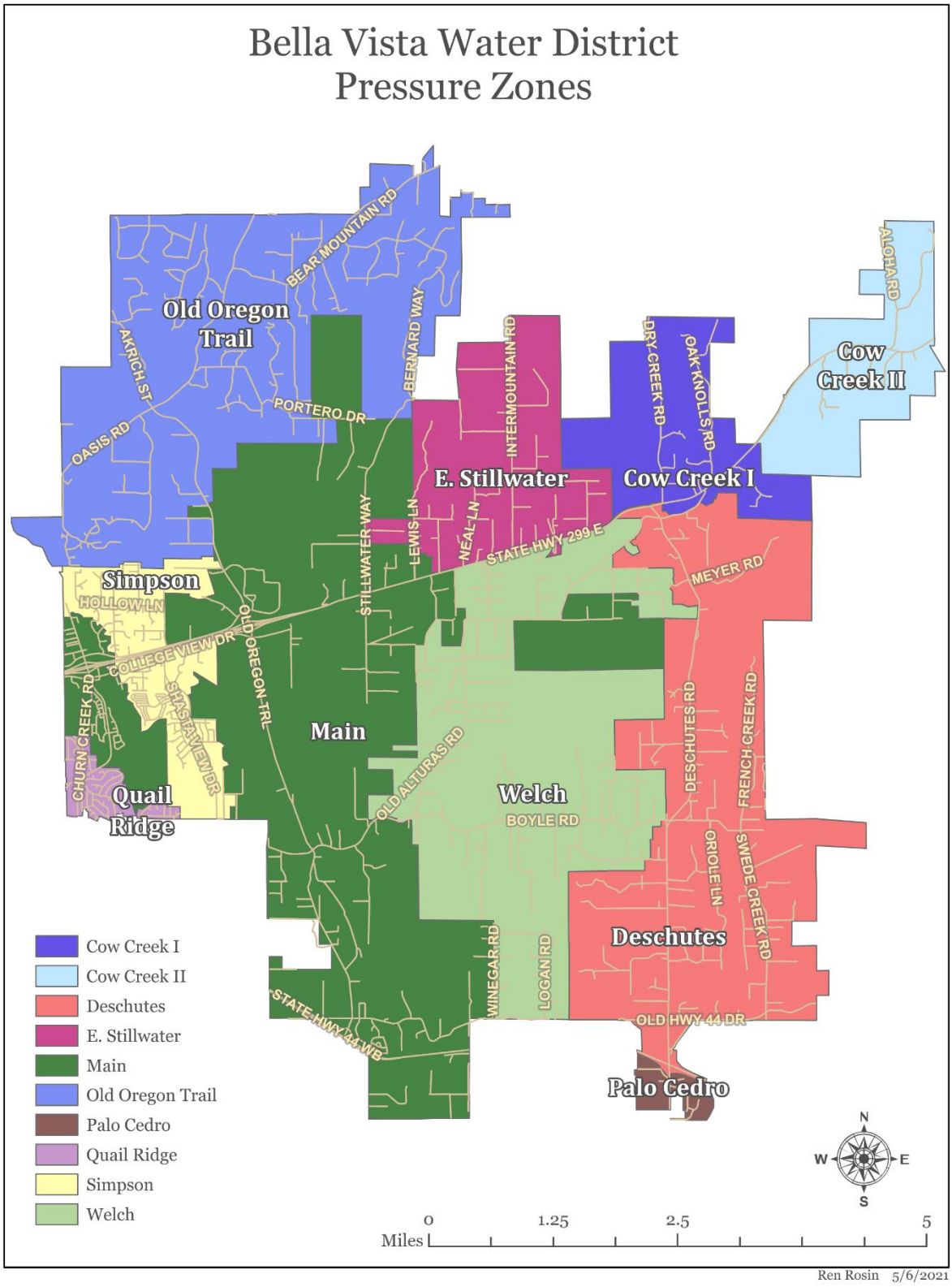


Figure 3-3: Existing Pressure Zones

3.1.3 Land Use

Interstate 5 (I-5), California State Highway 299 and California State Highway 44 serve as the primary transportation corridors in the County connecting the District to other communities, jobs, and services. As such, the areas along the highway corridors are anticipated to experience the most growth in the future. A portion of the City of Redding, which lies within the District boundary near I-5 has seen steady growth during the past 30 years.

The District provides water for multi-family, single-family, and rural residential homes. They also provide water to public institutions such as Shasta-Tehama-Trinity Joint Community College (Shasta College) and Simpson University, and several public and private schools. In addition to residential, rural, commercial, and public institutional customers, the District serves water to agricultural customers. The water is used for growing strawberries, grapes, fruit and nut trees, alfalfa, pasture, and vegetables.

As the City of Redding expands into the District, and formerly rural land is converted to denser residential use, additional water demand and service connections are anticipated. Rural parcels outside of the City of Redding limits and within the unincorporated areas of Shasta County will likely continue to be divided into smaller lots but will remain zoned rural residential, which also will create increased demand and require new connections. No growth in agricultural land is expected. Due to economic factors associated with agriculture (soils, climate, water supply reliability, etc.) and land values due to urban proximity and development pressure, some agricultural land may be developed to rural residential land uses. **Figure 3-4** and **Table 3-1** provide land use data for the District.

Two future projects that will impact water use are described below:

3.1.3.1 Bethel Campus

The project is a proposed 208,192 square-foot facility that will include a chapel, childcare center/nursery, school facility, cafeteria, bookstore, auditorium, and other office and special use rooms. The project will sit on approximately 40 acres. The facility will be used daily by approximately 3,000 students and 92 employees. Weekend use will vary with regard to special events and Sunday services. However, the auditorium facility is proposed to seat up to 2,600 people, and the project will have 1,592 parking spaces. The project is proposing 6.1 acres of landscaped area and a 2.2-acre stormwater detention pond. In July 2016, Tully and Young prepared a Draft Water Supply Evaluation Memo and estimated that demands would be approximately 90–100 AF/year at full build out.

3.1.3.2 Tierra Robles

Tierra Robles is a planned development that would reside entirely within BVWD between Deschutes Road to the east, Old Alturas Road to the west and north, and Boyle Road to the south. It is proposed to include 166 residential parcels ranging from 1.5 to 7.5 acres and an additional four open space parcels totaling 175.4 acres for a total of 715.4 acres. Water use estimates use calculations ranging from 0.71 AFY/home to 5.66 AFY/home assuming outdoor water irrigation ranging from 0.25 acres to 2 acres. In late 2020, the Shasta County Department of Resource

Management published a "Notice of Availability of a Partial Recirculated Draft Environmental Impact Report" for the proposed project.

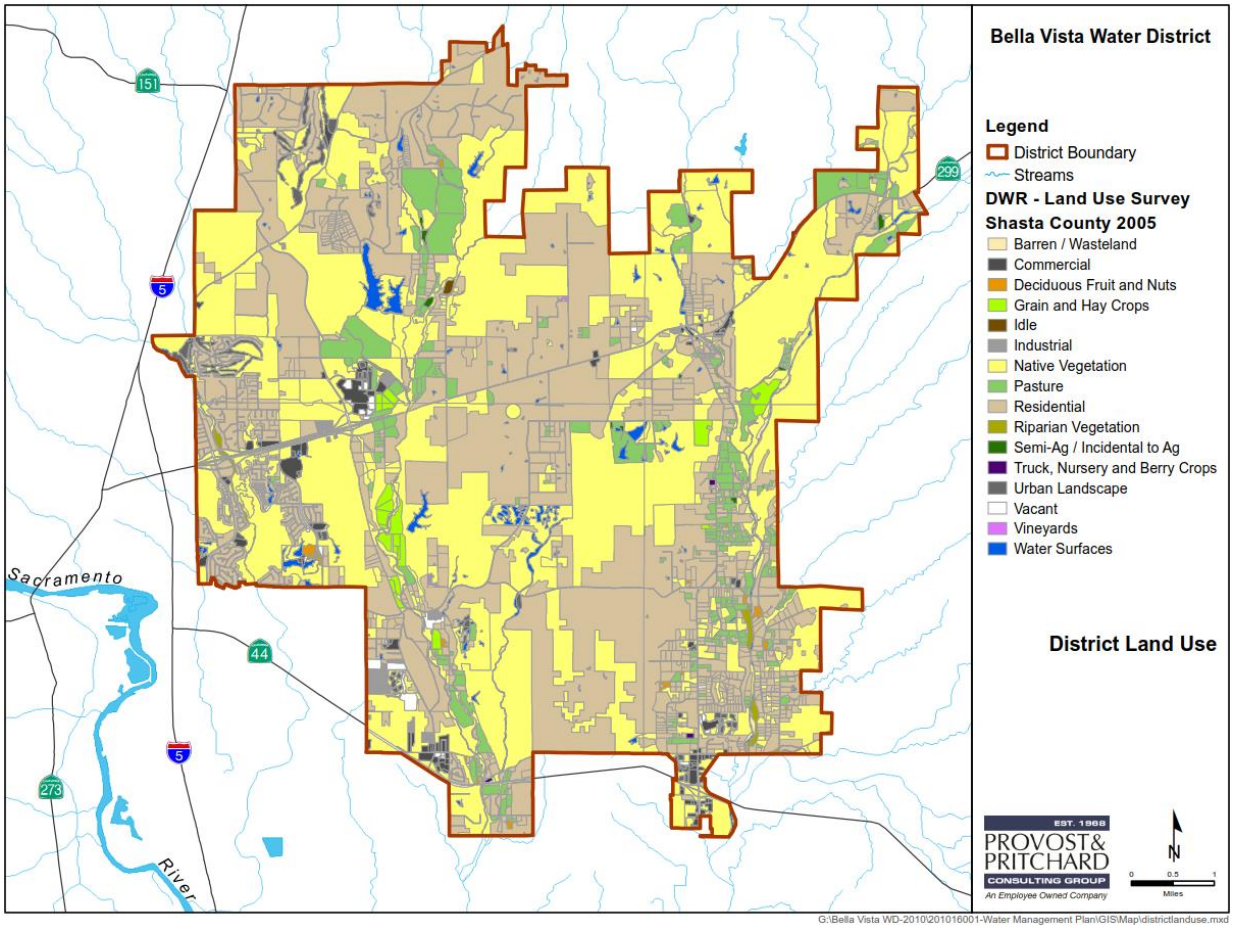


Figure 3-4: District Land Use Map

Table 3-1: Land Use Categories

Land use	Area (acres)	Percent of Total (%)
Residential/Rural	14,836	43.2%
Agricultural	2,364	6.8%
Institutional	130	0.4%
Commercial	404	1.1%
Open Space[1]	16,653	48.5%
Total	34,298	100.0%

Source: DWR Land Use Survey for Shasta County – 2005
1 - Open Space is land that is not intensively developed for residential, commercial, industrial, agricultural, or institutional use.

3.1.4 Climate

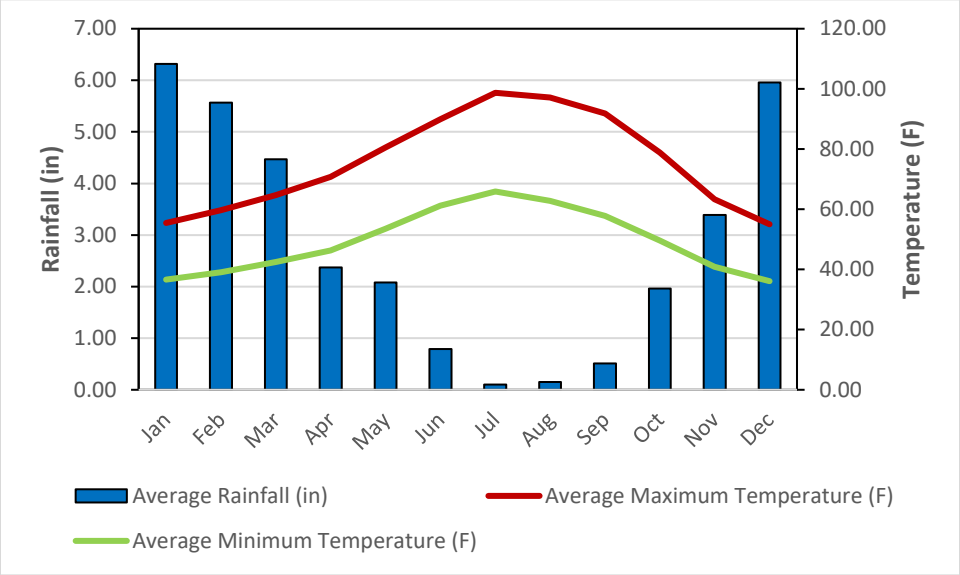
The District's climate is characterized by hot dry summers and mild winters with an average annual rainfall of approximately 33.10 inches over the last 34 years. The amount of precipitation varies considerably from year to year (**Table 3-2**). It should be noted that BVWD covers a large area and climate can be variant across the District especially when considering nearby water bodies and local topography. BVWD is less than five miles south of Shasta Lake and the southernmost portion of the Shasta-Trinity National Forest. Geographical differences along the northern boundary of the District may cause cooler temperatures and increased precipitation not reflected in climate data.

Table 3-2: Historic Annual Rainfall

1987 - 2003		2004 - 2020	
Year	**Rainfall (in)**	**Year**	**Rainfall (in)**
1987	32.43	2004	35.77
1988	30.83	2005	39.3
1989	29.58	2006	36.93
1990	24.76	2007	21.75
1991	25.52	2008	21.7
1992	37.74	2009	23.06
1993	43.86	2010	39.71
1994	25.67	2011	26.62
1995	57.59	2012	36.44
1996	41.03	2013	12.79
1997	31.99	2014	33.96
1998	61.59	2015	20.25
1999	24.3	2016	49.37
2000	36.69	2017	34.71
2001	37.34	2018	25.43
2002	28.09	2019	43.05
2003	37.71	2020	17.86
Average Annual Precipitation		**33.10**	

Source: Rainfall data from NOAA COOP 047304 Redding Municipal Airport

Precipitation is largely confined to the late fall, winter, and early spring months. Water consumption during the summer months is typically much greater than winter months due to high temperatures and low amounts of rainfall. **Figure 3-5** presents the relationship between precipitation and temperature showing both average maximum and minimum temperatures.



Temperature and Rainfall data from NOAA COOP 047304 Redding Municipal Airport

Figure 3-5: Temperature and Precipitation for Redding

Evapotranspiration (ETo) values, which serve as indicators of how much water is required to maintain healthy agriculture and landscaping, range from 1.75 inches during January to 8.37 inches in July. Evapotranspiration is the sum of water losses from a watershed because of the processes of evaporation from the earth's surface and transpiration from plant materials. Temperature, rainfall, and ETo averages for the District are presented in **Table 3-3**.

Table 3-3: Climate Characteristics

Month	Standard Monthly Average ETo (inches)	Monthly Average Rainfall (inches)	Monthly Average Temperature (ºF)	
			Min.	Max.
January	1.75	6.32	37	55
February	1.78	5.57	39	60
March	3.02	4.47	43	65
April	4.89	2.37	46	71
May	6.88	2.08	54	81
June	8.34	.79	61	90
July	8.37	0.10	66	99
August	7.24	0.15	63	97
September	5.34	.51	58	92
October	3.66	1.96	50	79
November	1.86	3.39	41	63
December	1.05	5.96	36	55
Annual Total/Average	**54.2**	**33.7[1]**	**49**	**76**

1-Total rainfall based on monthly averages varies from actual historic average (**Table 3-2**)
Source: ETo data from CIMIS, Station ID 224, Shasta College
Temperature and Rainfall data from NOAA COOP 047304 Redding Municipal Airport

3.2 Service Area Population and Demographics

Legal Requirements:

CWC 10631 (a)
Describe the service area of the supplier, including current and projected population… The projected population estimates shall be based upon data from the state, regional, or local service agency population projections within the service area of the urban water supplier and shall be in five-year increments to 20 years or as far as data is available.

This section summarizes historical, current, and projected population trends in the District and the methods used to calculate them. Population projections are essential to the planning process and form the basis for most planning decisions, yet projecting future growth is far from an exact science given the complex set of variables that can affect the rate of growth. Typically, projections are developed by taking past patterns and combining them with assumptions regarding the future to obtain an estimate of future growth rates. Additionally, Bella Vista Water District is not a census designated place so estimating populations even during census years presents its own complexities.

In the 2010 Bella Vista Water District UWMP, Carollo Engineers used the alternative method for calculating service area population for census years, found in Appendix A of the Methodologies for Calculating Baseline and Compliance per Capita Urban Water Use (October 1, 2010).

3.2.1 Census Data Calculations

For the 2010 UWMP, a map of the year 2000 service boundary was used and the census blocks that cover the District were identified. Several census blocks straddled the service area boundary. In cases where the blocks had 50 percent or more of the block inside the service area boundary the entire block was included. Likewise, if 50 percent or more of the block was outside of the service area boundary it was not included. **Figure 3-6** presents a map of the census blocks used for analysis with the 2000 service area boundary.

The census blocks identified fell into six block groups and then into several census tracts. The blocks, block groups, and census tracts were used to link the selected blocks with their corresponding population data. The total population, group quarters population by group quarter type, and the total population in occupied housing units by tenure by units in structure were downloaded off the census website and used to estimate the year 2000 population data. The estimated year 2000 population was 15,459 (refer to **Figure 3-6).**

The same process for determining population was applied to the census data for 1990 and 2010. **Figure 3-7** presents a map of the census blocks used for analysis with the 2010 service area boundary. Using the 2010 service area boundary the 2010 population was determined to be 17,619. Using the 1990 service area boundary the 1990 population was determined to be 10,149.

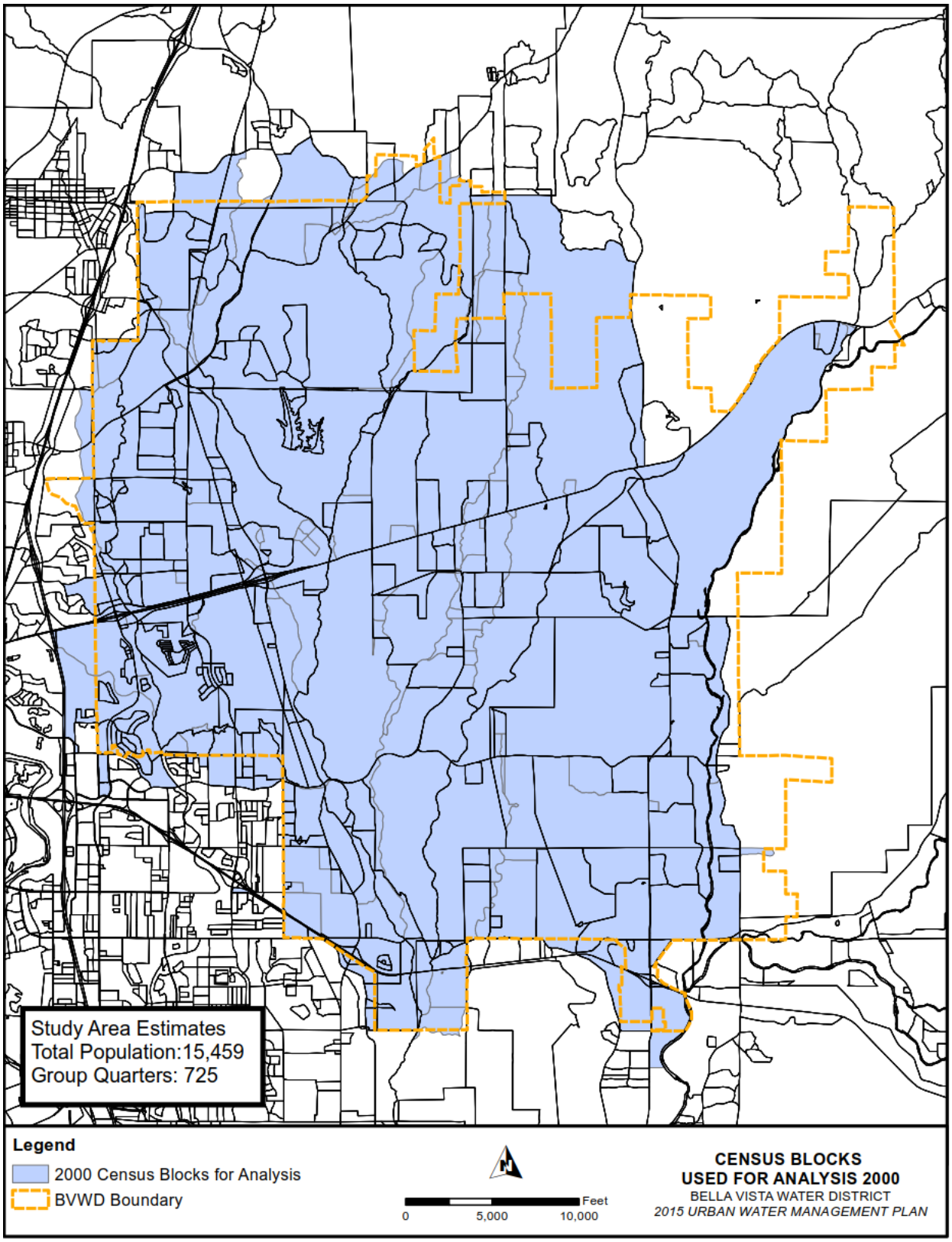


Figure 3-6: Census Block Map - Year 2000

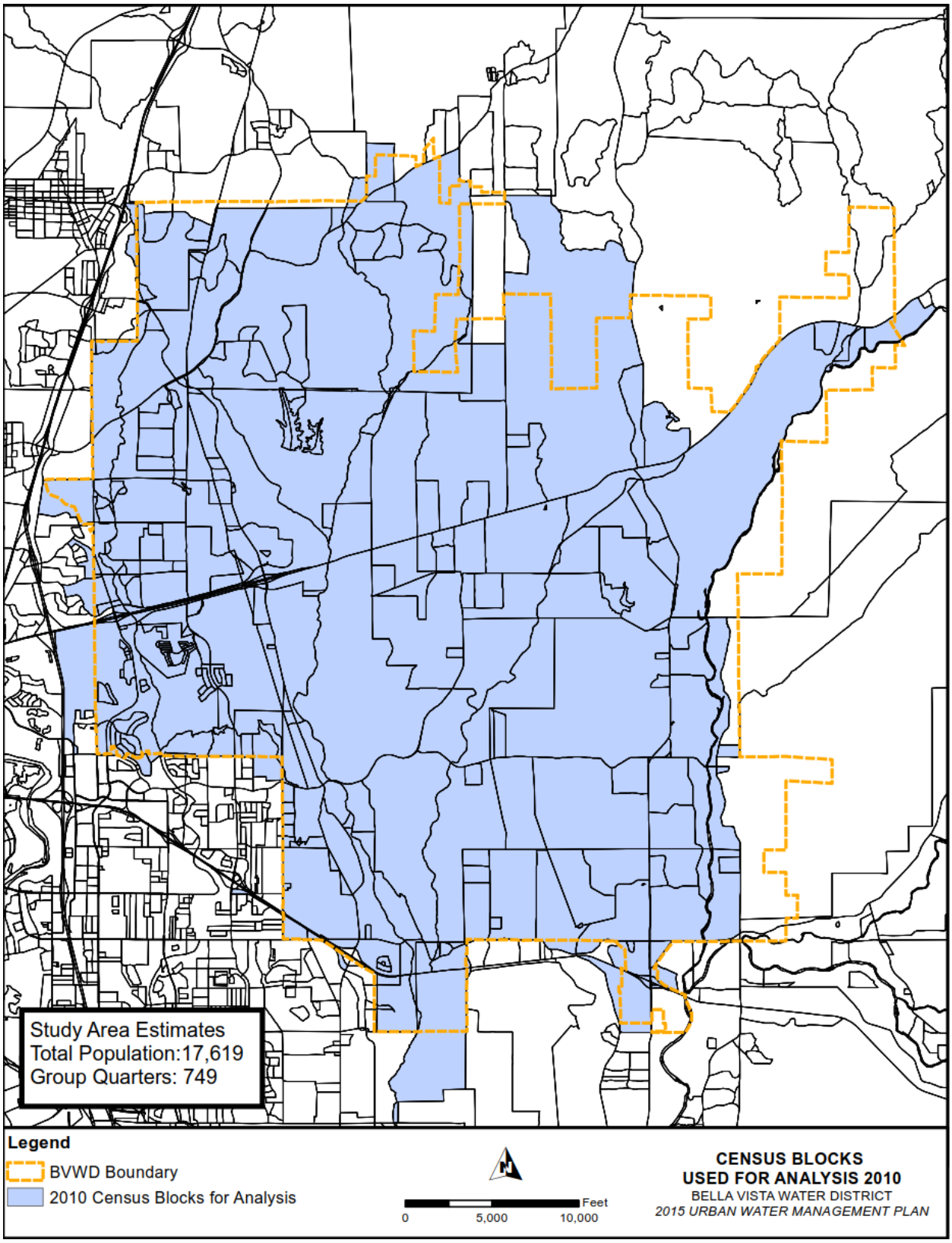


Figure 3-7: Census Block Map - Year 2010

3.2.2 Historic Population Calculations

In accordance with the updated DWR guidance for the 2020 UWMP the persons per connection method was used to calculate historic and baseline populations.

The number of active service connections in the District in 1990 was 3,373. Based on the estimated 1990 population of 10,149 there were approximately 3.01 persons per connection in 1990. The number of active service connections in the District in 2000 was 5,066. Based on the estimated 2000 population of 15,459 there were approximately 3.05 persons per connection in 2000. The number of active service connections in the District in 2010 was 6,014. Based on the estimated 2010 population of 17,619 there were approximately 2.93 persons per connection in 2010. **Table 3-4** shows the estimated populations for census years as well as for non-census years (based on the persons per connection) for baseline years and for 2020. As allowed by the DWR guidance the District is using the 2010 persons per connection to estimate the 2020 population to be 18,378.

Table 3-4: Historic Population Calculations

Population Using Persons-per-Connection				
	Baseline Year	Number of Connections	Persons Per Connection	Total Population
10 to 15 Year Baseline Population Calculations				
Year 1	1996	4,498	3.03	13,650
Year 2	1997	4,640	3.04	14,101
Year 3	1998	4,688	3.04	14,265
Year 4	1999	4,927	3.05	15,014
Year 5	2000	5,066	3.05	15,459
Year 6	2001	5,275	3.04	16,032
Year 7	2002	5,419	3.03	16,404
Year 8	2003	5,572	3.01	16,801
Year 9	2004	5,707	3.00	17,136
Year 10	2005	5,855	2.99	17,511
5 Year Baseline Population Calculations				
Year 1	2003	5,572	3.01	16,801
Year 2	2004	5,707	3.00	17,136
Year 3	2005	5,855	2.99	17,511
Year 4	2006	5,921	2.98	17,636
Year 5	2007	5,977	2.97	17,729
2020 Compliance Year Population Calculations				
	2020	6,273	2.93	18,378

3.2.3 Projected Population Calculations

The Shasta County Economic Development Council anticipates that the Shasta County annual average growth rate will be 0.42 percent from 2020 through 2045. The District anticipates that its annual average growth rate will be the same as that for Shasta County. The current and projected populations for the District are shown in **Table 3-4**.

Table 3-5: Population – Current and Projected

	2020	2025	2030	2035	2040	2045
Service Area Population[1]	18,378	18,767	19,164	19,570	19,985	20,408

1- Service area population is defined as the population served by the distribution system. Source US Census data 2000, 2010. Population is estimated to grow 0.42% annually.

Figure 3-8 below graphs the District's historic and projected population.

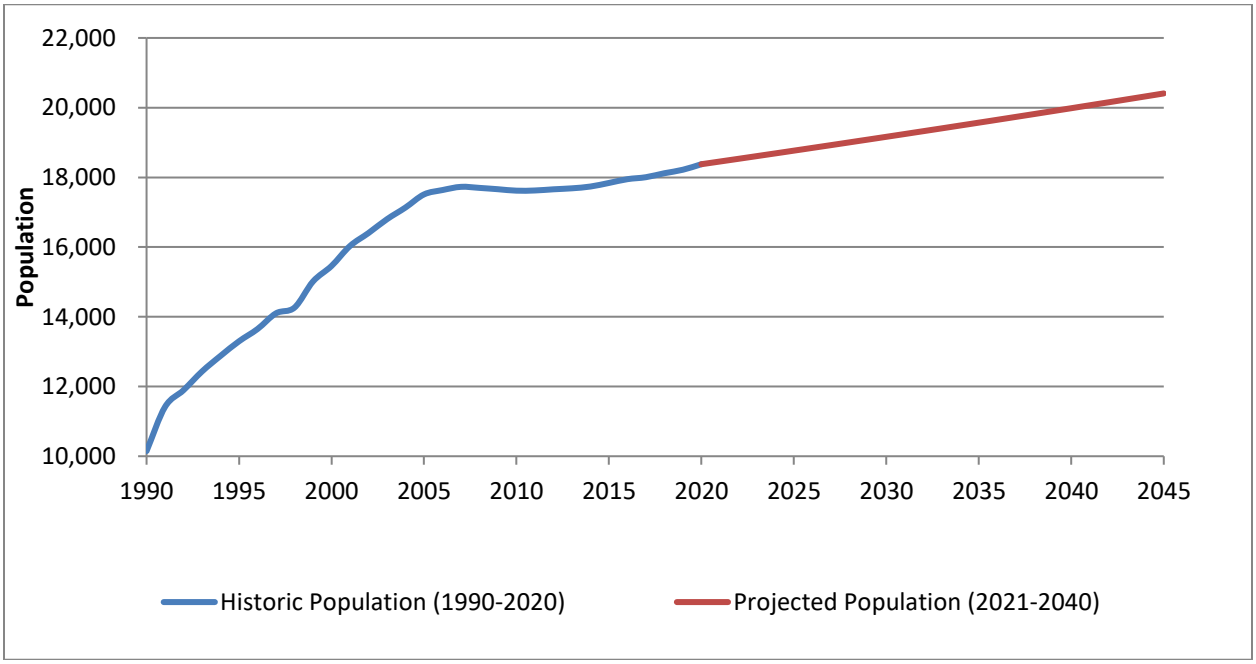


Figure 3-8: Historic and Projected Population

3.3 Other Demographic Factors

Legal Requirements:

CWC 10631 (a)
Describe the service area of the supplier, including. . . other demographic factors Affecting the supplier's water management planning.

The District is predominately zoned rural residential. This land use type has a large impact on water use. Rural residential and agricultural customers have properties at least two acres or larger and therefore use more water than the typical single-family or multi-family urban residential connections.

The median income (in 2019 dollars) for Shasta for the 2015-2019 period was $54,667 and for the City of Redding it was $54,278. The unemployment rate for the Redding Metropolitan Statistical Area (MSA) was 7.8% in December 2020.

According to the US Census Bureau 13.3%of the population of Shasta County and 17.5% of the population of Redding are below the poverty level.

4 System Water Use

Legal Requirements:

CWC 10631(d)
(1) Quantify, to the extent records are available, past and current water use, over the same five-year increments described in subdivision (a), and projected water use, based upon information developed pursuant to subdivision (a), identifying the uses among water use sectors, including, but not necessarily limited to, all of the following:
(A) Single-family residential.
(B) Multifamily.
(C) Commercial.
(D) Industrial.
(E) Institutional and governmental.
(F) Landscape.
(G) Sales to other agencies.
(H) Saline water intrusion barriers, groundwater recharge, or conjunctive use, or any combination thereof.
(I) Agricultural.
(2) The water use projections shall be in the same five-year increments described in subdivision (a).

4.1 Connections

Water demands served by BVWD are primarily agricultural and domestic (residential, rural, commercial, and public institutional). Residential connections comprise the majority of customers for the District. It is assumed that the number of residential and rural connections will continue to increase over time. Although these categories make up the majority of connections, agricultural properties cover more land and typically consume more water per connection. It is assumed that as development encroaches on agricultural properties and water deliveries become more expensive and less reliable, agricultural connections will decrease over time, being replaced by single-family residential and rural customers. The number of active connections in 2020 is shows in **Table 4-1**, and illustrated in **Figure 4-1**.

Table 4-1: 2020 Active Connections

Connections	Connections	% of Total connections
Residential	4,025	64.2%
Agricultural	172	2.7%
Rural	1,721	27.4%
Commercial	301	4.8%
Public Institutional	54	0.9%
Total	6,273	100.0%

The District will be investigating the establishment of additional customer classifications (e.g., multi-family) in order to provide a better match with the customer types listed in the UWMP Guidebook Tables and enable the District to segregate these types of uses in the future. **Table**

4-1and **Figure 4-1** show the number of active connections by type for 2020. All connections in the District are metered.

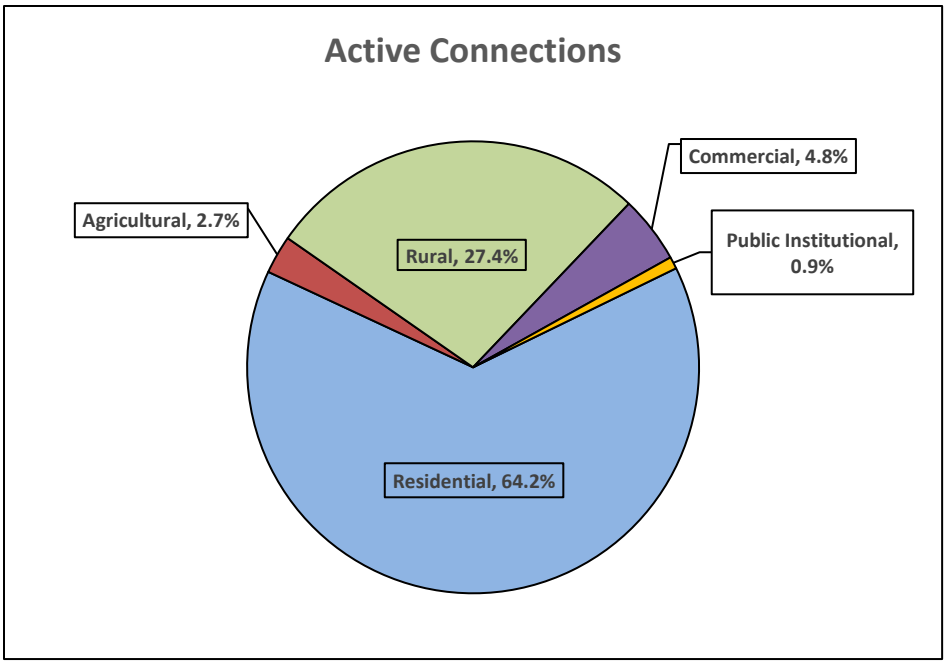


Figure 4-1: 2020 Active Connections

It is also important to note that agricultural customers are supplied both domestic and agricultural water from the same meter and each agricultural connection was counted as one (1) residential connection when determining persons per connection. Water supplied to agricultural users is billed at the agricultural rate. This includes domestic water used for indoor and landscaping purposes. According to the Water Service Contract, Article 1 definitions (m) "Irrigation Water" shall mean water made available from the Project that is used primarily in the production of agricultural crops or livestock, including domestic use incidental thereto, and watering of livestock. When water use restrictions are implemented by Reclamation and irrigation water allocations are zero, agricultural (irrigation) users are not entitled to any irrigation water. In order to be able to provide its agricultural users with water for domestic use, the District includes one-half (½) an acre foot of M&I in the base rate for agricultural users. In this way, when Irrigation deliveries are zero, they will receive enough water to meet their household domestic needs.

4.2 Water Use

4.2.1 Types and Classifications

Water use types in BVWD include commercial, residential, rural, public/institutional, agriculture, transfers, losses, and other. It should be noted that these categories are considered separately when Reclamation institutes water reductions to the District and connection types differ from use types. Reclamation determines water allocations for BVWD based on historic use for M&I allocations

and on the remaining contract quantity for deliveries at the Irrigation allocation. Water supply allocations, shortage conditions, and other parameters are explained further in the CVP Water Shortage Policy. In severe drought years, such as 2015, these allocations required the District to enforce extreme conservation measures.

Conversely, reductions required by the State Water Conservation Bill are overreaching, requiring a general 20% reduction in daily per capita use water use. Water reduction implementation is the responsibility of the water supplier. In 2015, a severe drought year, BVWD used only 39% of its 2015 interim target GPCD water usage required by the Water Conservation Bill SBX 7-7. In 2020, BVWD used only 72% of its 2020 the target GPCD water usage required by the Water Conservation Bill SBX 7-7. Conservation and water allocations are explained further in the remaining chapters of this document.

M&I water use typically includes all other water use categories except losses. Construction water is metered using portable fire hydrant meters rented by contractors. These meters can be attached to any fire hydrant within the District, subject to the approval by the District. System losses and other unmetered municipal uses are included in **Table 4-2** below. These use types are calculated using the AWWA water audit software and described further in **Section 4.3.**

4.2.2 2020 Water Use

Figure 4-2 shows water use for 2020 by type. Water included in the "other" category is metered and used as construction water, emergency intertie water, and run-to-waste (for line flushing).

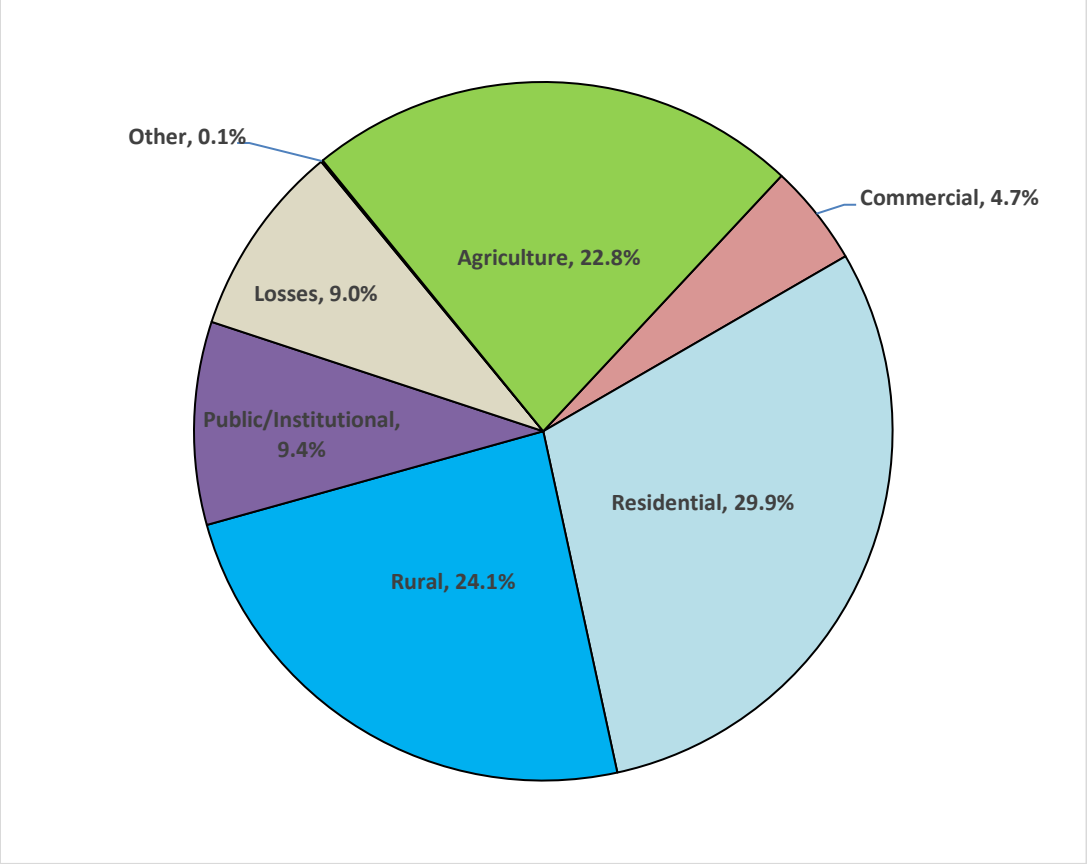


Figure 4-2: 2020 Water Use by Type

4.2.3 Average Water Use (2011-2020)

Figure 4-3 shows average percentage of water use by type from 2011-2020. Water uses included in "other" consist of construction water, emergency intertie water, and run to waste (for line flushing), ASR water, and losses. Averages for existing data (typically less than 5 years) were calculated, summed, and entered as "Other." In **Table 4-2**, 2020 use totals will be used for future projections.

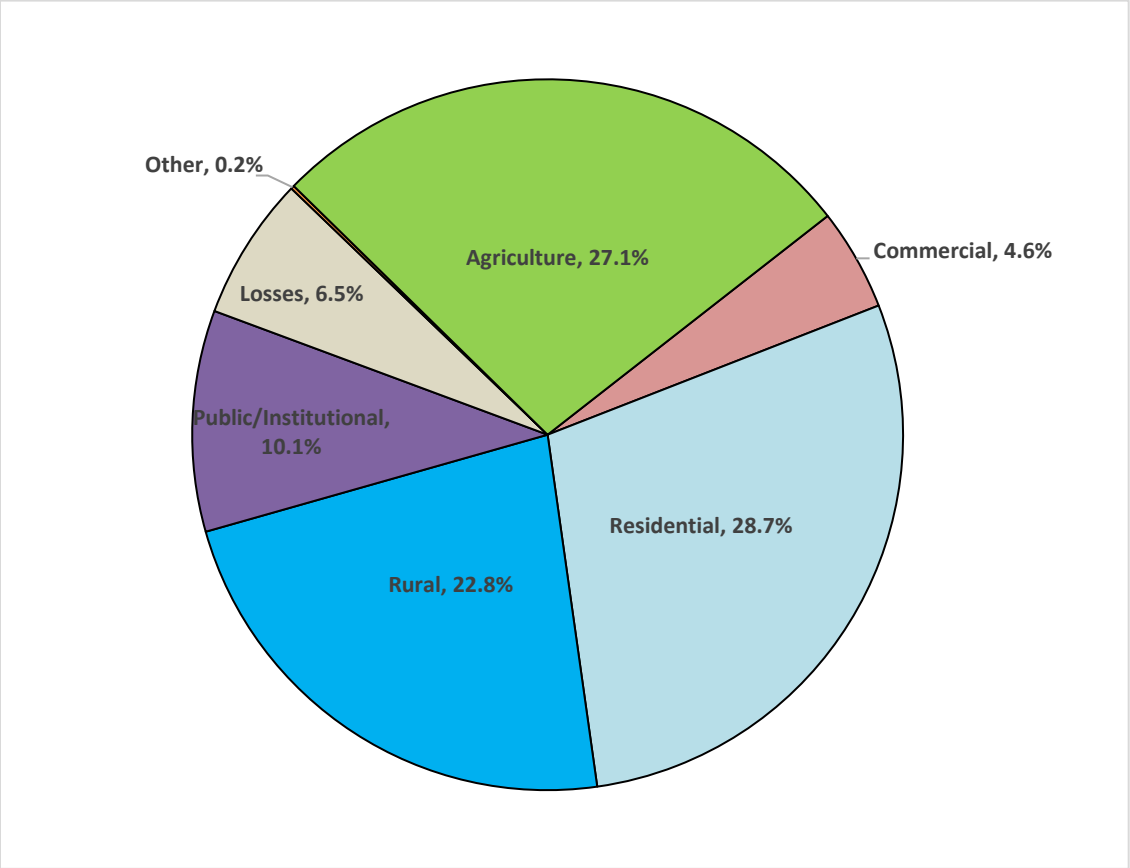


Figure 4-3: Average Water Use by Type (2011-2020)

4.2.4 Future Water Use Projections

Water use projections are calculated until 2045. Total water demands are estimated using the District's 2020 per capita water reduction goal of 758 GPCD (**Chapter 5**) multiplied by the population. The total population-based demand is then broken into specific use types, multiplying total demand by percentage of average use by type (**Figure 4-3**).

Table 4-2 projects total water demands for each use type. The projected water usage values represent water demands under average hydrologic conditions. Future demands are expected to increase by 0.42%/year for all water use categories. This is the same as the assumed population growth rate.

Table 4-2: Demands for Potable Water – Current and Projected

Use Type[1]	Average Use (AF) 2016-2020	2016-2020 Percentages	2025[2]	2030[2]	2035[2]	2040[2]	2045[2]
Commercial	458	4.69%	468	478	488	498	509
Residential[3]	2,882	29.53%	2,943	3,006	3,070	3,134	3,201
Rural	2,273	23.29%	2,321	2,371	2,421	2,472	2,525
Public/Institutional	974	9.98%	995	1,016	1,037	1,059	1,082
Construction	4	0.04%	4	4	5	5	5
Agriculture	2,427	24.86%	2,478	2,531	2,585	2,639	2,696
Unbilled Metered[4]	6	0.06%	6	6	6	7	7
Unbilled Unmetered[5]	73	0.75%	75	76	78	79	81
Losses[5]	662	6.78%	676	690	705	720	735
Transfers (Out)	2	0.02%	2	2	2	2	2
Totals	**9,762**	**100.00%**	**9,969**	**10,181**	**10,397**	**10,616**	**10,843**

1 - All volumes are acre-feet per year.
2 - Volumes each category for 2025 - 2045 are based on the 2016-2020 percentages and the projected total water demands for each year.
3 - Residential use includes single-family and multi-family homes.
4 – Includes BVWD Yard and Run to Waste water.
5 – 2016-2020 Losses calculated using AWWA Software; projected real losses and authorized unbilled unmetered losses were calculated from average water loss.

4.3 Annual Water Use

Figure 4-4 graphs total annual water use and population. It can be seen from this graph that water use has declined substantially since 2008. The decline in water use coincides with several events including a decline in the number of agricultural customers, an economic recession, multi-year droughts, higher water prices, and water conservation measures. The number of active metered connections and other data regarding BVWD's usage can be found in **Appendix D.**

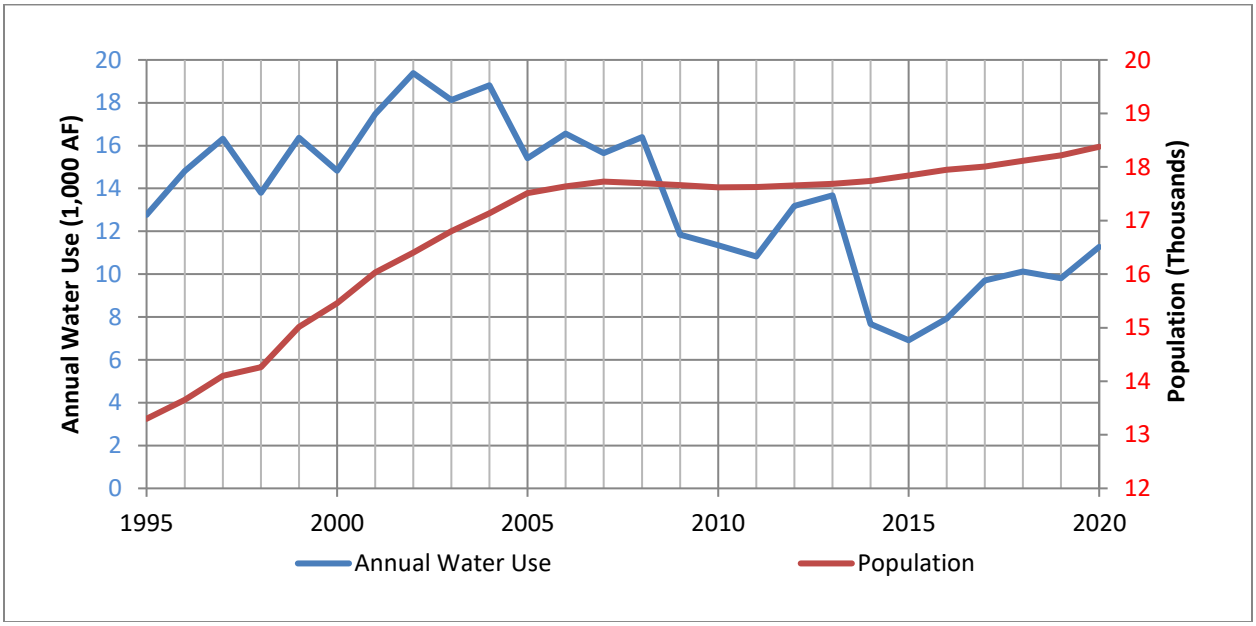


Figure 4-4: Relationship between Annual Water Use and Population

4.4 Distribution System Water Losses

Legal Requirements:

CWC 10631(d)(1) and (2)
Quantify, to the extent records are available, past and current water use over the same five-year increments described in subdivision (a), and projected water use, identifying the uses among water use sectors, including, but not necessarily limited to, all of the following uses…(J) Distribution system water loss.

CWC 10631 (d)(3)
(A) The distribution system water loss shall be quantified for each of the five years preceding the plan update, in accordance with rules adopted pursuant to Section 10608.34.
(B) The distribution system water loss quantification shall be reported in accordance with a worksheet approved or developed by the department through a public process. The water loss quantification worksheet shall be based on the water system balance methodology developed by the American Water Works Association.

System water losses for the 2016-2020 calendar-year were calculated using AWWA Free Water Audit Software v5.0. The software uses inputs of the volume of water supplied, the volume of

water delivered, and metering error percentages to quantify and classify discrepancies between water production meters and customer consumption meters. It should be noted that the difference between metered water production and metered water deliveries is not necessarily water lost through leakage. Authorized unmetered use (firefighting, line flushing, etc.) is included in water deliveries as calculated by the AWWA software. Definitions for the different types of losses are provided below:

- **"Water Losses"** is the difference between water supplied (water production less water exported) and authorized water demand.
- **"Apparent Losses"** is comprised of the following:
    - "Unauthorized consumption" is water that is stolen or obtained without permission. The software uses a default value of 0.25% to calculate unauthorized unmetered water as a percentage of water losses.
    - "Customer metering inaccuracies" are apparent water losses caused by the collective under-registration of customer water meters. Many customers water meters gradually wear as large cumulative volumes of water are passed through them over time. This causes the meters to under-register the flow of water. In its calculations the District has used a value of 1.0% of the water losses.
    - "Systematic data handling errors" are apparent losses caused by accounting omissions, errant computer programming, gaps in policy, procedure and permitting/activation of new accounts; and any type of data lapses that results in under-stated customer water consumption in summary billing reports. The default software value of 0.25% of total losses has been used for calculating these apparent losses.
- **"Real losses"** are actual losses from the system due to transmission and distribution pipeline leakage and line breaks; leakage and overflows at water storage tanks; and leakage on service connections up to the customer's water meter. It is the difference between total loss and apparent loss.
- **"Authorized unmetered"** (unbilled unmetered) consumption is also estimated using the AWWA Software. This value is included in authorized water demand. Authorized unmetered activities include line flushing of mains and hydrants, firefighting, and other municipal activities that use water, but are not metered. It is calculated using a default percentage of total water production (1.25%).

Table 4-3 below shows total water losses for 2020 calculated by AWWA software. Water losses in 2020 represent approximately 7.7 percent of the total amount of water supplied to the distribution system. Values for all loss types can be found in the AWWA worksheet in **Appendix G.**

Table 4-3: Water Loss Summary 2016 through 2020

Calendar Year	2016	2017	2018	2019	2020	Averages
Water Supplied	7,927	9,699	10,117	9,802	11,268	9,763
Authorized Consumption	8,176	8,810	9,610	9,318	10,404	9,264
Water Losses (AF)	**-249**	**889**	**507**	**484**	**864**	499
Water Losses (%)	-3.1%	9.2%	5.0%	4.9%	7.7%	5.1%

4.5 Water Savings from Codes, Standards, Ordinances, and Plans

Legal Requirements:

CWC 10631 (d)(4)
(A Water use projections, where available, shall display and account for the water savings estimated to result from adopted codes, standards, ordinances, or transportation and land use plans identified by the urban water supplier, as applicable to the service area.
(B) To the extent that an urban water supplier reports the information described in subparagraph (A), an urban water supplier shall do both of the following:
(i) Provide citations of the various codes, standards, ordinances, or transportation and land use plans utilized in making the projections.
(ii) Indicate the extent that the water use projections consider savings from codes, standards, ordinances, or transportation and land use plans. Water use projections that do not account for these water savings shall be noted of that fact.

Water savings from codes, standards, ordinances, or transportation and land use plans are also known as "passive savings." These various factors generally decrease the water use for new and future customers, compared to historical customers. These codes and ordinances may include implementation of a Model Water Efficient Landscape Ordinance (MWELO), the California Energy Commission Title 20 appliances standards for toilets, urinals, faucets, and showerheads, the CALGreen Building Code, etc.

Passive savings have not been specifically incorporated in projected water demands since there are currently no practical method or system in place to calculate, estimate, or determine the actual water savings from these measures. Instead, future water demands are projected based on population and the District's target per capita water use, as documented in Chapter 5 and discussed above. However, the District does expect that passive savings, such as established plumbing standards and water conservation efforts, will help the District continue to meet its target per capita water demand in the future.

4.6 Water Use for Lower Income Households

Legal Requirements:

CWC 10631.1
(a)The water use projections required by Section 10631 shall include projected water use for single-family and multifamily residential housing needed for lower income households, as defined in Section 50079.5 of the Health and Safety Code, as identified in the housing element of any city, county, or city and county in the service area of the supplier.

California Health and Safety Code 50079.5
(a)"Lower income households" means persons and families whose income does not exceed the qualifying limits for lower income families… In the event the federal standards are discontinued, the department shall, by regulation, establish income limits for lower income households for all geographic areas of the state at 80 percent of area median income, adjusted for family size and revised annually.

The BVWD's Policy for Water Services for Affordable Housing states that the District will ensure that priority for water services is given to proposed developments that include housing units affordable to lower income households. The District will not deny or condition the approval of an application for service to, or reduce the number of services applied for by, a proposed development that includes housing units affordable to lower income households, unless the Board of Directors makes specific written findings that the denial, condition, or reduction is necessary due to the existence of one or more of the following:

- The District does not have sufficient water supply as defined in Government Code Section 66473.7(a)(2), or is operating under a water shortage emergency as defined in Water Code Section 350, or does not have sufficient water treatment or distribution capacity to serve the needs of the proposed development, as demonstrated by a written engineering analysis and report.

- The District is subject to a compliance order issued by the SWRCB Division of Drinking Water that prohibits new water connections.

- The developer has failed to agree to reasonable terms and conditions relating to the provision of service generally applicable to development projects seeking service from the District, including, but not limited to, the requirements of local, state, or federal laws and regulations or payment of a fee or charge imposed pursuant to Government Code Section 66013.

The California Department of Housing and Community Development provided Shasta County (County) with the Regional Housing Need Determination and Plan for the Sixth Housing Element Update[3] that contained the final determination of Regional Housing Need Allocation (RHNA) and a Regional Housing Need Plan (RHNP) for the County. The RHNA utilized the American

[3] http://hcd.ca.gov/housing-policy-development/housing-resource-center/plan/he/shasta_cou5rhna063012.pdf

Community Survey data since only partial demographic data was available from the 2010 Census and the California Department of Finance (DOF). The DOF determined the County's regional housing need to be a minimum of 3,675 new housing units (including 2,112 low-income housing units) for the projection period from December 31, 2018, and ending April 15, 2028.

The RHNP distributed the 2,112 low-income units by percentage to three cities (Anderson, Redding, Shasta Lake) and unincorporated areas of the County. The majority of the District service area lies within the unincorporated areas of the County. The percentage of the low-income housing needs the RHNP distributed to the unincorporated areas was 30.5 percent (645 units) of the 2,112 units.

Following the procedure in the RHNP, the share for the District water service area was calculated based on the County and District projected populations through the planning period (ending April 15, 2028). The RHNP estimates the population in Shasta County to be 186,880 at that time. The District's population is projected to be 19,004 at that same time. Therefore, the District's share or the new low-income housing units required during the projection period is 215 units (approximately 10.2% of the total). Based on the eight-year projection period this would be 27 units per year.

Table 4-4 projects water demands associated with lower income water users through year 2045. The values shown below for the years 2025 through 2040 are the same as provided in the 2015 UWMP. It should be noted that the low-income demand projections presented in **Table 4-4** are included in the total water use projections provided in **Section 4.2.4**. As the District continues to gather data on the single-family and multi-family connections, the projected low-income water demands can be separated into those customer categories.

Table 4-4: Low-Income Projected Water Demands

Low Income Water Demands	2025	2030	2035	2040	2045
Residential	272	282	292	302	312
Units : acre-feet					

4.7 Climate Change Considerations

CWC 10635
(b) Every urban water supplier shall include, as part of its urban water management plan, a drought risk assessment for its water service to its customers as part of information considered in developing the demand management measures and water supply projects and programs to be included in the urban water management plan. The urban water supplier may conduct an interim update or updates to this drought risk assessment within the five-year cycle of its urban water management plan update. The drought risk assessment shall include each of the following…
(4) Considerations of the historical drought hydrology, plausible changes on projected supplies and demands under climate change conditions, anticipated regulatory changes, and other locally applicable criteria.

DWR guidelines require urban water suppliers to consider the potential effects related to climate change in the UWMP as it relates to water demands, water supply, and water supply reliability. These topics are addressed in Chapters 4, 6, and 7 of the UWMP, respectively.

In early 2021, the District adopted a Drought Contingency Plan (see **Appendix L)** that addressed historical drought hydrology, the potential impacts of drought on the District's water supplies and identified potential mitigation and response actions.

Two different USBR studies evaluated the potential impacts of climate change on the Sacramento Valleys. These include:

- USBR, West-Wide Climate Risk Assessment, Sacramento and San Joaquin Basins Climate Impact Assessment, September 2014.
- USBR, Sacramento and San Joaquin Basin Study, March 2016.

These studies outline the following major effects of climate change on temperature, precipitation, and runoff:

- **Temperature.** Temperatures are projected to increase steadily during this century, with generally greater changes occurring farther inland. In the Sacramento region, warming is projected to increase by about 1.8 degrees Fahrenheit (^{o}F) to 5.4^{o}F at mid-21st century (2055), and about 3^{o}F to 9°F at end-of-century (2084) (USBR, 2014).

- **Precipitation.** Projections of future precipitation have a much greater range of variability than those for temperature. In the northern part of the Sacramento Valley, projections indicate a slight increase of about 2 percent in precipitation around the mid-century period with increases continuing into the late century (USBR, 2016).

- **Snowpack.** Snowpack, as measured by April 1st snow water equivalent (SWE), is projected to decrease continuously throughout the 21st century. Snowmelt from the Sierra Nevada currently provides an annual average of 15 million acre-feet of water, slowly released between April and July each year. The greatest changes will occur in the lower elevations of the watersheds. By 2025, the Sacramento Valley watershed is projected to experience decreases in the April 1st snow water equivalent (SWE) in the range of 10 percent in the higher portions of the watershed to 70 percent in the lower elevations. By the end of the century, even the highest elevations may see a decrease of 70 percent (USBR, 2016).

- **Evapotranspiration.** Evapotranspiration is projected to increase continuously during the 21st century due to warmer temperatures. This would result in longer growing seasons, thus increasing the amount of water needed for permanent crops, urban landscaping, and environmental water (USBR, 2016).

- **Runoff.** Projected runoff in the Sacramento Region varies by climate scenario. Under the no climate change scenario, average annual runoff was about 22,700 thousand acre-feet

(TAF)/year in the Sacramento Region. Across the range of all climate scenarios, average annual runoff ranged from 18,000 to 31,900 TAF/year for 2012-2040; 17,000 to 29,100 TAF/year for 2041-2070; and 18,400 to 28,700 TAF/year for 2071-2099 (USBR, 2014). In the median climate scenario, average annual runoff was only slightly higher than the no climate change scenario.

- **Timing of Runoff.** Higher temperatures during winter are projected to cause more precipitation to occur as rainfall causing increased runoff, less snowpack water storage, and earlier spring snowmelt runoff with reduced volume. This seasonal shift is greater in basins where the elevations of the historical snowpack areas are relatively low and, therefore, more susceptible to warming induced changes in precipitation from snow to rain (USBR, 2014).

These climate change projections are merely estimations; however, it is well accepted that the future climate is uncertain, and changes could occur that negatively impact the District's water supplies. At this point, impacts from possible climate change are not quantifiable.

The potential impacts of climate change on the District's water supplies could include more prolonged droughts, with more frequent reductions in the District's surface water allocations from the Central Valley Project. As a result, the District recognizes the need for redundancy and resiliency in their water supplies and will be pursuing the development of increased groundwater supplies to help offset the potential impacts of reductions in its surface water supplies.

Climate change is also likely to result in increased irrigation demands in the District's service area due to the projected increases in temperatures that will cause increases evapotranspiration and increased evaporation from swimming pools and water features.

As climate change becomes noticeable and quantifiable, the District's responses will include taking actions to reduce water demands to match possible reduction of water supplies. Mitigating possible increased water demands for landscape irrigation may require less landscaping, increased use of drought tolerant plantings, and more efficient irrigation strategies.

5 Baseline and Targets

The 2015 UWMP calculated the baseline gallons-per-capita/day (GPCD) water usage for both the 10-year and 5-year baseline periods. It also established the GPCD goals for 2020.

The DWR provided SBX7-7 Excel tables that were utilized by the District in their 2015 UWMP and the SB X7-7 2020 Compliance Form Excel tables are included as an appendix (**Appendix F**).

5.1 Baseline Water Use

The 10-year baseline period selected in the 2015 UWMP was 1996 through 2005 and the corresponding average baseline use was calculated to be 947 GPCD. The 5-year baseline period selected in the 2015 UWMP was 2003 through 2007 and the corresponding average baseline use was calculated to be 956 GPCD.

5.2 2020 Targets

Table 5-1 summarizes the average daily per capita water use for both the 10-year and 5-year baseline periods along with the 2020 daily per capita water use target established in the District's 2015 UWMP.

Table 5-1: Baselines and Targets Summary

Baseline Period	Start Years	End Years	Average GPCD	Confirmed 2020 Target
10-year	1996	2005	947	758
5-Year	2003	2007	956	

5.3 2020 Compliance Daily per Capita Water Use

Legal Requirements:

CWC 10608.12 (e)
"Compliance daily per-capita water use" means the gross water use during the final year of the reporting period, reported in gallons per capita per day.
CWC 10608.22
Notwithstanding the method adopted by an urban retail water supplier pursuant to Section 10608.20, an urban retail water supplier's per capita daily water use reduction shall be no less than 5 percent of base daily per capita water use as defined in paragraph (3) of subdivision (b) of Section 10608.12. This section does not apply to an urban retail water supplier with a base daily per capita water use at or below 100 gallons per capita per day.
CWC 10608.24 (b)
Each urban retail water supplier shall meet its urban water use target by December 31, 2020.

This section verifies BVWD compliance with reaching and surpassing the 2020 water use target.

5.3.1 Meeting the 2020 Target

The District's gross water use in 2020 was 11,268 acre-feet. The 2020 population estimate for the District is 18,378. Therefore, the calculated water usage in the District was 546 GPCD. The actual usage was approximately 72% of the target GPCD. The 2020 usage was a reduction of 410 GPCD from the five-year baseline's average of 956 GPCD for a reduction of approximately 43%.

Table 5-2: 2020 Compliance

2020 Interim Target	2020 Actual GPCD	Adjustments	Actual as Percent of Target	In Compliance? Y/N
758	546	0	72%	Yes

The following figure shows the 10-Year Baseline, the 2015 Interim Target, and the 2020 Target GPCD as well as the historical GPCD of water usage in the District over the past years 1990 through 2020.

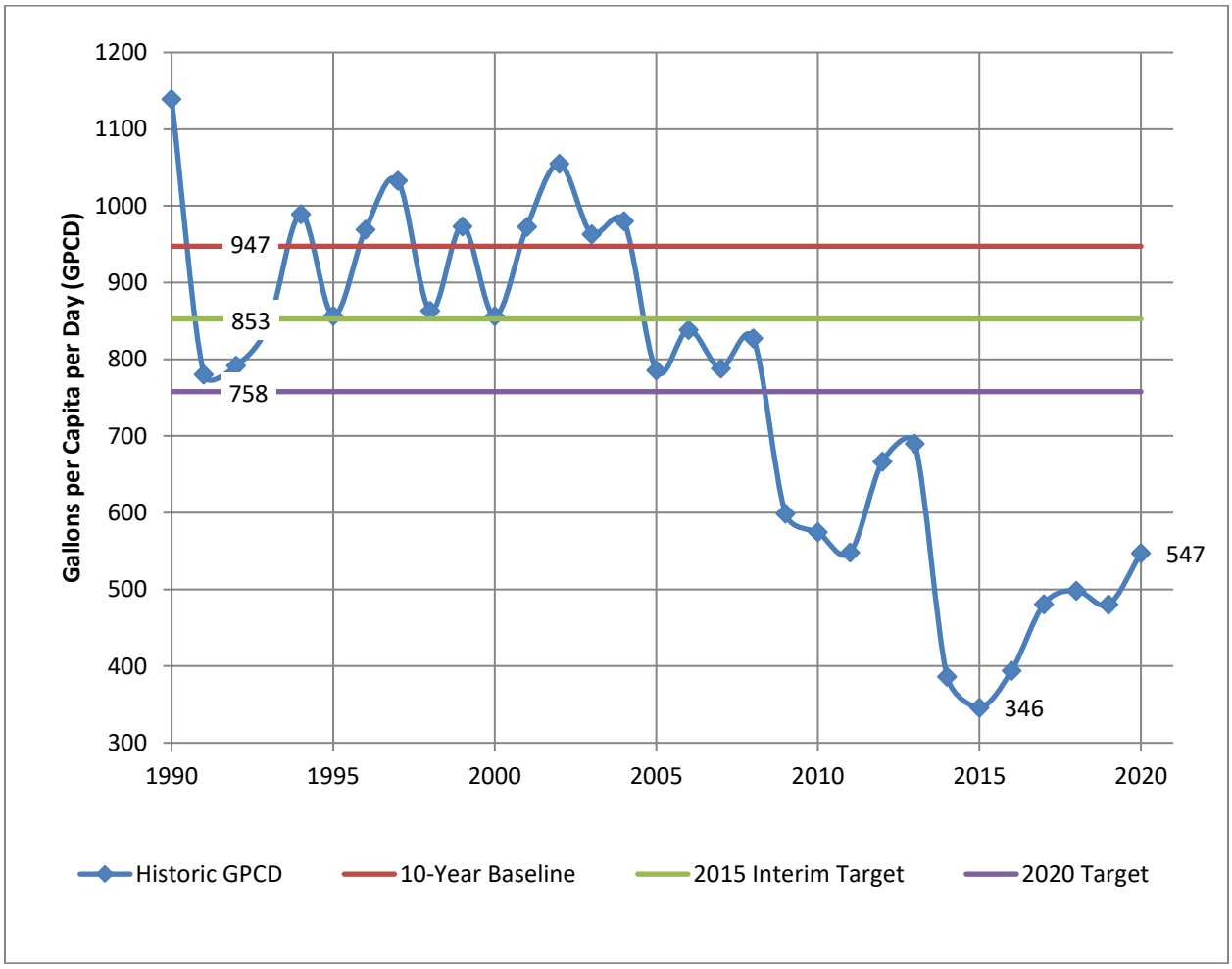


Figure 5-1: Per Capita Water Use, Baseline, and Targets

6 System Supplies

Legal Requirements:

CWC 10631(b)
Identify and quantify, to the extent practicable, the existing and planned sources of water available to the supplier over the same five-year increments described in subdivision (a).

UWMP requirements state that the water supplier must describe their existing and planned water supply sources for the next 20 years. The following description includes information on the District's water supplies (surface water, groundwater and transferred water), recycled water opportunities, pertinent information on groundwater management, and potential future water projects.

The District's water supply is a combination of a long-term renewable water service contract with the United States Bureau of Reclamation (USBR), groundwater, and a long-term transfer agreement with the Anderson-Cottonwood Irrigation District (ACID). Contracts for these supplies are included in **Appendix H**. The District also occasionally enters into short-term water transfer agreements; typically, this only occurs during years when its CVP contract supplies are severely reduced. The District also has interties with several local agencies in which emergency transfers of water can be made.

The contract with Reclamation to take water from the Sacramento River is the District's main source of water. During low rainfall years, the District's allocation can be reduced significantly depending upon Reclamation's water supply projections. To secure a more reliable water supply for existing developments, and to guard against potential multi-year shortages, the District entered into a long-term transfer agreement with the Anderson-Cottonwood Irrigation District (ACID) and is looking into increasing groundwater utilization as well as other water transfer opportunities.

6.1 Purchased/Imported Water

6.1.1 Contract Water

The District entered into a long-term (25-year) renewal contract with Reclamation (Contract No. 14-06-200-851A-LTR1) that authorizes the District to divert from the Sacramento River a specified quantity of the water supply via the Central Valley Project (CVP). The original contract was signed in 1964 and interim contract renewals were continued uninterrupted until a long-term contract was executed in February 2005, which allows the District to divert up to 24,578 acre-feet per year (AFY) of CVP water for agricultural (irrigation) and municipal and industrial (M&I) purposes. The contract includes a permanent assignment of 578 acre-feet (AF) of CVP water from Shasta County Water Agency (identified as contract 14-06-200-3367Y) to BVWD. This total supply is subject to shortage provisions that reduces available supply during periods of drought, and from environmental regulations and related regulatory actions. Allocations of water supplies

to agriculture and for M&I purposes are subject to Reclamation's adopted rules and related guidelines also known as the M&I Shortage Policy. This Policy was adopted by a Record of Decision that was signed on November 13, 2015. As a condition of the contract with USBR, the District is required to prepare, submit, and implement a Federal Water Management Plan (FWMP) to Reclamation for review and approval every five years.

In December 2016, President Obama signed the Water Infrastructure Improvement for the Nation (WIIN) Act, which provides "[u]pon request of the contractor, the Secretary of the Interior shall convert" any "[w]ater service contracts that were entered into under section (e) of the Act of August 4, 1939 (53 Stat. 1196), to be converted under this section shall be converted to repayment contracts under section 9(d) of that Act (53 Stat. 1195)." 130 Stat. 1878. The WIIN Act also provides that the converted contract shall "continue so long as the contractor pays applicable charges, consistent with section 9(d) of the Act of August 4, 1939 (53 Stat. 1195), and applicable law." 130 Stat. 1879. Pursuant to that law, BVWD and numerous other water agencies elected to convert their water service contracts to repayment contracts, which under provisions of federal reclamation law enacted in 1939 remain in effect so long as the contractor satisfies the terms of the contract. The permanent nature of these converted contracts is based on a principle of federal reclamation law enacted nearly 120 years ago: "…once water users have repaid their share of the construction costs of a project, they would have a permanent right to the use of water developed by the project for which they paid."

Pursuant to the WIIN Act and following CVP-wide, regional and District specific negotiations, Reclamation and the District executed an Amendment to the Existing Contract (14-06-200-851A-P) on September 15, 2020. Among other amendments, Article 2, Term of Contract, was amended and replaced in its entirety with the following new Article "(a) This Contract shall be effective October 1, 2020, and shall continue so long as the Contractor pays applicable Rates and Charges under this Contract, consistent with Section 9(d) or 9(c)(l) of the Act of August 4, 1939 (53 Stat. 1195) as applicable, and applicable law." See **Appendix H** for copies of the contract and Amendment.

The amended contract states that Reclamation will use all reasonable means to guard against shortages in the quantity of water available to the District. However, the contract also states that no liability shall accrue against the United States if shortages occur due to drought or other causes, which are beyond the control of the United States. During drought conditions, CVP diversions can be cut back significantly, as was the case in 1992 when M&I allocations were reduced to 50 percent of historical use in the region and in 2015 when they were reduced to 25 percent of historic use. Pursuant to the M&I Shortage Policy, the percent reduction is applied to the historical average of the District's actual M&I water usage over the prior three unconstrained water years, or "public health and safety, whichever is greater". Agricultural water supplies can and have been reduced by as much as 100 percent (to zero) in shortage years.

6.1.2 Supplemental Water Program

In order to augment supply on behalf of agricultural customers that would otherwise be subjected to significant shortages, the District's Board of Directors adopted a Supplemental Water Program in April 2009. This approval was prompted by the prospect of an unreliable water supply resulting

from an evolving regulatory environment. The goal of the Program is to acquire additional water supplies in shortage years on behalf of participating agricultural customers on a voluntary basis for customers that choose to participate, without obligating the entire customer class. For example, those customers that have permanent crops may choose to participate while others with row crops may choose to idle or fallow during shortages.

In the winter months and early spring, District staff review the CVP supply forecast, estimate demands, and determine the interest for additional water supplies in the upcoming water year. Once the Supplemental Water Program is activated, District staff then identifies, negotiates, and acquires needed supplies based on the applications received. The most likely source of supplemental water is from willing sellers that are also Central Valley Project contractors. Once a supply of water is obtained, the District then works with the appropriate agencies to obtain necessary approvals, schedule delivery, and transfer the water into the District.

6.2 Groundwater

6.2.1 Groundwater Basin Description

Legal Requirements:

CWC 10631
(b)(4) If groundwater is identified as an existing or planned source of water available to the supplier, all of the following information shall be included in the plan:

(B) A description of any groundwater basin or basins from which the urban water supplier pumps groundwater. …For a basin that has not been adjudicated, information as to whether the department has identified the basin as a high- or medium-priority basin in the most current official departmental bulletin …

The District is located in the northern area of the Redding Area Groundwater Basin, Enterprise Sub-basin (Groundwater Basin Number 5-6.04) and Millville Sub-basin (Groundwater Basin Number 5-6.05), which contains the main water-bearing geologic units in the northern Sacramento Valley.

The District extracts groundwater from the Enterprise Sub-basin of the Redding Area Groundwater Basin. **Appendix J** contains Bulletin 118 for the Enterprise Sub-basin and the Millville Sub-basin. Based on the current sub-basin boundaries, all of the District wells are within the Enterprise Sub-basin. If the District constructs new wells in the Millville Sub-basin further information on that sub-basin will be included in future UWMPs.

The Enterprise Sub-basin comprises the portion of the Redding Area Groundwater Basin bounded on the west and southwest by the Sacramento River, on the north by the Klamath Mountains, and on the east by Little Cow Creek and Cow Creek. Annual precipitation within the basin ranges from 29 to 41 inches, increasing to the north. Recharge to the principal aquifer formation is mostly by infiltration of stream flows. Infiltration of applied water and stream flows and direct infiltration of precipitation are the main sources of recharge in the sub-basin (Bulletin 118).

The basin is not adjudicated and according to the Department of Water Resources' Sustainable Groundwater Management Act 2019 Basin Prioritization report (May 2020) the Enterprise Sub-basin is a "Medium" priority basin.

6.2.2 Groundwater Quality

The predominant water quality mineral classification in the Enterprise Sub-basin is magnesium-sodium bicarbonate. Sodium bicarbonate and sodium chloride type waters are also found. Locally high concentrations of iron and manganese occur in the sub-basin (Bulletin 118). The groundwater extracted by the District is treated for iron and manganese prior to distribution.

6.2.3 Groundwater Management

Legal Requirements:

CWC 10631
(b)(4) If groundwater is identified as an existing or planned source of water available to the supplier, all of the following information shall be included in the plan:

(A) The current version of any groundwater sustainability plan or alternative adopted pursuant to Part 2.74 (commencing with Section 10720), any groundwater management plan adopted by the urban water supplier, including plans adopted pursuant to Part 2.75 (commencing with Section 10750), or any other specific authorization for groundwater management for basins underlying the urban water supplier's service area.

(B) A detailed description of the efforts being undertaken by the urban water supplier to coordinate with groundwater sustainability agencies or groundwater management agencies listed in subdivision (c) of Section 10723 to maintain or achieve sustainable groundwater conditions in accordance with a groundwater sustainability plan or alternative adopted pursuant to Part 2.74 (commencing with Section 10720).

(C) A detailed description and analysis of the location, amount, and sufficiency of groundwater pumped by the urban water supplier for the past five years. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records.

(D) A detailed description and analysis of the amount and location of groundwater that is projected to be pumped by the urban water supplier. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records.

The District is a member agency of the Enterprise-Anderson Groundwater Sustainability Agency (EAGSA), established on May 5, 2017. The EAGSA is currently preparing a groundwater sustainability plan (GSP) to meet the requirements of the Sustainable Groundwater Management Act (SGMA) of 2014 and with the requirements of the GSP Emergency Regulations, California Code of Regulations 5 (CCR) Title 23, Water, Division 2 Department of Water Resources, Chapter 1.5 Groundwater 6 Management, Subchapter 2, Groundwater Sustainability Plans, and related guidance documents. Further information on the current plan and draft sections is located at Enterprise Anderson Groundwater Sustainability Agency | City of Redding.

SGMA, which comprises a three-bill legislative package, Assembly Bill (AB) 1739, Senate Bill (SB) 1168, 13 and SB 1319, describes the goals and general approach to achieve sustainability.

The intent of the 14 legislation is to ensure sustainable, local, and regional management of groundwater use and address the 15 issue of over-drafted groundwater basins across the State. GSP regulations developed by the California 16 Department of Water Resources (DWR) subsequent to SGMA describe the specific requirements for 17 developing GSPs. The purpose of this GSP is to describe the approaches to achieve groundwater 18 sustainability goals for the Enterprise Subbasin and to meet the GSP regulatory requirements.

The Enterprise Groundwater Basin, in which the District resides, has been defined as a medium priority basin. Medium priority basins are required to have a completed GSP by January 31, 2022. The EAGSA is currently ahead of schedule to meet this deadline.

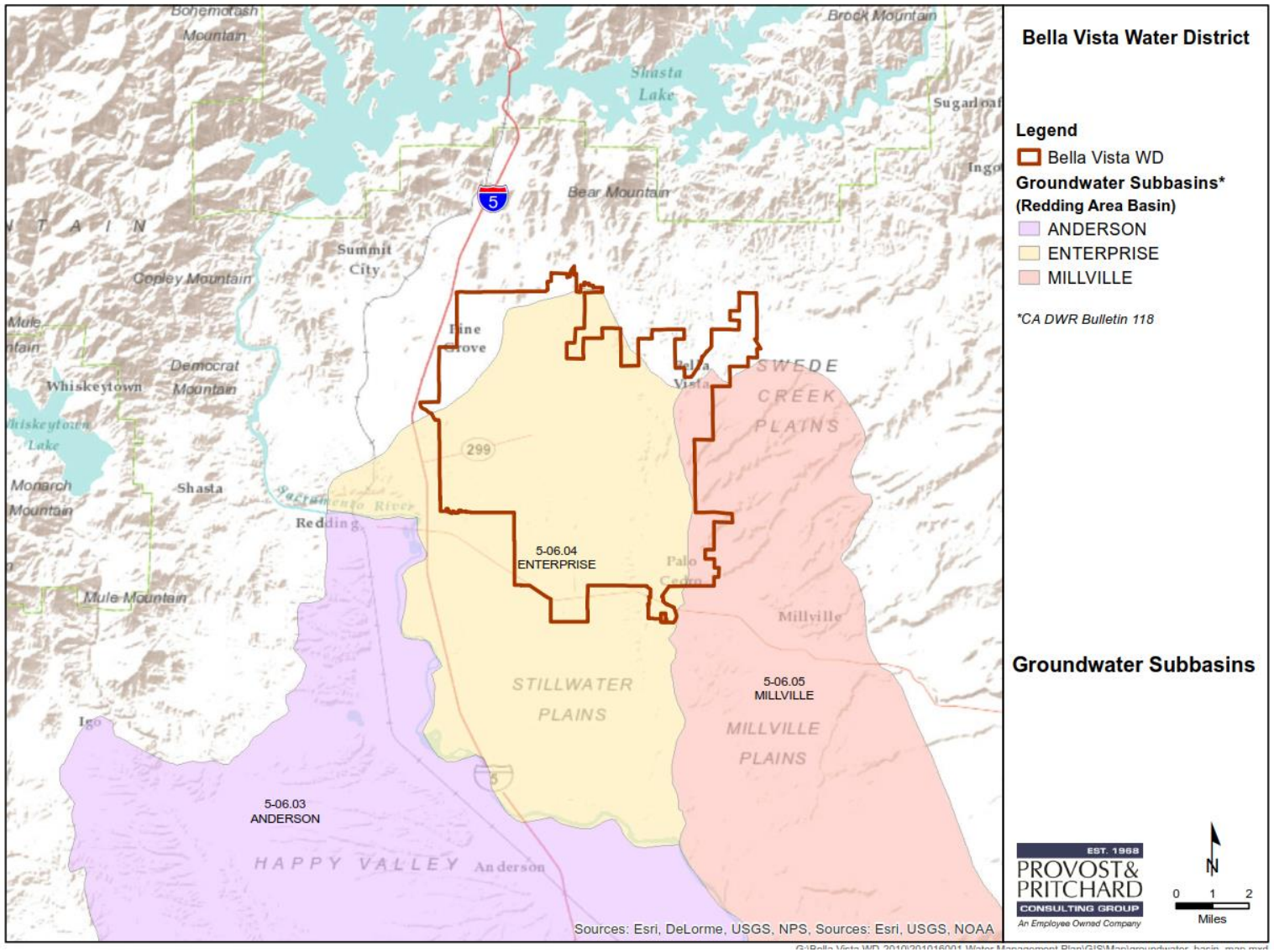


Figure 6-1: Groundwater Basin Map

6.2.4 Basin Priority

Legal Requirements:

CWC 10631
(b)(4)(B) . For a basin that has not been adjudicated, information as to whether the department has identified the basin as a high- or medium-priority basin in the most current official departmental bulletin that characterizes the condition of the groundwater basin

The Redding Basin and the Enterprise Subbasin have not been adjudicated. The California Statewide Groundwater Elevation Monitoring (CASGEM) Program considers the Enterprise Subbasin as a medium priority basin[4]. According to Bulletin 118, groundwater levels in the Enterprise Subbasin fluctuate seasonally approximately 5 to 10 feet and, for the semi-confined wells, between 10 to 15 feet for normal and dry years.

Measurements of groundwater have shown levels start dropping in early spring and continue to decline through the summer until early September. Maximum levels are usually reached by February. Overall, there does not appear to be any increasing or decreasing trends in groundwater levels and over the long-term levels have remained steady. There are seasonal fluctuations, as mentioned above, and there are some fluctuations caused by climatic patterns, but overall levels have not changed significantly between 1998 and 2018 (CalGW Update 2020 - Mann-Kendall GW Level Trends (1998-2018)).

6.2.5 Historical Pumping

Legal Requirements:

CWC 10631
(b)(4) If groundwater is identified as an existing or planned source of water available to the supplier, all of the following information shall be included in the plan:
(C) A detailed description and analysis of the location, amount, and sufficiency of groundwater pumped by the urban water supplier for the past five years. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic use records.

The District currently has five active groundwater wells located along the southern boundary of the District (refer to **Figure 3-1**). The District's groundwater production is metered at each of its wells. **Table 6-2** presents the volume of potable water pumped each year between 2016 and 2020 from the District's wells.

Groundwater levels in the Redding Basin fluctuate seasonally in response to the quantities of discharge from, and recharge to, the groundwater basin that occurs in a particular year. The primary source of groundwater discharge from the aquifer is groundwater pumping, along with a small

[4] http://www.water.ca.gov/groundwater/casgem/prioritymap.cfm

quantity of subsurface outflow from the basin, while the main sources of recharge are deep percolation of precipitation and applied water, along with leakage from surface streams.

The District monitors the water levels in its wells on a regular basis. The water levels wary seasonally with the water levels dropping by a few feet over the summer when demand on the groundwater basin is highest and recovering in the fall and winter as demand drops and recharge increases. **Table 6-1** shows the water levels (depth to water) in the District's wells over the past five years. The minimum well levels represent the pumping water levels in the respective wells while the maximum water levels represent (static) water levels when the wells are not running. Overall, both the pumping water levels and the static water levels in the District's wells have increased over the past five years.

Table 6-1: Well Water Levels (water surface elevation, in feet)

BVWD Well Water Levels 2016-2020						
		Well 1	Well 2	Well 3	Well 4	Well 6
2016	Min	360.5	371	364	415	343.5
	Max	432.5	428	415	417	435.5
2017	Min	372.5	377	348	415	351.5
	Max	434.5	430	418	429	436.5
2018	Min	366.5	379	349	430	349.5
	Max	433.5	430	414	435	436.5
2019	Min	370.5	387	370	418	369.5
	Max	438.5	433	418	441	440.5
2020	Min	369.5	386	368	418	376.5
	Max	439.5	434	415	440	440.5

The variation in quantity pumped over the past five years is due to differences in the operation and maintenance requirements for the District's water system. Operation of these wells during this period has been limited to periods when surface source water (CVP water) turbidity exceeds economically feasible treatment parameters, periods when either the Wintu Pump Station or the District's Water Treatment Plant have been down for maintenance and/or construction, and during power outages affecting the Wintu Pump Station.

The five wells in service can produce 2,800 to 4,000 acre-feet (AF) of water annually combined. The combined maximum capacity of the wells is approximately 3,500 gallons per minute (GPM), or about 5 million gallons per day (MGD). However, the wells can only be utilized about 50 to 75 percent of the time due to operational constraints. Pumping and treating the well water is 1.5 to 2 times more expensive than CVP water.

The District controls monthly operation and maintenance cost by utilizing the wells on an as-needed basis, typically during the winter when river turbidity is high and District-wide water demand drops to approximately 3 to 4 MGD. The wells can also be used during droughts when surface water supplies are limited. The well capacity is greater than what has been historically

needed during the winter when irrigation demands are minimal. However, due to the variable operation of the wells the volume projected to be pumped each year cannot be estimated.

Table 6-2: Groundwater – Volume Pumped

Basin	Well Number	2016	2017	2018	2019	2020
Redding Area Groundwater Basin Enterprise Sub-basin	1	74	33	30	50	33
	2	183	201	134	39	57
	3	15	34	107	11	36
	4	71	95	78	12	23
	6	231	215	118	62	72
Totals		574	579	467	174	222

Units : AF
No safe yield has been established for the Redding Area Groundwater Basin, but groundwater modeling as part of the Coordinated AB 3030 Groundwater Management Plan indicates that the Redding Area Groundwater Basin is resilient to severe drought conditions and is able to recover with one year of normal rainfall. (Source: Shasta County Water Agency)

6.2.6 Groundwater Recharge, Storage, and Banking

In 2015, the District performed a pilot study for aquifer storage and recovery (ASR). ASR involves injection of water down a well for temporary storage, and recovery of the water using the same well, and/or other nearby wells, when the water is needed. ASR can provide an opportunity for temporary storage of surface water supplies underground. ASR can be useful for the District's surface water supply, which often is only available during certain periods with quantities that exceed demand; hence short-term storage is needed.

The ASR study performed by Lawrence & Associates ran for 25 days, from March 5 until March 31, 2015. An average of 585 gallons per minute (GPM) was pumped into Well #2 while BVWD staff monitored the pumping rate, depth to water (DTW), electrical conductance (EC) in Wells # 2, 1, and 6. Water was then withdrawn from April 1, 2015, to April 30, 2015, while pumping rate, DTW, and EC were monitored.

Transmissivity and hydraulic conductivity of the aquifer were calculated as 34,450 gallons per day per foot and 26 feet/day respectively. The District was also able to project water level increases with continued water injection to be approximately 45 feet. Estimates of aquifer storage coefficients and interference of infection on other wells with respect to distance from the injection site were also calculated. Results of the ASR test were documented in a 2015 report entitled "*Results of the Aquifer Storage & Recovery Pilot Test on BVWD Well #2, Shasta County CA,*".

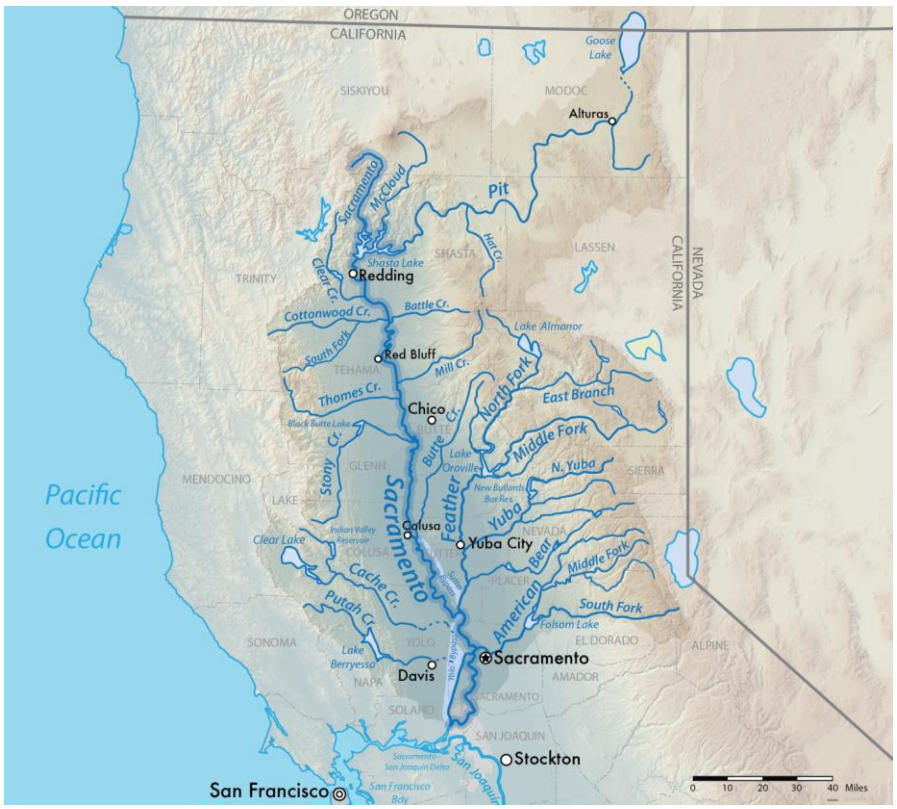
The study demonstrated that ASR was feasible; however, since the District's wells are up gradient from the majority of the Enterprise Sub-Basin and there are numerous other public and private wells drawing from the basin, long-term storage of water in the aquifer was determined not to be practical for the District.

6.3 Surface Water

The District depends mostly on surface water from the Sacramento River. BVWD maintains water contracts as described in **Section 6.1 – Purchased/Imported Water**. Reclamation's Central Valley Project water and ACID transfer water are both diverted from the Sacramento River. The Sacramento River originates in the mountains and northern California (see **Figure 6-2**). Three major waterways flow into Shasta Lake: the Upper Sacramento, McCloud, and Pit Rivers.

The Shasta Dam, on the Sacramento River near Redding, California, serves to control floodwaters and store surplus winter runoff for irrigation in the Sacramento and San Joaquin Valleys, maintain navigation flows, provide flows for the conservation of fish in the Sacramento River, water for municipal and industrial use, among other uses. The Shasta Dam is the second largest dam in mass in the United States. The dam is 602 feet high, with a crest length of 3,460 feet. It is 883 feet thick at the bottom and 30 feet thick at the top.

The Sacramento River flows 382 miles (615 km) south-southwest between the Cascade and Sierra Nevada ranges, through the northern section (Sacramento Valley) of the Central Valley. It forms a common delta with the San Joaquin River before entering the northern arm of San Francisco Bay. Total drainage area is about 27,100 square miles; average annual runoff is 22 million acre-feet.



https://commons.wikimedia.org/w/index.php?curid=46977072

Figure 6-2: Sacramento River Basin

6.4 Conjunctive Use

Conjunctive use of groundwater and surface water is vital to optimize the water demand/supply balance within the District during dry years. Conjunctive use can include storing surface water in a groundwater basin during wet years followed by retrieval in dry years, or short-term storage during a period of surplus, which is possible with Aquifer Storage and Recovery (ASR). Historically, BVWD has not performed conjunctive use and long-term storage in the Enterprise sub-basin is not practical for the District due to the numerous public and private wells that also draw water from the basin.

6.5 Stormwater

Bella Vista Water District does not manage stormwater in their service area. Outside the Redding City limits rainwater runoff is allowed to percolate into the ground and flow into local waterways. Within the City limits, the Redding Public Works Department[5] manages storm drains and storm water retention.

6.6 Wastewater and Recycled Water

The UWMPA requires that the UWMP address the opportunities for development of recycled water, including the description of existing recycled water applications, quantities of wastewater currently being treated to recycled water standards, limitations on the use of available recycled water, an estimate of projected recycled water use, the feasibility of said projected uses, and practices to encourage the use of recycled water.

6.6.1 Recycled Water Coordination

Legal Requirements:

CWC 10633
The plan shall provide, to the extent available, information on recycled water and its potential for use as a water source in the service area of the urban water supplier. The preparation of the plan shall be coordinated with local water, wastewater, groundwater, and planning agencies that operate within the supplier's service area.

Recycled water opportunities are very limited within the District. The only municipal wastewater treatment plant (WWTP) in proximity to the District is the City of Shasta Lake's WWTP. The District has cooperated with the City of Shasta Lake in exploring the potential and feasibility of conveyance of treated wastewater to landscape irrigation customers within the District. However, absent significant grant funding for the construction of the necessary infrastructure, including recycled water transmission and distribution system facilities, the project was determined not economically feasible.

[5] http://www.cityofredding.org/departments/public-works/public-works-utilities/storm-drain-utility

The District does not currently have any recycled water opportunities identified for the future. If recycled water opportunities occur in the future, the District would develop methods to encourage recycled water use.

6.6.2 Wastewater Collection, Treatment, and Disposal

Legal Requirements:

CWC 10633
(a) (Describe) the wastewater collection and treatment systems in the supplier's service area, including a quantification of the amount of wastewater collected and treated and the methods of wastewater disposal.
(b) (Describe) the quantity of treated wastewater that meets recycled water standards, is being discharged, and is otherwise available for use in a recycled water project.

The domestic wastewater generated within the Redding city limits is collected and treated by the City of Redding at their centralized Stillwater Treatment Plant located well outside of the District. The wastewater generated in the remaining portions of the District is treated primarily with septic systems with a portion going to Shasta County's CSA#8 Palo Cedro Sewage Disposal System. Wastewater generated at Shasta College goes to their on-site treatment ponds with some of the water being used for on-site irrigation. **Table 6-2** summarizes the collection and treatment systems servicing the District lands.

BVWD calculated the total wastewater collected from the service area to be 888 AF for 2020. The quantity of wastewater collected within the District's service area in 2020 is based on estimates provided by the City of Redding - Department of Public Works - Wastewater Utility; Shasta County Department of Public Works; and Shasta College - Physical Plant Department. This value does not include the volume of wastewater treated through private septic systems.

Table 6-3: Wastewater Collected within Service Area in 2020

Submittal Table 6-2 Retail: Wastewater Collected Within Service Area in 2020						
☐	There is no wastewater collection system. The supplier will not complete the table below.					
	Percentage of 2020 service area covered by wastewater collection system (optional)					
	Percentage of 2020 service area population covered by wastewater collection system (optional)					
Wastewater Collection			**Recipient of Collected Wastewater**			
Name of Wastewater Collection Agency	Wastewater Volume Metered or Estimated? *Drop Down List*	Volume of Wastewater Collected from UWMP Service Area 2020 *	Name of Wastewater Treatment Agency Receiving Collected Wastewater	Treatment Plant Name	Is WWTP Located Within UWMP Area? *Drop Down List*	Is WWTP Operation Contracted to a Third Party? *(optional)* *Drop Down List*
City of Redding	Estimated	833	City of Redding	Stillwater Wastewater Treatment Plant	No	No
Shasta County CSA#8	Estimated	22	Shasta County CSA#8	Palo Cedro Sewage Disposal System	No	No
Shasta College	Estimated	33	Shasta College	Shasta College Wastewater Treatment Facility	Yes	No
Total Wastewater Collected from Service Area in 2020:		888				
**** Units of measure: AF***						
NOTES: The majority of the District's service area is not served by sewage collections systems. Developed properties not within the areas served by the sewage collection systems listed above have their own on-site septic tank and leach field disposal systems.						

In 2020, there was no treated wastewater meeting recycled water standards being discharged or otherwise available for use in a recycled water project within the District's service area.

6.6.3 Recycled Water Systems

Legal Requirements:

CWC 10633
(c) (Describe) the recycled water currently being used in the supplier's service area, including, but not limited to, the type, place, and quantity of use.

There is no recycled wastewater currently being used within the District's service area.

However, the District does capture and recycle process water (i.e., filter backwash effluent and rinse-to-waste) produced at their Water Treatment Plant (WTP). The District completed the construction of a recycle pump station in 2011. Since that time, the District no longer releases process water from its settling ponds into Dry Gulch, Churn Creek and ultimately into the Sacramento River. Currently, the recycling facility returns the supernatant from the backwash settling ponds to the headworks of the plant, where it is combined with influent raw water for treatment.

This water recycling at the WTP reduces the amount of water that the District diverts from the Sacramento River or pumps from groundwater wells and provides a reliable source of much needed water during shortages. Between 2016 and 2020, the WTP recycled an average of approximately 500 acre-feet annually. This represents approximately 5.3 percent of what was pumped from the Sacramento River over the same period. The recycled process water flows from 2016 to 2020 are shown in the table below.

Table 6-4: Recycled Process Water Flows

Recycled Pump Station Flows		
Year	Flows	
	MG	AF
2016	124.5	383.6
2017	178.4	549.7
2018	140.5	432.9
2019	173.2	533.7
2020	185.5	571.6
Averages	160.4	494.3

The amount of process water that is recycled is not included in the water supply summary, as it recaptures water that was diverted from the Sacramento River and is not considered a source of additional water.

6.6.4 Recycled Water Beneficial Uses

Legal Requirements:

CWC 10633
(d) (Describe and quantify) the potential uses of recycled water, including, but not limited to, agricultural irrigation, landscape irrigation, wildlife habitat enhancement, wetlands, industrial reuse, groundwater recharge, indirect potable reuse, and other appropriate uses, and a determination with regard to the technical and economic feasibility of serving those uses .
(e) (Describe) the projected use of recycled water within the supplier's service area at the end of 5, 10, 15 and 20 years…and the projected use of recycled water within the supplier's service area at the end of 5, 10, 15, and 20 years, and a description of the actual use of recycled water in comparison to uses previously projected pursuant to this subdivision.

The District has previously performed joint studies with the City of Shasta Lake regarding the feasibility of using recycled wastewater for landscape irrigation; however, it was determined not to be feasible. At present, the District does not anticipate that any recycled municipal wastewater will be available for use within its service area over the next 20 to 25 years.

6.6.5 Actions to Encourage and Optimize Future Recycled Water Use

Legal Requirements:

CWC 10633
(f) (Describe the) actions, including financial incentives, which may be taken to encourage the use of recycled water, and the projected results of these actions in terms of acre- feet of recycled water used per year.
(g) (Provide a) plan for optimizing the use of recycled water in the supplier's service area, including actions to facilitate the installation of dual distribution systems, to promote recirculating uses, to facilitate the increased use of treated wastewater that meets recycled water standards, and to overcome any obstacles to achieving that increased use.

There is no recycled water currently available for use anywhere within the District's service area. Therefore, there are no actions that can be taken by the District to encourage the use of recycled water.

6.7 Desalinated Water Opportunities

Legal Requirements:

CWC 10631
(g) Describe the opportunities for development of desalinated water, including, but not limited to, ocean water, brackish water, and groundwater, as a long-term supply.

At the present time, the District does not foresee any opportunities for the use of desalinated water, including ocean water, brackish water, and brackish groundwater, as a long-term supply.

6.7.1 Brackish Water and/or Groundwater Desalination

Brackish water in the "Chico Formation" underlies portions of the District including below portions of the Redding Area Groundwater Basin. However, since previous studies have indicated that suitable groundwater supplies exist within portions of the District's service area, the development of brackish groundwater supplies is not anticipated in the next 25 years. Should desalination of brackish groundwater become logistically and economically feasible in the future, the District may consider this option.

6.7.2 Seawater Desalination

Due to the geographic location of the District, desalination of seawater for use by the District is not practical or economically feasible.

6.8 Exchanges or Transfers

Legal Requirements:

CWC 10631
(c) Describe the opportunities for exchanges or transfers of water on a short-term or long-term basis.

Reclamation's Mid-Pacific Region facilitates transfers of both CVP and non-CVP water. The transfer of CVP-water may occur as long as it is consistent with the transfer provisions set forth in §3405(a) of the Central Valley Project Improvement Act (CVPIA) (Title 34 of Public Law 102-575), and the transfer of non-CVP water is consistent with California State Law. The CVPIA authorizes all individuals or districts who receive CVP water under water service or repayment contracts, water rights settlement contracts, or exchange contracts to transfer, subject to certain terms and conditions, all or a portion of the water subject to such contract to any other California water users or water agency, State or Federal agency, Indian Tribe, or private non-profit organization for project purposes or any purpose recognized as beneficial under applicable State law. Non-CVP water transfers requiring the use of Federal facilities for conveyance and/or storage are supported through annual Warren Act contracts.

Water transfers are an important water management tool the District has utilized to augment supply to partially offset the impacts of reduced CVP allocations as a result of drought and regulatory requirements. The District has been a party to both short- and long-term water transfers as a transferee, receiving transferred water in shortage years and occasionally as a transferor in years when the District is unable to carryover or otherwise temporarily store any remaining CVP supply.

A list of recent water transfers is provided in **Table 6-5** followed by more detailed explanations. The District is also actively seeking other short-term and long-term water transfer opportunities to help improve their water reliability.

Table 6-5: Transfer and Exchanges

Transfer agency	Transfer Type	Term	Volume	Termination date
Anderson-Cottonwood ID[1]	IN	Long Term	1,152 - 1,800	2045
Anderson-Cottonwood ID	IN	Short Term	0 - 1,548	N/A
Colusa County WD	OUT	Short Term	Varies	2014
McConnell Purchase Agreement	IN	Short Term	Varies	N/A
City of Redding	IN	Long Term	0 - 500	Until Terminated
Total			Varies	Varies

Units : Acre-feet
1 – In 2021 the agreement was amended adding 264 AF to the annual volume bringing the maximum amount available to 1,800 AF and the amount in a shortage year to 1,350 AF.

6.8.1 Anderson-Cottonwood Irrigation District Transfer Agreement[6]

The District has a long-term transfer agreement with the ACID for 1,536 AFY of CVP water, subject to shortage curtailment. The agreement is effective from November 24, 2008, to February 28, 2045. ACID sells and transfers the water under its Sacramento River Settlement Contract (14-06-2000-3346A-R-1) for diversion of CVP water from the Sacramento River. This transfer is available to the District between April 1 and October 31. Shortage provisions for this Settlement Contract state: "*In a Critical Year, the Contractor's Base Supply and Project Water agreed to be diverted during the period April through October of the Year in which the principal portion of the Critical Year occurs and, each monthly quantity of said period shall be reduced by 25 percent*."

6.8.2 Anderson-Cottonwood Irrigation District Short Term Transfers

In 2015, due to the drought and the extreme cutback in the District's CVP water allocation from Reclamation, the District executed a short-term water transfer agreement with ACID for approximately 1,550 acre-feet of water to provide water to the District's agricultural customers under its Supplemental Water Program. The availability of this water in the future is uncertain.

6.8.3 McConnell Foundation Purchase Agreements

The McConnell Foundation has a Contract with Reclamation to receive 5,100 AF of CVP water each year, without any shortage provisions. The District purchased 100 AF of water from the McConnell Foundation in 2016. In non-shortage years, the District has ample water supplies to meet its projected needs. Therefore, the District does not have a need to secure additional supplies of water from the McConnell Foundation in non-shortage years. However, when Reclamation's allocations to the District are severely reduced the District may enter into short-term agreements to purchase water from the McConnell Foundation in the future if needed to supplement its supply.

[6] The agreement was amended in 2021 adding 264 AF to the annual transfer quantity, bringing the maximum amount available to 1,800 AF and the amount in a shortage year to 1,350 AF

6.8.4 Colusa County WD

For many years, the District has requested, and Reclamation has denied, the carryover or "rescheduling" of conserved CVP project supply from one year to the next, despite a specific contract provision that allows for rescheduling subject to USBR's approval. Absent a rescheduling program option, the District has historically entered into short-term water transfer agreements to transfer water to other CVP Contractors in years the District has a temporarily surplus CVP supply that would have otherwise gone unutilized and forfeited at the end of the water year. To ensure the water is beneficially utilized, and to assist other CVP water agencies under a supply shortage, the District has historically entered into temporary (1 year) water transfer agreements with other North of Delta Water Service Contractors, including Colusa County Water District.

6.8.5 Emergency Use Interties

The District has interties with the City of Redding, the City of Shasta Lake, Palo Cedro CSA 8, and Mountain Gate Community Services District (CSD). The interties with the cities of Redding and Shasta Lake can operate in either direction; however, the District can deliver, but not receive water through the interties with the Mountain Gate CSD and Palo Cedro CSA#8. All of the interties are restricted contractually for emergency use and physically by pressure and flow rate. All the interties require manual activation, with the exception of the District's incoming intertie with the City of Redding at the Quail Ridge Pump Station, which will open automatically if the water pressure on the District side drops below a set value. Pumping is also required for water deliveries from the District to the City of Shasta Lake and Mountain Gate CSD through the respective interties.

6.9 Future Water Projects

Legal Requirements:

CWC 10631

(f) …The urban water supplier shall include a detailed description of expected future projects and programs that the urban water supplier may implement to increase the amount of the water supply available to the urban water supplier in normal and single-dry water years and for a period of drought lasting five consecutive water years. The description shall identify specific projects and include a description of the increase in water supply that is expected to be available from each project. The description shall include an estimate with regard to the implementation timeline for each project or program.

The District prepared a Master Plan in 2005 that includes detailed list of proposed improvements (see Table ES-1 in Master Plan).

In 1990, Lawrence and Associates prepared a report entitled *Feasibility Study for the Expansion of Groundwater Supplies for the Bella Vista Water District*. The development of groundwater supplies of up to 12.2 MGD was determined to be feasible. The District's 2005 Master Plan recommended the drilling of one additional well within the 10-year planning horizon of the Master Plan and additional wells beyond the 10-year planning horizon.

In early 2021, the District adopted a Drought Contingency Plan that identified several projects that the District could implement to increase the amount of water supplies available to the District in normal as well as drought years.

The projects identified included one or more new wells and the construction of additional treated water storage to maximize the amount of water that could be supplied by the District's existing and new wells. Each new well could increase the District's water supplies by approximately 1,000 acre-feet per year. The estimated implementation time for a new well is three to five years. Construction of the new treated water storage tank is also estimated to take three to five years.

See **Table 6-6** for a list of future water projects.

Table 6-6: Future Water Supply Projects

Name of Future Projects or Programs	Joint Project with other suppliers?	Description	Planned Implementation Year	Planned for Use in Year Type	Expected Increase in Water Supply to Supplier*
Groundwater Wells 7 and 8	No	Construction of additional groundwater wells including iron and manganese treatment and chlorination	Within the next 5 to 10 years	All Year Types	Approximately 1,000 AF per new well

6.10 Summary of Existing and Planned Sources of Water

Legal Requirements

CWC 10631
(b) Identify and quantify, to the extent practicable, the existing and planned sources of water available to the supplier over the same five-year increments described in subdivision (a), providing supporting and related information…, including all of the following:
(1) A detailed discussion of anticipated supply availability under a normal water year, single dry year, and droughts lasting at least five years, as well as more frequent and severe periods of drought, as described in the drought risk assessment. For each source of water supply, consider any information pertinent to the reliability analysis conducted pursuant to Section 10635, including changes in supply due to climate change.

The primary water source for the Bella Vista Water District has historically been the Central Valley Project, but due to uncertain water supply and perhaps chronic shortages due to regulatory constraints that have revised CVP operations, reduced CVP yield, and supply allocation, they are seeking alternative water sources to augment supply. BVWD has a contract with Reclamation that allows deliveries to the District of up to 24,578 AF of water annually. They also have a contract with Anderson-Cotton Irrigation District to supply an additional 1,536 AF of water annually.

In a normal year, the quantity of water from these three sources is more than adequate to meet the District's water demands for the next 25 years.

In 2020, the District supplies were primarily from its CVP and ACID Long-Term Transfer contracts supplemented by its groundwater well supplies to facilitate maintenance on pumping and treatment facilities. **Table 6-7** includes a summary of water sources for 2020.

Table 6-7: Summary of 2020 Water Supplies

Water Supplies		2020		
Type	Additional Detail on Water Supply	Actual Volume*	Water Quality	Total Right or Safe Yield* (optional)
Surface water (not desalinated)	CVP Water Service Contract supply pumped from the Sacramento River	9,510	Drinking Water	
Surface water (not desalinated)	ACID Long-term transfer supply pumped from the Sacramento River	1,536	Drinking Water	
Groundwater (not desalinated)	Wells are located in the Enterprise Sub-basin of the Redding Groundwater Basis	222	Drinking Water	
	Total	11,268		0

The District has five (5) groundwater wells that averaged 399 AF of annual water yield from 2016 through 2020 with the maximum production of 579 AF in 2017. Groundwater production was down substantially from the 1,535 AF that were produced in 2015 (a severe drought year). Groundwater is utilized as a supplemental source of water rather than a long-term water supply. The wells can produce approximately 5 MGD (15.3 AF/day). It is estimated that at 75% utilization (allowing for well maintenance, equipment failures, reduced output if the wells are run for an extended amount of time, and low demands during the fall and winter months) the wells could produce an average of approximately 3,300 AF of water annually. The District has conducted several studies regarding water supply sources. These include studies to construct additional wells for groundwater utilization, and aquifer storage and recovery (the injection of surface water into existing wells for later use).

Table 6-8 (UWMP Table 6-9) includes a summary of anticipated water sources for 2025 to 2045. The values in this table are for an average, or typical, year.

Table 6-8: Projected Water Supplies (2025-2045)

Submittal Table 6-9 Retail: Water Supplies — Projected											
Water Supply	Additional Detail on Water Supply	Projected Water Supply * Report To the Extent Practicable									
		2025		2030		2035		2040		2045 (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)
Surface water (not desalinated)	CVP Water Service Contract supply pumped from the Sacramento River	18,700	24,578	18,700	24,578	18,700	24,578	18,700	24,578	18,700	24,578
Surface water (not desalinated)	ACID Long-term transfer supply pumped from the Sacramento River	1,459	1,536	1,459	1,536	1,459	1,536	1,459	1,536	1,459	1,536
Groundwater (not desalinated)	Wells are located in the Enterprise Sub-basin of the Redding Groundwater Basis	4,315		5,315		5,315		5,315		5,315	
	Total	24,474	26,114	25,474	26,114	25,474	26,114	25,474	26,114	25,474	26,114
NOTES: Reasonably available volume for the CVP and ACID Long-term Transfer supplies is based on the average supplies available over the past 10 years (2011-2020). Reasonably available volume for the Well supply is based on the construction of one new well by 2025 and a second new well by 2030. Short-term Transfers are not included in this table because they are typically only needed and utilized during shortage years.											

6.11 Summary Energy Consumption

Energy intensity is defined as the amount of energy used to collectively divert, store, convey, treat, and distribute each unit volume of water and herein is reported as kilowatt hours per acre-foot (kWh/AF). An analysis was performed for the reporting period of January 1, 2020, through December 31, 2020.

The District's surface water supply is pumped from the Sacramento River and treated using direct filtration without having to repump the water that enters the distribution system. At the Water Treatment plant, pumps are used to recycle backwash water and filter-to-waste flows. Pumps are also used to boost the water pressure for backwash water flows and for chemical feed and chemical injection. For the District's groundwater supplies, the well pumps are used to extract the water and deliver it into the distribution system at distribution system pressures. Chemical feed pumps are used at the wells to inject chlorine solution into the raw groundwater before it goes through pressure filters for iron and manganese removal. Pumps recycle all of the filter backwash water through the treatment process. Within the distribution system booster pump stations pump water from lower elevation pressures zones to higher elevation zones, pump water into storage tanks and, for some pressure zones, booster pumps maintain set water pressures within their associated pressure zone.

The facilities that use energy to extract and divert water are:

- The raw water pump station (the Wintu Pump Station), and
- Five groundwater wells that extract water, pump it through iron and manganese treatment facilities, and discharge it into the District’s distribution system.

The facilities that use energy to treat water include:

- A surface water treatment plant that includes a recycle pump station, and
- Five groundwater wells that extract water, pump it through iron and manganese treatment facilities, and discharge it into the District's distribution system. However, since the majority of the energy is used to extract the water and pump it into the distribution system, all of the energy used for the wells is included in the "extract and divert water" category.

The facilities that use energy within the distribution system include:

- Nine distribution system pump stations, four of which pump into storage tanks and five of which pump continuously to maintain set pressures within the portions of the distribution system that they serve, and
- Five water tanks including a 100,000-gallon surge tank between Wintu Pump Station and the Water Treatment Plant, and four treated water storage tanks ranging in size from 200,000 gallons to four million gallons.

Electrical service to the facilities is provided by three different utilities including:

- The Western Area Power Administration that serves the Wintu Pump Station,
- City of Redding Electric that serves the Surge Tank, the Water Treatment Plant and Recycle Pump Station, two wells, and two distributions system pump stations, and
- Pacific Gas & Electric that serves three wells, seven distribution system pump stations and four treated water storage tanks.

The energy intensity analysis is shown below in **Table 6-9.** The final calculated energy intensity is 558.0 kWh/AF.

Table 6-9: Energy Intensity

Energy Intensity (Year 2020)				
Description	Water Management Process			
	Extract and Divert	Treatment	Distribution	Total Utility
Volume of Water Entering Process (AF)	11,268	11,046	11,268	11,268
Energy Consumed (kWh)	4,959,356	214,108	1,114,562	6,288,026
Energy Intensity (kWh/AF)	440.1	19.4	98.9	558.0

Self-Generated Renewable Energy

The District has four solar power generating facilities that are used to offset their energy demands on the electrical grid. In 2020, the energy generated at the District's solar facilities totaled 1,257,804 kWh, offsetting approximately 95% of their treatment and distribution system energy usage or approximately 20% of their total electrical energy usage.

Data Quality Narrative

All energy usage numbers are based on actual electrical providers' meter readings. Most of the electrical meter readings fell on dates other than January 1st or December 31st. Electrical usage and generation at the beginning and end of the year was prorated based on the number of days that fell within calendar year 2020. Some of the self-generated renewable energy metering data for 2020 was missing due to metering equipment outages. Where data for self-generated power was missing, data for the same dates in 2019 were used to provide 366 days of generated data energy for 2020.

7 Water Supply Reliability

This section examines the reliability of the water supply available to the District. Two aspects of supply reliability are considered. The first relates to immediate service needs and is primarily a function of the availability and adequacy of the supply facilities. The second aspect is climate-related and involves the availability of water during mild or severe drought periods.

7.1 Constraints on Water Sources

Legal Requirements:

CWC 10635
(a) Every urban water supplier shall include, as part of its urban water management plan, an assessment of the reliability of its water service to its customers during normal, dry, and multiple dry water years. This water supply and demand assessment shall compare the total water supply sources available to the water supplier with the long-term total projected water use over the next 20 years, in five-year increments, for a normal water year, a single dry water year, and a drought lasting five consecutive water years.
CWC 10634
The plan shall include information, to the extent practicable, relating to the quality of existing sources of water available to the supplier over the same five-year increments as described in subdivision (a) of Section 10631, and the manner in which water quality affects water management strategies and supply reliability.

Water supply reliability is dependent on multiple factors. **Table 7-1** summarizes factors limiting water supply sources available to BVWD. Not every limiting factor is covered in depth, but limiting factors tend to indirectly overlap. For example, limitation quantifications may result from either legal or climactic factors. The same can be said for environmental limitations. Because constraints vary by source, it is important to know which factor will limit water availability and what source limits will entail.

7.1.1 CVP Water Availability

The District, as a water retailer that is predominantly reliant upon the Central Valley Project (CVP), is subject to significant water supply uncertainty and shortages due to dry hydrologic conditions, compounded by operational and regulatory constraints both directly and indirectly related to the Endangered Species Act. Much of the previously available yield from the CVP is no longer available to Water Service Contractors as a result of regulatory actions and court rulings that mandate reoperation and water releases for environmental purposes. This reallocation of water supply over the last couple of decades with no added storage to offset these impacts means the District is likely to experience shortages more frequently and more severely in the future. The water supply reliability goal of the District is to meet 100 percent of demand in normal years.

Table 7-1: Factors Resulting in Inconsistency of Supply

Water supply sources	Specific source name, if any	Limitation quantification	Legal	Environmental	Water quality	Climatic	Additional information
Water Service Contract with Reclamation	CVP	Note 1, 2	X	X	X	X	
Anderson-Cottonwood Irrigation District Sacramento River Settlement Contract	CVP	Note 1, 2	X	X	X	X	
Redding Area Groundwater Basin Enterprise Sub-basin	Groundwater	Note 2		X	X		

1 - Quantity dependent on Reclamation's allocations.
2 - Water quality factors include potential contaminants due to activities occurring near the source/watershed.

In normal years, there are no specific rules on how much of the CVP water must be allocated for M&I versus agriculture uses. However, during dry periods there is a specific water shortage policy that must be followed; this is discussed in the following section.

7.1.2 Central Valley Project Water Shortage Policy

As mentioned previously, the District serves residential, rural, commercial, and public/institutional customers as well as agricultural customers. The CVP places these uses into two categories: municipal and industrial (M&I) and agricultural. The CVP M&I Water Shortage Policy[7] was developed by Reclamation to:

(1) Define water shortage terms and conditions applicable to all CVP M&I contractors, as appropriate,
(2) Establish CVP water supply levels that would sustain urban areas during droughts, and during severe or continuing droughts would assist the M&I contractors in their efforts to protect public health and safety, and
(3) Provide information to M&I contractors for development of drought contingency plans.

The M&I water supply shortage for the District is the difference between total M&I demands and the sum of the reduced CVP allocation and additional secure sources of supply for M&I purposes. In a severe water supply shortage (including a "Water Shortage Emergency" declared by the

7 https://www.usbr.gov/mp/nepa/documentShow.cfm?Doc_ID=22958

governor of the state of California), Reclamation could reduce CVP water deliveries to the District to a public health and safety water supply level, providing CVP water is available. In such an emergency, the combination of the District's CVP allocation and groundwater supply will be sufficient to satisfy human consumption, sanitation, and fire protection requirements in accordance with Water Code Section 350 et seq.

USBR's M&I Water Shortage Policy provides for a minimum allocation of 75 percent of adjusted historical use until agricultural allocations fall below 25 percent. If agricultural allocations fall below 25 percent, M&I allocations are further reduced; when agricultural allocations are reduced to zero, M&I allocations can be reduced to 50 percent or less including a public health and safety allocation of 55 gallons per capita per day (CVP and SWP Drought Contingency Plan, Reclamation et al, 2015). In 2015, the initial allocation was zero percent (0 percent) for agriculture and 25 percent of the historical M&I use over the last three unconstrained years (a reduction of 75 percent).

The 2015 update to the Policy does not guarantee delivery of CVP water to meet any unmet Public Health and Safety (PHS) needs. Rather, the unmet PHS needs identified would be a target that Reclamation would try to meet subject to the availability of CVP water. Reclamation expects water service contractors, at their discretion, to use CVP water in conjunction with their other non-CVP supplies to meet demand during all years, including years when a Condition of Shortage exists. This is the highest concern BVWD has concerning the new changes. There is no guarantee of PHS water, and BVWD has very limited supplemental sources to meet PHS demands in successive dry years.

7.1.3 Transfer Water Available

On April 13, 2009, BVWD adopted a Supplemental Water Program (Resolution 09-02) which provides the District's agricultural water customers, who bear a disproportionate share of curtailment in shortage years, the option of having the District obtain supplemental supply on an individual subscription basis on their behalf. It is anticipated that shortage year subscriptions for agricultural water will be supplied through CVP water transfers into the District pursuant to Section 3405(a) of Public Law 102-575, Title 34, of the Central Valley Project Improvement Act (CVPIA).

The need for the transfer arises from shortages caused by a relatively inelastic demand and potential future reduced CVP allocations due to natural changes in hydrology and regulatory induced shortages. The BVWD has a long-term transfer agreement with Anderson-Cotton Irrigation District (ACID). This agreement provides 1,536 AF of water to the District. This water is subject to critical year type shortage provisions and can be reduced if necessary. The District also has emergency interties with the City of Redding and the City of Shasta Lake that can provide water to the District in case of short-term emergencies.

7.1.4 Water Quality

The District's water sources include surface water from the Sacramento River and groundwater from the Enterprise sub-basin of the Redding Groundwater Basin. The water qualities of both sources are vulnerable to activities occurring near the source and in the watershed.

The river is most vulnerable to the following activities associated with contaminants detected in the water supply: metal plating/finishing/fabricating, wood/pulp/paper processing and mills, and drinking water plants. The river is also considered most vulnerable to the following activities not associated with any detected contaminants: concentrated aquatic animal production facilities, historic waste dumps/landfills, landfills/dumps, historic mining operations, and wastewater treatment plants and disposal facilities above Shasta Dam.

The District's groundwater sources are considered most vulnerable to the following activities not associated with any detected contaminants: lumber processing and manufacturing, septic systems, sewer collection systems, historic waste dumps/landfills, automobile-gas stations, and utility stations-maintenance areas (FWMP, 2012).

Water quality does not have a significant effect on water management strategies or reliability due to the good quality of the surface water and groundwater supplies. Because of the nature of the potential water quality impacts described above, no future unaddressed impacts have been identified and the potential quantitative impacts cannot be established. The District's drinking water meets all applicable water quality regulations (See **Appendix K** for a copy of the District's 2020 Consumer Confidence Report).

7.2 Reliability by Type of Year

Legal Requirements:

CWC 10631
(b) Identify and quantify, to the extent practicable, the existing and planned sources of water available to the supplier over the same five-year increments described in subdivision (a), providing supporting and related information, including …

(1) A detailed discussion of anticipated supply availability under a normal water year, single dry year, and droughts lasting at least five years, as well as more frequent and severe periods of drought, as described in the drought risk assessment. For each source of water supply, consider any information pertinent to the reliability analysis conducted pursuant to Section 10635, including changes in supply due to climate change.

This section considers the District's water supply reliability during three water scenarios: average (normal) year, single-dry year, and droughts lasting at least five years. Historical curtailments in the District's supply have occurred during drought years. During recent droughts, CVP allocations have been substantially reduced from those associated with droughts in the 1970s to 1990s due to the reallocation increased of CVP supplies for environmental purposes.

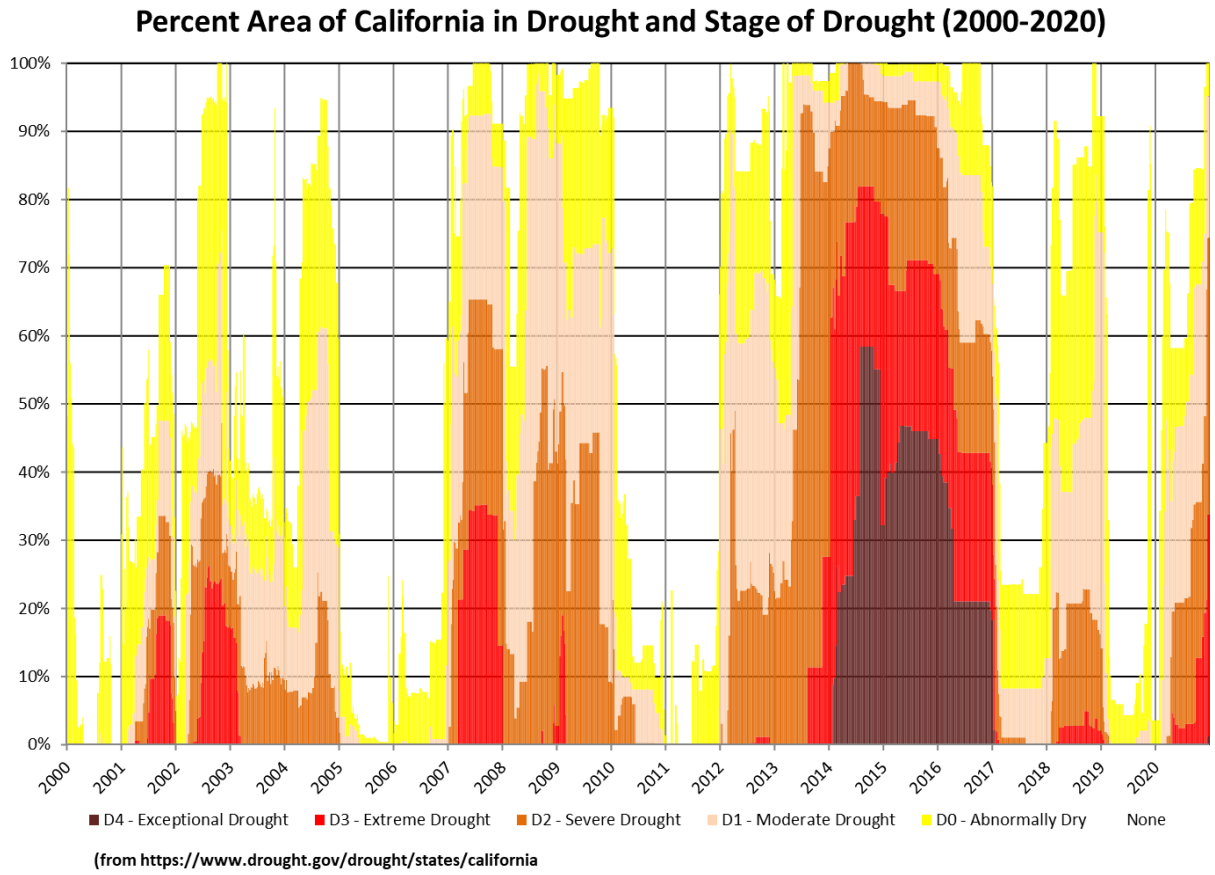


Figure 7-1: California Droughts (2000-2020)

BVWD service area experienced droughts from 1985 to 1992, from 2007 to 2010, and again from 2012 to the end of 2016. **Figure 7-1** shows the percentages of California that were in various stages of drought from 2000 through 2020. The specific years identified for normal year, single-dry year, and droughts lasting at least five years presented in **Table 7-2** were developed based on historical hydrology and surface water allocations.

The impact of a single dry year typically does not result in cutbacks in the District's CVP water allocations due to carryover storage within the CVP's reservoirs; however, the cumulative impact of the multiple-dry years has resulted in significant reductions the District's CVP contract allocations. The District's allocations are based on CVP allocations for "North-of-Delta." The amount of water available under the District's long-term transfer agreement with ACID is based on the "North-of-Delta" allocations for settlement contractors. The historical "North-of-Delta" CVP allocations for M&I, Irrigation, and Settlement Contractors are shown in **Figure 7-2**.

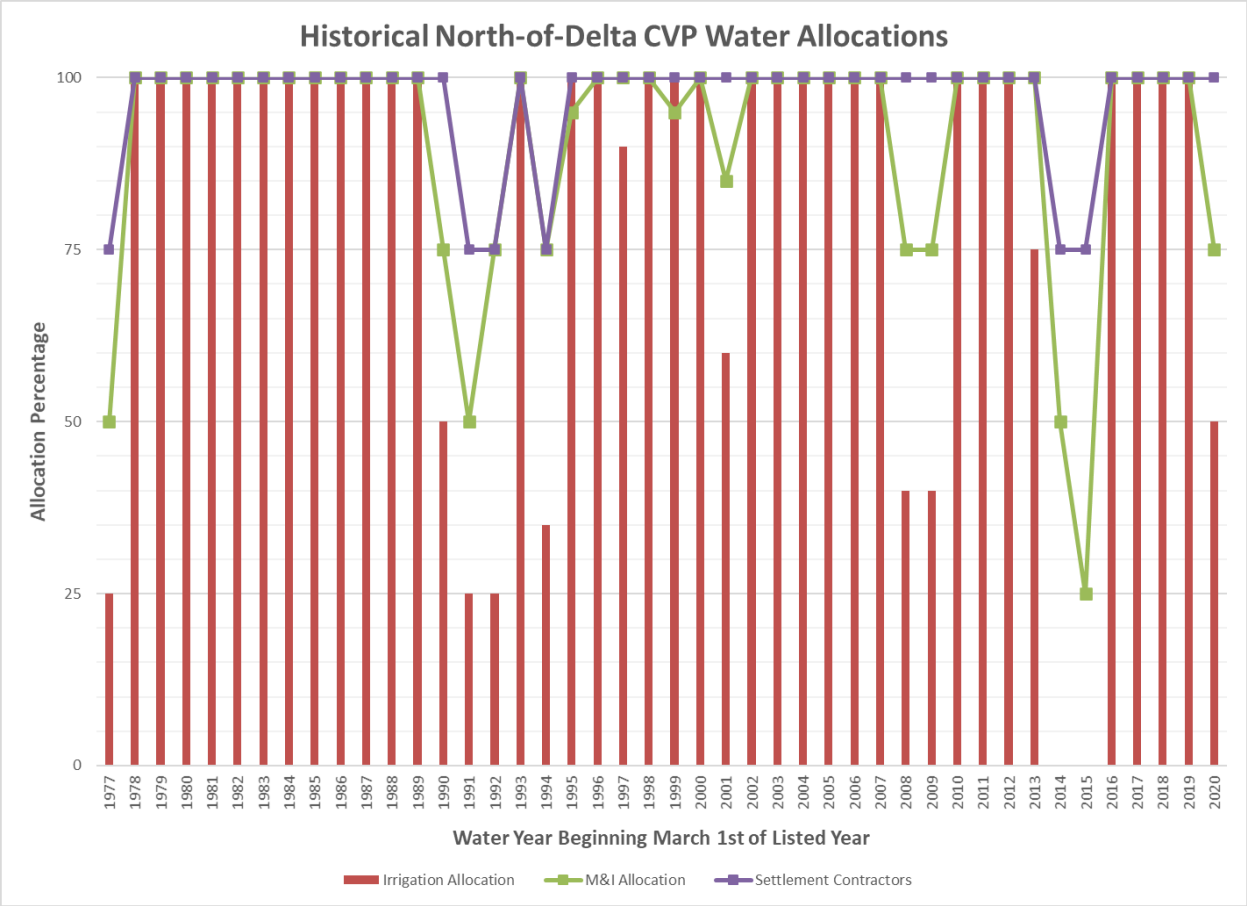


Figure 7-2: Historical North-of-Delta CVP Water Allocation Percentages

The District's CVP supply is both the largest and the most unreliable of its water supplies, changing significantly based on hydrologic conditions. This presents water management challenges, since the CVP is the District's largest water source. Under Reclamation's CVP M&I Water Shortage Policy-guidelines, the District's allocation under its contract with Reclamation is based on historical M&I water usage as well as its total contract amount. Using recent historical use of approximately 7,000 AF annually, **Table 7-2** shows how the allocation percentages shown in **Figure 7-2** translate into the quantity of water that the District is allowed to divert in a given year.

Table 7-2: CVP Allocations based on 7,000 AF of Historical M&I Usage

BVWD CVP Allocations						
Year	Irrigation Allocation	M&I Allocation	M&I Allocation per CVP	CVP Contract Allocation		Total CVP Water
				At Full Supply	Remainder of Contract @ Irrigation Allocation	
1977	25	50	3,500	-	4,395	7,895
1978	100	100	-	24,578	-	24,578
1979	100	100	-	24,578	-	24,578
1980	100	100	-	24,578	-	24,578
1981	100	100	-	24,578	-	24,578
1982	100	100	-	24,578	-	24,578
1983	100	100	-	24,578	-	24,578
1984	100	100	-	24,578	-	24,578
1985	100	100	-	24,578	-	24,578
1986	100	100	-	24,578	-	24,578
1987	100	100	-	24,578	-	24,578
1988	100	100	-	24,578	-	24,578
1989	100	100	-	24,578	-	24,578
1990	50	75	5,250	-	8,789	14,039
1991	25	50	3,500	-	4,395	7,895
1992	25	75	5,250	-	4,395	9,645
1993	100	100	-	24,578	-	24,578
1994	35	75	5,250	-	6,152	11,402
1995	100	95	-	24,578	-	24,578
1996	100	100	-	24,578	-	24,578
1997	90	100	7,000	-	15,820	22,820
1998	100	100	-	24,578	-	24,578
1999	100	95	-	24,578	-	24,578
2000	100	100	-	24,578	-	24,578
2001	60	85	5,950	-	10,547	16,497
2002	100	100	-	24,578	-	24,578
2003	100	100	-	24,578	-	24,578
2004	100	100	-	24,578	-	24,578
2005	100	100	-	24,578	-	24,578
2006	100	100	-	24,578	-	24,578
2007	100	100	-	24,578	-	24,578
2008	40	75	5,250	-	7,031	12,281
2009	40	75	5,250	-	7,031	12,281
2010	100	100	-	24,578	-	24,578
2011	100	100	-	24,578	-	24,578
2012	100	100	-	24,578	-	24,578
2013	75	100	7,000	-	13,184	20,184
2014	0	50	3,500	-	-	3,500
2015	0	25	1,750	-	-	1,750
2016	100	100	-	24,578	-	24,578
2017	100	100	-	24,578	-	24,578
2018	100	100	-	24,578	-	24,578
2019	100	100	-	24,578	-	24,578
2020	50	75	5,250	-	8,789	14,039

Other important components of the District's water supply portfolio are its long-term transfer agreement with ACID and the District's wells. In a normal year, the amount of water available through the agreement is 1,536 AF. However, the quantity available through the agreement with ACID, as a "Settlement Contractor", is also subject to being reduced by 25 percent (to 1,152 AF) during critical dry years. Settlement contractors have had their allocations reduced six times since 1977. The years that their allocations have been cut coincide with years that the District's CVP agricultural allocations have been reduced by 50 percent or more (1977, 1991, 1992, 1994, 2014 and 2015).

The District's wells are an important component of the District's water reliability. They are estimated to have an annual capacity of approximately 3,300 AF. Typically, they are only used when other facilities are down for maintenance, or during short- and long-term water shortages. Hence, they are truly a supplemental supply. The District has never had a need to maximize the pumping capacity since they often are able to secure surface water transfers at a lower cost than running wells.

Table 7-2 reflects the various water year types and reductions correlating with a normal-year (2017), a single-dry year (2014), and a five-year drought period (using the water supplies available for 2012 through 2015 with a repeat of 2015 for the fifth year) discussed above. The 2014 calendar year was selected for use as the single dry year because it is representative of the sharp reduction in supplies that can happen in a single year. While the 2015 calendar year had the most severe reduction in the water supplies available in the District's history, it was the third year of a drought. For the five-year drought the years 2013, 2014 and 2015 were used for the first three years and a repeat of the 2014 and 2015 years were used to simulate what might happen during an extended drought lasting five years.

Table 7-3 below shows actual surface water deliveries for average, single-year drought and a five-year drought. The District typically uses as much surface water as feasible, since it costs less than groundwater, and helps to preserve its groundwater resources. The groundwater values shown in **Table 7-3** are not the annual groundwater pumpage, but rather the estimated maximum yield from the District's wells. This represents the total available groundwater and is best used when estimating future water available. The construction of one new well is anticipated to be online by the fourth year of the five-year drought.

The data in **Table 7-3** will be used in **Section 7.3** (Supply and Demand Assessment) to compare future water supplies and demands for normal, dry and an extended drought lasting five years.

Table 7-3: Bases of Water Year Data

Water Year Type	Base Year(s)	Available Supplies					
		CVP	ACID[3]	Ground-water[5]	Other[1]	Total[2]	Percent of Normal Demand[4]
Average Water Year[3]	2017	24,578	1,536	3,300	0	29,414	294%
Single-Dry Water Year	2014	3,500	1,152	3,000	1,657	9,309	93%
Five Year Drought – 1st Year	2013	20,184	1,536	300	0	22,020	220%
Five Year Drought – 2nd Year	2014	3,500	1,152	3,300	1,657	9,609	96%
Five Year Drought – 3rd Year	2015	1,750	1,152	3,000	1,264	7,166	72%
Five Year Drought – 4thYear	2014	3,500	1,152	3,800	1,657	10,109	101%
Five Year Drought – 5th Year[6]	2015	1,750	1,152	3,320	1,264	7,486	75%

1-Other supply includes transfers, which are subject to availability. Future availability is unknown.
2-All water deliveries are calculated in acre-feet per year (AFY). It should be noted that they are not adjusted for population growth.
3-ACID transfers can be reduced to 1,152 AF/year in a critically dry year.
4-Based on a normal annual demand of 10,000 acre-feet.
5-Groundwater production assumed to drop off by approximately 10 percent per year if pumped for multiple consecutive years and one new well on-line by the 4th year of the drought increasing well production to 3,500 AF for the 4th year of the drought.
6-Fifth year of the drought assumed to be a repeat of the 3rd year.

7.3 Supply and Demand Assessment

Legal Requirements:

CWC 10635
(a) Every urban water supplier shall include, as part of its urban water management plan, an assessment of the reliability of its water service to its customers during normal, dry, and multiple dry water years. This water supply and demand assessment shall compare the total water supply sources available to the water supplier with the long-term total projected water use over the next 20 years, in five-year increments, for a normal water year, a single dry water year, and a drought lasting five consecutive water years. The water service reliability assessment shall be based upon the information compiled pursuant to Section 10631, including available data from state, regional, or local agency population projections within the service area of the urban water supplier.

Normal Year

Assuming the availability of their entire allotment of water supplies under its contracts with Reclamation and ACID (i.e., 24,578 AFY from its CVP Water Service Contract with Reclamation and 1,536 AFY from ACID), the District would have a water surplus during normal water years. The surplus water could be used for groundwater recharge, potentially stored for later use, or

transferred to another agency. Absent a program and authorization from Reclamation to reschedule or "carry over" remaining supply by keeping the supply in storage, any water that is not beneficially used within the water year is forfeited by BVWD and utilized by Reclamation for other CVP obligations and purposes. Over the past ten years the average supply available from the District's CVP contract has been 18,700 AFY and the average quantity available through its transfer agreement with ACID has been 1,459 AFY.

Whenever Reclamation is unable to supply enough water to meet the District demands, BVWD will need to supplement water supplies with groundwater and water transfers. Table 7-3 shows anticipated supplies and demands in a normal year through 2045. The District is expected to have adequate supplies to meet these demands.

Table 7-4: Normal Year Supply and Demand Comparison

Descriptions	Water Supply and Demand (AFY)				
	2025	2030	2035	2040	2045
Supply Totals[1,3,]	24,474	25,474	25,474	25,474	25,474
Demand Totals[2]	9,969	10,181	10,397	10,616	10,843
Difference	+ 15,505	+ 15,293	+ 15,077	+ 14,858	+ 14,631

1 – Supply totals the average CVP and ACID transfer water supplies available over the period of 2011-2020, plus 4,315 AFY of groundwater available in 2025, increasing to 5,315 AFY by 2030 (from DWR Table 6-9)
2 – Projected water demand based on average water use over the past five years (2016-2020) adjusted for growth (from DWR Table 4-2)
3 – Two additional wells are projected to be added (one by 2025 and the second by 2030) with a capacity of 1,000 AFY each

Single Dry Year and Five-Year Drought

During a single-dry year or five-year drought certain sources of water may not be available or have restrictions limiting use. Because BVWD utilizes several sources of water, a single approach to water supply totals during drought years is not practical. Each source of water has been examined to determine how dry years affect their availability. **Table 7-5** and **Table 7-6** provide estimates of the projected supply and demand for single and five-year drought using water supplies from **Table 7-3**.

Water supply from the District's contract with Reclamation is subject to extreme cutbacks during drought years. Reclamation's allotments of CVP water for M&I use can be reduced by 50 percent or more and agricultural allotments can be reduced to zero percent. It was assumed that 100% of the ACID transfer water supply (1,536 AFY in a normal year or 1,152 AFY in cutback years) and 100% of the reliable groundwater supply (4,315 AFY) will be available for future use. Therefore, CVP contract water will be the limiting factor for all dry year types.

Demand reductions due to water rationing and water conservation efforts are not included in the demand estimates. The agricultural demands are included in total demands to show the impact of single and multiple-dry years for the consideration of the supplemental supply program offered by the District. As a result, the 'Difference' in the table below shows how much water needs to be made up through conservation, land fallowing, and water transfers, which are not included in

demand totals due to uncertainty of availability. However, because of the cost difference between groundwater treatment and transfer water purchase, transfers may be utilized before groundwater or conservation efforts may be put into place to minimize the use of groundwater.

Table 7-5: Single Dry Year Projected Supply and Demand Comparison

Descriptions	Water Supply and Demand (AFY)				
	2025	2030	2035	2040	2045
Supply Totals[1,4]	10,309	11,309	11,309	11,309	11,309
Demand Totals[2]	9,969	10,181	10,397	10,616	10,843
Difference[3]	340	1,128	912	693	466

1 - Single dry year supply based on values in Table 7-3 plus supplies from planned new wells.
2 – Projected water demand based on 2016-2020 average demand adjusted for growth.
3 – Difference can be supplemented using short term transfer agreements.
4 – New wells are scheduled to be added (one before 2025 and a second by 2030) for an additional 1,000 AFY each

Table 7-6: Five-Year Drought Supply and Demand Comparison

Year	Descriptions	Water Supply and Demand (AFY)				
		2025	2030	2035	2040	2045
Year 1	Supply totals[1,2]	22,020	22,020	22,020	22,020	22,020
	Demand totals	9,969	10,181	10,397	10,616	10,843
	Difference	12,051	11,839	11,623	11,404	11,177
Year 2	Supply totals[1,2]	10,609	11,609	11,609	11,609	11,609
	Demand totals	10,011	10,224	10,441	10,661	10,889
	Difference	598	1,385	1,168	948	720
Year 3	Supply totals[1,2]	8,459	9,359	9,359	9,359	9,359
	Demand totals	10,053	10,267	10,485	10,705	10,934
	Difference	(1,594)	(908)	(1,126)	(1,346)	(1,575)
Year 4	Supply totals[1,2]	10,109	10,909	10,909	10,909	10,909
	Demand totals	10,095	10,310	10,529	10,750	10,980
	Difference	14	599	380	159	(71)
Year 5	Supply totals[1,2]	7,486	8,286	8,286	8,286	8,286
	Demand totals	10,138	10,353	10,573	10,795	11,026
	Difference	(2,652)	(2,067)	(2,287)	(2,509)	(2,740)

1–-Multiple dry year supply quantities based on values in Table 7-2. .
2 – Projected water demand based on 2016-2020 average demand adjusted for growth.
3 – Demands projected to increase along with population growth at an annual rate of 0.42%
4 – Difference can be supplemented using short term transfer agreements and water use restrictions.
5 – New wells are scheduled to be added (one before 2025 and a second by 2030 with a water production capacity of 1,000 AFY each with well production decreasing by 10% per year starting with year 3 of the 5-year drought

7.4 Drought Risk Assessment

A drought risk assessment was completed to evaluate the District's ability to meet a 5-year drought if it occurred over the next five years. The assessment looks at current demands and effectiveness of water augmentation and water use reduction measures.

The assessment simulates the same 5-year drought evaluated in **Section 7.3** - Supply and Demand Assessment. This drought is simulated using estimated water demands over the next 5 years (2021-2025). The following procedure was used in developing the Drought Risk Assessment:

1. Water demands were interpolated between current (2020) usage and anticipated 2025 demands.
2. Water supplies are based on the values presented in Table 7-3. Each supply was evaluated and quantified separately and then summed.
3. Water augmentation measures included the District's wells, which are used during severe drought and operational emergencies. The yield was based on the current capacity of the wells in 2020 and the addition of one new well by the fourth year of the drought (2024).
4. A primary method of water use reduction is through reduced surface water deliveries to agricultural water users. During a severe drought, surface water deliveries for irrigation (agricultural use) available from the District's CVP Water Service Contract are reduced to zero. The drought risk assessment assumes that this will occur during years 2 through 5 of the 5-year drought.
5. Water supplies for agricultural irrigation are assumed to be augmented through water transfers during years 2 through 5. The transfer quantities included in available water supplies reflect transfers for agricultural irrigation purposes only.
6. Water use reduction savings could potentially come from the District's water conservation efforts. However, the impact of water conservation education on usage is difficult to predict and is not accounted for here.

The results of the Drought Risk Assessment are shown in **Table 7-7** below.

Table 7-7: Five-Year Drought Risk Assessment, ac-ft/yr

Description	2021	2022	2023	2024	2025
Total Supplies	22,020	9,609	7,166	10,109	7,486
Gross Water Use	9,969	10,011	10,053	10,095	10,138
Surplus/(Shortfall) w/o WSCP Action	12,051	(402)	(2,887)	14	(2,652)
WSCP - agricultural use reductions (a)	0	402	1,869	0	1,869
WSCP - M&I use reductions (b)	0	0	1,018	0	783
Total of WSCP reductions	0	402	2,887	0	2,652
Resulting % Use Reduction from WSCP action	0%	2%	29%	0%	27%
(a) Net agricultural use reduction after water transfers for supplemental water					
(b) Reductions in M&I demand through voluntary and mandatory water conservation measures and drought penalties					

7.5 Regional Supply Reliability

Legal Requirements

CWC 10620
(f) An urban water supplier shall describe in the plan water management tools and options used by that entity that will maximize resources and minimize the need to import water from other regions.

The District is considering several options to expand its water supplies and provide increased reliability to its water supplies. Chapter 6 discusses future projects and agreements that will supply additional water to BVWD. These projects include the construction of additional groundwater wells and more treated water storage.

Water conservation measures implemented by the District will also increase water supply reliability by lowering the demand on the District's water supplies. These are discussed further in Chapters 8 and 9. Conservation measures include prohibitions on end users, enforceable water waste policy, and methods to increase public awareness on water waste and water conservation.

7.6 Seismic Risk

Legal Requirements

CWC 10632.5
(a) In addition to the requirements of paragraph (3) of subdivision (a) of Section 10632, beginning January 1, 2020, the plan shall include a seismic risk assessment and mitigation plan to assess the vulnerability of each of the various facilities of a water system and mitigate those vulnerabilities.

(b) An urban water supplier shall update the seismic risk assessment and mitigation plan when updating its urban water management plan as required by Section 10621.

(c) An urban water supplier may comply with this section by submitting, pursuant to Section 10644, a copy of the most recent adopted local hazard mitigation plan or multihazard mitigation plan under the federal Disaster Mitigation Act of 2000 (Public Law 106-390) if the local hazard mitigation plan or multihazard mitigation plan addresses seismic risk.

The District is located is an area of moderate seismicity, in the less seismically active western half of Shasta County. The county is subject to low and moderate ground shaking but has not sustained significant property damage or loss of life due to earthquakes in the past 120 years of records. However, the November 26, 1998, local magnitude ML 5.2 earthquake centered near Keswick Dam, west of the District, rocked the District's four-million-gallon water tank on its foundation causing bent anchor bolts and deformed washers. This was the largest recorded earthquake since USGS monitoring began in 1981 and is believed to have been the largest earthquake in the area since 1878.

The 2017 Shasta County Local Hazard Mitigation Plan states that earthquake activity in the area has not been a serious hazard in the past and is unlikely to become a serious hazard in the future. Soils in the area are not classified as being at risk of liquification so any earthquake damage would most likely be due to ground shaking rather than ground failure. The county enforces the California Building Code, which is applicable to new structures and based on predicted earthquake intensities, to minimize risk of loss of life and property damage due to seismic activity. The City of Redding has run earthquake scenarios calculating six percent Building Damage Ratios (repair cost divided by replacement cost, as a percentage) for older structures in the city's downtown and three percent for all other areas of the city. The District service area includes part of the northeastern part of Redding, but not downtown, corresponding to the three percent Building Damage Ratio. A copy of the Shasta County Local Hazard Mitigation Plan can be found at https://www.co.shasta.ca.us/docs/libraries/public-works-docs/hmp-documents/shasta-county-hazard-mitigation-plan-november-2017.pdf. A copy of the section of the Shasta County Local Hazard Mitigation Plan pertaining to seismic risk ("Section 4.34 Earthquake") is included in **Appendix R**.

All of the District's pump stations, wells, treatment facilities, and its main office have been constructed to meet California's earthquake standards. Nearly all of the facilities either have been extensively modified or built since 1990.

In 2000, the District completed seismic improvements on its four-million-gallon storage tank. The Improvements included the installation of sixty #14 (1.693-inch) anchor bolts and strengthened anchor bolt chairs to bring the tank installation up to the current AWWA tank design standards. In 2015, the District performed seismic improvements on the Surge Tank on Hilltop Drive to also bring that tank installation up to the current ANSI/AWWA D100 Standard for steel tank design. The Improvements on the Surge Tank included the installation of thirty-five 2-inch anchor bolts and strengthened anchor bolt chairs.

8 Water Shortage Contingency Planning

This section describes the District's Water Shortage Contingency Plan (WSCP) including stages of action, triggering mechanisms, water use prohibitions, penalties, consumption reduction methods, revenue impacts, and catastrophic supply interruption.

In 2015, the District adopted an updated Municipal and Industrial (M&I) Water Shortage Contingency Plan (Resolution 15-04). In 2020, the District began work on an updated Drought Contingency Plan. The new Drought Contingency Plan was adopted by the District's Board of Directors on February 22, 2021 (Resolution 21-02, Adopting the 2020 Drought Contingency Plan) that included a Water Shortage Contingency Plan that met new State requirements. The new WSCP was made available to the District's customers and can be found in **Appendix L.**

The District anticipates that as part of the adoption of its 2020 UWMP that minor changes will be made to the Water Shortage Contingency Plan. Once the revised WSCP is adopted a copy will be filed with the Department of Water Resources and make it available for public review during normal business hours. Copies will also be made available to the City of Redding and to Shasta County.

8.1 Stages of Action

Legal Requirements:

CWC 10632
(3) (A) Six standard water shortage levels corresponding to progressive ranges of up to 10, 20, 30, 40, and 50 percent shortages and greater than 50 percent shortage. Urban water suppliers shall define these shortage levels based on the suppliers' water supply conditions, including percentage reductions in water supply, changes in groundwater levels, changes in surface elevation or level of subsidence, or other changes in hydrological or other local conditions indicative of the water supply available for use. Shortage levels shall also apply to catastrophic interruption of water supplies, including, but not limited to, a regional power outage, an earthquake, and other potential emergency events.

The stages of action described below are from the 2021 M&I Water Shortage Contingency Plan (**Appendix L**). The goal of the Water Shortage Contingency Plan is to provide a prioritized and orderly staged response depending on shortage severity, and to ensure an adequate supply of water to meet the public health and safety needs of the District customers at all times.

To manage a water supply shortfall, six demand reduction stages have been defined in the District's Water Shortage Contingency Plan. The total demand reduction goal for each stage increases from less than 10 percent to more than 50 percent or more of normal demand from Stage 1 to Stage 6. The stages are summarized in **Table 8-1**. The District defines a water supply shortage as a reduction in its total available water supplies to below its normal water production quantities, either on a long-term (annual) basis or a short-term (daily, weekly, or monthly) basis.

Table 8-1: Stages of Water Shortage Contingency Plan

Stage	Supply Reduction	Water Supply Condition
1	0%-10%	Normal Water Supply (90% to 100% of Normal Water Production)
2	10%-20%	Moderate Water Shortage (80% to 90% of Normal Water Production)
3	20%-30%	Severe Water Shortage (70% to 80% of Normal Water Production)
4	30%-40%	Extreme Water Shortage (60% to 70% of Normal Water Production)
5A	40%-50%	Critical I Water Shortage-Short Term (50% to 60% of Normal Water Production)
5B	40%-50%	Critical I Water Shortage-Long Term (50% to 60% of Normal Water Production)
6A	50+%	Critical II Water Shortage-Short Term (Less than 50% of Normal Water Production)
6B	50+%	Critical II Water Shortage-Long Term (Less than 50% of Normal Water Production)

The declaration of a shortage and the corresponding stage measures are communicated to District customers by way of billing inserts, newspaper advertising, on the District's webpage (www.bvwd.org), and by verbal communication as District staff and personnel interact with the District's customers. If it is deemed necessary to reduce water consumption to ensure that the District has sufficient supplies to meet anticipated demands the District may declare a water shortage emergency pursuant to California Water Code section 350 et seq.

California Water Code section 350 states:

> *"The governing body of a distributor of a public water supply, whether publicly or privately owned and including a mutual water company, shall declare a water shortage emergency condition to prevail within the area served by such distributor whenever it finds and determines that the ordinary demands and requirements of water consumers cannot be satisfied without depleting the water supply of the distributor to the extent that there would be insufficient water for human consumption, sanitation, and fire protection."*

California Water Code section 375(a) states:

> *"Notwithstanding any other law, any public entity that supplies water at retail or wholesale for the benefit of persons within the service area or area of jurisdiction of the public entity may, by ordinance or resolution adopted by a majority of the members of the governing body*

after holding a public hearing upon notice and making appropriate findings of necessity for the adoption of a water conservation program, adopt and enforce a water conservation program to reduce the quantity of water used by those persons for the purpose of conserving the water supplies of the public entity.

Due to the severe reductions in CVP supplies for the 2021-22 water year the District declared a Stage 2 water shortage on March 22, 2021, which included the declaration of a water shortage emergency requiring customers to reduce their demand by at least 10% of their historical (average of their past three years) water usage. All water usage above 90-percent of their historical usage will be billed at an overuse penalty rate that is approximately 2.16 times the District's regular water consumption charge.

On June 2, 2021, in response to Reclamation's further reduction their water allocation for the District, the District declared a Stage 3 water shortage requiring all customers to reduce their demand by at least 20% of their historical water usage with usage above that amount subject to the overuse penalty rate.

The District's Policy Manual also includes penalties for the wasteful use of water.

8.2 Demand Reduction Triggering Mechanisms

A water reduction stage is implemented if a water supply shortfall is forecast for the upcoming year. The estimate of the supply shortfall is only a preliminary projection, even as late in the year as the end of February. Although the criteria described in the District's water supply contract will be used to determine District's CVP water allocation, these criteria define District's M&I water supply allocation relative to a period of "historical use."

"Historical use" is defined by the M&I Water Shortage Policy as the average quantity of CVP M&I water put to beneficial use within the service area during the prior three years of water deliveries, unconstrained by the availability of CVP water. The M&I Water Shortage Policy also recognizes that certain circumstances may require adjustment of the historical use such as growth, extraordinary water conservation measures, or availability and use of non-CVP water supplies.

The level of supply shortfall is expressed as a percent of the normally occurring demand that would need to be reduced to meet the available supplies. Available supplies include CVP, ACID long-term transfer, and groundwater. This percent reduction is matched to the total reduction goal shown in **Table 8-1** to select the appropriate stage. Additional factors to be considered in implementing a water reduction stage include the following:

- Time and circumstances permitting, stages should be stepped through without skipping stages. This avoids drastic and sometimes unnecessary actions that may cause problems for the District including loss of customer confidence, financial shortfall, and difficulties implementing the emergency water reduction program.

- Customer response to the current stage may either require the District to implement the next stage or remain at a current stage. The stages allow the District to note the customer's response to less severe stages before implementing the stricter stages.
- Predictions of demand and supply are not always accurate. To help determine if the water reduction program is achieving expected results, demands should be monitored monthly during Stage 1, weekly during Stages 2 and 3, and daily during Stages 4 and 5.

The estimate of the water supply shortage is rough, and a contingency should be made to err on the side of achieving a more than adequate water reduction level. Additions to the actions and methods shown in **Appendix M** may be adjusted by future resolutions.

8.3 Prohibitions on End Users

Legal Requirements:

CWC 10632
(a)(4) Shortage response actions that align with the defined shortage levels and include…
(B) Locally appropriate demand reduction actions to adequately respond to shortages., and
(D) Additional, mandatory prohibitions against specific water use practices that are in addition to state-mandated prohibitions and appropriate to the local conditions.

The Water Shortage Contingency Plan **(see Appendix N)** contains a table of customer measures during each water shortage stage. In order to provide information on the measures required for the current water supply condition the applicable measures will be distributed to customers and posted on the District's website whenever a stage other than Stage 1 is declared. Water uses regulated or prohibited under the Water Shortage Contingency Plan are considered to be nonessential; and continuation of such uses during times of water shortage or other emergency water supply condition are deemed to constitute a waste of water which subjects the offender(s) to surcharges, penalties, and/or fines.

The customer reduction goals by stage, shown in the tables in **Appendix N**, vary by customer type to achieve the overall desired reduction goal for the stage, while acknowledging the constraints various customer classes may have in effecting short-term demand reduction. Alternative allocations may be considered at the time a given stage is implemented. The District recognizes that reductions for commercial and public institutional customers can have significant economic impacts. Therefore, the requested reductions to commercial and public institutional customers are lower than for residential, rural, and agricultural customer classes. It was also recognized that multi-family residential water users have primarily indoor water use and cannot reduce their water use as much as single-family residences, which typically use nearly half or more of their annual water use for outdoor purposes.

Mandatory prohibitions on water wasting include use of potable water for street cleaning, washing paved or hard-surfaced areas, and failure to repair a controllable leak of water**. Table 8-2** contains mandatory prohibitions and the water shortage stage when they are enacted.

Table 8-2: Water Shortage Contingency – Mandatory Prohibitions

Customer Actions		Stage 1	Stage 2	Stage 3	Stage 4	Stage 5		Stage 6	
						ST	LT	ST	LT
Water Waste	Water shall be used for beneficial uses only; all unnecessary and wasteful uses of water are prohibited (District Policy Manual Section 143).	✓	✓	✓	✓	✓	✓	✓	✓
	Water shall not be applied to outdoor 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. Care shall be taken not to water past the point of saturation.	✓	✓	✓	✓	✓	✓	Landscape Irrigation is Prohibited	
	Free-flowing hoses for all uses shall be prohibited. Customers shall use automatic shutoff devices on any hose or filling apparatus in use.	✓	✓	✓	✓	✓	✓	✓	✓
	Leaking customer pipes or faulty sprinklers shall be repaired within the specified working days or less by Stage after due to the severity of the problem or shall not be utilized until repaired.	5 Days or Less	5 Days or Less	2 Days or Less	24 hours or Less	24 hours or Less		Immediately	
Pools and Water features	All pools, spas, and ornamental fountains/ponds shall be equipped with a recirculation pump and shall be constructed to be leakproof.	✓	✓	✓	✓	✓	✓	✓	✓
	Swimming pool and spa covers encouraged to prevent evaporative water loss.	✓	✓	✓	✓	✓	✓	✓	✓
	Potable water use for ornamental ponds and fountains is prohibited.					✓	✓	✓	✓
	Pool draining and refilling shall be allowed only for health, maintenance, or structural considerations.	✓	✓	✓	✓	✓	✓	✓	✓
	Water use for ornamental ponds, fountains, or other ornamental water feature for aesthetic purposes is prohibited except where necessary to support aquatic life.				✓				

Customer Actions		Stage 1	Stage 2	Stage 3	Stage 4	Stage 5		Stage 6	
						ST	LT	ST	LT
	Water use for ornamental ponds and fountains is prohibited.					□	□	□	□
Buildings and Driveways	Washing streets, parking lots, driveways, or sidewalks, except as necessary for health, aesthetic, or sanitary purposes, is prohibited.	□	□	□					
	Application of potable water to driveways and sidewalks is prohibited				□	□	□	□	□
Water Use Reductions	Residential and Rural Customers Reductions.	Up to 10%	10-20%	20-30%	30-40%	40-50%	40-50%	50%or more	50%or more
	Multi-family and Public Institutional Customers Reductions	Up to 10%	10-20%	20-30%	30-40%	40-50%	40-50%	50%or more	50%or more
	Commercial Customers Reductions	Up to 10%	5-10%	20%	30%	30%	30%	30% or more	30% or more
	Landscape Irrigation Reductions	Up to 10%	15-25%	25-35%	35-50%	50%	50%	100%	100%
	Water use exceedance tiered pricing or penalties may be implemented.			□	□				
	Water use exceedance tiered pricing or penalties will be implemented					□	□	□	□
Irrigation	To reduce evaporation, between March 1 and October 31 the use of sprinkler irrigation systems for all landscape irrigation systems shall be limited to be between the hours of 7:00 p.m. and 9:00 a.m. Sprinkler irrigation systems may be run outside of these hours for testing, but not for more than 15 minutes per cycle and only long enough to verify proper operation and make sprinkler adjustments.	□	□	□	□	□	□	Landscape Irrigation is Prohibited	
	Customers with "smart" irrigation timers or controllers are asked to set their controllers to achieve the specified % of the evapotranspiration (ET) rate.		90-95%	75%	75%	50-75%	50-75%		
	Irrigated landscaped areas shall include efficient irrigation systems (e.g., drip irrigation, timed sprinklers, rain sensors, low-flow spray heads, etc.).	□	□	□	□	□	□	Landscape Irrigation is Prohibited	

Customer Actions		Stage 1	Stage 2	Stage 3	Stage 4	Stage 5		Stage 6	
						ST	LT	ST	LT
	Landscape irrigation limited to the days per week specified. Customers whose street addresses end with an odd number may water on Wednesday, Friday, and Sunday. Customers whose street addresses end with an even number may water on Tuesday, Thursday, and Saturday.			3 days per week	3 days per week	3 days per week	3 days per week		
	Application of potable water to outdoor landscapes during or within 48 hours after measurable rainfall is prohibited.			□	□	□	□		
Commercial	Eating or drinking establishments, including but not limited to: Restaurants, cafes, cafeterias, bars, or other public places where food or drink are served and/or purchased shall serve water only upon request.		□	□	□	□	□	□	□
	Operators of hotels and motels shall offer patrons the option of not having their towels and linens washed daily.		□	□	□	□	□	□	□
Equipment/Vehicle Washing	Motor vehicles or equipment shall be washed only with buckets or hoses with automatic shutoff nozzles.			□	□	□			
	Motor vehicles and equipment shall be washed only at commercial establishments that use recycled or reclaimed water.						□	□	□
Construction/New Service	Users of construction meters and fire hydrant meters will be monitored for efficient water use.		□	□			□	No Construction Water	
	Water for flow testing and construction purposes from water agency fire hydrants and blow- offs is prohibited.					□	□	□	□
	Installation of new turf or landscaping is prohibited.				□	□	□	□	□
	New connections to the District's water distribution system will be allowed but their water use shall be restricted to the minimum requirements for personal health and safety.				□	□	□	□	□
	No potable water from the District's system shall be used for construction purposes including but not limited to dust control, compaction, or trench jetting.					□	□	□	□
	No commitments ("will serves") will be made to provide service for new water service connections.								□
Health & Safety	Flushing of water mains, sewers, or fire hydrants is prohibited except for emergencies and essential operations.			□		□	□	□	□

Customer Actions		Stage 1	Stage 2	Stage 3	Stage 4	Stage 5		Stage 6	
						ST	LT	ST	LT
	Water use shall be restricted so as to meet the minimum requirements for personal health and safety.								

ST- Short Term
LT- Long Term

8.4 Penalties, Charges, and Other Enforcement of Prohibitions

Legal Requirements:

CWC 10632
(a)(6) Penalties or charges for excessive use, where applicable.

In 2015, in response to the continuing drought conditions and cutbacks in the District's CVP allocation, the District's Board of Directors adopted Resolution 15-05, on March 23, 2015, established two penalty tiers. The "Exceedance Penalty Charge Tier 1" for usage of 100% to 120% of the base allotment was set at $1.50/HCF and the "Exceedance Penalty Charge Tier 2" for usage of more than 120% of the base allotment was set at $2.50/HCF. Board action in October of 2015 eliminated Tiers 2 and 3 and the penalty rate for all use greater than 100% of the allotment was reduced to $1.00/HCF.

8.5 Consumption Reduction Methods by Agencies

Legal Requirements:

CWC 10632
(a)(4) Shortage response actions that align with the defined shortage levels and include… the following:
(E) For each action, an estimate of the extent to which the gap between supplies and demand will be reduced by implementation of the action.

The UWMPA requires that the UWMP include an urban water shortage contingency analysis that estimates reduction in consumption to be expected by the measures included in the agency's water shortage contingency plan. **Table 8-3** contains consumption reduction methods by water shortage stage with projected reduction.

Table 8-3: Water Shortage Contingency – Consumption Reduction Methods

Consumption Reduction Method	Stage When Method Takes Effect	Projected Reduction (%)
Public Education	All	Up to 10%
Voluntary Rationing	1	Up to 10%
Mandatory Rationing	2-5	20% to 50% or more
Excess Water Use Penalties and Water Shortage Pricing	2-6	20% to 50% or more
Prohibition of Outdoor Watering	6	More than 50% during the irrigation season

8.6 Monitoring and Reporting Requirements

Legal Requirements:

CWC 10632
(a)(9) For an urban retail water supplier, monitoring and reporting requirements and procedures that ensure appropriate data is collected, tracked, and analyzed for purposes of monitoring customer compliance and to meet state reporting requirements.

Demands must be monitored frequently during emergency water shortages to enable the District to effectively manage the balance between supply and demand. Following are procedures for monitoring reductions during different stages:

- In normal water supply conditions (Stage 1), production and pumping amounts are recorded daily. Totals are reported monthly to the District Engineer.
- During Stage 2, 3 and 4 water shortage conditions, weekly production and pumping amounts are reported to the District Engineer to compare the weekly data to the targets to verify that the reduction goal is being met.
- During a Stage 5 or 6 water shortage, a daily production and pumping report will be provided to the District Engineer to verify that the reduction goal is being met.

8.7 Revenue and Expenditure Impacts/Measures to Overcome Impacts

Legal Requirements:

CWC 10632
(a)(8) A description of the financial consequences of, and responses for, drought conditions, including, but not limited to, all of the following:
(A) A description of potential revenue reductions and expense increases associated with activated shortage response actions described in paragraph (4).
(B) A description of mitigation actions needed to address revenue reductions and expense increases associated with activated shortage response actions described in paragraph (4).
(C) A description of the cost of compliance with Chapter 3.3 (commencing with Section 365) of Division 1.

The revenue sources available to the District include water sales, system connection fees, interest income, special assessments, reserves, and other non-operating revenues including various grants.

The District's current rate schedules are based on assigning fixed costs to base rates and variable costs to usage rates. In doing so, and when water usage is reduced due to water shortages or other causes (e.g., unusually wet weather), the reduction in revenues is generally matched by a reduction in expenses. However, during a drought the District's expenses, per acre-foot, for additional water supplies such as short-term water transfers and increased costs for producing more water from its groundwater wells exceed the per acre-foot expenses for water in a non-shortage year.

The District currently maintains a specific M&I Rate Stabilization Fund to help mitigate the expense and revenue impacts of a prolonged drought. In addition, costs for supplemental water for its agricultural customers during a severe water shortage are passed directly through to the agricultural customers that participate in the District's Supplemental Water Program.

Additionally, there may be outside funding sources made available to water agencies under a water emergency situation (Stages 3 through 6).

8.8 Resolution or Ordinance

The California Water Code requires that the District develop mandatory provisions and a draft water shortage contingency resolution as part of the UWMP to reduce water use, including prohibitions against specific wasteful practices, such as gutter flooding. In March 2021, the District adopted a Drought Contingency Plan that included a Water Shortage Contingency Plan (**Appendix L**). The District's Board of Directors must be kept well informed of the shortage status to enable them to make timely and appropriate decisions on the following actions:

- Declaration of water shortage emergency,
- Adoption of Emergency Water Reduction Plan,
- Frequent assessment of water shortage status,
- Adoption of resolutions to change stages as necessary, and
- Coordination with customers on the development and implementation of the plan.

8.9 Catastrophic Supply Interruption

Legal Requirements:

CWC 10632
(a)(3)(A) Shortage levels shall also apply to catastrophic interruption of water supplies, including, but not limited to, a regional power outage, an earthquake, and other potential emergency events.

The UWMPA requires that the District develop stages of action to be undertaken during a catastrophic interruption of water supply or the District's water treatment facilities that could include flooding, major fire emergencies, regional power outage, earthquake, water contamination, and acts of sabotage. In response to these possibilities, the District has developed an Emergency Response Plan, which includes appropriate personnel listings, resource inventories, locations for emergency operations centers, response procedures, and the steps necessary to resume normal operations. The plan contains a section on the water system including alternative water sources and communication procedures. These procedures are consistent with guidelines prepared by the California State Office of Emergency Services.

Stages 5 and 6 of the District Water Shortage Contingency Plan's response actions include water use restrictions and prohibitions for both short-term and long-term shortages. The Stage 6 short-

term provisions are intended for implementation during power outages, an earthquake, and other potential emergency events.

8.10 Supply Availability – Normal, Single Dry, & Five-Year Drought

Legal Requirements:

CWC 10631
(b)(1) A detailed discussion of anticipated supply availability under a normal water year, single dry year, and droughts lasting at least five years, as well as more frequent and severe periods of drought, as described in the drought risk assessment.

The California Water Code requires that the District discuss the anticipated supply availability under a normal water year, single dry year, and droughts lasting at least five years, as well as more frequent and severe periods of drought.

The District's primary water supply is through its CVP Water Service Contract with Reclamation. That contract provides for up to 24,578 acre-feet of water in a normal year. The District also has a long-term transfer agreement with the Anderson-Cottonwood Irrigation District for 1,536 acre-feet of water in a normal year. **Figure 7-2** shows the historical CVP water allocations to the District and ACID from 1977 through 2020.

In addition to its surface water supplies, the District has five groundwater wells that are capable of producing an estimated 3,315 acre-feet annually. Therefore, in a normal water year the District's available water supplies total approximately 29,400 acre-feet which greatly exceeds its normal demand (in 2020 the total water usage was 11,268 acre-feet). It should be noted that in a normal year and in years when the combination of its CVP and ACID long-term transfer supplies are adequate to meet all of the District's water demands, the wells are typically run for less than one month producing approximately 300 AF per year.

The worst CVP allocations that the District has ever received from Reclamation were in 2015, when Reclamation's CVP allocation for the District was 25 percent of historical M&I usage and a 0 percent allocation for irrigation, but this was the last year of a three-year drought. So, it is not considered the worst single dry year; instead, it is included in the five-year drought analysis.

For the purposes of this UWMP the worst single dry year of record for the District was 2014 when Reclamation's CVP allocation for the District was 50 percent of historical M&I usage and a 0 percent allocation for irrigation. Based on the current historical M&I usage for the District, this would result in a CVP contract supply of 3,324 AF (= 50% of 6,649 plus 0% of 17,929). Typically, whenever the District's Irrigation allocation is zero, the amount of water available under the District's long-term transfer with ACID is reduced to 75% of the amount available in a normal year. In that case, the amount of water available from ACID is 1,152 AF. In a single dry year, the District would produce as much water as they could from their current wells, which would be approximately 3,315 AF. This would result in a total supply of approximately 7,791 AF before any short-term transfers.

By 2025, the District is planning to construct one new well capable of producing approximately 1,000 AF per year and by 2030, the District is planning to construct a second new well capable of producing approximately 1,000 AF per year. The water supplies provided by these new wells is included in the future supply totals for the District.

In the 55 years that the District has been delivering water to its customers, it has never experienced a five-year drought. The worst five-year drought that the District has experienced was from 1990 through 1994. **Figure 7-2** shows the historical CVP water allocations to the District and ACID from 1977 through 2020. As can be seen in **Figure 7-2**, the 1990-1994 drought was interrupted by a normal year in 1993. Therefore, the analysis for a five-year drought is based on the 2013 through 2015 drought with the fourth and fifth years being a repeat of the 2014 and 2015 years.

Table 8-4 establishes the basis for estimating lowest estimated water supply for the next five years based on CVP water allocations for the base years shown. The ACID transfer quantities use the critical year allotment for the second through fifth years. It also assumes that well production will be maximized during the shortage years and will diminish by approximately ten percent in the fourth year and an additional ten percent in the fifth year. The table is based on the District's current well production capacity and does not include the new well that is planned to be available by 2025.

Table 8-4: Water Supplies for Five-Year Drought

Year	Base Year(s)	Available Supplies in 2020				
		CVP	ACID[3]	Ground-water[5]	Other[1]	Total[2]
1st Year	2013	20,184	1,536	3,300	300	25,320
2nd Year	2014	3,500	1,152	3,000	1,657	9,309
3rd Year	2015	1,750	1,152	3,300	1,264	7,466
4th Year	2014	3,500	1,152	3,000	1,657	9,309
5th Year[6]	2015	1,750	1,152	2,700	1,264	6,866

1-Other supply includes transfers, which are subject to availability. Future availability is unknown.
2-All water deliveries are calculated in acre-feet per year (AFY). It should be noted that they are not adjusted for population growth.
3-ACID transfers can be reduced to 1,152 AF/year in a critically dry year
4-Based on a normal annual demand of 10,000 acre-feet.
5-Groundwater production assumed to drop off by approximately 10 percent per year if pumped for multiple consecutive years.
6-Fifth year of the drought assumed to be a repeat of the 3rd year.

9 Demand Management Measures (DMM)

Legal Requirements:

CWC 10631
(f) Provide a description of the supplier's water demand management measures. This description shall include all of the following:
(1) (A) For and urban water supplier, as defined in Section 10608.12, a narrative description that addresses the nature and extent of each water demand management measure implemented over the past five years. The narrative shall describe the water demand management measure that the supplier plans to implement to achieve its water use targets pursuant to Section 10608.20.
(B)The narrative pursuant to this paragraph shall include descriptions of the following water demand management measures:
(i) Water waste prevention ordinances.
(ii) Metering.
(iii) Conservation pricing.
(iv) Public education and outreach.
(v) Programs to assess and manage distribution system real loss.
(vi) Water conservation program coordination and staffing support.
(vii) Other demand management measures that have a significant impact on water use as measured in gallons per capita per day, including innovative measures, if implemented.

9.1 DMMs

This chapter presents an analysis of the demand management measures currently implemented by BVWD as well as proposed efforts to further develop their water conservation program.

9.1.1 Water Waste Prevention Ordinances

The District's policy on wasting water is found in the District Policy Manual (**Appendix O**), Section 143, and states the following: "*No customer shall permit leaks or otherwise waste water, whether intentionally or negligently. In the event that water is wastefully or negligently used on a customer's premises, the District shall have the right to discontinue service to the premises and shall have the right to enter upon the premises for the purpose of disconnecting the service*."

In addition, the following sections of the District's Policy Manual detail the enforcement of District policies: 444-Discontinuance (Non-Compliance with Regulations), 461-Prohibited Acts, 462-Determination of Violation, and 463-Penalties. District crews follow up with property owners on water waste calls/tips and, if the customer is not home, District crews place water waste door hangers at properties in which they notice water waste (broken sprinklers, water flowing off property, etc.)

The effectiveness of this DMM can be determined by a decrease in violators. The number of citations and violations is tracked internally on a monthly basis through the District's work order system. If an area is determined to have excessive violations, the District could implement a

specific outreach program informing the public.

9.1.2 Metering

Assembly Bill No. 514 (AB 514) became law in 2003 and promulgated that all Central Valley Project municipal contractors are required to install water meters on all residential and commercial services constructed prior to 1992. This bill was enacted to prevent the loss of water supplies by CVP municipal contractors which fail to comply with federal water metering requirements. AB 514 applies to all municipal water suppliers that receive CVP water.

All of the District retail deliveries are metered, and all new connections are required to be metered. Automatic Meter Read (AMR) meters are installed on 75 percent of all connections. Installing water meters and billing for actual water use provides a strong incentive for customers to use less water and equalizes service cost for each customer to their actual use (high water users would pay a more equitable share of the system costs). Water metering can reduce exterior landscape water use and can also achieve a modest reduction in interior water use.

With a previous grant, the District piloted BEACON Advanced Metering Analytics (AMA), a type of AMI that uses the cellular network, to target the highest water users. There are 310 active BEACON end points with cellular connections. Of these, only 66 active EyeOnWater mobile app customer accounts have been established in which the customer has signed up, downloaded the app and is using the portal to view their water use and set overuse alarms. However, these 66 customer accounts may represent approximate one third of active endpoints because more than one endpoint is required for some meters (compound meters require two endpoints, combo meters require three endpoints, and accounts with fire service require one endpoint for the fire service meter). The District is interested in expanding the program to offer it to all customers as an option with a cost, pending availability of funding and technical fixes relating to using a cellular network with better coverage than was used in the pilot program.

Water allocations to agricultural water users have been based on the District's CVP allocation from Reclamation for agricultural use. Enforcement of water curtailments for agricultural water users is based on metered use and the imposition of penalties for all use exceeding their allocation. Unlike municipal and industrial customers, agricultural allocation exceedances have been on a cumulative annual basis rather than a bi-monthly billing basis. During shortage years, the District has implemented a Supplemental Water Program that allows agricultural customers to augment their allocation on a voluntary basis purchased at "market rates." During the zero allocation years, agricultural customers that include a dwelling (residential/potable demands) receive a public health and safety allocation (0.698 AF in 2014 and 2015). Metered use exceeding their public health and safety allocation plus supplemental supply, if any, are penalized at the adopted penalty rate determined during the shortage year.

9.1.3 Conservation Pricing

Bella Vista Water District prices water at a flat rate based on volume, with base charges according to meter class. During a drought, the District may adopt over-use penalties to provide customers with a disincentive to using more water than their allocations. The penalties may be tiered based

on used percentages of their allocation (e.g., one tier for using between 100% to 110% of their allocation and a second tier for use above 110% of their allocation). During a drought, M&I customers' allocations are calculated for each account based on the last three years of unconstrained use. Each drought results in different penalties because the penalty is calculated based on the water supplies available during that drought. The District's rate schedule is updated annually and is easily accessible on the District website. (**Appendix Q**).

The District purchases both Irrigation (agricultural) and Municipal and Industrial (M&I) water from the CVP through their U.S. Bureau of Reclamation (USBR) contract. Both types of water are defined in the contract, and historically Reclamation's rates for Irrigation water have been significantly less than rates for M&I water. BVWD charges customers for water based on four different customer classes and rate schedules: residential/commercial/public-institutional rate, rural rate, and agricultural rate. Each water rate schedule is broken down into two components: a base charge and a volumetric commodity charge. The bi-monthly base charge per service connection does not provide for any water, but only for offsetting the cost of providing water service and maintaining/improving the District facilities. The commodity charge is a unit charge for the amount of water used.

The residential/commercial/public-institutional rate is used for charging urban water customers. Nearly all customers with properties smaller than two acres are billed using this rate structure.

The rural rate is similar to the residential/commercial/public-institutional rate but is only available to properties at least two acres or larger and with a one-inch or larger meter. The rural rate was originally established for agricultural properties that did not meet the requirements for receiving irrigation water and was set at a level higher than the agricultural rate but lower than the residential rate.

The agricultural rate is used for customers owning properties eligible for Reclamation's irrigation water, that is, land primarily used in the commercial production of agricultural crops or livestock, including incidental domestic use. Customers desiring to fall under the agricultural rate must have: 1) a property with at least two acres of cultivated land under irrigation and dedicated to crop production; 2) a meter at least one inch in size; 3) a business plan; 4) crops or livestock sales or documented barter: and 5) improvements to land (including, but not limited to buildings, irrigation systems, corrals, fencing, fruit or nut trees, vines, etc.).

9.1.4 Public Education and Outreach

9.1.4.1 PUBLIC INFORMATION PROGRAMS

Public information programs for water demand management includes coordination with other agencies and provision of programs promoting water conservation, speakers for the media or community groups, public service announcements, water conservation bill inserts, and water use comparisons on customer's bills. BVWD has an on-going public information program and posts large signs about conserving water in the service area. In addition to the District's efforts, Reclamation performs public outreach on water conservation. The District's program for implementation of public information is summarized in **Table 9-1**.

Table 9-1: Implementation of Public Outreach

Program	Description
The District newsletter is drafted six times per year (bi-monthly) and provided on the BVWD website.	Includes seasonal water conservation tips, updates on water allocations, and District news concerning infrastructure improvement projects, board decisions, educational events, and budgetary decisions.
Water Smart Gardening web hosting.	Water Smart Gardening links posted on District's website.
Active management of District website: www.bvwd.org[8]	Features daily water saving tip, educational links, District news, policies, and rates.
Tours of water treatment and pumping facilities to college students and District board members.	Though a Vulnerability Assessment recommended against promoting tours open to the general public, the District gives tours to Shasta College classes and District board members on a regular basis in order to educate and increase awareness among current and future stakeholders and decision-makers in the water industry.
Demonstration garden	Located at BVWD main office.
Irrigation Evaluation	District's QWEL certified landscape irrigation auditor offers free irrigation evaluations to residential customers.

9.1.4.2 SCHOOL EDUCATION PROGRAMS

Components of this DMM include provision of education materials, instructional assistance, and classroom presentations. The District's program for implementation of school education programs is summarized in **Table 9-2**.

Similar to a public information program, a school education program can be one of the best tools to conserve water. The AWWA and the Water Education Foundation (WEF) provide educational material for youth to explain the water cycle and pollution, and to promote water conservation, including videos, bookmarks, games, and water experiments. As a long-term dues-paying member of WEF, the District offers local schools free access to Project WET educational materials for K-12 levels. The Water Conservation Coordinator could enhance the program by meeting with school principals and educators to promote classroom presentations. The effectiveness of this program is determined by the number of students and schools that participate.

[8] http://www.bvwd.org/

Table 9-2: Implementation of Educational Programs

Program	Description
Lending library available to and promoted among local elementary, middle, and high school teachers.	BVWD offers to purchase grade-level appropriate, standards-correlated, educational materials through organizations such as Project Wet and watereducation.org for classroom use. Resources can be promoted through periodic use of an educator email list procured through school administrators.
Shasta College internships	BVWD offers placements for the Shasta College Worksite Learning Program in which students earn college credit while working at paid or volunteer jobs.
School Tours	School tours of BVWD facilities, treatment operations, and filter effluent recycling are available upon request.
Shasta College CIMIS station	Shasta College students perform maintenance and calibration on CIMIS station #224.

9.1.5 Programs to Assess and Manage Distribution System Real Loss

This DMM focuses on the water distribution system itself, and includes water audits, leak detection, and repair. The first step in a water audit is relatively straightforward, involving comparison of the amount of water produced with the amount of water delivered to customers. The difference is termed "unaccounted water," which includes actual losses (leaks) in the distribution system, authorized but unmetered use (e.g., hydrant flushing and firefighting), unauthorized water use, and meter error. The best way to evaluate the effectiveness of this program is to compare water production data at the water treatment plant with water consumption from the District's customers.

BVWD offers leak detection kits at the District office which contain toilet tank dye, water efficient shower heads and shut-off nozzles. The meter replacement program is annually budgeted to replace 1/15 of total meters but fell short in 2020 due to COVID-19-related staffing challenges.

The District uses the American Water Works Association (AWWA) water audit and loss control software. The entire District is metered which allows the District to routinely calculate water losses. The District uses a run-to-waste log to track all known or discovered leaks and "discharges" from its system, for monitoring, tracking and reporting purposes. This information is also utilized for the District's annual water audit validation that uses the AWWA Water Audit software/spreadsheet. In addition to discovered leaks where the quantity is estimated, other logged run-to-waste events includes line flushing of dead-end lines for improved water quality, hydrant

flushing for water quality, hydrant maintenance, or creating a temporary demand for pump efficiency testing. In some cases, these discharges are metered and are otherwise estimated by trained and certified Distribution System Operators. Line breaks or leaks are estimated and incorporated into the AWWA water loss audit and get reported to the Regional Water Quality Control Board on the drinking water permit. Additional information on water losses can be reviewed in **Section 4.4**.

The District also has a proactive program for replacement of aged infrastructure and conducts a prompt and efficient repair program. For example, in 2018 the District inspected and made repairs on over one mile of the BVWD main distribution pipeline. In 2020, the District identified a small leak that ran for several months on a 32-inch pipe and several leaks per year on 6-inch lines. The District will continue to review data and identify leaks for repair, perform reviews of the AWWA audit information to determine if a full-scale system audit is warranted, and perform distribution leak detection when warranted. The District's program for implementation of this DMM is summarized in **Table 9-3**.

Table 9-3: Implementation of Real Loss Management

Program	Description
Proactive replacement of aged portions of distribution system	The USBR-owned distribution system, originally installed in the mid 1960's, is estimated to have a life span of 75-100 years. The District budgets money annually for pipeline replacement as part of its Extraordinary Operations, Maintenance, and Replacement (EOMR) Program. The District has projected improvements until fiscal year 35-36 which include well, water storage tank, pipeline, and pump station rehabilitation.
Efficient crew response to reports of system leaks	When a leak is reported or identified, a work order is written, and Distribution Department staff is sent out to investigate the leak. The staff promptly responds to all reported leaks, typically within 15 minutes. If the leak is reported outside of normal business hours, there is an on-call person required to respond to the location within 30 minutes. No systematic leak detection program currently exists.
Annual calculation of system-wide water loss using AWWA water budget software.	The District has been actively replacing the older and larger meters in the District, which is likely the major reason for the decrease in non-revenue water. The District has also been replacing water lines that have had a history of failures.
Meter replacement program	The District's goal is to have all of the meters either replaced or rebuilt on a 20-year cycle. Annual meter replacement rate is 1/15 of total in order to overcome backlog and to reach equilibrium of replacing any given meter every 20 years. Smaller meters are typically replaced, while it can be more economical to rebuild larger meters. The District is also installing more compound meters or magnetic meters for the larger meters in order to register water usage at lower flow rates and during periods of reduced water allocations.

9.1.6 Water Conservation Program Coordination and Staffing Support

This DMM entails designating a water conservation coordinator responsible for managing water conservation efforts, developing progress reports, promoting water conservation to agency staff, and evaluating the results of efforts. Wayne Ohlin is the designated Conservation Coordinator. Wayne coordinates all BVWD conservation activities and goals, including coordinating the preparation of annual FWMP updates. All these tasks further the goals and objectives in the Reclamation's BMPs Guidelines and UWMPA DMMs. The effectiveness of this DMM is determined by the work performed by the Water Conservation Coordinator.

Table 9-4: Water Conservation Program Coordinator

Name:	Wayne Ohlin	Title:	District Engineer
Address:	11368 E. Stillwater Way, Redding, CA 96003-9510		
Telephone:	(530) 241-1085	E-mail:	wohlin@bvwd.org

In addition to the Water Conservation Program Coordinator, the District has a QWEL certified irrigation auditor, Ren Rosin, who conducts water evaluations and audits in support of water conservation programs.

9.1.7 Other Demand Management Measures

The District implements several other DMMs, which are described below.

9.1.7.1 WATER SURVEY PROGRAMS FOR SINGLE-FAMILY AND MULTI-FAMILY RESIDENTIAL CUSTOMERS

The District frequently conducts outdoor landscape audits to assist residential, rural and commercial customers in achieving improved efficiency and conservation. These free and confidential irrigation system evaluations are promoted through the District's newsletter and provide customers with recommendations on irrigation equipment and scheduling to improve water use efficiency and save money. Three irrigation system evaluations were completed in 2017, none in 2018, nine in 2019, none in 2020, and four have been completed in 2021 with 12 pending. Due to liability and safety reasons, the District does not conduct in-home audits of any kind.

Automatic Meter Read (AMR) meters installed on 75 percent of connections (residential, commercial, institutional, landscape, and agriculture) identify continuous use and flag the account. The District notifies customers of high use, continuous use (indicating a leak or other problem) and out of range use. These events sometimes prompt the customer to request an audit. The District's program for implementation of customer water audits is summarized in **Table 9-5**.

Table 9-5: Implementation of Customer Water Audits

Program	Description
AMR (Automatic Meter Read) detects possible leaks by flagging 24-hour meter movement (no stopped meter for two consecutive hours).	When a flag is noticed, District staff checks for leaks at the meter. If none are found the customer is notified of possible leak(s) on their side of the meter.
Current and historical customer water use information is available to all District customers upon signing into their online account.	Allows customers to review usage and discuss with District and request an audit.
Customer service representatives are available to answer customer questions and address concerns.	District staff available during normal business hours, Monday through Friday.

9.1.7.2 RESIDENTIAL PLUMBING RETROFIT

This DMM involves enforcement of plumbing fixture efficiency standards and encourages programs to retrofit existing inefficient fixtures with newer reduced flow fixtures. This retrofit program focuses on plumbing installed prior to 1992, in part due to the passage of the Federal Energy Policy Act of 1992, which restricted all newly manufactured faucets and showerheads to a flow of 2.5 gallons per minutes (Department of Water Resources [DWR], August 1994).

The California Urban Water Conservation Council (CUWCC) estimates that a low-flow showerhead retrofit will save approximately 2.9 gallons per capita per day (GPCD) on post-1980 homes and 7.2 GPCD on pre-1980 constructed homes. The average savings for a toilet retrofit is 1.3 GPCD on pre-1980 constructed homes. The effectiveness of this DMM is based upon the percentage of customers that install low-flow fixtures.

Full implementation of this DMM is not feasible for the District. BVWD does offer literature and water conservation kits with retrofit materials at District offices to encourage plumbing retrofits. However, enforcement of this DMM is not feasible for the District since they are not a City or County. BVWD has to rely on Shasta County or the City of Redding Building Departments and the real estate process to identify these requirements to homeowners.

9.1.7.3 LARGE LANDSCAPE CONSERVATION PROGRAMS AND INCENTIVES

Water demand by large landscape water users can be managed by providing water audits and incentives for water conservation. The first consideration of this measure begins with identifying large irrigators and their water use, followed by development of a program for regular auditing (at least one every five years), with provisions that include water conservation training and information, with financial incentives.

The District promotes the County and the City of Redding Water Efficient Landscape

requirements[9] to its customers. The District does not develop water use budgets and does not have a regular program for audits. Should funding become available, BVWD could conduct a feasibility study to assess the benefits and costs of installing dedicated landscape meters for customers with large landscape areas and develop an implementation program if appropriate. **Table 9-6** summarizes implementation of landscape audits.

Table 9-6: Implementation of Large Landscape Irrigation Audits

Program	Description
Commercial/Institutional landscape surveys/audits	Tehama County Resource Conservation District (TCRCD) currently provides free audits to BVWD agricultural customers. BVWD will negotiate with TCRCD and others regarding offering landscape audits to larger institutional customers for payment.
Shasta College CIMIS Station (Station #224)	District supplied initial materials and funded the installation and retrofit of the station and will provide replacement parts to support maintenance, as needed. The station provides District customers with irrigation related data and support to help improve irrigation scheduling and water use efficiency.

9.1.7.4 CONSERVATION PROGRAMS FOR COMMERCIAL, INDUSTRIAL, AND INSTITUTIONAL ACCOUNTS

Implementation of water conservation for commercial, industrial, and institutional (CII) customers includes identifying the largest water users among CII customers, offering audits and incentives sufficient to conserve water, and providing follow-up audits as needed. At this time, all commercial and institutional customers are metered and charged for water usage in accordance with their metered use. The District does not have any industrial customers.

BVWD has good relationships with its CII customers including Simpson University and golf courses. These customers typically know their landscape water investment, manage it efficiently and hire an outside auditor if they desire an audit. If requested, the District would provide assistance, but the District has not been approached for such assistance by CII customers.

The District provides water audits and water conservation information to their metered customers upon request. Current and historical customer water use information is available to all District customers upon signing into their online account. The best way to determine the effectiveness of this DMM is to monitor the actual water use. In the future, the District could monitor the water use of the commercial and institutional customers, and assess demand characteristics and water

[9] Shasta County and the City of Redding enforce the California Model Water Efficient Landscape Ordinance (MWELO)

use patterns. Historic data can be compared to current average annual water use for each account type.

9.1.7.5 HIGH-EFFICIENCY WASHING MACHINE REBATE PROGRAMS

The District is too small to offer or create a washing machine rebate program due to staffing and funding constraints; however, BVWD will continue to provide a link on the BVWD website to the *California's Water Conservation Resource - Save our Water* website[10] that provides water conservation tips and rebates. Notifying customers of the rebate in billing inserts may be a method of increasing awareness and ultimately, the number of water efficient washing machines installed, which would contribute to water conservation within the District.

9.1.7.6 RESIDENTIAL ULTRA-LOW FLUSH TOILET REPLACEMENT PROGRAMS

This DMM involves implementation of programs for replacing existing high-water-use toilets with ultra-low flush (1.28 gallons or less) toilets in SFR and MFR. Full implementation of this DMM is not feasible or enforceable for the District since they are not a City or County[11]. The District has to rely on the County or the City of Redding Building Departments and the real estate process to help with replacement of toilets. Any new construction or remodel needs to comply with green building standards.

The District offers literature at District offices to encourage retrofits and provides a link to the Save our Water website on their website that recommends installation of a high-efficiency toilet to save 19 gallons per person per day. The District will not be pursuing this program due to feasibility, staffing, and funding constraints. The program would be revisited if funding were available.

9.2 Planned Implementation to Achieve Water Use Targets

Legal Requirements

CWC 10631
(f) Provide a description of the supplier's water demand management measures. This description shall include all of the following:
(1) (A) …The narrative shall describe the water demand management measures that the supplier plans to implement to achieve its water use targets pursuant to Section 10608.20.

The District currently employs several methods of water conservation. They are active in community engagement and host a website where customers can learn about water conservation and view their water use. Upgrades to the BVWD distribution system and loss prevention are done regularly to reduce water use. Based on the reductions in water use achieved by the District since 2010, the District's existing DMMs will help ensure that the District maintains its 2020 water use target.

[10] http://saveourwater.com/
[11] County and City Building Codes have adopted the California Building Code, requiring all new construction and major remodels to install low flow fixtures, including low flow toilets.

10 Completed UWMP Checklist

Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location
Chapter 1	10615	A plan shall describe and evaluate sources of supply, reasonable and practical efficient uses, reclamation, and demand management activities.	Introduction and Overview	Section 1 - Introduction and Overview
Chapter 1	10630.5	Each plan shall include a simple description of the supplier's plan including water availability, future requirements, a strategy for meeting needs, and other pertinent information. Additionally, a supplier may also choose to include a simple description at the beginning of each chapter.	Summary	Executive Summary
Section 2.2	10620(b)	Every person that becomes an urban water supplier shall adopt an urban water management plan within one year after it has become an urban water supplier.	Plan Preparation	2.1
Section 2.6	10620(d)(2)	Coordinate the preparation of its plan with other appropriate agencies in the area, including other water suppliers that share a common source, water management agencies, and relevant public agencies, to the extent practicable.	Plan Preparation	2.2
Section 2.6.2	10642	Provide supporting documentation that the water supplier has encouraged active involvement of diverse social, cultural, and economic elements of the population within the service area prior to and during the preparation of the plan and contingency plan.	Plan Preparation	2.2, 2.3
Section 2.6, Section 6.1	10631(h)	Retail suppliers will include documentation that they have provided their wholesale supplier(s) - if any - with water use projections from that source.	System Supplies	N/A
Section 3.1	10631(a)	Describe the water supplier service area.	System Description	3.1.1, 3.1.2
Section 3.3	10631(a)	Describe the climate of the service area of the supplier.	System Description	3.1.4
Section 3.4	10631(a)	Provide population projections for 2025, 2030, 2035, 2040 and optionally 2045.	System Description	3.2.3
Section 3.4.2	10631(a)	Describe other social, economic, and demographic factors affecting the supplier's water management planning.	System Description	3.3

Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location
Sections 3.4 and 5.4	10631(a)	Indicate the current population of the service area.	System Description and Baselines and Targets	3.2.2
Section 3.5	10631(a)	Describe the land uses within the service area.	System Description	3.1.3
Section 4.2	10631(d)(1)	Quantify past, current, and projected water use, identifying the uses among water use sectors.	System Water Use	4.2.2, 4.2.3 & 4.2.4
Section 4.2.4	10631(d)(3)(C)	Retail suppliers shall provide data to show the distribution loss standards were met.	System Water Use	4.4
Section 4.2.6	10631(d)(4)(A)	In projected water use, include estimates of water savings from adopted codes, plans, and other policies or laws.	System Water Use	4.5
Section 4.2.6	10631(d)(4)(B)	Provide citations of codes, standards, ordinances, or plans used to make water use projections.	System Water Use	4.5, 4.6
Section 4.3.2.4	10631(d)(3)(A)	Report the distribution system water loss for each of the 5 years preceding the plan update.	System Water Use	4.4
Section 4.4	10631.1(a)	Include projected water use needed for lower income housing projected in the service area of the supplier.	System Water Use	4.6
Section 4.5	10635(b)	Demands under climate change considerations must be included as part of the drought risk assessment.	System Water Use	4.7
Chapter 5	10608.20(e)	Retail suppliers shall provide baseline daily per capita water use, urban water use target, interim urban water use target, and compliance daily per capita water use, along with the bases for determining those estimates, including references to supporting data.	Baselines and Targets	5.1, 5.2
Chapter 5	10608.24(a)	Retail suppliers shall meet their water use target by December 31, 2020.	Baselines and Targets	5.3.1
Section 5.2	10608.24(d)(2)	If the retail supplier adjusts its compliance GPCD using weather normalization, economic adjustment, or extraordinary events, it shall provide the basis for, and data supporting the adjustment.	Baselines and Targets	N.A.
Section 5.5	10608.22	Retail suppliers' per capita daily water use reduction shall be no less than 5 percent of base daily per capita water use of the 5-year baseline. This does not apply if the suppliers base GPCD is at or below 100.	Baselines and Targets	5.3.12

Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location
Section 5.5 and Appendix E	10608.4	Retail suppliers shall report on their compliance in meeting their water use targets. The data shall be reported using a standardized form in the SBX7-7 2020 Compliance Form.	Baselines and Targets	Appendix F
Sections 6.1 and 6.2	10631(b)(1)	Provide a discussion of anticipated supply availability under a normal, single dry year, and a drought lasting five years, as well as more frequent and severe periods of drought.	System Supplies	7.3
Sections 6.1	10631(b)(1)	Provide a discussion of anticipated supply availability under a normal, single dry year, and a drought lasting five years, as well as more frequent and severe periods of drought, *including changes in supply due to climate change.*	System Supplies	7.3, 4.7
Section 6.1	10631(b)(2)	When multiple sources of water supply are identified, describe the management of each supply in relationship to other identified supplies.	System Supplies	7.2, 7.3
Section 6.1.1	10631(b)(3)	Describe measures taken to acquire and develop planned sources of water.	System Supplies	6.9
Section 6.2.8	10631(b)	Identify and quantify the existing and planned sources of water available for 2020, 2025, 2030, 2035, 2040 and optionally 2045.	System Supplies	6.10, 8.10
Section 6.2	10631(b)	Indicate whether groundwater is an existing or planned source of water available to the supplier.	System Supplies	6, 6.2, 6.9
Section 6.2.2	10631(b)(4)(A)	Indicate whether a groundwater sustainability plan or groundwater management plan has been adopted by the water supplier or if there is any other specific authorization for groundwater management. Include a copy of the plan or authorization.	System Supplies	6.2.3
Section 6.2.2	10631(b)(4)(B)	Describe the groundwater basin.	System Supplies	6.2.1
Section 6.2.2	10631(b)(4)(B)	Indicate if the basin has been adjudicated and include a copy of the court order or decree and a description of the amount of water the supplier has the legal right to pump.	System Supplies	6.2.4
Section 6.2.2.1	10631(b)(4)(B)	For unadjudicated basins, indicate whether or not the department has identified the basin as a high or medium priority. Describe efforts by the supplier to coordinate with sustainability or groundwater agencies to achieve sustainable groundwater conditions.	System Supplies	6.2.4

Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location
Section 6.2.2.4	10631(b)(4)(C)	Provide a detailed description and analysis of the location, amount, and sufficiency of groundwater pumped by the urban water supplier for the past five years	System Supplies	6.2.5
Section 6.2.2	10631(b)(4)(D)	Provide a detailed description and analysis of the amount and location of groundwater that is projected to be pumped.	System Supplies	6.2.5, 6.9
Section 6.2.5	10633(b)	Describe the quantity of treated wastewater that meets recycled water standards, is being discharged, and is otherwise available for use in a recycled water project.	System Supplies (Recycled Water)	6.6.2
Section 6.2.5	10633(c)	Describe the recycled water currently being used in the supplier's service area.	System Supplies (Recycled Water)	6.6.3
Section 6.2.5	10633(d)	Describe and quantify the potential uses of recycled water and provide a determination of the technical and economic feasibility of those uses.	System Supplies (Recycled Water)	6.6.4
Section 6.2.5	10633(e)	Describe the projected use of recycled water within the supplier's service area at the end of 5, 10, 15, and 20 years, and a description of the actual use of recycled water in comparison to uses previously projected.	System Supplies (Recycled Water)	6.6.4
Section 6.2.5	10633(g)	Provide a plan for optimizing the use of recycled water in the supplier's service area.	System Supplies (Recycled Water)	6.6.5
Section 6.2.6	10631(g)	Describe desalinated water project opportunities for long-term supply.	System Supplies	6.7
Section 6.2.5	10633(a)	Describe the wastewater collection and treatment systems in the supplier's service area with quantified amount of collection and treatment and the disposal methods.	System Supplies (Recycled Water)	6.6.2
Section 6.2.8, Section 6.3.7	10631(f)	Describe the expected future water supply projects and programs that may be undertaken by the water supplier to address water supply reliability in average, single-dry, and for a period of drought lasting 5 consecutive water years.	System Supplies	6.9
Section 6.4 and Appendix O	10631.2(a)	The UWMP must include energy information, as stated in the code, that a supplier can readily obtain.	System Suppliers, Energy Intensity	6.11

Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location
Section 7.2	10634	Provide information on the quality of existing sources of water available to the supplier and the manner in which water quality affects water management strategies and supply reliability	Water Supply Reliability Assessment	7.1.4
Section 7.2.4	10620(f)	Describe water management tools and options to maximize resources and minimize the need to import water from other regions.	Water Supply Reliability Assessment	7.4
Section 7.3	10635(a)	Service Reliability Assessment: Assess the water supply reliability during normal, dry, and a drought lasting five consecutive water years by comparing the total water supply sources available to the water supplier with the total projected water use over the next 20 years.	Water Supply Reliability Assessment	7.3
Section 7.3	10635(b)	Provide a drought risk assessment as part of information considered in developing the demand management measures and water supply projects.	Water Supply Reliability Assessment	7.1, 7.2
Section 7.3	10635(b)(1)	Include a description of the data, methodology, and basis for one or more supply shortage conditions that are necessary to conduct a drought risk assessment for a drought period that lasts 5 consecutive years.	Water Supply Reliability Assessment	7.3
Section 7.3	10635(b)(2)	Include a determination of the reliability of each source of supply under a variety of water shortage conditions.	Water Supply Reliability Assessment	7.3
Section 7.3	10635(b)(3)	Include a comparison of the total water supply sources available to the water supplier with the total projected water use for the drought period.	Water Supply Reliability Assessment	7.3
Section 7.3	10635(b)(4)	Include considerations of the historical drought hydrology, plausible changes on projected supplies and demands under climate change conditions, anticipated regulatory changes, and other locally applicable criteria.	Water Supply Reliability Assessment	7.2
Chapter 8	10632(a)	Provide a water shortage contingency plan (WSCP) with specified elements below.	Water Shortage Contingency Planning	8, Appendix L - WSCP
Chapter 8	10632(a)(1)	Provide the analysis of water supply reliability (from Chapter 7 of Guidebook) in the WSCP	Water Shortage Contingency Planning	Appendix L - Section 2

Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location
Section 8.10	10632(a)(10)	Describe reevaluation and improvement procedures for monitoring and evaluation the water shortage contingency plan to ensure risk tolerance is adequate and appropriate water shortage mitigation strategies are implemented.	Water Shortage Contingency Planning	Appendix L - Section 10
Section 8.2	10632(a)(2)(A)	Provide the written decision-making process and other methods that the supplier will use each year to determine its water reliability.	Water Shortage Contingency Planning	Appendix L - Section 2.1
Section 8.2	10632(a)(2)(B)	Provide data and methodology to evaluate the supplier's water reliability for the current year and one dry year pursuant to factors in the code.	Water Shortage Contingency Planning	Appendix L - Section 2.2
Section 8.3	10632(a)(3)(A)	Define six standard water shortage levels of 10, 20, 30, 40, 50 percent shortage and greater than 50 percent shortage. These levels shall be based on supply conditions, including percent reductions in supply, changes in groundwater levels, changes in surface elevation, or other conditions. The shortage levels shall also apply to a catastrophic interruption of supply.	Water Shortage Contingency Planning	8.1, Appendix L - Section 3
Section 8.3	10632(a)(3)(B)	Suppliers with an existing water shortage contingency plan that uses different water shortage levels must cross reference their categories with the six standard categories.	Water Shortage Contingency Planning	N.A.
Section 8.4	10632(a)(4)(A)	Suppliers with water shortage contingency plans that align with the defined shortage levels must specify locally appropriate supply augmentation actions.	Water Shortage Contingency Planning	Appendix L - Section 4.3
Section 8.4	10632(a)(4)(B)	Specify locally appropriate demand reduction actions to adequately respond to shortages.	Water Shortage Contingency Planning	8.3, Appendix L - Section 4.4
Section 8.4	10632(a)(4)(C)	Specify locally appropriate operational changes.	Water Shortage Contingency Planning	Appendix L - Section 4.5
Section 8.4	10632(a)(4)(D)	Specify additional mandatory prohibitions against specific water use practices that are in addition to state-mandated prohibitions and appropriate to local conditions.	Water Shortage Contingency Planning	8.3, Appendix L - Section 4.6
Section 8.4	10632(a)(4)(E)	Estimate the extent to which the gap between supplies and demand will be reduced by implementation of the action.	Water Shortage Contingency Planning	Appendix L - Section 4.1

Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location
Section 8.4.6	10632.5	The plan shall include a seismic risk assessment and mitigation plan.	Water Shortage Contingency Plan	8.9, Appendix L - Section 2.2.
Section 8.5	10632(a)(5)(A)	Suppliers must describe that they will inform customers, the public and others regarding any current or predicted water shortages.	Water Shortage Contingency Planning	8.3, Appendix L – Section 5.1
Section 8.6	10632(a)(6)	Retail supplier must describe how it will ensure compliance with and enforce provisions of the WSCP.	Water Shortage Contingency Planning	8.4, Appendix L – Section 6
Section 8.7	10632(a)(7)(A)	Describe the legal authority that empowers the supplier to enforce shortage response actions.	Water Shortage Contingency Planning	8, 8.1, Appendix L – Section 7
Section 8.7	10632(a)(7)(B)	Provide a statement that the supplier will declare a water shortage emergency Water Code Chapter 3.	Water Shortage Contingency Planning	8.1, Appendix L – Section 7.1
Section 8.7	10632(a)(7)(C)	Provide a statement that the supplier will coordinate with any city or county within which it provides water for the possible proclamation of a local emergency.	Water Shortage Contingency Planning	8.1, Appendix L – Section 7.2
Section 8.8	10632(a)(8)(A)	Describe the potential revenue reductions and expense increases. associated with activated shortage response actions.	Water Shortage Contingency Planning	8.7, Appendix L - Section 8
Section 8.8	10632(a)(8)(C)	Retail suppliers must describe the cost of compliance with Water Code Chapter 3.3: Excessive Residential Water Use During Drought	Water Shortage Contingency Planning	8.7, Appendix L - Section 8.3
Section 8.9	10632(a)(9)	Retail suppliers must describe the monitoring and reporting requirements and procedures that ensure appropriate data is collected, tracked, and analyzed for purposes of monitoring customer compliance.	Water Shortage Contingency Planning	8.6, Appendix L - Section 9
Section 8.11	10632(b)	Analyze and define water features that are artificially supplied with water, including ponds, lakes, waterfalls, and fountains, separately from swimming pools and spas.	Water Shortage Contingency Planning	8.3, Appendix L - Section 4.2
Section 8.14	10632(c)	Make available the Water Shortage Contingency Plan to customers and any city or county where it provides water within 30 after adopted the plan.	Water Shortage Contingency Planning	8, Appendix L - Section 5.3
Sections 9.2 and 9.3	10631(e)(1)	Retail suppliers shall provide a description of the nature and extent of each demand management measure implemented over the past five years. The description will address specific measures listed in code.	Demand Management Measures	9.1

Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location
Chapter 10	10608.26(a)	Retail suppliers shall conduct a public hearing to discuss adoption, implementation, and economic impact of water use targets (recommended to discuss compliance).	Plan Adoption, Submittal, and Implementation	2.3
Section 10.2.1	10621(b)	Notify, at least 60 days prior to the public hearing, any city or county within which the supplier provides water that the urban water supplier will be reviewing the plan and considering amendments or changes to the plan. Reported in Table 10-1.	Plan Adoption, Submittal, and Implementation	2.31
Section 10.4	10621(f)	Each urban water supplier shall update and submit its 2020 plan to the department by July 1, 2021.	Plan Adoption, Submittal, and Implementation	2.3.3
Sections 10.2.2, 10.3, and 10.5	10642	Provide supporting documentation that the urban water supplier made the plan and contingency plan available for public inspection, published notice of the public hearing, and held a public hearing about the plan and contingency plan.	Plan Adoption, Submittal, and Implementation	2.3.4
Section 10.2.2	10642	The water supplier is to provide the time and place of the hearing to any city or county within which the supplier provides water.	Plan Adoption, Submittal, and Implementation	2.3
Section 10.3.2	10642	Provide supporting documentation that the plan and contingency plan has been adopted as prepared or modified.	Plan Adoption, Submittal, and Implementation	2.3.2
Section 10.4	10644(a)	Provide supporting documentation that the urban water supplier has submitted this UWMP to the California State Library.	Plan Adoption, Submittal, and Implementation	2.3.3
Section 10.4	10644(a)(1)	Provide supporting documentation that the urban water supplier has submitted this UWMP to any city or county within which the supplier provides water no later than 30 days after adoption.	Plan Adoption, Submittal, and Implementation	NA
Sections 10.4.1 and 10.4.2	10644(a)(2)	The plan, or amendments to the plan, submitted to the department shall be submitted electronically.	Plan Adoption, Submittal, and Implementation	2.3.3
Section 10.5	10645(a)	Provide supporting documentation that, not later than 30 days after filing a copy of its plan with the department, the supplier has or will make the plan available for public review during normal business hours.	Plan Adoption, Submittal, and Implementation	2.3.4
Section 10.5	10645(b)	Provide supporting documentation that, not later than 30 days after filing a copy of its water shortage contingency plan with the department, the supplier has or will make the plan available for public review during normal business hours.	Plan Adoption, Submittal, and Implementation	2.3.4, 8

Guidebook Location	Water Code Section	Summary as Applies to UWMP	Subject	2020 UWMP Location
Section 10.6	10621(c)	If supplier is regulated by the Public Utilities Commission, include its plan and contingency plan as part of its general rate case filings.	Plan Adoption, Submittal, and Implementation	NA
Section 10.7.2	10644(b)	If revised, submit a copy of the water shortage contingency plan to DWR within 30 days of adoption.	Plan Adoption, Submittal, and Implementation	8

11 Bibliography/References

1. Bella Vista Water District, *2012 Federal Water Management Plan*, 2015.

2. Bella Vista Water District, *Water Services for Affordable Housing (under Resolution 07-01)*, January 22, 2007.

3. California Department of Housing and Community Development, *Regional Housing Need Determination and Plan for the Fifth Housing Element Update*, June 30, 2012.

4. California Department of Water Resources, *2015 Urban Water Management Plans - Guidebook for Urban Water Suppliers*, 2015.

5. Lawrence and Associates, *Results of the Aquifer Storage & Recovery Pilot Test on BVWD Well #2, Shasta County CA, 2015.*

6. State of California, *20x2020 Water Conservation Plan*, February 2010.