2015 Urban Water Management Plan

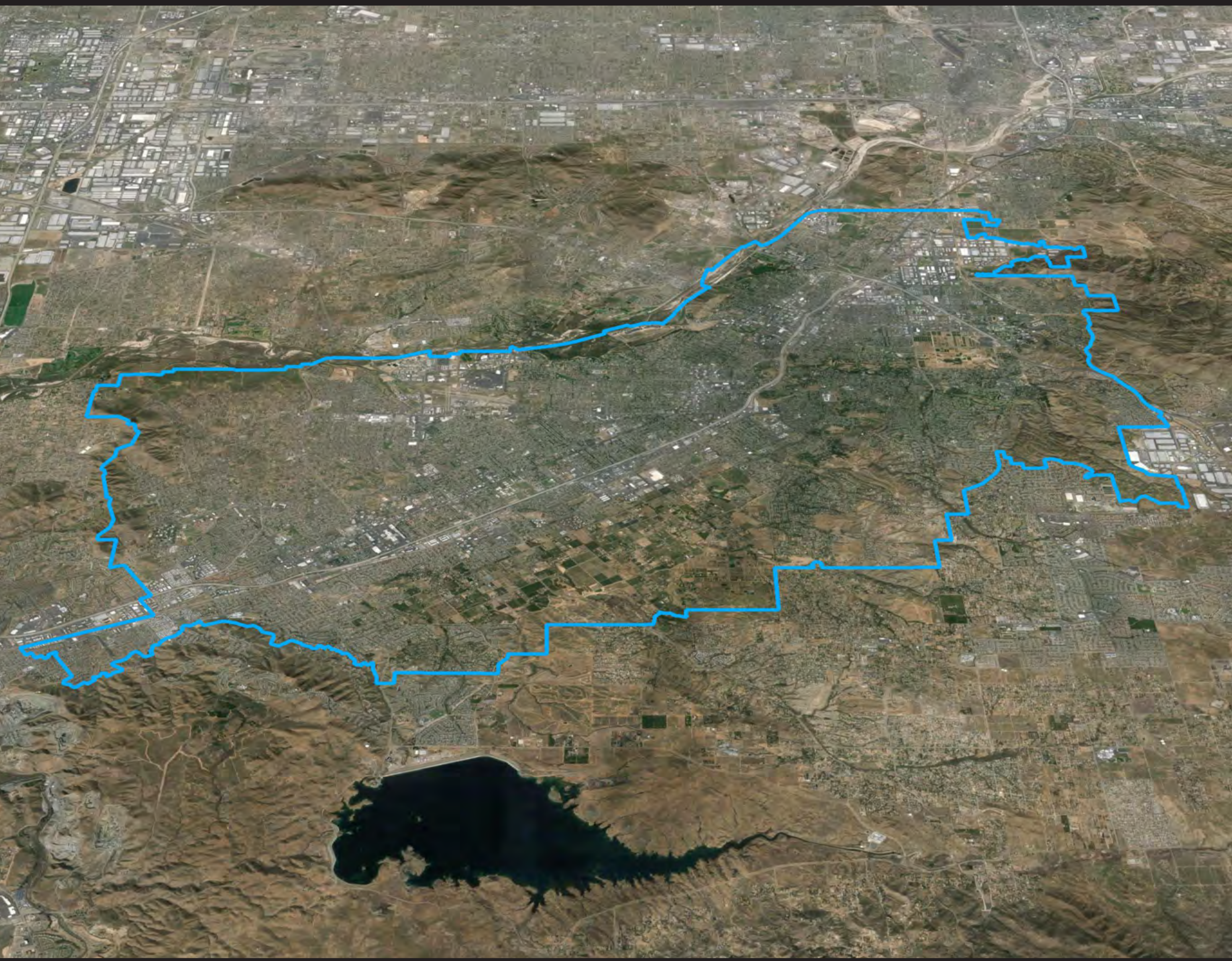
for Riverside Public Utilities

Water Division

WATER | ENERGY | LIFE

CITY OF RIVERSIDE

PUBLIC UTILITIES



• June 2016 •

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WATER SYSTEMS CONSULTING, INC.

2015 Urban Water Management Plan

City of Riverside Public Utilities Department

June 2016

DRAFT

Prepared by:

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Abbreviations and Acronyms

AF	Acre-feet
AFY	Acre-feet per year
BTAC	Basin Technical Advisory Committee
CWC	California Water Code
DMM	Demand Management Measure
DWR	California Department of Water Resources
EMWD	Eastern Municipal Water District
ERNIE	Emergency Response Network of the Inland Empire
gpm	Gallons per minute
IRWMP	Integrated Regional Water Management Plan
IWMP	Integrated Water Management Plan
MWD	Metropolitan Water District of Southern California
MHI	Median Household Income
msl	Mean sea level
NPDES	National Pollutant Discharge Elimination System
OCWD	Orange County Water District
OWOW	One Water One Watershed
RHWC	Riverside Highland Water Company
RPU	Riverside Public Utilities
RWQCP	Regional Water Quality Control Plant
RWQCB	Regional Water Quality Control Board
SARWQCB	Santa Ana Regional Water Quality Control Board
SAWPA	Santa Ana Watershed Project Authority

SB X7-7	Senate Bill X7-7 (Water Conservation Act of 2009)
SBBA	San Bernardino Basin Area
SBVWCD	San Bernardino Valley Water Conservation District
SCAG	Southern California Association of Governments
SCE	Southern California Edison
SGPWA	San Gorgonio Pass Water Agency
State	State of California
SWP	State Water Project
SWRCB	State Water Resources Control Board
TDS	Total Dissolved Solids
TIN	Total Inorganic Nitrogen
USARW	Upper Santa Ana River Watershed
UWMP	Urban Water Management Plan
Valley District	San Bernardino Valley Municipal Water District
VOCs	Volatile Organic Compounds
WMWD	Western Municipal Water District
WRP	Water Reclamation Plant
WTP	Water Treatment Plant
WUE	Water Use Efficiency
WVWD	West Valley Water District
WWTP	Wastewater Treatment Plant
YVWD	Yucaipa Valley Water District

Appendices

1 Executive Summary

1.1 Plan Preparation

The City of Riverside Public Utilities Department (RPU) prepared its 2015 Urban Water Management Plan (UWMP) in accordance with the Urban Water Management Planning Act, sections 10610 through 10656 of the California Water Code. This UWMP summarizes RPU's projected retail and wholesale water demands and characterizes the source waters available to meet those demands for the years 2020 through 2040. The plan also describes the reliability of RPU's water supplies and discusses RPU's water shortage contingency plan during a catastrophic event or drought conditions.

RPU encouraged participation in this plan by surrounding water management agencies, water retailers, public agencies, and members of the community. The draft plan was available at the RPU office located at 3750 University Ave. 3rd Floor, Riverside CA 92501 and as a PDF on the RPU website (www.riversidepublicutilities.gov) prior to the public hearing. The final 2015 UWMP will also be available at the RPU office located at 3750 University Ave. 3rd Floor, Riverside CA 92501 or as a PDF on the RPU website.

1.2 Water Demands

In 2015, RPU's total water demands were approximately 75,000 acre-feet. This amount includes potable water, raw water for non-potable uses, and recycled water. It includes water delivered to RPU's retail customers, as well as water delivered to other agencies. The projected water demands are summarized in Table 1-1.

Table 1-1. Actual and Projected Demands

Level of Treatment When Delivered	Use Type	2015	2020	2025	2030	2035	2040
Drinking Water	Single Family	26,897	29,931	31,064	32,241	33,462	34,730
Drinking Water	Multi-Family	4,821	5,365	5,568	5,779	5,998	6,225
Drinking Water	Commercial/Institutional	8,950	9,959	10,337	10,728	11,135	11,556
Drinking Water	Industrial	8,847	9,845	10,218	10,605	11,006	11,423
Drinking Water	Landscape	1,842	1,050	100	150	200	250
Drinking Water	Agricultural irrigation	1,534	1,707	1,772	1,839	1,908	1,981
Drinking Water	Other	333	371	385	399	414	430
Drinking Water	Deliveries to WMWD	1,442	4,300	4,300	4,300	4,300	4,300
Drinking Water	Wholesale to HGCWD	180	0	0	0	0	0
Drinking Water	UCR Demand related to UCR Expansion	0	3,300	3,300	3,300	3,300	3,300
Drinking Water	California Baptist University additional demand	0	150	150	150	150	150
Drinking Water	GCC (Upper)	5,783	6,000	6,000	6,000	6,000	6,000
Raw Water	GCC (Lower)	6,139	7,000	7,000	7,000	7,000	7,000
Raw Water	Overlying Uses	901	1,200	1,200	1,200	1,200	1,200
Raw Water	WMWD	662	2,500	2,500	2,500	2,500	2,500
Drinking Water	Potable Losses	6,302	5,278	5,375	5,559	5,750	5,948
Raw Water	Irrigation Water Loss	295	835	835	835	835	835
Total Raw and Potable		**74,928**	**88,791**	**90,104**	**92,585**	**95,159**	**97,827**
Recycled Water	Landscape Irrigation	200	260	260	260	260	260
Recycled Water	Jackson Street Pipeline	0	3,370	3,370	3,370	3,370	3,370
Recycled Water	Arlington Avenue Pipeline	0	1,600	1,600	1,600	1,600	1,600
Recycled Water	Regional Concept Pipeline	0	1,200	1,200	1,200	1,200	1,200
Total Recycled Water		**200**	**6,430**	**6,430**	**6,430**	**6,430**	**6,430**
Total Demand		**75,128**	**95,221**	**96,534**	**99,015**	**101,589**	**104,257**
Notes: Overlying uses include local demand for irrigation water met with production from RPU wells.							

Retail water deliveries include potable and recycled water sales to retail customers within the RPU service area. Wholesale deliveries include potable and non-potable water sales to other water retailers. RPU wholesales potable water to the Home Gardens County Water District (HGCWD) and Western Municipal Water District (WMWD). RPU wholesales non-potable water to WMWD. RPU exchanges potable and non-potable water to the GCC at the lower connection to the Gage Canal. Additional water uses include nonrevenue water, including system losses.

In accordance with the requirements of Senate Bill No. X7-7 (i.e. Water Conservation Act of 2009), water retailers must establish an urban water use target for 2020, which reduces their urban per capita water use by 20 percent from their baseline water use, and must establish an interim urban water use target for 2015, which reduces their urban per capita water use by 10 percent from the baseline. In addition, water retailers are required to develop a water use reduction plan to describe the measures that will be implemented to meet the interim and urban water use targets.

As part of this plan, RPU established its interim and urban water use targets for 2015 and 2020 in accordance with the Water Conservation Act of 2009. While these values were calculated in the 2010 UWMP, they have been updated in this UWMP to reflect the use of updated Census Bureau population data, as required by the California Department of Water Resources (DWR). The interim and urban water use targets for the RPU service area are 239 gallons per capita per day (gpcd) and 213 gpcd, respectively. These values are only slightly different than the values calculated in the 2010 UWMP, which were 238 gpcd and 211 gpcd, respectively. RPU intends to meet the conservation requirements of the Water Conservation Act of 2009 through increased use of recycled water and continued implementation of water conservation measures.

In 2015, the annual daily per capita water use was 180 gpcd. RPU currently meets the 2015 and 2020 urban water use targets, and it plans to continue to develop recycled water and implement water conservation programs to maintain its consumption below the 2020 target.

1.3 Water Supplies

RPU's water supply consists primarily of groundwater from the Bunker Hill Basin, Riverside North, and Riverside South sub-basins. Additional sources of water available to RPU include groundwater from the Rialto-Colton Basin, recycled water from the Riverside Water Quality Control Plant (RWQCP), and imported water from WMWD through a connection at the Metropolitan Water District of Southern California's (MWD) Henry J. Mills Treatment Plant (Mills WTP).

RPU plans to augment its existing water supplies through conjunctive use projects in the Bunker Hills and Riverside North Basins and recycled water infrastructure projects. The planned projects are summarized in Table 1-2.

Table 1-2. Expected Future Water Supply Projects or Programs

Name of Future Projects or Programs	Planned Implementation Year	Expected Increase in Water Supply (AFY)
Seven Oaks Dam Conservation Project Enhanced Phase II	2020	1,000
Riverside North Aquifer Storage and Recovery	2020	2,000
Jackson Street and Arlington Avenue Pipelines	2020	4,970
Recycled Water Regional Concept Pipeline	2020	1,200
Bunker Hill Basin (BHB) Groundwater Banking	2025	2,000
Bunker Hill Basin Active Recharge Project	2025	1,500
Stormwater Recharge at Columbia, Marlborough, and Kansas Detention Basins	2025	1,500
Box Spring Local Stream Recharge and Direct Use	2030	2,800

Table 1-3 shows the anticipated water supplies available to RPU through 2040.

Table 1-3. Actual and Planned Supplies

Water Supply	Additional Detail on Water Supply	2015 Actual	2020	2025	2030	2035	2040
Groundwater	Bunker Hill	53,793	55,263	55,263	55,263	55,263	55,263
Groundwater	Banking BH Conjunctive Use	0	0	2,000	2,000	2,000	2,000
Groundwater	Seven Oaks Dam Phase II (Enhanced)	0	1,000	1,000	1,000	1,000	1,000
Groundwater	BH Active Recharge 2025	0	0	1,500	1,500	1,500	1,500
Groundwater	Riverside North	6,357	10,902	10,902	10,902	10,902	10,902
Groundwater	RNASR	0	2,000	2,000	2,000	2,000	2,000
Groundwater	Riverside South	13,571	16,880	16,880	16,880	16,880	16,880
Groundwater	Box Springs	0	0	0	2,800	2,800	2,800
Groundwater	Columbia, Etc. Stormwater	0	0	1,500	1,500	1,500	1,500
Groundwater	Rialto-Colton	1,205	2,728	2,728	2,728	2,728	2,728
Recycled water	RWQCP	200	6,430	6,430	6,430	6,430	6,430
Purchased or Imported Water	From WMWD	0	21,700	21,700	21,700	21,700	21,700
	Total	**75,126**	**116,903**	**121,903**	**124,703**	**124,703**	**124,703**
Notes: **Imported water from WMWD is shown as a supply available to RPU. RPU intends to use this supply only if needed.**							

1.4 Water Supply Reliability

RPU's available source waters include groundwater, recycled water, and imported water. RPU plans to augment groundwater production through conjunctive use projects that recharge surface water, recycled water, and/or imported water.

Local groundwater supplies account for most of RPU's water supplies, with approximately 60 percent originating from the Bunker Hill Basin, which is adjudicated. RPU's water rights are based on the long-term safe yield from the Bunker Hill Basin, which includes wet, dry, and normal periods. RPU's wells are generally located in the section of the basin with the greatest thickness of water bearing layers. Thus, RPU's water supply from the Bunker Hill Basin is considered reliable during single and multi-year dry periods.

To increase water supply reliability, RPU intends to augment natural recharge in the Bunker Hill and Riverside basins through conjunctive use projects identified in Table 1-2. These projects capture excess surface water flows when they are available and put the water in storage in the groundwater basins, from where it can be withdrawn during dry periods. The quantity of surface water recharge from these projects is dependent on the hydrologic conditions in the Santa Ana River Watershed. However, in wet years, above average recharge will occur and, in dry years, below average recharge will occur. These projects each have inherent storage capacity, whether it is storage capacity behind Seven Oaks Dam or storage capacity within a groundwater basin. Therefore, over a single or multi-year dry period the quantity of supply from these projects will only be slightly reduced, because in those dry years, supplemental water can be pulled from storage.

RPU’s supply of recycled water comes from the RWQCP and is not considered subject to reduced availability during dry years. RPU is contracted to receive State Water Project water from MWD through WMWD. The 2015 State Water Project Delivery Capability Report (DCR) estimates that on an average basis, State Water Contractors can expect about 60 percent of their annual maximum entitlement. RPU has implemented several measures to maximize the use of local water resources and eliminate reliance on imported water.

1.5 Water Shortage Contingency Plan

RPU's 2010 UWMP included a Water Shortage Contingency Plan (WSCP) and three supporting appendices: RPU Water Rule #9 (Shortage of Water Supply and Interruption of Delivery, also known as the Water Shortage Ordinance); RPU Water Rule #15 (Water Waste); and a draft Water Conservation Ordinance that expanded on the Water Shortage Ordinance and was adopted by RPU's Board after the preparation of the 2010 UWMP. The Water Conservation Ordinance amended the Riverside Municipal Code (RMC) Title 14 and included a detailed description of unreasonable uses of water, RPU's Water Conservation Program, responses to water shortage emergencies, and enforcement and severability.

The Water Conservation Ordinance establishes a Water Conservation Program which uses four stages to address conditions and needs. The Water Conservation Stage shall be set by City Council action.

In July of 2014, the City Council adopted revisions to the City’s Water Conservation Ordinance, as set forth in RMC Chapter 14.22, and adopted a resolution implementing Stages 1 and 2 of the City’s Water Conservation Ordinance. In June of 2015, the City Council adopted additional changes to the Water Conservation Ordinance. The changes included additional restrictions on irrigation water use and an updated enforcement policy. The City also adopted a resolution implementing Stages 1, 2, and 3 of the Water Conservation Ordinance.

In addition to water supply shortages caused by drought conditions, there are other major hazards that can degrade the quality and/or impact the quantity of water available to the RPU water system. These include: regional power outages, earthquakes, liquefaction (i.e. high groundwater levels that could compromise water delivery infrastructure), floods, chemical spills, groundwater contamination, and terrorist acts. Some of these hazards could also adversely impact the distribution systems, such as the major transmission mains or reservoirs. Interruptions to water supplies from any of the above mentioned hazards may be limited to days or even months, except for groundwater contamination, which could last several years.

RPU has implemented several measures to improve the reliability of its water system. Actions taken to prepare for a catastrophe include:

- Establishing criteria for a proclamation of water shortage
- Developing alternate sources of water supplies
- Establishing contacts and mutual aid agreements with other agencies
- Establishing an Emergency Response Team/Coordinator
- Preparing an Emergency Response Plan (ERP)
- Developing public awareness programs
- Conduct mock emergency drills at the Emergency Operations Center annually

In 2008, the City updated its ERP, which incorporates the RPU Water System Emergency Response Plan.

1.6 Conclusion

The current drought has created a challenging environment for all California water agencies. RPU's conservation efforts and long-range planning have created a situation where RPU's identified supplies exceed the expected demands through 2040. RPU will continue to engage in proactive planning to effectively manage its water resources and meet customer demands in a cost-effective and environmentally responsible manner.

2 Introduction and Overview

The City of Riverside Public Utilities Department has prepared this Urban Water Management Plan (UWMP) to document its current and future water demands and planned supplies. Water suppliers in California are required to update their UWMP every five years, in years ending in 5 or 0. RPU completed its 2010 UWMP in 2011, in accordance with the modified schedule established by the California Department of Water Resources (DWR). The Urban Water Management Planning Act (UWMP Act) and the California Water Code (CWC) require the preparation of a UWMP by water suppliers who have more than 3,000 service connections or who serve more than 3,000 acre-feet per year (AFY).

2.1 Urban Water Management Planning and the California Water Code

The UWMP Act of 1983 describes the required contents of a UWMP. The UWMP has been amended over time to include additional requirements. After the preparation of the 2010 UWMPs, further changes were incorporated into the CWC in the areas of Demand Management Measures, Electronic Submittal of Data, Water Loss, Estimating Future Water Savings, Voluntary Reporting of Energy Intensity, and Defining Water Features.

DWR prepared a Guidebook for Urban Water Suppliers (Guidebook) to help agencies develop UWMPs that meet the updated requirements of the CWC. RPU used this Guidebook to develop the structure and contents of this UWMP.

The Water Conservation Act of 2009, also known as SB X7-7, required retail urban water suppliers to report their Base Daily per Capita Water Use (Baseline GPCD), 2015 Interim Urban Water Use Target, 2020 Urban Water Use Target, and Compliance Daily per Capita Water Use. In the 2015 UWMP, water suppliers are required to use an approved method for calculating service area population that reflects incorporation of the 2010 census results. RPU used the online population tool developed by DWR to re-calculate its service area population for the baseline years and current conditions.

The UWMP Act is attached as Appendix A, and the complete text of SB X7-7 is attached as Appendix B.

2.2 UWMP Organization

RPU has structured this document to follow the organization recommended by DWR. This report includes the following chapters:

1. Executive Summary
2. Introduction and Overview
3. Plan Preparation
4. System Description
5. System Water Use
6. Baselines and Targets
7. System Supplies
8. Water Supply Reliability
9. Water Shortage Contingency Planning
10. Demand Management Measures
11. Plan Adoption, Submittal, and Implementation

2.3 UWMPs and Grant or Loan Eligibility

As documented in Chapter 6, RPU has met its 2015 Interim Urban Water Use Target and is in compliance with the water conservation requirements established by the Water Conservation Act of 2009.

3 Plan Preparation

RPU prepared its 2015 UWMP in accordance with the Urban Water Management Planning Act, sections 10610 through 10656 of the California Water Code. The Urban Water Management Planning Act is attached as Appendix A.

This chapter provides information required by the CWC to establish the basis for RPU's plan preparation. A number of previous planning documents and regional efforts were used in the development of this 2015 UWMP. These documents include:

- 2010 RPU Urban Water Management Plan
- 2011 Arlington Basin Groundwater Management Plan
- 2012 Riverside Basin Groundwater Management Plan
- 2015 Upper Santa Ana River Integrated Water Resources Management Plan
- 2015 RPU Integrated Water Management Plan
- 2015 Basin Technical Advisory Committee Regional Water Management Plan
- 2015 Annual Report of the Western-San Bernardino Watermaster

3.1 Basis for Preparing a Plan

RPU provides water to a service area that includes most of the City of Riverside. RPU operates a single Public Water System (PWS) as defined by DWR. In 2015, RPU delivered approximately 60,000 acre-feet of potable water to its retail customers. Relevant statistics about RPU's PWS are presented in Table 3-1.

Table 3-1. DWR Table 2-1R. Public Water Systems

Public Water System Number	Public Water System Name	Number of Municipal Connections 2015	Volume of Water Supplied 2015
3310031	City of Riverside Public Utilities	64,871	59,525

3.2 Regional Planning

RPU participates in regional planning efforts including the Upper Santa Ana Watershed Integrated Regional Water Management Plan (IRWMP) process and the San Bernardino Basin Area (SBBA) Basin Technical Advisory Committee (BTAC).

In preparing this plan, RPU has drawn on previous planning documents including the 2015 Integrated Water Management Plan and the 2015 Upper Santa Ana River Integrated Regional Water Management Plan. RPU is actively participating in regional planning efforts with neighboring agencies to assess regional supplies and demands and develop new sources of supply as needed.

RPU is primarily a retail agency, and has prepared this UWMP as an individual retail agency. RPU does sell some water to neighboring agencies, but this amount falls below the 3,000-AFY threshold that would require RPU to prepare its UWMP as a wholesale agency.

Table 3-2. DWR Table 2-2. Plan Identification

Check	Type of Plan
X	Individual UWMP
	Regional UWMP (RUWMP)
	RUWMP includes a Regional Alliance
	RUWMP does not include a Regional Alliance

3.3 Fiscal or Calendar Year and Units of Measure

RPU has prepared this report presenting data on a calendar year basis (January 1 through December 31). The report includes data for the entire calendar year 2015. This report uses units of acre-feet for water volume, and acre-feet per year (AFY) for annual amounts.

Table 3-3. DWR Table 2-3. Agency Identification

Check	Type
	Agency is a Wholesaler
X	Agency is a retailer
X	UWMP Tables are in Calendar Years
	UWMP Tables are in Fiscal Years
Units of Measure:	Acre Feet (AF)

3.4 Coordination and Outreach

RPU's service area is centrally located within the Santa Ana River Watershed. RPU shares water resources with several public agencies and private water retailers. This arrangement requires on-going coordination between the water management agencies and local water retailers for sustainable long term planning of these resources.

In addition to collaborating with the water management agencies and surrounding water retailers, RPU values the continued partnership with its community. RPU has developed procedures to inform the general public of current events and provides opportunities by which its constituents can share ideas and provide feedback.

3.4.1 Agency Coordination

Pursuant to the UWMP Act, RPU sent a Notice of Preparation letter in February of 2016 to the surrounding water management agencies, water retailers, and public agencies to inform them that RPU was in the process of preparing its 2015 UWMP. The Notice of Preparation letter also contained details related to the availability of the draft plan, comment period, and public hearing.

Copies of the Notice of Preparation letters are included in Appendix C.

RPU coordinated with its wholesale water supplier, Western Municipal Water District (WMWD), in the preparation of the demand and supply estimates presented in the report.

Table 3-4. DWR Table 2-4R. Water Supplier Information Exchange

The retail supplier has informed the following wholesale supplier(s) of projected water use in accordance with CWC 10631.
Wholesale Water Supplier Name
Western Municipal Water District

In addition to WMWD, RPU requested input, data, and comments from many neighboring agencies while preparing this plan. These agencies are shown in Table 3-5.

Table 3-5. Water Agencies Notified of the 2015 RPU UWMP Update

Agency Name
Riverside County Planning Department
Riverside County Flood Control and Water Conservation District
City of Riverside Planning Department
City of San Bernardino Municipal Water Department
City of Rialto Water and Wastewater Utilities
City of Colton
City of Loma Linda Public Works
City of Redlands Municipal Utilities and Engineering
City of Corona Department of Water and Power
City of Norco Public Works
San Bernardino Valley Municipal Water District
San Bernardino Valley Water Conservation District
Western Municipal Water District
Eastern Municipal Water District
West Valley Water District
East Valley Water District
Rubidoux Community Services District
Jurupa Community Services District
Home Gardens County Water District
Gage Canal Company
Riverside Highland Water Company
Elsinore Valley Municipal Water District (Meeks & Daley Water Company)
Fontana Water Company

3.4.2 Public Outreach

RPU communicates water supply information to the community throughout the year. For example, RPU provides water highlights at one of the two monthly Riverside Board of Public Utilities (Board) meetings. These highlights include information on current water news and data related to daily water production and consumption, peak and average consumption, and daily temperature and rainfall. In addition, RPU regularly encourages public water awareness and water conservation at the Board meetings and on its website www.riversidepublicutilities.gov.

During the current drought, RPU has increased its outreach efforts to encourage water conservation. RPU's communications have included the use of newspaper advertisements, the establishment of a dedicated web page (www.riversidedrought.com), billboard advertising, and bill stuffers. RPU has also reached out to customers through radio advertising and social media messaging related to the importance of wise water use.

4 System Description

RPU is the municipally-owned utility that provides potable, non-potable, and recycled water to retail customers primarily within the City of Riverside.

The water utility can trace its heritage directly back to the founding of the Riverside Colony as an agricultural community in 1870. In that year, a preliminary survey was made for a canal (Riverside Upper Canal) to irrigate groves of Mulberry trees, and a notice of water appropriation was posted for diverting water, via gravity, from the Santa Ana River. An additional canal (Riverside Lower Canal) was constructed in 1874 and increased Riverside's capacity of carrying water to 5,000 miner's inches, or approximately 56,100 gallons per minute (gpm).

In 1883, the City of Riverside was incorporated, in part to free up control of water and land sales from the privately held Riverside Land & Irrigating Company. In 1884, a compromise between the Riverside Land & Irrigating Company and local irrigators led to the creation of the Riverside Water Company. The agreement made the Riverside Water Company the default water supplier for most of the Riverside area.

By the late 1880s, surface diversions from the Santa Ana River were inadequate for the Riverside Water Company's needs, so artesian wells were drilled to augment water supply. Wells were constructed throughout Riverside and San Bernardino counties.

In 1913, Riverside voters approved a $1,115,000 bond issue to purchase three water companies and establish its municipal water department. The purchase included the Riverside Water Company, Artesia Water Company, and the Henry P. Kyes water system.

As early as 1956, the City of Riverside started buying stock in the Gage Canal Company (GCC). In 1965, the City of Riverside acquired the GCC and all of its production, transportation, and distribution assets by condemnation. Since 1959, the City of Riverside's water supply has come from groundwater sources and remains essentially the same to this day. The service area of the original Riverside Upper Canal developed as a highly productive agricultural area specializing in citrus crops. In recent years, urbanization has increasingly encroached on agricultural land. As a result, there has been a shift in water use from agricultural irrigation to domestic, municipal, and industrial applications.

4.1 General Description

The RPU service area is located within the Santa Ana River Valley approximately 60 miles east of Los Angeles and 100 miles north of San Diego. The RPU service area is approximately 75 square miles, of which approximately 70 square miles are located in Riverside's City limits. The remaining 5 square miles consist mainly of unincorporated land within the County of Riverside. The area within Riverside's City boundaries is approximately 80 square miles, of which approximately 10 square miles are served by water retailers other than RPU. The other potable water retailers within the City include Western Municipal Water District (WMWD, 9 square miles), Eastern Municipal Water District (EMWD, 1 square mile), and the Riverside Highland Water Company (RHWC, 0.25 square miles).

4.2 Service Area Boundary Map

The RPU service area is bounded on the north by the City of Colton; on the east by the RHWC and WMWD; on the south by WMWD; and on the west by Home Gardens County Water District (HGCWD), City of Corona, City of Norco, Rubidoux Community Services District, and the Jurupa Community Services District. A service area map is shown in Figure 4-1.

The City's Sphere of Influence extends to the south of the City boundary and includes areas where retail water service is currently provided by WMWD. For this UWMP, it was assumed that RPU's water service area would not expand beyond its current boundaries.

The RPU service area overlies portions of several groundwater basins, including Riverside, Arlington, and Chino. The RPU service area is shown relative to groundwater basins in Figure 4-2.

The surface elevation within the RPU service area ranges from more than 1,900 feet above mean sea level in the northeast to less than 700 feet above mean sea level in the southwest. The Santa Ana River is the main watercourse that drains the RPU service area. Other major tributaries include the Spring Brook, Tequisquite Arroyo, Prenda, Woodcrest, Mockingbird, and Hole Lake drainages.

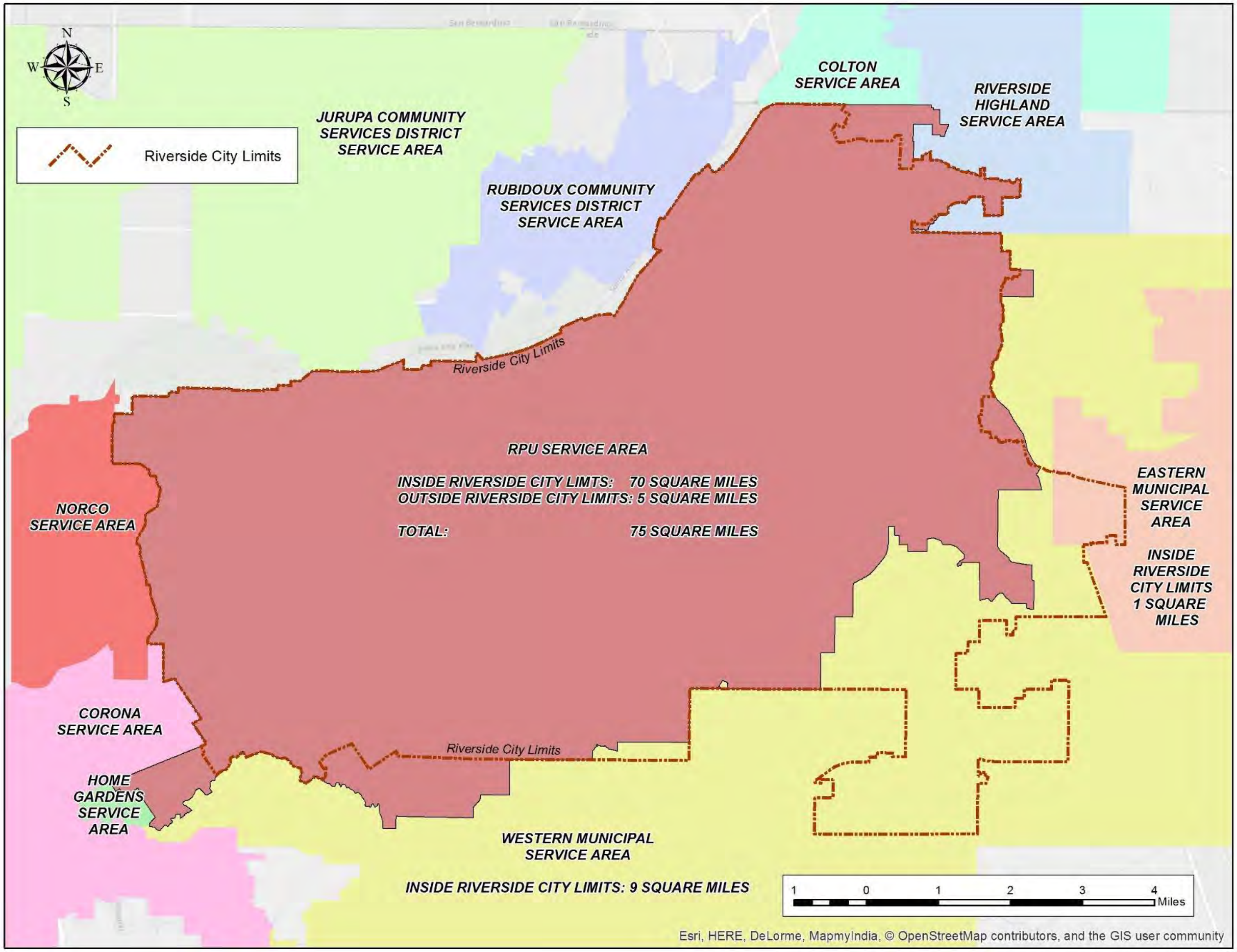

Figure 4-1. RPU Water Service Area

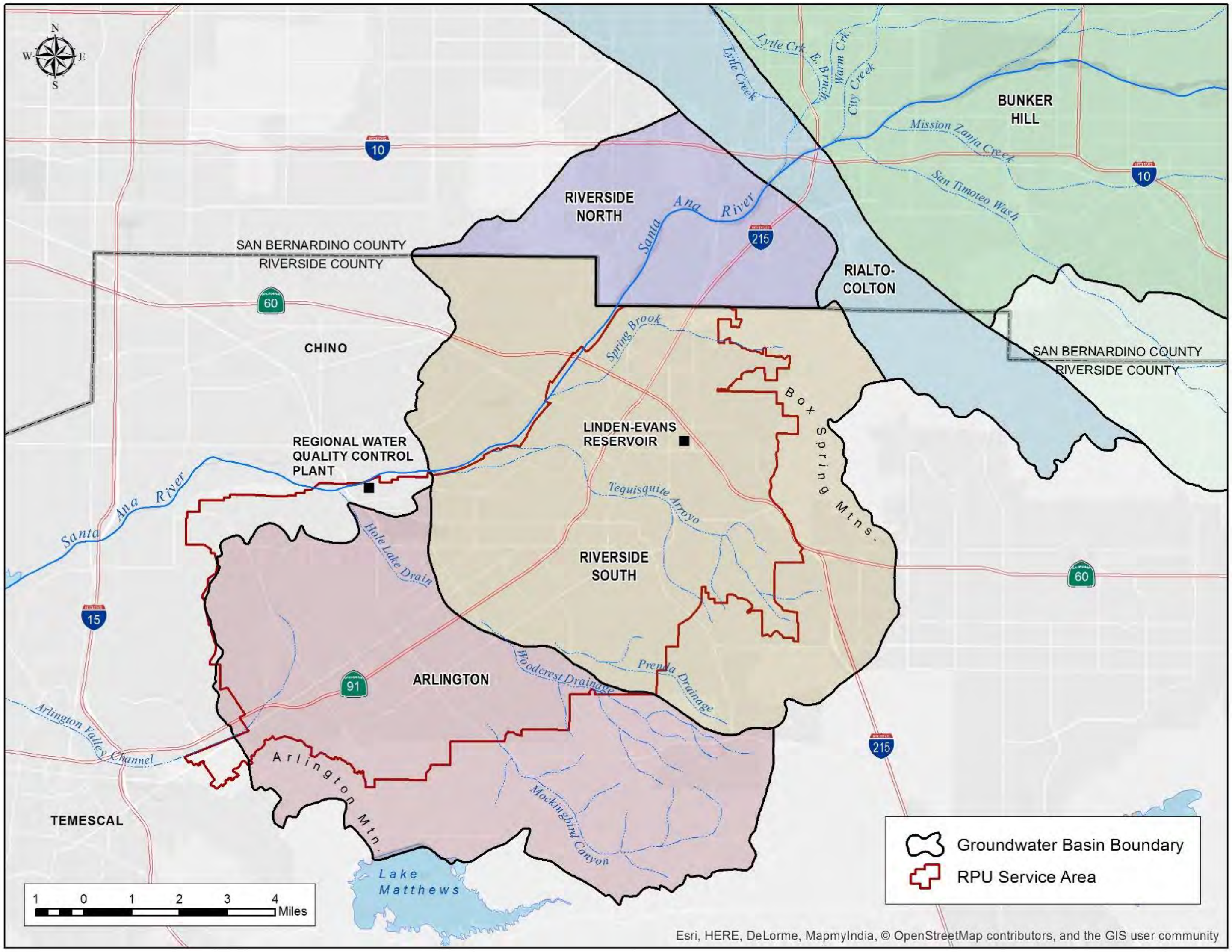

Figure 4-2. Groundwater Basins Underlying Service Area

4.3 Service Area Climate

The RPU service area is located in the southwest arid region of the United States. The climate typically exhibits hot, dry summers and mild, wet winters. Climate is a primary factor that influences water demand within the RPU service area. Most rainfall occurs during the months of November through April. The hottest and driest period of the year is from June through September. It is not unusual during the summer months to have several consecutive days that the daily temperature exceeds 100 degrees Fahrenheit.

There has been a long-term trend of rising temperatures in the region. The average temperature and precipitation for each year from 1956 through 2015 are shown in Figure 4-3.

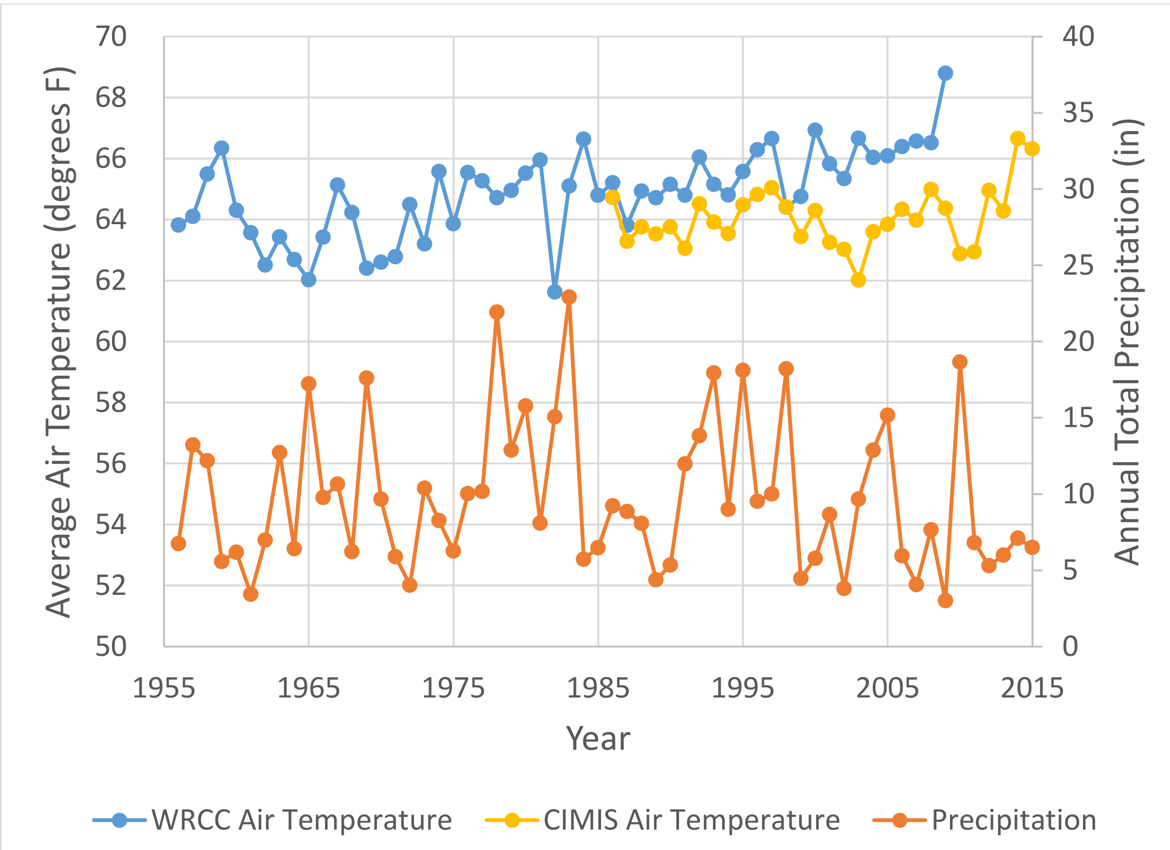

Figure 4-3. Historic Temperature and Precipitation

The data in Figure 4-3 were obtained from the Western Regional Climate Center (WRCC) for the station at the Riverside Citrus Experiment Station. Data for this station show an increasing trend in average air temperature. WRCC has only compiled data for this station through 2009. To represent current conditions, data were obtained from another monitoring station, part of the California Irrigation Management Information System (CIMIS). These data are based on 30 years of record (1986-2015) at Station 044 (University of California Riverside) within CIMIS.

Average temperature, precipitation, and evapotranspiration by month are shown in Figure 4-4 Evapotranspiration (ET) is the water lost to the atmosphere by the combined processes of evaporation (from soil and plant surfaces) and transpiration (from plant tissues). It is an indicator of how much water crops, lawn, garden, and trees need for healthy growth and productivity. ET from a standardized grass surface is commonly denoted as ETo.

Based on historical average data, annual precipitation is approximately 9 inches and average annual evapotranspiration is approximately 57 inches. Therefore, approximately 48 inches of supplemental water is required each year to maintain a healthy lawn in the RPU service area.

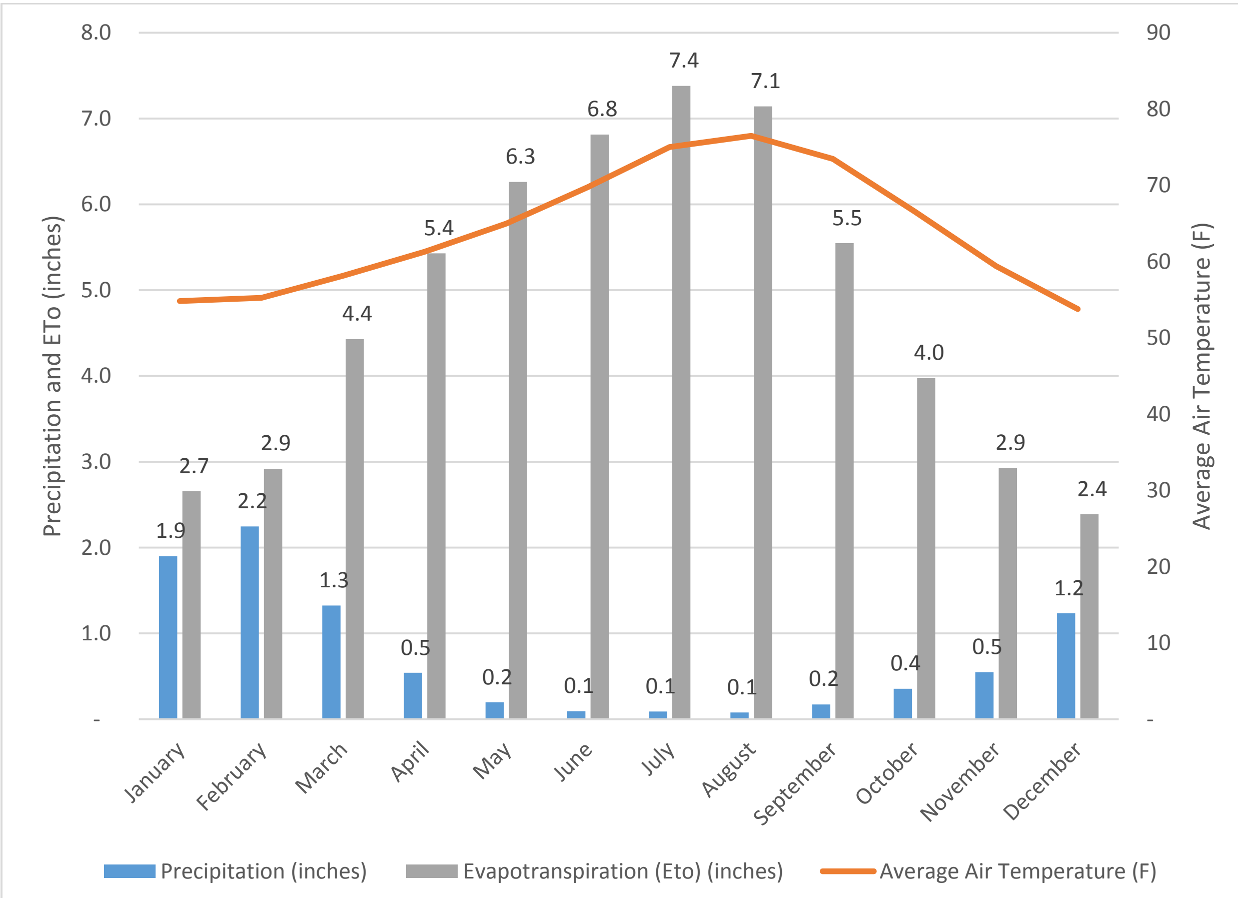

Figure 4-4. Historical Climate Data

4.3.1 Climate Change Impacts on Service Area

Climate change has the potential to impact water supplies and demands for RPU. Water demands could increase if summer temperatures rise, or if there are more days with high temperatures. Water supplies could be affected by changes in precipitation and runoff that contribute to groundwater recharge.

RPU participates in regional planning efforts that have considered potential impacts of climate change. The 2015 Upper Santa Ana River Watershed Integrated Regional Water Management Plan (IRWMP) included a discussion of climate change and its potential impacts on water demand. The IRWMP included a Climate Change Vulnerability Assessment. The Checklist is included in Appendix D of this document. Some areas identified in the vulnerability assessment include wildfires and potential erosion impacts on water quality, as well as floods and their potential impact on water facilities.

4.4 Service Area Population and Demographics

The RPU service area is approximately 75 square miles, of which approximately 70 square miles are located in Riverside's City boundaries.

For the 2015 UWMP cycle, DWR developed a GIS-based tool to estimate the population within a water agency's service area using census data. This DWR Population Tool was used to intersect RPU's water service area with compiled census data to estimate historic populations for the RPU water service area. The tool provided service area populations for 1990, 2000, and 2010 using census data. The tool was used to estimate a 2015 population by using the number of residential connections in 2010 and 2015, along with the census population in 2010. The resulting estimate for 2015 was approximately 295,000 people in the service area.

The Southern California Association of Governments (SCAG) develops regional forecasts of future population. The current available data set from SCAG is the 2012 Adopted Growth Forecast. This forecast includes estimates of future population for approximately 4,000 Traffic Analysis Zones (TAZ) that cover southern California. RPU used GIS software to intersect RPU's service area with the SCAG projections to arrive at population estimates for 2008, 2020, and 2035. These population estimate were used to calculate a compound annual growth rate for the service area of 1.07% up to 2020, and a compound annual growth rate of 0.75% beyond 2020. These growth rates were then used to calculate future population estimates for the service area, starting with the 2015 value that had been calculated using the DWR Population Tool.

Demographic factors that can influence future water demand include land use, relative proportion of single-family residences to multi-family residences, population density, economic characteristics (e.g., income levels, employment rate), and the composition of customer types.

The RPU service area is approximately 80 percent built out and contains about 15 percent vacant land available for development. RPU has identified three categories of growth for ultimate build out: (1) development within the remaining vacant land, (2) increased density within areas already developed as defined in the City's General Plan 2025, and (3) water demand associated with growth and expansion at the University of California Riverside (UCR) and California Baptist University.

The estimated service area population is shown in Table 4-1.

Table 4-1. DWR Table 3-1R. Population - Current and Projected

Population Served	2015	2020	2025	2030	2035	2040
Population Served	294,500	310,700	322,500	334,700	347,300	360,500

5 System Water Use

RPU meets the water demands of retail customers within its service area. In the following section these retail demands are categorized by customer category (i.e. residential, commercial, and industrial). In addition to these retail demands, RPU meets several other types of demands. These additional water uses include:

- Through an existing agreement, RPU exchanges water with the Gage Canal Company (GCC). GCC receives all of its water supply from RPU-owned wells and serves water to its agricultural customers via the Gage Canal. The GCC service area is completely within the RPU service area. The projections reported by RPU account for water delivered to the Gage Canal.
- WMWD has extraction rights in the Bunker Hill Basin. Through an existing agreement, RPU extracts WMWD water from the Bunker Hill Basin and delivers it to WMWD through the RPU distribution system. This water use is considered to be “wheeled”, since RPU does not have the rights to extract it. This wheeled water has been excluded from the demand projections in this UWMP.
- RPU sells potable water to the Home Garden County Water District (HGCWD), although this use is not expected to continue. RPU also sells some potable water to WMWD from time to time. Future potable water sells are subject to Riverside’s Board and Council approval.
- RPU sells non-potable water to WMWD via the Riverside Canal.

RPU's potable distribution system delivers water to RPU retail customers, the GCC, HGCWD, and WMWD. RPU's non-potable distribution system delivers water to the GCC and WMWD. RPU's recycled distribution system delivers recycled water to RPU retail customers. All of RPU's customers are metered.

5.1 Water Uses by Sector

RPU's historical water use for the years from 2011 through 2015 is summarized in Table 5-1.

Table 5-1. DWR Table 4-1R. Demands for Raw and Potable Water - Actual

Use Type	Level of Treatment When Delivered	2011	2012	2013	2014	2015
Single Family	Drinking Water	30,110	33,106	33,002	32,570	26,897
Multi-Family	Drinking Water	5,397	5,934	5,915	5,838	4,821
Commercial/Institutional	Drinking Water	9,564	10,488	10,234	10,283	8,950
Industrial	Drinking Water	9,870	10,403	10,528	10,419	8,847
Landscape	Drinking Water	1,652	2,247	2,184	2,250	1,842
Agricultural irrigation	Drinking Water	1,593	1,760	1,714	1,765	1,534
Other	Drinking Water	272	359	335	407	333
Deliveries to WMWD	Drinking Water	1,328	772	0	0	1,442
Wholesale to HGCWD	Drinking Water	354	454	483	434	180
GCC (Upper)	Drinking Water	4,509	6,658	7,570	5,804	5,783
GCC (Lower)	Raw Water	7,373	6,413	4,581	6,092	6,139
Overlying Uses	Raw Water	1,322	1,364	734	1,084	901
WMWD	Raw Water	1,123	1,310	1,117	293	662
Potable Losses	Drinking Water	7,432	7,079	7,042	5,851	6,302
Irrigation Water Losses	Raw Water	2,688	2,054	1,607	734	295
	Total	**84,587**	**90,401**	**87,046**	**83,824**	**74,928**

RPU prepared projections of future demand by using the year 2015 as a starting point and escalating retail demands by an annual growth percentage. The annual growth percentage incorporated two factors: the expected increase in service area population, and the expected change in per-capita consumption. Because of the drought and ongoing conservation efforts, RPU's per-capita consumption has fallen the past three years in a row, and currently stands at approximately 180 gallons per capita per day (gpcd). While some conservation achievements are due to relatively permanent changes, such as fixture replacements, some of the reduction is due to behavioral changes that could be reversed if the drought subsides. RPU assumed that the per-capita consumption would rise approximately 5 percent from 2015 to 2020 due to changes in temporary behaviors adopted during the current drought. While RPU will continue to emphasize the importance of water conservation, prudent planning requires considering the possibility that consumption will experience some rebound from its currently low level.

This demand growth rate (the combination of the population growth rate and the anticipated change in per-capita consumption) was used to project increased retail demand through 2040. Water demands were assumed to grow in proportion with service area population; the consumption by new customers was not calculated separately from consumption by current customers. The non-retail demands were estimated based on current planning activities and coordination with neighboring agencies. Table 5-2 includes an estimate of recycled water demands to arrive at an estimate of total water demands. The projection of recycled water demands is dependent on recycled water infrastructure projects that are discussed in the Water Supplies chapter.

Table 5-2. DWR Table 4-2R. Demands for Raw and Potable Water - Projected

Use Type	Level of Treatment	2020	2025	2030	2035	2040
Single Family	Drinking Water	29,931	31,064	32,241	33,462	34,730
Multi-Family	Drinking Water	5,365	5,568	5,779	5,998	6,225
Commercial/Institutional	Drinking Water	9,959	10,337	10,728	11,135	11,556
Industrial	Drinking Water	9,845	10,218	10,605	11,006	11,423
Landscape	Drinking Water	1,050	100	150	200	250
Agricultural irrigation	Drinking Water	1,707	1,772	1,839	1,908	1,981
Other	Drinking Water	371	385	399	414	430
Deliveries to WMWD	Drinking Water	4,300	4,300	4,300	4,300	4,300
Wholesale to HGCWD	Drinking Water	0	0	0	0	0
Additional UCR Demand	Drinking Water	3,300	3,300	3,300	3,300	3,300
California Baptist University Added Demand	Drinking Water	150	150	150	150	150
GCC (Upper)	Drinking Water	6,000	6,000	6,000	6,000	6,000
GCC (Lower)	Raw Water	7,000	7,000	7,000	7,000	7,000
Overlying Uses	Raw Water	1,200	1,200	1,200	1,200	1,200
WMWD	Raw Water	2,500	2,500	2,500	2,500	2,500
Potable Water Loss	Drinking Water	5,278	5,375	5,559	5,750	5,948
Irrigation Water Loss	Raw Water	835	835	835	835	835
	Total	**88,791**	**90,104**	**92,585**	**95,159**	**97,827**

Table 5-3. DWR Table 4-3R. Total Water Demands

Demand	2015	2020	2025	2030	2035	2040
Potable and Raw Water	74,928	88,791	90,104	92,585	95,159	97,827
Recycled Water Demand	200	6,430	6,430	6,430	6,430	6,430
Total Water Demand	**75,128**	**95,221**	**96,534**	**99,015**	**101,589**	**104,257**

5.2 Distribution System Water Losses

RPU estimates water losses each year by monitoring total water entering the distribution system and total withdrawals for retail demands, wholesale demands, or other known uses. Losses calculated in this manner include both apparent losses (due to factors such as water that is not registered as consumption because of meter error) and real losses (due to leaks in the distribution system). Based on historic data, RPU estimated future losses from the potable system as 8 percent of potable water deliveries.

For the irrigation water system, RPU estimates losses as 5 percent of raw water deliveries, based on data from recent years. The historical percentage was considerably higher, but RPU has identified and implemented operational improvements that have significantly reduced losses from this system.

RPU has performed AWWA water loss audits on the potable water distribution system for the past five fiscal years beginning in 2010-11. These audits provide an estimate of apparent water losses, real losses, and unavoidable real losses. The results of RPU's most recent audit, for fiscal year 2014-15, are shown in Table 5-4. These results are for RPU's fiscal year from July of 2014 through June of 2015; therefore, they do not correspond exactly with demands reported in other tables for calendar year 2015. RPU's completed audit for fiscal year 2015 is included as Appendix E.

Table 5-4. DWR Table 4-4R. Water Loss Summary Most Recent 12 Month Period Available

Reporting Period Start Date (mm/yyyy)	Volume of Water Loss
07/2014	**2,755**

The loss in Table 5-4 is taken from the field "Water Losses" on the AWWA Audit worksheet. The value for fiscal year 2015 of 2,755 acre-feet represents about 5 percent of water deliveries during the year and includes both apparent losses and real losses.

5.3 Estimating Future Water Savings

RPU is committed to long-range planning to provide a reliable, cost-effective water supply to its customers. RPU recently completed an Integrated Water Management Plan (IWMP) that combined information from previous studies and laid out an approach to developing new sources of supply as they are required. RPU actively monitors water consumption in its service area, in part to prepare required monthly reports for the State Water Resources Control Board.

For this report, RPU has projected that future demands will increase at a percentage growth rate that incorporates two factors: the percentage growth in service area population, and potential changes in the per-capita consumption. This approach provides estimates for future system-wide demand that can be used for long-range planning.

In the 2015 UWMP, water suppliers have the option of preparing more detailed demand forecasts by estimating demand factors based on land use categories. For example, RPU could identify typical water use per single family customer and per commercial account. These customer classes can be further sub-divided by lot size, neighborhood, or other variables. The intent is to quantify the estimated water use per customer in different customer classes, and then to forecast how future changes will impact water use within each customer class.

Once this step is complete, these land use-based demand factors can be adjusted to account for future water savings from codes, standards, and ordinances. For example, new single family construction would be assigned a demand factor that reflects the installation of plumbing fixtures and landscaping that meets the current codes. This demand factor would likely be less than the average demand factor for existing homes.

RPU has developed land use-based demand factors for previous master planning efforts. The increased level of detail allows for more disaggregated analysis of water demands and potential future changes. However, for this document, RPU has elected not to develop land use-based demand factors and apply future savings from codes and standards. Recent drought regulations have induced significant changes in water consumption patterns, and there is considerable uncertainty as to how demands will change in the future if the drought subsides.

Given this uncertainty, RPU elected to apply a percentage growth rate to demands across the service area for this UWMP.

5.4 Water Use for Lower Income Households

A significant portion of the residential sector in the RPU service area is comprised of low-income households. The City's General Plan 2025 defines a lower-income household as a household that earns 0 to 80 percent of the median family income. The General Plan refers to the median family income for Riverside County, as determined by the California Department of Housing and Community Development (HCD) as the reference point for median family income. For 2015, HCD has defined the median family income for a four-person household in Riverside County as $65,000. HCD also provides estimates for other size households.

The United States Census Bureau provides annual demographic data for the City through its American Community Survey (ACS). As of 2014, the average household size in the City was approximately 3.2. For a three-person household in Riverside County, HCD has defined the income limit of "lower income" as $48,250. Based on 2014 data, approximately 43 percent of households in the City have a household income less than this value. Because RPU's accounting system does not track the number of low-income households, the City-wide percentage of households was used to estimate the water use by lower-income households. The estimated water demands from lower-income households are shown in Table 5-5. These demands have been estimated as 43 percent of RPU's residential demands, and they are included in the demand projections in this UWMP.

Table 5-5. Estimated Water Demands from Lower-Income Households

Demand	2015	2020	2025	2030	2035	2040
Lower Income Single Family Residential	11,686	13,004	13,497	14,008	14,539	15,089
Lower Income Multi-Family Residential	2,095	2,331	2,419	2,511	2,606	2,705
Total Water Demand from Lower-Income Households	13,781	15,335	15,916	16,519	17,145	17,794

As discussed in Section 5.3, RPU is incorporating conservation programs into its demand projections, but it is not explicitly quantifying the expected water savings due to codes and standards.

Table 5-6. DWR Table 4-5R. Inclusion in Water Use Projections

Question	Answer
Are Future Water Savings Included in Projections?	False
Section Number	
Are Lower Income Residential Demands Included in Projections?	True

5.5 Climate Change Impacts on Demands

The 2015 Upper Santa Ana River Watershed Integrated Regional Water Management Plan (IRWMP) included a discussion of climate change and its potential impacts on water demand. This discussion is included here.

The IRWM Region's currently consistent climate with hot summers and cool winters with mild precipitation, and rain in low elevations with snow in higher elevations, would change as temperatures increase, resulting in less precipitation as snow which would affect the snow pack. Increased precipitation as rain would make it more difficult to capture storm flows and store them for drier periods.

The Intergovernmental Panel on Climate Change has vetted and approved 112 climate models based on projections in greenhouse gas emissions and associated changes in precipitation and temperature. These models make use of various greenhouse gas emissions scenarios based on population growth and economic activity. Global climate models used in the study were scaled down to 12 kilometer grids to make them relevant for regional analysis. The down-scaled global climate model projections are produced by internationally recognized climate modeling centers around the world and make use of greenhouse gas emissions scenarios, which include assumptions of projected population growth and economic activity. Projected climate variables, including daily precipitation, minimum temperature, maximum temperature and wind speed were included, as well as historical model simulations over the period from 1950 to 1999. Final products included data sets at key locations for precipitation, temperature, evapotranspiration, April 1st Snow Water Equivalent, and stream flow.

The models show that in the future the number of days over 95°F will increase in multiple locations. The results for the City of Riverside are shown in Table 5-7.

Table 5-7. Estimated Days per Year Exceeding 95 Degrees F

City	Historical	2020	2050	2070
Riverside	43	58	72	82

The numbers of high temperature days in Riverside are expected to double between the present and 2070. Similar increases in temperature can be anticipated throughout the inland valleys. These increased temperature levels are expected to increase water demands across the watershed, mainly for agricultural and irrigation purposes.

6 SB X7-7 Baselines and Targets

To meet the requirements of SB X7-7, water agencies are required to calculate their baseline water use in gallons per capita per day (gpcd) for a 10- to 15-year period ending before 2010. The agency then calculates a water use target for 2020, using one of four methodologies defined by DWR. An interim water use target for 2015 is then calculated as the average of the baseline and the 2020 water use target.

In the 2010 UWMP, RPU calculated a baseline water use of 264 (gpcd) for the period from 1999 through 2008. RPU then used Target Method 1 to calculate a compliance water use target of 211 gpcd for 2020, and an interim water use target of 238 gpcd for 2015. In 2010, the actual consumption was calculated as 206 gpcd.

For the 2015 UWMP cycle, DWR has made a GIS-based population tool (the DWR Population Tool) available to calculate service area population using census data. DWR is requiring that water agencies use a method at least as accurate as the DWR Population Tool to calculate their service area population for the baseline years and for 2015. RPU has used the DWR Population Tool to re-calculate its service area population, baseline per-capita use, and compliance targets.

The DWR Guidebook included a number of standard tables to document the calculations that determine the baseline water use and the targets. These tables showing the calculations for the RPU service area are attached as Appendix F.

6.1 Updating Calculations from 2010 UWMP

RPU has updated its calculations of service area population and per-capita consumption to reflect the use of the DWR Population Tool, which incorporates Census Bureau data for 1990, 2000, and 2010.

6.2 Baseline Periods

For those agencies that met more than 10 percent of their demands in 2008 using recycled water, SB X7-7 provides the option of using a longer baseline period (up to 15 years) to calculate their baseline water use. For other agencies, a 10-year period is used for the baseline. Because recycled water made up less than 10 percent of RPU's retail water deliveries in 2008, the baseline water use is generated for a 10-year period. For the 2015 UWMP, RPU used the same baseline period as the one used in the 2010 UWMP (1999 through 2008). This baseline period was selected because it provided the highest average water use for the baseline period.

6.3 Service Area Population

RPU's service area population was calculated using the DWR Population Tool. The GIS-based tool was used to intersect RPU's service area with Census Bureau data. The tool directly calculated a service area population for 1990, 2000, and 2010. The tool was then used to estimate a 2015 population, based on the change in the number of residential connections from 2010 to 2015. Populations for intermediate years between census years were calculated by assuming a constant growth rate between census years.

The output of the DWR Population Tool is included in Appendix G.

6.4 Gross Water Use

The calculation of gross water use begins with the total amount of water that was put into the potable water distribution system by RPU. Water that was exported to another agency was then subtracted, to leave the amount used by RPU retail customers.

Water delivered to agricultural customers was included in the urban water demand because those customers, although designated as agricultural customers, receive water from RPU's potable system and use that water to meet both potable and irrigation demands.

For the period of 1999 to 2008, gross water use in the RPU service area fluctuated between 73,000 and 83,000 acre-feet per year.

6.5 Baseline Daily per Capita Water Use

RPU divided the gross water use by the service area population to calculate an average daily per capita use for each year in the baseline period. For the period from 1999 through 2008, the average base daily per capita water use was 266 gpcd.

6.6 2015 and 2020 Targets

The 2020 urban water use target was calculated by multiplying the base daily per capita water use for the 10-year base period by 80 percent (Target Method 1). The urban water use target for the RPU service area for 2020 is 80 percent of 266 gpcd, or 213 gpcd.

The 2015 interim urban water use target was calculated by adding the base daily per capita water use for the 10-year base period to the 2020 urban water use target and then dividing the total by two. For the RPU service area, the interim urban water use target for 2015 is 239 gpcd (i.e. the sum of 213 gpcd and 266 gpcd divided by two).

Both the 2020 urban water use target and the 2015 interim urban water use target were determined independently without forming a regional alliance with other agencies. The baseline consumption values, the 2015 interim target, and the 2020 target are summarized in Table 6-1.

Table 6-1. DWR Table 5-1R. Baselines and Targets Summary

Baseline Period	Start Year	End Year	Average Baseline GPCD	2015 Interim Target	Confirmed 2020 Target
10-year	1999	2008	266	239	213
5-year	2004	2008	269		

6.7 2015 Compliance Daily per Capita Water Use

RPU did not apply any of the optional adjustments for extraordinary events, economic conditions, or weather in calculating 2015 gross water use. The calculated 2015 water use is 180 gpcd. This value is below the interim water use target calculated for 2015 (239 gpcd). These values are summarized in Table 6-2.

Table 6-2. DWR Table 5-2R. 2015 Compliance with Interim Target GPCD

Actual 2015 GPCD	2015 Interim Target GPCD	Extraordinary Events	Economic Adjustment	Weather Normalization	Total Adjustments	Adjusted 2015 GPCD	2015 GPCD (Adjusted if applicable)	Did Supplier Achieve Targeted Reduction for 2015?
180	239	0	0	0	0	180	180	YES

7 System Supplies

This chapter describes the sources of supply available to RPU to meet water demands. The available sources include imported water, local groundwater, and recycled water.

7.1 Purchased or Imported Water

RPU has the ability to purchase State Water Project water from Western Municipal Water District (WMWD) through a connection at the Metropolitan Water District of Southern California (MWD) Henry J. Mills Water Treatment Plant (WTP). Up to 30 cubic feet per second (cfs) or 19.4 million gallons per day (mgd) of imported water can be purchased from WMD through an existing agreement and conveyed through existing infrastructure. Historically, imported water has only been purchased during the peak demand months, when needed.

A copy of the agreement between WMWD and RPU is included in Appendix H.

7.2 Groundwater

RPU has facilities to extract groundwater from five groundwater basins: Bunker Hill, Rialto-Colton, Riverside North, Riverside South, and Arlington Basins. The Riverside Basin is divided into Riverside North and Riverside South by the San Bernardino County/Riverside County boundary. These basins are hydrogeologically connected but separated for administrative purposes.

Groundwater extracted from the Bunker Hill Basin, Rialto-Colton Basin, Riverside North, and Riverside South sub-basins is conveyed to RPU's potable or non-potable distribution system depending on the well location and local water quality. Raw groundwater from many of RPU's wells receives treatment prior to entering the potable distribution system.

RPU has a total of 201 wells, of which 50 are potable wells; 14 are non-potable wells; 85 are monitoring wells; and 50 are not active (i.e., standby, out of service, abandoned, destroyed or unknown).

7.2.1 Western-San Bernardino Judgment

An important management consideration that affects RPU’s groundwater production in several basins is the Western-San Bernardino Judgment (Western Municipal Water District of Riverside County v. East San Bernardino County Water District, Case No. 78426). The Western-San Bernardino Judgment addresses groundwater management within the Rialto-Colton Basin, Riverside-Arlington basin, and the San Bernardino Basin Area (SBBA), which contains the Lytle Basin and the Bunker Hill Basin. The Western-San Bernardino Judgment was established at the same time as the Orange County Judgment (Orange County Water District v. City of Chino, et al., Case No. 117 628) to settle rights within the upper Santa Ana River watershed to ensure resources would be sufficient to meet flow obligations in the lower Santa Ana River set by the Orange County Judgment. The Western-San Bernardino Judgment established the entitlements and groundwater replenishment obligations of the two major water agencies, San Bernardino

Valley Municipal Water District (Valley District) and WMWD. The Western-San Bernardino Judgment provides:

- A determination of the safe yield of the SBBA;
- Establishment of specific amounts of water that can be extracted from the SBBA by plaintiff parties (parties in Riverside County);
- Valley District must provide replenishment for extractions from the SBBA by non-plaintiffs (entities in the Valley District service area) in aggregate exceeding 72.05% of the safe yield, which is 167,228 AFY;
- WMWD must replenish the Rialto-Colton and Riverside-Arlington basins if extractions for use in Riverside County in aggregate exceed certain specific amounts; and
- Valley District must replenish the Rialto-Colton and Riverside-Arlington basins if water levels are lower than certain specific water level elevations in specified wells.

These areas are defined by DWR as the Bunker Hill Groundwater Basin, Rialto-Colton Groundwater Basin, and the northern portion of the Riverside-Arlington Groundwater Basin. The Riverside Basin is split by the Western-San Bernardino Judgment based on county boundaries into Riverside North (San Bernardino County) and Riverside South (Riverside County).

The adjudication resulted in the naming of the Western-San Bernardino Watermaster (Watermaster) consisting of two persons, one nominated by Valley District and the other by WMWD, appointed by the presiding judge. The Watermaster prepares an annual report documenting the previous year's pumping and export activities. In addition, groundwater elevation, streamflow, and water quality are documented.

The Western-San Bernardino Judgment also required the Watermaster to establish base extraction rights and export rights based on the average annual extractions and exports over the 5-year period from 1959 through 1963.

A copy of the Western-San Bernardino Judgment is included in Appendix I.

7.2.2 Groundwater Basin Description

RPU has facilities to extract water from five groundwater basins. Each of these basins are discussed below.

7.2.2.1 Bunker Hill Basin

The Bunker Hill Basin is a valley-fill aquifer comprised of six confining and water-bearing hydrogeologic units. The Bunker Hill Basin lies between the San Andreas and San Jacinto Faults. The primary source of recharge for the Bunker Hill Basin is runoff from precipitation in the San Bernardino Mountains to the north and San Gabriel Mountains to the northwest. Wastewater discharge and imported water contribute to smaller amounts of groundwater recharge.

Valley District, WMWD, and the SBVWCD are active in recharging the Bunker Hill Basin.

RPU's extraction rights from the San Bernardino Basin Area, which includes the Bunker Hill Basin, have been revised to reflect new water conservation associated with the operation of the Seven Oaks Dam. The adjusted rights are summarized in Table 7-1.

Table 7-1. RPU Extraction Rights from SBBA Reflecting New Conservation

	Extraction Right	New Conservation (195 cfs)	Adjusted Right (subtotal)
City of Riverside (RW Co and Gage Canal Co)	49,542	1,719	51,261
Agua Mansa and Meeks & Daley Water Co - RPU share	2,908	100	3,008
Riverside Highland Water Co - RPU Share	440	0	440
Regents of the University of California - Agreement	536	18	554
Total	53,426	1,837	55,263

7.2.2.2 Rialto-Colton Basin

The Rialto-Colton Basin is bounded by the San Jacinto fault to the northeast, Rialto-Colton fault to the southwest, the San Gabriel Mountains to the northwest, and Badlands to the southeast. The Rialto-Colton Basin consists of four hydrostratigraphic units with the water-bearing units expressing unconfined to partly confined properties.

The basis for establishment of extraction rights stipulated within the Western-San Bernardino Judgment was groundwater production over the 5-year period from 1959 through 1963 (Base Period). For the Rialto-Colton Basin, the base period extraction is set only for that which is used within Riverside County. Provided that the minimum groundwater elevations within the Rialto-Colton Basin are maintained by Valley District, extractions from the Rialto-Colton Basin for use within San Bernardino Valley are not limited. The Western-San Bernardino Judgment established 3,381 acre-feet as the base period extraction for use of Rialto-Colton Basin groundwater in Riverside County. Should extractions exceed the base period extraction over a 5-year period, or by more than 20 percent in a single year, WMWD is responsible for replenishment in the following year equal to the excess extractions over a 20-percent peaking allowance, unless credits are available from previous years due to production below the base period extraction or to importing water.

RPU's extraction rights from the Rialto-Colton Basin include 2,418 AFY for the City of Riverside and 310 AFY for RPU's shares of Agua Mansa and Meeks & Daley Water Company, for a total of 2,728 AFY.

As of the 2015 Watermaster Annual Report, WMWD has total credits of 466,040 acre-feet for the Rialto-Colton and Riverside Basins.

7.2.2.3 Riverside North Basin

The Riverside Basin is bounded by the Rialto-Colton fault to the north, Arlington Basin to the south, Box Spring Mountains to the east, and Chino Basin to the west. The Riverside basin is an alluvial fill, unconfined basin.

The basis for establishment of extraction rights stipulated within the Western-San Bernardino Judgment was groundwater production in the Riverside Basin over the 5-year period from 1959 through 1963. The Western-San Bernardino Judgment divides the Riverside Basin into two areas, based on jurisdictional boundaries: the portion of the Riverside Basin in San Bernardino County (Riverside North) and the portion of the Riverside Basin in Riverside County (Riverside South).

For Riverside North, the base period extraction is set only for that which is used within Riverside County. Provided that the minimum groundwater elevations within Riverside North are maintained by Valley District, extractions from Riverside North for use within San Bernardino Valley are not limited. The Judgment established 21,085 acre-feet as the base period extraction for use of Riverside North groundwater in Riverside County.

In Riverside North for use in Riverside County, should extractions exceed the base period extraction over a 5-year period, or by more than 20 percent in a single year, WMWD is responsible for replenishment in the following year equal to the excess extractions over a 20-percent peaking allowance. WMWD’s replenishment obligation can be reduced through credits that are available from previous years due to importing water into the basin or production below the base period extraction.

RPU's extraction rights from Riverside North are 10,902 AFY.

As of the 2015 Watermaster Annual Report, WMWD has total credits of 466,040 acre-feet for the Rialto-Colton and Riverside Basins. To avoid confusion, the Watermaster no longer allocates this credit among groundwater basins. The Annual Report is included as Appendix J.

7.2.2.4 Riverside South Basin

For Riverside South, the Western-San Bernardino Judgment set a 5-year base period extraction of 29,663 acre-feet for use in Riverside County. In Riverside South, should extractions exceed the base period extraction over a 5-year period, or by more than 20 percent in a single year, WMWD is responsible for replenishment in the following year equal to the excess extractions over a 20 percent peaking allowance, unless credits are available from previous years due to productions below the base period extraction or to importing water.

RPU's extraction rights from Riverside South are 16,880 AFY.

As of the 2015 Watermaster Annual Report, WMWD has total credits of 466,040 acre-feet for the Rialto-Colton and Riverside Basins.

7.2.2.5 Arlington Basin

The Arlington Basin consists of alluvial deposits and is located between the Riverside South and the Temescal Basin. The Arlington Basin is not currently used by RPU due to the high levels of total dissolved solids and nitrates. The City may use the Arlington Basin as a source of water supply in the future if the costs for alternative new supplies make treatment of water from this source cost-effective. The Arlington Basin is not adjudicated.

7.2.3 Groundwater Management

Groundwater management activities are undertaken in cooperation with local agencies including WMWD, Valley District, Santa Ana Watershed Project Authority (SAWPA), and the San Bernardino Valley Water Conservation District (SBVWCD). The court appointed the Western-San Bernardino Watermaster to manage and report on the conditions of the local groundwater basins. Annually, Valley District publishes an engineering report to determine the replenishment requirements for the Bunker Hill Basin in the ensuing water year.

In 2005, the Upper Santa Ana Water Resources Association (USAWRA) formed the Basin Technical Advisory Committee (BTAC) with Valley District as the lead agency to develop an Integrated Regional Water Management Plan (IRWMP) for the Upper Santa Ana River Watershed. The IRWMP was completed in 2007 and was updated in 2015. It focuses on long-term management of water resources in the Bunker Hill and Rialto-Colton basins and the reduction of reliance on imported water. Currently, BTAC meets monthly with the primary purpose of managing resources to optimize groundwater recharge and extraction activities.

The 2015 IRWMP is available at the website:
http://www.sbvmwd.com/about-us/projects/irwmp

The Valley District has established target ranges for groundwater level management within Bunker Hill Basin, and is obligated under the Western-San Bernardino Judgment to maintain water levels in the Rialto-Colton Basin and Riverside North.

In 2010, SAWPA adopted its One Water One Watershed (OWOW) Integrated Regional Water Management Plan for the entire Santa Ana River watershed. RPU participated in development of the OWOW plan and in the developed of the revised plan, OWOW 2.0, in 2014.

RPU assists in regional groundwater management as a member of both USAWRA and BTAC. RPU, in collaboration with WMWD, the Valley District, and other water retails that produce water from the Riverside Basin, developed a Groundwater Management Plan (GWMP) for Riverside North and Riverside South. The purpose of the plan is to improve sustainability by managing the quantity and quality of groundwater resources. In addition, WMWD has developed a GWMP for the Arlington Basin.

The Riverside Basin Groundwater Management Plan is available at the website:
http://www.water.ca.gov/groundwater/docs/GWMP/SC-17_CityOfRiverside_RI_2011.pdf

The Arlington Basin Groundwater Management Plan is available at the website: *http://www.water.ca.gov/groundwater/docs/GWMP/SC-18_ArlingtonBasin_GWMP_2012.pdf*

7.2.4 Overdraft Conditions

The basins used by RPU include Bunker Hill (DWR Basin Number 8-2.06), Rialto-Colton (8-2.04), and Riverside-Arlington (8-2.03). In the current edition of Bulletin 118, these basins are identified as Groundwater Budget Type A. None of these basins are identified as critically overdrafted.

The IRWMP determined that the San Bernardino Basin (which includes Bunker Hill and Lytle) and Rialto-Colton Basins are being overdrafted, but there are sufficient supplies to meet replenishment obligations.

The 2011 Riverside GWMP identified that Riverside North is currently overdrafted, and both Riverside North and Riverside South are projected to be overdrafted. The Valley District is obligated per the Western-San Bernardino Judgment to maintain water levels in the Bunker Hill and Rialto-Colton Basins, and in Riverside North.

WMWD is required to replenish excess extractions above the base period extractions in Rialto-Colton, Riverside North, and Riverside South as specified in the Western-San Bernardino Judgment.

The Arlington Basin is being overdrafted and will be managed by WMWD in accordance with the Arlington Basin GWMP.

RPU contributes to several efforts to monitor and manage the surrounding groundwater basins. RPU participates in independent groundwater level and quality monitoring in Bunker Hill, Riverside, and Arlington basins. In addition, all groundwater production is metered and extractions are reported to the Western-San Bernardino Watermaster.

7.2.5 Historical Groundwater Pumping

RPU's historical production from each groundwater basin for the past five years is shown in Table 7-2.

Table 7-2. DWR Table 6-1R. Groundwater Volume Pumped

Groundwater Type	Location or Basin Name	Water Quality	2010	2011	2012	2013	2014	2015
Alluvial Basin	Bunker Hill	Drinking Water	45,360	46,148	50,515	46,702	47,862	48,086
Alluvial Basin	Riverside North	Drinking Water	8,993	7,397	10,862	9,237	6,735	5,095
Alluvial Basin	Riverside South	Drinking Water	11,942	13,773	10,926	14,859	15,221	7,966
Alluvial Basin	Bunker Hill	Raw Water	4,229	4,191	5,859	7,329	5,399	5,707
Alluvial Basin	Riverside North	Raw Water	3,127	5,339	4,319	2,943	2,013	1,262
Alluvial Basin	Riverside South	Raw Water	8,695	7,739	7,921	5,976	6,595	5,605
Alluvial Basin	Rialto-Colton	Raw Water	0	0	0	0	0	1,205
	Total		**82,346**	**84,587**	**90,402**	**87,046**	**83,825**	**74,926**

7.3 Surface Water

RPU intends to augment natural recharge in the Bunker Hill and Riverside basins through conjunctive use projects. These projects will provide enhanced groundwater recharge when excess water is available, with the goal of making that water available for groundwater production during dry periods. These projects are summarized in Table 7-8. The exact scope and expected yield of these projects is subject to adjustment as the projects move through the planning and implementation process.

7.4 Stormwater

In addition to the supply sources currently utilized by RPU to meet demands in its service area, local stormwater is another potential supply that could be used. While the Riverside County Flood Control and Water Conservation District (RCFC&WCD) and the San Bernardino County Flood Control District (SBCFCD) own and operate the existing regional flood control systems in and around RPU's service area, opportunities are available for RPU to capture and recharge additional stormwater.

The IWMP included an assessment of stormwater capture opportunities. The findings of this analysis translated in the definition of a number of potential water supply projects, which were further developed and described in the IWMP. RPU is continuing to investigate and develop these potential projects; they are summarized in Table 7-8.

7.5 Wastewater and Recycled Water

The City of Riverside Public Works Department operates and maintains the Riverside Regional Water Quality Control Plant (RWQCP). The plant capacity has recently been expanded to 46 million gallons per day (mgd). The service area of the RWQCP extends beyond the RPU service area to include the areas served by Jurupa, Rubidoux, and Edgemont Community Services Districts.

Tertiary-treated effluent from the RWQCP is discharged into the Santa Ana River (SAR). The RWQCP is required to discharge 15,250 acre-feet per year, adjusted for quality, to meet downstream obligations to Orange County Water District (OCWD) established in the Orange County Judgment. A separate requirement, to discharge a total of 25,000 AFY, is included in the RWQCP ORDER WR 2008 – 0024 Conditionally Approving Wastewater Change Petition WW-0045.

RPU maintains a recycled water distribution system that provides recycled water for landscape irrigation and commercial purposes.

7.5.1 Recycled Water Coordination

RPU and the City's Public Works Department conjointly manage and plan wastewater and recycled water operations and programs. The Public Works Department operates and maintains the RWQCP. The RWQCP is the only wastewater treatment plant that receives wastewater generated within the RPU service area.

7.5.2 Wastewater Collection, Treatment, and Disposal

All wastewater from the RPU water service area is treated at the RWQCP, a tertiary treatment facility. The tables below summarize the volume collected from the RPU service area and the volume treated at the RWQCP in 2015.

Table 7-3. DWR Table 6-2R. Wastewater Collected within Service Area in 2015

Name of Wastewater Collection Agency	Wastewater Volume Metered or Estimated?	Volume of Wastewater Collected in 2015 (AF)	Name of Wastewater Treatment Agency Receiving Collected Wastewater	Treatment Plant Name	Is WWTP Located within UWMP Area?	Is WWTP Operation Contracted to a Third Party?
City of Riverside	Metered	20,024	City of Riverside	Riverside Water Quality Control Plant	Yes	No
	Total Wastewater Collected from Service Area in 2015	20,024				

Table 7-4. DWR Table 6-3R. Wastewater Treatment and Discharge within Service Area in 2015

Waste - water Treatment Plant Name	Discharge Location Name or Identifier	Discharge Location Description	Waste- water Discharge ID Number	Method of Disposal	Does this Plant Treat Waste - water Generated Outside the Service Area?	Treat- ment Level	Waste- water Treated Volume 2015	Dis- charged Treated Waste- water Volume 2015	Recycled Within Service Area Volume 2015	Recycled Outside of Service Area Volume 2015
Riverside Water Quality Control Plant		Santa Ana River		River or creek	Yes	Tertiary	29,130	28,930	200	0
						Total	29,130	28,930	200	0

7.5.3 Recycled Water System

The City currently operates a recycled water distribution system with a combined pipeline length of approximately 4 miles. This system serves six existing customers with a combined demand of approximately 260 acre-feet per year. The existing recycled water distribution system is shown in Figure 7-1.

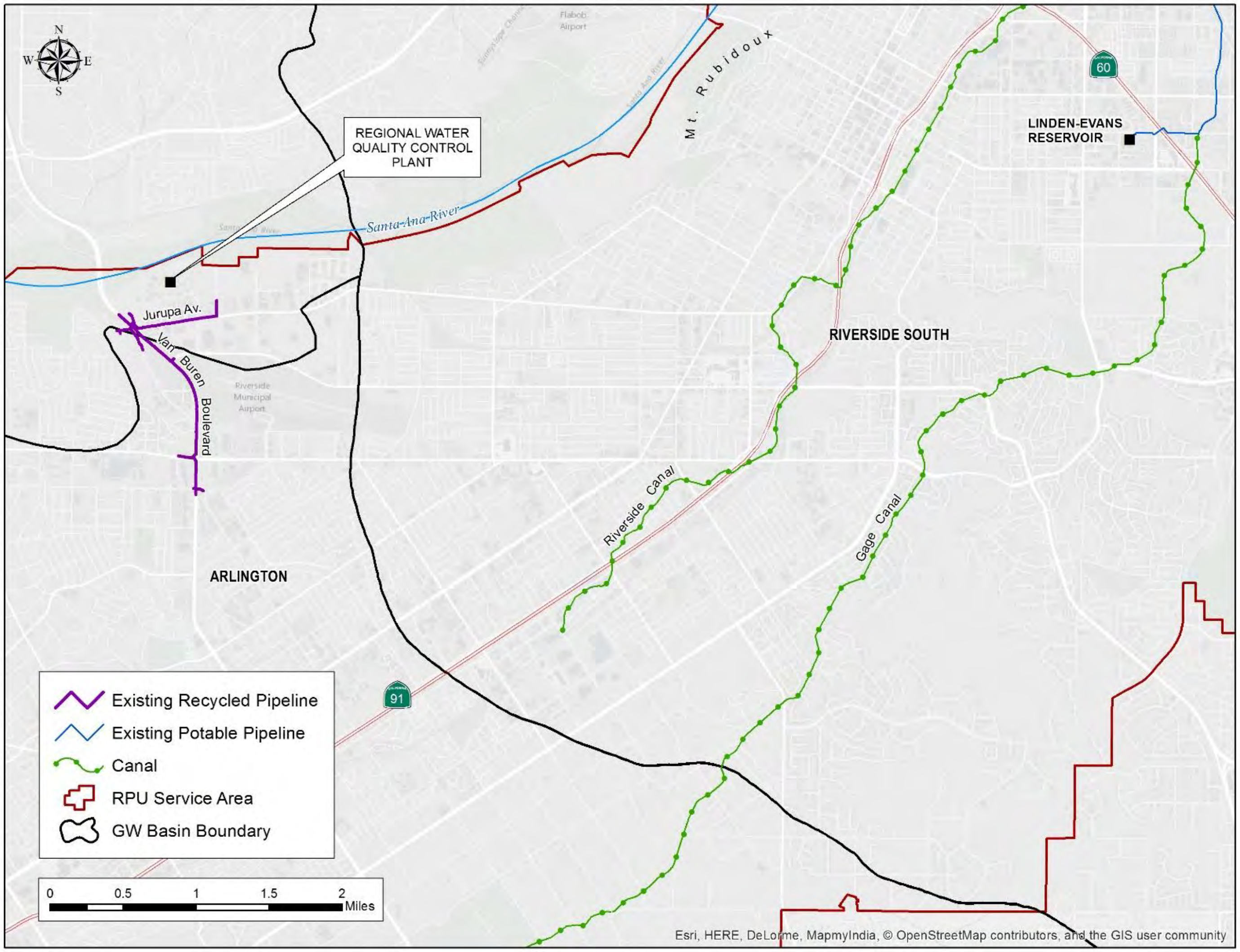

Figure 7-1. Existing Recycled Water Distribution System

7.5.4 Recycled Water Beneficial Uses

RPU has developed estimates of the future beneficial uses of recycled water from the RWQCP. Achieving these uses will depend on projects to expand the recycled water distribution infrastructure and create new facilities for groundwater recharge. These recycled water infrastructure projects are discussed in Chapter 6.8. The projected values for future beneficial use are dependent on the completion of these infrastructure projects. In the 2010 UWMP, RPU had anticipated the completion of additional recycled water infrastructure projects when projecting the estimated beneficial use in 2015. However, these projects have not yet been implemented; therefore, the actual recycled water use in 2015 was lower than previously projected.

Table 7-5. DWR Table 6-4R. Current and Projected Recycled Water Direct Beneficial Uses within Service Area

Name of Agency Producing (Treating) the Recycled Water:	City of Riverside Public Works Department							
Name of Agency Operating the Recycled Water Distribution System:	City of Riverside Public Utilities Department							
Supplemental Water Added in 2015	0							
Source of 2015 Supplemental Water	None							
Beneficial Use Type	**General Description of 2015 Uses**	**Level of Treatment**	**2015**	**2020**	**2025**	**2030**	**2035**	**2040**
Other	Direct use and to WMWD for recharge and non-potable use	Tertiary	200	6,430	6,430	6,430	6,430	6,430
		Total	200	6,430	6,430	6,430	6,430	6,430

Table 7-6. DWR Table 6-5R. 2010 UWMP Recycled Water Use Projection Compared to 2015 Actual

Beneficial Use Type	2010 Projection for 2015	2015 Actual Use
Other	3,650	200
Total	3,650	200

7.5.5 Actions to Encourage and Optimize Future Recycled Water Use

Establishing standards for the use of recycled water is one of the policies included in the City's General Plan 2025. In addition, RPU has adopted an ordinance titled Mandatory Use of Recycled Water that is designed to encourage recycled water use. A copy of this ordinance is attached as Appendix K.

RPU's actions to encourage recycled water use are summarized in Table 7-7.

Table 7-7. DWR Table 6-6R. Methods to Expand Future Recycled Water Use

Name of Action	Description	Planned Implementation Year	Expected Increase in Recycled Water Use
Expand Recycled Water Infrastructure	The proposed Jackson-Arlington project would provide infrastructure to deliver recycled water to users in the RPU service area and to WMWD. The Regional Concept pipeline would provide infrastructure to deliver recycled water to additional users in the RPU service area.	2020	6,170 AFY

7.6 Desalinated Water Opportunities

The Arlington Basin provides a local source of groundwater with elevated salt levels. WMWD owns and operates the Arlington Desalter to improve groundwater quality and supply water to the City of Norco using five wells in the western part of the basin. The Arlington Basin is not adjudicated and is downstream of RPU's major water reservoirs. RPU is evaluating the potential for desalting groundwater from Riverside South to meet demands. Because of RPU’s distance from the ocean, seawater desalination is expected to be cost-prohibitive.

7.7 Exchanges or Transfers

RPU maintains interconnections with neighboring agencies to provide water during short-term outages or emergencies. RPU exchanges water with GCC.

7.8 Future Water Supply Projects

In the IWMP, RPU identified a number of future water supply projects. The projects anticipated to more forward during the planning horizon of this UWMP are summarized in Table 7-8.

Table 7-8. DWR Table 6-7R. Expected Future Water Supply Projects or Programs

Name of Future Projects or Programs	Joint Project with Other Agencies?	Other Agency Names	Description	Planned Imple-mentation Year	Planned for Use in Year Type	Expected Increase in Water Supply to Agency
Seven Oaks Dam Phase II Conservation Project (Enhanced)	True	WMWD, Valley District, and others	Phase II would provide additional groundwater recharge in the Bunker Hill Basin through the Seven Oaks Dam Conservation Project.	2020	Average Year	1,000
Riverside North Aquifer Storage and Recovery	True	WMWD	This project would include in-channel and off-channel facilities to recharge water along the Santa Ana River.	2020	Average Year	2,000
Jackson Street and Arlington Avenue Pipelines	True	WMWD	This project would provide new recycled water pipelines to increase the direct use of recycled water in the RPU service area and provide recycled water to WMWD for direct use and groundwater recharge.	2020	Average Year	4,970
Regional Concept Pipeline	True	WMWD, Valley District, and others	This project would provide a recycled water pipeline to allow discharge to the Santa Ana River for habitat benefits. The pipeline would also allow RPU to provide recycled water to additional direct use customers.	2020	Average Year	1,200
Box Spring Local Stream Recharge and Direct Use	True	RCFC&WCD	This local stream recharge project would recharge the Riverside Basin through the development of recharge facilities adjacent to or as a part of existing RCFC&WCD facilities. Recharge of stormwater would potentially be augmented with recycled water	2030	Average Year	2,800

Name of Future Projects or Programs	Joint Project with Other Agencies?	Other Agency Names	Description	Planned Imple-mentation Year	Planned for Use in Year Type	Expected Increase in Water Supply to Agency
Stormwater Recharge at Columbia, Marlborough, and Kansas Detention Basins	True	RCFC&WCD	This project would provide groundwater recharge using stormwater. Recharge of stormwater would potentially be augmented with recycled water.	2025	Average Year	1,500
Bunker Hill Basin (BHB) Groundwater Banking	True	Valley District, WMWD, SBVWCD	RPU could utilize BHB conjunctively, if it were to store supplies when available, for extraction when needed. If used in association with other RPU recharge programs, the basin could be managed to maximize yield while preventing high groundwater levels.	2025	Average Year	2,000
Bunker Hill Basin Active Recharge Project	True	Valley District, WMWD	This project consists of construction of new facilities or re-operation of facilities already in existence to capture more of the stormwater that flows out of the San Bernardino Basin Area (SBBA) through the tributaries of the Santa Ana River.	2025	Average Year	1,500

Supplemental information about these projects is provided below:

- The Seven Oaks Dam Conservation Project is a cooperative, interagency project among WMWD, Valley District, RPU, and others that allows the agencies to capture up to 200,000 AFY of previously unallocated stormwater from the Santa Ana River. This surface supply is obtained from Seven Oaks Dam, a flood control facility owned by the Army Corps of Engineers, and recharged at new, jointly owned spreading basins immediately downstream from the dam. The cooperative project does not involve extraction of stored groundwater. Participants, including RPU, would have to use their existing facilities or build new groundwater extraction wells within the Bunker Hill Basin to be able to utilize the allocated water.
- The Riverside North ASR project is located on the east side of the SAR, approximately 1.5 miles southwest of the I-15 and I-10 interchange. The site is located on a tract of

land referred to as the "Flume Well Tract." Implementation of this project would benefit RPU by recharging the Riverside North Basin with stormwater through in-channel and off-channel recharge facilities. The off-channel facilities are located to the west of the SAR on RPU-owned land.

- Jackson-Arlington Project
    - The Project involves construction of approximately 27,650 linear feet (LF) of 8-inch and 24-inch diameter recycled water pipelines. The Project's ultimate alignment is from the intersection of Jackson St. and Van Buren Blvd., heading southeast along Jackson St. and Monroe St. to Cleveland Ave. where it will tie into the existing 24-inch Western Municipal Water District (WMWD) non-potable water pipeline, continuing southeasterly and ending at Mockingbird Reservoir.
    - The Jackson Street Pipeline is estimated to provide approximately 820 acre-feet per year (AFY) to RPU customers and up to 2,550 AFY to WMWD for a total of 3,370 AFY of recycled water from the RWQCP.
    - In addition to the proposed Jackson Street Pipeline project (Phase I and II), a subsequent expansion, the Arlington Avenue Pipeline, has been identified for future consideration. The Arlington Avenue Pipeline would allow for recycled water use to be expanded within a relatively short time frame (less than 5 years) to provide up to 4,970 AFY of recycled water, which is broken down as follows:
        - Up to 2,420 AFY (Jackson Street Pipeline: 820 + Arlington Avenue Pipeline: 1,600) to be distributed to adjacent or nearby RPU customers for direct landscape irrigation use;
        - Up to 1,150 AFY to neighboring WMWD for groundwater recharge of the Arlington basin; and
        - Up to 1,400 AFY to WMWD for non-potable usage.
    - The Arlington Avenue Pipeline involves construction of approximately 20,060 LF of 8-inch, 12-inch, and 16-inch distribution recycled water pipelines. The Arlington Avenue Pipeline is estimated to provide approximately 1,600 AFY to RPU customers not directly adjacent to the Jackson St. alignment.

7.9 Summary of Existing and Planned Sources of Water

RPU intends to fully utilize its water rights from the Bunker Hill Basin plus the quantity of water available through conjunctive use. RPU plans to increase the use of recycled water as described above. The balance of RPU's water supply will come from the Rialto-Colton Basin, Riverside North, and Riverside South. RPU's conjunctive use projects in the Riverside Basin will augment the yield of the basin and allow RPU to increase production over historical levels.

Production and recharge associated with RPU's conjunctive use projects will be coordinated with Valley District and WMWD to prevent adverse effects on groundwater levels and quality. RPU anticipates being able to mitigate any unforeseen incremental contamination issues stemming from increased production through existing or future wellhead treatment facilities and/or through blending.

The current and projected supplies available to RPU are shown in Table 7-9 and Table 7-10.

Table 7-9. DWR Table 6-8R. Water Supplies - Actual

Water Supply	Additional Detail on Water Supply	2015 Actual Volume	2015 Water Quality
Groundwater	Bunker Hill	48,086	Drinking Water
Groundwater	Riverside North	5,095	Drinking Water
Groundwater	Riverside South	7,966	Drinking Water
Groundwater	Bunker Hill	5,707	Raw Water
Groundwater	Riverside North	1,262	Raw Water
Groundwater	Riverside South	5,605	Raw Water
Groundwater	Rialto-Colton	1,205	Raw Water
Recycled water	RWQCP	200	Recycled Water
Purchased or Imported Water	From WMWD	0	Drinking Water
	Total	**75,126**	

Table 7-10. DWR Table 6-9R. Water Supplies - Projected

Water Supply	Additional Detail on Water Supply	2020	2025	2030	2035	2040
Groundwater	Bunker Hill	55,263	55,263	55,263	55,263	55,263
Groundwater	Banking BH Conjunctive Use	0	2,000	2,000	2,000	2,000
Groundwater	Seven Oaks Enhanced Phase II	1,000	1,000	1,000	1,000	1,000
Groundwater	BH Active Recharge 2025	0	1,500	1,500	1,500	1,500
Groundwater	Riverside North	10,902	10,902	10,902	10,902	10,902
Groundwater	RNASR	2,000	2,000	2,000	2,000	2,000
Groundwater	Riverside South	16,880	16,880	16,880	16,880	16,880
Groundwater	Box Springs	0	0	2,800	2,800	2,800
Groundwater	Columbia, Etc. Stormwater	0	1,500	1,500	1,500	1,500
Groundwater	Rialto-Colton	2,728	2,728	2,728	2,728	2,728
Recycled water	RWQCP	6,430	6,430	6,430	6,430	6,430
Purchased or Imported Water	From WMWD	21,700	21,700	21,700	21,700	21,700
	Total	**116,903**	**121,903**	**124,703**	**124,703**	**124,703**

7.10 Climate Change Impacts to Supply

The 2015 Integrated Water Management Plan (IWMP) included a discussion of potential climate change impacts on RPU's water supplies. That discussion relied in part on work that was performed by the U.S. Bureau of Reclamation and documented in a technical memorandum titled "Climate Change Analysis for the Santa Ana River Watershed." The IWMP identified the potential for climate change to contribute to declining groundwater levels, which would necessitate capital projects by RPU to modify wells and add new wells.

The 2015 Upper Santa Ana River Watershed Integrated Regional Water Management Plan (IRWMP) included a discussion of climate change and its potential impacts on water resources. That discussion is reproduced here.

The following vulnerabilities were identified for the Upper SAR Basin. The vulnerabilities were listed in rank order by the BTAC subcommittee updating the IRWM Plan. In all cases, actions identified in the IRWM address vulnerabilities.

1) Uncertainty around the Sacramento-San Joaquin Bay Delta, especially given dependence on snow pack for water supplies, will make imported supplies less reliable.

The Region's ability to capture additional stormwater and store it in the large underlying groundwater basins will provide some ability to offset this vulnerability. In addition, the Region plans to maximize the import of water during wet years and store it in the large underlying groundwater basins which will also help offset this vulnerability.

2) Current groundwater capture facilities are not operationally equipped to capture less frequent, but more intense storm events.

As much of the Region's water supply ultimately falls on precipitation, either as rain or snow, in the local mountains, the ability to capture more intense storm flows is crucial. As these flows are often intense and of short duration, further development of additional facilities to capture and recharge the tail end of an intense storm becomes crucial in the Region. Plans for these facilities are discussed elsewhere in the IRWM Plan. Additionally, through a partnership between SBVWCD and Valley District, capacity to recharge water from released from the Seven Oaks Dam will be increased. As the dam serves to attenuate flood flows, this project is well suited to increase the Region's capacity to recharge water.

3) More frequent drought periods will result in more frequent and intense wildfires. Water quality and the ability to capture storm flows will be reduced.

Wildfires are already a concern in the Region, and have historically caused water quality and flood control issues. Should climate change increase drought periods and result in more frequent and intense wildfires, water quality and flood control will be further impacted.

4) Increased surface water temperatures will degrade water quality and negatively impact aquatic life, especially in mountain areas.

High gradient stream systems located in the mountainous areas support a number of species that exist in a narrow geographic range limited by altitude. Some of the more sensitive species, such as the mountain yellow-legged frog, are listed by the U.S. Fish and Wildlife Service and active restoration and recovery programs are underway. Increases in surface water temperature will negatively impact aquatic life as already narrow geographic ranges will be further reduced.

5) Uncertainty related to managing intense winter storms to protect downstream life and property will make holding water in the flood system for recharge more difficult.

As seasonal storms become less frequent and more intense, flood management may become more complex. However, collection of water for recharge during intense storm events is difficult and most efforts are focused on “scalping” the tail of a storm flow. The high volume flows move downstream and the tailing, less intense flows can be collected by rubber dams or other structures. These structures are intended to be deflated or moved during high flow events. Planning is underway for a number of these facilities within the watershed.

6) Increased temperatures will result in increased water demand for landscape irrigation.

As days with highs over 95 degrees increase in frequency, absent any intervention, landscape irrigation demands would increase. Recent programs by local water retailers, including a popular public-private partnership called Water Saving Garden Friendly, have provided education and resources for homeowners and businesses to reduce irrigation demand through the use of drought tolerant plants in landscaping. A recent partnership with California State University resulted in a drought tolerant demonstration garden where the public can see and better understand the benefits of drought tolerant landscaping. Additionally, like in most parts of California, numerous incentive programs are underway to increase water use efficiency by the homeowner, especially outdoor use. These programs will need to be continued or even expanded to counteract increasing temperatures in the future.

7) Decreased runoff and subsurface flows from the mountain front areas as the result of more frequent and severe droughts.

As drought conditions become more frequent, it becomes more important to capture storm flows when they are available. Further development of recharge facilities within the IRWM Region and imports of water during wet years for underground storage allows the Region to store water in the wet years for use during periods of drought. The Bunker Hill Subbasin is a tremendous resource and the cooperative management of the basin has created the structure where more water could be stored in wet years.

Most of the IRWM Region's vulnerabilities are addressed by work already occurring in the upper watershed. More active stormwater capture and more active recharge of imported water in wet years will help prepare the Region for changed climatic conditions.

8 Water Supply Reliability Assessment

This chapter includes an assessment of the expected reliability of RPU's water supplies during a dry period. This discussion focuses on the long-term (one to many years) reliability in response to below-normal precipitation. RPU maintains a number of interconnections with neighboring agencies that could be used to provide supplemental water during a short-term reduction in supply.

8.1 Constraints on Water Sources

Historically, RPU's source waters have proven reliable, even during the multi-year droughts from 1984 to 1990, 1999 to 2002, 2006 to 2009, and the current drought. To date, RPU has not experienced any major deficiencies in water supply. RPU, water management agencies, and other local water retailers are cooperating to further increase the reliability of groundwater from the Bunker Hill Basin, Rialto-Colton Basin, Riverside North Sub-basin, and Riverside South Sub-basin.

In order to increase groundwater production beyond historical levels and improve water supply reliability of the local groundwater basins, RPU has collaborated with other local water retailers through SAWPA, the USAWRA, and BTAC to address the various groundwater management issues. Typical collaborative efforts include developing groundwater models, sharing groundwater quantity/quality data, partnering on regional projects, and conducting source water assessments.

RPU produces groundwater from wells spatially distributed across the Bunker Hill Basin, Riverside North, and Riverside South. Some treatment occurs at wellhead or regional facilities prior to delivery to the major transmission mains. Production from wells and/or treatment facilities is blended and chlorinated within the major transmission mains prior to distribution from the Linden Evans Reservoir. The blending makes the system water less vulnerable to contamination at individual wells.

RPU regularly monitors the quality of its water supply. Annually, RPU distributes summary reports on water quality to its customers.

RPU's most recent Annual Water Quality Report is attached as Appendix L.

8.1.1 Groundwater

Local groundwater supplies account for most of RPU's water supplies, with approximately 60 percent originating from the Bunker Hill Basin, which is adjudicated. RPU's water rights are based on the long-term safe yield from the Bunker Hill Basin, which includes wet, dry, and normal periods. RPU's wells are generally located in the section of the basin with the greatest thickness of water bearing layers. Thus, RPU's water supply from the Bunker Hill Basin is considered reliable during single and multi-year dry periods. The Western-San Bernardino

Judgment also permits producers to increase groundwater production by up to 20 percent in any single year for peaking purposes.

As part of the 2011 Riverside Basin Groundwater Management Plan, the safe yield for the Riverside and Arlington Basins were established based on 43 years of historical production and hydrologic conditions (1965 to 2007). This period includes wet, dry, and normal periods and is considered to be representative of long-term mean climatological conditions. The calibrated numerical groundwater model of the Riverside and Arlington basins determined the safe yield to be 27,200 acre-feet in Riverside North and 35,100 acre-feet in Riverside South. Recharge associated with RPU's planned conjunctive use projects will allow RPU to increase groundwater production from the Riverside Basin without adversely impacting the sustainability of this water resource.

In general, the natural quality of water in local groundwater basins is acceptable and reliable. Potential hazards that could impact the quality of groundwater from local basins include migrating contaminant plumes, chemical spills, agricultural return flows, leaky underground storage tanks, and septic systems. Chemical spills and leaking underground storage tanks initially tend to affect a small number of wells, whereas contaminant plumes, agricultural return drainage, and septic systems may impact regional aquifers.

Previous improper waste disposal practices created several groundwater plumes that have the potential to impact a number of RPU wells. RPU implemented several measures to address groundwater contamination that affected its source water. Some of the implemented measures include well replacement, wellhead treatment pilot studies, and preparation of a water treatment feasibility study. RPU has also developed a Water Supply Contingency Plan and a water quality blending optimization model.

RPU was able to improve the quality of its domestic water by successfully implementing a comprehensive strategy that emphasized pollution prevention and source water protection.

8.1.2 Surface Water

The quantity of surface water recharge from RPU's existing and planned conjunctive use projects is dependent on the hydrologic conditions in the Santa Ana River Watershed. Through the use of the groundwater basins for storage, RPU is not reliant on surface water flows to directly meet demands during a dry period. Therefore, RPU’s supply reliability is not impacted by short-term fluctuations in local surface water flow.

8.1.3 Recycled Water

The primary source of recycled water is local groundwater that has been used as potable water then reclaimed at the RWQCP. RPU plans to reuse available recycled water from the RWQCP and considers this supply to be 100 percent reliable during single or multi-year dry periods.

The RWQCP treats effluent to tertiary standards and monitors the quality to ensure compliance with the discharge permit from Santa Ana Regional Water Quality Control Board (SARWQCB) and the regulations set by the Division of Drinking Water (DDW).

8.1.4 Imported Supplies

RPU is contracted to receive State Water Project (SWP) water from MWD through WMWD. MWD is the largest State Water Contractor, with an annual maximum entitlement of 1,911,500 acre-feet through 2035. However, actual deliveries of State Water Project to MWD vary each year based on the amount of precipitation and projected water use within MWD's service area.

Imported water is treated at the Mills WTP in Riverside prior to delivery to RPU by WMWD. SWP water quality is maintained and governed by the standards established by DWR. The salinity as measured by Total Dissolved Solids (TDS) of SWP water delivered to WMWD is usually less than 300 mg/L, but was as high as 430 mg/L during the 1977 drought. DWR and/or MWD regularly conduct sanitary surveys and monitor the quality of the water according to the applicable standards and regulations.

DWR prepares a biennial report to assist SWP contractors and local planners in assessing the near and long-term availability of supplies from the SWP. DWR issued its most recent update, the 2015 DWR State Water Project Delivery Capability Report (DCR), in July 2015. In the 2015 update, DWR provides SWP supply estimates for SWP contractors to use in their planning efforts, including for use in their 2015 UWMPs. The 2015 DCR includes DWR's estimates of SWP water supply availability under both current and future conditions.

DWR's estimates of SWP deliveries are based on a computer model that simulates monthly operations of the SWP and Central Valley Project systems. Key assumptions and inputs to the model include the facilities included in the system, hydrologic inflows to the system, regulatory and operational constraints on system operations, and projected contractor demands for SWP water. For example, the 2015 DCR uses the following assumptions to model current conditions: existing facilities, hydrologic inflows to the model based on 82 years of historical inflows (1922 through 2003), current regulatory and operational constraints, and contractor demands at maximum Table A amounts.

To evaluate SWP supply availability under future conditions, the 2015 DCR included four model studies. The first of the future-conditions studies, the Early Long Term (ELT) scenario, used all of the same model assumptions for current conditions, but reflected changes expected to occur from climate change, specifically, a 2025 emission level and a 15 cm sea level rise. The other three future-conditions include varying model assumptions related to the Bay Delta Conservation Plan/California Water Fix ("BDCP"), such as changes to facilities and/or regulatory and operational constraints.

In spring 2015, DWR announced that BDCP would move from a Section 10 permit to a Section 7 permit process under the Federal Endangered Species Act. As a practical matter, this split the project into two distinct parts known as Cal WaterFix (Alternative 4A), the conveyance portion, and Cal EcoRestore, the restoration portion. Cal WaterFix is Alternative 4A in the recirculated environmental document, and the preferred alternative. Alternative 4A is different than any of the future scenarios modeled by DWR in the DCR. While there is widespread support for the BDCP/Cal WaterFix project, it would be speculative at this time to assume they will move forward. While there is significant support for BDCP, plans are currently in flux; environmental review is ongoing and is not anticipated to be final until at least 2016, and several regulatory and legal requirements must be met prior to construction.

This UWMP uses the ELT scenario to estimate future SWP supply availability because it is based on existing facilities and regulatory constraints, with hydrology adjusted for the expected effects of climate change. This scenario is consistent with the studies DWR has used in its previous SWP Delivery Reliability Reports for supply availability under future conditions. Therefore, in this UWMP, future SWP supply availability is based on the ELT study included in the 2015 DCR.

The extremely dry sequence from the beginning of January 2013 through the end of 2014 was one of the driest two-year periods in the historical record. Water year 2013 was a year with two hydrologic extremes. October through December 2012 was one of the wettest fall periods on record, but was followed by the driest consecutive 12 months on record. Accordingly, the 2013 State Water Project (SWP) supply allocation was a low 35% of SWP Table A amounts. The 2013 hydrology ended up being even drier than DWR's conservative hydrologic forecast, so the SWP began 2014 with reservoir storage lower than targeted levels and less stored water available for 2014 supplies. Compounding this low storage situation, 2014 also was an extremely dry year, with runoff for water year 2014 the fourth driest on record. Due to extraordinarily dry conditions in 2013 and 2014, the 2014 SWP water supply allocation was a historically low 5% of Table A amounts. The dry hydrologic conditions that led to the low 2014 SWP water supply allocation were extremely unusual, and to date have not been included in the SWP delivery estimates presented in DWR's 2015 Delivery Capability Report. It is anticipated that the hydrologic record used in the DWR model will be extended to include the period through 2014 during the next update of the model, which is expected to be completed prior to issuance of the next update to the biennial SWP Delivery Capability Report. For the reasons stated above, this UWMP uses a conservative assumption that a 5% allocation of SWP Table A amounts represents the "worst case" scenario.

8.2 Reliability by Type of Year

In general, groundwater and recycled water supplies are less vulnerable to seasonal and climatic changes than surface water (i.e. local and imported) supplies. RPU has been able to increase production from local groundwater basins during previous droughts pursuant to the Western-San Bernardino Judgment. The Western-San Bernardino Watermaster also independently reviews groundwater conditions annually to assess the change in groundwater levels. Historically, the Watermaster permitted additional extraction beyond the specified water rights from the Bunker Hill Basin to decrease higher than optimal groundwater levels in the basin.

DWR defines a multiple-dry year period as "three or more consecutive years with the lowest average annual runoff." In recent years RPU has obtained the majority of its water supply from the Bunker Hill Basin. In the Bunker Hill Basin, 1999 through 2002 were selected to represent multiple-dry years. The year 2014 was selected to represent the single dry year.

The reliability of imported water from MWD is described in the 2015 DCR. MWD's average supply under the ELT scenario is 60 percent of its Table A amount. The most recent year in the DCR evaluation period is 2003, when the available supply to MWD was 60 percent of its Table A amount. Therefore 2003 is used as an average year.

For multiple dry years, the DCR identifies 1931 through 1934 as the four-year dry period. Over the course of the four-year dry period, the average available imported water from MWD is estimated to be 33 percent of its Table A amount.

The bases for dry water years are summarized in Table 8-1.

Table 8-1. DWR Table 7-1R. Bases of Water Year Data

	Groundwater and Recycled Water		Imported SWP Water	
Year Type	Base Year	% of Average Supply	Base Year	% of Maximum Table A
Average Year	2003	100	2003	60
Single-Dry Year	2014	100	2014	5
Multiple Dry Year One	1999	100	1931	33
Multiple Dry Year Two	2000	100	1932	33
Multiple Dry Year Three	2001	100	1933	33
Multiple Dry Year Four	2002	100	1934	33

Note:
Expected Supply Percentages for SWP from DWR Delivery Capability Report

8.3 Supply and Demand Assessment

RPU has assumed that 100 percent of its groundwater and recycled water supplies would remain available during a single dry year and multiple dry years. The availability of imported water has been adjusted based on the scenarios identified for the State Water Project.

Comparisons of expected supply and demand during a normal year, single dry year, and multiple dry years are shown in the tables below.

Table 8-2. DWR Table 7-2R. Normal Year Supply and Demand Comparison

Totals	2020	2025	2030	2035	2040
Supply Totals	116,903	121,903	124,703	124,703	124,703
Demand Totals	95,221	96,534	99,015	101,589	104,257
Difference	21,682	25,369	25,688	23,114	20,446

Table 8-3. DWR Table 7-3R. Single Dry Year Supply and Demand Comparison

Totals	2020	2025	2030	2035	2040
Supply Totals	96,288	101,288	104,088	104,088	104,088
Demand Totals	95,221	96,534	99,015	101,589	104,257
Difference	1,067	4,754	5,073	2,499	(169)

During a period of multiple dry years, the expected supplies are slightly higher because of the higher average availability of water from the State Water Project.

Table 8-4. DWR Table 7-4R. Multiple Dry Years Supply and Demand Comparison

Year	Totals	2020	2025	2030	2035	2040
First Year	Supply Totals	102,364	107,364	110,164	110,164	110,164
	Demand Totals	95,221	96,534	99,015	101,589	104,257
	Difference	7,143	10,830	11,149	8,575	5,907
Second Year	Supply Totals	102,364	107,364	110,164	110,164	110,164
	Demand Totals	95,221	96,534	99,015	101,589	104,257
	Difference	7,143	10,830	11,149	8,575	5,907
Third Year	Supply Totals	102,364	107,364	110,164	110,164	110,164
	Demand Totals	95,221	96,534	99,015	101,589	104,257
	Difference	7,143	10,830	11,149	8,575	5,907

8.4 Regional Supply Reliability

RPU is committed to minimizing the need to import water from other regions. RPU participates in regional supply planning projects to optimize and enhance the use of local groundwater resources. As described in Chapter 10, RPU operates a number of conservation programs to implement various Demand Management Measures. RPU is also evaluating the future use of additional recycled water from the RWQCP, either through direct use or through groundwater recharge.

9 Water Shortage Contingency Planning

RPU's 2010 UWMP included a Water Shortage Contingency Plan (WSCP) and three supporting appendices: RPU Water Rule #9 (Shortage of Water Supply and Interruption of Delivery, also known as the Water Shortage Ordinance); RPU Water Rule #15 (Water Waste); and a draft Water Conservation Ordinance that expanded on the Water Shortage Ordinance and was adopted by RPU's Board after the preparation of the 2010 UWMP. The Water Conservation Ordinance amended the Riverside Municipal Code Title 14 and included a detailed description of unreasonable uses of water, RPU's Water Conservation Program, responses to water shortage emergencies, and enforcement and severability.

In July of 2014, the City Council adopted revisions to the City's Water Conservation Ordinance, as set forth in RMC Chapter 14.22, and adopted a resolution implementing Stages 1 and 2 of the City's Water Conservation Ordinance. The revisions to Chapter 14.22 changed Stage 2 restrictions from voluntary to mandatory. They also limited non-agricultural landscape watering to four days in Stage 2 and decreased the non-agricultural landscape watering to three days in Stage 3.

In June of 2015, the City Council adopted additional changes to the Water Conservation Ordinance. The changes included additional restrictions on irrigation water use and an updated enforcement policy. The City also adopted a resolution implementing Stages 1, 2, and 3 of the Water Conservation Ordinance.

This chapter provides additional details about the current Water Conservation Ordinance.

9.1 Stages of Action

The Water Conservation Ordinance establishes a Water Conservation Program which uses four stages to address conditions and needs. The Water Conservation Stage shall be set by City Council action. All normal water efficiency programs and water conservation regulations shall remain in force during any stage, unless the City Council directs otherwise.

The stages are described below:

- Stage One (Normal Water Supply) applies when the City can meet all of its water demands, but has determined that certain conservation methods are warranted to preserve existing water supplies in the event the City will be unable to meet future water demands. Any other normal water efficiency programs and water conservation regulations remain in force during Stage One.
- Stage Two (Minimum Water Shortage) applies when a reasonable probability exists that the City will not be able to meet all of its water demands or other regional or statewide conditions warrant implementation.

- Stage Three (Moderate Water Shortage) applies when the City will not be able to meet all of the water demands of its Customers or other regional or statewide conditions warrant implementation.
- Stage Four (Severe Water Shortage) applies when the City's ability to meet its water demands is seriously impaired.

Stage One represents normal conditions. Stage One conservation measures are voluntary, and will be enforced through public outreach, education, and awareness measures by the City.

Stages Two, Three and Four represent potential and actual shortages. Stages Two, Three and Four may be triggered by a local or regional water supply shortage; production, treatment, transmission, or delivery infrastructure problems; limited or unavailable alternative water supplies; or other circumstances. Stages Two, Three, and Four conservation measures are mandatory, and violations may be subject to criminal, civil, and administrative action. Stage One conservation measures become mandatory when Stage Two, Three, of Four are declared.

If the City Council has declared either Stage Three or Stage Four conservation, it may also, by resolution, declare a Water Shortage Emergency. A Water Shortage Emergency may be an immediate emergency, or a threatened future water shortage, or both.

Upon declaration of a Water Shortage Emergency:

1) No new construction meters will be issued.
2) No construction water may be used for earth work such as road construction purposes, dust control, compaction, or trench jetting.
3) No new building permit(s) shall be issued, except:
   a) Projects found by the City Council to be necessary for public health, safety.
   b) Projects using recycled water for construction.
   c) Projects which will not result in a net increase in non-recycled water use.
   d) Projects with adequate Conservation Offsets, if available. The City, in its sole discretion, may choose to make Conservation Offsets available. Conservation Offset costs shall be based on the cost of conserving the water elsewhere to provide the water needed for a project, the cost of providing an alternative water supply deemed acceptable by the City, or other measures as may be found in the City's Water Use Efficiency Master Plan. Conservation Offset fees will be set forth in the Water Rules and Rate Schedules.

During a mandated reduction, RPU will intensify its water conservation programs, especially public education. RPU promotes efficient water use including non-potable uses such as landscaping and irrigation (Chapter 19.67 of the Riverside Municipal Code). Recycled water from the RWQCP may be used for street cleaning.

The stages are summarized in Table 9-1.

Table 9-1. DWR Table 8-1R. Stages of WSCP

Stage	Percent Supply Reduction	Water Supply Condition
1	0	Normal Water Supply
2	15	Minimum Water Shortage
3	15 - 20	Moderate Water Shortage
4	20 - 50	Severe Water Shortage

9.2 Prohibitions on End Uses

The water use prohibitions for each stage are found in Riverside Municipal Code Chapter 14.22 (as amended from time to time), found in Appendix M.

9.3 Penalties, Charges, Other Enforcement of Prohibitions

The Water Conservation Ordinance states that any violation shall be subject to enforcement by issuance of an administrative citation pursuant to Chapter 1.17 of the Riverside Municipal Code. Prior to issuance of an administrative citation, the City shall give one courtesy notice requesting voluntary correction of the violation. The City Manager, or his or her designee, may enter into a written agreement with a customer to resolve any violation provided that such agreement is consistent with the purpose and intent of the Water Conservation Ordinance.

RPU has mechanisms in-place for monitoring compliance with actual mandated reductions. Water sales to customers are metered and billed monthly. RPU implements a meter maintenance program to assure accuracy. Collected revenues from water sales are incorporated into the monthly financial reports produced by the RPU Finance Section. RPU's billing system can be used to provide customers with reports of their water usage for current year and previous years. The billing software can also be used to evaluate compliance with mandated reductions.

RPU has the capability to determine reductions in water production. RPU maintains a comprehensive Supervisory Control and Data Acquisition (SCADA) system to monitor and control the water distribution system. All production wells are metered and monitored. The SCADA system is capable of recording potable water production and water levels within potable water reservoirs. Water levels of selected wells are regularly monitored and charted. Flow meters installed at pump stations and booster stations can be read automatically through the SCADA system to determine usage.

Water Rule No. 15 includes penalties for excessive water usage. According to Water Rule No. 15,

> "Whenever it appears to the Director that water delivered by the Water Utility is being used in violation of the terms of this Rule, he [/she] shall give written notice

to the person so wasting water of his [/her] intention, after a reasonable time to be therein stated, to shut-off the water supply to the Person's Premises".

9.4 Consumption Reduction Methods

RPU offers various rebates to encourage conservation (i.e. ultra-low flush toilet replacements, high efficiency washing machines, etc.). RPU has a water rate structure that promotes water efficiency. The reduction goal is to balance supply and demand.

A summary of RPU's Consumption Reduction Methods is shown in Table 9-2.

Table 9-2. DWR Table 8-3R. Stages of WSCP - Consumption Reduction Methods

Stage	Consumption Reduction Methods by Water Supplier	Additional Explanation or Reference
All	Expand Public Information Campaign	
All	Provide Rebates on Plumbing Fixtures and Devices	
All	Provide Rebates for Landscape Irrigation Efficiency	
All	Other	Water Efficiency Pricing
1	Other	Voluntary Conservation
2,3,4	Other	Mandatory Conservation

9.5 Determining Water Shortage Reductions

RPU has the capability to determine reductions in water production and consumption. RPU maintains a comprehensive SCADA system of the water distribution system. All production wells are metered and monitored. The SCADA system is capable of recording potable water production and water levels within potable water reservoirs. Water levels of selected wells are regularly monitored and charted. Flow meters installed at pump stations and booster stations can be read automatically through the SCADA system to determine usage. RPU can also use billing data to monitor changes in consumption.

9.6 Revenue and Expenditure Impacts

RPU is fortunate as a water provider in California in that it owns, operates and maintains its own water supply and is not typically dependent on imported water from outside sources. RPU has responded to the ongoing drought by continuing to offer a wide variety of water conservation programs for its customers in an effort to conserve its water resources. In addition, RPU has increased its drought messaging to its customers, increased community educational awareness and leveraged funding from The Metropolitan Water District of Southern California to dramatically increase incentive levels for water conservation programs such as turf removal.

RPU’s long range water supply planning includes significant contributions of both conservation and recycled water. The behavioral changes instituted through conservation and water use efficiency should have some permanent impact. Changes in landscape patterns and uses will have permanent and on-going impacts to water use. Continuing conservation measures could negatively impact the RPU revenues and will be addressed in the on-going cost of service analysis.

RPU's typical water rate includes the following components: a fixed monthly charge, a prorated commodity charge based on consumption with increasing marginal rates and adjustments for seasonality, an energy factor adjustment, a surcharge for customers not within City Limits, and a Water Conservation and Reclamation surcharge. Revenue from fees such as fixed monthly charges, development related fees, and the backflow protection program will not be impacted by reduction in water usage due to droughts.

RPU has many options to cushion reduction in revenues due to reduced demand by its retail customers. RPU maintains reserves that can offset minor revenue impacts. The Riverside Water Financial Plan reserve levels reached approximately $60 million in 2014. In addition to these liquid assets, RPU has an additional 12 to 18 months of operating revenue in the form of non-liquid assets such as land and buildings. Other potential measures that RPU can implement to mitigate some revenue impacts due to shortages include adjusting the water rates, using water that has been stored in reservoirs, and refinancing existing bonds or issuing new bonds.

RPU seeks to maintain flexibility to adjust expenditures during drought conditions as well. Some expense categories such as purchased energy, treatment costs, and operations and maintenance will be reduced as revenue from water sales decrease. RPU estimated a reduction in energy costs of $350,000 per year assuming a 10-percent reduction in water demand. RPU can reduce or avoid some water treatment costs by choosing to operate wells that require the least amount of treatment. RPU can also pump the most efficient wells to further reduce energy costs. RPU can investigate additional energy savings from switching to cheaper rate schedules based on time of use by taking advantage of distribution system reservoir storage. Lastly, RPU can delay capital expenditures.

9.7 Resolution or Ordinance

The current version of the Water Conservation Ordinance, which is amended from time to time, is included in Appendix M.

9.8 Catastrophic Supply Interruption

Major hazards that can degrade the quality and/ or impact the quantity of water available to the RPU water system include: regional power outages, earthquakes, liquefaction (i.e. high groundwater levels), floods, chemical spills, groundwater contamination, and terrorist acts. Some of these hazards could also adversely impact the distribution systems, such as the major transmission mains or reservoirs. Interruptions to water supplies from any of the above mentioned hazards may be limited to days or even months, except for groundwater contamination, which could last several years.

RPU has implemented several measures to improve the reliability of its water system. Actions taken to prepare for a catastrophe include:

- Establishing criteria for a proclamation of water shortage
- Developing alternate sources of water supplies
- Establishing contacts and mutual aid agreement with other agencies
- Establishing an Emergency Response Team/Coordinator
- Preparing an Emergency Response Plan (ERP)
- Conducting mock exercises and drills to evaluate and improve response procedures
- Developing public awareness programs

In 2008, the City updated its ERP, which incorporates the RPU Water System Emergency Response Plan. The plan may be activated whenever any of the following conditions exist:

- Natural disasters such as earthquake, flood, etc.
- Major loss of power
- Loss of water transmission lines, main breaks, or other major facilities
- Water quality issues involving a "boil water" order or other major public relations/communication issues
- Emergency curtailment
- Disturbance affecting nearby utilities
- Hazardous spills
- Terrorist activities

The ERP will guide damage assessment, record keeping, prioritization of repairs, and coordination with other City Departments. The goal is returning to normal operations as soon as practicable.

Typically, RPU's actions during voluntary rationing include a public information campaign and media outreach to encourage conservation. Typical emergency response actions to the above listed possible catastrophes may include the following:

- Assemble crisis management teams at pre-designated locations and Emergency Operations Center (EOC)
- Assess and document damaged facilities and repair or reactivate as appropriate
- Assess for signs of contamination, i.e., increase the frequency of monitoring
- Deactivate contaminated sources
- Install additional treatment facilities
- Community outreaches e.g., public education, media outreach, boil water advisories
- Coordination with other City Departments, and other government agencies
- Seek mutual aid assistance
- Drain contaminated reservoirs as quickly as possible

9.8.1 Mutual Aid Agreement and Emergency Water Connections to other Agencies

The USA WRA, which RPU is a member, assists in developing mutual aid agreements for use during emergencies. Inter-ties between water systems can be used to deliver water from other water retailers to assist RPU during short-term emergencies. RPU is also a member of the Water Agency Response Network (WARN).

RPU also participates in the Emergency Response Network of the Inland Empire (ERNIE). ERNIE is a water/wastewater mutual aid network within San Bernardino and Riverside counties. ERNIE meets monthly and provides regular training for utilities in emergency response and long-term emergency planning.

An assessment of each listed catastrophe and summarized description of previous responses and/or actions undertaken to prepare for such catastrophic events is described below.

9.8.2 Regional Power Outages

RPU is a municipal owned utility that provides both water and electricity within the City of Riverside. RPU maintains a diverse power supply portfolio that includes long term base load and local generating facilities (LGF) and increasing amount of renewable resources. The long-term base load of approximately 215 megawatts (MW) includes Intermountain Coal Plant (137 MW) and Palo Verde (12 MW) nuclear plant, and the Salton Sea Geothermal Plant (66 MW). LGFs include rooftop solar power (a total of 3 MW), Springs 'Peaker' Power Plant (40 MW), and the Riverside Energy Resource Center (RERC) Power Plant (192 MW). The renewable resources currently under contract are: solar PV (52 MW) and wind (42 MW). RPU's total available capacity to meet summer peak demand is currently 669 MW, while its all-time record peak demand was 607 MW in August 2007. More important, with 232 MW of internal generation (Springs and RERC) on RPU's distribution system, RPU can maintain a high level of reliability in emergency situations. The City of Riverside was not severely impacted by the electrical power crisis in 2001, and today, with the additions of the Springs Plant, which came on-line in 2002, and four RERC units, two of which came on-line in 2006 and the other two in 2011, the City is even less vulnerable to regional power outages. However, Riverside's system may be vulnerable to natural gas disruption. Due to the unavailability of Aliso Canyon gas storage facilities, the availability of uninterruptible gas supply to fuel RPU's local generating units is not certain. If natural gas interruption were to occur when RPU's system demand reaches its peak, RPU may experience heightened stress to maintain service reliability to RPU customers.

Some wells in the Bunker Hill Basin are powered by electricity provided by Southern California Edison. During electrical power outages, RPU will still be able to produce some potable water from the Gage wells and the Garner B well because they are or can be powered by gas engines. The water distribution system is entirely within the RPU electric service territory. Most of the pressure zones within the distribution system are fed by gravity from reservoirs. The 2009 Water Master Plan sized distribution system reservoirs using several criteria including emergency storage capacity of at least 150-percent of average day demand or 88-percent of the maximum day demand. RPU is likely to have water in storage to meet an average day demand should a power outage occur.

9.8.3 Earthquakes

The City of Riverside is located close to two major earthquake faults: the San Andreas and San Joaquin. Earthquakes pose potential significant risks to the RPU water system and could potentially result in water supply shortages and disruptions to the transmission/ distribution systems.

Groundwater produced from wells in the Bunker Hill Basin is conveyed using two major transmission mains that cross several earthquake faults before reaching the Linden Evans Reservoir in Riverside.

The City of Riverside has experienced some earthquakes in the past without significant water supply shortages or disruptions. Stronger earthquakes can result in major water service disruptions either due to facility damage or to power outages. In some cases, harmful microorganisms could migrate into the distribution system because of pipe breaks and/ or damage to water disinfection facilities. It could take several days (or more) to restore the water distribution system depending on the severity of damage.

An earthquake in northern or central California could disrupt deliveries from the State Water Project to WMWD. The California Department of Water Resources (DWR) has estimated that in the event of a major earthquake in or near the Delta, regular water supply deliveries from the SWP could be interrupted for up to three years, posing a substantial risk to the California business economy. Accordingly, a post-event strategy has been developed which would provide necessary water supply protections. The plan has been coordinated through DWR, the Army Corps of Engineers (Corps), Bureau of Reclamation, California Office of Emergency Services (Cal OES), the Metropolitan Water District of Southern California, and the State Water Contractors. Full implementation of the plan would enable resumption of at least partial deliveries from the SWP in less than six months.

DWR has developed the Delta Flood Emergency Management Plan to provide strategies for a response to Delta levee failures, which addresses a range of failures up to and including earthquake-induced multiple island failures during dry conditions when the volume of flooded islands and salt water intrusion are large. Under such severe conditions, the plan includes a strategy to establish an emergency freshwater pathway from the central Delta along Middle River and Victoria Canal to the export pumps in the south Delta. The plan includes the pre-positioning of emergency construction materials at existing and new stockpiles and warehouse sites in the Delta, and development of tactical modeling tools (DWR Emergency Response Tool) to predict levee repair logistics, water quality conditions, and timelines of levee repair and suitable water quality to restore exports. The Delta Flood Emergency Management Plan has been extensively coordinated with state, federal and local emergency response agencies. DWR, in conjunction with local agencies, the Corps and Cal OES, regularly conduct simulated and field exercises to test and revise the plan under real time conditions.

DWR and the Corps provide vital Delta region response to flood and earthquake emergencies, complementary to an overall Cal OES structure. Cal OES is preparing its Northern California Catastrophic Flood Response Plan that incorporates the DWR Delta Flood Emergency Management Plan. These agencies utilize a unified command structure and response and recovery framework. DWR and the Corps, through a Draft Delta Emergency Operations

Integration Plan (April 2015), would integrate personnel and resources during emergency operations.

The DWR Delta Levees Subvention Program has prioritized, funded, and implemented levee improvements along the emergency freshwater pathway and other water supply corridors in the central and south Delta region. These efforts have been complementary to the DWR Delta Flood Emergency Management Plan, which along with use of pre-positioned emergency flood fight materials in the Delta, relies on pathway and other levees providing reasonable seismic performance to facilitate restoration of the freshwater pathway after a severe earthquake. Together, these two DWR programs have been successful in implementing a coordinated strategy of emergency preparedness for the benefit of SWP and CVP export systems.

Significant improvements to the central and south Delta levee systems along Old and Middle Rivers began in 2010 and are continuing to the present time at Holland Island, Bacon Island, Upper and Lower Jones Tracts, Palm Tract and Orwood Tract. This complements substantially improved levees at Mandeville and McDonald Islands and portions of Victoria and Union Islands. Together, levee improvements along the pathway and Old River levees consisting of crest raising, crest widening, landside slope fill and toe berms, meet the needs of local reclamation districts and substantially improve seismic stability to reduce levee slumping and create a more robust flood-fighting platform. Many urban water supply agencies have participated or are currently participating in levee improvement projects along the Old and Middle River corridors.

9.8.4 Liquefaction

Another potential hazard related to earthquakes is soil liquefaction. Liquefaction is a phenomenon that occurs in loose, saturated, granular soils when subjected to strong ground movement. High groundwater levels shallower than the threshold (between 30 and 50 feet below ground surface) may at some locations increase the potential for liquefaction during very strong earthquakes. Some of the wells in the North Orange area of the Riverside Basin are located in areas prone to liquefaction.

RPU also has wells located in the lower part of the Bunker Hill Basin (i.e. the pressure zone), which can be vulnerable to liquefaction. Some segments of RPU's major water transmission mains from the Bunker Hill Basin to the Linden Evans Reservoir are located within potential liquefaction zones.

RPU cooperated with BTAC to develop and implement a "high groundwater" mitigation plan to reduce the potential for liquefaction in the Bunker Hill Basin. During the past five years, the Western San-Bernardino Watermaster has not declared a "high groundwater" risk. Groundwater levels are lower in the Bunker Hill Basin due to climactic conditions and increased pumping. Should high groundwater pose a threat in the future, RPU will assist by pumping additional groundwater from the pressure zone, in accordance with the rules and regulations of the Western-San Bernardino Watermaster.

9.8.5 Floods

Some RPU wells are located within the flood plains of the Santa Ana River and vulnerable to flooding. In 1995, floods washed away the superstructure of the Gage 21 well and the sub-surface portion of the well was subsequently abandoned. The Gage 98-1 well replaced the Gage 21 well with funding assistance from the Federal Emergency Management Agency (FEMA). The other wells most vulnerable to flooding include some Warren Tract wells. Some of the Warren Tract wells were replaced upstream with the Cooley J well.

In 1999, the Seven Oaks Dam, which is located near the headwaters of the Santa Ana River, became operational and will reduce the magnitude, frequency and vulnerability of flooding while increasing available water rights.

RPU has implemented many measures in order to minimize adverse impacts of flooding on groundwater contamination. For example, RPU increased the length of well seals for newer wells to greater depths than required by the State of California water well standards. RPU also screens newer wells generally deeper than 200 feet below ground surface. Additional chlorination stations were added further upstream of the major transmission mains thereby increasing the disinfection contact time. Prior to 2003, wells in the North Orange area used to pump directly into the distribution system. The North Orange wells have now been connected by a major transmission main to the Linden Evans Reservoir for increased disinfection contact time.

Potential hazards from floods are not limited to physical damage and/ or loss of water infrastructure. Studies have found that more than half of the waterborne disease outbreaks in the United States in the past 50 years were preceded by heavy rainfall. Outbreaks due to surface water contamination, which accounted for approximately 24-percent of all outbreaks, were associated with extreme precipitation occurring during the month of the outbreak and one month prior. Outbreaks due to groundwater contamination, which accounted for approximately 36-percent of all outbreaks, were associated with extreme precipitation occurring within a three-month lag preceding the outbreaks.

9.8.6 Groundwater Contamination

Potential hazards that could result in groundwater contamination include migrating contaminant plumes, chemical spills, agricultural return flows, leaky underground storage tanks, and septic systems. Chemical spills and leaking underground storage tanks initially tend to affect a small number of wells, whereas contaminant plumes, agricultural return flows, and septic systems may impact regional aquifers.

Previous improper waste disposal practices have created several groundwater contamination plumes that impact a number of RPU wells. Groundwater contamination has the ability to interrupt water supplies for an extended period. However, some groundwater contamination/ chemical spills have Potentially Responsible Parties (PRP) who can be made to pay mitigation costs. PRPs are mitigating groundwater contamination due to organic solvents thus assuring continued availability and reliability of water supplies affected by those plumes.

In 2001, RPU reached an agreement with manufacturers of the pesticide dibromochloropropane (DBCP) that has contaminated wells in the Riverside Basin. Under the agreement, DBCP manufacturers agreed to pay the capital costs and 40 years of operating and maintenance costs of facilities to remove DBCP from production wells. RPU has been reimbursed for Granular Activated Carbon (GAC) treatment plants that enable RPU to produce additional water from wells previously abandoned due to contamination.

In the late 1980s and early 1990s, water produced from wells connected to the Waterman Transmission main were used to blend impaired water produced from the Gage wells to meet potable drinking water standards. However, water quality within the Gage wells has improved since the Responsible Parties constructed wellhead treatment facilities and replaced shallow wells with deeper ones. The treatment facilities are capable of removing a range of contaminants.

In 1999, RPU prepared a Water Supply Contingency Plan (WSCP) that addressed the potential water quality issues facing the City, especially from the Crafton-Redlands plume(s). The WSCP also included Contingency Plans for addressing issues related to more stringent water quality regulations. The California Department of Public Health approved the WSCP.

9.9 Minimum Supply Next Three Years

For RPU, the most appropriate dry three-year historical sequence is from 2000-2002. This period showed below-normal precipitation and runoff, and the period best reflects the most recent hydrogeological situation within local groundwater basins and higher water demand due to population growth.

The estimated minimum water supply for the next three years is shown in Table 9-3. The supply was estimated by using the available supply of groundwater and recycled water; it was assumed that imported water might not be available in a dry year. RPU is able to increase groundwater production during droughts pursuant to the Western-San Bernardino Judgment.

Table 9-3. DWR Table 8-4R. Minimum Supply Next Three Years

Available Water Supply	2016	2017	2018
Available Water Supply	96,288	96,288	96,288

10 Demand Management Measures

RPU is a signatory to the Memorandum of Understanding Regarding Urban Water Conservation in California (Urban MOU), a program of the California Urban Water Conservation Council (CUWCC). The Urban MOU was first adopted in December 1991 and has been amended over time to reflect changes in best practices. RPU has continued to implement a broad range of conservation programs. This chapter provides information on these programs.

10.1 Demand Management Measures for Retail Agencies

The reporting format for Demand Management Measures (DMMs) in the 2015 UWMP is different than the 2010 UWMP. This discussion has been arranged into the seven sections recommended by DWR in the 2015 UWMP Guidebook.

10.1.1 Water waste prevention ordinances

The Water Conservation Ordinance includes a prohibition on the unreasonable use of water. The Ordinance states:

No person shall waste water or use it unreasonably. Unreasonable use of water includes, but is not limited to, the following:

1. Allowing water to leave the Person's property by drainage onto adjacent properties or public or private roadways or streets due to excessive irrigation and/or uncorrected leaks
2. Failing to timely repair a water leak;
3. Using water to wash down sidewalks, driveways, parking areas, tennis courts, patios or other paved areas, except to alleviate immediate safety or sanitation hazards;
4. Watering outdoor landscaped areas on rainy days and two days thereafter;
5. Failing to adjust sprinklers and irrigation systems to eliminate overspray and avoid run-off into streets, sidewalks, parking lots, alleys or other paved surfaces;
6. Operating a water fountain or other decorative water feature that does not use re-circulated water;
7. Installing single pass cooling systems in buildings requesting new water service;
8. Installing non-re-circulating water systems in new commercial conveyor car wash and new commercial laundry systems; and
9. Failing to install operational re-circulating water systems for commercial conveyor car wash systems and commercial laundry systems.

The ordinance is included in Appendix M.

City of Riverside Code Enforcement has two personnel dedicated to water waste enforcement.

10.1.2 Metering

All connections in RPU's service area are currently metered. RPU is currently investigating a transition to the use of Advanced Metering Infrastructure (AMI), or "smart meters," that would capture and transmit water use data electronically. The use of these meters would allow RPU to monitor consumption on a shorter time frame than the current monthly meter reads. This technology can also be used to provide reporting capability to customers so they can monitor their water use and see how their water use compares to similar households. This transition will require a significant investment of resources and will likely be phased in over time.

10.1.3 Conservation pricing

In the RPU service area, 100 percent of service connections are metered and billed on an increasing block rate structure with seasonal rates to promote water conservation. The rate structure includes four tiers of quantity-based rates for residential customers. RPU's current rate structure is on the RPU web site at *http://www.riversideca.gov/utilities/water-rulesandrates.asp*.

10.1.4 Public education and outreach

RPU implements its public information program in coordination with wholesale agencies, Western Municipal Water District (WMWD) and Eastern Municipal Water District (EMWD). Regional advertising and media programs are implemented with WMWD and EMWD. RPU conducts its own program as well, through public events, demonstration gardens, school programs, media advertising, and bill stuffers.

RPU has been implementing a school education program since 1989. The school education program is implemented in coordination with WMWD. Educational handout materials and class presentations are provided to students in grades K through 6.

Public education and outreach efforts include marketing of rebates and give-aways, communicating water use via water bills, providing school education programs, information booths at fairs and public events, newsletters, informative websites, online tools, social media, or newspaper articles.

To date, RPU has issued press releases, developed back-of-bill informational items, acquired advertising, posted on social media, updated the RPU website and communicated through radio and at special events to promote water conservation and the efficient use of water. RPU has launched an outreach program to local restaurants with posters, stickers, table tents and coasters encouraging further water savings. Furthermore, future education and outreach efforts will focus on:

- outlining the new City ordinance and how it affects Riverside;
- RPU/City facilities going brown for the cause;
- stress your lawn, but protect your trees;
- innovative ways to save water and best practices;
- what 25% water use reductions looks like to our community;
- developing a water calculator to help people determine what they need to do to save water and
- sharing statistics on the community's performance towards achieving the drought conservation targets.

Additionally, RPU has developed, with input from the City Manager's Office, a color coded lawn sign program to communicate the source of water used to irrigate large landscaped parcels citywide that do not receive water from RPU's potable distribution system. For example, parcels that irrigate with recycled water would have purple lawns signs, parcels that use local well water would have greens signs, so as to inform nearby residents.

RPU also maintains a dedicated web site with drought-related information at *http://www.riversidedrought.com/.*

10.1.5 Programs to assess and manage distribution system real loss

RPU has performed water loss audits per the American Water Works Association (AWWA) M-36 manual. The results of these audits have been used to focus efforts to reduce water losses. RPU has used the water audit results to:

1) Refine data collection practices and establish routine business practices
2) Refine, enhance, and expand ongoing programs based on economic justification
3) Conduct detailed planning, budgeting, and launch of comprehensive improvements for metering, billing, and infrastructure management
4) Establish mid-range (5-year horizon) apparent and real loss reduction goals
5) Perform benchmarking

RPU has an active program to repair leaks as they are detected. RPU has a proactive water main replacement program that identifies high risk pipelines based on age, leak history, and pipe material. RPU's annual budget for the main replacement program is approximately $8,600,000. RPU has three construction crews dedicated to main replacement and three maintenance crews dedicated to leak repairs for a total of 27 personnel with their associated equipment and support staff. In addition, about 10 members of the engineering staff dedicate a majority of their time planning and developing pipeline replacement projects.

RPU has developed an unaccounted water team to analyze all system aspects from billing to system modeling. The team reviews data to identify areas of the system where leaks of water loss appears evident. The results of the system analysis are used to aid RPU in its infrastructure and CIP planning to best control losses.

10.1.6 Water conservation program coordination and staffing support

RPU has had a conservation coordinator since 1999. Ryan McManus is currently the conservation coordinator for RPU.

The conservation program has an approximate staffing level of 1.5 full-time equivalents (FTEs) and an approximate annual funding level of $2,000,000. The Demand Management Measures described in this chapter are coordinated through the conservation program. In addition, RPU has five marketing staff and more than 30 customer service representatives who provide drought-related information to the public.

10.1.7 Other demand management measures

RPU has seen a significant increase in conservation program participation by residential and commercial customers over the past year. As an example, the Turf Removal Program provides $2 per square foot in rebates for residential customers and $3 per square foot for commercial customers; and, over the past year the program has multiplied by five times with over 460,000 square feet of turf removed resulting in over 19.5 million gallons of water saved per year, which will have long lasting conservation impacts in the City.

Other rebate programs have also seen increased participation for Commercial Waterwise Landscapes, rotating nozzles, WBICs, efficient toilets and clothes washers. RPU has also worked with hotels, homeowners' associations, schools, commercial businesses, universities and other City departments to provide rebates, technical assistance, landscape surveys and customized water reduction solutions to help them conserve.

To further assist customers conserve water intended for outdoor use, RPU intends to expand many of the programs above, but proposes to focus predominantly on enhancing the Residential and Commercial Waterwise Landscape and WBIC rebate programs. The Metropolitan Water District has recently committed $350 million dollars to its "Cash for Grass" program and specified the following limits: residential rebates of $2 per square foot of turf removed would be limited to a one-time maximum of $6,000 per property, commercial properties would receive $1 per square foot with an annual limit of $25,000 and public agencies could get $2 per square foot for the first 3,000 square feet then $1 per square foot after that, with an annual limit of $50,000 per property. Expanding the WBIC Program is another cost effective way to reduce water waste and over-irrigation.

RPU's other demand management measures are discussed below.

10.1.7.1 Residential Water Surveys

RPU has been providing indoor and outdoor water surveys to single-family residential and multi-family residential accounts since 1989.

10.1.7.2 High Efficiency Clothes Washers (HECW) Rebate Program

The High-Efficiency Clothes Washer Rebate is an energy and water conservation incentive program that offers RPU's residential customers a chance to replace their existing high-energy and water use clothes washer with high-efficiency clothes washers (HECW). HECW must be Energy Star-rated and have a water factor of 4 or less per load. The level of incentive on qualified units is currently $160 for RPU water customers. There is also an energy rebate incentive of $75 available to RPU electric customers.

10.1.7.3 Smart Irrigation Program

In 2011, RPU launched a Smart Irrigation Program targeting the top 10 percent of water users in RPU's service area. The program requires a certified water audit before installation of water efficient landscaping equipment occurs. In addition to these audits, RPU offers qualified customers free installation of smart irrigation controllers and high efficiency sprinkler nozzles to achieve additional water savings.

10.1.7.4 WaterWise Landscape Rebate Program

The WaterWise Landscape Rebate Program provides incentives for RPU residential and commercial water customers who replace existing lawn areas with water-efficient, California-friendly plants. Customers can receive up to $1.00 per square foot for living grass (lawn) that is replaced with WaterWise landscaping suited to our region’s semi-arid climate. The maximum rebate for residential customers is limited to 3,000 square feet and 25,000 square feet for commercial customers. By replacing large turf areas with drought-tolerant, California-friendly landscaping and using efficient irrigation, outdoor water use can be reduced by up to 50%.

10.1.7.5 High-Efficiency Toilet (HET) Incentive Program

The High-Efficiency Toilet (HET) Incentive Program is a water conservation rebate program that offers RPU's customers a chance to replace high water-use toilets, or upgrade Ultra Low Flush Toilet models with water-saving HET models. HETs are the new standard in water-efficient toilets and use only 1.28 gallons of water per flush (gpf) or less. There are also Dual Flush HETs that offer a separate, low water use flush for liquids that only use between 0.8 and 1.1 gpf. This can mean up to 4,000 gallons of water saved each year.

RPU's water customers can receive rebates of up to $100 for purchasing and installing a qualified High-Efficiency Toilet (standard or Dual Flush) that replaces an older, high water-use toilet. Rebates are limited to four new HET installations or four HET upgrades per account.

10.1.7.6 Landscape Surveys for Commercial, Industrial, and Institutional Accounts

RPU has provided surveys for a total of five percent of its current commercial, industrial, and institutional accounts.

10.1.7.7 Weather-Based Irrigation Control (WBIC) Rebate Program

A Weather-Based Irrigation Controller (WBIC) is a sprinkler control device that automatically adjusts irrigation schedules in response to changing weather or environmental conditions. The WBIC rebate program provides rebates for residential customers who install these systems. Sensors on WBIC systems can tell the device if it's hot or raining and adjust watering times accordingly. Studies have shown that by using a WBIC a household can reduce their outdoor water use by about 20%. That translates into savings of about 40 gallons per day, or 14,600 gallons per year. Incentives per qualified unit installed by a licensed contractor is up to $200 per 12-station Irrigation Controller purchased and installed by a licensed contractor.

10.1.7.8 Residential Plumbing Retrofits

RPU has been installing low-flow showerheads since 1981 as part of a "Weatherization" program targeted to low income residents and senior citizens. The 2010 Water Use Efficiency Master Plan estimated that at least 90 percent of pre-1992 residences are outfitted with low-flow showerheads.

10.1.7.9 Free Sprinkler Nozzles

This program is coordinated by Western Municipal Water District. It serves customers of 28 different water agencies. It allows residential customers to obtain water-efficient sprinkler nozzles. Information about this program is at http://www.FreeSprinklerNozzles.com.

10.1.7.10 High Efficiency Sprinkler Nozzles Rebate Program

The High Efficiency Sprinkler Nozzles Rebate Program provides incentives for RPU's residential water customers who replace standard, pop-up sprinkler head spray nozzles with newer water-efficient sprinkler head spray nozzles. Using pop-up sprinkler spray heads with new water-efficient nozzles can save more than 6,600 gallons of water per nozzle over a 5-year period. Water-efficient sprinkler nozzles apply water more evenly than conventional spray nozzles, thus saving water and reducing the amount of run-off. The level of incentive is $3 per qualified nozzle.

10.1.7.11 Commercial Water Efficiency Rebates

This program is coordinated with Metropolitan Water District of Southern California. It includes a number of rebate programs focused on commercial customers, including:

- High-Efficiency, Ultra Low-Flush and Zero Water Urinals
- Connectionless Food Steamers
- Weather-Based "Smart" Irrigation Controllers
- Central Computer Irrigation Controllers. These sophisticated systems are designed for larger irrigated areas such as golf courses, parks, schools and large commercial complexes. Central computer irrigation controllers consist of a master controller (often a personal computer) which tells the valves in remote locations to open and close.
- High-Efficiency Nozzles for Pop-Up Spray Heads
- High-Efficiency Nozzles for Large Rotary Heads

- In-Stem Flow Regulators - The in-stem regulator controls water flow in irrigation systems at the head.
- Laminar Flow Restrictors - Laminar flow devices avoid drawing air into the water stream, allowing them to produce a non-aerated clear stream of water while inhibiting bacterial growth and transmission.
- Conductivity Controllers - Conductivity controllers can lower the cost of operating a cooling tower by providing greater control over the tower's blow down and subsequent makeup water.
- Dry Vacuum Pumps - Liquid ring vacuum pumps use large quantities of water to create a liquid seal and enable suction. Dry vacuum pumps, on the other hand, use machined parts with extremely close tolerances to create suction. Both types of vacuum pumps are used in manufacturing facilities, including medical and dental manufacturing, among other uses.
- Air-Cooled Ice Machines - Air-cooled ice machines use less water and energy than conventional ice machines, and make ice more quickly and efficiently.

10.2 Implementation over the Past Five Years

RPU maintains records of each of the programs described above, including the extent of each program, the expenditures, and the anticipated water savings. This information has been summarized for 2011 through 2015.

Details about the expenditures on each program are provided in Appendix N.

10.3 Planned Implementation to Achieve Water Use Targets

RPU's current per-capita consumption is less than its 2020 compliance target. RPU expects to continue to implement its current conservation programs to encourage conservation and maintain per-capita consumption below the compliance target.

10.4 Members of the California Urban Water Conservation Council

In 1997, RPU signed the Memorandum of Understanding Regarding Urban Water Conservation in California (Urban MOU), which requires the implementation of 14 Best Management Practices (BMPs) for water conservation. As a signatory of the Urban MOU, RPU can report regularly on its implementation efforts with regards to each of the 14 BMPs. These reports are archived in an online BMP Reporting Database at the California Urban Water Conservation Council website and are publicly available.

11 Plan Adoption, Submittal, and Implementation

This chapter describes RPU's process for holding a public hearing, adopting the UWMP, and submitting the adopted UWMP.

11.1 Inclusion of all 2015 Data

RPU has developed the UWMP presenting data on a calendar year basis. This report includes data through December 31, 2015.

11.2 Notice of Public Hearing

RPU held a public hearing to present the Draft UWMP for public comment on June 27, 2016. In February of 2016, RPU provided notice of the public hearing to the cities and counties to which RPU provides water. As required by the CWC, these agencies are identified in Table 11-1. RPU provided similar notice to surrounding water management agencies and water retailers, as discussed in Chapter 3.

Legal public notices for the public hearing were published in the local newspapers and posted at City of Riverside's (City) offices and on the City and RPU website. Copies of the draft UWMP were available at the RPU office located at 3750 University Ave. 3rd Floor, Riverside CA 92501 or as a PDF on the RPU website prior to the public hearing.

The notice that was published in advance of the public hearing is attached as Appendix C.

Table 11-1. DWR Table 10-1R. Notification to Cities and Counties

City or County Name	60 Day Notice	Notice of Public Hearing
Riverside County	True	True
City of Riverside	True	True

11.3 Public Hearing and Adoption

The draft Final UWMP was presented to the Board at a public hearing on June 27, 2016. The draft Final UWMP was presented to the City Council for adoption on June 28, 2016.

A copy of the resolution adopting the UWMP is attached as Appendix O.

11.4 Plan Submittal

After adoption by the RPU Board of Public Utilities, this UWMP was submitted to DWR using the online submittal tool. The data tables and a copy of the complete report were submitted using the WUE data online submittal tool.

Within 30 days after adoption, a CD copy of this report was submitted to the California State Library. In addition, an electronic copy of this report was submitted to the cities and counties to which RPU provides water.

11.5 Public Availability

The adopted UWMP will be available for public review at the City offices at 3750 University Ave. 3rd Floor, Riverside CA 92501, during normal business hours (8:00 am to 5:00 pm). The adopted UWMP will also be available for review on the RPU website at *http://www.riversideca.gov/utilities.*