Carlsbad
Municipal Water District

Urban Water Management Plan

2015

RMC
water and environment

Revised Draft
June 2016

Carlsbad Municipal Water District
2015 Urban Water Management Plan

Revised Draft

Prepared by:

June 2016

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List of Abbreviations

Act	Urban Water Management Planning Act
AF	Acre-feet
AFY	Acre-feet per year
AMI	Advanced Metering Infrastructure
AWWA	American Water Works Association
BMP	Best management practices
Carlsbad	City of Carlsbad
Carlsbad WRF	Carlsbad Water Reclamation Facility
CASGEM	California Groundwater Elevation Monitoring
CCF	Hundred cubic feet
cfs	Cubic feet per second
CII	Commercial, Industrial, and Institutional
CIP	Capital improvement program
City	City of Carlsbad
CUWCC	California Urban Water Conservation Council
CWC	California Water Code
CMWD	Carlsbad Municipal Water District
DMM	Demand Management Measure
DOF	California Department of Finance
DWR	California Department of Water Resources
EI	Energy intensity
EWA	Encina Wastewater Authority
EWPCF	Encina Water Pollution Control Facility
GHG	Greenhouse gas
GIS	Geographic Information System
gpcd	Gallons per capita per day
gpd	gallons per day
gpm	gallons per minute
Guidebook	2015 Urban Water Management Plans Guidebook for Urban Water Suppliers
IPR	Indirect potable reuse
IRWM	Integrated Regional Water Management
kWh	Kilowatt hour
LWWD	Leucadia Wastewater District
MG	million gallons
mg/L	Milligrams per liter
mgd	million gallons per day
MHI	Median household income
MWD	Metropolitan Water District of Southern California
NOAA	National Oceanic and Atmospheric Administration
NSDWRC	North San Diego Water Reuse Coalition
OMWD	Olivenhain Municipal Water District
Plan	Urban Water Management Plan
Poseidon	Poseidon Resources Corporation
QSA	Quantification Settlement Agreement
RAC	Regional Advisory Committee
RWMG	Regional Water Management Group
RWQCB	Regional Water Quality Control Board
SANDAG	San Diego Association of Governments
SBX7-7	Senate Bill X7-7 (The Water Conservation Act of 2009)

SDCWA	San Diego County Water Authority
SLR	Sea level rise
SWP	State Water Project
TAP	Tri-Agency Pipeline
TDS	Total Dissolved Solids
UAW	Unaccounted-for water use
UWMP	Urban Water Management Plan
VID	Vista Irrigation District
VWD	Vallecitos Water District
WELO	Water Efficient Landscape Ordinance
WRF	Water Recycling Facility
WSCP	Water Shortage Contingency Plan

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Executive Summary

ES 1 Purpose and Organization

Preparation of an Urban Water Management Plan (UWMP) is required by the California Department of Water Resources (DWR) for all urban water suppliers within the State of California. Urban water suppliers are defined as publicly or privately owned water suppliers that provide water for municipal purposes either directly or indirectly to more than 3,000 customers or supply more than 3,000 acre-feet (AF) of water annually. UWMPs must meet requirements established by the California Water Code (CWC) and the Urban Water Management Planning Act (Act).

This report constitutes the 2015 Urban Water Management Plan (2015 UWMP) for Carlsbad Municipal Water District (CMWD), which must be adopted by CMWD's Board of Directors and submitted to DWR by July 1, 2016. This 2015 UWMP satisfies the requirements of the CWC, the Act, and subsequent amendments. In addition to satisfying regulatory requirements, this report is a resource document that includes an analysis of long-term water supply and demand planning for CMWD's service area. **Table ES-1** includes a summary of each section of this 2015 UWMP.

Table ES-1: Organizational Overview of the 2015 UWMP

Section	Section Name	Information Contained within Section
Section 1	Introduction and Overview	• General legal requirements for 2015 UWMPs • Local planning efforts
Section 2	Plan Preparation	• Plan preparation • Agency coordination and outreach • Document overview
Section 3	System Description	• History of CMWD • General description of CMWD's service area • Hydrologic and climate characteristics • Current and projected population and demographic figures • Description of CMWD's water system • Overview of potential impacts of climate change
Section 4	System Water Use	• Overview of past water use • Information about existing water use in 2015 • System water losses • Water use projections through 2040 • Water demands for lower income households
Section 5	Baselines and Targets	• Information on water conservation mandates • Baseline gross per capita water use • Updated target method • Urban water use targets for 2015 and 2020 • 2015 target compliance
Section 6	Water Supplies	• Existing and projected supplies, including purchased and imported water, desalinated water, and recycled water • Description of planned future water projects • Climate change impacts to supplies

Section	Section Name	Information Contained within Section
Section 7	Water Supply Reliability	• Constraints on each of CMWD's supplies • Projections for water supply and water demands under normal, single dry, and multiple dry year conditions
Section 8	Water Shortage Contingency Planning	• Overview of CMWD's water shortage stages • Prohibitions that are enacted during water shortages • Methods for reducing water use • Catastrophic supply interruption plan • Minimum supply available for the next three years
Section 9	Demand Management Measures	• Summary of CMWD's demand management measures implemented over the past five years • Summary of future DMM implementation
Section 10	Plan Adoption, Submittal, and Implementation	• Summary of the plan review and notification process • Overview of the UWMP adoption process • Implementation of the 2015 Plan

ES 2 CMWD's Service Area Background and Water Supplies

CMWD's service area is located in northern San Diego County, encompassing approximately 32 square miles. CMWD serves the majority of the City of Carlsbad; Olivenhain Municipal Water District (OMWD) and Vallecitos Water District (VWD) serve the remaining southeastern portion. The service area is bordered by OMWD and the City of Encinitas to the south, VWD to the southeast, the City of Vista to the northeast, the City of Oceanside to the north, and the Pacific Ocean to the west.

CMWD's weather is characterized as a Mediterranean climate with mild temperatures year round. The mild climate is derived from the warm ocean water being pulled north from Mexico and from the subtropical, semi-desert locale. Resulting temperatures are, on average, 64 degrees in January and 75 degrees in August. CMWD's service area receives an average of approximately 11 inches of precipitation annually, with most of the rainfall occurring in January and February.

CMWD's 2015 water supplies included purchased water and recycled water. Potable water demands are all currently met with water purchased from the San Diego County Water Authority (SDCWA), while recycled water is used for non-potable uses to offset potable water use. SDCWA is the regional wholesale water agency in San Diego County, and serves 24 member agencies, including CMWD. SDCWA's supply mix includes Colorado River water, State Water Project (SWP) water, and desalinated seawater. SDCWA purchases its SWP and a portion of its Colorado River supplies from the Metropolitan Water District of Southern California (MWD). SDCWA also receives Colorado River water via transfers from Imperial Irrigation District (IID) and conservation savings from various canal lining projects. However, both of these imported sources (SWP and Colorado River) have become less reliable since the early 1990s as a result of significant droughts, water rights issues, and environmental restrictions. To help offset demands on these imported supplies, SDCWA purchases desalinated seawater from the Claude "Bud" Lewis Carlsbad Desalination Plant (Carlsbad Desalination Plant) and blends it into member agency supplies.

Moving forward, CMWD plans to increase local supply reliability and offset demands for imported water by expanding its recycled water distribution system, increasing its purchases of desalinated seawater, building a direct connection to the desalinated pipeline, and exploring its groundwater rights. CMWD is a member of the North San Diego Water Reuse Coalition (NSDWRC), which consists of ten member

agencies who are cooperatively implementing a regional recycled water system to maximize recycled water use and implement potable reuse. These projects will allow CMWD to expand beneficial reuse of local wastewater for non-drinking water purposes such as irrigation and industrial uses. CMWD may also pursue groundwater as a future supply source, and is currently exploring its groundwater rights. In addition, CMWD's Board approved an agreement in April 2016 to purchase additional desalinated seawater, separate from the desalinated water received via SDCWA purchases, and to construct a direct connection to the desalinated seawater pipeline. Table ES-2 provides a summary of CMWD's projected water supplies from 2020-2040. Note that future groundwater supplies are not included in this table because they have not yet been quantified.

Table ES-2: Summary of Projected Supplies (AFY)

Source	2020	2025	2030	2035	2040
SDCWA Purchases	15,507	16,677	16,965	17,244	17,268
Seawater Desalination	2,500	2,500	2,500	2,500	2,500
Recycled Water[1]	10,519	10,519	10,519	10,706	10,706
Total Water Supplies	**28,526**	**29,696**	**29,984**	**30,450**	**30,474**

[1] Recycled Water supplies include the Carlsbad WRF capacity plus the existing recycled water purchased from VWD and LWWD. The Carlsbad WRF is undergoing an expansion, resulting in the substantial increase in recycled water supply between 2015 and 2020.

ES 3 CMWD's Current and Projected Demands

CMWD's historical water demands have varied from year to year, which is mainly attributed to annual variations in weather and droughts. All urban water suppliers throughout California are mandated by the Water Conservation Act of 2009 (also referred to as SBx7-7) to reduce per capita potable water demands by 20% by the year 2020. For 2015, CMWD was required to have a per capita water use (measured in gallons per capita per day [gpcd]) of 233 gpcd. CMWD's actual potable water demands for 2015 were 145 gpcd, which is well below the 2015 target. Reduced demands in CMWD's service area are likely the result of ongoing conservation programs that have been implemented in response to the SBx7-7 legislation, along with enhanced conservation that is currently in effect in response to a multi-year drought. Table ES-3 shows the baselines and targets projected for CMWD for compliance with SBx7-7. As shown in the table, CMWD elected to use a 10-year baselines, from 1999 through 2008, inclusive.

Table ES-3: SBx7-7 Baselines and Targets for CMWD

Baseline Period	Start Years	End Years	Average GPCD	2015 Target	2020 Target
10-15 year	1999	2008	259	233	207

CMWD's demand projections anticipate a rebound effect (increased demands) when the drought subsides. However, CMWD also assumes ongoing conservation, and increased recycled water use, which will reduce potable water demands. The 2015 UWMP demand analysis demonstrates that with existing and anticipated conservation efforts, CMWD is on track to meet its 2020 gpcd target of 207 gpcd. Table ES-4 summarizes CMWD's baseline demands, conservation, recycled water use, and overall potable demand projections for 2020-2040.

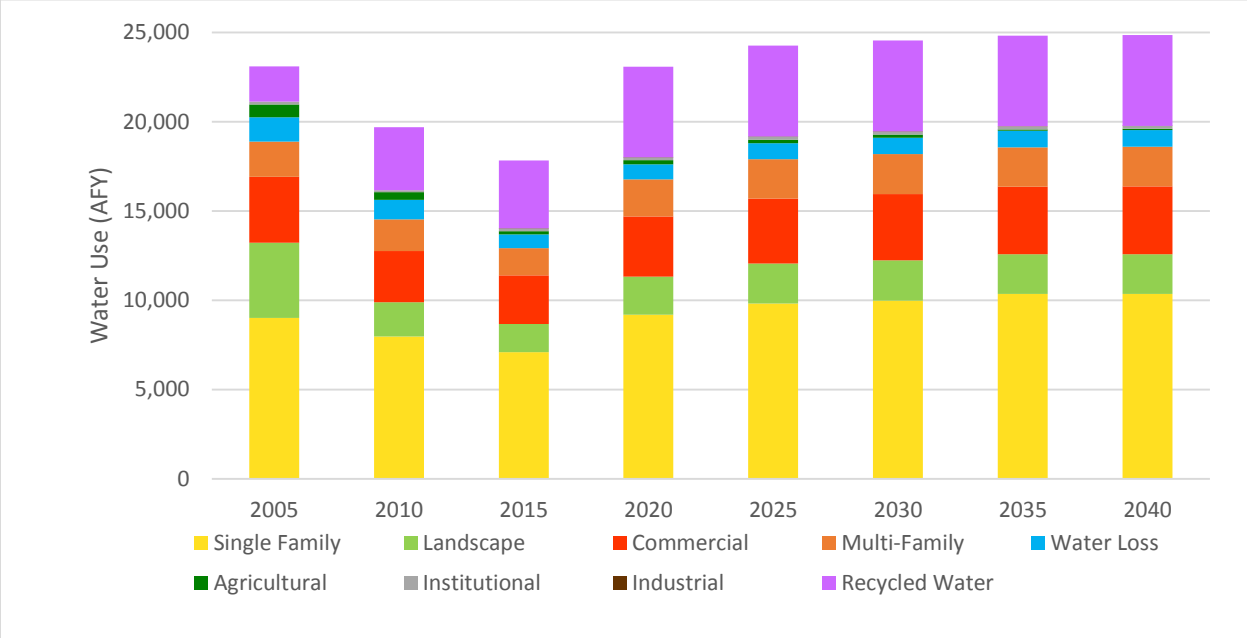
Table ES-4: Summary of Projected Demands (AFY)

		2020	2025	2030	2035	2040
A	Baseline Water Use[1]	25,965	27,523	28,191	28,822	29,236
B	Active and Passive Conservation[1]	2,880	3,268	3,648	4,000	4,390
C	Total Projected Demands[2] (A-B)	23,085	24,255	24,543	24,822	24,846
D	Existing Recycled Water Use[3]	3,942	3,942	3,942	3,942	3,942
E	Increase in Recycled Water Use[4]	1,136	1,136	1,136	1,136	1,136
F	Total Recycled Water (D+E)	5,078	5,078	5,078	5,078	5,078
G	Total Potable Water[5] (C-F)	18,007	19,177	19,465	19,744	19,768

[1] Baseline water use and active/passive conservation calculated via SDCWA 2015 UWMP demand forecast.
[2] Projected demands include potable and recycled water demands.
[3] Recycled water was lower in 2015 than average; existing recycled water use projected forward is based on a five-year average.
[4] Increased demand from expansion of recycled water system, refer to *Section 6 System Supplies*. Increased recycled water use will offset projected potable demands.
[5] Total Potable Water is the Projected Demands less Recycled Water Demand.

Figure ES-1 shows historical and projected water use, by use sector. Recycled water is also shown to provide a comprehensive image of CMWD's supply portfolio. Projected demands assume a normal hydrologic year, while 2015 demands are the third year of a multiple dry year period. Projected potable demands meet or exceed CMWD's SBX7-7 target.

Figure ES-1: CMWD's Historical, Current, and Projected Water Use



ES 4 CMWD's Water Supply Reliability

One of the key requirements of UWMPs is the inclusion of a long-term supply reliability analysis that demonstrates the supply-demand balance in normal, single-dry, and multiple-dry year hydrologic conditions. Consistent with SDCWA's 2015, CMWD projects that demands will increase as weather gets hotter and drier during the single-dry year and multiple-dry year scenarios. Recycled water supplies and CWMD's direct purchase of desalinated seawater would remain steady in all hydrologic scenarios because they are both drought-proof, local supplies. Changes in demands would necessitate changes to CMWD's purchases of supplies from SDCWA. Because SDCWA and CMWD coordinated on their supply and demand projections, for all years that SDCWA projects reliability, CMWD assumes it will be able to purchase sufficient supplies to meet demands. In the event that SDCWA projects a supply shortfall, CMWD would implement extraordinary conservation measures or convert additional customers to recycled water to reduce potable water demands.

CMWD's water supply reliability analysis shows that with implementation of additional planned supplies (such as groundwater) and conservation measures, supplies will meet demands under all hydrologic scenarios.

ES 5 Water Shortages and Demand Management

CMWD has two ordinances in place to help manage demands during potential water shortages. Ordinance No. 44: Drought Response Plan and Water Conservation Program is CMWD's Drought Ordinance, which establishes CMWD's drought response levels and the conservation measures that are enacted for each level as it is declared. Each of these response levels enacts increasingly stringent water use reduction measures and potential penalties. In general, higher response levels incorporate all previous restrictions, and impose additional restrictions as described in the Drought Ordinance. Ordinance No. 46: Water Schedules is an amendment to CMWD's Drought Ordinance, and revised Drought Response Levels 2 and 3 to allow for increased flexibility for CMWD in establishing water limits during these drought levels.

CWMD also engages in various public outreach and education campaigns and conservation programs to improve water use efficiency and awareness. Staff attend community events and manage water conservation booths, as well as

UWMPs and the Water Conservation Act of 2009: Conservation requirements for the UWMP are based on the Water Conservation Act of 2009 (SBX7-7). This act mandates a 20% reduction in water use from average (based on 10-15 year baseline), measured in GPCD (gallons per capita per day, based on gross water use), by 2020, with an interim target of 10% reduction by 2015. For more information, refer to: http://www.water.ca.gov/urbanwatermanagement/uwmp2015.cfm

2015/2016 Emergency Regulations: Executive Order B-29-15 (April 2015; extended March 2016) imposed temporary mandatory conservation aimed at achieving 25% reduction statewide from 2013 levels during the current multi-year drought. Each water purveyor was assigned a conservation target by the state, measured in R-GCPD (residential gallons per capita per day, based on residential water use). CMWD's initial conservation target was 28%, but was reduced to 20% due to regional supply development. For more information, refer to: http://www.waterboards.ca.gov/water_issues/programs/conservation_portal/emergency_regulation.shtml

2016 Extended Emergency Regulations: In May 2016, the SWRCP adopted new emergency regulations (applies June 2016 – January 2017) that would allow water purveyors to identify their own temporary conservation targets based on their ability to meet demands during continuation of multiple dry year conditions into 2017, 2018, and 2019. For more information refer to: http://www.waterboards.ca.gov/water_issues/programs/conservation_portal/emergency_regulation.shtml

visiting local schools to talk to students about water resources. Water conservation resources are provided to customers at CMWD's Water Savings Tips website (http://www.carlsbadca.gov/services/depts/pw/utils/water/tips.asp), which provides links to water use calculators, WaterSmart landscaping guides, videos on water conservation, and information on water conservation and efficiency rebates, among others.

Section 1

Introduction and Overview

This *2015 Urban Water Management Plan* (2015 UWMP) addresses the Carlsbad Municipal Water District (CMWD) and includes descriptions of CMWD's water supply sources, projected water demands, and supply reliability. The 2015 UWMP presents a comparison of projected water supplies to water demands during normal, single-dry, and multiple-dry years. This chapter provides an introduction to the purpose of the 2015 UWMP and an overview of the Urban Water Management Planning Act.

1.1 Background and Purpose

Water planning has become increasingly critical as California endures the ongoing drought and prepares for expected long-term climate changes. Prior to the adoption of the Urban Water Management Planning Act (the Act), water suppliers were not required to conduct long-term water resources planning, which could leave agencies vulnerable to supply disruptions during periods of drought or other supply shortages. The Act was adopted to require a minimum level of resource assessment and planning by water suppliers in order to reduce susceptibility to supply shortages. Water resources planning at the local level also allows for local community involvement and consideration of unique circumstances and local conditions of the individual agency. This 2015 UWMP is an update to CMWD's 2010 UMWP.

1.2 Urban Water Management Planning Act

This 2015 UWMP has been prepared in accordance with the Act, as amended, California Water Code Division 6, Part 2.6, §10610 through 10657. The Act became part of the California Water Code with the passage of Assembly Bill 797 during the 1983–1984 regular session of the California legislature. It requires every urban water supplier that provides water for municipal purposes to more than 3,000 connections or supplying more than 3,000 acre-feet (AF) of water annually to adopt and submit a plan every five years to the California Department of Water Resources (DWR). The Act was amended in November 2009 with the adoption of Senate Bill (SB) x7-7. SBx7-7 sets a goal of achieving a 20 percent reduction in urban per capita water use statewide by 2020. This 2015 UWMP recalibrates the baseline and targets established for SBx7-7 compliance in CMWD's 2010 Plan. The agency will be held accountable to the targets set forth in this Plan. The Act states that urban water suppliers should make every effort to assure the appropriate level of reliability in water service is in place to meet the needs of its various categories of customers during normal, dry, and multiple dry years. The Act describes the required contents of the 2015 UWMP, as well as how urban water suppliers should adopt the UWMP.

This 2015 UWMP has been developed in accordance with the DWR *2015 Urban Water Management Plans Guidebook for Urban Water Suppliers* (2015 Guidebook), which provides guidance to agencies on how to include the information required under the California Water Code (CWC), as amended. In accordance with the CWC, this Plan must be adopted and submitted to DWR by July 1, 2016.

1.3 Relation to Other Planning Efforts

Urban Water Management Plans allow for integration of information from other planning documents, as well as regional planning efforts. This 2015 UWMP synthesizes information from CMWD's current planning documents and complements regional planning documents. Upon completion, the 2015 UWMP will help to inform other planning decisions, such as updates to the Carlsbad General Plan, and can be used to establish priorities in other planning efforts. Further, the information developed for this 2015 UWMP will be used to inform and enhance the San Diego County Water Authority's (SDCWA) *2015 Urban Water Management Plan*, which provides water reliability assessment for the region's water wholesaler.

This 2015 UWMP aims to provide guidance on minimization of imported water supplies and maximization of local water supplies, which continues to be a priority for CMWD. CMWD has increased the use of recycled water, implemented water conservation measures, and participated in the planning of a local seawater desalination project as steps to maximize the use of local water resources.

Relevant, related planning efforts include the following:

1. CMWD, *2012 Water Master Plan* – Documents existing water system facilities and demands, identifies existing deficiencies in the system, confirms facility sizing, and recommends a future capital improvement program (CIP) based on updated water demand projections.
2. CMWD, *2012 Recycled Water Master Plan* – Evaluates the capabilities of the existing recycled water system, defines the most cost-effective system expansions through build-out conditions, and develops a recycled water CIP.
3. CMWD, *2012 Phase III Recycled Water Project Feasibility Study* – Identifies customer demands and establishes the pipeline expansion segments, recycled water supply, and appurtenances necessary for Phase III.
4. North San Diego Water Reuse Coalition (NSDWRC), *2015 Regional Recycled Water Project EIR* – Identifies infrastructure between ten water and wastewater agencies interconnecting regional recycled water supply and distribution systems in order to maximize water reuse capacity. In the near term, this regional project potentially could supply additional non-potable demands of 18,808 acre-feet per year (AFY).
5. SDCWA, *2015 Urban Water Management Plan* – Identifies regional water sources and volumes for SDCWA's service area, including supply reliability analysis of the wholesale (imported + desalinated seawater) supply.
6. San Diego Regional Water Management Group (RWMG), *2013 San Diego Integrated Regional Water Management Plan* – Regional effort to identify water resource issues, challenges, and solutions within western San Diego County, with emphasis on solutions that maximize collaboration and coordination among entities to best manage water resources.

Section 2

Plan Preparation

Section 2 Plan Preparation addresses CWMD's basis for preparing an UWMP and related information. It also provides a description of how this 2015 UWMP is organized, and identifies general details regarding CMWD and the data used for this plan.

2.1 Basis for Preparing a Plan and Agency Identification

This 2015 UWMP was prepared by CMWD. CMWD is a retail water agency that supplied 17,822 AF of water (potable and recycled) to over 86,000 people via 29,282 connections in 2015. Of these deliveries, 3,793 AF was recycled water, serving 761 recycled water connections, while the remaining 28,521 connections received a total of 13,264 AF potable water. Approximately 765 AF were lost as unmetered water. Unmetered water includes real losses, defined as physical water losses such as leaks, and apparent losses, which include "paper losses" or water lost through inaccurate measuring or recording.

This 2015 UWMP was prepared as an individual plan in coordination with appropriate agencies. This chapter provides descriptions of agency coordination, public participation, Plan adoption, and Plan organization. Table 2-1, Table 2-2, and Table 2-3 provide information on CMWD as a retail water agency and its water system, and how data will be reported throughout the 2015 UWMP.

Table 2-1: Retail: Public Water System

DWR Table 2-1 Retail: Public Water Systems			
Public Water System Number	**Public Water System Name**	**Number of Municipal Connections 2015**	**Volume of Water Supplied 2015 (AFY)**
CA3710005	Carlsbad Municipal Water District	28,521	14,029
NOTES: This table only reflects potable water connections and deliveries. CMWD's recycled water system has 761 connections, and supplied 3,793 AF in 2015. Note that system losses included in the total volume of water supplied was calculated for FY2015, while deliveries were recorded for calendar year 2015.			

Table 2-2: Plan Identification

DWR Table 2-2: Plan Identification	
☑	Individual UWMP
	Regional UWMP

Table 2-3: Agency Identification

DWR Table 2-3 Agency Identification	
Name of Agency	Carlsbad Municipal Water District
Select one or both	
	Agency is a wholesaler
☑	Agency is a retailer
Fiscal or Calendar Year	
☑	UWMP Tables are in Calendar Years
	UWMP Tables are in Fiscal Years
Units of Measure	
☑	Acre Feet (AF)
	Million Gallons (MG)
	Hundred Cubic Feet (CCF)

2.2 Agency Coordination

The Act requires CMWD to coordinate the preparation of its plan with other appropriate agencies in the area, including other water suppliers that share a common source, water management agencies, and relevant public agencies, to the extent practicable. While preparing the 2015 UWMP, CMWD attended workshops conducted by DWR to discuss the requirements of the Act and attended meetings with SDCWA, CMWD's wholesale water supplier. SDCWA's *2015 Urban Water Management Plan* should be consulted for details regarding CMWD's wholesale water supplies. Table 2-4 identifies SDCWA as CMWD's wholesale water supplier, with whom CMWD has coordinated on their supply and demand evaluations.

Table 2-4: Water Supplier Information Exchange

DWR Table 2-4 Retail: 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
San Diego County Water Authority

CMWD worked closely with the City of Carlsbad's Community and Economic Development Department in the preparation and review of 2015 UWMP elements. In preparing the recycled water elements of this 2015 UWMP, CMWD consulted with the agencies responsible for the existing and potential sources of recycled water in northern San Diego County, including Vallecitos Water District (VWD), Leucadia Wastewater District (LWWD), Encina Wastewater Authority (EWA), City of Escondido, City of Oceanside, Olivenhain Municipal Water District (OMWD), Rincon del Diablo Municipal Water District (Rincon), San Elijo Joint Powers Authority (SEJPA), Santa Fe Irrigation District (SFID), and Vista Irrigation District (VID). Table 2-5 provides a summary of CMWD's coordination with the appropriate agencies.

Table 2-5: Coordination with Appropriate Agencies

Organization/Agency Name	Level of Participation		
	Sent 60-Day Notice of 2015 UWMP Public Hearing	Sent Revised Notice of 2015 UWMP Availability	Contacted for Assistance
City of Carlsbad	X	X	X
City of Encinitas	X	X	
City of Escondido	X	X	
City of Oceanside	X	X	
City of San Marcos	X	X	
City of Vista	X	X	
County of San Diego	X	X	
Encina Wastewater Authority	X	X	X
Leucadia Wastewater District	X	X	X
Metropolitan Water District of Southern California	X	X	
Olivenhain Municipal Water District	X	X	
Rincon del Diablo Municipal Water District	X	X	
San Diego Association of Governments	X	X	X
San Diego County Water Authority	X	X	X
San Diego Local Area Formation Commission	X	X	
San Elijo Joint Powers Authority	X	X	
Santa Fe Irrigation District	X	X	
Vallecitos Water District	X	X	X

2.3 Public Participation

CMWD encouraged community and public involvement in the 2015 UWMP. CMWD will hold a public hearing on June 14, 2016, that provides an opportunity for CMWD's customers (including social, cultural, and economic community groups) to learn about the water supply situation and plans to continue to provide a reliable water supply for the future. The hearing is an opportunity for people to ask questions regarding the 2015 UWMP and will include discussion of the per capita water use targets.

A 60-day notice of the public hearing was provided to San Diego County and adjacent cities and other entities on March 31, 2016. A revised notice of 2015 UWMP availability was also provided to San Diego County and adjacent entities when the Revised Draft UWMP was released. The notification list is included in **Appendix A**.

Public hearing notifications were published in the San Diego Union Tribune on May 24 and May 31, 2016. Copies of the 2015 UWMP were made available for public review at the City of Carlsbad's

Faraday Center, 1635 Faraday Avenue; at the Carlsbad City Library located at 1250 Carlsbad Village Drive; at the Carlsbad City Clerk's Office, 1200 Carlsbad Village Drive, and on the City of Carlsbad's website (www.carlsbadca.gov) two weeks before the public hearing. A copy of the published Notice of Public Hearing is included in **Appendix A**. This Plan will be considered for adoption by the Board of Directors on June 14, 2016. A copy of the adoption resolution is provided in **Appendix B**.

The 2015 UWMP will be submitted to DWR, the California State Library, and San Diego County within 30 days after adoption. The 2015 UWMP will be available for public review on the City of Carlsbad's website (www.carlsbadca.gov) within 30 days after filing a copy of the 2015 UWMP with DWR. The CMWD shall implement the adopted 2015 UWMP in accordance with the schedule described in this UWMP.

2.4 Plan Organization

Section 1 provides an overview of the background and purpose of the Urban Water Management Planning Act and the 2015 UWMP. *Section 2* describes the plan preparation process and plan organization. *Section 3* provides a description of the service area, climate, and water system. *Section 4* presents historical and projected water use and demands. *Section 5* presents the baselines and targets required by SBx7-7. *Section 6* describes CMWD's water supplies. *Section 7* provides an assessment of local and regional water supply reliability. *Section 8* discusses water shortage contingency planning. *Section 9* presents demand management measures. *Section 10* discusses the plan adoption, submittal and implementation process. The appendices provide relevant supporting documents.

DWR has provided a checklist of the items that must be addressed in each UWMP based upon the Act. This checklist makes it simple to identify exactly where in the UWMP each item has been addressed. The checklist was completed for this 2015 UWMP and is provided in **Appendix C**. It references the sections and page numbers where the specific items can be found. A copy of all of the required DWR tables has been provided as **Appendix D**. CMWD has elected to include additional tables in various chapters to provide clarity and support chapter narratives. Throughout this 2015 UWMP, tables are numbered sequentially, with tables containing information addressed in the required DWR tables indicated in the dark blue header row of the given table:

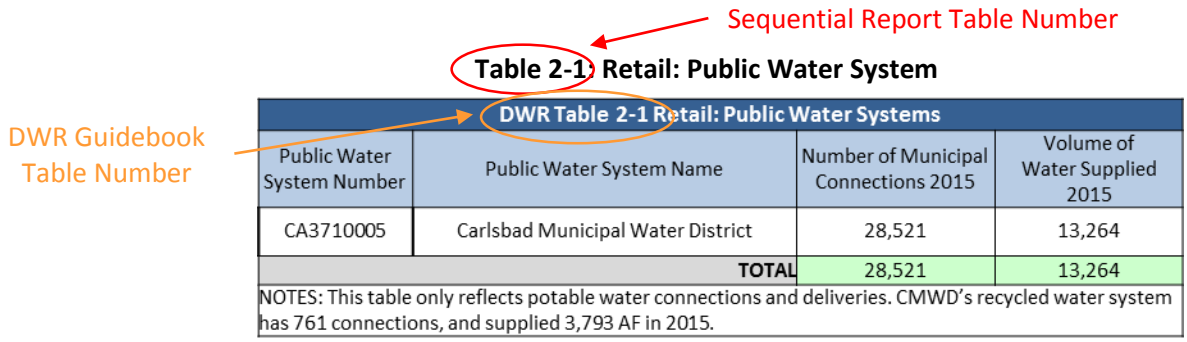


Table 2-1: Retail: Public Water System

DWR Table 2-1 Retail: Public Water Systems			
Public Water System Number	Public Water System Name	Number of Municipal Connections 2015	Volume of Water Supplied 2015
CA3710005	Carlsbad Municipal Water District	28,521	13,264
	TOTAL	28,521	13,264
NOTES: This table only reflects potable water connections and deliveries. CMWD's recycled water system has 761 connections, and supplied 3,793 AF in 2015.			

Section 3

System Description

This section describes CMWD's service area and water system, including climate and water supply infrastructure.

3.1 Description of Service Area

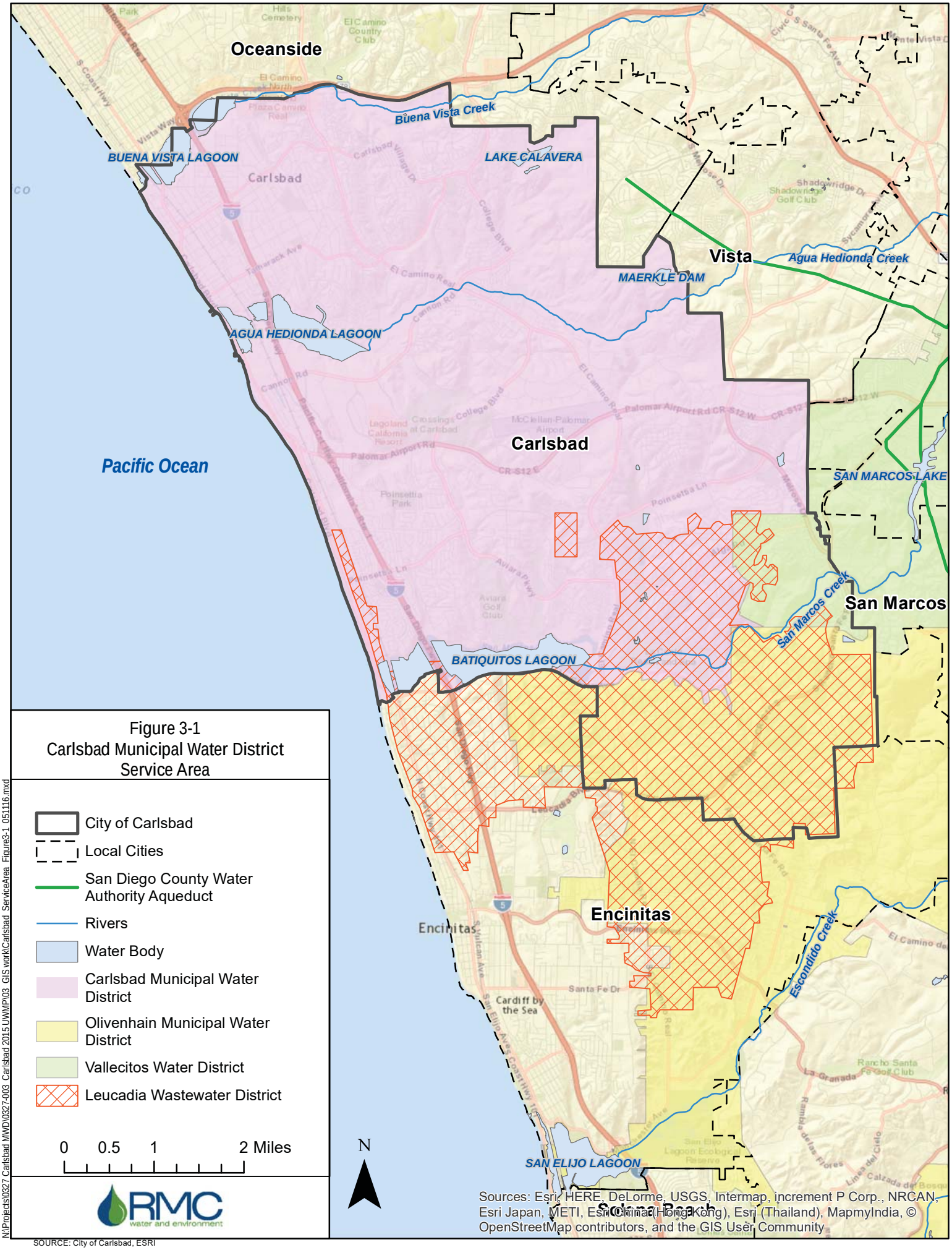
CMWD covers an area of 20,682 acres, approximately 32 square miles, and provides potable and recycled water supply to most of the City of Carlsbad (the City or Carlsbad). CMWD's boundary, which defines the Study Area for this 2015 UWMP, is shown on **Figure 3-1**.

CMWD supplies potable water within its service area and currently receives 100% of its potable water supply from SDCWA. The potable water distribution system consists of 450 miles of pipeline, 57 pressure regulating stations, five pump stations, ten storage tanks, and one reservoir. CMWD also has an extensive recycled water distribution system. CMWD supplies recycled water through two recycled water distribution systems, which include 77 miles of pipeline, five pressure zones, three storage tanks, three booster pumping stations, three supply sources with pumping stations, and three pressure regulating stations. Sanitary sewer collection service within the CMWD service area is provided by City of Carlsbad and LWWD. Wastewater treatment is provided by EWA through the Encina Water Pollution Control Facility (EWPCF), located in Carlsbad. Tertiary treatment and recycled water production is provided by CWMD's Carlsbad Water Recycling Facility (WRF).

Key water users within CMWD's service area are residential, which represented 61% of total demands in 2015 and commercial, which included 19% of total demands in 2015. Carlsbad's housing stock composition consists of mostly single-family homes, with some multi-family and mobile homes. Single-family residences generally contain larger landscaped areas, predominantly planted in turf, and require more water for outdoor application in comparison to other types of housing. The general characteristics of multi-family and mobile homes limit their outdoor landscaping and water use, although some condominium and apartment developments do contain green belt areas. Commercial users in CMWD's service area include offices and commercial centers, which have limited outdoor water use, but also include hotels, resorts, golf courses, and other tourism and recreational facilities. As described below, Carlsbad's visitor rates are often equal to or higher than its residential population in a given month. Additional information regarding these key users, along with other important water use sectors, is included in *Section 4 System Demands*.

3.1.1 Agency Organizational Structure

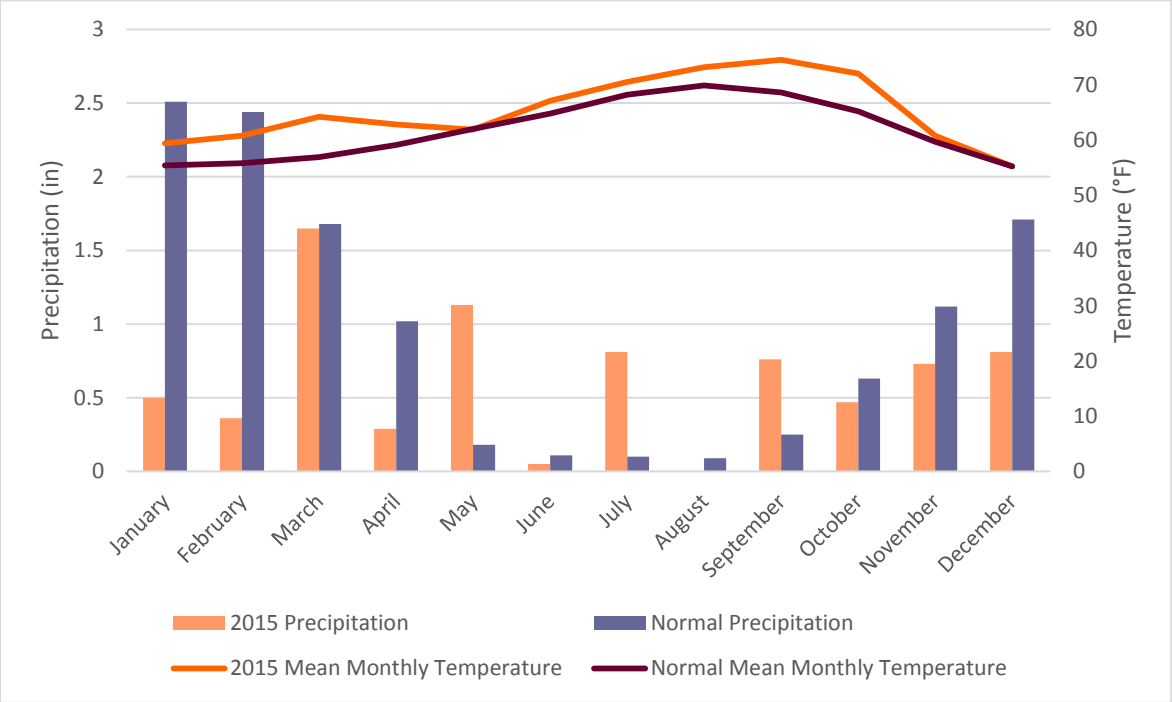
CMWD is a subsidiary district of the City of Carlsbad. The City was incorporated in 1952, and the assets of the two previous water suppliers for the Carlsbad area were purchased by the City in 1957. CMWD was initially formed in 1954 to facilitate the transfer of imported water to the unincorporated areas surrounding the City and to wholesale water to the newly formed City. In 1983, the City conveyed all of its functional water responsibilities for the provision of water service to CMWD. In 1990, CMWD became a subsidiary district to the City of Carlsbad. The five-member Carlsbad City Council governs CMWD and acts as CMWD's Board of Directors. CMWD's service area covers approximately 77.6% of the incorporated City. Additional history of water services within CMWD's service area is provided in *Section 3.2 Water System Background,* below.


Oceanside
Buena Vista Creek
BUENA VISTA LAGOON
LAKE CALAVERA
Carlsbad
Vista
Agua Hedionda Creek
MAERKLE DAM
AGUA HEDIONDA LAGOON
Pacific Ocean
Carlsbad
SAN MARCOS LAKE
San Marcos
San Marcos Creek
BATIQUITOS LAGOON
Encinitas
Encinitas
Escondido Creek
Cardiff by the Sea
SAN ELIJO LAGOON
Solana Beach
Figure 3-1
Carlsbad Municipal Water District
Service Area
City of Carlsbad
Local Cities
San Diego County Water Authority Aqueduct
Rivers
Water Body
Carlsbad Municipal Water District
Olivenhain Municipal Water District
Vallecitos Water District
Leucadia Wastewater District
0 0.5 1 2 Miles
N
RMC water and environment
Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
N:\Projects\0327 Carlsbad MWD\0327-003 Carlsbad 2015 UWMP\03 GIS work\Carlsbad ServiceArea Figure3-1 051116.mxd
SOURCE: City of Carlsbad, ESRI

3.1.2 Service Area Climate

Carlsbad's climate is characteristically Mediterranean with mild temperatures year round. This mild climate is derived equally from the warm ocean water being pulled north from Mexico and from its subtropical, semi-desert locale. The result is temperatures with an average high of 64 degrees in January and 75 degrees in August, with an average annual rainfall of about 11 inches. Data from the National Oceanic and Atmospheric Administration's (NOAA) climate station at the McClellan Palomar Airport shows that 2015 temperatures were above normal (calculated for the 30-year period 1981 to 2010), while precipitation was lower than normal. There was also a shift in the precipitation pattern in 2015 from normal, with higher rainfall in the summer months than normal, and lower rainfall in the winter months. **Figure 3-2** provides a comparison of 2015 precipitation and mean monthly temperatures with normal climate, as recorded at the McClellan Palomar Airport. A detailed discussion of potential climate change impacts to CMWD's service area is provided in *Section 3.1.6 Climate Change*, below.

Figure 3-2: Comparison of 2015 Climate to Normal for Carlsbad, California



Source: NOAA, 2016a and 2016b

3.1.3 Population and Demographics

To accurately project CMWD's future water demands and water use characteristics, future population and growth trends are essential. The population projections presented in **Table 3-1** were developed using San Diego Association of Government (SANDAG)'s Series 13 Growth Forecast for CMWD's service area. A secondary analysis was completed to confirm the SANDAG projection, using U.S. Census-based estimates for population in 2010. This analysis compared CMWD's estimated population in 2000 and 2010 with the Census population for the City of Carlsbad to verify the projections from SANDAG. In 2000, the City recorded a population of 78,247 people with the U.S. Census, while a Geographical Information System (GIS) analysis of population data by census block found CMWD's service area included 61,261 people (78% of the City's population). In 2010, the City

recorded 105,328 people, while CMWD's service area included 81,081 (77% of the City's population). CMWD has therefore assumed its population is approximately 77.6% of the City of Carlsbad, as the average of the two Census years evaluated.

Table 3-1: CMWD's Service Area Population – Current and Projected

DWR Table 3-1 Retail: Population - Current and Projected						
Population Served	2015	2020	2025	2030	2035	2040
	86,080	91,935	94,130	96,375	97,239	97,525
NOTES: Projections used 2010 Census data (77.6% of City of Carlsbad population), 2020-2040 projections from SANDAG Series 13 model for CMWD service area, and a straight line projection from 2010-2020 for year 2015.						

Water use in CMWD's service area is closely linked to the local economy, population, and weather. Over the last half century, a prosperous local economy has stimulated population growth, which in turn produced a relatively steady increase in water demand. However, fluctuating economic and weather conditions in the 1990s and lingering effects from the 1987-1992 drought resulted in deviations from historic demand patterns. By 1999, a new combination of natural population increases and job creation surfaced as the primary drivers of water consumption increases. The recession that started in 2008 brought an increase in unemployment and decrease in housing prices that has dampened population growth and water use. In addition, CMWD adopted a residential tiered water rate in July 2009 which further dampened demand by the residential population. Current demands are limited as a result of drought response measures and State-mandated water use cutbacks. As described in *Section 4 System Demands*, CMWD's service area is host to a substantial tourist and temporary population throughout the year, with overnight guests in the City of Carlsbad ranging between approximately 75,000 and 199,000 people per month. Water use is further described in *Section 4 System Demands* and *Section 5 Baselines and Targets*.

3.1.4 Existing and Future Development

The City's *2015 General Plan Update* identifies current land uses, including residential, commercial and industrial, public and quasi-public uses, parks and recreation, agriculture, open space or natural areas, and vacant land. The remaining land is right-of-way (City of Carlsbad, 2015a). Table 3-2 provides a summary of the land use classifications within the CMWD service area, as compared to the City of Carlsbad.

Table 3-2: Land Use Classifications within City of Carlsbad and CMWD

Land Use Classification	Percent of City of Carlsbad[1]	Percent of CMWD[2]
Residential	27%	24%
Commercial and Industrial	8%	14%
Public and Quasi-Public Uses	6%	1%
Parks and Open Space	33%	30%
Agriculture	4%	6%
Rights-of-Way	13%	14%
Vacant	9%	11%
1. City of Carlsbad, 2015a *2. CMWD, 2011*		

As of 2013, the City of Carlsbad had 44,440 housing units, or just over 81% of the maximum 54,599 housing units allowed in the City's *Growth Management Plan*. Between 2000 and 2010, the City grew by almost 30,000 people, or a rate of 2.5%, substantially higher than the 0.9% growth rate experienced by San Diego County as a whole. The City's *General Plan* estimates buildout at 51,821 housing units by 2035, or nearly 95% of the maximum allowed under the *Growth Management Plan*. The majority (80%) of this growth is projected to occur within the Northwest and Northeast quadrants of the City, both within CMWD's service area (City of Carlsbad, 2015a).

Existing land uses within the CMWD service area are primarily residential and parks and open space, with a mix of agricultural, light industrial, and commercial. Additionally, a county airport, tourist attractions such as Legoland, and a mix of resorts are located within CMWD's service area. Residential uses make up approximately 24% and parks and open space make up approximately 30%. Vacant land makes up approximately 11% of CMWD's service area (CMWD, 2011).

According to SANDAG's Series 13 Growth Forecast land use projections, an additional 1,038 acres are anticipated to be developed within CMWD's service area between 2015 and 2040. The bulk of this development will increase single-family, industrial, and commercial land; a decrease will occur in agricultural land. Although some land uses are anticipated to grow or decrease by a few hundred acres, most land use categories are anticipated to continue to represent a similar proportion of total developed area within CMWD's service area. For example, single-family residential land use is 35% of CMWD's developed area in 2015, and despite growing by over 700 acres between 2015 and 2040, will only represent 38% of CMWD's total developed area in 2040. Table 3-3 shows the projected land uses within CMWD's service area, as a percentage of total developed land.

Table 3-3: Projected Land Use within CMWD's Service Area as Percentage of Developed Area

Land Use	Year				
	2020	2025	2030	2035	2040
Agricultural	5%	4%	3%	2%	2%
Commercial	10%	10%	11%	11%	11%
Industrial	14%	13%	14%	14%	15%
Institutional	2%	2%	2%	2%	2%
Irrigation	27%	28%	26%	26%	26%
Residential	7%	7%	7%	7%	7%
Multi-Family	*5%*	*4%*	*3%*	*2%*	*2%*
Single-Family	*35%*	*36%*	*37%*	*37%*	*37%*
Source: SANDAG, Series 13 Growth Forecast Land Use Data, CMWD Service Area					

CMWD is anticipating a 12% increase in residential units and approximately a 55% increase in non-residential square footage. As of February 2010, CMWD contains nearly 36,000 residential units and just over 16 million square feet of non-residential building area (CMWD, 2011). Projected total buildout for CMWD's service area includes 40,068 residential units and approximately 25 million square feet of non-residential building space (CMWD, 2011).

Planned development within the City of Carlsbad is anticipated to include a mix of residential and mixed-use developments. These planned developments are expected to occupy the majority of the remaining vacant land in CMWD's service area (CMWD, 2011).

3.1.5 Overview of Significant Water Uses

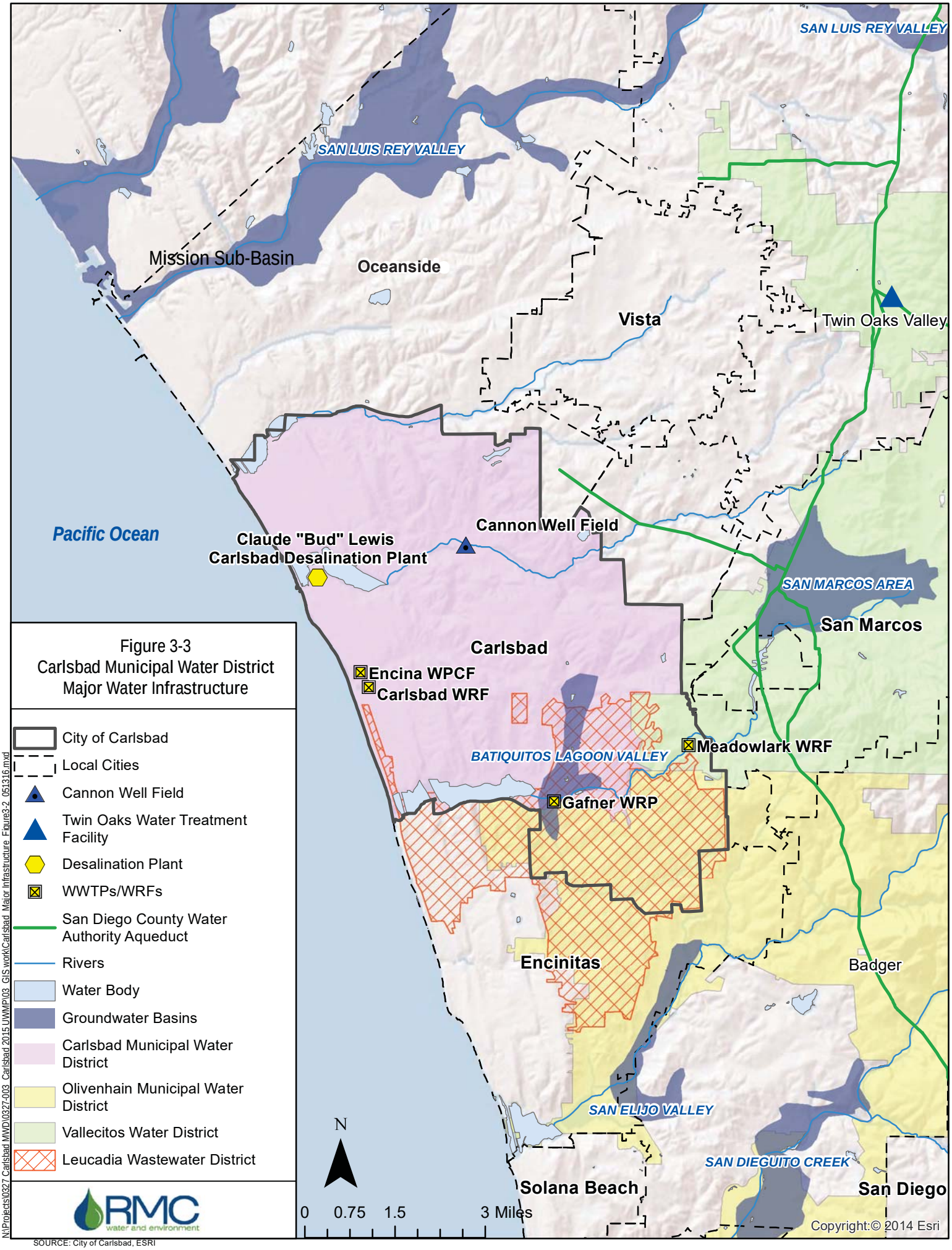
The primary water uses in CMWD's service area are residential, commercial and industrial, agricultural, and irrigation. Residential water use represents the largest water use sector for CMWD. Residential water uses include both indoor and outdoor uses for single-family and multi-family categories. Commercial water uses generally consist of incidental uses necessary for business operation. Major commercial water uses include restaurants, car washes, laundries, hotels, as well as institutional uses including schools and churches. Industrial water uses consist of product processing, equipment cooling, sanitation and air conditioning. Agricultural water uses are relatively minor, and primarily consist of commercial strawberry and flower fields, and wholesale nursery operations. Irrigation water uses fluctuate by season and primarily include the irrigation of medians, slopes and parkways. Detailed information of CMWD's water use sectors can be found in *Section 4.1.1 Water Uses by Sector*.

3.2 Description of Water System

CMWD currently receives 100% of its potable water supply from SDCWA through four treated water turnouts. Two of the turnouts, Connections No. 1 and No. 2, are direct connections to SDCWA's Second Aqueduct. Connection No. 1 supplies only CMWD, and Connection No. 2 supplies CMWD, VWD, and OMWD. Water supply to CMWD from Connection No. 2 is delivered through a VWD transmission main. Connections No. 3 and No. 4 are on SDCWA's Tri-Agency Pipeline (TAP), which is also supplied from the Second Aqueduct. The TAP also serves the City of Oceanside and VID. Major water infrastructure facilities are shown in **Figure 3-3**.

Potable water is delivered within the CMWD service area through 450 miles of pipeline, 17 pressure zones, 57 pressure regulating stations, five pump stations, ten storage tanks, and one reservoir. The CMWD water distribution system is flexible in that supply from the four aqueduct connections can be routed to different parts of the distribution system, as needed. The total operational storage for CMWD is 245.5 million gallons (MG), which includes the 195 MG Maerkle Dam Reservoir.

CMWD also has an extensive recycled water distribution system, shown in **Figure 6-1** in *Section 6 System Supplies*. CMWD supplies recycled water through two recycled water distribution systems, which include 77 miles of pipeline, five pressure zones, three storage tanks, three booster pumping stations, three supply sources with pumping stations, and three pressure regulating stations. CMWD supplies a majority of recycled water from the Carlsbad WRF, owned by CMWD and operated by EWA. Recycled water is also served to a portion of the La Costa Resort and Spa through a second recycled water system supplied by LWWD's Gafner WRF. Finally, a portion of the eastern service area is served by the third system supplied by VWD's Meadowlark WRF. CMWD is currently in the process of expanding their recycled water system with the Phase III Recycled Water Project, which will construct an additional 18 miles of recycled water pipeline, install 156 metered service connections, expand the capacity of the Carlsbad WRF from 4.0 mgd to 8.0 mgd, and construct a 1.5 MG storage reservoir (CMWD, 2012).


SAN LUIS REY VALLEY
SAN LUIS REY VALLEY
Mission Sub-Basin
Oceanside
Vista
Twin Oaks Valley
Pacific Ocean
Claude "Bud" Lewis
Carlsbad Desalination Plant
Cannon Well Field
SAN MARCOS AREA
San Marcos
Carlsbad
Encina WPCF
Carlsbad WRF
Meadowlark WRF
BATIQUITOS LAGOON VALLEY
Gafner WRP
Encinitas
Badger
SAN ELIJO VALLEY
SAN DIEGUITO CREEK
Solana Beach
San Diego
Figure 3-3
Carlsbad Municipal Water District
Major Water Infrastructure
City of Carlsbad
Local Cities
Cannon Well Field
Twin Oaks Water Treatment Facility
Desalination Plant
WWTPs/WRFs
San Diego County Water Authority Aqueduct
Rivers
Water Body
Groundwater Basins
Carlsbad Municipal Water District
Olivenhain Municipal Water District
Vallecitos Water District
Leucadia Wastewater District
N
0 0.75 1.5 3 Miles
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SOURCE: City of Carlsbad, ESRI

3.3 Water System Background

Water demands for the area were initially supplied by the privately held Carlsbad Mutual Water Company and Terramar Water Company through the utilization of local groundwater and surface water supplies. The Carlsbad Mutual Water Company constructed nine wells in the Mission Basin of the San Luis Rey River, booster pumping stations, storage tanks, an earthen dam (Lake Calavera), and transmission facilities to supply residential, commercial and agricultural users. The Terramar Water Company constructed four wells located in Agua Hedionda Creek (referred to as the Cannon Well Field), a second connection to the Carlsbad Mutual Water Company's pipeline from Lake Calavera at El Camino Real, a reservoir, plus a distribution system to supply residential, commercial, and agricultural users.

The Carlsbad Mutual Water Company's groundwater wells began being developed prior to 1914 with rights to 2,382 AFY. In addition, a license was obtained (terminable by the State Division of Water Rights, Department of Water Resources [DWR]) for another 1,000 AFY. A total of 9 wells were eventually constructed in the Mission Basin of the San Luis Rey River located in the City of Oceanside generally near the intersection of Mission Avenue and Fousat Road. Prior to 1942, local groundwater was the only developed source of water for the Carlsbad Mutual Water Company.

In September 1941, Carlsbad Mutual Water Company completed construction of an earthen dam (Calavera Dam), which captured local surface water runoff creating Lake Calavera. Lake Calavera also included a 2 million gallons per day (mgd) water filtration plant. A permit to divert 150 AFY from Calavera Creek was obtained.

The Cannon Well Field's four wells were constructed beginning in 1950, and are approximately located at the Rancho Carlsbad Golf Course property. The groundwater pumped from these wells was the original supply for the Terramar Water Company, and had a safe yield capacity estimated at 400 AFY. This groundwater was obtained from the Carlsbad hydrologic unit of the San Diego Region, a designation assigned by DWR. The four wells remain, but are in a state of disrepair and will need to eventually be removed and new replacement wells constructed.

The City of Carlsbad was incorporated in 1952, and the assets of the Carlsbad Mutual Water Company and Terramar Water Company were purchased by the City of Carlsbad in an agreement dated August 30, 1957. The City operated and maintained both water systems from 1958 to 1962.

CMWD was formed in 1954 as a vehicle to bring imported water to the unincorporated areas surrounding the City of Carlsbad and to wholesale water to the newly formed City of Carlsbad. CMWD's first meeting was held on March 22, 1954, and CMWD became a member of SDCWA

CMWD's 8.5 MG D3 Reservoir

that same year. CMWD began receiving imported water deliveries in 1955 through existing aqueduct connections located in the City of Escondido. CMWD constructed a pipeline in 1956 to convey imported water directly to the City of Carlsbad and unincorporated areas within CMWD's service area. In 1962, CMWD constructed Maerkle Dam (previously called Squires Dam) with a capacity of 600 AF in the Agua Hedionda Basin. CMWD also obtained a permit for surface water rights tributary to Maerkle Dam in the amount of 25 AFY.

As demands for water increased, seawater intrusion into the groundwater supply resulted in the gradual degradation of groundwater quality in the Mission Basin of San Luis Rey River. The total dissolved solids (TDS) content of the groundwater in the Mission Basin increased to the point where treatment would be required. At the same time, lower-cost imported water became available through CMWD. As a result of the availability of this alternative supply of water, the City of Carlsbad ceased extracting groundwater and suspended use of local surface water supplies by the end of 1962. As a result, the water filtration plant at Lake Calavera was dismantled because of regulations requiring that surface waters be fully treated prior to introduction into a potable water system. The cost to construct facilities to treat the small amount of infrequently occurring surface water was determined to be much greater than the comparable cost of imported water. The Mission Basin wells were beyond repair and subsequently removed by 2005, in accordance with California Department of Public Health requirements.

In an agreement dated May 25, 1983, the City of Carlsbad conveyed all of its functional water responsibilities for the provision of water service to CMWD, including all the water facilities and groundwater and surface water rights purchased from Carlsbad Mutual Water Company and Terramar Water Company in 1957. This included all existing water facilities and responsibility for planning, financing, and construction of all major capital facilities necessary to provide potable water service within CMWD and portions of the City of Carlsbad not located in other retail water service agencies.

On January 1, 1990, CMWD became a subsidiary district of the City of Carlsbad through an agreement between both agencies approved by the City Council on April 25, 1989. From 1979 until joining with the City as a subsidiary district, CMWD was known as the Costa Real MWD. The Carlsbad City Council acting as CMWD's Board of Directors governs CMWD. CMWD's current water supplies consist of treated water purchased from SDCWA and recycled water. In April 2016, CMWD's Board approved a purchase agreement to receive desalinated seawater directly from SDCWA, along with the purchased water blend provided to all member agencies. SDCWA's supply mix includes desalinated seawater, imported water purchased from MWD (treated at MWD's Skinner Filtration Plant in Riverside County), and through purchase agreements and exchanges with other agencies. SDCWA supplies delivered to CWMD are also treated at SDCWA's Twin Oaks Water Treatment Plant in San Marcos, and conveyed to CMWD through SDCWA aqueducts.

3.4 Climate Change

3.4.1 Climate Action Plan and Energy Intensity of Water System

The City of Carlsbad has developed a *Climate Action Plan* (City of Carlsbad, 2015b) that in part identifies actions to reduce its GHG emissions. Government operations, including CMWD's operations, produce only 1.2% of the City's GHG emissions. CMWD's operation and maintenance activities were estimated to use 189,440 kWh electricity and 86 terms of natural gas in 2011, or 2% and less than 0.01% of the government operations energy demands, respectively, for buildings. Water and wastewater transport (conveyance and distribution system) used over 2.3 million kWh in 2011, or 10% of the entire government operations emissions (0.12% of citywide emissions). The *Climate Action Plan* identifies a number of actions to reduce GHG emissions, including those presented in Table 3-4, which

are GHG reduction actions associated with water and wastewater facilities and operations. A detailed discussion of energy intensity of CMWD's 2015 supplies is provided in *Section 6 System Supplies*.

Table 3-4: Water- and Wastewater-Related GHG Emissions Reduction Measures Included in 2015 Climate Action Plan

Goal	Action
Reduce intensity of GHG emissions from water utilities (including water supply, wastewater, and recycled water) conveyance, treatment, and distribution by 8 percent by 2035	Improve water utilities (including water supply, wastewater, and recycled water) conveyance, treatment and distribution, and other system improvements (e.g., replace sewer lift stations with gravity pipelines; increase utilization of methane capture and cogeneration; expand recycled water distribution system)
Encourage installation of greywater and rainwater collection systems with a goal of 15 percent of homes by 2035	Host workshops on greywater and rainwater collection systems through CMWD, or partner with existing workshop providers, or homeowners interested in installing systems suitable for their property
	Created a design reference manual, or provide links to an existing one, for the design of greywater and rainwater collection systems
	Evaluate the feasibility of offering a rebate for residential greywater systems that require a permit to cover the cost of obtaining a permit
Source: City of Carlsbad, 2015b.	

3.4.2 Climate Change Vulnerability Analysis

As an agency with limited local water supplies and located in a coastal area that could be subject to impacts from sea level rise, climate change is of concern to CMWD. CMWD is an active participant in the San Diego Integrated Regional Water Management (IRWM) Program, having been a member of the Regional Advisory Committee (RAC) since 2013. In 2013, the IRWM Program completed an update of the *San Diego IRWM Plan* (RWMG, 2013), which collated regional water management information and identified water management priorities for the region. Through this effort, a Climate Change Vulnerability Analysis was completed and included in the *San Diego IRWM Plan* (refer to Section 7 and Appendix 7-D of the *San Diego IRWM Plan*). While this analysis evaluated climate change vulnerabilities and identified priorities and actions for the region as a whole, it generally corresponds closely with CMWD's individual vulnerabilities, priorities, and potential actions.

The San Diego region anticipates experiencing temperature increases, sea level rise, and changes to precipitation patterns. Table 3-5 presents the potential climate change impacts to the San Diego region, as presented in the *San Diego IRWM Plan* Climate Change Vulnerability Analysis. Regional climate change vulnerabilities that are applicable to CMWD and its service area are presented in Table 3-6, and include decreased imported supplies, sensitivity due to higher drought potential, damage to coastal areas and inundation of storm drains and sewer systems from sea level rise, and decreases in available habitat for native species.

Table 3-5: Potential Impacts of Climate Change on the San Diego Region

Impact	Effect[1]
Temperature	1.5°F to 4.5°F average temperature increase
Rainfall	Variable projections predict between 35% drier and 17% wetter Increase in variability between years
Supply	Up to 25% decrease in State Water Project (SWP) supply Up to 20% decrease in Colorado River supply 164,000 acre-feet per year shortfall in imported supply
Demand	Potential 0.6% to 1.8% increase in demand by 2035
Sea level rise	12 to 18 inch rise in mean sea level rise
Wildfires	40% increase in California Coastal Shrub acreage burned in Southwestern U.S. 54% increase in overall acreage burned in Western U.S.

[1] Effects are described to the year 2050, unless otherwise noted
Source: RWMG, 2015.

Table 3-6: Prioritized Climate Change Vulnerability Issues for CMWD's Service Area

Priority Level	Category and Vulnerability Issue
Very High	Water Supply: Decrease in imported supply
High	Water Supply: Sensitivity due to higher drought potential Water Quality: Increased constituent concentrations Flooding: Increases in flash flooding and inundation (extreme weather) Ecosystem/Habitat: Decrease in available necessary habitat Sea Level Rise: Inundation of storm drains and sewer systems Ecosystem/Habitat: Decrease in ecosystem services
Medium	Water Demand: Industrial demand would increase Water Quality: Increase in treatment cost Sea Level Rise: Damage to coastal recreation / tourism due to inundation Sea Level Rise: Decrease in land Sea Level Rise: Damage to ecosystem/habitat
Low	Water Demand: Crop demand would increase Water Demand: Limited ability to conserve further Water Quality: Increased eutrophication Flooding: Increases in inland flooding Ecosystem/Habitat: Increased impacts to coastal species
Very Low	Water Demand: Limited ability to meet summer demand Water Supply: Invasive species can reduce supply available Water Quality: Decrease in recreational opportunity Ecosystem/habitat: Decrease in environmental flows

Source: Adapted from RWMG, 2015.

Following identification and prioritization of regional climate change vulnerabilities, the *San Diego IRWM Plan* Climate Change Vulnerability Analysis identified and prioritized strategies to mitigate and adapt to the identified vulnerabilities. These strategies were grouped into Tier 1, 2, and 3, which represent actions that are recommended to implement first, second, and third, based on ease, effectiveness, and contribution to reducing greenhouse gas (GHG) emissions. **Table 3-7** presents the Tier 1 strategies that are applicable to CMWD. A complete list of strategies is provided in **Appendix E**, along with the vulnerability indicator question assessment completed for the Climate Change Vulnerability Analysis.

Table 3-7: Tier 1 Climate Change Management Strategies Relevant to CMWD and its Service Area

Strategy	Description
Reduce Water Demand	
Urban water use efficiency	Technological and behavioral improvements that decrease indoor and outdoor residential, commercial, industrial and institutional water use.
Education	Implement outreach program to educate urban and agricultural water users in water demand reduction practices.
Gray water use	Implement gray water use systems to reduce water supply demand.
Rainfed agriculture	Transfer crop consumptive use to be supplied directly by rainfall.
Improve Operational Efficiency/Transfers	
Conveyance - Regional/local	Improvements to regional and local conveyance facilities that improve conveyance capacity.
System Reoperation	Change existing operation and management procedures for existing reservoirs and conveyance facilities to increase water related benefits from these facilities.
Increase Water Supply	
Recycled Municipal Water	Increase supply of recycled water through additional wastewater treatment, and/or expand conveyance of recycled water to end users.
Improve Water Quality	
Pollution Prevention	Prevent pollution of local surface waters and groundwater using tools that prevent point and non-point sources of pollution.
Salt and Salinity Management	Manage salt and salinity in surface and/or groundwater. Examples of methods include dilution and displacement, desalination, and salt collection and storage.
Urban Runoff Management	Prevent pollution of local surface waters by implementing best management practices (BMPs) designed to reduce the pollutant loading and reduce the volumes and velocities of urban runoff discharged to surface waters.
Improve Flood Management	
Flood Risk Management	Enhance flood protection through projects and programs that assist in the management of flood flows and to prepare for, respond to, and recover from a flood.

Strategy	Description
Practice Resource Stewardship	
Agricultural Lands Stewardship	Conserve natural resources and protect the environment by conserving and improving land for food, fiber and biofuels production, watershed functions, soil, air, energy, plant and other conservation purposes.
Economic Incentives (Loans, Grants, Water Pricing)	Provide incentives such as financial assistance, water pricing, and water market policies intended to influence water management.
Ecosystem Restoration	Improve the condition of modified natural landscapes and biological communities to provide for their sustainability and for their use and enjoyment by current and future generations.
Land Use Planning and Management	Integrate land use and water management for the planning of housing and economic development needs of a growing population while providing for the efficient use of water, water quality, energy and other resources.
Water-dependent recreation protection	Incorporate planning for water-dependent recreation activities in water project, and implement project that protect/create water-dependent recreation opportunities.
Watershed/Soils/Forest management	Create and implement plans, programs, projects and activities to restore, sustain, and enhance watershed functions, soil functions, and forests.
Water-dependent cultural resources and practices preservation	Create and implement plans, programs, projects and activities to preserve water-dependent cultural resources and practices.
Increase urban forest management	Encourage the planting of trees in urban areas to improve urban water quality and local supplies.
Sea Level Rise	
Building water facilities in coordination with land use/sea level rise planning	Integrate water/wastewater resources planning with land use/sea level rise planning.

Source: Adapted from RWMG, 2015.

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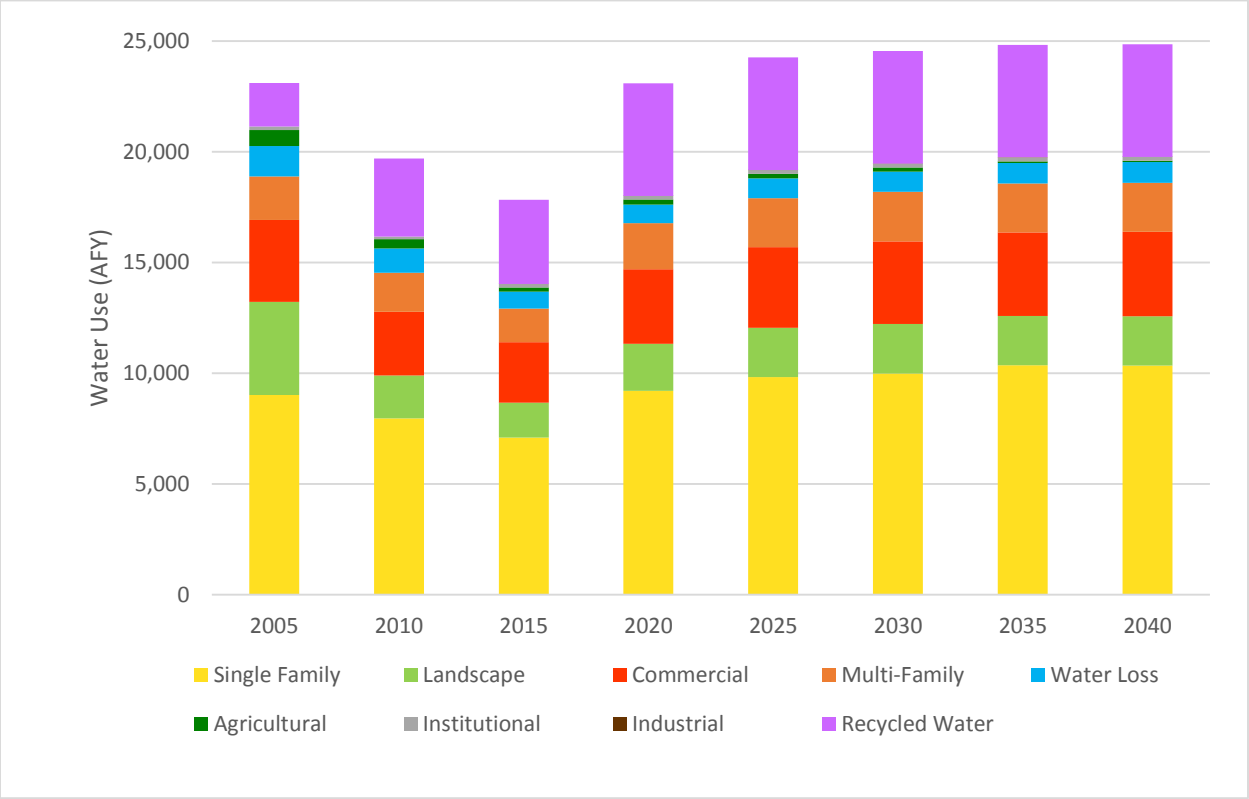
Section 4

System Water Use

This section addresses current and projected system water use for CMWD's service area. System water use consists of water used by CMWD, water sold to others, and additional water uses and losses. **Tables 4-1** and **4-5** present the current (2015) and projected (through 2040) potable water sales, respectively, including demands from low-income households. CMWD's demand projections presented in this section meet CMWD's gallons per capita per day (gpcd) demand targets that are described in *Section 5 Baselines and Targets*. **Figure 4-1** shows historical, current, and projected water use within CMWD's service area by use type. Note that non-potable recycled water use is included.

Figure 4-1: Historical, Current, and Projected Water Use



4.1 Existing Water Use and Demands

Existing water use and demands are based on metering data for calendar year 2015. Water use consists of water used by CMWD, water sold to others, and additional water uses and losses. **Table 4-1** presents the current potable water sales by customer sector for 2015. In addition to potable water, CMWD also provides recycled water to some of its customers. Current and projected recycled water demands are summarized in **Table 4-3**, with a detailed discussion of CMWD's recycled water supplies and demands in *Section 6 System Supplies*.

Table 4-1: 2015 Demands for Potable and Raw Water

DWR Table 4-1 Retail: Demands for Potable and Raw Water - Actual		
Use Type	2015 Actual	
	Level of Treatment When Delivered	Volume (AFY)
Single Family	Drinking Water	7,088
Multi-Family	Drinking Water	1,526
Commercial	Drinking Water	2,721
Industrial	Drinking Water	6
Institutional	Drinking Water	159
Agricultural	Drinking Water	181
Landscape	Drinking Water	1,583
Water Losses	Drinking Water	765
	TOTAL	**14,029**

NOTES: CMWD does not serve raw water to customers; all non-recycled water is potable. Actual potable water demands are based on CMWD's 2015 billing data and the AWWA water loss audit (refer to **Appendix F** for the complete audit). The AWWA water loss audit was completed for FY2015 as the most recent water loss data available, while billing data are reported in calendar year. CMWD's temporary potable meters billing category was incorporated into the Single Family use type, while the fire protection billing category was incorporated into the Institutional/Governmental use type for consistency with demand projection categories for 2020 through 2040.

4.1.1 Water Use by Sector

CMWD's potable water system serves water to four major sectors: 1) Residential (single-family and multi-family); 2) Commercial/Industrial/Institutional (CII) (reported as three separate sectors); 3) Agricultural; and 4) Landscape. A brief description of each sector and factors affecting their water use is provided here. In addition to the four major sectors, tourism and temporary residents create a substantial demand for water within CMWD's service area. These temporary population increases affect demands, but their impacts are not always captured to their true extent in reported metrics. A brief narrative of the tourism sector in CMWD's service area is provided below. Table 4-1 presents current potable water demands of these sectors in 2015.

Residential

Residential water use represents the largest water use category for CMWD and includes both single-family and multi-family customers. Residential water consumption comprises both indoor and outdoor uses. Residential indoor water use includes sanitation, bathing, laundering, cooking, and drinking. The majority of outdoor residential water use satisfies landscaping irrigation needs. Other minor outdoor residential water uses include car washing, surface cleaning, and similar activities. Total residential water use is anticipated to increase over time as CMWD's service area reaches residential buildout, though an increased culture of conservation and water use restrictions are likely to result in a lower per-capita increase in demands compared to historical growth. Residential land use currently occupies almost 5,200 acres, and is anticipated to continue to expand to approximately 5,970 acres by 2040.

Commercial/Industrial/Institutional

Commercial water use generally consists of incidental uses necessary for the operation of a business or institution, such as drinking, sanitation, and landscape irrigation. Major commercial water users include service industries such a restaurants, car washes, laundries and hotels. Statistics indicate that almost 60% of Carlsbad's employment base is in the commercial sector. This sector is anticipated to grow substantially in the near future, as infill development in the Carlsbad Village is implemented, and additional hotel properties developed to support the City's growing tourism economy. Commercial land use is anticipated to grow from 1,214 acres in 2015 to 1,470 acres in 2040.

Industrial water use consists of a wide range of uses, including product processing and small-scale equipment cooling, sanitation and air conditioning. Water-intensive industrial uses in Carlsbad, such as electronics manufacturing and biotech research, typically require smaller amounts of water when compared to other water-intensive industries found elsewhere in Southern California, such as petroleum refineries, chemical processors, and canneries. Industrial land use is anticipated to expand by over 350 acres in the next 25 years, from 1,599 acres today to 1,951 acres in 2040.

Institutional water use consists primarily of schools and churches within the service area. Water use characteristics tend to be similar to commercial uses, but based on average daily attendance. Outdoor use also tends to be somewhat higher for landscaped areas and ball fields. However, many of these areas tend to be metered separately and categorized as irrigation. Institutional land uses are anticipated to grow 50 acres between 2015 and 2040, increasing from 229 acres to 279 acres.

Tourism and Temporary Residents

Included in CMWD's CII water uses are tourism-related water demands. Within the City, overnight visitors averaged over 162,402 people per month for 2014, with tourism rates estimated to exceed 2 million visitors for 2015 (Heagy, pers.comm. 2016a). With a permanent population estimated at approximately 111,000 in 2015, the City's population has more than doubled on a monthly basis when considering temporary residents. Visitors are drawn to Carlsbad for its proximity to attractions in San Diego County, Legoland, nearby state beaches, and other general lifestyle factors that make Southern California a tourist destination.

The tourism industry in Carlsbad affects water usage by not only the number of visitors, but also through the expansion of service industries and attractions, which tend to be larger outdoor water users. Tourism peaks during summer months, particularly July and August, but is high throughout the year. The peaking experienced in summer months affects seasonal demand and water system peaking. Population forecasts do not specifically account for tourism, but tourism is reflected in the economic forecasts and causes per capita use to increase. Tourism can also

Recycled water use at golf course in CMWD's service area

increase per capita demands because tourists are less likely to be as conscientious with their water use as locals. Tourists may not be familiar with water-wise practices (e.g., shorter showers, turning off faucets when brushing teeth) or are in "vacation mode" and not actively aware of their water use. They may also be engaging in inherently water-heavy tourism-based activities.

Agricultural

Agricultural water use has been decreasing in Carlsbad for the last two decades to the point that it currently represents a very small portion of CMWD's water demand. For example, in 1991 CMWD sold 1,744 AF to agriculture. By 2000, the agriculture consumption had declined to 1,204 AF, to 420 AF in 2010, and to 181 AF in 2015. By 2040, agricultural demands are projected to drop to only 69 AFY. The Agricultural sector experiences wide seasonal fluctuations due to weather conditions and timing of the growing seasons, and consists primarily of commercial strawberry and flower fields, and wholesale nursery operations. Agricultural land use is anticipated to continue to decrease from a current extent of 535 acres to an estimated 102 acres by 2040 (SANDAG, 2016).

Landscape

Landscape irrigation is the third largest water use in CMWD's service area, just behind commercial water use, and demands are strongly influenced by seasonal differences. Development within the City of Carlsbad over the last decade and a half has brought about the creation of a large amount of irrigated areas with various uses, including medians, slopes and parkways.

The City of Carlsbad adopted a *Landscape Manual* in November 1990 to assist development applicants and landscape architects in understanding the City's policies toward landscaping. Specifically, the manual requires that irrigation systems be designed to provide the optimum amount of water for plant growth without causing soil erosion or runoff. At the same time, it requires that landscape design will include water conservation and alternative (non-potable) water sources as primary criteria. This manual was updated in 2012 and incorporates Carlsbad Municipal Code Chapter 18.50 – Water Efficient Landscape Ordinance (WELO), among other changes. In May 2010, the City of Carlsbad adopted the WELO in accordance with the State's Water Conservation in Landscaping Act of 2006 (Assembly Bill 1881). This Act promotes consistency in landscape regulations among land use authorities throughout San Diego County. The regulations reflect improvements for landscape and irrigation design plans, irrigation technologies, and water management for achievable water savings. Total irrigated land use areas, including roadways and parks, are anticipated to remain relatively constant between 2015 and 2040, decreasing by only 8 acres, or approximately 0.2%.

Landscape irrigation is also a substantial recycled water user within CMWD's service area. Recycled water is regulated by CMWD's *Reclamation Rules and Regulations for Construction of Reclaimed Water Mains* (1993) and *Mandatory Use Ordinance* (Ordinance No. 43, 2005), the San Diego Regional Water Quality Control Board's reclamation permits and waste discharge requirements for CMWD's Carlsbad WRF (Order No. 2001-352, as amended by Order No. R9-2012-0027), LWWD's Gafner WRF (Order No. R9-2004-0223), and VWD's Meadowlark WRF (Order No. R9-2007-0018), and California's Title 22 regulations.

4.1.2 Additional Water Uses

Additional water uses include recycled water and other uses such as fire protection. Recycled water is used by irrigation customers to water golf courses, median strips and other landscaped areas. Overall, recycled water use represents 22% of total water use in CMWD's service area for 2015. Recycled water use tends to be lower in the winter months because of less irrigation demand for landscape, the primary use for recycled water. Recycled water use is projected to increase in the near future through

implementation of the Phase III Recycled Water Project and increased awareness of safe and appropriate use of recycled water. Recycled water use is addressed in greater detail in *Section 6 System Supplies*.

4.1.3 Distribution System Water Losses

System losses or unaccounted-for water use (UAW) is unmetered water use such as for water system flushing, sewer cleaning, system leaks, unauthorized connections, reservoir cleaning, and other municipal uses. Unaccounted-for water can also result from meter inaccuracies. As required by the 2015 Guidebook, CMWD completed a water loss audit using the American Water Works Association (AWWA) Water Audit methodology (see **Appendix F**). Apparent losses (unauthorized consumption and metering inaccuracies) were calculated as 233 AFY, while Real Losses were calculated at 532 AFY, for a total loss of 765 AFY. Unlike the rest of the data presented in this UWMP, the Water Loss Audit was completed for Fiscal Year 2014/15, while the rest of the UWMP reports data from calendar year 2015. 2015 water losses are therefore considered approximate. Calculated water losses for CMWD's water system are shown in **Table 4-2**. Based on FY2015 losses, CMWD anticipates that water losses represent 4.7% of total potable use, calculated as the volume of water loss (765 AF) divided by the total volume of water produced (16,241 AF). Projected water losses presented in **Table 4-6** are estimated using this proportion.

Table 4-2: 2015 Water Losses (AFY)

DWR Table 4-4 Retail: 12 Month Water Loss Audit Reporting	
Reporting Period Start Date	**Volume of Water Loss**
07/2014	765
NOTES: Water losses are reported in Fiscal Year, while the rest of the water use tables use 2015 Calendar Year data.	

4.1.4 Sales to Other Agencies

CMWD does not currently sell potable water to other agencies, nor does it anticipate doing so in the future. CMWD does not currently have its own local potable water supply, though it may utilize groundwater and may receive desalinated seawater directly from the Claude "Bud" Lewis Carlsbad Desalination Plant (Carlsbad Desalination Plant) in the future. CMWD sells a portion of the recycled water it produces at the Carlsbad WRF to customers of neighboring agencies to help meet their non-potable water demands, but does not sell recycled water directly to any other agency. In 2015, CMWD sold 42.4 AF of recycled water through nine meters (customers) located within the City, but within VWD's service area. As part of the NSDWRC, CMWD anticipates there may be potential future recycled water sales to additional customers of other agencies, generally building on recycled water system expansions designed to primarily serve CMWD's service area.

4.1.5 Estimating Water Savings from Codes, Ordinances, or Transportation and Land Use Plans

CMWD is actively encouraging customers to reduce potable water use through the increased use of recycled water, installation of water-wise landscaping, replacement of fixtures with water-saving and low-flow devices, and outreach and educational campaigns. *Section 9 Demand Management Measures* provides details on CMWD's efforts to encourage water conservation. CMWD's future water savings resulting from increased conversion from potable to recycled water through its Phase III Recycled Water Project's expansion of its recycled water system is included in future water use projections. Compliance with applicable regulations and codes requiring use of low-flow fixtures in new

construction will result in passive savings. Passive savings are reflected in CMWD's SBx7-7 target water use, and therefore incorporated into the demand projections presented in *Section 4.3 Projected Total Water Use and Demand Projection Provided to Wholesaler*.

Table 4-3: Inclusion of Future Water Savings and Lower Income Demands

DWR Table 4-5 Retail Only: Inclusion in Water Use Projections	
Are Future Water Savings Included in Projections?	Yes
If "Yes" to above, state the section or page number, in the cell to the right, where citations of the codes, ordinances, etc… utilized in demand projections are found.	Page 2-5
Are Lower Income Residential Demands Included In Projections?	Yes

On June 21, 2005, CMWD's Board of Directors adopted Ordinance No. 43. This ordinance, also referred to as CMWD's Mandatory Use Ordinance, requires customers to use recycled water "wherever it has determined that its use is economically justified, financially and technically feasible, and consistent with legal requirements, preservation of public health, safety and welfare, and the environment." As a result of this ordinance, new development is prepared to convert to recycled water for irrigation purposes once recycled water becomes accessible. CMWD has identified a large number of potential recycled water customers who are prepared to utilize recycled water, as appropriate, in accordance with Ordinance No. 43. CMWD's ability to meet these customers' recycled water demands now and in the future has been included in its recycled water use and recycled water supply projections. As recycled water use increases, CMWD's per capita potable water use will decrease, helping to achieve the SBx7-7 targets.

In addition to potable water use savings achieved through conversion to recycled water, CMWD anticipates water savings resulting from compliance with water efficiency regulations. A number of regulatory changes have been made in recent years to encourage or mandate the use of low-flow and efficient plumbing fixtures, along with improvements to building standards to encourage green building. These changes include, but are not limited to, AB 715 (efficient toilets and urinals) and SB 407 (retrofitting for efficient fixtures). Prior to 2010, CMWD's water use was generally above its SBx7-7 target, though CMWD has successfully taken measures to reduce per capita water use since the Water Conservation Act of 2009 was enacted. CMWD has met or exceeded its SBX7-7 targets every year since 2010. Conservation measures implemented by CMWD include installation of water efficient fixtures and turf replacement, as described in *Section 9 Demand Management Measures*. New development in CWMD's service area will be constructed compliant with all applicable codes, and mandatory retrofits will be implemented, as applicable. The reduced water use resulting from these codes and regulations have been incorporated into CMWD's demand projections because they are reflected in the decreased per capita demands of the SBx7-7 targets. Because much of the existing development in the City of Carlsbad is relatively new, many residences, commercial buildings, and other facilities already use lower flow devices, and there are limited opportunities or need to retrofit existing structures to further improve water use efficiency to increase passive savings for existing development. Recent reductions in water use and SBx7-7 compliance is discussed in greater detail in *Section 5 Baselines and Targets*.

4.1.6 Climate Change Effects on Demand

As discussed in *Section 3 System Description*, CMWD is vulnerable to the effects of climate change, in large part due to its reliance on imported water to meet potable demands. As a participant in the San Diego IRWM Program, CMWD contributed to the climate change vulnerability assessment prepared for the *2013 San Diego IRWM Plan* (SDRWMG, 2013), the results of which are summarized in *Section 3 System Description*. The complete assessment is included here as **Appendix E**.

Solar and wind power used at CMWD's off-grid Santa Fe II facility

Preliminary analysis indicates that regional water demands would show a slight increase of between 0.6% – 1.8% by 2035. These increases in demand are anticipated to be associated with increased temperatures, increased drought potential, and increased wildfire potential, coupled with increased variability in rainfall that may reduce the availability of local supplies and/or the ability for vegetation to access natural water supplies when they need them. Within the San Diego region as a whole, five water demand vulnerabilities were identified, four of which apply to CMWD's service area. These vulnerabilities include potential increases in industrial and crop demands, a limited ability to conserve further, and a limited ability to meet summer demand.

Table 3-6 in *Section 3 System Description* presents these vulnerabilities and their priorities for CMWD. None of the water demand vulnerabilities applicable to CMWD were classified as very high or high priority. CMWD has taken steps to address water demand vulnerabilities by increasing supply reliability and expanding use of local and recycled water supplies, as well as encouraging improved water use efficiencies (refer to *Section 6 System Supplies*, *Section 7 Water Supply Reliability Assessment*, and *Section 9 Demand Management Measures*). As described below, agricultural land use is anticipated to decrease, reducing the impact of increases in crop demand that may result from climate change. Increases in industrial demand are not anticipated to substantially affect CMWD demands because industrial use is currently low and projected to remain low. Further, the majority of the projected increase in industrial water demands will be met with recycled water. While there may be limitations to CWMD's ability to further conserve, CMWD is on track to meeting its SBx7-7 2020 target, achieved through a combination of conservation and increased recycled water use. CMWD's efforts to improve supply reliability will help them meet summer demands, and in a normal year, supply is anticipated to exceed demands, providing a buffer for unexpected increases in demand that may result from climate change.

4.2 Projected Water Demands

This section presents CMWD's projected potable water use, in five-year intervals, from 2020 through 2040. Projected water use consists of projected water used by CMWD, projected water sold to others, and additional projected water uses and losses. Table 4-4 shows projected potable and recycled water demands. CMWD's demand projections presented in this section meet CMWD's gpcd demand targets that are described in *Section 5 Baselines and Targets*.

SDCWA currently provides all of the potable water distributed by CMWD. The projected amount of water that CMWD expects to purchase from SDCWA to meet water demands in the future is considered in *Section 6 System Supplies*. CMWD's projections of future wholesale water that will be supplied by SDCWA do not entirely align with the projections developed by SDCWA in their 2015 UWMP, but are relatively similar. These differences are a result of different methodologies and assumptions used to develop the water demand projections.

Water use and production records, combined with population, employment, and urban development projections, provide the basis for estimating future water supply requirements. The population projections presented in *Section 3 System Description* already incorporate land use changes and other local economic and demographic factors, and provide an appropriate basis for demand projection calculations. SDCWA's demand forecast model was used to determine CMWD's baseline water demands and projected active and passive conservation. SDCWA's model incorporates land use and population projections generated by SANDAG for water agency service areas in San Diego County, and utilizes the Series 13 Growth Forecast model developed specifically for the San Diego region (including CMWD's service area). The Series 13 model incorporates land uses and historical growth to project population growth in the future. A description of the demand forecast methodology is provided in SDCWA's 2015 UWMP.

SDCWA's baseline demand projections for CMWD's service area includes both potable and recycled water. To determine projected potable water demands, CMWD took the baseline and removed projected active/passive conservation and projected recycled water use (see Table 4-4). Although CMWD's SBx7-7 target allows potable water use to be as high as 207 gpcd from 2020 into the future (refer to *Section 5 Baselines and Targets*), CMWD projects a lower per-capita water use as a result of the area's growing conservation ethic and the increased use of recycled water to offset potable demands.

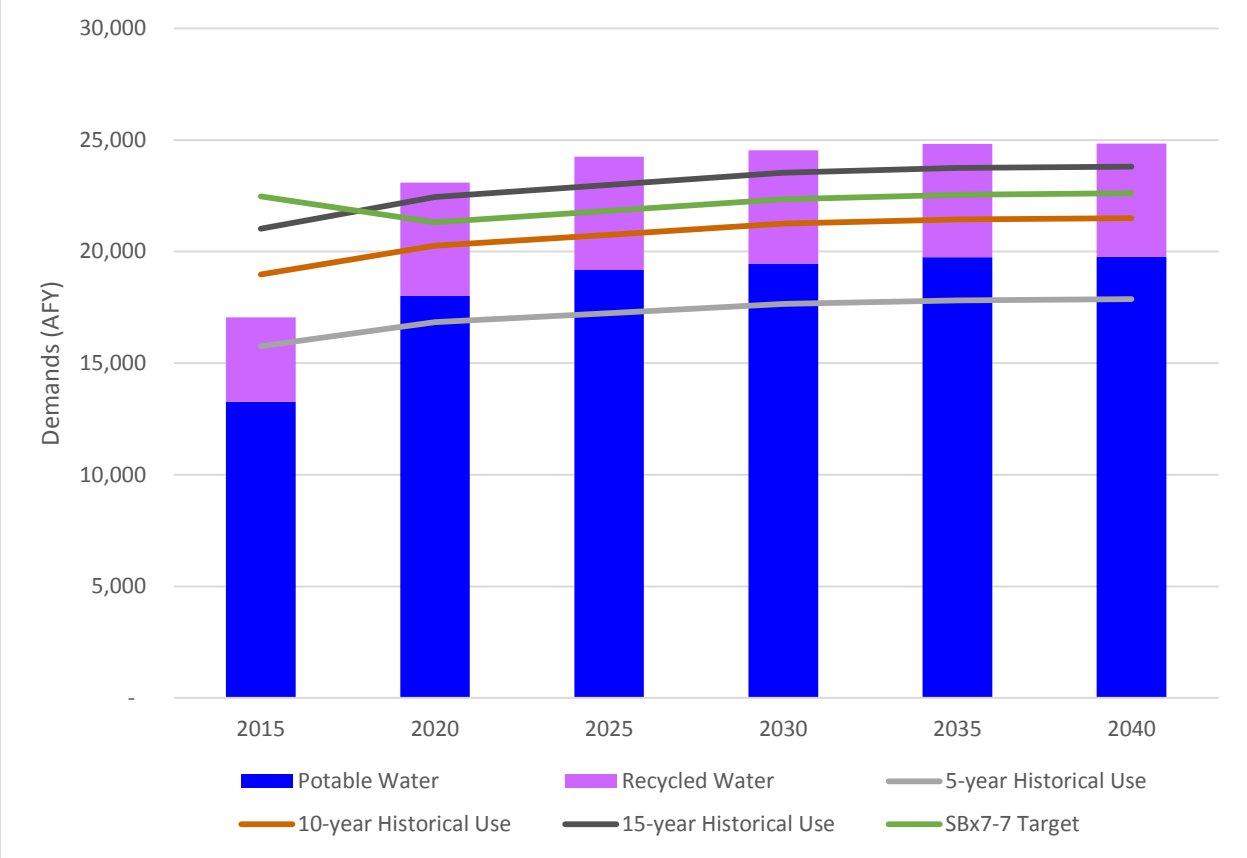
Figure 4-2 shows the share of total demands that will be met by potable supplies and those met by recycled supplies. In addition to the projected demands, CMWD applied four scenarios to its water projections for purposes of comparison. These scenarios used the five-year, ten-year, and fifteen-year historical average water use, as well as CMWD's SBx7-7 targets, and applied these to the projected populations. These scenarios are also presented in Figure 4-2. The fifteen-year and five-year scenarios were found to be unrealistic due to exceeding the maximum allowable water use or reflecting depressed demands from extraordinary conservation, respectively. Both the ten-year average scenario, which reflects some recent water savings as well as normal water years, and the SBx7-7 target scenario, which reflects CMWD's legal maximum potable water use, were considered reasonable water demands. CWMD has elected to use SDCWA's forecast for consistency with its wholesale water supplier and to allow for a consistent supply reliability analysis.

Table 4-4: Projected Demands for CMWD (AFY)

		2020	2025	2030	2035	2040
A	Baseline Water Use[1]	25,965	27,523	28,191	28,822	29,236
B	Active and Passive Conservation1	2,880	3,268	3,648	4,000	4,390
C	Projected Demands[2] (A-B)	23,085	24,255	24,543	24,822	24,846
D	Existing Recycled Water Use[3]	3,942	3,942	3,942	3,942	3,942
E	Increase in Recycled Water Use[4]	1,136	1,136	1,136	1,136	1,136
F	Total Recycled Water (D+E)	5,078	5,078	5,078	5,078	5,078
G	Total Potable Water[5] (C-F)	18,007	19,177	19,465	19,744	19,768

[1] Baseline water use and active/passive conservation calculated via SDCWA 2015 UWMP demand forecast.
[2] Projected demands include potable and recycled water demands.
[3] Recycled water was lower in 2015 than average; existing recycled water use projected forward is based on a five-year average.
[4] Increased demand from expansion of recycled water system, refer to *Section 6 System Supplies*. Increased recycled water use will offset projected potable demands.
[5] Total Potable Water is the Projected Demands less Recycled Water Demand.

Figure 4-2: Projected CMWD Demands



Once total demands were projected, sector-based demands could be estimated. To project water use, CMWD developed an analysis based on projected land use from SANDAG's Series 13 Growth Forecast. SANDAG land use data were available for 2012, 2015, and every 5 years to 2050. To allow for consistency between the water use and land use data, SANDAG land use categories were reconciled with CMWD's water use billing categories by consolidating categories as shown in **Table 4-5**.

Table 4-5: Reconciliation of CMWD Water Billing Categories and SANDAG Land Uses

Reconciled Categories	CMWD Water Billing Category[1]	SANDAG Land Use Type[2]
Agricultural	Agricultural	Agricultural
Commercial	Commercial	Commercial Mixed Use Office
Industrial	Industrial	Industrial
Institutional	Institutional Fire Protection	School Military
Irrigation	Irrigation	Roads Parks
Multi-Family	Multi-Family	Multi-Family Mobile Home Other[3]
Single Family	Single Family Temporary Potable Meters	Low Density Single Family Single Family

[1] Water Use Category based on CMWD billing categories
[2] Land Use Types grouped into water use categories based on information from SANDAG regarding land uses categorized under each type
[3] "Other" land use includes group housing

To project water use by category, a "water use unit factor" was calculated that estimated a volume of water used for each acre of land use type. For purposes of this analysis, 2012 water use data were used as representative of a normal water year, because it reflects CMWD's anticipated level of water use when mandatory water use restrictions are not in place. 2012 actual water use was calibrated to CMWD's total water use projection methodology by scaling up actual 2012 water use (which was equivalent to a gpcd of 173) proportionally by use type as follows:

% 2012 Actual Use x 2012 Water Use Calculated Using SBx7-7 Method = 2012 Water Use Proxy

For example, Agriculture used 368 AF water, or 2% of total potable water use for 2012. Using the SBx7-7 Demand Projection, the interim target of 233 gpcd, and the 2012 population of 82,748 people, total demand in 2012 would have been calculated as 21,597 AF. Agricultural demand was therefore calibrated as 2% of 21,597, or 398 AF, for the 2012 Proxy for agriculture.

For each use type, the 2012 Proxy water use was divided by the land use to get a water use unit factor in AF per acre (AF/AC). For Agriculture, this was 0.71 AF/AC. Projecting forward, this unit factor was applied to the projected acreage for each land use type. Recycled water was then added, and water losses accounted for. The FY2015 AWWA water audit completed for CMWD indicated 4.7% of water produced was lost, calculated as the volume of water loss (real + apparent losses) divided by the

volume of total water produced (water supplied). Limited discrepancies were reconciled proportionally across water use type. The estimated projected water use by sector for 2020 through 2040 is presented in Table 4-6.

Table 4-6: Projected Demands for Potable Water (AFY)

DWR Table 4-2 Retail: Demands for Potable and Raw Water - Projected					
Use Type	Projected Water Use				
	2020	2025	2030	2035	2040
Agricultural	226	205	190	70	69
Commercial	3,373	3,637	3,724	3,771	3,809
Industrial	7	7	7	7	7
Institutional	162	171	172	171	166
Landscape	2,122	2,235	2,249	2,232	2,227
Multi-Family	2,073	2,201	2,229	2,214	2,214
Single Family	9,198	9,820	9,979	10,351	10,346
Water Losses	846	901	915	928	929
TOTAL	**18,007**	**19,177**	**19,465**	**19,744**	**19,768**
NOTES: CMWD does not serve raw water to customers; all non-recycled water is potable. Institutional use includes public buildings, schools, and fire protection. Single Family includes single family, low density single family, and temporary potable meters. Water loss was calculated as 4.7% of potable water use (water loss divided by water production), based on FY2015 AWWA water audit for CMWD's potable system. Some differences may occur due to rounding.					

4.3 Projected Total Water Use and Demand Projection Provided to Wholesaler

Table 4-7 provides a summary of the total projected potable and recycled water use for CMWD, including retail water deliveries and additional water uses and losses for a normal or average year. SDCWA is projecting higher demands in dry years (SDCWA, 2016). CMWD's water demands would be higher in dry years similar in proportion to SDCWA projections. Estimated changes in demand resulting from single or multiple dry years are provided in *Section 7 Water Supply Reliability Assessment*.

Table 4-7: Current and Projected Total Water Demands (AFY)

DWR Table 4-3 Retail: Total Water Demands						
	2015	2020	2025	2030	2035	2040
Potable Water	14,029	18,007	19,177	19,465	19,744	19,768
Recycled Water	3,793	5,078	5,078	5,078	5,078	5,078
Total Water Demand	**17,822**	**23,085**	**24,255**	**24,543**	**24,822**	**24,846**
NOTES: Recycled Water Demands are discussed in *Section 6 System Supplies*						

SDCWA currently provides 100% of the potable water distributed by CMWD, and CMWD does not receive raw water from any of its supply sources. CMWD's Board approved an agreement for CMWD to purchase desalinated seawater from the Carlsbad Desalination Plant as part of its local supplies. These supplies are anticipated to begin deliveries in 2016. Therefore, CMWD's projected demands on

imported SDCWA potable water are equal to the total potable water demands presented in Table 4-6, less the 2,500 AFY desalinated seawater local supply.

4.4 Water Demands for Lower Income Households

CMWD does not keep direct records of which customers are low income households, but an estimate of low income water use and projected demands has been developed based on estimated household incomes for the City of Carlsbad. DWR has defined a low-income household as one with a median household income (MHI) of less than 80% of statewide MHI. According to 2009-2013 American Community Survey, low income households are those earning $48,875 or less per year.

The City of Carlsbad's General Plan does not include data on number of low income housing units currently present within the City. CMWD therefore used SANDAG projections of household incomes to estimate the number of Low Income households it serves. Using the Series 13 Growth Forecast, which was developed based on general plans and anticipated development for cities within San Diego County, SANDAG developed projections of household incomes in tiers of $15,000. This analysis assumes that any household earning less than $45,000 annually qualifies as low income now and into the future. Within the City of Carlsbad, this translates to 23% of households, or 9,777 households. Applying the proportion of the City of Carlsbad residing in CMWD's service area (77.6%) to this number results in an estimated 7,587 low income households in 2015. The proportion of households designated as low income with this analysis was then applied to projected residential demands to estimate low income water demands. This estimate assume that the ratio of low-income multi-family and single-family homes is consistent with the overall ratio of multi-family and single-family customers. Table 4-8 presents the projected low income water demands. The residential water demands presented in Table 4-1 and 4-6 include the water demands of low income housing as required by SB 1087.

Table 4-8: Projected Water Demands of Low-Income Households

Low Income Water Demands	2015	2020	2025	2030	2035	2040
Low Income Households	7,587	8,058	7,970	7,659	7,461	7,207
Low Income Single-Family Demands (AFY)	2,176	2,118	2,186	2,113	2,101	2,016
Low Income Multi-Family Demands (AFY)	468	477	490	472	449	431
Total (AFY)	**2,644**	**2,595**	**2,677**	**2,585**	**2,550**	**2,448**

Section 5

Baselines and Targets

The Water Conservation Act of 2009 (also known as Senate Bill x7-7 [SBx7-7]) was signed into law in November 2009 as part of a comprehensive water legislation package. SBx7-7 sets a goal of achieving a 20% reduction in urban per capita water use statewide by 2020. DWR developed technical methodologies to guide the consistent development by urban water suppliers of their baseline per capita water use and targets. These baselines and targets were first reported in the 2010 UWMPs.

5.1 Overview of Baselines and Targets Calculations

SBx7-7 requires urban water suppliers to establish per capita water use targets by using one of four methods:

- **Method 1:** A per capita water use by 2020 that is 80% of the urban retail water supplier's baseline per capita daily water use using a 10-year average ending no earlier than December 31, 2004, and no later than December 31, 2010. Since CMWD's recycled water comprised more than 10% of 2008 retail water delivery, a 10- to 15-year baseline period can be used that ends no earlier than December 31, 2004 and no later than December 31, 2010. As described below, a 10-year baseline period from 1999-2008 was selected, resulting in a baseline of 259 gallons per capita per day (gpcd). The resulting per capita demand target for 2020 is 207 gpcd, with an interim 2015 target of 233 gpcd.
- **Method 2:** The per capita daily water use estimated using the sum of several defined performance standards. This method requires quantifying the landscaped area and the baseline commercial, industrial, and institutional (CII) use. Method 2 was not calculated during development of this 2015 UWMP.
- **Method 3:** The 2020 water use target is calculated as 95% of the applicable state hydrologic region target, as set forth in the 2015 UWMP Guidebook (DWR, 2016). CMWD, located in DWR's South Coast Hydrologic Region Number 4, has a year 2020 target of 95% of 149 gpcd, which is 142 gpcd.
- **Method 4:** A provisional method that was developed by DWR where the target is based on indoor residential, CII, outdoor, and water loss components. Using the Provisional Method 4 Target Calculator provided by DWR with a CII water use in 1997 of 3,241 acre feet (AF), Method 4 establishes a target of 207 gpcd.

An urban water supplier must select one of the methods to set their per capita water use target. Water suppliers may choose to change the selected method until 2015. CMWD has selected Method 1 for establishing the 2020 per capita water use target of 207 gpcd.

In January 2014, the Governor of California declared a State of Emergency, directing state officials to take all necessary actions to prepare for drought conditions. This declaration requested that all Californians reduce water consumption and that local water suppliers implement local water shortage contingency plans. With the continuation of the drought, in April 2015, the Governor issued an executive order (Executive Order B-29-15) to impose mandatory water use restrictions, including an order for CMWD to reduce potable water use by 28%. On February 2, 2016, the emergency drought regulations were revised and extended through October 2016. These revisions adjusted agency reduction targets to reflect local supplies and conservation efforts. As a result, CMWD's mandatory reduction target dropped from 28% to 20%. Due to the current multi-year drought, CMWD is in a stage two "Drought

Alert," which implements mandatory water restrictions such as restricted irrigation watering days and times. This level of reduction has reduced CMWD's water use below its 2020 target.

Since 2007, CMWD's per capita water use has been experiencing a decline partially due to increased retail water cost, increased use of water conservation measures by customers responding to drought conditions, and poor economic conditions. CMWD's per capita water use in 2015 (149 gpcd) was already below the 2020 target. This 2015 water use may be temporary as a result of conservation efforts to meet State-mandated demand reductions in response to the current unprecedented drought. A partial rebound to prior per capita water use levels may occur once the drought is over, although water use has met or exceeded its SBX7-7 targets.

CMWD's approach to meeting the 2020 per capita water use target has several elements consisting of increased saturation into the customer base of low flow plumbing devices and fixtures, continued implementation of demand management measures, water use reductions that occur with the increased costs of water, and increased use of recycled water. Recycled water is excluded from gross water use in determining per capita water use according to the DWR guidance. CMWD's water conservation efforts are described in *Section 6 Demand Management Measures*.

5.2 Water Use and SBx7-7 Compliance

CMWD's gross water use is the total volume of potable water entering its distribution system. Only gross potable water use is used for SBx7-7 compliance. All required tables for calculating and demonstrating SBx7-7 compliance are provided in **Appendix G**.

As directed by DWR, the 2015 UWMP is an opportunity to revise the SBx7-7 baselines and targets, and allows agencies to use finalized 2010 U.S. Census data for its population estimates for baseline years. CMWD has updated its population estimates for 2000-2010, and subsequently revised its baseline water use and targets, as described below.

5.2.1 Baseline GPCD Water Use

Baseline gpcd water use was calculated using Method 1. This method requires calculating gpcd for each of the potential baseline periods, using updated U.S. Census population estimates for the years 2001-2010. Census data for 2000 and 2010 were overlaid with the CMWD service area, and an analysis was completed at the block-level to calculate the population served by CMWD in those years. For Census blocks that are partially within the CMWD service area, a proportion of the population equal to the proportion of the geographical area within the service area was used. The resulting population numbers were then compared to the U.S. Census population for the City of Carlsbad, and it was determined that on average, CMWD serves 77.6% of the total City's population. This proportion was then applied to California Department of Finance (DOF) population estimates for the City of Carlsbad to provide an estimate of CMWD population in non-Census years. Using the population analysis results and water use data, the annual gpcd was determined for each year between 1990 and 2010. **Table 5-1** presents the annual gpcd for each potential baseline year.

Table 5-1: Annual Potable Water Use for Potential Baseline Years

Year	Service Area Population	Gross Potable Water Use (AFY)	Daily Per Capita Water Use[1] (GPCD)
1990	50,764	17,919	315
1991	51,730	16,450	284
1992	52,715	13,753	233
1993	53,718	14,928	248
1994	54,741	14,963	244
1995	55,783	14,008	224
1996	56,845	15,140	238
1997	57,927	16,011	247
1998	59,030	15,449	234
1999	60,154	17,313	257
2000	61,261	19,952	291
2001	64,372	18,884	262
2002	68,007	20,586	270
2003	69,916	20,278	259
2004	71,459	21,222	265
2005	72,975	20,163	247
2006	75,672	21,206	250
2007	77,619	22,099	254
2008	79,400	21,187	238
2009	80,340	19,867	221
2010	81,081	17,142	189

5.2.2 Baseline Periods

The population projection described above was applied to CMWD's 1990-2010 gross potable water use to determine a revised baseline for CMWD's SBx7-7 compliance. No adjustments were made to the 1990-2010 water use data from the 2010 UWMP because they are actual gross potable water use for CMWD's system. The baseline period for CMWD was selected after consideration of all potential baselines periods. In accordance with the *2015 UWMP Guidebook*, agencies meeting at least 10% of total water deliveries with recycled water in 2008 can use a 10- to 15-year baseline. CMWD's recycled water deliveries in 2008 were 3,877 AF, or 15.9% of its total water deliveries of 24,460 AF. CMWD can therefore use a baseline consisting of a 10- to 15-year continuous period ending between December 31, 2004, and December 31, 2010. The potential baselines in Table 5-2 are presented by ending year. For a 10-year baseline ending in 2004, the starting year would be 1995; for the 15-year baseline ending in 2004, the starting year is 1990.

Table 5-2: Average GPCD for Potential Baseline Years, by Ending Year

Ending Year	Average GPCD for Baseline Years					
	10-years	11-years	12-years	13-years	14-years	15-years
2004	255	254	253	252	254	258
2005	257	254	253	253	251	253
2006	258	256	254	253	252	251
2007	259	258	256	254	253	253
2008	259[1]	257	256	255	253	252
2009	256	256	254	253	252	250
2010	245	250	250	249	249	248
[1] Selected Baseline GPCD						

CMWD selected 1999-2008 for its baseline period, which has an average per capita water use of 259 gpcd. As shown in **Table 5-1**, during this baseline period, gross potable water use ranged between 17,313 AF in 1999 to a high of 22,099 AF in 2007. The average gross potable water use during the baseline period was 20,289 AFY. Population grew from 60,154 people in 1999 to 79,400 people in 2008, a growth of over 19,000 people over ten years.

5.2.3 SBx7-7 Baseline and Targets

Using Method 1, which calculates the 2020 Target as 80% of the baseline per capita water use, CMWD's water use target for 2020 is 207 gpcd, or a reduction of 52 gpcd. The interim target for CMWD water use, to be achieved by 2015, was calculated as the midpoint between the selected baseline and the 2020 target water use (233 gpcd).

A 5-year baseline from 2003 to 2007 had an average water use of 255 gpcd, and was used to confirm the 2020 target was reasonable. **Table 5-3** provides a summary of the baseline and targets for CMWD. The revised baseline and targets are preferred for inclusion in this 2015 UWMP because they represent a more accurate estimate of water use in CMWD's service areas during the selected baseline period. While these revisions provide a minimally higher SBx7-7 target, which provides for some flexibility should growth occur at a different rate than is projected in the 2015 UWMP, it does not substantially affect CMWD conservation planning or implementation activities.

Table 5-3: Baselines and Targets Summary

DWR Table 5-1 Baselines and Targets Summary					
Baseline Period	Start Years	End Years	Average GPCD	2015 Interim Target	Confirmed 2020 Target
10-15 year	1999	2008	259	233	207
5 Year	2003	2007	255		
NOTES: CMWD selected a 10-year baseline period					

The 2015 UWMP is required to show compliance with the interim target for SBx7-7. As shown in **Table 5-4**, CMWD has met, and exceeded, its 2015 interim target. Because of this, no additional calculation of extraordinary events, economic adjustment, or weather normalization was conducted.

Table 5-4: 2015 Compliance

DWR Table 5-2: 2015 Compliance							
2015 Actual GPCD	2015 Interim Target	Optional Adjustments to 2015 GPCD				2015 GPCD	In Compliance? Y/N
		Extraordinary Events	Economic Adjustment	Weather Normalization	Adjusted 2015 GPCD		
145	233	-	-	-	145	145	Y
NOTES: No adjustments were made to CMWD's 2015 GPCD; Water use is significantly reduced from the baseline period due to extraordinary conservation activities underway for the ongoing drought.							

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Section 6

Water Supplies

This section discusses CMWD's sources of water supply, new supply opportunities, exchanges and transfers of water, wastewater and recycled water opportunities, projected water supplies, and climate change impacts to water supply.

6.1 Summary of Existing and Planned Water Sources

CMWD's existing water sources include a local supply of recycled water and purchased SDCWA water. All of CMWD's potable demands are currently met with imported purchased through SDCWA. CMWD's planned supplies include recycled water from the Phase III Recycled Water Project and desalinated seawater, along with continued purchases from SDCWA and groundwater. The Phase III Recycled Water Project will expand CMWD's existing recycled water system and increase recycled water production and delivery. The Phase III Recycled Water Project is currently being implemented, with construction of multiple pipeline segments and the Carlsbad WRF expansion underway. Beginning in late 2015, desalinated seawater water made available via the Carlsbad Desalination Plant has been blended into the treated water purchased from SDCWA. Under an agreement with SDCWA, CMWD plans on constructing its own direct connection to the desalination pipeline on Lionshead Avenue, which will consist of the Carlsbad 5 Flow Control Facility and Pressure Reducing Station.

Groundwater was used historically as a primary source of supply to Carlsbad. The groundwater quality was high in TDS compared to imported water supplies. Therefore, well production was subsequently discontinued after CMWD delivered imported water to the distribution system. However, the cost of imported water has increased substantially in the last ten years, making the local groundwater a viable local supply for the future even considering advanced treatment such as reverse osmosis.

A detailed summary of CMWD's projected supplies is provided in *Section 6.9 Projected Water Supplies*, while an overview of CMWD's supplies are provided in **Table 6-1.**

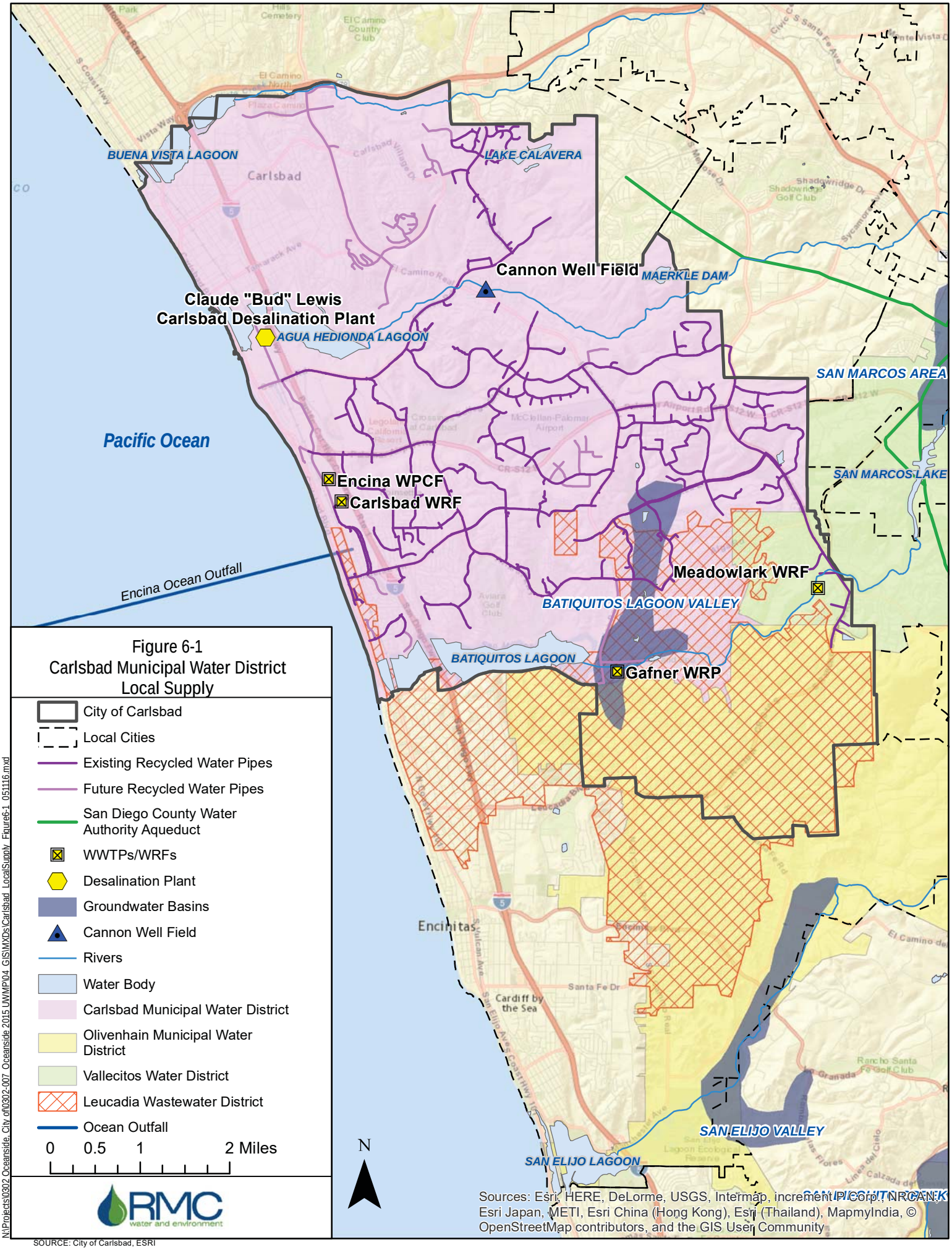
Table 6-1: Summary of Historical, Existing, and Planned Water Supplies (AFY)

Source	2010[1]	2015[1]	2020	2025	2030	2035	2040
SDCWA Purchases	16,449	14,321	15,507	16,677	16,965	17,244	17,268
Seawater Desalination	0	0	2,500	2,500	2,500	2,500	2,500
Recycled Water[2]	3,517	3,793	10,519	10,519	10,519	10,706	10,706
Total Water Supplies	**19,966**	**18,114**	**28,526**	**29,696**	**29,984**	**30,450**	**30,474**

[1] 2010 and 2015 show actual supplies produced.

[2] Recycled Water supplies include the Carlsbad WRF capacity plus the existing recycled water purchased from VWD and LWWD. The Carlsbad WRF is undergoing an expansion, resulting in the substantial increase in recycled water supply between 2015 and 2020.

Figure 6-1 shows CMWD's water supply facilities and infrastructure, and groundwater basins.


BUENA VISTA LAGOON
LAKE CALAVERA
Carlsbad
Cannon Well Field
MAERKLE DAM
Claude "Bud" Lewis
Carlsbad Desalination Plant
AGUA HEDIONDA LAGOON
SAN MARCOS AREA
Pacific Ocean
SAN MARCOS LAKE
Encina WPCF
Carlsbad WRF
Encina Ocean Outfall
Meadowlark WRF
BATIQUITOS LAGOON VALLEY
BATIQUITOS LAGOON
Gafner WRP
Encinitas
Cardiff by the Sea
SAN ELIJO VALLEY
SAN ELIJO LAGOON
Figure 6-1
Carlsbad Municipal Water District
Local Supply
City of Carlsbad
Local Cities
Existing Recycled Water Pipes
Future Recycled Water Pipes
San Diego County Water Authority Aqueduct
WWTPs/WRFs
Desalination Plant
Groundwater Basins
Cannon Well Field
Rivers
Water Body
Carlsbad Municipal Water District
Olivenhain Municipal Water District
Vallecitos Water District
Leucadia Wastewater District
Ocean Outfall
0 0.5 1 2 Miles
N
RMC water and environment
Sources: Esri, HERE, DeLorme, USGS, Intermap, increment P Corp., NRCAN, Esri Japan, METI, Esri China (Hong Kong), Esri (Thailand), MapmyIndia, © OpenStreetMap contributors, and the GIS User Community
N:\Projects\03302 Oceanside, City of\03302-007 Oceanside 2015 UWMP\04 GIS\MXDs\Carlsbad LocalSupply Figure6-1 051116.mxd
SOURCE: City of Carlsbad, ESRI

6.2 Purchased Water

CMWD imports all of its potable water from SDCWA, which in turn purchases SWP and Colorado River water from MWD, acquires Colorado River supplies directly or from other agencies, and purchases desalinated seawater produced at Poseidon's Carlsbad Desalination Plant, which began deliveries at the end of 2015. Imported water is conveyed into the area via MWD and SDCWA aqueducts. Upon its formation in 1954, CMWD joined SDCWA to acquire the right to purchase and distribute imported water throughout its service area. SDCWA has 24 member agencies, including CMWD, and is the regional wholesaler of imported water in San Diego County. Beginning in 2016, CWMD will begin receiving direct deliveries of desalinated seawater, reducing CMWD's reliance on SDCWA for potable supplies (see *Section 6.5 Seawater Desalination*).

CMWD also purchases disinfected tertiary recycled water from VWD and LWWD to help meet recycled water demands for customers remote from the Carlsbad WRF. Discussion of these recycled water suppliers are provided in *Section 6.7 Wastewater and Recycled Water Opportunities*.

6.2.1 Metropolitan Water District of Southern California

MWD was created in 1928 following the passage of the Metropolitan Water District Act by the California Legislature to provide supplemental water for cities and communities on the south coastal plain of California. MWD serves as a water wholesaler, and provides water to its member agencies from both the Colorado River and the SWP. It has 26 member agencies including SDCWA, and covers an area which includes all, or portions, of Ventura, Los Angeles, Orange, Riverside, San Bernardino, and San Diego Counties. MWD's water supplies and management programs are discussed in their *2015 Regional Urban Water Management Plan* (MWD, 2016).

6.2.2 San Diego County Water Authority (SDCWA)

SDCWA was organized on June 9, 1944 under the County Water Authority Act for the express purpose of importing Colorado River water into San Diego County. SDCWA annexed to MWD in 1946. As its largest customer, SDCWA is now represented on MWD's Board of Directors by four directors. SDCWA purchases water from MWD and other sources for resale to its 24 member agencies. Beginning at the end of 2015, SDCWA's potable supplies have included a mix of imported water, local surface water, and desalinated seawater from the Carlsbad Desalination Plant.

3-CMWD is one of 24 member agencies of SDCWA. Each member agency is autonomous and represented on SDCWA's Board of Directors, setting local policies and water pricing structures. The representatives on the Board of Directors are appointed by each member agency and the number of representatives for each agency is based on a ratio of each member's assessed valuation compared to the total of all member agencies. CMWD currently has two Board members on the 36-member Board of Directors. Member agency status entitles CMWD to directly purchase water from SDCWA on a wholesale basis. CMWD also looks to SDCWA to ensure, to the best of its ability, that adequate amounts of imported water will be available to satisfy future potable water requirements.

SDCWA's water supplies and management programs are discussed in their *2015 Urban Water Management Plan* (SDCWA, 2016). CMWD's projected water purchases from SDCWA are provided in Table 6-13, below.

6.3 Local Surface Water and Groundwater

CMWD does not currently use any local groundwater and surface water supplies, although in the past both types of water sources have been used. Prior to 1957, the Carlsbad Mutual Water Company supplied local surface water from Lake Calavera and groundwater from the Mission Basin of the San Luis Rey River to the City of Carlsbad. In addition, the Terramar Water Company provided local groundwater to a portion of the City of Carlsbad from the Agua Hedionda subunit 4.30 of the Carlsbad hydrologic unit through wells they developed, referred to as the Cannon Well Field. In August 1957, the water rights and other assets of the Carlsbad Mutual Water Company and Terramar Water Company were purchased by the City of Carlsbad. In May 1983, through an agreement, these local surface water and groundwater rights were transferred to CMWD by the City of Carlsbad. This included rights to Mission Basin of the San Luis Rey River Valley of 200 miner's inches (approximately 3,650 AFY) of groundwater, prescriptive rights of 5 cubic feet per second (cfs) (up to 2,382 AF) of groundwater, and/or pre-1914 appropriative rights

The Carlsbad Mutual Water Company held a permit with the State Division of Water Rights for another 1,000 AF annually from the Mission Basin. The original permit was for irrigation purposes and was later changed to recreational and fire protection purposes. Additionally, there were surface water rights for 150 AFY which were held from Calavera Creek. The Terramar Water Company had rights to 450 AFY of groundwater from the Agua Hedionda Creek Basin. Finally, CMWD obtained a permit for surface water in the amount of 25 AF from Agua Hedionda Creek as a result of constructing Maerkle Dam in 1962

Table 6-2 identifies the groundwater basins in the vicinity of CMWD according to DWR Bulletin 118, which are also shown in Figure 6-1, above. The Batiquitos Lagoon Valley Groundwater Basin is the only basin located in CMWD's service area. The San Luis Rey Valley Groundwater Basin is located north of CMWD and the San Marcos Valley Groundwater Basin is located east of CMWD. Of these groundwater basins, San Luis Rey Valley Groundwater Basin has been designated as a Medium Priority Basin under California Groundwater Elevation Monitoring (CASGEM), while both Batiquitos Lagoon Valley and San Marcos Valley Groundwater Basins are designated as Very Low Priority. High and Medium priority basins are required by the State to be monitored, while Low and Very Low priority basins are not currently considered basins of concern; as such, of the basins in the vicinity of CMWD's service area, only monitoring of the San Luis Rey Valley Groundwater Basin is mandated. This monitoring is being undertaken through a coordinated effort between the City of Oceanside and the County of San Diego. None of the basins listed in Table 6-2 are adjudicated, nor has DWR identified any of these groundwater basins as being in overdraft. Within the San Luis Rey Valley Groundwater Basin are several locally-recognized subbasins, which are commonly considered separate hydrological units: Mission, Bonsall, Moosa, Pala, and Pauma Basins (SDCWA, 2010).

Other potential sources of groundwater could be subsurface flows from local hydrologic areas within the Carlsbad Watershed, including Buena Vista Creek Basin, Agua Hedionda Creek Basin, Encinas Creek Basin, and the Batiquitos Hydrologic Subarea. These resources have low potential yields, poor quality, or no available data to substantiate their long term use in the public water supply. Generally speaking, these basins do not have geological characteristics or size comparable to the Mission Basin of the San Luis Rey Valley Groundwater Basin, and collectively could supply only a small portion of CMWD's needs.

Table 6-2: Groundwater Basins in the Vicinity of CMWD

Basin Name	DWR Basin Number	Basin Priority[1]	Located Within CMWD Service Area	Supply Currently Utilized by CMWD	Groundwater Management Plan Status
San Luis Rey Valley (including the Mission Basin)	9-7	Medium	No	0 AFY	Groundwater Sustainability Plan under development by CASGEM monitoring entities (City of Oceanside and County of San Diego)
Batiquitos Lagoon Valley	9-22	Very Low	Yes	0 AFY	None[2]
San Marcos Valley	9-32	Very Low	No	0 AFY	None[2]

[1] California Sustainable Groundwater Elevation Monitoring (CASGEM) designated priority

[2] Basin is not currently used as supply and no groundwater management plan has been developed or adopted by CMWD. Groundwater management plans or groundwater sustainability plans would be adopted prior to use of these groundwater basins for supply, as required.

Mission Basin

Of the groundwater basins available to CMWD, the Mission Basin of the San Luis Rey Valley Groundwater Basin has the most potential as a viable water resource. This basin has a large drainage area of 565 square miles and consists of alluvium and river channel deposits averaging 150 feet in depth. The quality is mildly brackish with TDS concentrations ranging from 1,000 to 1,500 milligrams per liter (mg/L). For CMWD's use, the water would need to be treated by a low pressure membrane, reverse osmosis process to achieve treated water quality in the range of 500 mg/L. The City of Oceanside is currently doing this at their Mission Basin Groundwater Purification Facility.

In 2005, CMWD completed a study on the cost effectiveness of utilizing the groundwater from the Mission Basin. This study showed that while the treatment and delivery of groundwater is feasible, it was not cost effective for CMWD at the time of the study. As a result, CMWD's Board approved the staff recommendation to discontinue efforts to utilize this groundwater source as an alternate local supply at that time. However, since 2005, improvements in technology may have resulted in lower costs for removing TDS, and these costs may continue to decrease over time. In addition, the cost of imported water has increased significantly since 2005 and this trend is projected by both MWD and SDCWA to continue over time. With the increasing cost and decreasing reliability of imported water, the cost effectiveness of using local groundwater once again has become attractive. A groundwater supply from the Mission Basin would require the construction of several wells, a groundwater treatment facility, and a conveyance system. Wheeling the treated groundwater through the Oceanside distribution system may be an option. Accordingly, CMWD currently is reevaluating its plans for utilization of groundwater in the Mission Basin, which may become cost effective, for CMWD or third parties, as technology continues to improve and imported water costs continue to increase. The *2012 Water Master Plan* included capital improvement project funding in Phase 4 to develop groundwater supplies in both the Mission Basin and Agua Hedionda Creek Basin areas.

Cannon Well Field

The Cannon Well Field, located within the Agua Hedionda Creek Basin subarea of the Carlsbad Watershed, was historically used as a source of local water. Pumping ceased after 1962, but in the years leading up to then, production ranged from 16 AFY to 238 AFY. This well field could be considered having a potential available yield of 450 AFY (CMWD, 2012). Historically, additional small private wells for individual residences were also located within this subarea, along with private wells in the Buena Vista Creek Basin (RWQCB, 1980).

A 1991 study titled *Report on the Feasibility for Development of the Cannon Well Field Carlsbad, California* was completed of the Agua Hedionda subunit where the Cannon Well Field is located. This study indicated that by a 1950 agreement between then-landowner Ellen Hall and J.D. Cannon, the Terramar Water Company was granted the right to drill for and remove water from the land. In 1964, this original agreement was merged with an agreement with the City of Carlsbad and the then-landowner to have the sole right and exclusive right to drill wells on the property and take and remove all water developed on the property and deliver it to such places as the City, in its sole discretion, may determine. The City (CMWD) shall be entitled to produce from the property an additional 16.5 AFY; however, there are no recorded groundwater rights. The safe yield was estimated in the 1991 study at 400 AFY. CMWD could begin the process of developing the groundwater. The Rancho Carlsbad Mobile Home Park does have one operating well in the vicinity, estimated at 100 AFY, which they use to supply water for irrigation of their landscaping and through a separate agreement supply water to the adjacent Rancho Carlsbad Golf Course. Ultimately, if there is excessive pumping, there may be adverse effects, such as the elimination of surface flow in Agua Hedionda Creek, reduction in the wetlands area downstream of the El Camino Real Bridge, and increased salinity in the transition zone of fresh water to salt water in the Agua Hedionda Lagoon. These problems can be addressed if the Cannon Well Field is developed by CMWD through a program of scheduled observations and a monitoring program.

CMWD is currently in the process of clarifying its groundwater rights. Groundwater could potentially be recovered from the Mission Basin and/or Agua Hedionda Lagoon, although such groundwater would require desalination. CMWD still is exploring groundwater as a local water supply concept; as such, groundwater is not included in CMWD's supply projections. CMWD does not currently pump groundwater; therefore DWR Table 6-1 (**Table 6-3**) is not currently applicable.

Table 6-3: Groundwater Volume Pumped

DWR Table 6-1 Retail: Groundwater Volume Pumped	
☑	Supplier does not pump groundwater. The supplier will not complete the table below.

6.4 Storm Water

CMWD does not currently utilize storm water for supply, nor does it plan to beneficially use storm water as a resource in the near future.

6.5 Seawater Desalination

Since 1999, a large-scale seawater desalination facility has been actively explored as a potential local supply for the San Diego region. CMWD was involved in planning for the seawater desalination facility throughout its development. After exploring the feasibility of a variety of purchase agreements and delivery structures, Poseidon Resources (Channelside), L.P. (Poseidon), SDCWA, and SDCWA's member agencies came to agreement to move forward with implementation of a desalination facility

for the region. In 2015, Poseidon completed construction of the Carlsbad Desalination Plant, located at the Encina Power Plant site adjacent to Agua Hedionda Lagoon, and began deliveries of desalinated seawater. Desalinated water produced at this facility is designated a local supply. Desalinated water from this facility is pumped to SDCWA's Twin Oaks Treatment Plant (refer to **Figure 3-2**), where it is blended with treated imported water for delivery to SDCWA member agencies, including CMWD. On April 12, 2016, CMWD Board of Directors approved an agreement between SDCWA and CMWD for the planning and design of the direct connection to the desalinated pipeline (Carlsbad 5 Flow Control Facility and Pressure Reducing Station), which will provide 2,500 AFY of local desalinated seawater to CMWD through a Take or Pay agreement. SDCWA currently purchases all of the water produced at the desalination facility under its purchase agreement with Poseidon. In addition to receiving desalinated seawater through SDCWA's supply mix, CMWD also opted to maintain its rights to receive water directly from the desalinated pipeline coming from the facility. A direct connection would improve water supply reliability and add infrastructure redundancy by providing a delivery system independent of SDCWA's larger system. Should supply disruption occur as a result of damage to SDCWA's system, CMWD would still be able to receive desalinated seawater when the option to pursue a direct connection to the facility which will consist of Carlsbad 5 Flow Control Facility and Pressure Reducing Station is implemented.

Through its general purchase of water supplies from SDCWA, CMWD receives a pro rata share of 1,449 AFY desalinated water, and CMWD will also directly receive an additional 2,500 AFY desalinated water as part of a Take or Pay agreement. This direct supply is considered a local supply for CMWD. In the event that additional water is produced by the Carlsbad Desalination Plant, beyond SDCWA's annual demand commitment of 48,000 AFY, CMWD may purchase an additional volume of desalinated water, equal to 5.21% of the additional production. This additional water is not accounted for in current supply projections due to uncertainty surrounding its procurement.

As shown in **Table 6-4**, the Carlsbad Seawater Desalination project and brackish groundwater from the San Luis Rey Valley provide opportunity for the development of desalinated water within CMWD's service area as a future supply source.

Table 6-4: Opportunities for Desalinated Water

Sources of Water	Opportunities
Ocean water	Carlsbad Seawater Desalination Project/Poseidon Resources
Brackish groundwater	Mission Basin of San Luis Rey Valley

6.6 Transfers and Exchange Opportunities

CMWD relies entirely on water purchased from SDCWA for potable water supplies, and does not participate individually in any water transfer or exchange programs at this time. After completion of the Phase III Recycled Water Project, CMWD may provide recycled water via transfers or exchanges to other agencies in the future as part of the NSDWRC.

6.7 Wastewater and Recycled Water

The City of Carlsbad provides wastewater services through its participation in EWA, while CMWD produces, buys, sells, and distributes recycled water to customers both within its service area and to customers located in adjacent agency service areas. This section describes wastewater and recycled water supplies and demands for customers within CMWD's service area, as well as those served by CMWD but located outside of its direct service area. **Table 6-5** provides a summary of recycled water

supply and demand, which are all further explained in detail below. CMWD's supply projections are significantly higher than current identified demands because CMWD has the potential to retain its current purchasing rights from VWD and LWWD, but is also expanding its Carlsbad WRF to increase local production of recycled water. CMWD will either identify new non-potable customers or sell the recycled water to neighboring agencies to allow the region to maximize local sources. CMWD anticipates only producing as much recycled water at Carlsbad WRF to meet demands, but the potential surplus of recycled water allows for flexibility in management of its supplies, and provides potential for increasing recycled water use within and adjacent to CMWD's service area,

Table 6-5: Summary of CMWD's Recycled Water Supplies and Demands (AFY)

	2015	2020	2025	2030	2035	2040
Recycled Water Supplies						
Carlsbad WRF	1,903[1]	8,272	8,272	8,272	8,272	8,272
Meadowlark WRF	2,000	2,000	2,000	2,000	2,187	2,187
Gafner WRF	247	247	247	247	247	247
Total Recycled Water Supplies	4,150	10,519	10,519	10,519	10,706	10,706
Recycled Water Demands						
Projected Recycled Water Demands	3,793	5,078	5,078	5,078	5,078	5,078
Potential Recycled Water Surplus	***357***	***5,441***	***5,441***	***5,441***	***5,628***	***5,628***

[1] Actual 2015 volume supplied.

6.7.1 Recycled Water Coordination

For production and delivery of recycled water sufficient to meet local demands, CMWD's recycled water system requires coordination with the three agencies listed here. CMWD's relationship with each of these organizations is also described.

- **Encina Wastewater Authority (EWA):** Regional wastewater collection and treatment system; supplies secondary effluent to Carlsbad WRF for tertiary treatment and discharges unused secondary effluent to the Pacific Ocean via the Encina Ocean Outfall
- **Vallecitos Water District (VWD):** Produces tertiary recycled water and sells to CMWD
- **Leucadia Wastewater District (LWWD):** Produces tertiary recycled water and sells to CMWD

6.7.2 Wastewater Treatment and Collection Facilities

EWA provides regional treatment and effluent disposal through an ocean outfall from the EWPCF. EWA is owned by six agencies in northern San Diego County, and operates under a joint powers agreement: Cities of Carlsbad, Vista, and Encinitas, VWD, Buena Sanitation District, and LWWD. In total, EWA provides wastewater services to approximately 300,000 people. Wastewater collected by EWA members are conveyed to the EWPCF, where it is treated to secondary, and either discharged to the Pacific Ocean via the Encina Ocean Outfall or conveyed to the Carlsbad WRF or Gafner WRF for additional treatment for beneficial reuse. The City of Carlsbad owns capacity rights at EWPCF for 10.26 mgd. The EWPCF provides for full secondary treatment, sludge handling, and disposal through a deep ocean outfall (Encina Ocean Outfall) that extends along the ocean floor to a point one and a half miles off shore, at a depth of over 150 feet. Treatment levels at EWPCF meet all current State and Federal requirements. Refer to **Figure 6-1** for location of the EWPCF and Encina Ocean Outfall.

Within CMWD's service area, wastewater collection is provided by the City of Carlsbad and LWWD. The City of Carlsbad's sewer system includes 288 miles of pipeline within CMWD's service area, and conveyed an average flow of 6.17 mgd for Fiscal Year 2015, a 4.6% increase over 2014 (EWA, 2015). LWWD provides wastewater services to the La Costa portion of CMWD's service area, and operates approximately 200 miles of pipeline to serve 60,000 people in Carlsbad and neighboring Encina. LWWD's flows to the EWPCF averaged 3.91 mgd in Fiscal Year 2015, a 4.2% decrease (EWA, 2015). All sewer flows are conveyed to the EWPCF for treatment.

Table 6-6 identifies the wastewater collected within CMWD's service area, while Table 6-7 identifies the volume of wastewater that is either recycled or discharged within CMWD's service area. The wastewater amounts generated within CMWD boundary are estimated to be approximately five to ten percent greater than the City of Carlsbad's sewer service area because it also includes a portion of LWWD's sewer service area.

Recycled water is presently supplied to CMWD from three sources consisting of a maximum allocation of 4.0 mgd from Carlsbad WRF, 3.0 mgd from Meadowlark WRF (owned by VWD) and 0.75 mgd from Gafner WRF (owned by LWWD). Meadowlark produces 2.7 mgd tertiary recycled water, or 3,632 AFY. Approximately 2,000 AFY of this tertiary recycled water is delivered to CMWD, while the remaining 1,600 AFY is delivered to Olivenhain Municipal Water District. All of the tertiary recycled water produced at the Gafner WRF is used by CMWD to support recycled water demands of the Omni La Costa Resort and Spa. On average, CMWD uses 247 AFY recycled water from the Gafner WRF, or approximately 0.2 mgd.

Chlorine contact basin at the existing Carlsbad WRF

Table 6-6: Wastewater Collected within Service Area in 2015

DWR Table 6-2 Retail: Wastewater Collected Within Service Area in 2015						
☐	There is no wastewater collection system. The supplier will not complete the table below.					
100%	Percentage of 2015 service area covered by wastewater collection system					
100%	Percentage of 2015 service area population covered by wastewater collection system					
Wastewater Collection			**Recipient of Collected Wastewater**			
Name of Wastewater Collection Agency	Wastewater Volume Metered or Estimated?	Volume of Wastewater Collected in 2015 (AFY)	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 Carlsbad	Metered	6,911	Encina Wastewater Authority	Encina Pollution Control Facility	Yes	Yes
Leucadia Wastewater District	Estimated	438	Encina Wastewater Authority	Encina Pollution Control Facility	Yes	Yes
Total Wastewater Collected from Service Area in 2015:		**7,349**				
NOTES: Wastewater flows are reported for Fiscal Year 2015, ending June 30, 2015. CMWD estimates that total wastewater flows within its service area are 5-10% higher than those collected by the City of Carlsbad due to LWWD serving a portion of CMWD's service area. 10% of LWWD's wastewater flows are included here as flows within CMWD's service area. The Encina Pollution Control Facility is owned and operated by the Encina Wastewater Authority, a joint powers authority that is owned by six agencies, including City of Carlsbad and Leucadia Wastewater District. Source: EWA, 2015.						

Table 6-7: Wastewater Treatment and Discharge within CMWD's Service Area

DWR Table 6-3 Retail: Wastewater Treatment and Discharge Within Service Area in 2015										
☐	No wastewater is treated or disposed of within the UWMP service area. The supplier will not complete the table below.									
Wastewater Treatment Plant Name	Discharge Location Name or Identifier	Discharge Location Description	Wastewater Discharge ID Number *(optional)*	Method of Disposal	Does This Plant Treat Wastewater Generated Outside the Service Area?	Treatment Level	2015 volumes (AFY)			
							Wastewater Treated	Discharged Treated Wastewater	Recycled Within Service Area	Recycled Outside of Service Area
Encina Water Pollution Control Facility[1]	Encina Ocean Outfall	Pacific Ocean		Ocean outfall	Yes	Secondary, Undisinfected	23,360	22,229	see below	not available
Encina Water Pollution Control Facility[1]	Carlsbad WRF	Carlsbad WRF		Other	Yes	Tertiary	0	0	1,903	0
Encina Water Pollution Control Facility[1]	Gafner WRF	Gafner WRF		Other	Yes	Tertiary	0	0	247	0
Meadowlark WRF[2]	CMWD	CMWD Customers		Other	Yes	Tertiary	3,673	654	1,643	1,376
						Total	**27,033**	**22,883**	**3,793**	**1,376**
NOTES: Wastewater flows reported in this table are for Fiscal Year 2015. All wastewater flows within CMWD's service area are treated at EWPCF, which discharges to three facilities - an Ocean Outfall, the Carlsbad WRF, and Gafner WWTP, the latter two of which recycle water for reuse. Sources: 1. EWA, 2015. 2. Robert Scholl, VWD, pers.comm. May 10, 2016.										

Encina Water Pollution Control Facility

The EWPCF is owned and operated by EWA, and currently treats an average flow over 20 mgd wastewater, but has the capacity to treat over 40 mgd. The EWPCF produces over 5.0 mgd of secondary treated recycled water. Treated secondary recycled water is used in the plant and reduces costs for potable water required to operate the facility. Additional effluent flows from the facility are diverted from the ocean outfall and transferred to Carlsbad WRF and Gafner WRF for further treatment. Secondary effluent that cannot be reused, either directly or through additional treatment to meet tertiary recycled water demands, is discharged through the Encina Ocean Outfall.

Carlsbad Water Recycling Facility

The Carlsbad WRF, owned by CMWD but operated by EWA staff, can currently be maximized at 4.0 mgd (4,480 AFY). Recent consumption report data shows an average of 4,225 AFY in combined recycled water deliveries in the past three years, with approximately 2,000 AFY from the Carlsbad WRF and the remaining from the Gafner and Meadowlark WRFs. This facility receives secondary treated water from the EWPCF for tertiary treatment. Through the implementation of the Phase III Recycled Water Project, the Carlsbad WRF will be expanded to 7.38 mgd (8,267 AFY) in the near-term, and 12 mgd (13,442 AFY) in the long-term, and is anticipated to help meet a 76% increase in recycled water demands.

Carlsbad Recycled Water Facility (Carlsbad WRF)

Gafner Water Recycling Facility

The Gafner WRF is owned and operated by LWWD, and has a total capacity of 1.0 mgd (RWQCB, 2001). CMWD is permitted to purchase up to the entire 1.0 mgd (1,120 AFY) from the Gafner WRF, but in recent years CMWD has purchased an average of 247 AFY. These supplies are delivered to the La Costa Resort and Spa, in the southern portion of CMWD's service area. CMWD's supply projections continue to include 247 AFY from Gafner WRF, although future purchases are uncertain as Segment 8 of the Phase III Recycled Water Project is intended to serve the La Costa Resort and Spa.

Meadowlark Water Reclamation Facility

Meadowlark WRF is owned and operated by VWD, and has a total capacity of 5 mgd. CMWD's rights to disinfected tertiary water from the Meadowlark WRF ranges from 2.0 mgd during the months of November through March and 3.0 mgd during the months of April through October and this equates to 2,989 AFY. The remaining amount of recycled water produced by the Meadowlark WRF can be sold to OMWD under an agreement up to a maximum of 1.0 mgd or 1,120 AFY. CMWD generally purchases approximately 2,000 AFY recycled water from Meadowlark WRF, although 2015 resulted in slightly lower purchases of only 1,643 AF. In 2015, Meadowlark produced a total of 3,673 AF recycled water.

6.7.3 Recycled Water Master Plan

CMWD completed an update to its *Recycled Water Master Plan* in January 2012. The *Recycled Water Master Plan* evaluates the existing recycled water system, demands, supplies, regulations, and future system expansions. Beginning in 1990, CMWD began implementation of recycled water within in service area. By 1995, CMWD served over 1,000 AFY of recycled water through the implementation of the recycled water system facilities of Phase I. CMWD began implementation of Phase II in 2000, which included the construction of the Carlsbad WRF and expansion of the Meadowlark WRF, improvements to Mahr reservoir, three new booster pump stations, and 24 miles of additional recycled water pipelines. CMWD is now in the process of implementing its Phase III Recycled Water Project, which is discussed in further detail in *Section 6.8 Future Water Projects*, below.

6.7.4 Recycled Water Use

CMWD began serving recycled water in 1993. Since 1993, CMWD has constructed treatment facilities, pumping stations, reservoirs, and pipelines, and has adopted a mandatory use ordinance requiring developers to install recycled water distribution pipelines within their projects. Water recycling is provided by CMWD to developed areas within CMWD's boundaries, which includes the majority of the City of Carlsbad's boundary, with the exception of the southeast corner of the City, which is served by OMWD and VWD. As described above and identified in **Table 6-12**, recycled water is presently supplied to CMWD from three sources: Carlsbad WRF, Meadowlark WRF, and Gafner WRF. The maximum flow rate available to CMWD from each treatment facility varies.

CMWD's current recycled water system has approximately 80 miles of recycled water distribution pipelines, as shown in **Figure 5-2**. As of December 2015, this distribution system had 788 meters supplying 362 recycled use sites. With full implementation of the Phase III Recycled Water Project (see below), an additional 88 customers will be connected to CMWD's recycled water distribution system. CMWD projects a total of 5,078 AFY recycled water demands beginning in 2020 and into the future. This includes only verifiable recycled water supplies, consistent with SDCWA's demand projections, but does not include planned or conceptual recycled water projects. There is potential for future projects to expand recycled water demands and deliveries beyond this volume. As of December 2015, five of these customers had already been connected to the expanded system. The largest and/or most recognized customers currently served by recycled water include:

The 150 HP Twin "D" Pump Station, which helps deliver recycled water to CMWD customers.

- La Costa Resort and Spa, Four Seasons Resort at Aviara
- Kemper Sports Management (Carlsbad Municipal Golf Course)
- Legoland of California
- Grand Pacific Palisades Hotel
- Karl Strauss Brewery

- Caltrans (Interstate 5 landscaping)
- The Flower Fields

In addition, recycled water is also supplied to parks, median strips, shopping areas, the common areas of numerous homeowners associations, and industrial parks. The Phase III Project will add the NRG Power Plant as one of its largest recycled water customers, estimated to use 215 AFY recycled water for industrial purposes. Recycled water use (current and projected) is presented, by use category, in Table 6-8.

Table 6-8: Current and Projected Recycled Water Direct Beneficial Uses Within Service Area (AFY)

DWR Table 6-4 Retail: Current and Projected Recycled Water Direct Beneficial Uses Within Service Area									
☐ Recycled water is not used and is not planned for use within the service area of the supplier. The supplier will not complete the table below.									
Name of Agency Producing (Treating) the Recycled Water:		Carlsbad Municipal Water District, Vallecitos Water District, Leucadia Wastewater District							
Name of Agency Operating the Recycled Water Distribution System:		Carlsbad Municipal Water District							
Supplemental Water Added in 2015		0 AFY							
Source of 2015 Supplemental Water		N/A							
Beneficial Use Type		General Description of 2015 Uses	Level of Treatment	2015	2020	2025	2030	2035	2040
Agricultural irrigation		Agricultural irrigation	Tertiary		23	23	23	23	23
Landscape irrigation (excludes golf courses)		Commercial property irrigation, community facilities, highways, HOAs, resort property irrigation, parks, and schools	Tertiary	2,703	3,705	3,705	3,705	3,705	3,705
Golf course irrigation		Golf course irrigation	Tertiary	1,090	1,033	1,033	1,033	1,033	1,033
Commercial use		Cooling	Tertiary		62	62	62	62	62
Industrial use		NRG Power Plant	Tertiary		215	215	215	215	215
Geothermal and other energy production									
Seawater intrusion barrier									
Recreational impoundment									
Wetlands or wildlife habitat									
Groundwater recharge (IPR)									
Surface water augmentation (IPR)									
Direct potable reuse									
Other	Type of Use	Public works projects	Tertiary		40	40	40	40	40
			Total:	**3,793**	**5,078**	**5,078**	**5,078**	**5,078**	**5,078**
IPR - Indirect Potable Reuse									

6.7.5 Potential and Projected Recycled Water Use

Actual recycled water use in 2015 within CMWD's service area was 3,793 AFY. The 2010 UWMP projected recycled water use in 2015 would be 5,000 AFY. The difference is accounted for by delays in construction and implementation of the Phase III Recycled Water Project. Table 6-9 compares the projected recycled water use for 2015 (as projected in the 2010 UWMP) with actual metered recycled water use for 2015.

Table 6-9: 2010 UWMP Recycled Water Use Projection Compared to 2015 Actual (AFY)

DWR Table 6-5 Retail: 2010 UWMP Recycled Water Use Projection Compared to 2015 Actual			
☐	Recycled water was not used in 2010 nor projected for use in 2015. The supplier will not complete the table below.		
Use Type		2010 Projection for 2015	2015 actual use
Agricultural irrigation			
Landscape irrigation (exc golf courses)		4,200	2,699
Golf course irrigation		800	1,094
Commercial use			
Industrial use			
Geothermal and other energy production			
Seawater intrusion barrier			
Recreational impoundment			
Wetlands or wildlife habitat			
Groundwater recharge (IPR)			
Surface water augmentation (IPR)			
Direct potable reuse			
Other			
Total		**5,000**	**3,793**
NOTES: The 2010 UWMP only considered Landscape Irrigation and Golf Course Irrigation and did not project for other types of use. For purposes of comparison, recycled water deliveries in 2015 were consolidated into these two use types.			

6.7.6 Methods to Encourage Recycled Water Use

CMWD has actively pursued recycled water in its service area, and has implemented multiple mechanisms to encourage recycled water use. Some of these mechanisms include rate incentives, policies and ordinances, development of clear use guidelines, participation in regional trainings and certifications, and active participation in regional and local recycled water projects that include outreach and expand distribution systems. Table 6-10 provides a summary of the methods that have been used to encourage recycled water use within CMWD's service area.

In 2015, CMWD charged a rate of $3.53/unit, or approximately $1,538/AF for recycled water. This is lower than potable water rates for all customer classes and rate types except Tier 1 Single and Multi-Family Residential customers (who use between 0 and 5 units potable water per month), which each paid $3.35/unit potable water. Commercial and Non-Residential customers paid $4.05/unit potable

water, Agricultural customers paid $4.15/unit potable water, and Irrigation customers paid $4.44/unit potable water. Recycled water can be an attractive choice given potential savings between $0.48/unit and $0.91/unit for non-residential users compared to potable water.

CMWD policy is that recycled water shall be used within the jurisdiction wherever its use is economically justified, financially and technically feasible, and consistent with legal requirements, preservation of public health, safety and welfare, and the environment. Since 1990, City policy requires that recycled water be used on all new land use developments proposed in the City of Carlsbad for all State-approved non-potable uses, if and when available. CMWD's *Recycled Water Master Plan* was prepared in support of CMWD's recycled water policy to define, encourage and develop the use of recycled water, and is required to be updated no less than every five years. The installation of dual irrigation systems and connections to recycled water sources is also required and subject to the conditions of CMWD's *Recycled Water Master Plan*.

CMWD has Cross Connection Control Technicians who review on-site irrigation systems to verify no cross connections have occurred between the potable and recycled water systems. In addition, reviews are made to eliminate overspray and nuisance problems. To date, no major problems have occurred. A quarterly report is submitted to the San Diego Regional Water Quality Control Board (RWQCB) on any field tests and observations. For businesses, cross connection tests are often performed at night to reduce impacts on their operations and customers.

CMWD's *Engineering Standards – Volume 2: Potable and Recycled Water* (CMWD, 2004) provide user guidelines that have been established by CMWD, in conjunction with the review by San Diego County Department of Environmental Health, which are intended to provide the basic parameters for the use of recycled water in landscape irrigation.

City of Carlsbad Recycled Water Use Guidance

- Irrigate between 10:00 p.m. and 6:00 a.m. only.
- Irrigate to minimize run-off, pooling and ponding.
- Adjust spray heads to eliminate overspray onto areas not controlled by the user.
- Monitor and maintain the system to minimize equipment and material failure.
- Continually educate all maintenance personnel on the presence and allowable uses of recycled water.
- Gain prior approval by CMWD of all proposed changes and modifications to any private facilities.
- Conduct annual cross connection inspection.
- Designate an on-site supervisor, in writing, who is familiar with the plumbing system, basic concepts of backflow/cross connection protection and the specific requirements of a recycled water system.

Each year, SDCWA hosts a one-day certified course designed to provide irrigation supervisors with a basic understanding of recycled water. Completion of the Recycled Water Site Supervisor Training fulfills the training requirement as mandated by regulatory authorities. The class provides information to supervisors on the water recycling process, recycled water quality and safety issues, the duties and responsibilities of the supervisor, landscape irrigation fundamentals, maintenance and management, and cross connection control shut-down tests and inspections. Understanding similarities and differences between recycled and potable water is important to the successful operation of a recycled water system.

Table 6-10: Methods to Expand Future Recycled Water Use (AFY)

DWR Table 6-6 Retail: Methods to Expand Future Recycled Water Use			
☐	Supplier does not plan to expand recycled water use in the future. Supplier will not complete the table below but will provide narrative explanation.		
N/A	Provide page location of narrative in UWMP		
Name of Action	Description	Planned Implementation Year	Expected Increase in Recycled Water Use
Rate Controls	Maintain recycled water rates below potable water rates		-
Phase III Recycled Water Project	Expand recycled water system to meet identified demands	2015 - 2025	1,136
Mandatory Use Ordinance	Requires dual plumbing in new development and use of recycled water if available	1990	-
Public Outreach	Outreach and education efforts as part of NSDWRC to educate public on benefits, safety, and proper use of various types of recycled water	2014 - 2016	-
		Total	**1,136**
NOTES: The actions included in this table all support increased recycled water use made available and accessible through the Phase III Recycled Water Project.			

6.8 Future Water Projects

CMWD is in the process of implementing the Phase III Recycled Water Project, which is being implemented by segment, with 1,136 AFY of the total demands considered "verifiable". These demands are ones that have already been awarded funding or are far enough along in the design and contracting process to be considered certain. The remaining demands of the Phase III Recycled Water Project are considered "planned" recycled water demands, and are not included in the recycled water projections in this UWMP. The Phase III project includes the following components, designed to meet the following demands. Note that some demands may have changed as the project is being implemented:

- Segment 1A – 99 AFY
- Segment 2 – 286 AFY
- Segment 4A – 554 AFY
- Segment 5 – 454 AFY
- Segment 7 – 114 AFY
- Segment 8 – 420 AFY
- Segment 9 – 91 AFY
- Segment 18 – 25 AFY
- Connection of Adjacent to Existing Users – 598 AFY
- Carlsbad WRF Expansion
- Additional Storage

CMWD is also one of ten member agencies of the NSDWRC, which is cooperatively implementing a regional recycled water system to maximize recycled water use and implement potable reuse in northern San Diego County. CMWD's portion of the NSDWRC Regional Project is the Phase III Recycled Water Project. Through the NSDWRC, CMWD may provide recycled water to other members, and may receive additional recycled water from other members, as necessary. Additional information about the NSDWRC and its recycled water project can be found at http://nsdwrc.org/.

CMWD may also pursue groundwater as a future supply, but potential groundwater supplies are still considered uncertain, and are not accounted for in Table 6-11, which summarizes future water supply projects and programs. Despite this uncertainty, CMWD anticipates that affirming its groundwater rights will lead to development of additional groundwater supplies, which will help to offset CMWD's demands on SDCWA for potable water. This addition of groundwater to CMWD's supply portfolio will strengthen its supply reliability and help reduce CMWD's reliance on imported supplies.

As noted previously, CMWD's Board approved an agreement with SDCWA to develop a direct connection to the desalinated seawater pipeline. Development of this supply will involve implementation of the Carlsbad 5 Flow Control Facility and Pressure Reducing Station project, and will result in 2,500 AFY additional local potable water. Once constructed, CMWD will own and operate the Pressure Reducing Station component, while the flow control facility will be constructed in agreement with SDCWA. Further, CMWD can purchase an additional 5.21% of any desalinated seawater produced beyond the 48,000 AFY minimum volume produced for SDCWA, which will further increase CMWD's share of desalinated seawater in its supply mix.

Claude "Bud" Lewis Carlsbad Desalination Plant is located adjacent to the Agua Hedionda Lagoon

Table 6-11: Expected Future Water Supply Projects or Programs

DWR Table 6-7 Retail: Expected Future Water Supply Projects or Programs						
☐	No expected future water supply projects or programs that provide a quantifiable increase to the agency's water supply. Supplier will not complete the table below.					
☐	Some or all of the supplier's future water supply projects or programs are not compatible with this table and are described in a narrative format.					
N/A	Provide page location of narrative in the UWMP					
Name of Future Projects or Programs	Joint Project with other agencies?		Description	Planned Implementation Year	Planned for Use in Year Type	Expected Increase in Water Supply to Agency (AFY)
	Y/N	Agency Name				
Phase III Recycled Water Project – Long-term demands	No		Expansion of recycled water distribution system	2035	Average Year	--
Groundwater Supply	No		Development of groundwater supplies	2025	Average Year	Unknown at this time
NSDWRC Regional Project	Yes	Leucadia Wastewater District, Vallecitos Water District, City of Oceanside, City of Escondido, Olivenhain Municipal Water District, Rincon del Diablo Municipal Water District, San Elijo Joint Powers Authority, Santa Fe Irrigation District, and Vista Irrigation District	Regional recycled water project	2035	Average Year	Supports implementation of Phase III recycled water project
Carlsbad 5 Flow Control Facility and Pressure Reducing Station	Yes	SDCWA	Direct connection to desalinated seawater pipeline	2016	Average Year	2,500
NOTES: Groundwater supplies are considered uncertain due to challenges associated with development of supplies. CMWD anticipates some flexibility in its recycled water supply due to projected recycled water surpluses. CMWD has the right to an additional 5.21% of any desalinated seawater produced for SDCWA beyond SDCWA's minimum volume of 48,000 AFY. This could result in additional supplies for CMWD which have not been quantified due to uncertainty over how much water would actually be available. CMWD's direct connection will be constructed by approximately September 2018, but CMWD will begin receiving this "Take or Pay" water via SDCWA's infrastructure until the direct connection is complete.						

6.9 Current and Projected Water Supplies

CMWD's supplies include SDCWA water (treated SWP and Colorado River, along with desalinated seawater, purchased as a blend from SDCWA), recycled water, and may in the future include groundwater. Current water supplies for CMWD during 2015 are presented in Table 6-12. Projected supplies for CMWD are presented in Table 6-13, and includes water supply projects that are underway or in development, along with projected population growth and supply availability from SDCWA.

Table 6-12: Water Supplies – Actual (AFY)

DWR Table 6-8 Retail: Water Supplies — Actual				
Water Supply	Additional Detail on Water Supply	2015		
		Actual Volume	Water Quality	Total Right or Safe Yield
Purchased or Imported Water	Purchased from SDCWA	13,264	Drinking Water	-
Recycled Water	Carlsbad WRF	1,546	Recycled Water	4,480
Recycled Water	Meadowlark WRF	2,000	Recycled Water	2,800
Recycled Water	Gafner WRF	247	Recycled Water	1,120
	Total	**17,057**		**8,400**

Table 6-13: Water Supplies – Projected (AFY)

DWR Table 6-9 Retail: Water Supplies — Projected											
Water Supply	Additional Detail on Water Supply	Projected Water Supply *Report To the Extent Practicable*									
		2020		2025		2030		2035		2040	
		Reasonably Available Volume	Total Right or Safe Yield	Reasonably Available Volume	Total Right or Safe Yield	Reasonably Available Volume	Total Right or Safe Yield	Reasonably Available Volume	Total Right or Safe Yield	Reasonably Available Volume	Total Right or Safe Yield
Purchased or Imported Water	Purchased from SDCWA	15,507	-	16,677	-	16,965	-	17,244	-	17,268	-
Recycled Water	Carlsbad WRF	8,272	8,272	8,272	8,272	8,272	8,272	8,272	8,272	8,272	8,272
Recycled Water	Meadowlark WRF	2,000	2,989	2,000	2,989	2,000	2,989	2,187	2,989	2,187	2,989
Recycled Water	Gafner WRF	247	1,120	247	1,120	247	1,120	247	1,120	247	1,120
Desalinated Water	Carlsbad Desalination Plant (purchased under Take or Pay with SDCWA)	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500
Total		**28,526**	**-**	**29,696**	**-**	**29,984**	**-**	**30,450**	**-**	**30,474**	**-**

NOTES: CMWD will receive 2,500 AFY desalinated water through a purchase agreement with SDCWA. If the plant produces more desalinated water and SDCWA purchases more than the 48,000 AFY that it currently purchases, CMWD may receive an additional 5.21% of the additional amount available. Because of uncertainty regarding this water, it has been omitted from this table as an available volume, but included in total right for desalinated water purchased via SDCWA. Purchases from SDCWA are not limited by Total Right or Safe Yield.

6.10 Energy Intensity of Supplies

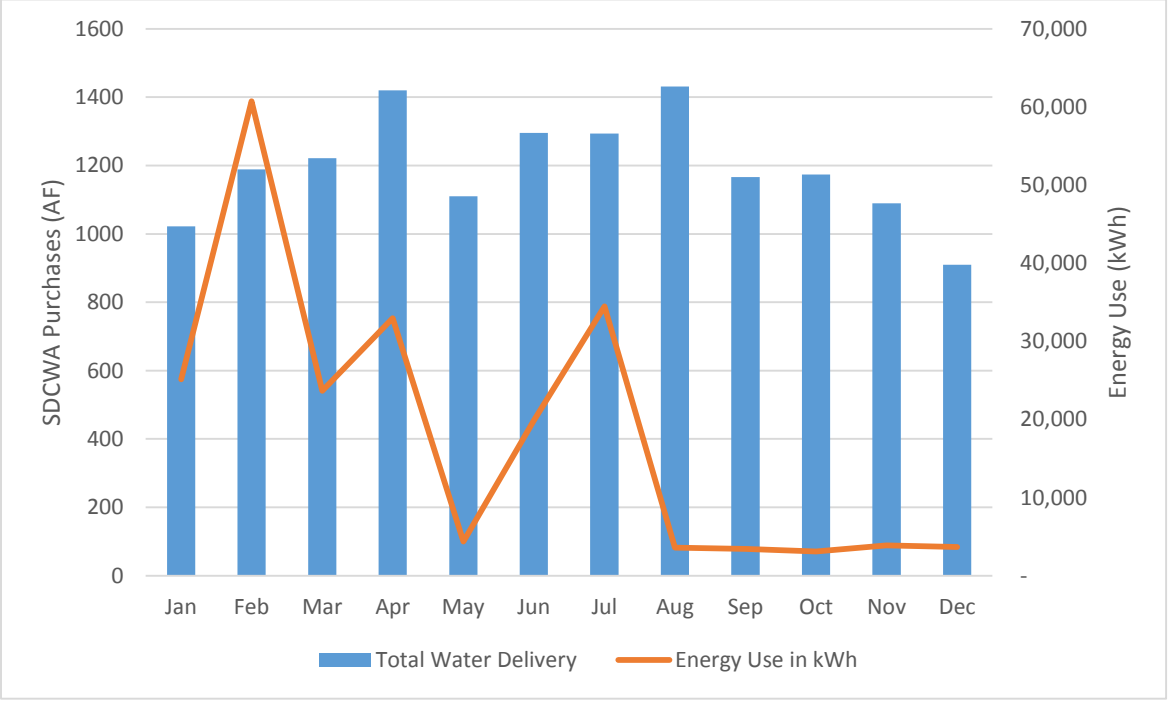
CMWD elected to estimate the energy intensity of its potable supplies, using Appendix O of the Guidebook. A technical memorandum and the applicable Appendix O tables have been included here as **Appendix I**.

Water energy intensity (EI) is the total amount of energy expended on a per AF basis to take water from the location CMWD acquires it to the point of delivery. Thus, EI includes conveyance, extraction, treatment, placing water into and taking it from storage, and distribution. CMWD's water EI only accounts for the water management processes occurring within its operational control; energy use associated with the extraction, treatment and conveyance of wholesale water to CMWD's points of diversion is not included. Because CMWD receives it potable water from SDCWA, and this water is already treated prior to entering CMWD's distribution system, energy demands for CMWD's potable system are limited to the requirements for distribution and limited local storage.

Using billing data for CMWD, designated as the "Water Department" on City of Carlsbad's gas and electric bills, for calendar year 2015, CMWD's total energy use was 218,818 kilowatt hours (kWh). During this same timeframe, CMWD received 14,321 AF of water from SDCWA that was placed in local storage or distributed to customers. Note that the water placed in storage during 2015 is excluded from gross water use reported elsewhere in this document. CMWD's potable water system therefore has a local EI of 15.3 kWh/AF.

Monthly energy demands vary greatly from month to month, depending on the length of time water remains in local storage, the level of demand (affecting pumping and storage levels), and the need to implement minor treatment or mixing to maintain potable quality. **Figure 6-2** shows energy demands and water purchases from SDCWA over the course of 2015.

Figure 6-2: Monthly 2015 Energy Use and SDCWA Purchases



6.11 Climate Change Impacts to Supply

Climate change is a concern for CMWD and other agencies within the San Diego region. A summary of climate change vulnerabilities, impacts, and actions to address these impacts is provided in *Section 3 System Description*. While the exact effects of climate change are unknown, average temperatures will increase, weather events will be more intense and more frequent, and precipitation patterns will change. As with other agencies in the region, CMWD relies heavily on imported water purchased from SDCWA. These imported supplies come from the SWP and the Colorado River. SWP reliability is dependent on rainfall and snowpack, and the timing of snowmelt. Climate change will make snowpack less reliable, either through changes in amount of water stored in snowpack, or through changes to the timing of snowmelt (e.g., earlier melt means excess water is available when demands are low, and less water is available during warmer months when demands are higher). Extreme weather events could damage imported water infrastructure or could exacerbate drought conditions.

As identified by the Climate Change Planning Study completed for the *2013 San Diego IRWM Plan*, climate change is anticipated to result in up to a 25% decrease in supplies from the SWP, up to a 20% decrease in supplies from the Colorado River, totaling a 164,000 AFY average shortfall in imported supply for the San Diego Region. The Climate Change Vulnerability Analysis found that that this anticipated decrease in imported supply was the greatest concern for the region, and was given a "Very High Prioritization". The vulnerabilities identified in the assessment may contribute to issues include a decrease in imported supply, a decrease in groundwater supply, sensitivity due to higher drought potential, and reduction in available supplies due to impacts from invasive species.

Local supply development is anticipated to help mitigate climate change impacts by developing drought-proof supplies (e.g. recycled water), reducing potential supply disruptions from imported water, and reducing overall energy demands for providing water to customers.

Table 6-14: Climate Change Vulnerability Assessment

Vulnerability Question	Justification
Does a portion of the water supply in your region come from snowmelt?	Imported supplies (SWP, Colorado River) come from snowmelt.
Does part of your region rely on water diverted from the Delta, imported from the Colorado River, or imported from other climate-sensitive systems outside your region?	Approximately 80% of the Region's supplies are imported.
Does part of your region rely on coastal aquifers? Has salt intrusion been a problem in the past?	Some brackish groundwater exists near the coast which limits the use of coastal aquifers.
Has your region faced a drought in the past during which it failed to meet local water demands?	Drought management plans had to be put into effect. Note that the Region has never failed to meet its customers' demands since drought measures were put into place. Development of additional supplies may reduce the Region's vulnerability to this issue.
Does your region have invasive species management issues at your facilities, along conveyance structures, or in habitat areas?	Invasive species include Quagga mussels, Arundo, and Tamarisk
Source: RWMG, 2013.	

Section 7

Water Supply Reliability

As an agency entirely dependent on SDCWA for its potable water supplies and with limited diversification options for its local supply portfolio, CMWD is particularly concerned about water supply reliability. Although CMWD is improving supply reliability by increasing recycled water use, utilizing local desalinated seawater, and reducing imported water demands, and SDCWA has taken action to increase its supply portfolio and decrease dependence on water imported via MWD, there remain a number of threats to supply reliability within CMWD's service area.

7.1 Constraints on Water Sources

CMWD's water supply is subject to some factors that could result in inconsistency of supply due to legal, environmental, water quality, or climatic factors. As noted throughout this 2015 UWMP, CMWD's potable demands are entirely served with potable water purchased from SDCWA, and is subject to availability of and access to those supplies. A lack of supply diversity contributes to potential supply constraints. Table 7-1 provides a summary of potential threats to supply reliability for CMWD's various sources of potable and non-potable water.

Table 7-1: Constraints on Water Supplies

Source	Potential Constraint on Supply
Imported Water[1]	**Legal:** Current supply from SWP is occasionally inconsistent due to legal and environmental decisions. Future supply may not be consistent due to delays in construction, legal rulings, or environmental decisions. Legal decisions regarding the Quantification Settlement Agreement could reduce supplies from the Colorado River. **Climatic:** Drought and climate change could result in reductions of imported water supply. Colorado River supply may be reduced due to extended drought period. Mandatory use restrictions during drought may affect ability to utilize supply, even if sufficient supplies are available.
Desalinated Seawater	No constraints identified at this time.
Groundwater	**Legal:** CMWD is continuing to explore their groundwater rights and determine ability to utilize groundwater. **Water quality:** The Mission Sub-Basin has high levels of total dissolve solids (TDS) and requires desalination for potable use. **Other:** Groundwater basins in the region have limited storage capacity.
Recycled Water	**Cost:** Cost of recycled water system expansion can be challenging to complete connections.
[1] Refer to SDCWA's 2015 UWMP for additional details regarding constraints on their supplies	

SDCWA Supply Constraints and Reliability Actions

SDCWA's primary supplies include a mix of imported water from various sources and desalinated seawater. As noted in Table 7-1, SDCWA supply constraints are primarily due to legal and climatic factors. Imported water from the SWP may be subject to restrictions during drought or specific times of year as a result of legal decisions to maintain minimum flows for environmental needs, or other

legal agreements. In addition, flows from SWP may be constrained if a section of the system shuts down for repair, construction, or other reason. Imported Colorado River supplies are subject to the Quantification Settlement Agreement (QSA), which may change as a result of legal decisions. However, Colorado River supplies are considered substantially more secure than SWP supplies, and are not anticipated to be constrained in this manner. Colorado River supplies are higher in TDS than SWP water however, affecting SDCWA's blended raw water quality. However, this does not affect CMWD's access to SDCWA supplies because CMWD purchases treated water from SDCWA, not raw water.

Drought may also reduce availability of imported water to SDCWA (and subsequently reduce SDCWA supply availability to CMWD). During recent years, SWP supplies have faced allocations in 2014 and 2015, and are anticipated to experience allocations in 2016. Allocations to SWP supplies are anticipated as long as the current drought is in effect.

SDCWA has taken steps to diversify its water supply with alternative sources, as described in SDCWA's 2015 UWMP. Such efforts include canal lining and the Carlsbad Desalination Plant (Carlsbad Desalination Plant). SDCWA's canal lining project provides conserved water by preventing unplanned loss to incidental recharge. This conserved water is guaranteed for SDCWA under the terms of the canal lining project. SDCWA also enabled construction of the Carlsbad Desalination Plant by agreeing to a minimum annual purchase of recycled water from the facility. This increases supply reliability because it is a drought-proof local supply. SDCWA anticipates that desalinated seawater from the Carlsbad Desalination Plant will meet approximately 10% of the region's potable water demands.

The reduced availability of any one of SDCWA's supply sources would be buffered because of the diversity of the supplies; the region's wholesale supplies are not reliant on a single source. To replace or supplement an existing supply, SDCWA could take steps to increase development of transfers or distribution of seawater desalination. SDCWA's 2015 UWMP should be consulted for details regarding their actions to ensure consistency of the wholesale water supply. While regional efforts to improve supply diversification, storage, and system redundancy have worked to reduce the impacts such allocations have on local access to supplies, there is potential that mandatory use restrictions (at a statewide level) will be enacted during severe drought. Such restrictions, including those put in place by the State in 2015, may not affect supply that the region has in storage, but could affect the region's ability to utilize supplies.

CMWD Local Supply Constraints and Reliability Actions

CMWD's reliance on SDCWA for potable supplies leaves it vulnerable to supply disruptions to SDCWA's system. As a result, CMWD has taken steps to ensure a more consistent water supply by expanding its local supplies. CMWD has two sources of local supply (recycled water and desalinated seawater) and one potential source of local supply (groundwater).

The only constraints on recycled water are capacity, connectivity, and the associated costs of providing additional connections. CMWD's Phase III Recycled Water Project is currently expanding its tertiary recycled water production capacity, as well as expanding CMWD's recycled water distribution system to reach additional customers. As part of the NSDWRC, CMWD is participating in a cooperative effort of ten north San Diego County water and wastewater agencies to maximize recycled water use and improve interconnectivity between their non-potable water systems. This effort will allow for additional flexibility in non-potable water system operation and increase recycled water efficiencies. To help defray the cost of expanding its recycled water services, CMWD has actively pursued additional funding programs to help cover costs of the Phase III Recycled Water Project. As of the end of 2015, CMWD had received grants from Proposition 84 and Proposition 1, as well as a low-interest loan through the Clean Water State Revolving Fund.

While CMWD is currently receiving its desalinated seawater via SDCWA's pipelines, CMWD is planning on constructing a direct connection to the desalinated seawater pipeline on Lionshead Ave. to provide a local, drought proof supply that would function independently of SDCWA's distribution system. This would create redundancy in the potable distribution system that would increase reliability of water deliveries from a drought-proof, secure, supply.

To further diversify its local supplies, CMWD is exploring use of its groundwater rights (refer to *Section 6 System Supplies*). Groundwater in the Mission Sub-basin is high in TDS, and would require desalination before use as a supply. The addition of groundwater to CMWD's supply portfolio would reduce its reliance on SDCWA to meet potable demands. However, since CMWD is currently working on its groundwater rights and the potential available volume of groundwater supply is uncertain, it has been excluded from CMWD's supply portfolio in this 2015 UWMP.

In the event of a severe drought, CMWD could effectively implement temporary water use reduction measures as defined in the water shortage contingency plan to assist in ensuring reliability. Such use reduction measures have been implemented in recent years (2014 and 2015) and proven successful in helping CMWD reach its temporary state-mandated reduction target of 28% under the State's Emergency Drought Restrictions issued in 2015.

7.2 Reliability by Type of Year

The water supply available to CMWD is defined based on three water supply condition scenarios: average/normal water year, single-dry water year, and multiple-dry water years. The water supplies available to CMWD from SDCWA during single- and multiple-dry years are based on the historical dry periods presented in Table 7-2 and are defined in SDCWA's 2015 UWMP. Both of CMWD's quantified local supplies (desalinated seawater and recycled water) are considered drought-proof supplies whose availability are not affected by drought. CMWD has therefore aligned its water supply reliability analysis with SDCWA's supply reliability assessment.

Calavera Hills Pump Station (60 HP)

Table 7-2: Basis of Water Year Data

DWR Table 7-1 Retail: Basis of Water Year Data		
Year Type	Base Year	Available Supplies if Year Type Repeats % of Average Supply
Average Year	1986-2015	100%
Single-Dry Year	2014	100%
Multiple-Dry Years 1st Year	2013	100%
Multiple-Dry Years 2nd Year	2014	100%
Multiple-Dry Years 3rd Year	2015	92% -100%
NOTES: CMWD selected base years that aligned with SDCWA's 2015 UWMP supply reliability assessment. The third year of a multiple-dry year scenario may result in deficits that must be met through extraordinary conservation or further expansion of the recycled water system. In years with supply reliability, additional purchases would be made from SDCWA to meet demands. As presented here, "% of Average Supply" indicates percent supply available to meet potable demands due to diversification and/or carryover storage.		

Although Table 7-2 identifies the percentage of available supply to meet demand, supply availability will vary by source because CMWD's local supplies would not be affected by dry year conditions. Changes to supply availability cannot be applied equally across each source. Potable and recycled water demands are both considered in CMWD's supply reliability assessment because recycled water use offsets potable demands, while shortages in recycled water supplies require supplementation with potable supplies.

SDCWA's 2015 UWMP projected overall demands would increase over time and across scenarios, with some variability depending on the time frame and hydrologic scenario. CMWD anticipates that its demands would generally increase in dry year scenarios consistent with SDCWA's overall demand increases in corresponding scenarios. Due to uncertainty inherent to projecting demands during dry hydrologic conditions, CMWD's demand projections increase over dry year scenarios at a consistent rate across time frames (2020, 2025, 2030, 2035, and 2040), calculated as the average increase presented in SDCWA's 2015 UWMP. Table 7-3 identifies how CWMD's demands are projected to change, as a percent of normal, for different scenarios.

Although demands are projected to increase, SDCWA has the right to purchase additional water from MWD in years where local supplies are insufficient to meet demands. Per SDCWA's purchase agreement with MWD, SDCWA has sufficient preferential rights to water from MWD to meet demands not met by other sources for most scenarios. However, there is a potential shortfall in 2035 and 2040 in the third year of the multiple-dry year scenario. In years where SDCWA shows reliability, CMWD anticipates being able to purchase enough water from SDCWA to meet potable demands that cannot be met with desalinated seawater.

Table 7-3: Demand and Supply Assumptions, as Percent of Normal

Source	Normal Water Year	Single-Dry Water Year	Multiple-Dry Water Years		
			Year 1	Year 2	Year 3
Demands					
Potable Water	100%	107%	106%	111%	116%
Recycled Water	100%	107%	106%	111%	116%
Total Percent of Normal Demands		**107%**	**106%**	**111%**	**116%**
Supplies					
SDCWA Purchases	100%	108%	103%	105%	107%
Seawater Desalination	100%	100%	100%	100%	100%
Recycled Water	100%	100%	100%	100%	100%
Total Percent of Normal Potable Supplies		**107%**	**106%**	**111%**	**Variable *(107%-116%)***
Total Percent of Overall Normal Supplies		**104%**	**104%**	**107%**	**Variable *(104%-111%)***

7.3 Supply and Demand Assessment

Supply reliability is the ability of CMWD to meet its demands. A comparison of projected supplies against projected demands helps to identify potential reliability issues during each hydrologic year scenario identified in Table 7-2. As indicated in Table 7-3, demands will vary depending on the hydrologic conditions. During dry years, demands are projected to increase to varying degrees based on the prior year hydrologic conditions. Demand increases are projected consistently for potable and non-potable demands because they will primarily be driven by irrigation needs. Note that these demand projections do not assume implementation of CMWD's Drought Response Plan with its mandatory conservation measures; demands are assumed to increase as climactic conditions get hotter and drier. However, as demonstrated in 2014 and 2015, implementation of the drought response stages will significantly reduce water use across CMWD's service area and can be levied as necessary if a supply shortage is identified.

Supply availability will also vary within each hydrologic scenario, as identified in Table 7-3. CMWD's local supply availability (recycled water and desalinated seawater) will remain consistent with projected normal year supplies regardless of hydrologic scenario because they are both drought-proof supplies. Supply from SDCWA will vary depending on SDCWA's supply mix and demands from its member agencies. CMWD only purchases enough water from SDCWA to meet potable demands that cannot be met with local supplies. Any increases in potable demand must therefore be met with increased purchases from SDCWA. Because demands are projected to increase during dry years, CMWD's purchases from SDCWA would also increase in those years, to the extent available.

CMWD has no long-term potable water storage, and only purchases as much potable water as necessary from SDCWA. As a result, no potable water surpluses are expected during any hydrologic scenario. As shown in Tables 7-6, 7-8, and 7-10, CMWD does anticipate a surplus in recycled water, due to the expanded Carlsbad WRF's capacity. CMWD does not anticipate producing recycled water in excess of demand (unused secondary wastewater is discharged via the ocean outfall). However, the

additional capacity provides flexibility for CMWD to identify additional recycled water customers or additional opportunities to sell recycled water to neighboring agencies.

Because CMWD's demand projections in various scenarios are consistent with SDCWA's projections for member agency demands, and SDCWA has accounted for all member agency local supplies, SDCWA's supply reliability analysis documents that regional water supplies are generally reliable. For CMWD, potable supply reliability is assumed for any year in which SDCWA projects sufficient supplies to meet demands. SDCWA projects a potential shortfall in the third year of a multiple-dry year scenario for 2035 and 2040, however, which results in a potential potable supply deficit for CMWD. In these years, CMWD could reduce demands through the use of extraordinary conservation measures as described in *Section 8 Water Shortage Contingency Planning*. CMWD may also identify additional recycled water customers to reduce potable water use through the service area. Table 7-4 summarizes the potential potable water deficit in this scenario. CMWD has demonstrated its ability to reduce potable demands in the event of a supply deficit, as shown by its 16% reduction in demands between 2012 (the most recent normal year) and 2015 (third year of a multiple-dry year scenario). The potential deficit may also spur new connections to recycled water to offset potable demands. No non-potable water deficits are projected under any scenario.

Table 7-4: Potential Potable Water Deficit in Year 3 of Multiple-Dry Year Scenarios (AFY)

Multiple-Dry Year: Year 3	2020	2025	2030	2035	2040
Potable Supply	20,924	22,284	22,618	22,125	21,128
Potable Demand	20,924	22,284	22,618	22,943	22,970
Potential Deficit	*0*	*0*	*0*	*818*	*1,842*
Extraordinary Conservation or Conversion to Recycled Water	0	0	0	818	1,842
Total Potable Demand	20,924	22,284	22,618	22,125	21,128
Supply Deficit	**0**	**0**	**0**	**0**	**0**

SDCWA's supply reliability analysis is more conservative than CMWD's analysis because it only included consideration of "verifiable" supplies, which are supplies that are sufficiently under development to be considered secure. Although CMWD's verifiable local supplies only include a portion of the Phase III Recycled Water Project, CMWD considers the entire recycled water expansion in its supplies. CMWD considers SDCWA's analysis as representing a "worst case" scenario. The analysis included here is conservative because it is based on SDCWA's conservative assessment of its available supplies, and because CMWD anticipates groundwater supplies in the future that have not been incorporated in this 2015 UWMP.

Table 7-5 shows the projected normal year supplies for CMWD's service area, broken down by supply source, along with projected normal year demands for corresponding years. Table 7-6 compares the supply and demands for a normal year. During normal years, CMWD anticipates sufficient supplies to meet projected demands. The surplus shown in Table 7-6 results from the increased capacity of the Carlsbad WRF; however, it is anticipated that the Carlsbad WRF would only produce as much tertiary recycled water as required to meet demands and short-term storage needs. These normal year projections are consistent with the projections included in *Chapter 4 System Demands* and *Chapter 6 System Supplies*.

Table 7-5: Normal Year Supply and Demand Breakdown (AFY)

Source	2020	2025	2030	2035	2040
Demands					
Potable Demand	18,007	19,177	19,465	19,744	19,768
Non-Potable Demand	5,078	5,078	5,078	5,078	5,078
Total Normal Year Demand	**23,085**	**24,255**	**24,543**	**24,822**	**24,846**
Supplies					
SDCWA Purchases	15,507	16,677	16,965	17,244	17,268
Seawater Desalination	2,500	2,500	2,500	2,500	2,500
Normal Year Potable Supply	*18,007*	*19,177*	*19,465*	*19,744*	*19,768*
Recycled Water	10,519	10,519	10,519	10,706	10,706
Total Normal Year Supply	**28,526**	**29,696**	**29,984**	**30,450**	**30,474**
Note: Surplus is non-potable recycled water capacity at Carlsbad WRF.					

Table 7-6: Normal Year Supply and Demand Comparison (AFY)

DWR Table 7-2 Retail: Normal Year Supply and Demand Comparison					
	2020	2025	2030	2035	2040
Supply totals	28,526	29,696	29,984	30,450	30,474
Demand totals	23,085	24,255	24,543	24,822	24,846
Difference	5,441	5,441	5,441	5,628	5,628
NOTES: Surplus is non-potable recycled water capacity at Carlsbad WRF. There is no surplus or deficit for potable supplies.					

7.3.1 Single-Dry Year

The single-dry year scenario, selected to align with SDCWA's reliability assessment, was determined to be 2015. SDCWA anticipates that regional demands will increase by approximately 7% in a single-dry year. CMWD assumes that this demand increase is consistent across the planning horizon. SDCWA's analysis, which included a conservative consideration of member agency local supplies, found that there were sufficient supplies to meet projected demands on SDCWA, even in the face of increased demand during a single-dry year. This increased demand would be met with increased purchases from MWD. As a result, CMWD has assumed that SDCWA will be able to meet 100% of CMWD's needs that cannot be met by local supplies, as shown in Table 7-7. Similar to the normal year reliability assessment, the surplus shown in Table 7-8 is recycled water.

Table 7-7: Single-Dry Year Supply and Demand Breakdown (AFY)

Source	2020	2025	2030	2035	2040
Demands					
Potable Water Demands	19,231	20,481	20,789	21,087	21,112
Non-Potable Demands	5,423	5,423	5,423	5,423	5,423
Total Single-Dry Year Demand	**24,655**	**25,904**	**26,212**	**26,510**	**26,536**
Supplies					
SDCWA Purchases	16,731	17,981	18,289	18,587	18,612
Seawater Desalination	2,500	2,500	2,500	2,500	2,500
Single-Dry Year Potable Supplies	*19,231*	*20,481*	*20,789*	*21,087*	*21,112*
Recycled Water	10,519	10,519	10,519	10,706	10,706
Total Single-Dry Year Supply	**29,750**	**31,000**	**31,308**	**31,793**	**31,818**
Note: Surplus is non-potable recycled water capacity at Carlsbad WRF.					

Table 7-8: Single Dry Year Supply and Demand Comparison (AFY)

DWR Table 7-3 Retail: Single Dry Year Supply and Demand Comparison					
	2020	2025	2030	2035	2040
Supply totals	29,750	31,000	31,308	31,793	31,818
Demand totals	24,655	25,904	26,212	26,510	26,536
Difference	5,096	5,096	5,096	5,283	5,283
NOTES: Surplus is non-potable recycled water capacity at Carlsbad WRF. There is no surplus or deficit for potable supplies.					

7.3.2 Multiple-Dry Year

During a multiple-dry year scenario, the region experiences on-going dry hydrologic conditions, such as in a multi-year drought. SDCWA's 2015 UWMP states that in a multiple-dry year scenario, water from carryover storage would be used to help address potential supply deficits. Similar to the single-dry year scenario, demands during a multiple-dry year scenario are projected to increase over normal. In each year of a multiple-dry year scenario demands are anticipate to increase by approximately 6% (year 1), 11% (year 2), and 16% (year 3).

SDCWA concludes that there is sufficient local, imported, and carryover storage supplies to meet demands in each year of a multiple-dry year scenario for 2020 through 2030. However, there is potential for a deficit in the third year of a multiple-dry year in 2035 and 2040. This deficit is due to regional demand growth outpacing verifiable supply growth. Any deficit experienced by SDCWA would result in a deficit in available supplies to its member agencies, including CMWD. While SDCWA's analysis was conservative, and only includes "verifiable" supplies, CMWD has elected to be consistent with SDCWA's analysis.

In the third year of a multiple-dry year scenario, SDCWA anticipates extraordinary conservation will be implemented by its member agencies. As in other hydrologic scenarios for CMWD, surplus would be realized for non-potable recycled water supplies only. Despite a potential overall surplus, extraordinary conservation and/or expansion of the recycled water system would be required in the third year of a multiple-dry year scenario in 2035 and 2040. CMWD projects additional recycled water demands that

are not captured in the verifiable supplies used for the SDCWA purchase projections; some of the extraordinary conservation is therefore anticipated to be addressed through planned conversion to recycled water. As needed, CMWD will implement its Drought Response Plan (refer to *Section 8 Water Shortage Contingency Plan*). Additional conversion to recycled water and/or extraordinary conservation efforts would reduce CMWD's demand (Table 7-9) and supplies would again be sufficient to meet demands (Table 7-10).

Table 7-9: Single-Dry Year Supply and Demand Breakdown (AFY)

	Source	2020	2025	2030	2035	2040
Multiple-Dry Year (First Year)	Potable Water Demands	19,159	20,404	20,711	21,008	21,033
	Non-Potable Demands	5,403	5,403	5,403	5,403	5,403
	Total Multiple-Dry Year 1 Demand	**24,562**	**25,807**	**26,114**	**26,411**	**26,436**
	SDCWA Purchases	16,659	17,904	18,211	18,508	18,533
	Seawater Desalination	2,500	2,500	2,500	2,500	2,500
	Multiple-Dry Year 1 Potable Supplies	*19,159*	*20,404*	*20,711*	*21,008*	*21,033*
	Recycled Water	10,519	10,519	10,519	10,706	10,706
	Total Multiple-Dry Year 1 Supply	**29,678**	**30,923**	**31,230**	**31,714**	**31,739**
Multiple-Dry Year (Second Year)	Potable Water Demands	20,024	21,325	21,645	21,955	21,982
	Non-Potable Demands	5,647	5,647	5,647	5,647	5,647
	Total Multiple-Dry Year 2 Demand	**25,671**	**26,972**	**27,292**	**27,602**	**27,629**
	SDCWA Purchases	17,524	18,825	19,145	19,455	19,482
	Seawater Desalination	2,500	2,500	2,500	2,500	2,500
	Multiple-Dry Year 2 Potable Supplies	*20,024*	*21,325*	*21,645*	*21,955*	*21,982*
	Recycled Water	10,519	10,519	10,519	10,706	10,706
	Total Multiple-Dry Year 2 Supply	**30,543**	**31,844**	**32,164**	**32,661**	**32,688**
Multiple-Dry Year (Third Year)	Potable Water Demands	20,924	22,284	22,618	22,943	22,970
	Potable Water Conservation or Shift to Recycled Water	*0*	*0*	*0*	*818*	*1,842*
	Multiple-Dry Year 3 Potable Demands	*20,924*	*22,284*	*22,618*	*22,125*	*21,128*
	Non-Potable Demands	5,901	5,901	5,901	5,901	5,901
	Total Multiple-Dry Year 3 Demand	**26,825**	**28,184**	**28,519**	**28,025**	**27,029**
	SDCWA Purchases	18,424	19,784	20,118	19,625	18,628
	Seawater Desalination	2,500	2,500	2,500	2,500	2,500
	Multiple-Dry Year 3 Potable Supplies	*20,924*	*22,284*	*22,618*	*22,125*	*21,128*
	Recycled Water	10,519	10,519	10,519	10,706	10,706
	Total Multiple-Dry Year 3 Supply	**31,443**	**32,803**	**33,137**	**32,831**	**31,834**

Note: Surplus is non-potable recycled water capacity at Carlsbad WRF. There is no surplus or deficit for potable supplies and demands in the first or second year of a multiple-dry year scenario. Potential deficits in potable supplies in the third year of a multiple-dry year would be addressed with additional planned supplies (e.g., groundwater), extraordinary conservation, and/or expansion of recycled water service.

Table 7-10: Multiple Dry Years Supply and Demand Comparison (AFY)

DWR Table 7-4 Retail: Multiple Dry Years Supply and Demand Comparison						
		2020	**2025**	**2030**	**2035**	**2040**
First year	Supply totals	29,678	30,923	31,230	31,714	31,739
	Demand totals	24,562	25,807	26,114	26,411	26,436
	Difference	5,116	5,116	5,116	5,303	5,303
Second year	Supply totals	30,543	31,844	32,164	32,661	32,688
	Demand totals	25,671	26,972	27,292	27,602	27,629
	Difference	4,872	4,872	4,872	5,059	5,059
Third year	Supply totals	31,443	32,803	33,137	32,831	31,834
	Demand totals	26,825	28,184	28,519	28,843	28,871
	Difference	4,618	4,618	4,618	3,988	2,963
NOTES: Surplus is non-potable recycled water capacity at Carlsbad WRF. There is no surplus or deficit for potable supplies and demands in the first or second year of a multiple-dry year scenario. Potential deficits in potable supplies in the third year of a multiple-dry year would be addressed with additional planned supplies (e.g., groundwater), extraordinary conservation, and/or expansion of recycled water service.						

Section 8

Water Shortage Contingency Planning

CMWD's arid climate, limited local supplies, and growing population make water shortage planning an important component of supply management, especially in light of the current severe drought and the potential for increased frequency, intensity, and duration of droughts due to climate change. CMWD has adopted measures and plans to address water shortages, should supplies be more limited than demand. This section describes CMWD's water shortage contingency plan, considers the potential impacts shortages could have on revenue and expenses, and summarizes CMWD's planned response in the event of catastrophic supply loss.

8.1 Water Shortage Contingency Plan

In 2009, CMWD's Board of Directors (Carlsbad City Council) adopted the following ordinances:

1. Ordinance No. 44 – Drought Response Plan and Water Conservation Program (Drought Ordinance), which established CMWD's current water conservation program and drought response levels.
2. Ordinance No. 46 – Watering Schedules, which revised Drought Response Levels 2 and 3.

Complete copies of these ordinances are provided here as **Appendix I** and the contents of each is described in further detail below. The Drought Ordinance replaced a previous Ordinance No. 35, which had included the Urban Water Shortage Contingency Plan. Because CMWD is dependent upon SDCWA for its water supply, SDCWA's 2015 UWMP should also be consulted for their water shortage contingency plan.

Emergency response stage actions become effective when SDCWA declares that it is unable to provide sufficient water supplies to meet the ordinary demands and requirements of its member agencies to the extent that insufficient water would be available. When SDCWA announces its stage declaration, CMWD concurrently declares its corresponding stage.

8.1.1 Stages of Action

The Drought Ordinance outlines CMWD's four drought response stages, as shown in **Table 8-1**. These stages, and their prohibitions, are described below. Each level builds on the previous level(s), placing additional restrictions on water use.

Table 8-1: CMWD Water Shortage Stages

DWR Table 8-1 Retail: Stages of Water Shortage Contingency Plan		
Stage	**Percent Supply Reduction[1]**	**Water Supply Condition**
Level 1 - Drought Watch Condition	0-10%	Reasonable probability that supplies will not meet demands
Level 2 - Drought Watch Condition	11-20%	Supplies will not be able to meet expected demands
Level 3 - Drought Critical Condition	21-40%	Supplies not meeting current demands
Level 4 - Drought Emergency Condition	above 40%	Major failure of a supply, shortage, or distribution system
[1] One stage in the Water Shortage Contingency Plan must address a water shortage of 50%.		
NOTES: A water shortage above 40% (including a 50% shortage) triggers Level 4 restrictions, which includes prohibition on outdoor water uses, and provides CMWD the authority to make further restrictions, as necessary, for non-compliant users, as well as for any CMWD customer should water supplies require.		

Drought Response Level 1 – Drought Watch

A Level 1 Drought Watch condition may apply when SDCWA notifies its member agencies that a demand reduction of up to 10% is required to allow for adequate supplies to meet demands. CMWD's Executive Manager shall declare the existence of Level 1 conditions, and Level 1 conservation practices shall be implemented.

Drought Response Level 2 – Drought Alert

A Level 2 Drought Alert condition may apply when SDCWA notifies its member agencies that a demand reduction of up to 20% is required due to drought conditions or other reduction in supplies. The CMWD Board of Directors will declare a Level 2 condition, at which point all water conservation measures under Level 1 must be adhered to, with the addition of Level 2 water use restrictions.

Drought Response Level 3 – Drought Critical

A Level 3 Drought Critical condition may apply when SDCWA notifies its member agencies that demand reductions of up to 40% are required due to drought or other reduction in supplies in order to have sufficient supplies for anticipated demands. The CMWD Board of Directors will declare a Level 3 condition, requiring the continuation of conservation measures under Level 1 and Level 2, and the implementation of Level 3 water use restrictions.

Drought Response Level 4 – Drought Emergency

A Level 4 Drought Emergency condition may apply when SDCWA declares a water shortage emergency and notifies its member agencies that demand reductions of more than 40% are required in order to maintain sufficient supplies for anticipated demands. The CMWD Board of Directors shall declare a Level 4 Drought Emergency in the manner and on the grounds provided in the California Water Code §350. With the declaration of a Level 4 drought response, all water conservation measures under Levels 1, 2, and 3 must be adhered to, with the addition of Level 4 mandatory conservation measures.

8.1.2 Prohibitions, Consumption Reduction Methods, and Penalties

CMWD's water use restrictions and prohibitions are listed in Table 8-2. The stage in which each prohibition is implemented and whether a penalty for violation of the prohibition is indicated. Mandatory and voluntary prohibitions, consumption reduction methods, and penalties are presented in Tables 8-2, 8-3, and 8-4, respectively. Methods used to determine actual water use reductions are described below under *Determining Water Use Reductions.* The reduction in water use that would occur from each of the reduction methods has not been quantified, as it varies depending on drought stage, local hydrology, and customer behavior. As specific stages are implemented, CMWD would closely monitor projected supply availability and demand. Depending on these projections, the methods presented in Table 8-5 would be enacted and enforced to achieve the desired reductions in water use.

Prohibitions

CMWD prohibits water waste at all times, and increases water use restrictions with each Drought Response Level in the Drought Ordinance. A description of all prohibition and restrictions under all levels of drought responses are provided here. As stated above, each response level also includes the restrictions of all previous levels.

Mandatory Restrictions and Prohibitions in Effect at all Times

The following water waste prohibitions are in effect at all times for CMWD's service area:

- Washing down impervious surfaces with potable water
- Water waste resulting from inefficient landscape irrigation
- Use a hand-held hose with a positive shut-off nozzle or bucket to water landscaped areas that are not irrigated by a landscape irrigation system
- Use re-circulated water to operate ornamental fountains
- Wash vehicles using a bucket or a hand-held hose with a positive shut-off nozzle or a mobile high pressure/low volume wash system
- Serve and refill water in restaurants only upon request
- Offer guests in hotels and motels the option of not laundering towels and linens daily
- Use recycled or non-potable water for construction purposes when available
- Single pass-through cooling systems as part of new water service connections will be prohibited. Non-recirculating systems in all new conveyer car wash and commercial laundry systems will also be prohibited
- Breaks, leaks, or other malfunctions in water user's plumbing or distribution system resulting in excess use, loss, or escape of water must be repaired in a timely manner

Table 8-2: CWMD Water Use Restrictions at Each Drought Response Level

DWR Table 8-2: Retail Only: Restrictions and Prohibitions on End Uses			
Stage	**Restrictions and Prohibitions on End Users**	**Additional Explanation or Reference**	**Penalty, Charge, or Enforcement?**
1	Landscape - Limit landscape irrigation to specific times	Irrigate residential and commercial landscape before 10 a.m. and after 6 p.m.	No
1	CII - Other CII restriction or prohibition	Irrigate nursery and commercial grower's products before 10 a.m. and after 6 p.m.	No
1	Other - Customers must repair leaks, breaks, and malfunctions in a timely manner	Repair all water leaks within five days of notification by CMWD	No
2	Landscape - Limit landscape irrigation to specific days	Limit residential and commercial landscape irrigation to days assigned by CMWD General Manager	Yes
2	Landscape - Other landscape restriction or prohibition	Limit irrigation using sprinklers to length of time determined by CMWD General Manager	Yes
2	Landscape - Other landscape restriction or prohibition	Water residential and commercial landscaped areas not irrigated by an irrigation system by using a bucket, land-held hose with positive shut-off nozzle, or low-volume non-spray irrigation	Yes
2	Other - Customers must repair leaks, breaks, and malfunctions in a timely manner	Repair all water leaks within seventy-two hours of notification by CMWD	Yes
2	Water Features - Restrict water use for decorative water features, such as fountains	Stop operating ornamental fountains unless recycled water is used	Yes
3	Landscape - Limit landscape irrigation to specific days	Limit residential and commercial landscape irrigation to days assigned by CMWD General Manager	Yes
3	Landscape - Other landscape restriction or prohibition	Limit irrigation using sprinklers to time limits determined by CMWD General Manager	Yes
3	Landscape - Other landscape restriction or prohibition	Water residential and commercial landscaped areas not irrigated by an irrigation system by using a bucket, land-held hose with positive shut-off nozzle, or low-volume non-spray irrigation	Yes
3	Water Features - Restrict water use for decorative water features, such as fountains	Stop filing or re-filling ornamental lakes or ponds, except to the extent needed to sustain aquatic life	Yes
3	Other - Prohibit vehicle washing except at facilities using recycled or recirculating water		Yes
3	Other - Customers must repair leaks, breaks, and malfunctions in a timely manner	Repair all water leaks within forty-eight hours of notification by CMWD	Yes
4	Landscape - Prohibit all landscape irrigation		Yes
4	Other - Customers must repair leaks, breaks, and malfunctions in a timely manner	Repair all water leaks within twenty-four hours of notification by CMWD	Yes

Drought Response Level 1 – Drought Watch

During Level 1 Drought Watch conditions, CMWD will increase its public education and outreach efforts to emphasize the need to implement the following conservation practices in addition to the previous listed measures:

- Irrigate residential and commercial landscape before 10 a.m. and after 6 p.m. only
- Irrigate nursery and commercial grower's products before 10 a.m. and after 6 p.m. only
- Repair all water leaks within five days of notification by CMWD

Drought Response Level 2 – Drought Alert

Under Level 2 Drought Alert conditions all water conservation measures under Level 1 must be adhered to, with the addition of the following mandatory conservation measures:

- Limit residential and commercial landscape irrigation to specified assigned days per week, which will be established by CMWD's General Manager
- Limit irrigation using sprinklers to time limits per watering station per assigned day as established by CMWD's General Manager
- Water landscaped areas not irrigated by a landscape irrigation system by using a bucket, hand-held hose with positive shut-off nozzle, or low-volume non-spray irrigation
- All leaks must be repaired within 72 hours of notification by CMWD
- Stop operating ornamental fountains or similar decorative water features unless recycled water is used

Drought Response Level 3 – Drought Critical

During Level 3 Drought Critical conditions, conservation measures under Level 1 and Level 2 shall continue, with the implementation of the following additional mandatory measures:

- Limit landscape irrigation using sprinklers to time limits water station per assigned day as established by the General Manager
- Water landscaped areas not irrigated by a landscape irrigation system by using a bucket, hand-held hose with a positive shut-off nozzle, or low-volume non-spray irrigation
- Stop filling or re-filling ornamental lakes or ponds, except to the extent needed to sustain aquatic life
- Stop washing vehicles except at commercial carwashes that re-circulate water, or by high pressure/low volume wash systems
- Repair all leaks within 48 hours of notification by CMWD

Additionally, under a Level 3 drought response, no new potable water service shall be provided, no new temporary meters or permanent meters shall be provided, and no statements of immediate ability to serve or provide potable water service shall be issued, with the exception of the circumstances listed in the Drought Ordinance. The CMWD Board of Directors will suspend consideration of annexations to its service area and may establish a water allocation for property served by CMWD.

Drought Response Level 4 – Drought Emergency

With the declaration of a Level 4 Drought Emergency, all water conservation measures under Levels 1, 2, and 3 must be adhered to with the addition of the following mandatory conservation measures:

- Stop all landscape irrigation, except crops and landscape products of commercial growers and nurseries
- Repair all leaks within 24-hours of notification by CMWD
- CMWD may install a flow restricting device for services of up to one and one-half inch size and comparatively sized restrictors for larger services upon a prior determination that the customer has repeatedly violated the provision of Ordinance 44.

Additionally, CMWD may establish a water allocation for property served by CMWD.

Consumption Reduction Measures

CMWD also implements consumption reduction measures to assist customers throughout its service area in reducing water use. These methods include rebate programs, public information and education programs and the suspension of additional water connections within its service area. CMWD's consumption reduction measures are provided in Table 8-3.

Table 8-3: Consumption Reduction Measures Implemented by CMWD

DWR Table 8-3 Retail Only: Stages of WSCP - Consumption Reduction Methods		
Stage	**Consumption Reduction Methods by Water Supplier**	**Additional Explanation or Reference**
All Stages	Provide Rebates on Plumbing Fixtures and Devices	
All Stages	Provide Rebates for Landscape Irrigation Efficiency	
All Stages	Provide Rebates for Turf Replacement	
1	Expand Public Information Campaign	
3	Moratorium or Net Zero Demand Increase on New Connections	
3	Other	Suspension of consideration of annexations to CMWD service area
3	Other	The Board of Directors may establish a water allocation for property in served by CMWD
4	Other	The Board of Directors may establish a water allocation for property in served by CMWD

Penalties

When mandatory restrictions are in place, CMWD implements penalties for violations of the restrictions or prohibitions described above, as proscribed by The Drought Ordinance and Ordinance No. 46. Each day that a violation occurs is considered a separate offense and administrative fines may be levied for each violation. For the first violation, CMWD will verbally notice the fact of the violation. For the second violation, CMWD will provide a written notice to the customer of the violation. For the third violation, CMWD may install a flow restricting device of one gallon per minute capacity for services of up to one

and one-half inch size and comparatively sized restrictions for larger services upon a prior determination of multiple violations. Additionally, an administrative fine of $100 may be issued for the third violation. For a fourth violation within a one year period, CMWD may issue a $200 administrative fine. Additional violations exceeding the fourth violation within a one year period may result in a $500 administrative fine. Table 8-4 indicates the penalties for violation and at what stage they take effect.

Table 8-4: CMWD Penalties for Use Restriction Violations

Penalty	Stage	Trigger
Warning letter	All stages	First Violation
Notice of violation	All stages	Second Violation
Flow restriction installed	All stages	Third Violation
Administrative citations	All stages	Third Violation ($100) Fourth Violation ($200) Fifth or More Violation ($500)

In lieu of administrative penalties as described above, when deemed appropriate and necessary, each violation may be prosecuted as a misdemeanor punishable by imprisonment for no more than thirty days or by a fine not to exceed $1,000, or by both. All customers who incur a penalty due to violation of the Drought Ordinance and Ordinance No. 46 have the right to appeal the penalty.

8.1.3 Determining Water Use Reductions

Because all water received from SDCWA is metered and monitored, and all CMWD customers are metered and billed monthly using computerized equipment, data are collected on an on-going basis that can allow CMWD to determine actual water use reductions. Each customer or customer group can be evaluated for compliance with conservation requirements. Methods used by CMWD to determine actual reductions in water use are summarized in Table 8-5.

Table 8-5: Methods for Measuring Water Use Reductions

Method for Determining Actual Reduction	Type and Quality of Data Expected
Use normalized or average water use baseline to determine reductions	Each customer will be given a schedule of monthly use targets based upon the required reduction compared to the base period usage. Usage over the amount allocated for any given month will result in the customer incurring penalty pricing for usage that month. Usage under that amount will be accumulated to possible offset over-usage in successive month period.
More frequent review of production	Water production is currently monitored on a real-time basis through CMWD's SCADA system, and reviewed on a daily basis.
More frequent meter reading at customer locations	Customer meters are read on a monthly basis which would coincide with the monthly allocation periods. Customers are given information on how to read their meter and monitor their own usage.
More frequent leak detection and repair	Leak detection and repair is currently an active and ongoing O&M function, so no major changes would be expected.
System audit	The water system is currently audited on a monthly and annual basis, comparing metered deliveries from the SDCWA to metered deliveries to retail customers.

Method for Determining Actual Reduction	Type and Quality of Data Expected
Automated sensors and telemetry	CMWD has a SCADA system, which contains features to provide real-time monitoring and alarms communications to on-call operators for identify abnormalities in reservoir fill rates, draw-down rates, and pump function, which can be associated system leaks and other malfunctions that could result in water loss.
Monitor utility actions	All CMWD actions are monitored and reported in a comprehensive Activities Report provided to the Board of Directors on an annual basis. Other types of staff reports on CMWD activities are given at the two regular Board Meeting each month or on as needed basis by the Executive Manager.
Penalties for customers	If and when penalty pricing were implemented, the amount and frequency of penalties would be monitored by the City of Carlsbad's computerized billing system and then reported to the management staff and to the Board of Directors on a monthly basis.

8.2 Description of Revenue and Expenditure Impacts

In the event of a water emergency, the Drought Ordinance and Ordinance No. 46 would be activated to respond to the level of shortage. At that time, drought response stage actions would go into effect, and CMWD's revenue is anticipated to decrease due to reduced water sales. The amount of decreased revenue would depend upon the response stage, and how long each stage is in effect. In the event that revenues are less than required to meet CMWD's financial obligations as a result of a water shortage, the CMWD would draw from its operating reserves and then propose increasing water rates to appropriate levels for the Board's consideration. The operating reserves are maintained at adequate levels to provide short-term operating capital in case of emergencies as well as provide for rate stabilization. Tables 8-6 and 8-7 present how different actions and conditions impact revenues and expenditures, as well as provides a summary of potential actions that could be taken to address these impacts.

Table 8-6: Impacts to Revenues and Methods to Address Impact

Potential Impacts to Revenues	
Action	**Anticipated Revenue Impact**
Rate adjustment	No impact. This would be an administrative function to analyze rate structure options to offset potential losses in revenue associated with reduced sales.
Change in quantity of sales	Reduction in revenue expenses and associated reduction in quantity charge-based revenues generated to cover local O&M costs. Could be offset by a combination of budget reductions, expense deferrals, including some non-critical CIP projects, draws on rate stabilization and operating reserves, and rate adjustments.
Potential Solutions for Revenue Decreases	
Action	**Anticipated Effects**
Reserve Fund	This option would have no short-term impact on the rate payers or CMWD because there are currently sufficient funds in CMWD's operating reserves.
Change rate structure	Minimal changes in rates could offset significant reductions in available water supplies.
Reduce overhead	Overhead, or local fixed O&M costs, can be reduced in the short and mid-term by deferring selected cash-funded CIP and major maintenance projects, other expenditure reductions and if needed, hiring freezes.

Decrease capital expenditures	Deferral of selected, non-critical replacement projects will have little or no impact on CMWD or its customers, and would only extend the duration of the master planned replacement schedule. Infrastructure for new development is funded by new development and progresses at the rate needed by new development projects.
Revise planning estimates	If supply reduction were long-term, CMWD would make commensurate adjustments to its CIP schedule, staffing levels and retail rate structures based upon lower retail sales. Impacts would be moderate and implemented over time.

Table 8-7: Impacts to Expenditures and Methods to Address Impacts

Potential Impacts to Expenditures	
Actions	**Potential Impacts**
Change in quantity of sales	Sales reductions could be offset with rate and budget adjustments and moderate CIP deferrals.
Increased staff/salaries/overtime	No impacts. Existing staff would be re-assigned to perform functions required to implement and enforce consumption reduction methods and requirements.
Increased costs of new supplies, transfers or exchanges	SDCWA would secure new supplies whose cost would be melded into overall costs. Increased costs of wholesale water would be passed through to CMWD's customers.
Potential Solutions for Expenditure Impacts	
Action	**Anticipated Effects**
Reserve Fund	No impacts. The Replacement Fund is sufficient, and exists for the very purposes anticipated in a supply shortage scenario.
Change rate structure	Given the mix of wholesale water and power expenditures, non-commodity revenues needed to cover local fixed costs, availability of reserves and the flexibility to adjust CIP expenditures, no short-term (1 to 2 year) impacts are anticipated, mid-term (3 years) impacts would be moderate, and long-term (beyond 3 years) impacts would be moderate and incremental.
Reduce overhead	In the short-term and mid-term, overhead or local costs can be reduced by deferring non-critical CIP and major maintenance expenditures. In the long-term, costs can be reduced by adjusting operational and staffing levels and retail water rate structures to incorporate the reality of lower retail water sales than previously anticipated.
Decrease capital expenditures	In the short-term, there could be a decrease in the level of expenditures for CMWD's replacement program, or an interruption of expenditures. In the mid- to long-term, the retail rate structure and the prioritization schedule would be adjusted to ensure that projects critical to service and system reliability were implemented.
Revise planning estimates	If the reduced supply is determined to be a long-term condition, then commensurate adjustments would be incorporated into long-term staffing and water system facility requirements.

8.3 Catastrophic Supply Interruption Plan

CMWD's supplies are at risk for a catastrophic interruption because of its reliance on imported water to meet potable demands. While CMWD and SDCWA are both striving to reduce this dependence on imported water (through development of local supplies and increased recycled water use), the risk still exists that supplies will be interrupted in the event of a natural or man-made disaster.

Potential catastrophes to which CMWD's supplies may be vulnerable include, but may not be limited to:

- Earthquake
- Fire/explosion
- Medical
- Flood
- Tornado/severe weather
- Bomb threat
- Hard freeze
- Loss of normal water supply
- Hazardous material release
- Contamination of SDCWA or CMWD water supplies
- Terrorist attack

The 125 HP Bressi Potable Water Pump Station

CMWD has taken several actions for preparation for, and implementation during, a catastrophic interruption of water supplies. In the event of a supply interruption, CMWD's defined command chain dispatches crews to inspect infrastructure and critical operations. Operations response crews are assigned to monitor system operations and modify operations as necessary, depending on the status of the system, the disaster, and needs. The defined communication command chain coordinates with other local water agencies and emergency response officials as necessary. Criteria and procedures are provided to return system to normal operations, including initiating water quality testing when necessary and performing necessary emergency repairs to the system. The emergency operations plan contains contact information for responsible parties and support services. Water shortage contingency plan stages will be implemented as required by the situation.

8.4 Minimum Supply Next Three Years

CMWD's potable supplies are currently purchased from SDCWA. The minimum available supply for CMWD is determined by SDCWA, based on SDCWA's local supply projections, storage, and ability to access imported water, as well as CMWD's local needs. **Table 8-8** provides an estimate of the minimum water supply available from SDCWA during 2016, 2017, and 2018, assuming the same hydrology during the historical multiple-dry year period.

Table 8-8: Minimum Potable Water Supply for 2016-2018 (AFY)

DWR Table 8-4 Retail: Minimum Supply Next Three Years			
	2016	2017	2018
Available Water Supply	15,714	17,338	19,042
Notes: Assumes 2016, 2017, and 2018 are multiple-dry years 1, 2, and 3, with demand increasing over normal by 6%, 11%, and 16%, respectively. Normal year demands are assumed as a straight line projection between 2015 and 2020 to establish normal year demands for 2016, 2017, and 2017.			

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Section 9

Demand Management Measures

This section describes the past and current demand management measures (DMMs) undertaken by CMWD and quantifies, to the extent feasible, DMM efforts from 2010 through 2014 (the most recent years for which reporting is available).

9.1 Current Demand Management Measures

CMWD currently implements a variety of DMMs to manage customer demands. Together, these DMMs have contributed to CMWD's success in reaching its SBx7-7 Targets (refer to Section 5 Baselines and Targets) and contributed to a more conservation-literate population.

9.1.1 Water Waste Prevention Ordinances

CMWD has two ordinances in place (both adopted in 2009) to prohibit water waste and encourage water use efficiency within the service area. The ordinances are updated as-needed in order to comply with State regulations and regional response to drought conditions. A short summary of these ordinances is provided here. For more details, refer to *Section 8 Water Shortage Contingency Planning* and Appendix I.

1. Ordinance No. 44 – Drought Response Plan and Water Conservation Program (Drought Ordinance)
2. Ordinance No. 46 – Watering Schedules

UWMPs and the Water Conservation Act of 2009: Conservation requirements for the UWMP are based on the Water Conservation Act of 2009 (SBX7-7). This act mandates a 20% reduction in water use from average (based on 10-15 year baseline), measured in GPCD (gallons per capita per day, based on gross water use), by 2020, with an interim target of 10% reduction by 2015. For more information, refer to: http://www.water.ca.gov/urbanwatermanagement/uwmp2015.cfm

2015/2016 Emergency Regulations: Executive Order B-29-15 (April 2015; extended March 2016) imposed temporary mandatory conservation aimed at achieving 25% reduction statewide from 2013 levels during the current multi-year drought. Each water purveyor was assigned a conservation target by the state, measured in R-GCPD (residential gallons per capita per day, based on residential water use). CMWD's initial conservation target was 28%, but was reduced to 20% due to regional supply development. For more information, refer to: http://www.waterboards.ca.gov/water_issues/programs/conservation_portal/emergency_regulation.shtml

2016 Extended Emergency Regulations: In May 2016, the SWRCP adopted new emergency regulations (applies June 2016 – January 2017) that would allow water purveyors to identify their own temporary conservation targets based on their ability to meet demands during continuation of multiple dry year conditions into 2017, 2018, and 2019. For more information refer to: http://www.waterboards.ca.gov/water_issues/programs/conservation_portal/emergency_regulation.shtml

CMWD also provides information on its website's Water Rules page regarding any water use restrictions in place at a given time (http://www.carlsbadca.gov/services/depts/pw/utils/water/rules.asp).

Drought Response Plan and Water Conservation Program (Drought Ordinance):

The Drought Ordinance establishes ten water waste prohibitions in effect at all times, as well as four drought response levels that correspond to SDCWA's drought management plan stages for signaling appropriate conservation use restrictions and targets. Table 9-1 provides a summary of the four drought response levels and Section *8 Water Shortage Contingency Plan* includes a detailed discussion of the four levels. A copy of the full ordinance is included in Appendix I.

Table 9-1: Drought Response Levels

Drought Response Condition Levels	Use Restrictions	Conservation Target	Drought Management Plan Stage
Level 1-Drought Watch	Voluntary	Up to 10%	Stage 1 or 2
Level 2-Drought Alert	Mandatory	Up to 20%	Stage 2 or 3
Level 3-Drought Critical	Mandatory	Up to 40%	Stage 3
Level 4-Drought Emergency	Mandatory	Above 40%	Stage 3

Watering Schedules:

Ordinance No. 46 provides the authority for CMWD to set watering schedules when a drought response condition level is triggered, and provides a mechanism for appropriate public notification of any changes to watering schedules resulting from implementation of a drought response condition level. A copy of the ordinance is included in Appendix I.

9.1.2 Metering

All of CMWD's water connections are metered and billed according to water consumed. There are some mixed-use meters where irrigation and domestic use are metered through one service connection meter in CMWD's service area. CMWD plans to convert those property's irrigation systems to recycled water as the Phase III Recycled Water Project is constructed and the recycled water distribution system is extended.

CMWD has a water meter replacement and calibration plan in place to ensure that meters are performing correctly and all water consumed is being recorded. In general, CMWD replaces meters under 1-inch every 20 years and meters over 1-inch every 15 years.

9.1.3 Conservation Pricing

CMWD has and will continue to utilize a combination of uniform and increasing block or tiered rate conservation rate structures for potable water served. Single family and multifamily residential customer classes are billed in increasing block structures where the water rate increases for additional water units consumed. Table 9-2 shows the residential customer billing rates for 2015. Commercial, agricultural, and irrigation customer classes are billed using uniform rate structures where a flat rate is billed for every unit consumed. One unit is equal to a hundred cubic feet, or 748 gallons. Table 9-3 shows the 2015 billing rates for commercial customers. Recycled water was billed at a flat rate of $3.53 for all non-potable water customers in 2015.

Table 9-2: 2015 Residential Customer Billing Rates for Potable Water

Tier	Block Structure	Cost per Unit[1]
Single Family and Master-Metered[2]		
Tier 1	0 – 10 units	$3.35/unit
Tier 2	11-18 units	$4.45/unit
Tier 3	19 units and above	$6.42/unit
Multiple Family[2]		
Tier 1	0 – 5 units	$3.35/unit
Tier 2	6-10 units	$4.45/unit
Tier 3	11 units and above	$6.42/unit
[1] One water unit is 100 cubic feet or 748 gallons [2] Tiers are based on water use per dwelling unit, as measured in units of water consumed		

Table 9-3: 2015 Commercial Customer Billing Rates for Potable Water

Tier	Cost per Unit[1]
Agricultural rate	$4.15/unit
Irrigation rate	$4.44/unit
Commercial rate	$6.42/unit
[1] One water unit is 100 cubic feet or 748 gallons	

9.1.4 Public Education and Outreach

CMWD implements multiple approaches to public education and outreach on a variety of projects, initiatives, and goals. These approaches use outreach, workshops, school education programs, and provision of resources for CMWD customers. Many of CMWD's efforts are implemented in coordination with other agencies and through regional efforts. Between 2010 and 2014, CMWD has dedicated over $3.6 million to support public education and outreach efforts.

Outreach Activities

CWMD staffs a water conservation booth dedicated to promoting water conservation at several events throughout the year. Displayed are handouts containing indoor and outdoor water saving information and conservation tools as free giveaways

In order to reach a wide range of audiences, CMWD also makes brochures and handouts available at various community centers and City of Carlsbad and CMWD offices. Bill inserts are included with utility bills to announce available programs and important water conservation reminders. CMWD has consistently reached out to customers on at least a quarterly basis using various methods every quarter within the last five years. In coordination with SDCWA, CMWD promotes opportunities for residents to participate in regional programs such as Green Oceanside Business Network certification, California–Friendly landscape contest, Speaker Bureaus, and Citizens Water Academy. As a member of the NSDWRC, CMWD participates in outreach efforts educating the public on recycled water and potable reuse safety and use, and the importance of potable water conservation to the region.

Workshops

In coordination with SDCWA, CMWD provides workshops on water related themes geared to the residential user. Workshop topics presented in the past include California Friendly Landscape Training and Fix-a-Leak. Workshops are offered for free and held at different locations through the county, including within CMWD's service area.

School Education

CMWD offers two school education programs for local schools as well as education materials to teachers upon request through SDCWA. The Splash Lab offers assembly presentations available to grades K – 6th to educate students on water science. For Grades 4 – 6, students can participate in a mobile water lab for a hands-on experience learning water related topics.

Residential Customer Resources

In coordination with MWD's SoCal Water$mart program and SDCWA's WaterSmart San Diego County program, rebates are available to CMWD customers to promote indoor and outdoor water conservation. One popular program that exhausted funds in 2015 was the turf removal rebate program designed to encourage the replacement of water thirsty turf for drought tolerant plants. These programs are advertised and linked to on CMWD's water conservation website. Through SDCWA's turf replacement rebate program, CMWD customers have converted 24,258 square feet of turf to water-wise landscaping, as of June 2015. Additional funds were recently secured by SDCWA to continue its turf conversion rebates, and it is anticipated that CMWD customers will continue to participate in turf conversions through this program.

Table 9-4 provides a list of all rebates available and their associated rebate amounts.

Table 9-4 Residential Water Conservation Rebate

Rebate Program Name	Rebate Amount
Indoor Rebates	
Turf removal rebate	$2/sq ft up to $6,000
Clothes washer rebate	$135
HE toilets	$100
Outdoor Rebates	
Turf removal rebate	$2/sq ft up to $6,000
Irrigation controllers	$80
Irrigation nozzles	$4/nozzle - minimum is 15
Rain barrels	$75
Soil moisture sensors	$35/controller station

Commercial Customer Resources

In coordination with MWD's SoCal Water$mart Program and SDCWA's WaterSmart San Diego County program, CMWD provides information on available rebates for CMWD's commercial customers that promote water efficiency for businesses. Table 9-5 displays the rebates and their associated amounts available to commercial customers that were available in recent years.

Table 9-5 Commercial Water Conservation Rebates

Rebate Name	Rebate Amount
Indoor Fixtures	
HE toilet	$100 or $145 (for more efficient 4-liter)
Flush meters	$100
UL Urinal	$200
Zero Water urinal	$200
Flow valve restrictions	$5/valve
Outdoor Fixtures	
Turf removal	$2/sq ft up to $6,000
Irrigation controllers	$35/controller station
Irrigation heads	$4/nozzle
Flow regulators	$1
Soil moisture sensors	$35/station
Restaurant Fixtures	
Connectionless food steamers	$485
Air-cooled ice machines	$1,000
Commercial/Industrial	
Cooling tower conductivity controllers	$625
Cooling tower pH controllers	$1,750
Dry vacuum pump	$125
Laminar flow restrictors	$10/restrictor

Large Landscape Water Audits

Dedicated Large Landscape customers are offered water audits to provide suggestions on improving water efficiency and to qualify for water conservation rebates. In the past five years, approximately twelve water audits have been performed by CMWD staff and an independent contractor.

WaterSmart Check-up Program

CMWD has and will continue to offer the WaterSmart Check-up Program, in coordination with SDCWA, to top water users each month. During a WaterSmart check-up, a representative visits a property upon request to provide water saving tips and perform a water audit. This audit includes an inventory of water fixtures used indoors and outdoors, replacement of high use water fixtures, evaluating toilets for leaks, and performing a landscape water audit. During the water audit, sprinkler stations are turned on to evaluate inefficiencies and adjustments to watering schedules are made where appropriate. A summary report with additional conservation advertising is left with the customer at the end of the appointment.

9.1.5 Programs to Assess and Manage Distribution System Real Loss

CMWD has completed the AWWA Water Loss Audit Software program and has determined that water losses are within the acceptable industry standard range. Water losses have been incorporated into the appropriate tables in *Section 4 System Use*. CMWD is proactive in reducing unaccounted for water

by ensuring water meters are regularly maintained, evaluated for functionality, and replaced well within industry standards.

Reported leaks are investigated and recorded in a tracking database that collects the time of report, leak location, and type of leaking pipe or fitting. Leaks are repaired to the extent that is cost effective and prioritized based on potential water loss.

9.1.6 Water Conservation Program Coordination and Staffing Support

Water conservation staffing is performed by a full time (1 FTE) Water Conservation Specialist and a Supervisor at 25% time. The Water Conservation Specialist is responsible for developing, implementing, and monitoring water conservation programs and for conducting water audits. They are also responsible for promoting CMWD's conservation programs.

9.2 DMM Activity

CMWD is a signatory of the California Urban Water Conservation Council (CUWCC) and is in full compliance with the Memorandum of Understand. CMWD's CUWCC reports for 2013 and 2014 are included in Appendix J for further details of compliance status. A summary of the extent of the BMPs implemented by CMWD from 2010 through 2014, along with a summary of continued and planned BMPs, is presented in Table 9-6, organized by CUWCC Best Management Practice (BMP).

Table 9-6: Extent of CWMD's DMMs, as Reported to CUWCC

BMP	2010	2011	2012	2013	2014	Planned Future (2015-2020)
1.1 Operation Practices	-	Ordinance 44; Ordinance 45	Ordinance 44; Ordinance 45; 2010 UWMP	Ordinance 44	Ordinance 44	Ordinance 44
1.2 Water Loss Control	Not Quantified	Not Quantified	Not Quantified	88 Leaks repaired; 14 AF saved	159 Leaks repaired; 30 AF saved	Continue to repair leaks in a timely manner. A noise detection system will be evaluated for implementation or zone metering may be utilized.
1.3 Metering with Commodity	All accounts metered	All accounts metered	All accounts metered	All accounts metered	All accounts metered	All accounts will continue to be metered. Advanced metering will begin implementation in select areas.
1.4 Retail Conservation Pricing	Tiered rates in place for all residential customers	Tiered rates in place for all residential customers	Tiered rates in place for all residential customers	Tiered rates in place for all residential customers	Tiered rates in place for all residential customers	Tiered rates will remain in place for all residential customers
2.1 Public Outreach	2,517 contacts with the public; 15 contacts with the media; 9 types of contact; Additional outreach programs	194,187 individual outreach points of contact; 27 news releases; Additional rebate and outreach programs with partners	265,744 individual outreach points of contact; Additional rebate and outreach programs with partners	94,450 individual outreach points of contact; 55 news releases; Additional outreach programs	430,500 individual outreach points of contact; 50 news releases; 3 Water Talk Forums	Outreach efforts will continue to be implemented using similar mechanisms. CMWD may implement additional outreach efforts as opportunities arise and need is determined.
2.2 School Education Programs	$4,700 spent in-house on school education programs[1]	Over $451,000 spent on school education programs	Over $337,000 spent on school education programs	Over $89,600 spent on school education programs	Over $66,800 spent on school education programs	Annual funds will continue to be allocated to school education programs to the extent budget is available.

[1] In 2010, only CMWD's in-house costs were reported for School Education Programs, and does not reflect the full value and costs of the program for that year.

9.3 Future DMM Implementation

CMWD plans to continue to provide information about the available array of educational and rebate programs, as funds are available to sustain the programs. The popularity of the Turf Removal Rebate displays a need and desire for residential customers wanting a more permeant option to manage outdoor water use and it is expected that this program will be marketed heavily in the next few years as funding is made available by SDCWA. Although all fixtures for indoor conservation that are now available to California customers are water efficient, CMWD still sees their rebate program as a way to continue to encourage additional conservation through high efficiency devices.

In the next few years, CMWD will be undertaking two large projects to help reduce system losses:

1. Advanced Metering Infrastructure (AMI) – AMI is being installed currently on the commercial industrial customers. The AMI program will allow CMWD and customers additional monitoring capabilities showing real time water use.
2. Leak Detection – In the next five years, CMWD will be exploring the best leak detection solutions available for use. CMWD will evaluate the use of noise sensors with fixed listening devices and also roving leak detection equipment and decide which method would be best to implement.

As demonstrated in *Section 5 Baseline and Targets*, CMWD's 2015 GPCD is well within its 2015 target, and is anticipated to remain within its SBx7-7 target for 2020. These savings have been achieved in part to implementation of the DMMs described in this section, and CMWD is committed to continued demand management through ongoing permanent savings (e.g., from landscape conversions), water waste prohibition and waste prevention ordinances, expansion of recycled water service, and other conservation efforts.

Section 10

Plan Adoption, Submittal, and Implementation

This section of the 2015 UWMP will address the steps CMWD has taken to adopt this 2015 UWMP, submit it to DWR, and outlines the steps that will be taken should it prove necessary to amend the 2015 UWMP.

10.1 Plan Review and Notification Process

CMWD encouraged community and public involvement in the 2015 UWMP by releasing a draft UWMP for public comment and holding a public hearing. The public hearing will be held on June 14, 2016, and will provide an opportunity for CMWD's customers, interested agencies and organizations, and the public to learn about CMWD's current and projected water supply situation, as well as its plans to continue to provide a reliable water supply for the future. The hearing is an opportunity for people to ask questions regarding the current situation and the viability of future plans. The hearing also includes a discussion of CMWD's SBx7-7 per capita water use targets, and the progress that has been made to-date to meet the interim 2015 target.

A 60-day notice of the public hearing was provided to San Diego County and adjacent cities and other entities on March 31, 2016. The notification list has been included in **Appendix A**, and notified agencies, cities, and the county are listed in **Table 2-5** in *Section 2 Plan Preparation*, along with their level of involvement with plan development.

Table 10-1: Notification to Cities and Counties

DWR Table 10-1 Retail: Notification to Cities and Counties		
City Name	60 Day Notice	Notice of Public Hearing
City of Carlsbad	☑	☑
County Name	60 Day Notice	Notice of Public Hearing
San Diego County	☑	☑

Public hearing notifications were published in the San Diego Union Tribune on May 24 and 31, 2016, and copies of the draft 2015 UWMP were made available for public review at the City of Carlsbad's Faraday Center, 1635 Faraday Avenue; at the Carlsbad City Libraries located at 1250 Carlsbad Village Drive and 1775 Dove Lane; at the Carlsbad City Clerk's Office, 1200 Carlsbad Village Drive, and on the City of Carlsbad's website at www.carlsbadca.gov two weeks before the public hearing. A copy of the published Notice of Public Hearing is included in **Appendix A**.

10.2 Plan Adoption and Submittal Process

CMWD's Board of Directors will hold a public hearing to receive public comments on the UWMP, immediately prior to adoption of the UWMP. Following the public hearing on the document, this Plan will be considered for adoption by the Board of Directors on June 14, 2016. A copy of the adoption resolution is provided in Appendix B.

The 2015 UWMP will be submitted to DWR, the California State Library, and San Diego County within 30 days after adoption, prior to the CWC's deadline of July 1, 2016. Submitted items include an electronic copy of the 2015 UWMP, along with copies of the required tables submitted through the WUE data online submittal tool to DWR, and a CD with an electronic copy to the California State Library, in accordance with the requirements in the 2015 Guidebook. The 2015 UMWP will be available for public review on the City of Carlsbad's website within 30 days of filing a copy with DWR, or by July 30, 2016.

10.3 Plan Implementation

All data used in development of this UWMP is the most current data available, and unless otherwise noted includes data for the calendar year. CMWD shall implement the adopted 2015 UWMP in accordance with the schedule described in this Plan. Any amendments made to this Plan will require completion of the same series of notification, public hearing, adoption, and submittals as required in submittal of this original 2015 UWMP.

Section 11

References

Section 1 Introduction and Overview

Carlsbad Municipal Water District (CMWD). 2012. 2012 Water Master Plan. April.

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Section 3 System Description

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Section 4 System Water Use

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Section 5 Baselines and Targets

California Department of Water Resources (DWR). 2016. Guidebook for Urban Water Suppliers. March. Available: http://www.water.ca.gov/urbanwatermanagement/docs/2015/UWMP_Guidebook_Mar_2016_FINAL.pdf

Section 6 System Supplies

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Encina Wastewater Authority (EWA). 2015. Comprehensive Annual Financial Report, Year Ended June 30, 2015.

Metropolitan Water District of Southern California (MWD). 2016. 2015 Regional Urban Water Management Plan.

San Diego County Water Authority (SDCWA). 2010. Salinity/Nutrient Management Planning in the San Diego Region (9). September 1.

Appendix A - Notification

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Agencies Notified of CMWD 2015 UWMP
Olivenhain Municipal Water District
Rincon del Diablo Municipal Water District
San Elijo Joint Powers Authority
San Diego County Water Authority
San Diego Association of Governments
City of Encinitas
County of San Diego
City of San Diego
City of San Marcos
San Diego Local Area Formation Commission
City of Carlsbad
Vallecitos Water District
City of Vista
Encina Wastewater Authority
City of Escondido
City of Oceanside
Leucadia Wastewater District
Metropolitan Water District of Southern California
Santa Fe Irrigation District

CARLSBAD MUNICIPAL WATER DISTRICT
60-DAY PUBLIC HEARING NOTICE
2015 URBAN WATER MANAGEMENT PLAN

March 30, 2016

Carlsbad Municipal Water District
5950 El Camino Real
Carlsbad, CA 92008

This letter is to inform you that Carlsbad Municipal Water District (CMWD) is updating its Urban Water Management Plan (UWMP). California state law requires each urban water supplier to prepare and adopt an UWMP every five years. CMWD is currently preparing an update to its 2010 UWMP. The 2015 UWMP documents CMWD's plans to ensure adequate water supplies to meet existing and future demands for water under a range of water supply conditions, including water shortages.

In conformance with the California Water Code Division 6, Part 2.6, §10621, this letter serves as a notification to all city and county agencies within which CMWD provides water supplies that the UWMP is being reviewed and updated. The draft 2015 UWMP will be available for public review by May 24, 2016 on the City of Carlsbad website (www.carlsbadca.gov). Notice is hereby given that on **Tuesday, June 14, 2016** at **6:00 P.M.** at the City Council Chambers, 1200 Carlsbad Village Drive, Carlsbad, California 92008, the Board of Directors of CMWD will conduct a public hearing on the draft 2015 UWMP. Immediately following the public hearing on June 14, 2016, the 2015 UWMP will be considered for adoption by the CMWD Board of Directors. The adopted 2015 UWMP will be submitted to the California Department of Water Resources by July 1, 2016.

Please contact Ms. Shadi Sami at 760-603-7350 or Shadi.Sami@carlsbadca.gov if you would like additional information or to set up a meeting to discuss CMWD's 2015 UWMP.

Sincerely,

Wendy Chambers
General Manager

Notification of Public Hearing will be added prior to UWMP adoption

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Appendix B - UWMP Adoption Resolution

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2015 UWMP Adoption Resolution will be added after adoption

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Appendix C - UWMP Checklist

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Table F1
Checklist Arranged by Water Code Section

CWCSection	UWMP Requirement	Subject	Guidebook Location	UWMP Location
10608.20(b)	Retail suppliers shall adopt a 2020 water use target using one of four methods.	Baselines and Targets	Section 5.7 and App E	Appendix G - SBx7-7 Verification Form Section 5.1 and 5.2.3
10608.20(e)	Retail suppliers shall provide baseline daily per capita water use, urban water use target, interim urban water use target, and compliance daily per capita water use, along with the bases for determining those estimates, including references to supporting data.	Baselines and Targets	Chapter 5 and App E	Appendix G - SBx7-7 Verification Form and Section 5.2
10608.22	Retail suppliers' per capita daily water use reduction shall be no less than 5 percent of base daily per capita water use of the 5 year baseline. This does not apply is the suppliers base GPCD is at or below 100.	Baselines and Targets	Section 5.7.2	Appendix G - SBx7-7 Verification Form and Section 5.2.3
10608.24(a)	Retail suppliers shall meet their interim target by December 31, 2015.	Baselines and Targets	Section 5.8 and App E	Appendix G - SBx7-7 Verification Form and Section 5.2.3
1608.24(d)(2)	If the retail supplier adjusts its compliance GPCD using weather normalization, economic adjustment, or extraordinary events, it shall provide the basis for, and data supporting the adjustment.	Baselines and Targets	Section 5.8.2	N/A
10608.26(a)	Retail suppliers shall conduct a public hearing to discuss adoption, implementation, and economic impact of water use targets.	Plan Adoption, Submittal, and Implementation	Section 10.3	Section 10.1
10608.36	Wholesale suppliers shall include an assessment of present and proposed future measures, programs, and policies to help their retail water suppliers achieve targeted water use reductions.	Baselines and Targets	Section 5.1	N/A
10608.40	Retail suppliers shall report on their progress in meeting their water use targets. The data shall be reported using a standardized form.	Baselines and Targets	Section 5.8 and App E	Appendix G - SBx7-7 Verification Form and Section 5.2.3

10620(b)	Every person that becomes an urban water supplier shall adopt an urban water management plan within one year after it has become an urban water supplier.	Plan Preparation	Section 2.1	Section 2
10620(d)(2)	Coordinate the preparation of its plan with other appropriate agencies in the area, including other water suppliers that share a common source, water management agencies, and relevant public agencies, to the extent practicable.	Plan Preparation	Section 2.5.2	Section 2.2
10620(f)	Describe water management tools and options to maximize resources and minimize the need to import water from other regions.	Water Supply Reliability Assessment	Section 7.4	Section 7.3
10621(b)	Notify, at least 60 days prior to the public hearing, any city or county within which the supplier provides water that the urban water supplier will be reviewing the plan and considering amendments or changes to the plan.	Plan Adoption, Submittal, and Implementation	Section 10.2.1	Appendix A - Notification and Section 10.1
10621(d)	Each urban water supplier shall update and submit its 2015 plan to the department by July 1, 2016.	Plan Adoption, Submittal, and Implementation	Sections10.3.1 and 10.4	Section 10.2
10631(a)	Describe the water supplier service area.	System Description	Section 3.1	Section 3.1
10631(a)	Describe the climate of the service area of the supplier.	System Description	Section 3.3	Section 3.1.2
10631(a)	Indicate the current population of the service area.	System Description and Baselines and Targets	Sections 3.4and 5.4	Section 3.1.3
10631(a)	Provide population projections for 2020, 2025, 2030, and 2035.	System Description	Section 3.4	Section 3.1.3
10631(a)	Describe other demographic factors affecting the supplier’s water management planning.	System Description	Section 3.4	Section 3.1.3
10631(b)	Identify and quantify the existing and planned sources of water available for 2015, 2020, 2025, 2030, and 2035.	System Supplies	Chapter 6	Section 6.9
10631(b)	Indicate whether groundwater is an existing or planned source of water available to the supplier.	System Supplies	Section 6.2	Section 6.3

10631(b)(1)	Indicate whether a groundwater management plan has been adopted by the water supplier or if there is any other specific authorization for groundwater management. Include a copy of the plan or authorization.	System Supplies	Section 6.2.2	Section 6.3
10631(b)(2)	Describe the groundwater basin.	System Supplies	Section 6.2.1	Section 6.3
10631(b)(2)	Indicate if the basin has been adjudicated and include a copy of the court order or decree and a description of the amount of water the supplier has the legal right to pump.	System Supplies	Section 6.2.2	Section 6.3
10631(b)(2)	For unadjudicated basins, indicate whether or not the department has identified the basin as overdrafted, or projected to become overdrafted. Describe efforts by the supplier to eliminate the long-term overdraft condition.	System Supplies	Section 6.2.3	Section 6.3
10631(b)(3)	Provide a detailed description and analysis of the location, amount, and sufficiency of groundwater pumped by the urban water supplier for the past five years.	System Supplies	Section 6.2.4	Section 6.3
10631(b)(4)	Provide a detailed description and analysis of the amount and location of groundwater that is projected to be pumped.	System Supplies	Sections 6.2and 6.9	Section 6.3 and Section 6.9
10631(c)(1)	Describe the reliability of the water supply and vulnerability to seasonal or climatic shortage.	Water Supply Reliability Assessment	Section 7.1	Section 7.1
10631(c)(1)	Provide data for an average water year, a single dry water year, and multiple dry water years	Water Supply Reliability Assessment	Section 7.2	Section 7.2
10631(c)(2)	For any water source that may not be available at a consistent level of use, describe plans to supplement or replace that source.	Water Supply Reliability Assessment	Section 7.1	Sections 7.2 and 7.3
10631(d)	Describe the opportunities for exchanges or transfers of water on a short-term or long- term basis.	System Supplies	Section 6.7	Section 6.6
10631(e)(1)	Quantify past, current, and projected water use, identifying the uses among water use sectors.	System Water Use	Section 4.2	Sections 4.1 and 4.2
10631(e)(3)(A)	Report the distribution system water loss for the most recent 12-month period available.	System Water Use	Section 4.3	Section 4.1.3

10631(f)(1)	Retail suppliers shall provide a description of the nature and extent of each demand management measure implemented over the past five years. The description will address specific measures listed in code.	Demand Management Measures	Sections 9.2and 9.3	Section 9.1
10631(f)(2)	Wholesale suppliers shall describe specific demand management measures listed in code, their distribution system asset management program, and supplier assistance program.	Demand Management Measures	Sections 9.1and 9.3	N/A
10631(g)	Describe the expected future water supply projects and programs that may be undertaken by the water supplier to address water supply reliability in average, single-dry, and multiple-dry years.	System Supplies	Section 6.8	Section 6.8
10631(i)	Describe desalinated water project opportunities for long-term supply.	System Supplies	Section 6.6	Section 6.5
10631(j)	CUWCC members may submit their 2013- 2014 CUWCC BMP annual reports in lieu of, or in addition to, describing the DMM implementation in their UWMPs. This option is only allowable if the supplier has been found to be in full compliance with the CUWCC MOU.	Demand Management Measures	Section 9.5	Appendix J - CUWCC Reports
10631(j)	Retail suppliers will include documentation that they have provided their wholesale supplier(s) – if any - with water use projections from that source.	System Supplies	Section 2.5.1	Section 2.2 and Table 2-4
10631(j)	Wholesale suppliers will include documentation that they have provided their urban water suppliers with identification and quantification of the existing and planned sources of water available from the wholesale to the urban supplier during various water year types.	System Supplies	Section 2.5.1	N/A
10631.1(a)	Include projected water use needed for lower income housing projected in the service area of the supplier.	System Water Use	Section 4.5	Section 4.4
10632(a) and 10632(a)(1)	Provide an urban water shortage contingency analysis that specifies stages of action and an outline of specific water supply conditions at each stage.	Water Shortage Contingency Planning	Section 8.1	Section 8.1.1

10632(a)(2)	Provide an estimate of the minimum water supply available during each of the next three water years based on the driest three- year historic sequence for the agency.	Water Shortage Contingency Planning	Section 8.9	Section 8.4
10632(a)(3)	Identify actions to be undertaken by the urban water supplier in case of a catastrophic interruption of water supplies.	Water Shortage Contingency Planning	Section 8.8	Section 8.3
10632(a)(4)	Identify mandatory prohibitions against specific water use practices during water shortages.	Water Shortage Contingency Planning	Section 8.2	Section 8.1.2
10632(a)(5)	Specify consumption reduction methods in the most restrictive stages.	Water Shortage Contingency Planning	Section 8.4	Section 8.1.2
10632(a)(6)	Indicated penalties or charges for excessive use, where applicable.	Water Shortage Contingency Planning	Section 8.3	Section 8.1.2
10632(a)(7)	Provide an analysis of the impacts of each of the actions and conditions in the water shortage contingency analysis on the revenues and expenditures of the urban water supplier, and proposed measures to overcome those impacts.	Water Shortage Contingency Planning	Section 8.6	Section 8.2
10632(a)(8)	Provide a draft water shortage contingency resolution or ordinance.	Water Shortage Contingency Planning	Section 8.7	Appendix I - CMWD Drought Ordinance No. 44 and No. 46
10632(a)(9)	Indicate a mechanism for determining actual reductions in water use pursuant to the water shortage contingency analysis.	Water Shortage Contingency Planning	Section 8.5	Section 8.1.3
10633	For wastewater and recycled water, coordinate with local water, wastewater, groundwater, and planning agencies that operate within the supplier's service area.	System Supplies (Recycled Water)	Section 6.5.1	Section 6.7.1
10633(a)	Describe the wastewater collection and treatment systems in the supplier's service area. Include quantification of the amount of wastewater collected and treated and the methods of wastewater disposal.	System Supplies (Recycled Water)	Section 6.5.2	Section 6.7.2
10633(b)	Describe the quantity of treated wastewater that meets recycled water standards, is being discharged, and is otherwise available for use in a recycled water project.	System Supplies (Recycled Water)	Section 6.5.2.2	Section 6.7.2
10633(c)	Describe the recycled water currently being used in the supplier's service area.	System Supplies (Recycled Water)	Section 6.5.3 and 6.5.4	Section 6.7.4

10633(d)	Describe and quantify the potential uses of recycled water and provide a determination of the technical and economic feasibility of those uses.	System Supplies (Recycled Water)	Section 6.5.4	Section 6.7.5
10633(e)	Describe the projected use of recycled water within the supplier's service area at the end of 5, 10, 15, and 20 years, and a description of the actual use of recycled water in comparison to uses previously projected.	System Supplies (Recycled Water)	Section 6.5.4	Sections 6.7.5 and 6.9
10633(f)	Describe the actions which may be taken to encourage the use of recycled water and the projected results of these actions in terms of acre-feet of recycled water used per year.	System Supplies (Recycled Water)	Section 6.5.5	Section 6.7.6
10633(g)	Provide a plan for optimizing the use of recycled water in the supplier's service area.	System Supplies (Recycled Water)	Section 6.5.5	Section 6.7.6
10634	Provide information on the quality of existing sources of water available to the supplier and the manner in which water quality affects water management strategies and supply reliability.	Water Supply Reliability Assessment	Section 7.1	Section 7.1
10635(a)	Assess the water supply reliability during normal, dry, and multiple dry water years by comparing the total water supply sources available to the water supplier with the total projected water use over the next 20 years.	Water Supply Reliability Assessment	Section 7.3	Section 7.3
10635(b)	Provide supporting documentation that Water Shortage Contingency Plan has been, or will be, provided to any city or county within which it provides water, no later than 60 days after the submission of the plan to DWR.	Plan Adoption, Submittal, and Implementation	Section 10.4.4	Appendix A - Notification and Section 10.2
10642	Provide supporting documentation that the water supplier has encouraged active involvement of diverse social, cultural, and economic elements of the population within the service area prior to and during the preparation of the plan.	Plan Preparation	Section 2.5.2	Appendix A - Notification and Section 2.2 and 2.3
10642	Provide supporting documentation that the urban water supplier made the plan available for public inspection, published notice of the public hearing, and held a public hearing about the plan.	Plan Adoption, Submittal, and Implementation	Sections 10.2.2, 10.3, and 10.5	Appendix A - Notification and Section 10.1

10642	The water supplier is to provide the time and place of the hearing to any city or county within which the supplier provides water.	Plan Adoption, Submittal, and Implementation	Sections 10.2.1	Appendix A - Notification and Section 10.1
10642	Provide supporting documentation that the plan has been adopted as prepared or modified.	Plan Adoption, Submittal, and Implementation	Section 10.3.1	Appendix B and Section 10.2
10644(a)	Provide supporting documentation that the urban water supplier has submitted this UWMP to the California State Library.	Plan Adoption, Submittal, and Implementation	Section 10.4.3	Section 10.2
10644(a)(1)	Provide supporting documentation that the urban water supplier has submitted this UWMP to any city or county within which the supplier provides water no later than 30 days after adoption.	Plan Adoption, Submittal, and Implementation	Section 10.4.4	Section 10.2
10644(a)(2)	The plan, or amendments to the plan, submitted to the department shall be submitted electronically.	Plan Adoption, Submittal, and Implementation	Sections10.4.1 and 10.4.2	Section 10.2
10645	Provide supporting documentation that, not later than 30 days after filing a copy of its plan with the department, the supplier has or will make the plan available for public review during normal business hours.	Plan Adoption, Submittal, and Implementation	Section 10.5	Section 10.2

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Appendix D - UWMP Required Tables

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Table 2-1 Retail Only: Public Water Systems			
Public Water System Number	Public Water System Name	Number of Municipal Connections 2015	Volume of Water Supplied 2015
CA3710005	Carlsbad Municipal Water District	28,521	14,029
	TOTAL	28,521	14,029

NOTES: This table only reflects potable water connections and deliveries. CMWD's recycled water system has 761 connections, and supplied 3,793 AF in 2015. Note that system losses included in the total volume of water supplied was calculated for FY2015, while deliveries were recorded for calendar year 2015.

Table 2-2: Plan Identification		
☑	Individual UWMP	
☐	Regional UWMP (RUWMP)	
	Select One:	
	☐	RUWMP includes a Regional Alliance
	☐	RUWMP does not include a Regional Alliance
NOTES:		

Table 2-3: Agency Identification	
Type of Agency (select one or both)	
☐	Agency is a wholesaler
☑	Agency is a retailer
Fiscal or Calendar Year (select one)	
☑	UWMP Tables Are in Calendar Years
☐	UWMP Tables Are in Fiscal Years
If Using Fiscal Years Provide Month and Day that the Fiscal Year Begins (dd/mm)	
dd/mm	
Units of Measure Used in UWMP (select from Drop down)	
Unit	AF
NOTES:	

Table 2-4 Retail: 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
San Diego County Water Authority
NOTES:

Table 3-1 Retail: Population - Current and Projected						
Population Served	2015	2020	2025	2030	2035	2040
	86,080	91,935	94,130	96,375	97,239	97,525
NOTES: Projections used 2010 Census data (77.6% of City of Carlsbad population), 2020-2040 projections from SANDAG Series 13 model for CMWD service area, and a straight line projection from 2010-2020 for year 2015.						

Table 4-1 Retail: Demands for Potable and Raw Water - Actual			
Use Type	2015 Actual		
	Additional Description *(as needed)*	Level of Treatment When Delivered	Volume
Single Family		Drinking Water	7,088
Multi-Family		Drinking Water	1,526
Commercial		Drinking Water	2,721
Industrial		Drinking Water	6
Institutional/Governmental		Drinking Water	159
Agricultural irrigation		Drinking Water	181
Landscape		Drinking Water	1,583
Losses		Drinking Water	765
		TOTAL	14,029

NOTES: Actual potable water demands are based on CMWD's 2015 billing data and the AWWA water loss audit (refer to Appendix F for the complete audit). The AWWA water loss audit was completed for FY2015 as the most recent water loss data available, while billing data are reported in calendar year. CMWD's temporary potable meters billing category was incorporated into the Single Family use type, while the fire protection billing category was incorporated into the Institutional/Governmental use type for consistency with demand projection categories for 2020 through 2040.

Table 4-2 Retail: Demands for Potable and Raw Water - Projected						
Use Type	Additional Description *(as needed)*	Projected Water Use *Report To the Extent that Records are Available*				
		2020	2025	2030	2035	2040
Agricultural irrigation		226	205	190	70	69
Commercial		3,373	3,637	3,724	3,771	3,809
Industrial		7	7	7	7	7
Institutional/Governmental		162	171	172	171	166
Landscape		2,122	2,235	2,249	2,232	2,227
Multi-Family		2,073	2,201	2,229	2,214	2,214
Single Family		9,198	9,820	9,979	10,351	10,346
Losses		846	901	915	928	929
TOTAL		**18,007**	**19,177**	**19,465**	**19,744**	**19,768**

NOTES: Institutional/Governmental includes public buildings, schools, and fire protection. Single Family includes single family, low density single family, and temporary potable meters. Water loss was calculated as 4.7% of potable water use, based on recent AWWA water audits for CMWD's potable system.

Table 4-3 Retail: Total Water Demands						
	2015	2020	2025	2030	2035	2040
Potable and Raw Water *From Tables 4-1 and 4-2*	14,029	18,007	19,177	19,465	19,744	19,768
Recycled Water Demand *From Table 6-4*	3,793	5,078	5,078	5,078	5,078	5,078
TOTAL WATER DEMAND	17,822	23,085	24,255	24,543	24,822	24,846
NOTES: Recycled Water Demands are discussed in Section 6 System Supplies						

Table 4-4 Retail: 12 Month Water Loss Audit Reporting	
Reporting Period Start Date (mm/yyyy)	Volume of Water Loss
07/2014	765
NOTES: Water losses are reported in Fiscal Year, while the rest of the water use tables use 2015 Calendar Year data.	

Table 4-5 Retail Only: Inclusion in Water Use Projections	
Are Future Water Savings Included in Projections? (Refer to Appendix K of UWMP Guidebook)	Yes
If "Yes" to above, state the section or page number, in the cell to the right, where citations of the codes, ordinances, etc… utilized in demand projections are found.	Page 2-5
Are Lower Income Residential Demands Included In Projections?	Yes
NOTES:	

Table 5-1 Baselines and Targets Summary *Retail Agency or Regional Alliance Only*					
Baseline Period	Start Year	End Year	Average Baseline GPCD*	2015 Interim Target *	Confirmed 2020 Target*
10-15 year	1999	2008	259	233	207
5 Year	2003	2007	255		
*All values are in Gallons per Capita per Day (GPCD)					
NOTES: CMWD selected a 10-year baseline period					

Table 5-2: 2015 Compliance *Retail Agency or Regional Alliance Only**								
Actual 2015 GPCD	2015 Interim Target GPCD	**Optional Adjustments to 2015 GPCD**					2015 GPCD *(Adjusted if applicable)*	Did Supplier Achieve Targeted Reduction for 2015? Y/N
		Extraordinary Events	Economic Adjustment	Weather Normalization	TOTAL Adjustments	Adjusted 2015 GPCD		
145	233				0	145	145	Yes
**All values are in Gallons per Capita per Day (GPCD)*								
NOTES: No adjustments were made to CMWD's 2015 GPCD; Water use is significantly reduced from the baseline period due to extraordinary conservation activities underway due to the ongoing drought.								

Table 6-1 Retail: Groundwater Volume Pumped						
☑	Supplier does not pump groundwater. The supplier will not complete the table below.					
Groundwater Type	Location or Basin Name	2011	2012	2013	2014	2015
	TOTAL	0	0	0	0	0
NOTES:						

Table 6-2 Retail: Wastewater Collected Within Service Area in 2015						
❑	There is no wastewater collection system. The supplier will not complete the table below.					
100%	Percentage of 2015 service area covered by wastewater collection system *(optional)*					
100%	Percentage of 2015 service area population covered by wastewater collection system *(optional)*					
Wastewater Collection			**Recipient of Collected Wastewater**			
Name of Wastewater Collection Agency	Wastewater Volume Metered or Estimated?	Volume of Wastewater Collected in 2015	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? *(optional)*
City of Carlsbad	Metered	6,911	Encina Wastewater Authority	Encina Pollution Control Facility	Yes	Yes
Leucadia Wastewater District	Estimated	438	Encina Wastewater Authority	Encina Pollution Control Facility	Yes	Yes
Total Wastewater Collected from Service Area in 2015:		7,349				

NOTES: Wastewater flows are reported for Fiscal Year 2015, ending June 30, 2015. CMWD estimates that total wastewater flows within its service area are 5-10% higher than those collected by the City of Carlsbad due to LWWD serving a portion of CMWD's service area. 10% of LWWD's wastewater flows are included here as flows within CMWD's service area. The Encina Pollution Control Facility is owned and operated by the Encina Wastewater Authority, a joint powers authority that is owned by six agencies, including City of Carlsbad and Leucadia Wastewater District. Source: EWA, 2015.

Table 6-3 Retail: Wastewater Treatment and Discharge Within Service Area in 2015										
☐	No wastewater is treated or disposed of within the UWMP service area. The supplier will not complete the table below.									
Wastewater Treatment Plant Name	Discharge Location Name or Identifier	Discharge Location Description	Wastewater Discharge ID Number *(optional)*	Method of Disposal	Does This Plant Treat Wastewater Generated Outside the Service Area?	Treatment Level	2015 volumes			
							Wastewater Treated	Discharged Treated Wastewater	Recycled Within Service Area	Recycled Outside of Service Area
Encina Water Pollution Control Facility	Encina Ocean Outfall	Pacific Ocean		Ocean outfall	Yes	Secondary, Undisinfected	23,360	22,229	0	0
Encina Water Pollution Control Facility	Carlsbad WRF	Carlsbad WRF		Other	Yes	Tertiary	0	0	1,903	0
Encina Water Pollution Control Facility	Gafner WWTP	Gafner WWTP		Other	Yes	Tertiary	0	0	247	0
Meadowlark WRF	CMWD	CMWD Customers		Other	No	Tertiary	3,673	654	1,643	1,376
						Total	27,033	22,883	3,793	1,376
NOTES: Wastewater flows reproted in this table are for Fiscal Year 2015. All wastewater flows within CMWD's service area are treated at EWPCF, which discharges to three facitlities - an Ocean Outfall, the Carlsbad WRF, and Gafner WWTP, the later two of which recycle water for reuse. Sources: 1. EWA, 2015. 2. Robert Scholl, VWD, pers.comm. May 10, 2016.										

Table 6-4 Retail: Current and Projected Recycled Water Direct Beneficial Uses Within Service Area									
☐	Recycled water is not used and is not planned for use within the service area of the supplier. The supplier will not complete the table below.								
Name of Agency Producing (Treating) the Recycled Water:			Carlsbad Municipal Water District, Vallecitos Water District, Leucadia Wastewater District						
Name of Agency Operating the Recycled Water Distribution System:			Carlsbad Municipal Water District						
Supplemental Water Added in 2015			0 AFY						
Source of 2015 Supplemental Water			N/A						
Beneficial Use Type		General Description of 2015 Uses	Level of Treatment	2015	2020	2025	2030	2035	2040
Agricultural irrigation		Agricultural irrigation	Tertiary		23	23	23	23	23
Landscape irrigation (excludes golf courses)		Commercial property irrigation, communicity facilities, highways, HOAs, resort property irrigation, parks, and schools	Tertiary	2,703	3,705	3,705	3,705	3,705	3,705
Golf course irrigation		Golf course irrigation	Tertiary	1,090	1,033	1,033	1,033	1,033	1,033
Commercial use		Cooling	Tertiary		62	62	62	62	62
Industrial use		NRG Power Plant	Tertiary		215	215	215	215	215
Geothermal and other energy production									
Seawater intrusion barrier									
Recreational impoundment									
Wetlands or wildlife habitat									
Groundwater recharge (IPR)									
Surface water augmentation (IPR)									
Direct potable reuse									
Other	Type of Use	Public works projects	Tertiary		40	40	40	40	40
			Total:	3,793	5,078	5,078	5,078	5,078	5,078
IPR - Indirect Potable Reuse									

Table 6-5 Retail: 2010 UWMP Recycled Water Use Projection Compared to 2015 Actual			
☐	Recycled water was not used in 2010 nor projected for use in 2015. The supplier will not complete the table below.		
Use Type		2010 Projection for 2015	2015 Actual Use
Agricultural irrigation			
Landscape irrigation (excludes golf courses)		4,200	2,699
Golf course irrigation		800	1,094
Commercial use			
Industrial use			
Geothermal and other energy production			
Seawater intrusion barrier			
Recreational impoundment			
Wetlands or wildlife habitat			
Groundwater recharge (IPR)			
Surface water augmentation (IPR)			
Direct potable reuse			
Other			
Total		5,000	3,793
NOTES: The 2010 UWMP only considered Landscape Irrigation and Golf Course Irrigation and did not project for other types of use. For purposes of comparison, recycled water deliveries in 2015 were consolidated into these two use types.			

Table 6-6 Retail: Methods to Expand Future Recycled Water Use			
☐	Supplier does not plan to expand recycled water use in the future. Supplier will not complete the table below but will provide narrative explanation.		
N/A	Provide page location of narrative in UWMP		
Name of Action	Description	Planned Implementation Year	Expected Increase in Recycled Water Use
Rate Controls	Maintain recycled water rates below potable water rates		-
Phase III Recycled Water Project	Expand recycled water system to meet identified demands	2015 - 2025	1,136
Mandatory Use Ordinance	Requires dual plumbing in new development and use of recycled water if available	1990	-
Public Outreach	Outreach and education efforts as part of North San Diego Water Reuse Coalition to educate public on benefits, safety, and proper use of various types of recycled water	2014 - 2016	-
		Total	1,136
NOTES: The actions included in this table all support increased recycled water use made available and accessible through the Phase III Recycled Water Project.			

Table 6-7 Retail: Expected Future Water Supply Projects or Programs						
☐	No expected future water supply projects or programs that provide a quantifiable increase to the agency's water supply. Supplier will not complete the table below.					
☐	Some or all of the supplier's future water supply projects or programs are not compatible with this table and are described in a narrative format.					
N/A	Provide page location of narrative in the UWMP					
Name of Future Projects or Programs	Joint Project with other agencies?		Description (if needed)	Planned Implementation Year	Planned for Use in Year Type	Expected Increase in Water Supply to Agency
	Drop Down List (y/n)	*If Yes, Agency Name*				
Phase III Recycled Water Project - Long-term demands	No		Expansion of recycled water distribution system	2035	Average Year	-
Groundwater Supply	No		Development of groundwater supplies	2025	Average Year	Unknown at this time
NSDWRC Non-Potable Water Project	Yes	Leucadia Wastewater District, Vallecitos Water District, City of Oceanside, City of Escondido, Olivenhain Municipal Water District, Ricon del Diablo Municipal Water District, San Elijo Joint Powers Authority, Santa Fe Irrigation District, and Vista Irrigation District	Regional recycled water project	2035	Average Year	-
Carlsbad Flow Control Facility and Pressure Reducing Station	Yes	SDCWA	Direct connection to desalinated seawater pipeline	2016	Average Year	2,500
NOTES: Groundwater supplies are considered uncertain due to challenges associated with development of supplies. CMWD has the right to an additional 5.21% of any desalinated seawater produced for SDCWA beyond SDCWA's minimum volume of 48,000 AFY. This could result in additional supplies for CMWD which have not been quantified due to uncertainty over how much water would actually be available.						

Table 6-8 Retail: Water Supplies — Actual				
Water Supply	Additional Detail on Water Supply	2015		
		Actual Volume	Water Quality	Total Right or Safe Yield *(optional)*
Purchased or Imported Water	*Purchased from SDCWA*	13,264	Drinking Water	
Recycled Water	*Carlsbad WRF*	1,546	Recycled Water	4,480
Recycled Water	*Meadowlark WRF*	2,000	Recycled Water	2,800
Recycled Water	*Gafner WRF*	247	Recycled Water	1,120
	Total	17,057		8,400
NOTES:				

Table 6-9 Retail: Water Supplies — Projected											
Water Supply	Additional Detail on Water Supply	Projected Water Supply *Report To the Extent Practicable*									
		2020		2025		2030		2035		2040	
		Reasonably Available Volume	Total Right or Safe Yield *(optional)*	Reasonably Available Volume	Total Right or Safe Yield *(optional)*	Reasonably Available Volume	Total Right or Safe Yield *(optional)*	Reasonably Available Volume	Total Right or Safe Yield *(optional)*	Reasonably Available Volume	Total Right or Safe Yield *(optional)*
Purchased or Imported Water	*Purchased from SDCWA*	15,507		16,677		16,965		17,244		17,268	
Recycled Water	*Carlsbad WRF*	8,272	8,272	8,272	8,272	8,272	8,272	8,272	8,272	8,272	8,272
Recycled Water	*Meadowlark WRF*	2,000	2,989	2,000	2,989	2,000	2,989	2,187	2,989	2,187	2,989
Recycled Water	*Gafner WRF*	247	1,120	247	1,120	247	1,120	247	1,120	247	1,120
Desalinated Water	*Carlsbad Desalination Plant (purchased under Take or Pay with SDCWA)*	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500	2,500
Total		28,526	14,881	29,696	14,881	29,984	14,881	30,450	14,881	30,474	14,881

NOTES: CMWD will receive 2,500 AFY desalinated water through a purchase agreement with SDCWA. If the plant produces more desalinated water and SDCWA purchases more than the 48,000 AFY that it currently purchases, CMWD may receive an additional 5.21% of the additional amount available. Because of uncertainty regarding this water, it has been omitted from this table as an available volume, but included in total right for desalinated water purchased via SDCWA. Purchases from SDCWA are not limited by Total Right or Safe Yield.

Table 7-1 Retail: Basis of Water Year Data			
Year Type	Base Year	Available Supplies if Year Type Repeats	
		Agency may provide volume only, percent only, or both	
		Volume Available	% of Average Supply
Average Year	1986-2015	-	100%
Single-Dry Year	2014	-	100%
Multiple-Dry Years 1st Year	2013	-	100%
Multiple-Dry Years 2nd Year	2014	-	100%
Multiple-Dry Years 3rd Year	2015	-	92% -100%
Agency may use multiple versions of Table 7-1 if different water sources have different base years and the supplier chooses to report the base years for each water source separately. If an agency uses multiple versions of Table 7-1, in the "Note" section of each table, state that multiple versions of Table 7-1 are being used and identify the particular water source that is being reported in each table.			
NOTES: CMWD selected base years that aligned with SDCWA's 2015 UWMP supply reliability assessment. The third year of a multiple-dry year scenario may result in deficits that must be met through extraordinary conservation or further expansion of the recycled water system. In years with supply reliability, additional purchases would be made from SDCWA to meet demands. As presented here, "% of Average Supply" indicates percent supply available to meet potable demands due to diversification and/or carryover storage.			

Table 7-2 Retail: Normal Year Supply and Demand Comparison					
	2020	2025	2030	2035	2040
Supply totals (*autofill from Table 6-9)*	28,526	29,696	29,984	30,450	30,474
Demand totals *(autofill from Table 4-3)*	23,085	24,255	24,543	24,822	24,846
Difference	5,441	5,441	5,441	5,628	5,628
NOTES: Surplus is non-potable recycled water capacity at Carlsbad WRF. There is no surplus or deficit for potable supplies.					

Table 7-3 Retail: Single Dry Year Supply and Demand Comparison					
	2020	2025	2030	2035	2040
Supply totals	29,750	31,000	31,308	31,793	31,818
Demand totals	24,655	25,904	26,212	26,510	26,536
Difference	5,096	5,096	5,096	5,283	5,282
NOTES: Surplus is non-potable recycled water capacity at Carlsbad WRF. There is no surplus or deficit for potable supplies.					

Table 7-4 Retail: Multiple Dry Years Supply and Demand Comparison						
		2020	2025	2030	2035	2040
First year	Supply totals	29,678	30,923	31,230	31,714	31,739
	Demand totals	24,562	25,807	26,114	26,411	26,436
	Difference	5,116	5,116	5,116	5,303	5,303
Second year	Supply totals	30,543	31,844	32,164	32,661	32,688
	Demand totals	25,671	26,972	27,292	27,602	27,629
	Difference	4,872	4,872	4,872	5,059	5,059
Third year	Supply totals	31,443	32,803	33,137	32,831	31,834
	Demand totals	26,825	28,184	28,519	28,843	28,871
	Difference	4,618	4,618	4,618	3,988	2,963
NOTES: Surplus is non-potable recycled water capacity at Carlsbad WRF. There is no surplus or deficit for potable supplies and demands in the first or second year of a multiple-dry year scenario. Potential deficits in potable supplies in the third year of a multiple-dry year would be addressed with extraordinary conservation and/or expansion of recycled water.						

Table 8-1 Retail Stages of Water Shortage Contingency Plan		
Stage	Complete Both	
	Percent Supply Reduction[1] *Numerical value as a percent*	Water Supply Condition (*Narrative description)*
Level 1 - Drought Watch Condition	0-10%	Reasonable probability that supplies will not meet demands
Level 2 - Drought Watch Condition	11-20%	Supplies will not be able to meet expected demands
Level 3 - Drought Critical Condition	21-40%	Supplies not meeting current demands
Level 4 - Drought Emergency Condition	above 40%	Major failure of a supply, shortage, or distribution system
[1] *One stage in the Water Shortage Contingency Plan must address a water shortage of 50%.*		
NOTES: A water shortage above 40% (including a 50% shortage) triggers Level 4 restrictions, which includes prohibition on outdoor water uses, and provides CMWD the authority to make further restrictions, as necessary, for non-compliant users, as well as for any CMWD customer should water supplies require.		

Table 8-2 Retail Only: Restrictions and Prohibitions on End Uses			
Stage	Restrictions and Prohibitions on End Users	Additional Explanation or Reference *(optional)*	Penalty, Charge, or Other Enforcement?
1	Landscape - Limit landscape irrigation to specific times	Irrigate residential and commercial landscape before 10 a.m. and after 6 p.m.	No
1	CII - Other CII restriction or prohibition	Irrigate nursery and commercial grower's products before 10 a.m and after 6 p.m.	No
1	Other - Customers must repair leaks, breaks, and malfunctions in a timely manner	Repair all water leaks within five days of notification by CMWD	No
2	Landscape - Limit landscape irrigation to specific days	Limit residential and commercial landscape irrigation to days assigned by CMWD General Manager	Yes
2	Landscape - Other landscape restriction or prohibition	Limit irrigation using sprinklers to length of time determined by CMWD General Manager	Yes
2	Landscape - Other landscape restriction or prohibition	Water residential and commercial landscaped areas not irrigated by an irrigation system by using a bucket, land-held hose with positive shut-off nozzle, or low-volume non-spray irrigation	Yes
2	Other - Customers must repair leaks, breaks, and malfunctions in a timely manner	Repair all water leaks within seventy-two hours of notification by CMWD	Yes
2	Water Features - Restrict water use for decorative water features, such as fountains	Stop operating ornamental fountains unless recycled water is used	Yes

3	Landscape - Limit landscape irrigation to specific days	Limit residential and commercial landscape irrigation to days assigned by CMWD General Manager	Yes
3	Landscape - Other landscape restriction or prohibition	Limit irrigation using sprinklers to time limits determined by CMWD General Manager	Yes
3	Landscape - Other landscape restriction or prohibition	Water residential and commercial landscaped areas not irrigated by an irrigation system by using a bucket, land-held hose with positive shut-off nozzle, or low-volume non-spray irrigation	Yes
3	Water Features - Restrict water use for decorative water features, such as fountains	Stop filing or re-filling ornamental lakes or ponds, except to the extent needed ot sustain aquatic life	Yes
3	Other - Prohibit vehicle washing except at facilities using recycled or recirculating water		Yes
3	Other - Customers must repair leaks, breaks, and malfunctions in a timely manner	Repair all water leaks within forty-eight hours of notification by CMWD	Yes
4	Landscape - Prohibit all landscape irrigation		Yes
4	Other - Customers must repair leaks, breaks, and malfunctions in a timely manner	Repair all water leaks within twenty-four hours of notification by CMWD	Yes
NOTES:			

Table 8-3 Retail Only: Stages of Water Shortage Contingency Plan - Consumption Reduction Methods		
Stage	Consumption Reduction Methods by Water Supplier	Additional Explanation or Reference *(optional)*
All Stages	Provide Rebates on Plumbing Fixtures and Devices	
All Stages	Provide Rebates for Landscape Irrigation Efficiency	
All Stages	Provide Rebates for Turf Replacement	
1	Expand Public Information Campaign	
3	Moratorium or Net Zero Demand Increase on New Connections	
3	Other	Suspension of consideration of annexations to CMWD service area
3	Other	The Board of Directors may establish a water allocation for property in served by CMWD
4	Other	The Board of Directors may establish a water allocation for property in served by CMWD
NOTES:		

Table 8-4 Retail: Minimum Supply Next Three Years			
	2016	2017	2018
Available Water Supply	15,714	17,338	19,042
NOTES: Assumes 2016, 2017, and 2018 are multiple-dry years 1, 2, and 3, with demand increasing over normal by 6%, 11%, and 16%, respectively. Normal year demands are assumed as a straight line projection between 2015 and 2020 to establish normal year demands for 2016, 2017, and 2017.			

Table 10-1 Retail: Notification to Cities and Counties		
City Name	60 Day Notice	Notice of Public Hearing
City of Carlsbad	☑	☑
County Name	60 Day Notice	Notice of Public Hearing
San Diego County	☑	☑
NOTES:		

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Appendix E - Climate Change Strategies and Vulnerability Assessment

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SAN DIEGO
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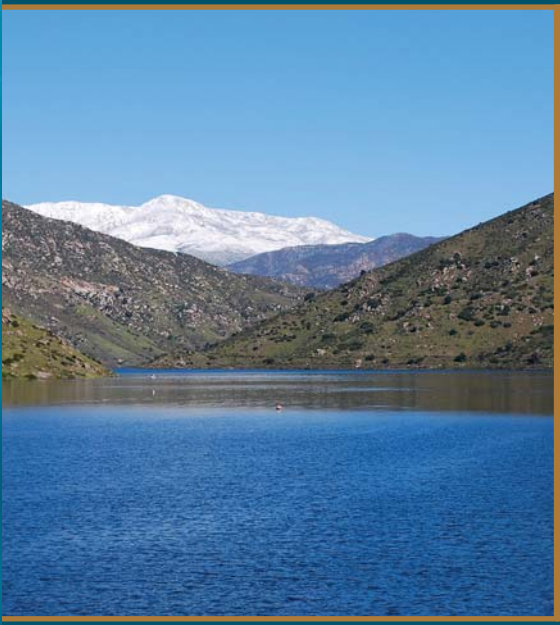
Appendix 7-D:
San Diego IRWM Climate Change Study




SAN DIEGO Integrated Regional Water Management

Climate Change Planning Study

Final

Prepared by:

RMC Water and Environment

May 2013

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List of Abbreviations

AB	Assembly Bill
AF	Acre-foot
CalEPA	California Environmental Protection Agency
CARB	California Air Resources Board
CAT	Climate Action Team
CCAR	California Climate Action Registry
CCAS	California Climate Action Strategy
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CH_4	Methane
CNRA	California Natural Resources Agency
CO_2	Carbon Dioxide
DWR	Department of Water Resources
EO	Executive Order
EPA	Environmental Protection Agency
GHG	Greenhouse Gas
HFCs	Hydrofluorocarbons
IRWM	Integrated Regional Water Management
kWh	kilowatt hours
$MMTCO_2E$	Million metric tons carbon dioxide equivalent
MSHCP	Multiple Species Habitat Conservation Plan
N_2O	Nitrous Oxide
NF_3	Nitrogen Trifluoride
OPC	Ocean Protection Council
OPR	Office of Planning and Research
PFCs	Perfluorocarbons
RMS	Resource Management Strategy
SB	Senate Bill
SDCWA	San Diego County Water Authority

SDG&E	San Diego Gas & Electric
SDRIP	San Diego River Improvement Project
SF_6	Sulfur Hexafluoride
SLR	Sea Level Rise
SWP	State Water Project
SWRCB	State Water Resources Control Board
TCR	The California Registry
TMDL	Total Maximum Daily Load
TDS	Total Dissolved Solids
USEPA	United States Environmental Protection Agency
WET-CAT	Water Energy Team of the Climate Action Team

1 Climate Change in Water Resources

This chapter addresses requirements set forth in the Resource Management Strategies (RMS) Standard in the *2012 IRWM Program Guidelines* (DWR 2012). As such, this chapter considers each RMS listed in the *California Water Plan (CWP) Update 2009* (DWR 2009), documents which RMS will help achieve the IRWM Plan Update objectives, presents all RMS considered for the IRWM Plan Update, and includes an evaluation of the adaptability of water management systems in the San Diego IRWM Region to climate change.

1.1 Introduction

Climate change projections have shown that California can expect to be impacted by changes to temperature and precipitation in the future, and even now California is beginning to experience the effects of these impacts. Water resource planners already face challenges interpreting new climate change information and discerning which response methods and approaches will be most appropriate for their planning needs. This Climate Change Planning Study (Study) examines current climate change science, policies, and regulations in terms of how they affect the San Diego Integrated Regional Water Management Region (Region). This Study serves as an initial guide for the Region to begin incorporating climate change adaptation and mitigation measures into its Integrated Regional Water Management (IRWM) Plan, where adaptation is how the Region can respond to climate change effects and mitigation is how the Region can reduce future climate change effects, and includes the following sections:

- Chapter 1: Climate Change in Water Resources
- Chapter 2: Climate Change in IRWM Planning
- Chapter 3: Effects of Climate Change on the Region
- Chapter 4: Vulnerability Analysis
- Chapter 5: Climate Change Management Strategies
- Chapter 6: Recommendations

1.2 Adaptation Relationship

Climate change is expected to directly impact a number of areas related to water resources, in particular temperature, precipitation, and sea level rise. As global temperature increases, seasonal precipitation patterns including the timing, intensity and form of precipitation, are projected to continue to change. Sea level rise, which has risen about seven inches over the last century due to warming, is expected to rise further in the future. In order for the Region to adapt to, or protect against, climate change, it must first identify the impacts climate change is expected to have on the Region.

These impacts are expected to further impact local water resources as follows (DWR, 2011):

- Temperature increases:
    - More winter precipitation falling as rain rather than snow, leading to reduced snowpack water storage, reduced long term soil humidity, reduced groundwater and downstream flows, and reduced imported water deliveries

  - Higher irrigation demands as temperatures alter evapotranspiration rates, and growing seasons become longer
  - Exacerbated water quality issues associated with dissolved oxygen levels, increased algal blooms and increased concentrations of salinity and other constituents
  - Impacted habitats for temperature-sensitive fish and other life forms, and increased susceptibility of aquatic habitats to eutrophication
- Precipitation pattern changes:
  - Increased flooding (both coastal and inland) caused by more intense storms
  - Changes to growth and life cycle patterns caused by shifting weather patterns
  - Threats to soil permeability, adding to increased flood threat and decreased water availability
  - Reduced water supply caused by the inability to capture precipitation from more intense storms, and a projected progressive reduction in average annual runoff (though some models suggest that there may be some offset from tropical moisture patterns increasingly moving northward)
  - Increased turbidity caused by more extreme storm events, leading to increased water treatment needs and impacts to habitat
  - Increased wildfires with less frequent, but more intense rainfall, and possibly differently timed rainfall through the year, potentially resulting in vegetation cover changes
  - Reduction in hydropower generation potential
- Sea level rise:
  - Inundation and erosion of coastal areas (coastal bluffs in particular), including coastal infrastructure
  - Saline intrusion of coastal aquifers
  - Increased risk of storm surges and coastal flooding and erosion during and after storms
  - Changes in near-shore protective biogeography such as loss of sand, tide pools and kelp beds

Although the extent of these changes is uncertain, scientists agree that some level of change is inevitable; therefore, it will be necessary to implement flexible adaptation measures that will allow natural and human systems to respond to these climate change impacts in timely and effective ways. Adaptation measures may be implemented in response to climate change impacts that have already occurred, or expected impacts that are projected to occur. It is important to take note that water resources decisions made in the future will impact the rate of climate change.

In addition to adapting to climate change, the Region has the opportunity to mitigate against climate change by minimizing greenhouse gas emissions emitted by water supply and wastewater activities. The relationship between water resources and greenhouse gas emissions is discussed further in the next section.

1.3 Water-Energy Nexus

To understand how water is related to climate change, it's helpful to understand the connection between water resources planning and energy, which is known as the water-energy nexus. Energy production accounts for between 30% and 40% of total GHG production in California, and can emit a number of different types of GHGs. California's Air Resources Board recognizes and inventories the following GHGs: carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), sulfur hexafluoride (SF6), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and nitrogen trifluoride (NF3). These GHGs vary in magnitude in terms of their GHG strength, and therefore are converted to be equivalent to CO2 for the purposes of measuring GHG emissions across the state. CO2 emissions (or the equivalent for other GHGs) are the common measurement for GHG emissions. (CARB, 2013). Currently, statewide water use accounts for nearly 20% of electricity use, and 30% of non-power plant related natural gas consumption (CEC, 2006). Water use and energy are linked in at least three critical ways (CEC, 2011):

1. Water pumping and purification: The amount of energy used to pump water will depend upon the source (e.g., surface versus groundwater), the distance and height the water must be moved, and the treatment requirements. For example, pumping water to San Diego County through the State Water Project, which accounts for nearly 80% of the County's water supply, uses about 4,600 kilowatt hours (kWh) per acre-foot of electricity (DWR, 2012a), while groundwater pumping typically uses 300 kWh/AF (Cohen, 2007).
2. Wastewater treatment: The amount of energy used in wastewater treatment plant typically ranges from 1,100 to 4,600 kWh per million gallons of wastewater treated (CEC, 2006).
3. Water heating: In an average California home, 41 percent of the water is used for dishwashing, faucets, laundry, and bathing water that is often heated.

These amounts, in total, are so significant that we must also count the amount of GHGs from the fossil fuels that are burned to produce the oil, gas, coal and other combustibles which are then burned to produce the electricity. Understanding the water-energy nexus in California provides opportunities to attain significant energy benefits through two primary strategies (CEC, 2006):

1. Conserving water saves the energy that would have been used to convey, treat, and distribute the water, and energy that may have been needed to collect, treat and dispose of the wastewater.
2. Reducing the energy intensity of water operations reduces the total amount of energy consumed in the water sector and ultimately reduces the value of energy embedded in saved water.

By reducing the energy used through the above strategies, GHG production can be reduced.

It should be noted that, at times, the above processes may also be used to generate energy, such as through cogeneration at wastewater treatment plants, or capturing energy as water flows downhill. Concurrently, energy production processes require water for steam production for thermoelectric power and to cool equipment by absorbing waste heat. Energy conservation in the Region can reduce this need.

These strategies are reflected in California's legislation and policy regarding climate change mitigation and greenhouse (GHG) emissions reduction discussed in the remainder of Chapter 1.

1.4 Legislative and Policy Context

In order to address currently-projected climate change impacts to California's water resources, the Department of Water Resources' (DWR's) 2012 IRWM Grant Program Guidelines require that IRWM Plans describe and consider climate change adaptation and mitigation. Below is a summary of State legislation and policy that were considered as part of this IRWM Plan.

Executive Order S-3-05

Executive Order (EO) S-3-05, signed on June 1, 2005 by Governor Arnold Schwarzenegger, is one of the key pieces of legislation that has laid the foundation for California's climate change policy. This piece of legislation recognizes California's vulnerabilities to the impacts of climate change, which include its water-related natural resources. EO S-3-05 established three GHG reduction targets for California:

- By 2010, reduce GHG emissions to 2000 California levels
- By 2020, reduce GHG emissions to 1990 California levels
- By 2050, reduce GHG emissions to 80 percent below 1990 California levels

In addition to establishing GHG reduction targets for California, EO S-3-05 dictates that the Secretary of the California Environmental Protection Agency (CalEPA) establish the Climate Action Team (CAT) for State agencies to coordinate oversight of efforts to meet these targets. As laid out in EO S-3-05, the CAT submits biannual reports to the governor and State legislature describing progress made toward reaching the targets.

There are currently 12 sub-groups within the CAT, one of which is the Water-Energy group (also known as WET-CAT). WET-CAT was tasked with coordinating the study of GHG effects on California's water supply system, including the development of GHG mitigation strategies for energy consumption related to water use. Since the adoption of the Assembly Bill 32 Scoping Plan (see the following section), WET-CAT has been working on the implementation and analyses of six water-related measures identified in the Scoping Plan:

- Water Use Efficiency
- Water Recycling
- Water System Energy Efficiency
- Reuse Urban Runoff
- Increase Renewable Energy Production
- Public Goods Charge for Water

Assembly Bill 32: The California Global Warming Solutions Act of 2006

Assembly Bill (AB) 32, the California Global Warming Solutions Act of 2006 was signed by Governor Schwarzenegger to codify the mid-term GHG reduction target established in EO S-3-05 (reduce GHG emissions to 1990 levels by 2020) through, among other mechanisms, imposing an enforceable cap on GHG emissions. AB 32 directed the California Air Resources Board (CARB) to develop discrete early actions to reduce GHG emissions by 2007, and to adopt regulations to implement early action measures by January 1, 2010.

Climate Change Scoping Plan

AB 32 also required CARB to prepare a Scoping Plan to identify and achieve reductions in GHG emissions in California. The approved Climate Change Scoping Plan, adopted by CARB in December 2008, recommends specific strategies for different business sectors, including water management, to achieve the 2020 GHG emissions limit. The Scoping Plan as it relates to water resources is discussed further in Section 0 below.

Senate Bill 97

Senate Bill 97 (SB 97) directed the Governor's Office of Planning and Research (OPR) to develop amendments to the California Environmental Quality Act (CEQA) Guidelines to determine how climate change is analyzed in documents required by CEQA. On December 31, 2009, the California Natural Resources Agency adopted amendments to the CEQA Guidelines and sent them to the California Office of Administrative Law for approval and filing with the Secretary of State. These CEQA Guideline amendments became effective on March 18, 2010. The CEQA Guidelines are not prescriptive; rather they encourage lead agencies to consider many factors in performing a CEQA analysis, and maintain discretion with lead agencies to make their own determinations based on substantial evidence.

Managing an Uncertain Future: Climate Change Adaptation Strategies for California's Water

DWR, in collaboration with the State Water Resources Control Board, other state agencies, and numerous stakeholders, has initiated a number of projects to begin climate change adaptation planning for the water sector. In October 2009, DWR released the first state-level climate change adaptation strategy for water resources in the U.S., and the first adaptation strategy for any sector in California. Entitled Managing an Uncertain Future: Climate Change Adaptation Strategies for California's Water, the report details how climate change is currently affecting the state's water supplies, and sets forth ten adaptation strategies to help avoid or reduce climate change impacts to water resources.

Central to these adaptation efforts will be the full implementation of IRWM plans, which address regionally-appropriate management practices that incorporate climate change adaptation. These plans will evaluate and provide a comprehensive, economical, and sustainable water use strategy at the watershed level for California.

Executive Order S-13-08

Given the potentially serious threat of sea level rise to California's water supply and coastal resources, and the subsequent impact it would have on our state's economy, population, and natural resources, Governor Schwarzenegger issued EO S-13-08 to enhance the state's management of climate impacts from sea level rise, increased temperatures, shifting precipitation, and extreme weather events. It requested a California Sea Level Rise Assessment Report to be conducted by the National Academy of Sciences, which was released in June 2012.

California Climate Adaptation Strategy

In response to the passage of EO S-13-08, the California Natural Resources Agency released the report entitled 2009 California Climate Adaptation Strategy that summarizes the best known science on climate change impacts in the state, assesses vulnerabilities, and outlines possible solutions that can be implemented within and across the state agencies to promote resilience to climate change.

GHG Reporting Rule

While California has taken the lead in climate change policy and legislation, there have been several recent important developments at the federal level. On September 22, 2009, the United States Environmental Protection Agency (USEPA) released its final GHG Reporting Rule (Reporting Rule). Starting in 2010, facility owners that emit 25,000 metric tons of CO2 emissions or more per year are required to submit an annual GHG emissions report with detailed calculations of facility GHG emissions. These activities will dovetail with the AB 32 reporting requirements in California.

Water Code Section 10541

California has included climate change in its water code to ensure that it is considered as part of water management. California Water Code Section 10541 contains requirements for considering climate change in IRWM Plans. Specifically, it states that the guidelines for IRWM Plans are required to include:

- Consideration of GHG emissions of identified programs and projects
- Evaluation of the adaptability to climate change of water management systems in the region

1.5 AB 32 Scoping Plan and CARB Strategies

As stated previously, AB 32 required CARB to prepare a Scoping Plan to identify and achieve reductions in GHG emissions in California, and recommended specific strategies for different business sectors to achieve the 2020 GHG emissions limit. This Scoping Plan was introduced in 2005, and adopted in 2008. Water use is identified in the AB 32 Scoping Plan as a sector requiring significant amounts of energy, and sets a goal to "continue efficiency programs and use cleaner energy sources to move and treat water." This goal recognizes that California has a history of advancing water efficiency and conservation programs.

The Scoping Plan identifies six greenhouse gas emissions reduction (mitigation) measures for the water sector that could reduce GHGs if implemented statewide (please note that not all of these measures may be applicable to the San Diego IRWM Region):

1. Water Use Efficiency: Through increases in water use efficiency measures, reduce total statewide emissions
2. Water Recycling: Through increases in water recycling, reduce total statewide emissions
3. Water system energy efficiency: Through increases in water system energy efficiency, reduce total statewide emissions
4. Reuse of urban runoff: Through reuse of urban runoff, reduce total statewide emissions
5. Increase renewable energy production: Through the increase in renewable energy production, reduce statewide emissions
6. Public goods charge: To be determined

The first three of the measures will reduce energy requirements associated with providing reliable water supplies. The next two measures will reduce the amount of non-renewable electricity associated with conveying and treating water. The final measure (public goods charge) focuses on providing sustainable funding for implementing these actions. Other sectors identified in the Scoping Plan, such as Agriculture and Green Building, recognize that water use efficiency measures

will help to decrease GHG emissions as well, but do not calculate water use efficiency savings separately. The Scoping Plan states that to implement these GHG reduction measures, CARB and other State agencies will work with stakeholders and the public to develop regulatory measures and other programs.

1.6 California Climate Action Registry/The Climate Registry

The California Climate Action Registry (CCAR) was a program of the Climate Action Reserve which closed in December 2010. It served as a voluntary GHG registry to promote early actions to reduce GHG emissions by organizations. CCAR members voluntarily measured, verified, and publicly reported their GHG emissions. Members of the CCAR have been transitioned over to The Climate Registry (TCR), which is a nonprofit GHG emissions registry for North America that provides organizations with the tools to help them calculate, verify, report and manage their GHG emissions within a single registry. A number of agencies and organizations in the IRWM Region are voluntary members of TCR, including:

- San Diego County Water Authority
- City of San Diego
- County of San Diego
- Metropolitan Water District of Southern California

TCR's tools and database are particularly useful to those entities required to report their GHG emissions according to the EPA's Greenhouse Gas Reporting Rule (74 FR 56260) which requires reporting of GHG data and other relevant information from large sources and suppliers in the United States, and went into effect in January 2010. Though primarily affecting facilities that supply fossil fuels or industrial GHGs, manufacturers of vehicles and engines, this rule also applies to facilities that are responsible for the emission of 25,000 metric tons or more of GHG emissions per year, and therefore may apply to water and wastewater utilities, and large water purchasers. In addition to meeting USEPA requirements, by becoming a member of TCR, a utility, agency or company may better be able to respond to California's requirements for reporting and reducing GHG emissions.

1.7 Climate Action Plans and Climate Initiatives

Climate action plans are becoming more common among California's cities and counties. A climate action plan, which may also be referred to as a climate mitigation and adaptation plan, is a set of strategies intended to guide efforts for reducing GHG emissions, and typically covers a range of sectors such as energy, transportation, water, wastewater, solid waste, infrastructure, urban forestry and agriculture, and public health. Plans may also include strategies to guide efforts for reducing the impact of climate change effects on the area. Within the Region, the County and a number of cities and agencies have developed or are developing climate action plans and adaptation plans:

- County of San Diego Climate Action Plan
- San Diego County Water Authority Climate Action Plan and Climate Mitigation Plan
- City of San Diego Climate Mitigation and Adaptation Plan

- City of San Diego Long Range Water Resources Plan
- City of Chula Vista Adaptation and Mitigation Plan
- City of Encinitas Climate Action Plan
- City of Escondido Climate Action Plan
- City of San Marcos Climate Action Plan
- Port of San Diego Climate Mitigation and Adaptation Plan
- San Diego Association of Governments (SANDAG) Regional Energy Strategy and Climate Action Strategy
- San Diego Bay Sea Level Rise Adaptation Study
- San Diego Foundation Focus 2050 Study

In addition to the Climate Action Plans developed in the Region, the San Diego Foundation has developed a Climate Initiative to support community awareness about the local impacts of climate change. This initiative aims to educate the community about climate change, support climate change research, partner with local governments to address climate change, and provide technical assistance for climate action planning. As part of this initiative, every jurisdiction in the County has completed a GHG emissions inventory.

2 Climate Change in IRWM Planning

2.1 DWR Requirements

As previously discussed, the California Water Code contain language stating that IRWM Plan guidelines require climate change be considered as part of IRWM Plans. In line with this, DWR has included a Climate Change Standard in the IRWM Guidelines that requires IRWM plans to include a "cursory analysis of the effects on the region due to climate change, with the intent that a more refined analysis be required as additional guidance is made available." To meet these guidelines, DWR has suggested that climate change be included in IRWM Plans as shown in Table 1.

Table 1: IRWM Plan Standards in Relation to Climate Change

Plan Section According to IRWM Plan Standards	Climate Change Information to Include[1]
Region Description	Language that describes likely climate change impacts on the Region as determined from a vulnerability assessment
Plan Objectives	Adaptation to climate change: • Address adapting to changes in the amount, intensity, timing, quality and variability precipitation, runoff and recharge. • Consider sea level rise effects on water supply and other water resource conditions (e.g., recreation, habitat) and identify suitable adaptation measures. Consider OPC's Sea Level Rise Policy Reducing emissions (mitigation of greenhouse gasses) • Reduce carbon consumption, especially the energy embedded in water use, and ultimately reduce GHG emissions • Consider the strategies adopted by CARB in its AB 32 Scoping Plan, including innovative applications • Consider options for carbon sequestration where such options are integrally(directly or indirectly) tied to supporting IRWM Plan objectives
Resource Management Strategies	Identify and implement adaptation strategies that address region-specific or local climate change contributions or impacts
Project Review Process	Include the following factors: • Contribution of the project to adapting to climate change • Contribution of the project in reducing GHG emissions as compared to project alternatives
Relation to Local Water Planning	Consider and incorporate water management issues and climate change adaptation and mitigation strategies from local plans into the IRWM Plan.
Relation to Local Land Use Planning	Demonstrate information sharing and collaboration with regional land use planning in order to management multiple water demands through the state (as described in CWP Update 2009), adapt water management systems to climate change, and potentially offset climate change impacts to water supply.
Plan Performance and Monitoring	Contain policies and procedures that promote adaptive management.
Coordination	Consider the following: • Stay involved in CNRA's California Adaptation Strategy process • Consider joining The California Registry (www.theclimateregistry.org)

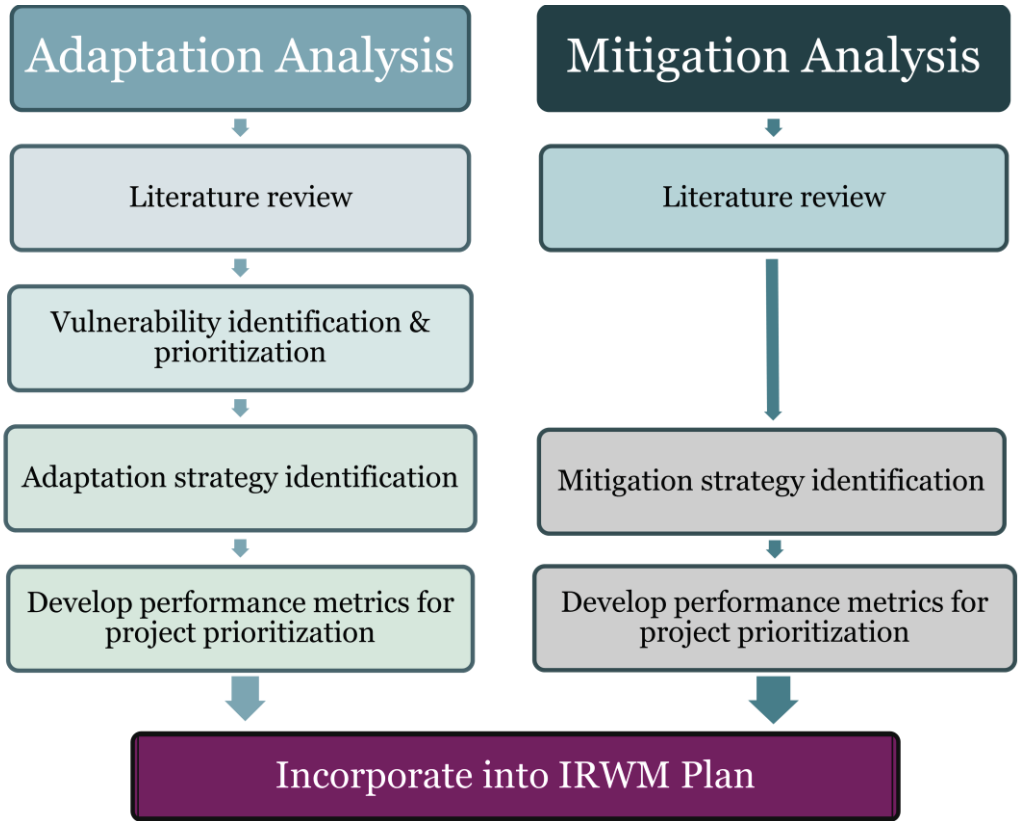
1. Based on information in DWR's 2012 Prop 84 and Prop 1E IRWM Guidelines, Appendix C, Table 7

2.2 Adaptation and Mitigation Analysis

In order to meet the IRWM Plan standards discussed in the previous section, the climate change analysis process shown in Figure 1 was followed. As previously discussed in this Study, climate change includes both adaptation (responding to climate change) and mitigation (reducing GHGs), and therefore is reflected in the analysis process below. While both the adaptation analysis and mitigation analysis include a literature review, strategy identification and performance metrics

development, the adaptation analysis includes an extra step to identify and prioritize climate change vulnerabilities. The information gathered through this climate change analysis will be incorporated into the Region's IRWM Plan update. By working through each of these steps, the Region can meet the requirements contained in DWR's IRWM Plan Guidelines.

Figure 1: Climate Change Analysis Process



2.3 San Diego IRWM Region Climate Change Study

To fulfill DWR's requirements and work through the climate change analysis discussed above, the Region established a Climate Change Workgroup (Workgroup) comprised of various water resources and planning representatives that have experience in climate change planning within the Region to work with a consultant to develop this Climate Change Planning Study (Study). In addition, local climate change efforts, in particular the San Diego Foundation Regional Focus 2050 Study which defines Region-specific climate change impacts, were used in the climate change assessment.

3 Effects of Climate Change on Region

3.1 Impacts and Effects on Region

Estimating the impacts of climate change at a regional level is challenging due to the coarse spatial scale of models that project climate change impacts of temperature and rainfall, and due to the long time scale evaluated in many models (to the year 2100). Recently, state and local entities have been working to downscale climate models to allow for climate change planning at a level that can be useful for planning efforts. The timescale used for these models has also been downscaled to provide outputs for the year 2050, and though this is still a longer timescale than is used in IRWM planning, is still useful for assessing climate change.

To incorporate climate change into water resources management, downscaled temperature and precipitation projections are input into other models, such as hydrologic models, to project impacts to water supply, water demand, snow pack, sea level rise, and wildfires. The results of these models have been summarized in a variety of studies and planning documents at the state, regional, and local levels. As part of this Study, a number of these documents were reviewed to determine which best represented the impacts for the Region. These documents include:

- *Regional Focus 2050 Study* (San Diego Foundation, 2008a & 2008b)
- *2010 Urban Water Management Plan* (San Diego County Water Authority, 2011)
- *Using Future Climate Projections to Support Water Resources Decision Making in California,* (California Climate Change Center, 2009)
- *Reconciling Projections of Colorado River Streamflow, Southwest Hydrology* (Hoerling et al., 2009)

Climate change impacts and effects are based on very different climate change assumptions and analysis approaches. Table 2 summarizes the impacts and effects of climate change on the San Diego Region by 2050 (unless otherwise indicated), which are typically based on an average of various climate change analyses. Generally, climate change is expected to increase temperature in the region. Rainfall projections vary with some projections showing that the Region will receive as much as 35% less rainfall and some showing up to 17% more rainfall (San Diego Foundation, 2008a). It's generally accepted that storms will be less frequent, but more intense (San Diego Foundation, 2008a). With higher temperatures and changes in rainfall volume and frequency, additional impacts will be felt in the Region.

Imported water supply from the State Water Project is projected to decrease by up to 25% (California Climate Change Center, 2009), while Colorado River Aqueduct supply may decrease by up to 20% (Hoerling et al, 2009). An overall shortfall of 164,000 acre-feet per year (AFY) in imported water is expected by 2050 (San Diego Foundation, 2008b).

Preliminary analysis of regional water demand trends in the San Diego County Water Authority service area indicate that climate change impacts may result in a slight demand increase, between 0.6 and 1.8%, by the year 2035. (SDCWA, 2011).

In currently accepted models, sea level rise is projected to be at least 12 to 18 inches by 2050, which would both inundate the coast due to the average rise, and impact coastal flood control during storms (San Diego Foundation, 2008a).

The changes to climate are also expected to increase the frequency of wildfires. Studies suggest that there will be a 40% increase in Coastal Sage Scrub acreage burned (San Diego Foundation, 2008a), and that 54% more acreage in the Western U.S. will burn compared to present (San Diego Foundation, 2008a). Increases in wildfires have the potential to increase sedimentation and turbidity of surface waters, and increase flash flooding.

Knowing what climate change impacts and effects are projected to have on the Region, it's possible to determine what water resources in the Region are most vulnerable to climate change. The next sections identify and prioritize the vulnerabilities to determine how to best apply management practices. These effects were presented to and vetted by the Workgroup at a meeting held on June 12, 2012.

Table 2: Impacts and Effects of Climate Change on Region by 2050

Impact	Effect
Temperature	• 1.5°F to 4.5°F average temperature increase
Rainfall	• Variable projections predict between 35% drier and 17% wetter • Increase in variability between years
Supply	• Up to 25% decrease in SWP supply • Up to 20% decrease in Colorado River supply • 164,000 afy average shortfall in imported supply
Demand	• Potential 0.6% to 1.8% increase in demand by 2035
Sea level rise	• 12 to 18 inch rise in mean sea level rise
Wildfires	• 40% increase in California Coastal Shrub acreage burned in Southwestern U.S. • 54% increase in overall acreage burned in Western U.S.

3.2 Identification of Vulnerabilities

Understanding the potential impacts and effects that climate change is projected to have on the Region allows an informed vulnerability assessment to be conducted for the Region's water resources. A climate change vulnerability assessment helps a Region to assess its water resource sensitivity to climate change, prioritize climate change vulnerabilities, and ultimately guides decisions as to what strategies and projects would most effectively adapt to and mitigate against climate change. DWR has identified a series of questions to help regions identify key indicators of potential vulnerability, including (DWR, 2011):

- Currently observable climate change impacts (climate sensitivity)
- Presence of particularly climate sensitive features, such as specific habitats and flood control infrastructure (internal exposure)
- Resiliency of a region's resources (adaptive capacity)

The Workgroup developed an analysis of the Region's vulnerabilities to climate change at the June 12, 2012 climate change workshop by asking a series of questions suggested by DWR in its 2011 *Climate Change Handbook for Regional Water Planning.* Table 3 summarizes the analysis, which includes:

- Vulnerability Question: Taken from Box 4-1 of DWR's *Climate Change Handbook*

- Answer: Provided at June 12, 2012 workshop
- Justification: Why Y (yes) or N (no) was selected
- Vulnerability Issue: What is the climate change vulnerability issue that is identified by asking the question?

Following this analysis, the vulnerability issues were prioritized by the Workgroup. This activity and results are described in Chapter 4.

Table 3: Climate Change Vulnerability Indicator Questions

Vulnerability Question	Answer	Justification	Vulnerability Issue
Water Demand			
Are there major industries that require cooling/process water in your planning region?	Y	Electronics and aerospace manufacturing, energy generation, research development, pharmaceutical. Biotech and energy growing. Room for efficiency improvements	Increase in industrial demand
Are crops grown in your region climate-sensitive? Would shifts in daily heat patterns, such as how long heat lingers before night-time cooling, be prohibitive for some crops?	Y	Primary crops include avocados, nurseries and citrus which can be climate sensitive, but agricultural land use is expected to decrease. Rise in smaller agricultural/urban farms/residential gardens, and increased crop diversity. Decrease in larger agricultural users.	Increase in agricultural crop water demand per acre; small food production use of permaculture could decrease per acre use
Do groundwater supplies in your region lack resiliency after drought events?	Y	The small groundwater basins in the Region tend to decrease resiliency. Increasing impermeability reduces recharge. Sweetwater, Oceanside, Escondido/Vista. Salt water intrusion as water tables drop.	Lack of groundwater storage to buffer drought
Are water use curtailment measures effective in your region?	Y	Shortage management activities currently in place were effective in meeting demands during the last major drought which began in 2007. Management measures not previously considered, such as soil conditions, may provide additional opportunities.	Perceived limited ability to conserve further
Does water use vary by more than 50% seasonally in parts of your region?	Y	Water agencies have peaking factors ranging from 2:1 to 6:1. Some of the higher peaking agencies dependent on imported water will have reduced peaking as agricultural use declines and more development occurs.	Limited ability to meet summer demand
Are some in-stream flow requirements in your region either currently insufficient to support aquatic life, or occasionally unmet?	N	Most streams are intermittent; however, some agencies that move water between reservoirs via streams have in-stream requirements to protect species during certain times of the year which impacts when water can be moved.	Habitat demand would be impacted
Water Supply			
Does a portion of the water supply in your region come from snowmelt?	Y	Imported supplies (SWP, Colorado River) come from snowmelt.	Decrease in imported supply
Does part of your region rely on water diverted from the Delta, imported from the Colorado River, or imported from other climate-sensitive systems outside your region?	Y	Approximately 80% of the Region's supplies are imported.	Decrease in imported supply

Vulnerability Question	Answer	Justification	Vulnerability Issue
Would your region have difficulty in storing carryover supply surpluses from year to year?	N	No, the County has sufficient storage capacity, and is currently completing an emergency storage carryover project. It should be noted that there is little transfer market available in California, with a focus of storage in northern California.	Decrease in reliability
Does part of your region rely on coastal aquifers? Has salt intrusion been a problem in the past?	Y	Some brackish groundwater exists near the coast which limits the use of coastal aquifers.	Decrease in groundwater supply
Has your region faced a drought in the past during which it failed to meet local water demands?	Y	Drought management plans had to be put into effect. It should be noted that the Region has never failed to meet its customers' demands once drought measures were put into place. Development of additional supplies may reduce the Region's vulnerability to this issue.	Sensitivity due to higher drought potential
Does your region have invasive species management issues at your facilities, along conveyance structures, or in habitat areas?	Y	Quagga, Arundo, Tamarisk	Invasives can reduce supply available
Water Quality			
Are increased wildfires a threat in your region? If so, does your region include reservoirs with fire-susceptible vegetation nearby which could pose a water quality concern from increased erosion?	Y	Wildfires are a common occurrence in the area, and often cause increased erosion in the Region's watersheds.	Increased erosion and sedimentation
Does part of your region rely on surface water bodies with current or recurrent water quality issues related to eutrophication, such as low dissolved oxygen or algal blooms? Are there other water quality constituents potentially exacerbated by climate change?	Y	Several water bodies are 303(d) listed for water quality issues related to eutrophication including the Lake Hodges, Famosa Slough, Guajome Lake, Loma Alta Slough, Mission Bay at the mouths of Rose Creek and Tecolote Creek, lower San Diego River, Sal Elijo Lagoon, Santa Margarita Lagoon, Tijuana River, and the Tijuana River Estuary.	Increased eutrophication
Are seasonal low flows decreasing for some water bodies in your region? If so, are the reduced low flows limiting the water bodies' assimilative capacity?	Y	At times during the year, the only flow in some streams is irrigation overflow, which in turn increase the concentration of constituents.	Increased constituent concentration
Are there beneficial uses designated for some water bodies in your region that cannot always be met due to water quality issues?	Y	At times recreation use in some reservoirs is impacted, and beach closures occur. Wildlife habitat and freshwater habitat issues as well.	Decrease in recreational opportunity

Vulnerability Question	Answer	Justification	Vulnerability Issue
Does part of your region currently observe water quality shifts during rain events that impact treatment facility operation?	Y	Total dissolved solids (TDS), turbidity and nutrient levels in reservoirs may increase during storm events, impacting water treatment, particularly after fires. Oils and feces show up in reservoirs as well.	Increase in treatment needs and cost
Sea Level Rise			
Has coastal erosion already been observed in your region?	Y	Coastal erosion occurs at unstable bluffs along the coast, for example: Sunset cliff, bluffs along City of San Diego, Encinitas, military infrastructure at Coronado Island and Camp Pendleton..	Decrease in land due to erosion
Do tidal gauges along the coastal parts of your region show an increase over the past several decades?	Y	San Diego Bay Adaptation shows increasing levels	Damage to coastal recreation/tourism due to inundation
Is there land subsidence in the coastal areas of your region?	N	None noted	
Are there coastal structures, such as levees or breakwaters, in your region?	Y	Examples include Mission Bay, San Diego Harbor	
Is there significant coastal infrastructure, such as residences, recreation, water and wastewater treatment, tourism, and transportation) at less than six feet above mean sea level in your region?	Y	Beach community - wide-spread	
Are there climate-sensitive low-lying coastal habitats in your region?	Y	Habitat type - salt marsh	Damage to ecosystems/habitats
Are there areas in your region that currently flood during extreme high tides or storm surges?	Y	Mission Valley flooded from San Diego river during high tidal events	Storm drains and sewer systems will be inundated
Flooding			
Does critical infrastructure in your region lie within the 200-year floodplain?	Y	There is low-lying water and wastewater infrastructure. Pump stations.	Increases in inland flooding
Does aging critical flood protection infrastructure exist in your region?	Y	San Diego River Flood Improvement project. San Diego River Improvement Project (SDRIP) at Mission Valley.	

Vulnerability Question	Answer	Justification	Vulnerability Issue
Have flood control facilities (such as impoundment structures) been insufficient in the past?	Y	Flooding (and flash flooding in particular) has been a danger in certain areas of the Region due to overflowing drainage channels, low lying areas with poor drainage, and debris build-up in basins. Some areas identified by the County include localized areas in Mission Valley, Moreno Valley, Ocotillo Wells, Lemon Crest, below San Vicente Reservoir, Ramona, etc.	
Are wildfires a concern in parts of your region?	Y	Wildfires are a common occurrence in the Region.	Increases in flash flooding
Does part of your region lie within the Sacramento-San Joaquin Drainage District?	N	Not applicable	Not applicable
Ecosystem and Habitat			
Does your region include inland or coastal aquatic habitats vulnerable to erosion and sedimentation issues?	Y	Erosion and sedimentation issues in Penasquitos Canyon, San Onofre, Crest Canyon, San Dieguito lagoon, Del Mar area, Encinitas area,	Increased impacts to coastal species
Does your region include estuarine habitats which rely on seasonal freshwater flow patterns?	Y	A number of brackish lagoons exist along the coast including Batiquitos Lagoon, Buena Vista Lagoon, Agua Hedionda Lagoon, and San Elijo Lagoon.	
Do estuaries, coastal dunes, wetlands, marshes, or exposed beaches exist in your region? If so, are coastal storms possible/frequent in your region?	Y	Estuaries, coastal dunes, wetlands, marshes and exposed beaches exist along the entire coast of the region. Historically, coastal storms have caused erosion.	
Do climate-sensitive fauna or flora populations live in your region?	Y	Numerous species dependent upon the Mediterranean climate live in the Region	Decreases in ecosystem services
Do endangered or threatened species exist in your region? Are changes in species distribution already being observed in parts of your region?	Y	A number of endangered and threatened species exist in the Region.	Decrease in available, necessary habitat
Does the region rely on aquatic or water-dependent habitats for recreation or other economic activities?	Y	Beach tourism, reservoir recreation, river trails	
Are there areas of fragmented estuarine, aquatic, or wetland wildlife habitat within your region? Are there movement corridors for species to naturally migrate? Are there infrastructure projects planned that might preclude species movement?	Y	Multiple Species Habitat Conservation Plans (MSHCPs) working on ensuring corridors but some need to be created	

Vulnerability Question	Answer	Justification	Vulnerability Issue
Does your region include one or more of the habitats described in the Endangered Species Coalition's Top 10 habitats vulnerable to climate change?	N	No, the Region is not within any of the ten listed habitats.	
Are there rivers in your region with quantified environmental flow requirements or known water quality/quantity stressors to aquatic life?	Y	Some rivers and streams have quantified flow requirements but are primarily related to water rights. There is a bacteria Total Maximum Daily Load (TMDL) covers almost every water body in region. Nutrient TMDLs on lots of water bodies	Decrease in environmental flows
Hydropower			
Is hydropower a source of electricity in your region?	Y	Approximately 10% of electricity provided by SDG&E is hydropower. The Water Authority also produces hydroelectric power which is sold to San Diego Gas & Electric (SDG&E).	Decrease in hydropower potential
Are energy needs in your region expected to increase in the future? If so, are there future plans for hydropower generation facilities or conditions for hydropower generation in your region?	Y	Energy demand is expected to increase in the future with population increase and development. Additional hydropower was recently created at Lake Hodges/Olivenhain Reservoir, and an additional project is possible at the San Vicente Dam.	

4 Vulnerability Analysis

Once the Workgroup identified the Region's areas of concern in terms of climate change issues, it was able to begin examining the adaptability of its water resources to climate change by prioritizing the vulnerability issues. In prioritizing the vulnerability issues, the Workgroup identified those water resources that are of highest concern to the Region in terms of the significance of the impact of climate change and therefore the level of adaptation that will be needed.

4.1 Vulnerability Prioritization Process

The vulnerabilities identified were then prioritized during an exercise conducted with the Working group. Each member selected five vulnerability issues they determined should have the highest priority in being addressed. In total, the nine members of the Workgroup resulted in 45 votes. Votes were spread across nearly all of the categories, indicating the Workgroup perceived there to be a wide range of climate change vulnerabilities. The vulnerability issues were then grouped into five priority levels ranging from very high to very low according to the number of votes: very high (nine votes), high (three to four votes), medium (two to three votes), low (one to two votes), very low (no votes).

At a subsequent meeting held on July 26, 2012, the Workgroup reviewed the results and made suggestions for refinements that could be made to better align the prioritization with the vulnerabilities identified in planning documents. These suggestions were incorporated into the prioritized vulnerability issues which are shown in the next section.

4.2 Vulnerability Prioritization Results

The Region's list of prioritized vulnerabilities developed by the Workgroup is shown in Table 4, and discussed further below.

Table 4: Prioritized Climate Change Vulnerability Issues

Priority Level	Category and Vulnerability Issue
Very High	• Water Supply: Decrease in imported supply
High	• Water Supply: Sensitivity due to higher drought potential • Water Quality: Increased constituent concentrations • Flooding: Increases in flash flooding and inundation (extreme weather) • Sea Level Rise: Inundation of storm drains and sewer systems • Ecosystem/Habitat: Decrease in available necessary habitatEcosystem/Habitat: Decrease in ecosystem services
Medium	• Water Demand: Crop demand would increase • Water Demand: Industrial demand would increase • Water Supply: Decrease in groundwater supply • Water Quality: Increase in treatment cost • Sea Level Rise: Damage to coastal recreation / tourism due to inundation
Low	• Water Demand: Limited ability to conserve further • Water Supply: Lack of groundwater storage to buffer drought • Water Quality: Increased eutrophication • Flooding: Increases in inland flooding • Ecosystem/Habitat: Increased impacts to coastal species

Priority Level	Category and Vulnerability Issue
Very Low	• Water Demand: Limited ability to meet summer demand • Water Supply: Invasives can reduce supply available • Water Quality: Decrease in recreational opportunity • Sea Level Rise: Decrease in land • Sea Level Rise: Damage to ecosystem/habitat • Ecosystem/habitat: Decrease in environmental flows • Hydropower: Decrease in hydropower potential

Very High Prioritization

Water supply: Decrease in imported supply

The water supply vulnerability issue of "decrease in imported supply" was identified by the Workgroup as the highest priority issue. The Region is highly dependent on imported water with nearly 80% of its supplies currently coming from the State Water Project and the Colorado River aqueduct. Given the Region's limited local water supplies and the projected 20% to 25% decrease in imported water supply, a decrease in imported supply with climate change could have a significant impact on the Region and is an issue that needs to be addressed.

High Prioritization

Water Supply: Sensitivity due to higher drought potential

Climate change is expected to increase drought potential in the Region. In past years, water suppliers in the Region have successfully implemented drought management measures in order to lower demand. However, there are limits on the effectiveness of drought management measures. For example, tourists visiting the area are not likely to take part in drought management measures. Taking these issues into account, the Region is expected to be more susceptible to drought conditions. As drought is expected to increase in frequency and severity, more direct/long-term measures may be warranted as well as evaluation of revenue impacts to local water districts.

Water Quality: Increased constituent concentrations

The water quality vulnerability issue of increased constituent concentrations with climate change was ranked highly as water bodies in the area already require treatment to meet water quality standards, such as pathogens and nutrients. Climate change is expected to decrease local water resources in the future, which will increase constituent concentrations leading to difficulty in meeting water quality standards and increases to treatment cost.

Flooding: Increases in flash flooding and inundation (extreme weather)

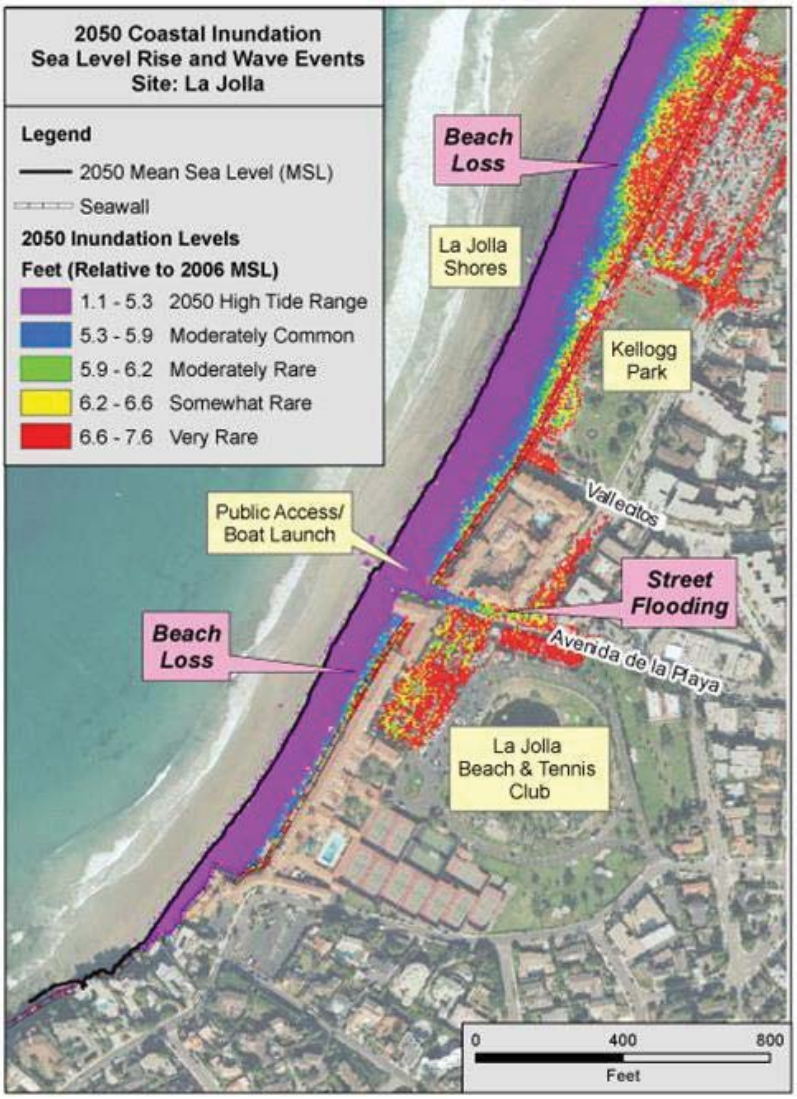
Flash flooding has been an issue for the Region in the past. Foothill areas are especially in danger from flash floods from large seasonal storms, which become a greater concern as the Region is prone to wildfires. Given that more frequent and intense storms are predicted as a consequence of climate change, in addition to increased wildfire risk, increases in flash flooding and inundation are of high concern.

Sea Level Rise: Inundation of storm drains and sewer systems

Regional studies have found that sea level rise is already occurring, and is expected to continue to rise an additional 12 and 18 inches by 2050. This new sea level will inundate a number of low-lying areas along the Region's coast such as Oceanside, La Jolla, Del Mar, Mission Beach, Coronado Island

and Camp Pendleton (Coastal Data Information Program, 2008), and impact their storm drains, wastewater systems, and other facilities and infrastructure. Coastal stormwater infrastructure and wastewater infrastructure that discharge to the ocean will be inundated with increased sea level rise, in particular during coastal storms, causing increased coastal flooding and sewer system overflows. An example of the extent of sea level rise on La Jolla is shown in Figure 2. Concern over aging systems and systems not designed for the increased capacity that will be needed with sea level rise led the group to give this issue a high-priority ranking

Figure 2: Projected 2050 Coastal Inundation with Sea Level Rise in La Jolla



(CDIP, 2008)

Ecosystem/Habitat: Decrease in available necessary habitat

The Region has numerous unique habitat areas extending from the mountains to the oceans which sensitive and endangered species are dependent upon. Anticipated higher temperatures, longer more frequent droughts, and more extreme precipitation events are projected to cause shifts and

loss of habitat necessary for these species. Of particular concern to IRWM planning is the shift and loss of riparian and wetland habitat. Riparian habitat will be altered due to decreased flows, increased water temperatures and increased constituent concentrations. These reductions in habitat and associated loss of sensitive and endangered species will, in turn, create biodiversity shifts and increase invasive species.

Ecosystem/Habitat: Decrease in ecosystem services

Ecosystem services provide important functions, such as material cycling and treatment of stormwater runoff that, if decreased, may result in the need for additional water treatment. As discussed above, climate change is expected to decrease available necessary habitat. This reduction in habitat and associated biodiversity shift and increase in invasive species is expected to decrease ecosystem services in the Region, and could result in additional cost.

Medium Prioritization

Water Demand: Increase in agricultural crop water demand per acre

Crop water demands are expected to increase with the increased temperatures caused by climate change. Though the number of acres of agricultural land is expected to decrease slightly in the future, the net demand for irrigation supply on the remaining acres may exceed current demand under climate change conditions. Through current jurisdictional plans, notably the County of San Diego General Plan, it is apparent that agriculture is an important industry to the Region, particularly smaller agricultural productions and urban farms that provide an economic base and community character to the Region. Given that agricultural land is decreasing, the Workgroup has given this climate change vulnerability issue a medium prioritization.

Water Demand: Increase in industrial demand

Industrial demand is expected to increase with temperature increases due to the need for cooling and process water. This vulnerability issue is particularly of concern for industries such as electronics and aerospace manufacturing, energy generation, research development and the pharmaceutical industry. Industrial demand increases are of concern in particular as increased demand in the Region could impact companies' decision to locate their plants within the Region, which would impact economic development.

Water Supply: Decrease in groundwater supply

Groundwater supply is projected to decline by seven inches per year with climate change. In addition, sea water intrusion caused by rising sea levels also has the potential to impact groundwater supply quality, which will reduce the amount of groundwater available for pumping. Despite these impacts, this vulnerability issue was prioritized as medium since the Region only obtains a small portion of its supplies through groundwater due to the limited size of the groundwater basins. This issue may be of a higher priority in localized areas such as the community of Lakeside, the Marine Corps Base at Camp Pendleton, Pauma Valley, the San Luis Rey River area, and National City where groundwater is a greater portion of supply.

Water Quality: Increase in treatment cost

Total dissolved solids (TDS) levels in reservoirs may increase due to increases in precipitation intensity, particularly after fires, which would in turn increase the cost of water treatment. The Region has a number of reservoirs which are downstream of forested watersheds, and are

susceptible to increased turbidity due to runoff from the surrounding area. However, this is not currently a large issues and therefore, the Workgroup rated this vulnerability issue as medium.

Sea Level Rise: Damage to coastal recreation / tourism due to inundation

As discussed previously, sea level rise is already documented as occurring, and is expected to continue to rise to between 12 and 18 inches by 2050. This rise in sea level is expected to cause damage to coastal recreation and tourism areas (such as beaches), though planning efforts such as the *Sea Level Rise Adaptation Strategy for San Diego Bay*, are ongoing. As the Region's economy relies partially on recreation and tourism, this vulnerability issue has been given a medium prioritization.

Low Prioritization

Water Demand: Limited ability to conserve further

The Region has already succeeded in implementing a large amount of water use efficiency measures. These measures have proven to be successful in mitigating against droughts such as in the severe drought that occurred in 2007. With this in mind, the Region may have difficulty in conserving further to meet greater drought frequency and intensity. However, additional savings measures are available and are being incorporated into Urban Water Management Plans and local climate action plans, which allow the Region to classify this issue as low.

Water Supply: Lack of groundwater storage to buffer drought

As mentioned under the water supply issue of decrease in groundwater supply, the Region's groundwater basins are limited in size, meaning there is very limited storage availability in the groundwater basins for use in buffering drought. Despite this, the Region's low reliability on groundwater makes this issue relatively less of a priority.

Water Quality: Increased eutrophication

Several water bodies in the Region are 303(d) listed for water quality issues related to eutrophication, including a number of lagoons, Tecolote Creek, lower San Diego River, and the Tijuana River Estuary. Consequently, it's probable that temperature increases caused by climate change could increase eutrophication of the Region's water bodies. This climate change vulnerability was ranked low, however, relative to other water quality vulnerability issues.

Flooding: Increases in inland flooding

Inland flooding was listed as a low priority for the Region, though there has been localized flooding in low-lying areas caused by insufficient and/or aging flood infrastructure. More extreme storms due to climate change could cause an increase in inland flooding, but as this is not a Region-wide issue, it has been prioritized as low as the Workgroup felt that this issue could best be addressed through local planning efforts.

Ecosystem/Habitat: Increased impacts to coastal species

Coastal dunes, wetlands, marshes and beaches provide unique habitats for the Region's species. Changes to temperature and precipitation have the potential to impact sensitive species. In addition, brackish lagoons provide estuarine habitat that depends on seasonal freshwater flow patterns. Habitat shifts and loss caused by climate change induced sea level rise, coastal erosion, and changes to freshwater flow patterns could also impact coastal species. Because coastal species

are already protected and because this is a localized issue, the Workgroup decided to classify it as low priority.

Very Low Prioritization

Water Demand: Limited ability to meet summer demand

Increased seasonal temperatures associated with climate change may create a challenge for the Region in meeting summer demands. However, as this is an issue mainly caused by agricultural and urban irrigation, it is ranked low compared to other vulnerability issues.

Water Supply: Invasives can reduce supply available

Invasive species in the Region such as Arundo, Tamarisk and Quagga mussels have the potential to damage water conveyance facilities. Climate change is expected to increase invasive species in the region, which has the potential to impact water supplies in the future. However, this is not currently an issues affecting the Region's water supply infrastructure, and therefore is ranked very low.

Water Quality: Decrease in recreational opportunity

As previously discussed, climate change is expected to increase constituent concentrations in the Region's reservoirs and beaches, a number of which are frequently used for recreation. The Regional already experiences beach closures due to poor stormwater quality which deposits contaminants in near shore areas. A decrease in water quality could impact this beneficial use of these water resources. However, because this is a localized issue, it is ranked very low.

Sea Level Rise: Decrease in land

Coastal erosion is already occurring in the Region along bluffs and cliffs. The continued rise of sea level with climate change is expected to continue to erode land along the Region's coast, and could eventually begin to impact water and wastewater facilities near to the coast, but is a localized issue.

Sea Level Rise: Damage to ecosystem/habitat

As discussed under the vulnerability issue of *increased impacts to coastal species*, sea level rise can be expected to damage coastal ecosystems and habitats. This may occur both through loss of land and through alterations to freshwater flow patterns. Again though, this is a localized issue.

Ecosystem/habitat: Decrease in environmental flows

Aquatic and wetland species often depend upon a minimum flow to survive, and could be impacted with a decrease in minimum flow caused by climate change. In addition, a reduction in flows may increase constituent concentrations in the Region's waters that could stress aquatic life. There are a number of known water quality issues that have the potential to impact species should they worsen in the future, however, there are currently no minimum environmental flows in the Region's rivers and streams,

Hydropower: Decrease in hydropower potential

The Region currently generates 40 megawatts of peak hydropower at the Olivenhain Reservoir and additional hydropower at the Rancho Peñasquitos Pressure Control Hydroelectric Facility, and is examining potential for construction of hydropower facilities elsewhere. Alterations to the Region's hydrology could decrease hydropower generation potential, however, hydropower generation within the Region is not currently a major electricity source.

Vulnerabilities Summary

As can be seen in the above discussion, the Region is faced with a wide range of climate change vulnerability issues. Should the Region not implement strategies to adapt to these, it would face a number of risks, such as:

- Insufficient water supply if current dependence on imported supply is maintained
- Inability to meet demand during droughts given increased overall seasonal demands without increases in long-term operational storage
- Poorer water quality that further impacts beneficial uses and increases treatment needs
- Damage from increased flash flooding and inland flooding
- Coastal flooding and inundation of storm drains and sewer systems due to sea level rise
- Damage to coastal ecosystems and habitats, and associated impacts to sensitive species due to reduced terrestrial flows and sea level rise

5 Climate Change Management Strategies

The next step in conducting the Region's climate change analysis is to identify appropriate strategies for adapting to the climate change vulnerability issues identified and prioritized in Chapter 4. The strategies selected will help the region to respond to or prevent future impacts of climate change on water resources. These strategies also have the potential to mitigate against further climate change by reducing the energy used to treat or convey water supplies and reducing GHG emissions, and some have the potential to provide carbon sequestration. This chapter details how the Workgroup identified, evaluated and prioritized adaptation and mitigation strategies relevant to the Region.

5.1 Identification of Strategies

Strategies were identified through the review of relevant climate change related documents. These documents include:

- California Water Plan (DWR, 2009)
- Managing an Uncertain Future (DWR, 2008)
- Climate Change Scoping Plan (CARB, 2006)
- Climate Action Team Biennial Report (CalEPA, 2010)
- Resolution on Sea Level Rise (OPC, 2010)
- California Climate Extremes Workshop Report (Scripps, 2011)

The California Water Plan contains Resource Management Strategies (RMS) that provide the primary list of strategies used for this Study. The remaining documents in the above list were reviewed for additional and/or more detailed versions of the strategies. The Workgroup reviewed the strategies from the above documents, and discussed them relative to each strategy's potential for addressing the vulnerability issues prioritized above and mitigating GHG emissions.

5.2 Strategy Prioritization

A series of criteria were used by the Workgroup to refine and prioritize the list of strategies. The Workgroup first determined which strategies may be infeasible or not currently relevant to the Region at this time, or were determined not to be desired by the Region, and were not considered further in the strategy identification process.

Following the acceptance screening process, the strategies were analyzed further by evaluating each strategy according to the following questions:

- Is the strategy a "no regret" strategy?
- Does the strategy help to adapt to the vulnerability issues identified and evaluated in Chapters 3 and 4 of this Study?
- Does the strategy help the Region to mitigate GHGs?

By definition, "no regret" strategies are those strategies that would provide benefits today while also reducing vulnerability to climate change impacts. "No regret" strategies are desirable for immediate implementation as they will provide some benefit even under the uncertainty of climate change projections. The strategies were cross referenced with the vulnerability issues discussed in Chapters 2 and 3 to determine the number and type of climate change vulnerabilities that can be addressed. In addition, a strategy received a higher priority if it addresses vulnerability issues vulnerable determined to be high priority. Finally, the strategies were evaluated to determine whether they would mitigate GHG emissions through energy efficiency, emissions reduction, and/or carbon sequestration. Appendix A shows the results of this evaluation.

Using this evaluation, an initial prioritization was completed based on the criteria shown in Table 5.

Table 5: Initial Strategy Prioritization Criteria

Tier	Criteria
Tier 1	• Considered "no regret" • Mitigates GHGs/is GHG neutral • Addresses the imported water (very high) vulnerability
Tier 2	• Included in other local climate change documents • Mitigates GHGs/is GHG neutral • Addresses at least 3 vulnerability areas
Tier 3	• Addresses at least 1 vulnerability or mitigates GHGs

This initial prioritization was then presented to the Workgroup at the August 23, 2012 meeting where the listing of strategies and prioritization were further refined to best represent the needs of the Region. The final list of prioritized climate change management strategies and definitions is shown in Table 6, Table 7 and

Table 8 as Tier 1, 2, and 3 strategies. Strategies that were not prioritized as they were determined to be infeasible or irrelevant for the Region, or would have opposition, are shown Table 9. By

prioritizing these strategies, the Region can better define the types of projects and targets that will help respond to climate change.

Table 6: Tier 1 Climate Change Management Strategies

Strategy	Description
Reduce Water Demand	
Urban water use efficiency	Technological and behavioral improvements that decrease indoor and outdoor residential, commercial, industrial and institutional water use.
Crop idling for water transfers	Remove lands from irrigation (with the aim of returning the lands to irrigation at a later time) in order to make water available for transfer.
Education	Implement outreach program to educate urban and agricultural water users in water demand reduction practices.
Gray water use	Implement gray water use systems to reduce water supply demand.
Rainfed agriculture	Transfer crop consumptive use to be supplied directly by rainfall.
Improve Operational Efficiency/Transfers	
Conveyance - Regional/local	Improvements to regional and local conveyance facilities that improve conveyance capacity, including locating and widening narrow points that constrict the movement of water to increase the water transmission capacity of the entire system, and improve operational flexibility.
System Reoperation	Change existing operation and management procedures for existing reservoirs and conveyance facilities to increase water related benefits from these facilities. May improve the efficiency of existing water uses or may increase the emphasis of one use over another.
Increase Water Supply	
Conjunctive Management & Groundwater Storage	Coordinate and plan use and management of both surface and groundwater resources to maximize the available and reliability of supplies.
Recycled Municipal Water	Increase supply of recycled water through additional wastewater treatment, and/or expand conveyance of recycled water to end users.
Improve Water Quality	
Drinking Water Treatment and Distribution	Develop and maintain adequate water treatment and distribution facilities, and protect the quality and safety of the raw water supply.
Groundwater/Aquifer Remediation	Remove contaminants that affect the beneficial use of groundwater. Can include passive or active methods.
Pollution Prevention	Prevent pollution of local surface waters and groundwater using tools that prevent point and non-point sources of pollution. Examples include water management actions and projects such as the increase of local flows, recharge area protection, etc.
Salt and Salinity Management	Manage salt and salinity in surface and/or groundwater. Examples of methods include dilution and displacement, desalination, and salt collection and storage. The Region is currently working to meet State Salinity/Nutrient Management Planning Guidelines, and will help to implement this strategy.
Urban Runoff Management	Prevent pollution of local surface waters by implementing best management practices (BMPs) designed to reduce the pollutant loading and reduce the volumes and velocities of urban runoff discharged to surface waters.
Improve Flood Management	
Flood Risk Management	Enhance flood protection through projects and programs that assist in the management of flood flows and to prepare for, respond to, and recover from a flood.
Practice Resource Stewardship	

Strategy	Description
Agricultural Lands Stewardship	Conserve natural resources and protect the environment by conserving and improving land for food, fiber and biofuels production, watershed functions, soil, air, energy, plant and other conservation purposes. Can also protect open space and the traditional characteristics of rural communities.
Economic Incentives (Loans, Grants, Water Pricing)	Provide incentives such as financial assistance, water pricing, and water market policies intended to influence water management in order to influence amount of use, time of use, wastewater volume, and source of supply.
Ecosystem Restoration	Improve the condition of modified natural landscapes and biological communities to provide for their sustainability and for their use and enjoyment by current and future generations.
Land Use Planning and Management	Integrate land use and water management for the planning of housing and economic development needs of a growing population while providing for the efficient use of water, water quality, energy and other resources.
Recharge area protection	Protect recharge areas to ensure that areas suitable for recharge continue to be capable of adequate recharge rather than covered by urban infrastructure, and prevent pollutants from entering groundwater.
Water-dependent recreation protection	Incorporate planning for water-dependent recreation activities in water project, and implement project that protect/create water-dependent recreation opportunities.
Watershed/Soils/Forest management	Create and implement plans, programs, projects and activities to restore, sustain, and enhance watershed functions, soil functions, and forests.
Water-dependent cultural resources and practices preservation	Create and implement plans, programs, projects and activities to preserve water-dependent cultural resources and practices
Increase urban forest management	Encourage the planting of trees in urban areas to improve urban water quality and local supplies.
Sea Level Rise	
Building water facilities in coordination with land use/sea level rise (SLR) planning	Integrate water/wastewater resources planning with land use/sea level rise planning.

Table 7: Tier 2 Climate Change Management Strategies

Strategy	Description
Improve Operational Efficiency/Transfers	
Conduct emissions inventory and target	Create inventory of all emission coming from water/wastewater operations, and develop a target for reduction of emissions.
Increase use of renewable energy sources	Use renewable energy sources for the treatment and conveyance of water and wastewater.
Increase Water Supply	
Surface Storage - Regional/local	Add or increase the storage capacity of surface storage reservoirs to increase carryover storage and optimize supplies in drought situations.
Improve Flood Management	
Protective Infrastructure	Construct flood management facilities to reduce the impact of climate change enhanced flooding.
Sediment Management	Implement sediment management practices to reduce the impact of climate change enhanced flash flooding.
Sea Level Rise	
Protect water facilities through the relocation or removal of vulnerable structures	Relocate or remove water/wastewater facilities that may be impacted by sea level rise.
Protect resources and facilities by constructing seawalls or levees	Construct seawalls or levees to protect from sea level rise caused by climate change.
Protect/restore/create coastal wetlands	Protect, restore or create coastal wetlands to prevent the loss of wetland due to sea level rise.

Table 8: Tier 3 Climate Change Management Strategies

Strategy	Description
Reduce Water Demand	
Water Meters Installation	Installation of water meters in order to bill customers volumetrically.
Improve Operational Efficiency/Transfers	
Treatment and Distribution Efficiency	Improve treatment and distribution efficiency or water/wastewater systems in order to reduce energy usage.
Water Transfers	Transfer or exchange of water or water rights that result in temporary or long-term change in the point of diversion, place of use, or purpose of use.
Localized Treatment	Implement localized (or decentralized) treatment of water/wastewater to reduce the energy required for conveyance.
Shift water use to off-peak hours	Implement policies that will shift water use (e.g. irrigation) to off-peak hours to reduce evaporative loss.
Optimize Sewer Systems	Optimize sewer systems (wastewater or stormwater) to adapt to increased precipitation caused by climate change.
Increase Water Supply	
Desalination (Seawater or Brackish Groundwater)	Construct desalination plant to treat seawater or brackish groundwater.
Indirect Potable Reuse/ Potable Reuse	Implement program that will use recycled water to recharge groundwater, or use advanced treated recycled water to augment drinking water supplies.

Table 9: Additionally Reviewed Climate Change Management Strategies

Strategy
Reduce Water Demand
Irrigated Land Retirement
Improve Operational Efficiency/Transfers
Conveyance - Delta
Increase Water Supply
Waterbag Transport/Storage Technology
Precipitation Enhancement
Surface Storage – CALFED
Dewvaporation or Atmospheric Pressure Desalination
Fog Collection
Matching Quality to Use
Sea Level Rise
Rolling Easements
Expendable/Movable Structures in Risk Areas

5.3 Performance Measures/Metrics for Adaptation and Mitigation Strategies

The set of strategies evaluated in the previous section were determined to be those that will best help the Region in responding to and reducing climate change impacts. When implementing these strategies, it will be necessary to develop performance measures or metrics to assess the effectiveness of a project in meeting the Region's goals. Though specific measures and metrics will be defined according a specific project or portfolio of projects, Table 10 provides examples of how these measures or metrics might be defined according to general water resource perspective. It should be noted that several of the strategies (the no regret strategies) may apply to additional objectives in the Region's IRWM Plan, and not solely to adapting to and/or mitigating climate change. Without specific metrics, it would be difficult to assess the effectiveness of strategies in responding to climate change. Moreover, some of the strategies implemented to adapt to climate change are "good planning" for future vulnerabilities and may not be immediately measurable. Many of the effects of climate change are anticipated past the planning horizon of the IRWM Plan. To respond to this uncertainty, the Region should update this climate change analysis during each IRWM Plan update, and implement adaptive management measures which will be discussed in the next chapter.

Table 10: Sample Performance Measures/Metrics

Strategy Category	Sample Performance Measures/Metrics
Reduce Water Demand	• Average (annual) water demand reduction • Peak (seasonal, monthly) water demand reduction
Improve Operational Efficiency	• Additional supply • Supply reliability
Increase Water Supply	• Additional supply • Potable demand offset • Supply reliability
Improve Water Quality	• Salt line migration • Stream temperature • Dissolved oxygen • Turbidity • Pollutant concentrations
Improve Flood Management	• Acres of a certain habitat or floodplain function restored/protected • Volume of natural flood storage provided • Storm return period used for planning • Expected damage resulting for a certain return period storm
Practice Resource Stewardship	• Presence/absence of key indicator species • Acres of a certain habitat or floodplain function restored/protected • Volume of natural flood storage provided • Acres of recharge area protected
Sea Level Rise	• Acres of coastal wetlands created/restored/protected • Miles of pipeline or number of facilities relocated away from coastlines • Length of coastline protected by seawalls or levees

6 Recommendations

The Region has taken the first steps in planning for climate change by examining current climate change projections to determine potential impacts, assessing water resource vulnerabilities, and developing a series of strategies that can be used in projects to adapt to climate change and mitigate GHGs. Chapter 6 discussed recommendations that may be used to successfully implement these strategies, including: use of adaptive management, objectives and targets for inclusion in the IRWM Plan, and project selection considerations for including climate change.

6.1 Adaptive Management

There is a level of uncertainty in projecting the effects and impacts of climate change. To respond to this, DWR recommends the use of adaptive management in implementing climate change strategies (DWR, 2011). Adaptive management consists of identifying and monitoring the most important uncertainties and translating them into risk triggers or early warning indicators. This allows for a flexible path of actions to take as triggers occur. DWR's *Climate Change Handbook* recommends the following steps in developing an adaptive management plan:

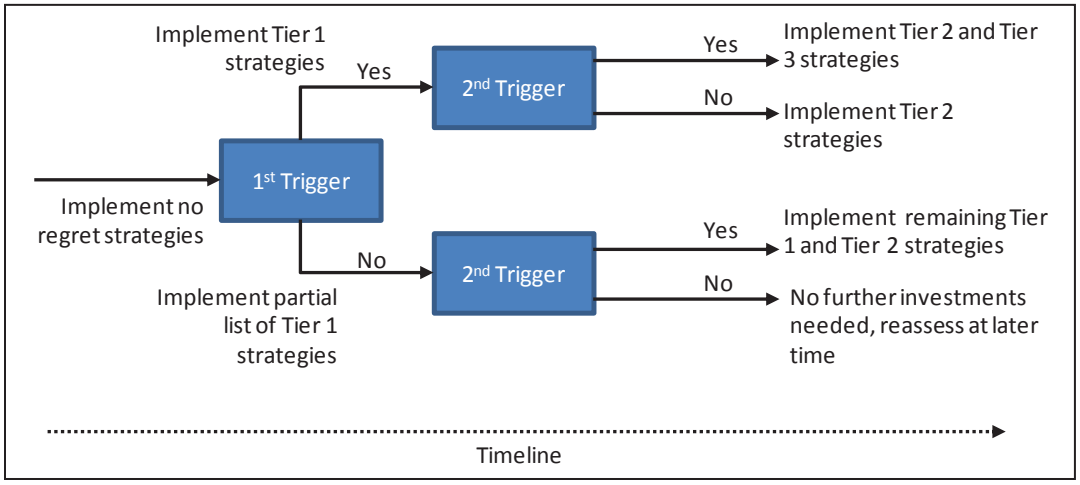
1. Identify risk triggers associated with important vulnerabilities or uncertainties
2. Quantify impacts and uncertainties
3. Evaluate strategies and define flexible implementation paths of action that allows for multiple options at specific triggers
4. Monitor performance and critical variables in the system
5. Implement or reevaluate strategies when triggers are reached

Under Step 1, the Region identifies risk triggers in order to monitor the Region's response to climate change. Risk triggers can be established deterministically (e.g., a threshold) or probabilistically (e.g. frequency of exceedance). The quantification of risk triggers are developed in Step 2, and serve as the basis for the definition of a path for plan implementation under Step 3.

Step 3 involves the definition of an implementation path for the evaluated strategies, and is central to the adaptive management process. The implementation path incorporates risk triggers over the course of time to allow the Region to determine what level of climate change adaptation/mitigation strategy should be implemented. Step 4 of the process, performance monitoring, incorporates performance measures and metrics used to evaluate water resources projects, and will help to define whether a risk trigger has been reached. Step 4 leads into the final step of implementing or reevaluating strategies, Step 5. The general structure of an adaptive management plan can be seen in Figure 3.

The key to successfully implementing the adaptive management process over time is continued active participation by stakeholders, and a clear understanding of project objectives. This should involve ongoing identification, monitoring, and updating of the most important impacts and uncertainties, and re-evaluation of the Region's vulnerabilities (DWR, 2011).

Figure 3: General Adaptive Management Plan



6.2 Climate Change Related Objectives and Targets

DWR requires that climate change be incorporated in the development of IRWM Plan objectives in terms of both climate change adaptation and GHG mitigation (DWR, 2012b). The strategies developed in Chapter 4 include both adaptation and mitigation, and therefore can be incorporated into climate change related objectives and targets that will meet DWR's requirement. The following objective and targets are recommended for inclusion in the IRWM Plan:

Objective: Effectively address climate change through adaptation and mitigation in water resource management.

Target 1: Encourage development of cost-effective carbon-efficient strategies for water management projects.

Target 2: Incorporate adaptation strategies to respond to sea-level rise, rainfall variability, and temperature variability in planning for water and wastewater management.

Target 3: Reduce or neutralize GHG emissions in all areas of water resource management.

6.3 Climate Change in Project Selection Considerations

In order for the Region to adapt to and mitigate against climate change, it will be necessary to ensure that projects utilize strategies identified in this study as helping the Region to adapt to and mitigate against climate change. It is recommended that the Region consider using the strategy priority levels discussed in Chapter 5 to assess the adaptation capacity of the project, and also consider whether the project helps the Region to mitigate GHGs. Oftentimes, a project that implements multiple strategies has the potential to increase the level of benefits provided while reducing the unit cost.

A recommended prioritization approach is presented in Table 11. In these prioritization criteria, projects are given higher priority for utilizing Tier 1 strategies and lower priority for Tier 3 strategies. Additionally, projects that contribute to two or more GHG measures, including energy efficiency, emissions reduction and carbon sequestration, are prioritized more highly. Projects that

contribute to one of these mitigation measures receive higher prioritization, and projects that would increase GHGs receive reduce prioritization. In the future, it is recommended that the Region define a threshold for GHG production or remediation to be used in the prioritization of projects. A worksheet to assist the Region in scoring projects according to the number of strategies utilized can be found in Appendix B. In this way, the Region can ensure that projects will help it to both adapt to climate change vulnerabilities of high concern, and will mitigate against climate change.

Table 11: Climate Change Project Prioritization Criteria

Adaptation	Mitigation[1]	Priority
Tier 1 Strategy	Contributes to 2 out of 3 mitigation measures	High
	Contributes to 1 out of 3 mitigation measures	High
	Increases greenhouse gasses	Medium or Low
Tier 2 Strategy	Contributes to 2 out of 3 mitigation measures	High
	Contributes to 1 out of 3 mitigation measures	Medium
	Increases greenhouse gasses	Low
Tier 3 Strategy	Contributes to 2 out of 3 mitigation measures	Medium
	Contributes to 1 out of 3 mitigation measures	Low
	Increases greenhouse gasses	Low

1. Mitigation measures referred to are: energy efficiency, emissions reduction, and carbon sequestration

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Appendix F - AWWA Water Audit

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AWWA Free Water Audit Software:
Reporting Worksheet

WAS v5.0

? Click to access definition
+ Click to add a comment

Water Audit Report for: Carlsbad Municipal Water District
Reporting Year: 2015 7/2014 - 6/2015

Please enter data in the white cells below. Where available, metered values should be used; if metered values are unavailable please estimate a value. Indicate your confidence in the accuracy of the input data by grading each component (n/a or 1-10) using the drop-down list to the left of the input cell. Hover the mouse over the cell to obtain a description of the grades

All volumes to be entered as: ACRE-FEET PER YEAR

To select the correct data grading for each input, determine the highest grade where the utility meets or exceeds all criteria for that grade and all grades below it.

Master Meter and Supply Error Adjustments

WATER SUPPLIED

<---------- Enter grading in column 'E' and 'J' ---------->

					Pcnt:	Value:	
Volume from own sources:	n/a		acre-ft/yr				acre-ft/yr
Water imported:	9	16,403.000	acre-ft/yr	10	1.00%		acre-ft/yr
Water exported:	n/a		acre-ft/yr				acre-ft/yr

Enter negative % or value for under-registration
Enter positive % or value for over-registration

WATER SUPPLIED: 16,240.594 acre-ft/yr

AUTHORIZED CONSUMPTION

Click here: ? for help using option buttons below

				Pcnt:	Value:	
Billed metered:	10	15,272.650	acre-ft/yr			
Billed unmetered:	n/a		acre-ft/yr			
Unbilled metered:	n/a		acre-ft/yr			
Unbilled unmetered:	6	203.007	acre-ft/yr	1.25%		acre-ft/yr

Default option selected for Unbilled unmetered - a grading of 5 is applied but not displayed

Use buttons to select percentage of water supplied **OR** value

AUTHORIZED CONSUMPTION: 15,475.657 acre-ft/yr

WATER LOSSES (Water Supplied - Authorized Consumption)

764.937 acre-ft/yr

Apparent Losses

				Pcnt:	Value:	
Unauthorized consumption:		40.601	acre-ft/yr	0.25%		acre-ft/yr

Default option selected for unauthorized consumption - a grading of 5 is applied but not displayed

Customer metering inaccuracies:	10	154.269	acre-ft/yr	1.00%		acre-ft/yr
Systematic data handling errors:	10	38.182	acre-ft/yr	0.25%		acre-ft/yr

Default option selected for Systematic data handling errors - a grading of 5 is applied but not displayed

Apparent Losses: 233.052 acre-ft/yr

Real Losses (Current Annual Real Losses or CARL)

Real Losses = Water Losses - Apparent Losses: 531.884 acre-ft/yr

WATER LOSSES: 764.937 acre-ft/yr

NON-REVENUE WATER

NON-REVENUE WATER: 967.944 acre-ft/yr

= Water Losses + Unbilled Metered + Unbilled Unmetered

SYSTEM DATA

Length of mains:	9	440.0	miles
Number of active AND inactive service connections:	10	29,360	
Service connection density:		67	conn./mile main

Are customer meters typically located at the curbstop or property line? Yes

Average length of customer service line: (length of service line, beyond the property boundary, that is the responsibility of the utility)

Average length of customer service line has been set to zero and a data grading score of 10 has been applied

Average operating pressure:	10	70.0	psi

COST DATA

Total annual cost of operating water system:	10	$36,590,921	$/Year	
Customer retail unit cost (applied to Apparent Losses):	10	$4.74	$/100 cubic feet (ccf)	
Variable production cost (applied to Real Losses):	9	$1,143.00	$/acre-ft	☐ Use Customer Retail Unit Cost to value real losses

WATER AUDIT DATA VALIDITY SCORE:

*** YOUR SCORE IS: 89 out of 100 ***

A weighted scale for the components of consumption and water loss is included in the calculation of the Water Audit Data Validity Score

PRIORITY AREAS FOR ATTENTION:

Based on the information provided, audit accuracy can be improved by addressing the following components:

1: Water imported
2: Unauthorized consumption
3: Systematic data handling errors

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Appendix G - SBX7-7 Verification Form

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SB X7-7 Table 0: Units of Measure Used in UWMP*
Acre Feet
**The unit of measure must be consistent with Table 2-3*
NOTES:

SB X7-7 Table-1: Baseline Period Ranges			
Baseline	**Parameter**	**Value**	**Units**
10- to 15-year baseline period	2008 total water deliveries	24,460	Acre Feet
	2008 total volume of delivered recycled water	3,877	Acre Feet
	2008 recycled water as a percent of total deliveries	15.85%	Percent
	Number of years in baseline period[1]	10	Years
	Year beginning baseline period range	1999	
	Year ending baseline period range[2]	2008	
5-year baseline period	Number of years in baseline period	5	Years
	Year beginning baseline period range	2003	
	Year ending baseline period range[3]	2007	

[1] *If the 2008 recycled water percent is less than 10 percent, then the first baseline period is a continuous 10-year period. If the amount of recycled water delivered in 2008 is 10 percent or greater, the first baseline period is a continuous 10- to 15-year period.*

[2] *The ending year must be between December 31, 2004 and December 31, 2010.*

[3] *The ending year must be between December 31, 2007 and December 31, 2010.*

NOTES:

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

SB X7-7 Table 3: Service Area Population		
Year		**Population**
10 to 15 Year Baseline Population		
Year 1	1999	60,154
Year 2	2000	61,261
Year 3	2001	64,372
Year 4	2002	68,007
Year 5	2003	69,916
Year 6	2004	71,459
Year 7	2005	72,975
Year 8	2006	75,672
Year 9	2007	77,619
Year 10	2008	79,400
5 Year Baseline Population		
Year 1	2003	69,916
Year 2	2004	71,459
Year 3	2005	72,975
Year 4	2006	75,672
Year 5	2007	77,619
2015 Compliance Year Population		
2015		86,080
NOTES:		

SB X7-7 Table 4: Annual Gross Water Use *								
	Baseline Year	**Volume Into Distribution System**	**Deductions**					**Annual Gross Water Use**
			Exported Water	Change in Dist. System Storage (+/-)	Indirect Recycled Water	Water Delivered for Agricultural Use	Process Water	
10 to 15 Year Baseline - Gross Water Use								
Year 1	1999	17,313			0		0	17,313
Year 2	2000	19,952			0		0	19,952
Year 3	2001	18,884			0		0	18,884
Year 4	2002	20,586			0		0	20,586
Year 5	2003	20,278			0		0	20,278
Year 6	2004	21,222			0		0	21,222
Year 7	2005	20,163			0		0	20,163
Year 8	2006	21,206			0		0	21,206
Year 9	2007	22,099			0		0	22,099
Year 10	2008	21,187			0		0	21,187
10 - 15 year baseline average gross water use								**20,289**
5 Year Baseline - Gross Water Use								
Year 1	2003	20,278			0		0	20,278
Year 2	2004	21,222			0		0	21,222
Year 3	2005	20,163			0		0	20,163
Year 4	2006	21,206			0		0	21,206
Year 5	2007	22,099			0		0	22,099
5 year baseline average gross water use								**20,994**
2015 Compliance Year - Gross Water Use								
2015		14,029			0		0	14,029
* NOTE that the units of measure must remain consistent throughout the UWMP, as reported in Table 2-3								
NOTES:								

SB X7-7 Table 4-A: Volume Entering the Distribution System(s) Complete one table for each source.				
Name of Source	SDCWA			
This water source is:				
☐	The supplier's own water source			
☑	A purchased or imported source			
Baseline Year *Fm SB X7-7 Table 3*		Volume Entering Distribution System	Meter Error Adjustment* *Optional* *(+/-)*	Corrected Volume Entering Distribution System
10 to 15 Year Baseline - Water into Distribution System				
Year 1	1999	17,313		17,313
Year 2	2000	19,952		19,952
Year 3	2001	18,884		18,884
Year 4	2002	20,586		20,586
Year 5	2003	20,278		20,278
Year 6	2004	21,222		21,222
Year 7	2005	20,163		20,163
Year 8	2006	21,206		21,206
Year 9	2007	22,099		22,099
Year 10	2008	21,187		21,187
5 Year Baseline - Water into Distribution System				
Year 1	2003	20,278		20,278
Year 2	2004	21,222		21,222
Year 3	2005	20,163		20,163
Year 4	2006	21,206		21,206
Year 5	2007	22,099		22,099
2015 Compliance Year - Water into Distribution System				
2015		14,029		14,029
** Meter Error Adjustment - See guidance in Methodology 1, Step 3 of Methodologies Document*				
NOTES:				

SB X7-7 Table 5: Gallons Per Capita Per Day (GPCD)				
Baseline Year		Service Area Population	Annual Gross Water Use	Daily Per Capita Water Use (GPCD)
10 to 15 Year Baseline GPCD				
Year 1	1999	60,154	17,313	257
Year 2	2000	61,261	19,952	291
Year 3	2001	64,372	18,884	262
Year 4	2002	68,007	20,586	270
Year 5	2003	69,916	20,278	259
Year 6	2004	71,459	21,222	265
Year 7	2005	72,975	20,163	247
Year 8	2006	75,672	21,206	250
Year 9	2007	77,619	22,099	254
Year 10	2008	79,400	21,187	238
10-15 Year Average Baseline GPCD				**259**
5 Year Baseline GPCD				
Baseline Year		Service Area Population	Gross Water Use	Daily Per Capita Water Use
Year 1	2003	69,916	20,278	259
Year 2	2004	71,459	21,222	265
Year 3	2005	72,975	20,163	247
Year 4	2006	75,672	21,206	250
Year 5	2007	77,619	22,099	254
5 Year Average Baseline GPCD				**255**
2015 Compliance Year GPCD				
2015		86,080	14,029	145
NOTES:				

SB X7-7 Table 6: Gallons per Capita per Day	
10-15 Year Baseline GPCD	259
5 Year Baseline GPCD	255
2015 Compliance Year GPCD	149
NOTES:	

SB X7-7 Table 7: 2020 Target Method		
Target Method		Supporting Documentation
☑	Method 1	SB X7-7 Table 7A
☐	Method 2	SB X7-7 Tables 7B, 7C, and 7D *Contact DWR for these tables*
☐	Method 3	SB X7-7 Table 7-E
☐	Method 4	Method 4 Calculator
NOTES:		

SB X7-7 Table 7-A: Target Method 1 20% Reduction	
10-15 Year Baseline GPCD	2020 Target GPCD
259	207
NOTES:	

SB X7-7 Table 7-F: Confirm Minimum Reduction for 2020 Target			
5 Year Baseline GPCD	Maximum 2020 Target*	Calculated 2020 Target	Confirmed 2020 Target
255	242	207	207
** Maximum 2020 Target is 95% of the 5 Year Baseline GPCD*			
NOTES:			

SB X7-7 Table 8: 2015 Interim Target GPCD		
Confirmed 2020 Target	10-15 year Baseline GPCD	2015 Interim Target GPCD
207	259	233
NOTES:		

SB X7-7 Table 9: 2015 Compliance								
Actual 2015 GPCD	2015 Interim Target GPCD	Optional Adjustments *(in GPCD)*					2015 GPCD *(Adjusted if applicable)*	Did Supplier Achieve Targeted Reduction for 2015?
		Extraordinary Events	Weather Normalization	Economic Adjustment	TOTAL Adjustments	Adjusted 2015 GPCD		
149	233	-	-	-	0	149	149	YES
NOTES:								

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Appendix H - Energy Intensity Technical Memorandum

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DRAFT Technical Memorandum

Carlsbad Municipal Water District 2015 UWMP

Subject:	**Energy Intensity**
Prepared For:	Shadi Sami
Prepared by:	Frederick Goddard, RMC
Reviewed by:	Sally Johnson, RMC
Date:	March 22, 2016
Reference:	0327-003

1 Introduction

Appendix O, Energy Intensity, of the *2015 Urban Water Management Plans Guidebook for Urban Water Suppliers* (DWR, 2016) provides guidance for estimating energy intensity associated with sources of water used by an urban water supplier. While estimating energy intensity (EI) is an optional portion of an Urban Water Management Plan (UWMP), Carlsbad Municipal Water District (CMWD) is aware of the importance of understanding energy usage within its water system and has chosen to estimate EI for its potable water system. The purpose of calculating CMWD's EI is to:

- Develop a baseline energy use per acre-foot of treated water delivered by the water system.
- Aid in identifying energy saving opportunities in the future.
- Allow for comparing energy use among similar districts.

Water EI is the total amount of energy expended on a per acre-foot (AF) basis to take water from the location CMWD acquires it to the point of delivery. Thus, EI includes conveyance, extraction, treatment, placing water into and taking it from storage, and distribution. CMWD's water EI only accounts for the water management processes occurring within its operational control; energy use associated with the extraction, treatment and conveyance of wholesale water to CMWD's points of diversion is not included. This technical memorandum (TM) describes CMWD's water EI and how it was calculated.

2 Estimating CMWDCWMD's Energy Intensity (EI)

2.1 CMWD's Water System

CMWD purchases all of its potable water supply from San Diego County Water Authority (SDCWA), which it diverts as treated water from four turnouts from SDCWA's regional aqueducts. The treated water is pumped from the aqueducts to CMWD's storage facilities and distributed to its customers. The following water management processes are accounted for in CMWD's water EI as described in the following sections.

- Placement of treated water into local storage.
- Distribution of treated water from the four aqueducts.

2.2 Data Collection and Analysis

Energy use data relating to the distribution and storage of water in CMWD's water supply system was gathered from San Diego Gas & Electric (SDG&E) meter data billed in calendar year 2015. Meter data is

collected during the middle of each month. As a result, January 2015 meter data represents meter readings between mid-December 2014 and mid-January 2015. One natural gas meter is included in CMWD's water system, but was not considered for this analysis. Appendix O of the 2015 UWMP Guidebook provides three reporting methods for EIs and associated tables:

- **Water Supply Process Approach, Table O1-A:** Report EI by water management operation component (aggregated across all supply sources), including extraction, conveyance, placement into storage, treatment and distribution.
- **Total Utility Approach, Table O1-B:** Report a single EI for all water management operations.
- **Multiple Water Delivery Products, Table O1-C:** report EI by water management operation and water delivery product (Retail Potable, Retail Non-Potable, Wholesale Potable, Wholesale Non-Potable, Agricultural, Environmental, and Other Deliveries).

It is not practical to distinguish between energy used for distribution and for energy used to place water in storage. CMWD therefore utilized Table O-1B for its EI calculations instead of Table O-1A or O1-C. CMWD does not use energy for any other water management processes.

2.3 EI Summary

Energy use for calendar year 2015 is summarized in Table 1. CMWD does not currently generate hydropower or renewable energy within its system to offset the use of SDGE-purchased energy.

Table 1: Carlsbad Municipal Water District Water EI Summary

Water Management Process	Volume (AF)	Energy Usage (kWh)
Distribution and Placement of Water in to Storage	14,321	218,818

Total energy use and volume of water entering CMWD's water system for calendar year 2015 were 218,818 kWh and 14,321 AFY, respectively, resulting in an EI of 15.3 kWh/AF. Table O1-B was completed and is attached to this TM (Attachment A).

Attachment A: Table O1-B

Urban Water Supplier: *Carlsbad Municipal Water District*

Water Delivery Product (If delivering more than one type of product use Table O-1C)

Retail Potable Deliveries

Table O-1B: Voluntary Energy Intensity - Total Utility Approach			
Enter Start Date for Reporting Period 1/1/2014 End Date 12/31/2014	**Urban Water Supplier Operational Control**		
	Sum of All Water Management Processes	**Non-Consequential Hydropower**	
	Total Utility	Hydropower	Net Utility
Volume of Water Entering Process (AF)	*14321.2*	*0*	*14321.2*
Energy Consumed (kWh)	*218818*	*0*	*218818*
Energy Intensity (kWh/AF)	*15.3*	*0.0*	*15.3*

Quantity of Self-Generated Renewable Energy

kWh

Data Quality *(Estimate, Metered Data, Combination of Estimates and Metered Data)*

Metered Data

Data Quality Narrative:

Please see TM.

Narrative:

Please see TM.

Appendix I - CMWD Drought Ordinance No. 44 and No. 46

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Exhibit 1

ORDINANCE NO. 44

AN ORDINANCE OF THE BOARD OF DIRECTORS OF THE CARLSBAD MUNICIPAL WATER DISTRICT ADOPTING A DROUGHT RESPONSE PLAN AND WATER CONSERVATION PROGRAM AND REPEALING ORDINANCE NO 35

WHEREAS, article 10, section 2 of the California Constitution declares that waters of the State are to be put to beneficial use, that waste, unreasonable use, or unreasonable method of use of water be prevented, and that water be conserved for the public welfare; and

WHEREAS, conservation of current water supplies and minimization of the effects of water supply shortages that are the result of drought are essential to the public health, safety and welfare; and

WHEREAS, regulation of the time of certain water use, manner of certain water use, design of rates, method of application of water for certain uses, installation and use of water-saving devices, provide an effective and immediately available means of conserving water; and

WHEREAS, California Water Code sections 375 et seq. authorize water suppliers to adopt and enforce a comprehensive water conservation program; and

WHEREAS, adoption and enforcement of a comprehensive water conservation program will allow the Carlsbad Municipal Water District (CMWD) to delay or avoid implementing measures such as water rationing or more restrictive water use regulations pursuant to a declared water shortage emergency as authorized by California Water Code sections 350 et seq.; and

WHEREAS, San Diego County is a semi-arid region and local water resources are scarce. The region is dependent upon imported water supplies provided by the San Diego County Water Authority, which obtains a substantial portion of its supplies from the Metropolitan Water District of Southern California. Because the region is dependent upon imported water supplies, weather and other conditions in other portions of this State and of the Southwestern United States affect the availability of water for use in San Diego County; and

WHEREAS, the San Diego County Water Authority has adopted an Urban Water Management Plan that includes water conservation as a necessary and effective component of

the Water Authority's programs to provide a reliable supply of water to meet the needs of the Water Authority's 24 member public agencies, including the CMWD. The Water Authority's Urban Water Management Plan also includes a contingency analysis of actions to be taken in response to water supply shortages. This ordinance is consistent with the Water Authority's Urban Water Management Plan; and

WHEREAS, as anticipated by its Urban Water Management Plan, the San Diego County Water Authority, in cooperation and consultation with its member public agencies, has adopted a Drought Management Plan, which establishes a progressive program for responding to water supply limitations resulting from drought conditions. This ordinance is intended to be consistent with and to implement the Water Authority's Drought Management Plan; and

WHEREAS, the Water Authority's Drought Management Plan contains three stages containing regional actions to be taken to lessen or avoid supply shortages. This ordinance contains drought response levels that correspond with the Drought Management Plan stages; and

WHEREAS, the CMWD, due to the geographic and climatic conditions within its territory and its dependence upon water imported and provided by the San Diego County Water Authority, may experience shortages due to drought conditions, regulatory restrictions enacted upon imported supplies and other factors. The Board of Directors of CMWD has adopted an Urban Water Management Plan that includes water conservation as a necessary and effective component of its programs to provide a reliable supply of water to meet the needs of the public within its service territory. The CMWD's Urban Water Management Plan also includes a contingency analysis of actions to be taken in response to water supply shortages. This ordinance is consistent with the Urban Water Management Plan adopted by the Board of Directors of CMWD; and

WHEREAS the water conservation measures and progressive restrictions on water use and method of use identified by this ordinance provide certainty to water users and enable CMWD to control water use, provide water supplies, and plan and implement water management measures in a fair and orderly manner for the benefit of the public;

NOW, THEREFORE, BE IT RESOLVED by the Board of Directors of the Carlsbad Municipal Water District of the City of Carlsbad, California, as follows:

1. That the above recitations are true and correct.

2. The Board of Directors of the Carlsbad Municipal Water District of the City of Carlsbad, California, hereby ordains as follows:

SECTION 1.0 DECLARATION OF NECESSITY AND INTENT

(a) This ordinance establishes water management requirements necessary to conserve water, enable effective water supply planning, assure reasonable and beneficial use of water, prevent waste of water, prevent unreasonable use of water, prevent unreasonable method of use of water within the CMWD in order to assure adequate supplies of water to meet the needs of the public, and further the public health, safety, and welfare, recognizing that water is a scarce natural resource that requires careful management not only in times of drought, but at all times.

(b) This ordinance establishes regulations to be implemented during times of declared water shortages, or declared water shortage emergencies. It establishes four levels of drought response actions to be implemented in times of shortage, with increasing restrictions on water use in response to worsening drought conditions and decreasing available supplies.

(c) Level 1 condition drought response measures are voluntary and will be reinforced through local and regional public education and awareness measures that may be funded in part by CMWD.

(d) During drought response condition Levels 2 through 4, all conservation measures and water-use restrictions are mandatory and become increasingly restrictive in order to attain escalating conservation goals.

SECTION 2.0 DEFINITIONS

(a) The following words and phrases whenever used in this chapter shall have the meaning defined in this section:

1. "Grower" refers to those engaged in the growing or raising, in conformity with recognized practices of husbandry, for the purpose of commerce, trade, or industry, or for use by public educational or correctional institutions, of agricultural, horticultural or floricultural products, and produced: (1) for human consumption or for the market, or (2) for the feeding of fowl or livestock produced for human consumption or for the market, or (3) for the feeding of fowl or livestock for the purpose of obtaining their products for human consumption or for the market. "Grower" does not refer to customers who purchase water subject to the Metropolitan Interim Agricultural Water Program or the Water Authority Special Agricultural Rate programs.

2. "Water Authority" or "CWA" means the San Diego County Water Authority.

3. "DMP" means the Water Authority's Drought Management Plan in existence on the effective date of this ordinance and as readopted or amended from time to time, or an equivalent plan of the Water Authority to manage or allocate supplies during shortages.

4. "Metropolitan" or "MWD" means the Metropolitan Water District of Southern California.

5. "Person" means any natural person, corporation, public or private entity, public or private association, public or private agency, government agency or institution, school district, college, university, or any other user of water provided by the CMWD.

6. "District" or "CMWD" means the Carlsbad Municipal Water District.

SECTION 3.0 WATER WASTE PROHIBITIONS

The following water conservation measures will be in effect at all times:

1. Washing down impervious surfaces, including but not limited to sidewalks, driveways, parking lots, tennis courts, or patios with water from a pressurized source, such as a garden hose, except when it is necessary to alleviate safety or sanitation hazards. When used in this section impervious surface means any surface covered with non-porous material.

2. Water waste resulting from inefficient landscape irrigation, such as runoff, low head drainage, or overspray, etc. is prohibited. Water flows onto non-targeted areas, such as adjacent property, non-irrigated areas, hardscapes, roadways, or structures is prohibited.

3. Use a hand-held hose equipped with a positive shut-off nozzle or bucket to water landscaped areas, including trees and shrubs located on residential and commercial properties that are not irrigated by a landscape irrigation system.

4. Use re-circulated water to operate ornamental fountains.

5. Wash vehicles using a bucket and a hand-held hose with positive shut-off nozzle or a mobile high pressure/low volume wash system.

6. Serve and refill water in restaurants and other food service establishments only upon request.

7. Offer guests in hotels, motels, and other commercial lodging establishments the option of not laundering towels and linens daily.

8. Use recycled or non-potable water for construction purposes when available.

9. Single pass-through cooling systems as part of new water service connections will be prohibited. Non-recirculating systems in all new conveyer car wash and commercial laundry systems will also be prohibited.

10. The excess use, loss or escape of water through breaks, leaks or other, malfunctions in the water user's plumbing or distribution system for any period of time after such escape of water could have reasonably been discovered and corrected.

SECTION 4.0 APPLICATION

(a) The provisions of this ordinance apply to any person in the use of any water provided by the CMWD.

(b) This ordinance is intended solely to further the conservation of water. It is not intended to

implement any provision of federal, State, or local statutes, ordinances, or regulations relating to protection of water quality or control of drainage or runoff. Refer to the local jurisdiction or Regional Water Quality Control Board for information on any stormwater ordinances and stormwater management plans.

(c) Nothing in this ordinance is intended to affect or limit the ability of the CMWD to declare and respond to an emergency, including an emergency that affects the ability of the CMWD to supply water.

(d) The provisions of this ordinance do not apply to use of water from private wells or to recycled water.

(e) Nothing in this ordinance shall apply to use of water that is subject to a special supply program, such as the Metropolitan Interim Agricultural Water Program or the Water Authority Special Agricultural Rate programs. Violations of the conditions of special supply programs are subject to the penalties established under the applicable program. A person using water subject to a special supply program and other water provided by the CMWD is subject to this ordinance in the use of the other water.

SECTION 5.0 AUTHORIZATION

The District General Manager, or a designated representative, is hereby authorized and directed to implement the provisions of this ordinance.

SECTION 6.0 DROUGHT RESPONSE LEVEL 1 – DROUGHT WATCH CONDITION

(a) A Drought Response Level 1 condition is also referred to as a "Drought Watch" condition. A Level 1 condition may apply when the Water Authority notifies its member agencies that due to drought or other supply reductions, there is a reasonable probability there will be supply shortages and that a consumer demand reduction of up to 10 percent is required in order to ensure that sufficient supplies will be available to meet anticipated demands. The Executive Manager upon recommendation of the General Manager shall declare the existence of a Drought Response Level 1 and take action to implement the Level 1 conservation practices identified in this ordinance.

(b) During a Level 1 Drought Watch condition, CMWD will increase its public education and outreach efforts to emphasize increased public awareness of the need to implement the following water conservation practices.

1. Irrigate residential and commercial landscape before 10 a.m. and after 6 p.m. only.

2. Irrigate nursery and commercial grower's products before 10 a.m. and after 6 p.m. only. Watering is permitted at any time with a hand-held hose equipped with a positive shut-off nozzle, a bucket, or when a drip/micro-irrigation system/equipment is used. Irrigation of nursery propagation beds is permitted at any time. Watering of livestock is permitted at any time.

3. Repair all water leaks within five (5) days of notification by the CMWD unless other arrangements are made with the General Manager or Designee.

SECTION 7.0 DROUGHT RESPONSE LEVEL 2 – DROUGHT ALERT CONDITION

(a) A Drought Response Level 2 condition is also referred to as a "Drought Alert" condition. A Level 2 condition may apply when the Water Authority notifies its member agencies that due to

cutbacks caused by drought or other reduction in supplies, a consumer demand reduction of up to 20 percent is required in order to have sufficient supplies available to meet anticipated demands. The CMWD Board of Directors shall declare the existence of a Drought Response Level 2 condition and implement the mandatory Level 2 conservation measures identified in this ordinance.

(b) All persons using CMWD water shall comply with Level 1 Drought Watch water conservation practices during a Level 2 Drought Alert, and shall also comply with the following additional conservation measures:

1. Limit residential and commercial landscape irrigation to no more than three (3) assigned days per week on a schedule established by the General Manager and posted by the CMWD. During the months of November through May, landscape irrigation is limited to no more than once per week on a schedule established by the General Manager and posted by the CMWD. This section shall not apply to commercial growers or nurseries.

2. Limit lawn watering and landscape irrigation using sprinklers to no more than ten (10) minutes per watering station per assigned day. This provision does not apply to landscape irrigation systems using water efficient devices, including but not limited to: weather based controllers, drip/micro-irrigation systems and stream rotor sprinklers.

3. Water landscaped areas, including trees and shrubs located on residential and commercial properties, and not irrigated by a landscape irrigation system governed by section 5 (b) (1), on the same schedule set forth in section 5 (b) (1) by using a bucket, hand-held hose with positive shut-off nozzle, or low-volume non-spray irrigation.

4. Repair all leaks within seventy-two (72) hours of notification by the CMWD unless other arrangements are made with the General Manager or Designee.

5. Stop operating ornamental fountains or similar decorative water features unless recycled water is used.

SECTION 8.0 DROUGHT RESPONSE LEVEL 3 – DROUGHT CRITICAL CONDITION

(a) A Drought Response Level 3 condition is also referred to as a "Drought Critical" condition. A Level 3 condition may apply when the Water Authority notifies its member agencies that due to increasing cutbacks caused by drought or other reduction of supplies, a consumer demand reduction of up to 40 percent is required in order to have sufficient supplies available to meet anticipated demands. The CMWD Board of Directors shall declare the existence of a Drought Response Level 3 condition and implement the Level 3 conservation measures identified in this ordinance.

(b) All persons using CMWD water shall comply with Level 1 Drought Watch and Level 2 Drought Alert water conservation practices during a Level 3 Drought Critical condition and shall also comply with the following additional mandatory conservation measures:

1. Limit residential and commercial landscape irrigation to no more than two (2) assigned days per week on a schedule established by the General Manager and posted by the CMWD. During the months of November through May, landscape irrigation is limited to no more than once per week on a schedule established by the General Manager and posted by the CMWD.

2. Limit lawn watering and landscape irrigation using sprinklers to no more than ten (10) minutes per watering station per assigned day. This section shall not apply to commercial growers or nurseries.

3. Water landscaped areas, including trees and shrubs located on residential and commercial properties, and not irrigated by a landscape irrigation system governed by section 6 (b) (1), on the same schedule set forth in section 6 (b) (1) by using a bucket, hand-held hose with a positive shut-off nozzle, or low-volume non-spray irrigation.

4. Stop filling or re-filling ornamental lakes or ponds, except to the extent needed to sustain aquatic life, provided that such animals are of significant value and have been actively managed within the water feature prior to declaration of a drought response level under this ordinance.

5. Stop washing vehicles except at commercial carwashes that re-circulate water, or by high pressure/low volume wash systems.

6. Repair all leaks within forty-eight (48) hours of notification by the CMWD unless other arrangements are made with the General Manager or Designee.

(c) Upon the declaration of a Drought Response Level 3 condition, no new potable water service shall be provided, no new temporary meters or permanent meters shall be provided, and no statements of immediate ability to serve or provide potable water service (such as, will serve letters, certificates, or letters of availability) shall be issued, except under the following circumstances:

1. A valid, unexpired building permit has been issued for the project; or

2. The project is necessary to protect the public's health, safety, and welfare; or

3. The applicant provides substantial evidence of an enforceable commitment that water demands for the project will be offset prior to the provision of a new water meter(s).

This provision shall not be construed to preclude the resetting or turn-on of meters to provide continuation of water service or to restore service that has been interrupted for a period of one year or less.

(d) Upon the declaration of a Drought Response Level 3 condition, the Board of Directors of CMWD will suspend consideration of annexations to its service area.

(e) The Board of Directors of CMWD may establish a water allocation for property served by the CMWD taking into consideration a method that does not penalize persons for the implementation of conservation methods or the installation of water saving devices. If the Board of Directors of CMWD establishes a water allocation notice of the allocation shall be provided by including it in the regular billing statement for the fee or charge or by any other mailing to the address to which the CMWD customarily mails the billing statement for fees or charges for on-going water service. Following the effective date of the water allocation as established by the Board of Directors of CMWD, any person that uses water in excess of the allocation shall be subject to a penalty in the amount equal to the penalty rate established by the Metropolitan Water District for each billing unit of water in excess of the allocation. The penalty for excess water usage shall be cumulative to any other remedy or penalty that may be imposed for violation of this ordinance.

SECTION 9.0 DROUGHT RESPONSE LEVEL 4 – DROUGHT EMERGENCY CONDITION

(a) A Drought Response Level 4 condition is also referred to as a "Drought Emergency" condition. A Level 4 condition may apply when the Water Authority Board of Directors declares a water shortage emergency pursuant to California Water Code section 350 and notifies its member agencies that Level 4 requires a demand reduction of more than 40 percent in order for the CMWD to have maximum supplies available to meet anticipated demands. The CMWD Board of Directors shall declare a Drought Emergency in the manner and on the grounds provided in California Water Code section 350.

(b) All persons using CMWD water shall comply with conservation measures required during Level 1 Drought Watch, Level 2 Drought Alert, and Level 3 Drought Critical conditions and shall also comply with the following additional mandatory conservation measures:

1. Stop all landscape irrigation, except crops and landscape products of commercial growers and nurseries. This restriction shall not apply to the following categories of use unless the CMWD has determined that recycled water is available and may be lawfully applied to the use.

A. Maintenance of trees and shrubs that are watered on the same schedule set forth in section 6 (b) (1) by using a bucket, hand-held hose with a positive shut-off nozzle, or low-volume non-spray irrigation;

B. Maintenance of existing landscaping necessary for fire protection as specified by the Fire Marshal of the local fire protection agency having jurisdiction over the property to be irrigated;

C. Maintenance of existing landscaping for erosion control;

D. Maintenance of plant materials identified to be rare or essential to the well being of rare animals;

E. Maintenance of landscaping within active public parks and playing fields, day care centers, school grounds, cemeteries, and golf course greens, provided that such irrigation does not exceed two (2) days per week according to the schedule established under section 6 (b) (1);

F. Watering of livestock; and

G. Public works projects and actively irrigated environmental mitigation projects.

2. Repair all water leaks within twenty-four (24) hours of notification by the CMWD unless other arrangements are made with the General Manager or Designee.

3. The District may install a flow restricting device for services of up to one and one-half inch (1-1/2") size and comparatively sized restrictors for larger services upon a prior determination that the customer has repeatedly violated the provisions of this Ordinance and that such action is reasonably necessary to assure compliance with this ordinance.

Any willful tampering with or removal of any flow restriction devise may result in termination of service for a period to be determined in writing by the General Manager.

Prior to any restoration of service, the customer may pay all District charges for any restriction of service and its restoration as provided for in the District's rules governing water service.

(c) The CMWD may establish a water allocation for property served by the CMWD. If the CMWD establishes a water allocation it shall provide notice of the allocation by including it in the regular billing statement for the fee or charge or by any other mailing to the address to which the CMWD customarily mails the billing statement for fees or charges for on-going water service. Following the effective date of the water allocation as established by the CMWD, any person that uses water in excess of the allocation shall be subject to a penalty in the amount equal to the penalty rate established by the Metropolitan Water District for each billing unit of water in excess of the allocation. The penalty for excess water usage shall be cumulative to any other remedy or penalty that may be imposed for violation of this ordinance.

SECTION 10.0 CORRELATION BETWEEN DROUGHT MANAGEMENT PLAN AND DROUGHT RESPONSE LEVELS

(a) The correlation between the Water Authority's DMP stages and the CMWD's drought response levels identified in this ordinance is described herein. Under DMP Stage 1, the CMWD may implement Drought Response Level 1 actions. Under DMP Stage 2, the CMWD may implement Drought Response Level 1 or Level 2 actions. Under DMP Stage 3, the CMWD may implement Drought Response Level 2, Level 3, or Level 4 actions.

(b) The drought response levels identified in this ordinance correspond with the Water Authority DMP as identified in the following table:

Drought Response Levels	Use Restrictions	Conservation Target	DMP Stage
1 - Drought Watch	Voluntary	Up to 10%	Stage 1 or 2
2 - Drought Alert	Mandatory	Up to 20%	Stage 2 or 3
3 - Drought Critical	Mandatory	Up to 40%	Stage 3
4 - Drought Emergency	Mandatory	Above 40%	Stage 3

SECTION 11.0 PROCEDURES FOR DETERMINATION AND NOTICATION OF DROUGHT RESPONSE LEVEL

(a) The existence of a Drought Watch condition may be declared by the Executive Manager upon a written determination of the existence of the facts and circumstances supporting the determination. A copy of the written determination shall be filed with the Secretary of the CMWD and provided to the CMWD Board of Directors. The CMWD may publish a notice of the determination of existence of Drought Response Level 1 condition in one or more newspapers, including a newspaper of general circulation within the CMWD. The CMWD may also post notice of the condition on their website.

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(b) The existence of Drought Response Level 2 or Level 3 conditions may be declared by resolution of the CMWD Board of Directors adopted at a regular or special public meeting held in accordance with State law. The mandatory conservation measures applicable to Drought Response Level 2 or Level 3 conditions shall take effect on the tenth (10) day after the date the response level is declared. Within five (5) days following the declaration of the response level, the CMWD shall publish a copy of the resolution in a newspaper used for publication of official notices.

(c) The existence of a Drought Response Level 4 condition may be declared in accordance with the procedures specified in California Water Code sections 351 and 352. The mandatory conservation measures applicable to Drought Response Level 4 conditions shall take effect on the tenth (10) day after the date the response level is declared. Within five (5) days following the declaration of the response level, the CMWD shall publish a copy of the resolution in a newspaper used for publication of official notices. If the CMWD establishes a water allocation, it shall provide notice of the allocation by including it in the regular billing statement for the fee or charge or by any other mailing to the address to which the CMWD customarily mails the billing statement for fees or charges for on-going water service. Water allocation shall be effective on the fifth (5) day following the date of mailing or at such later date as specified in the notice.

(d) The CMWD Board of Directors may declare an end to a Drought Response Level by the adoption of a resolution at any regular or special meeting held in accordance with State law.

SECTION 12.0 HARDSHIP VARIANCE

(a) If, due to unique circumstances, a specific requirement of this ordinance would result in undue hardship to a person using agency water or to property upon which agency water is used, that is disproportionate to the impacts to CMWD water users generally or to similar property or classes of water uses, then the person may apply for a variance to the requirements as provided in this section.

(b) The variance may be granted or conditionally granted, only upon a written finding of the existence of facts demonstrating an undue hardship to a person using agency water or to property upon with agency water is used, that is disproportionate to the impacts to CMWD water users generally or to similar property or classes of water use due to specific and unique circumstances of the user or the user's property.

1. Application. Application for a variance shall be a form prescribed by the General Manager of the CMWD and shall be accompanied by a non-refundable processing fee in an amount set by resolution of the CMWD Board of Directors.

2. Supporting Documentation. The application shall be accompanied by photographs, maps, drawings, and other information, including a written statement of the applicant.

3. Required Findings for Variance. An application for a variance shall be denied unless the General Manager finds, based on the information provided in the application, supporting documents, or such additional information as may be requested, and on water use information for the property as shown by the records of the CMWD, all of the following:

A. That the variance does not constitute a grant of special privilege inconsistent with the limitations upon other CMWD customers.

B. That because of special circumstances applicable to the person, property or its use, the strict application of this ordinance would have a disproportionate impact on the person, property or use that exceeds the impacts to customers generally.

C. That the authorizing of such variance will not be of substantial detriment to adjacent properties, and will not materially affect the ability of the CMWD to effectuate the purpose of this chapter and will not be detrimental to the public interest.

D. That the condition or situation of the subject person, property or the intended use of the property for which the variance is sought is not common, recurrent or general in nature.

4. Approval Authority. The General Manager or Designee shall exercise approval authority and act upon any completed application no later than 10 days after submittal and may approve, conditionally approve, or deny the variance. The applicant requesting the variance shall be promptly notified in writing of any action taken. Unless specified otherwise at the time a variance is approved, the variance applies to the subject property during the term of the mandatory drought response.

5. Appeals to CMWD Executive Manager or Designee(s). An applicant may appeal a decision or condition of the General Manager on a variance application to the CMWD Executive Manager or Designee(s) within 10 days of the decision upon written request for a hearing. The request shall state the grounds for the appeal. At the appeal hearing, the CMWD Executive Manager or Designee(s) shall act as the approval authority and review the appeal de novo by following the regular variance procedure. The decision of the CMWD Executive Manager or Designee(s) is final.

SECTION 13.0 VIOLATIONS AND PENALTIES

(a) Any person, who uses, causes to be used, or permits the use of water in violation of this ordinance is guilty of an offense punishable as provided herein.

(b) Each day that a violation of this ordinance occurs is a separate offense.

(c) Administrative fines may be levied for each violation of a provision of this ordinance as follows:

1. For the first violation by any customer of any of the provisions of this Ordinance the District shall verbally notice the fact of such violation to the customer.

2. For a second violation by any customer of any of the provisions of this Ordinance the District shall issue a written notice of the fact of such violation to the customer.

3. For a third violation by a customer of any provision of this Ordinance the District may install a flow restricting device of one gallon per minute (1 GPM) capacity for services of up to one and one-half inch (1-1/2") size and comparatively sized restrictors for larger services upon a prior determination that the customer has repeatedly violated the provisions of this Ordinance regarding the conservation of water and that such action is reasonably necessary to assure compliance with this Ordinance regarding the conservation of water. In addition, the District may levy an administrative fine of one hundred dollars.

4. Two hundred dollars for a fourth violation of any provision of this ordinance within one year.

5. Five hundred dollars for each additional violation of this ordinance within one year.

(d) If determined by General Counsel to be necessary and appropriate, in lieu of administrative remedies above, each violation of this ordinance may be prosecuted as a misdemeanor punishable by imprisonment in the county jail for not more than thirty (30) days or by a fine not exceeding $1,000, or by both as provided in Water Code section 377.

(e) Willful violations of the mandatory conservation measures and water use restrictions as set forth in Section 7.0 and applicable during a Stage 4 Drought Emergency condition may be enforced by discontinuing service to the property at which the violation occurs as provided by Water Code section 356.

(f) All remedies provided for herein shall be cumulative and not exclusive.

(g) Any customer against whom a penalty is levied pursuant to this section shall have the right to appeal as follows:

1. The request must be in writing and received by the General Manager within ten (10) calendar days of the mailing of the notice of the action to the customer. Any determination not timely appealed shall be final. The written request shall include:

A. a description of the issue,
B. evidence supporting the claim, and
C. a request for resolution of the dispute.

The General Manager will review the material submitted and make an indepedent determination of the issue, which shall be mailed out within fifteen (15) calendar days of receipt of the appeal.

2. The General Manager's determination may be appealed in writing within ten (10) calendar days of the mailing of the notice of determination to the Board of Directors of the CMWD by filing with the Secretary of the CMWD a written notice of such appeal. The Secretary shall set the matter for a hearing before the Board of Directors at an upcoming Board meeting. Notice of the hearing shall be mailed out at least ten (10) calendar days prior to the date of the appeal. The Board may, in its discretion, affirm, reverse or modify the determination.

3. Fees for filing an appeal under this section shall be established by a resolution of the Board of Directors of the CMWD.

SECTION 14.0 REPEAL OF ORDINANCE NO. 35

Ordinance No. 35 of the Carlsbad Municipal Water District relating to the Necessity for and Adopting a Drought Response Conservation Program is hereby repealed in its entirety.

SECTION 15.0 EFFECTIVE DATE

This ordinance is effective immediately upon adoption.

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INTRODUCED AND FIRST READ at a Special Meeting of the Carlsbad Municipal Water District Board on the 16th day of December, 2008, and thereafter.

PASSED, APPROVED AND ADOPTED at a Special Meeting of the Carlsbad Municipal Water District Board, on the 6th day of January, 2009, by the following vote to wit:

AYES: Board Members Lewis, Kulchin, Hall, Packard and Blackburn.

NOES: None.

ABSENT: None.

ABSTAIN: None.

APPROVED AS TO FORM AND LEGALITY

RONALD R. BALL, General Counsel
1-6-09

CLAUDE A. LEWIS, President

ATTEST:

LORRAINE M. WOOD, Secretary

(SEAL)

CARLSBAD MUNICIPAL WATER DISTRICT
ORGANIZED MAR. 22, 1954
CALIFORNIA

EXHIBIT 1

ORDINANCE NO. 46

AN ORDINANCE OF THE BOARD OF DIRECTORS OF THE CARLSBAD MUNICIPAL WATER DISTRICT AMENDING ORDINANCE NO. 44. TO AUTHORIZE THE GENERAL MANAGER TO SET WATERING SCHEDULES

WHEREAS, article 10, section 2 of the California Constitution declares that waters of the State are to be put to beneficial use, that waste, unreasonable use, or unreasonable method of use of water be prevented, and that water be conserved for the public welfare; and

WHEREAS, conservation of current water supplies and minimization of the effects of water supply shortages that are the result of drought are essential to the public health, safety and welfare; and

WHEREAS, regulation of the time of certain water use, manner of certain water use, design of rates, method of application of water for certain uses, installation and use of water-saving devices, provide an effective and immediately available means of conserving water; and

WHEREAS, California Water Code sections 375 et seq. authorize water suppliers to adopt and enforce a comprehensive water conservation program; and

WHEREAS, adoption and enforcement of a comprehensive water conservation program will allow the Carlsbad Municipal Water District (CMWD) to delay or avoid implementing measures such as water rationing or more restrictive water use regulations pursuant to a declared water shortage emergency as authorized by California Water Code sections 350 et seq.; and

WHEREAS, San Diego County is a semi-arid region and local water resources are scarce. The region is dependent upon imported water supplies provided by the San Diego County Water Authority, which obtains a substantial portion of its supplies from the Metropolitan Water District of Southern California. Because the region is dependent upon imported water supplies, weather and other conditions in other portions of this State and of the Southwestern United States affect the availability of water for use in San Diego County; and

WHEREAS, the San Diego County Water Authority has adopted an Urban Water Management Plan that includes water conservation as a necessary and effective component of the Water Authority's programs to provide a reliable supply of water to meet the needs of the

Water Authority's 24 member public agencies, including the CMWD. The Water Authority's Urban Water Management Plan also includes a contingency analysis of actions to be taken in response to water supply shortages. This ordinance is consistent with the Water Authority's Urban Water Management Plan; and

WHEREAS, as anticipated by its Urban Water Management Plan, the San Diego County Water Authority, in cooperation and consultation with its member public agencies, has adopted a Drought Management Plan, which establishes a progressive program for responding to water supply limitations resulting from drought conditions. This ordinance is intended to be consistent with and to implement the Water Authority's Drought Management Plan; and

WHEREAS, the Water Authority's Drought Management Plan contains three stages containing regional actions to be taken to lessen or avoid supply shortages. This ordinance contains drought response levels that correspond with the Drought Management Plan stages; and

WHEREAS, the CMWD, due to the geographic and climatic conditions within its territory and its dependence upon water imported and provided by the San Diego County Water Authority, may experience shortages due to drought conditions, regulatory restrictions enacted upon imported supplies and other factors. The Board of Directors of CMWD has adopted an Urban Water Management Plan that includes water conservation as a necessary and effective component of its programs to provide a reliable supply of water to meet the needs of the public within its service territory. The CMWD's Urban Water Management Plan also includes a contingency analysis of actions to be taken in response to water supply shortages. This ordinance is consistent with the Urban Water Management Plan adopted by the Board of Directors of CMWD; and

WHEREAS the water conservation measures and progressive restrictions on water use and method of use identified by this ordinance provide certainty to water users and enable CMWD to control water use, provide water supplies, and plan and implement water management measures in a fair and orderly manner for the benefit of the public;

NOW, THEREFORE, BE IT RESOLVED by the Board of Directors of the Carlsbad

Municipal Water District of the City of Carlsbad, California, as follows:

1. That the above recitations are true and correct.

2. The Board of Directors of the Carlsbad Municipal Water District of the City of Carlsbad, California, hereby ordains as follows:

SECTION 7.0 DROUGHT RESPONSE LEVEL 2 – DROUGHT ALERT CONDITION

(a) A Drought Response Level 2 condition is also referred to as a "Drought Alert" condition. A Level 2 condition may apply when the Water Authority notifies its member agencies that due to cutbacks caused by drought or other reduction in supplies, a consumer demand reduction of up to 20 percent is required in order to have sufficient supplies available to meet anticipated demands. The CMWD Board of Directors shall declare the existence of a Drought Response Level 2 condition and implement the mandatory Level 2 conservation measures identified in this ordinance.

(b) All persons using CMWD water shall comply with Level 1 Drought Watch water conservation practices during a Level 2 Drought Alert, and shall also comply with the following additional conservation measures:

1. Limit residential and commercial landscape irrigation to assigned days per week on a schedule established by the General Manager. Within five (5) days following the declaration of the response level, the CMWD shall publish a notice of the assigned days in one or more newspapers, including a newspaper of general circulation within the CMWD. The CMWD may also post notice of the condition on its website. This section shall not apply to commercial growers and nurseries.

2. Limit lawn watering and landscape irrigation using sprinklers to time limits per watering station per assigned day as established by the General Manager. Within five (5) days following the declaration of the response level, the CMWD shall publish a notice of the assigned time limits in one or more newspapers, including a newspaper of general circulation within the CMWD. The CMWD may also post notice of the condition on its website. This provision does not apply to landscape irrigation systems using water efficient devices, including but not limited to: weather based controllers, drip/micro-irrigation systems and stream rotor sprinklers.

3. Water landscaped areas, including trees and shrubs located on residential and commercial properties, and not irrigated by a landscape irrigation system governed by section 5 (b) (1), on the same schedule set forth in section 5 (b) (1) by using a bucket, hand-held hose with positive shut-off nozzle, or low-volume non-spray irrigation.

4. Repair all leaks within seventy-two (72) hours of notification by the CMWD unless other arrangements are made with the General Manager or Designee.

5. Stop operating ornamental fountains or similar decorative water features unless recycled water is used.

SECTION 8.0 DROUGHT RESPONSE LEVEL 3 – DROUGHT CRITICAL CONDITION

(a) A Drought Response Level 3 condition is also referred to as a "Drought Critical" condition. A

Level 3 condition may apply when the Water Authority notifies its member agencies that due to increasing cutbacks caused by drought or other reduction of supplies, a consumer demand reduction of up to 40 percent is required in order to have sufficient supplies available to meet anticipated demands. The CMWD Board of Directors shall declare the existence of a Drought Response Level 3 condition and implement the Level 3 conservation measures identified in this ordinance.

(b) All persons using CMWD water shall comply with Level 1 Drought Watch and Level 2 Drought Alert water conservation practices during a Level 3 Drought Critical condition and shall also comply with the following additional mandatory conservation measures:

1. Limit lawn watering and landscape irrigation using sprinklers to time limits per watering station per assigned day as established by the General Manager. Within five (5) days following the declaration of the response level, the CMWD shall publish a notice of the assigned days in one or more newspapers, including a newspaper of general circulation within the CMWD. The CMWD may also post notice of the condition on its website. This section shall not apply to commercial growers or nurseries.

2.Water landscaped areas, including trees and shrubs located on residential and commercial properties, and not irrigated by a landscape irrigation system governed by section 6 (b) (1), on the same schedule set forth in section 6 (b) (1) by using a bucket, hand-held hose with a positive shut-off nozzle, or low-volume non-spray irrigation.

3.Stop filling or re-filling ornamental lakes or ponds, except to the extent needed to sustain aquatic life, provided that such animals are of significant value and have been actively managed within the water feature prior to declaration of a drought response level under this ordinance.

4.Stop washing vehicles except at commercial carwashes that re-circulate water, or by high pressure/low volume wash systems.

5.Repair all leaks within forty-eight (48) hours of notification by the CMWD unless other arrangements are made with the General Manager or Designee.

(c) Upon the declaration of a Drought Response Level 3 condition, no new potable water service shall be provided, no new temporary meters or permanent meters shall be provided, and no statements of immediate ability to serve or provide potable water service (such as, will serve letters, certificates, or letters of availability) shall be issued, except under the following circumstances:

1. A valid, unexpired building permit has been issued for the project; or

2. The project is necessary to protect the public's health, safety, and welfare; or

3. The applicant provides substantial evidence of an enforceable commitment that water demands for the project will be offset prior to the provision of a new water meter(s).

This provision shall not be construed to preclude the resetting or turn-on of meters to provide continuation of water service or to restore service that has been interrupted for a period of one year or less.

(d) Upon the declaration of a Drought Response Level 3 condition, the Board of Directors of CMWD will suspend consideration of annexations to its service area.

(e) The Board of Directors of CMWD may establish a water allocation for property served by the CMWD taking into consideration a method that does not penalize persons for the implementation of conservation methods or the installation of water saving devices. If the Board of Directors of CMWD establishes a water allocation notice of the allocation shall be provided by including it in the regular billing statement for the fee or charge or by any other mailing to the address to which the CMWD customarily mails the billing statement for fees or charges for on-going water service. Following the effective date of the water allocation as established by the Board of Directors of CMWD, any person that uses water in excess of the allocation shall be subject to a penalty in the amount equal to the penalty rate established by the Metropolitan Water District for each billing unit of water in excess of the allocation.
The penalty for excess water usage shall be cumulative to any other remedy or penalty that may be imposed for violation of this ordinance.

EFFECTIVE DATE: This ordinance shall be effective thirty days after its adoption; and the Secretary shall certify the adoption of this ordinance and cause it to be published at least once in a newspaper of general circulation in the City of Carlsbad within fifteen days after its adoption.

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INTRODUCED AND FIRST READ at a Special Meeting of the Carlsbad Municipal Water District Board of Directors on the 10th day of November 2009, and thereafter;

PASSED, APPROVED AND ADOPTED at a Special Meeting of the Board of Directors of the Carlsbad Municipal Water District on the 1st day of December 2009 by the following vote to wit:

AYES: Board Members Lewis, Kulchin, Hall, Packard and Blackburn.

NOES: None.

ABSENT: None.

ABSTAIN: None.

APPROVED AS TO FORM AND LEGALITY

RONALD R. BALL, General Counsel
12/2/2009.

CLAUDE A. LEWIS, President

ATTEST:

LORRAINE M. WOOD, Secretary
Assistant Secretary

(SEAL)

CARLSBAD MUNICIPAL WATER DISTRICT
ORGANIZED MAR. 22, 1954
CALIFORNIA

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Appendix J - CUWCC Reports

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CUWCC BMP Retail Coverage Report 2013

Foundational Best Managemant Practices for Urban Water Efficiency

BMP 1.1 Operation Practices

ON TRACK

6996 Carlsbad Municipal Water District

1. Conservation Coordinator provided with necessary resources to implement BMPs?

Name: Mario Remillard

Title: Water Conservation Coordinator

Email: mario.remillard@carlsbadca.gov

2. Water Waste Prevention Documents

WW Document Name	WWP File Name	WW Prevention URL	WW Prevention Ordinance Terms Description
Option A Describe the ordinances or terms of service adopted by your agency to meet the water waste prevention requirements of this BMP.		http://www.carlsbadca.gov/services/depts/pw/utils/water/rules.asp	Carlsbad Municipal Water District Ordinance No. 44 and No. 45 Carlsbad Municipal Water District 2010 Urban Water Management Plan
Option B Describe any water waste prevention ordinances or requirements adopted by your local jurisdiction or regulatory agencies within your service area.			
Option C Describe any documentation of support for legislation or regulations that prohibit water waste.			
Option D Describe your agency efforts to cooperate with other entities in the adoption or enforcement of local requirements consistent with this BMP.			
Option E Describe your agency support positions with respect to adoption of legislation or regulations that are consistent with this BMP.			
Option F Describe your agency efforts to support local ordinances that establish permits requirements for water efficient design in new development.			

At Least As effective As No

Exemption No

Comments:

CUWCC BMP Retail Coverage Report 2013

Foundational Best Managemant Practices for Urban Water Efficiency

BMP 1.1 Operation Practices **ON TRACK**

CUWCC BMP Coverage Report 2013

Foundational Best Management Practices For Urban Water Efficiency

BMP 1.2 Water Loss Control **ON TRACK**

6996 Carlsbad Municipal Water District

Completed Standard Water Audit Using AWWA Software?	Yes
AWWA File provided to CUWCC?	Yes
AWWA Free Water Audit 2013.xls	
AWWA Water Audit Validity Score?	72
Complete Training in AWWA Audit Method	Yes
Complete Training in Component Analysis Process?	Yes
Component Analysis?	Yes
Repaired all leaks and breaks to the extent cost effective?	Yes
Locate and Repar unreported leaks to the extent cost effective?	Yes
Maintain a record keeping system for the repair of reported leaks, including time of report, leak location, type of leaking pipe segment or fitting, and leak running time from report to repair.	Yes

Provided 7 Types of Water Loss Control Info

Leaks Repairs	Value Real Losses	Value Apparent Losses	Miles Surveyed	Press Reduction	Cost Of Interventions	Water Saved (AF)
88	386.81	23162	1	True	75000	14.37

At Least As effective As No

Exemption No

Comments:

CUWCC BMP Coverage Report 2014

Foundational Best Management Practices For Urban Water Efficiency

BMP 1.3 Metering With Commodity

ON TRACK

6996 Carlsbad Municipal Water District

Numbered Unmetered Accounts	No
Metered Accounts billed by volume of use	Yes
Number of CII Accounts with Mixed Use Meters	269
Conducted a feasibility study to assess merits of a program to provide incentives to switch mixed-use accounts to dedicated landscape meters?	Yes
Feasibility Study provided to CUWCC?	Yes

Date: 1/1/0001

Uploaded file name:

Completed a written plan, policy or program to test, repair and replace meters	Yes

At Least As effective As No

Exemption No

Comments:

CUWCC BMP Coverage Report 2013

Foundational Best Management Practices For Urban Water Efficiency

BMP 1.4 Retail Conservation Pricing

On Track

6996 Carlsbad Municipal Water District

Implementation (Water Rate Structure)

Customer Class	Water Rate Type	Conserving Rate?	(V) Total Revenue Comodity Charges	(M) Total Revenue Fixed Carges
Single-Family	Increasing Block	Yes	13810970.5	6243322.74
Multi-Family	Increasing Block	Yes	2200753.65	757136.34
Commercial	Uniform	Yes	4391518.56	1176948.03
Institutional	Uniform	Yes	212034.65	76224.85
Dedicated Irrigation	Uniform	Yes	4025167.9	752525.06
Agricultural	Uniform	Yes	516287.26	47551.69
			25156732.52	**9053708.71**

Calculate: V / (V + M) **74 %**

Implementation Option: Use Annual Revenue As Reported

☐ Use 3 years average instead of most recent year

Canadian Water and Wastewater Association

Upload file:

Agency Provide Sewer Service: Yes

Customer Class	Rate Type	Conserving Rate?
Single-Family	Uniform	Yes
Multi-Family	Uniform	Yes
Commercial	Uniform	Yes
Institutional	Uniform	Yes

At Least As effective As No

Exemption No

Comments:

CUWCC BMP Coverage Report 2013

Foundational Best Management Practices For Urban Water Efficiency

BMP 2.1 Public Outreach

ON TRACK

6996 **Carlsbad Municipal Water District** **Retail**

Does your agency perform Public Outreach programs? Yes

The list of wholesale agencies performing public outreach which can be counted to help the agency comply with the BMP

Metropolitan Water District of SC,San Diego County Water Authority

Agency Name	ID number
Metropolitan Water District of SC	161
San Diego County Water Authority	196

The name of agency, contact name and email address if not CUWCC Group 1 members

Did at least one contact take place during each quater of the reporting year? Yes

Public Outreach Program List	Number
Website	450
Newsletter articles on conservation	4000
Flyers and/or brochures (total copies), bill stuffers, messages printed on bill, information packets	65000
General water conservation information	25000
Total	**94450**

Did at least one contact take place during each quater of the reporting year? Yes

Number Media Contacts	Number
News releases	55
Total	**55**

Did at least one website update take place during each quater of the reporting year? Yes

Public Information Program Annual Budget

Annual Budget Category	Annual Budget Amount
Public Outreach	565764
Total Amount:	**565764**

Public Outreah Additional Programs
HEW Rebate Program
Water-Energy Pilot Program
Energy Efficiency Assessments for Water Agencies
Home Energy and Water Saving Kits
SDCWA water conservation garden website

CUWCC BMP Coverage Report 2013

Foundational Best Management Practices For Urban Water Efficiency

BMP 2.1 Public Outreach

ON TRACK

Description of all other Public Outreach programs

Retail agencies and The Home Depot to offer Plant Fairs

Comments:

At Least As effective As	No	
Exemption	No	0

CUWCC BMP Coverage Report 2013

Foundational Best Management Practices For Urban Water Efficiency

BMP 2.2 School Education Programs

ON TRACK

6996 Carlsbad Municipal Water District **Retail**

Does your agency implement School Education programs? Yes

The list of wholesale agencies performing public outreach which can be counted to help the agency comply with the BMP

San Diego County Water Authority

Agencies Name	ID number
San Diego County Water Authority	196

Materials meet state education framework requirements? Yes

Yes, all are compliant with state curriculum standards

Materials distributed to K-6? Yes

Posters on water distribution and water cycle, corresponding workbooks (Watersheds, Water and You), coloring books & crayons, cootie catchers with rain tips., Pencil Pouches with conservation messages.

Materials distributed to 7-12 students? Yes (Info Only)

Materials related to Water Quality Testing

Annual budget for school education program: 89645.00

Description of all other water supplier education programs

Water-related assemblies, Splash Mobile Lab, Science Fair, Scout Patch Program, Reuben H Fleet Science Center

Comments:

At Least As effective As No

Exemption No 0

CUWCC BMP Retail Coverage Report 2014

Foundational Best Managemant Practices for Urban Water Efficiency

BMP 1.1 Operation Practices

ON TRACK

6996 Carlsbad Municipal Water District

1. Conservation Coordinator provided with necessary resources to implement BMPs?

Name: Mario Remillard

Title: Conservation Coordinator

Email: mario.remillard@carlsbadca.gov

2. Water Waste Prevention Documents

WW Document Name	WWP File Name	WW Prevention URL	WW Prevention Ordinance Terms Description
Option A Describe the ordinances or terms of service adopted by your agency to meet the water waste prevention requirements of this BMP.	Ord 44 drought response plan.pdf		Ordinance No. 44. An ordinance of the Board of Directors of the Carlsbad Municipal Water District adopting a drought response pland and water conservation program.
Option B Describe any water waste prevention ordinances or requirements adopted by your local jurisdiction or regulatory agencies within your service area.			
Option C Describe any documentation of support for legislation or regulations that prohibit water waste.			
Option D Describe your agency efforts to cooperate with other entities in the adoption or enforcement of local requirements consistent with this BMP.			
Option E Describe your agency support positions with respect to adoption of legislation or regulations that are consistent with this BMP.			
Option F Describe your agency efforts to support local ordinances that establish permits requirements for water efficient design in new development.			

At Least As effective As No

Exemption No

CUWCC BMP Retail Coverage Report 2014

Foundational Best Managemant Practices for Urban Water Efficiency

BMP 1.1 Operation Practices **ON TRACK**

Comments:

CUWCC BMP Coverage Report 2014

Foundational Best Management Practices For Urban Water Efficiency

BMP 1.2 Water Loss Control **ON TRACK**

6996 Carlsbad Municipal Water District

Completed Standard Water Audit Using AWWA Software?	Yes
AWWA File provided to CUWCC?	Yes
AWWA Free Water Audit 2014.xls	
AWWA Water Audit Validity Score?	72
Complete Training in AWWA Audit Method	Yes
Complete Training in Component Analysis Process?	Yes
Component Analysis?	Yes
Repaired all leaks and breaks to the extent cost effective?	Yes
Locate and Repar unreported leaks to the extent cost effective?	Yes
Maintain a record keeping system for the repair of reported leaks, including time of report, leak location, type of leaking pipe segment or fitting, and leak running time from report to repair.	Yes

Provided 7 Types of Water Loss Control Info

Leaks Repairs	Value Real Losses	Value Apparent Losses	Miles Surveyed	Press Reduction	Cost Of Interventions	Water Saved (AF)
159	200.97	50312	2	True	106726.9	30

At Least As effective As No

Exemption No

Comments:

CUWCC BMP Coverage Report 2014

Foundational Best Management Practices For Urban Water Efficiency

BMP 1.3 Metering With Commodity

ON TRACK

6996 Carlsbad Municipal Water District

Numbered Unmetered Accounts	No
Metered Accounts billed by volume of use	Yes
Number of CII Accounts with Mixed Use Meters	269
Conducted a feasibility study to assess merits of a program to provide incentives to switch mixed-use accounts to dedicated landscape meters?	Yes
Feasibility Study provided to CUWCC?	Yes

Date: 1/1/0001

Uploaded file name:

Completed a written plan, policy or program to test, repair and replace meters	Yes

At Least As effective As No

Exemption No

Comments:

CUWCC BMP Coverage Report 2014

Foundational Best Management Practices For Urban Water Efficiency

BMP 1.4 Retail Conservation Pricing

On Track

6996 Carlsbad Municipal Water District

Implementation (Water Rate Structure)

Customer Class	Water Rate Type	Conserving Rate?	(V) Total Revenue Comodity Charges	(M) Total Revenue Fixed Carges
Single-Family	Increasing Block	Yes	15224203.39	6004403.9
Multi-Family	Increasing Block	Yes	2788364.73	842901.9
Commercial	Uniform	Yes	4872136.05	1318121.4
Institutional	Uniform	Yes	233675.25	87811.07
Dedicated Irrigation	Uniform	Yes	4401853.72	843804.21
Agricultural	Uniform	Yes	396342.55	45216.41
			27916575.69	**9142258.89**

Calculate: V / (V + M) **75 %**

Implementation Option: Use Annual Revenue As Reported

☐ Use 3 years average instead of most recent year

Canadian Water and Wastewater Association

Upload file:

Agency Provide Sewer Service: Yes

Customer Class	Rate Type	Conserving Rate?
Single-Family	Non-Volumetric Flat Rate	No
Multi-Family	Uniform	Yes
Commercial	Uniform	Yes
Institutional	Uniform	Yes
Agricultural	Uniform	Yes

At Least As effective As No

Exemption No

Comments:

CUWCC BMP Coverage Report 2014

Foundational Best Management Practices For Urban Water Efficiency

BMP 2.1 Public Outreach

ON TRACK

6996 **Carlsbad Municipal Water District** **Retail**

Does your agency perform Public Outreach programs? No

The list of wholesale agencies performing public outreach which can be counted to help the agency comply with the BMP

San Diego County Water Authority

Agency Name	ID number
San Diego County Water Authority	196

The name of agency, contact name and email address if not CUWCC Group 1 members

Did at least one contact take place during each quater of the reporting year? Yes

Public Outreach Program List	Number
Newsletter articles on conservation	500
Website	300000
Flyers and/or brochures (total copies), bill stuffers, messages printed on bill, information packets	100000
General water conservation information	30000
Total	**430500**

Did at least one contact take place during each quater of the reporting year? No

Number Media Contacts	Number
News releases	50
Total	**50**

Did at least one website update take place during each quater of the reporting year? Yes

Public Information Program Annual Budget

Annual Budget Category	Annual Budget Amount
Public Outreach & Conservation Budget	471641
Total Amount:	**471641**

Public Outreah Additional Programs
3 WaterTalk Forums

Description of all other Public Outreach programs

Home Depot Plant Fairs, World Water Day, Carlsbad Beachfest

Comments:

CUWCC BMP Coverage Report 2014

Foundational Best Management Practices For Urban Water Efficiency

BMP 2.1 Public Outreach

ON TRACK

At Least As effective As	No	
Exemption	No	Select an Exemption Type

CUWCC BMP Coverage Report 2014

Foundational Best Management Practices For Urban Water Efficiency

BMP 2.2 School Education Programs

ON TRACK

6996 Carlsbad Municipal Water District **Retail**

Does your agency implement School Education programs? Yes

The list of wholesale agencies performing public outreach which can be counted to help the agency comply with the BMP

San Diego County Water Authority

Agencies Name	ID number
San Diego County Water Authority	196

Materials meet state education framework requirements? Yes

Yes, All programs are compliant with state curriculum standards.

Materials distributed to K-6? Yes

Poster on water distribution and water cycle, corresponding workbooks (Watersheds, Water and You), cootie catchers with rain tips, pencil pouches.

Materials distributed to 7-12 students? Yes (Info Only)

Material related to Water Quality Testing.

Annual budget for school education program: 66805.00

Description of all other water supplier education programs

Water-related assemblies, Splash Mobile Lab, Science Fair, Reuben H Fleet Science Center Display.

Comments:

At Least As effective As No

Exemption No 0

CUWCC BMP Coverage Report 2014

6996 Carlsbad Municipal Water District

Baseline GPCD: 240.31

GPCD in 2014 188.75

GPCD Target for 2018: 197.10

Biennial GPCD Compliance Table

ON TRACK

		Target		Highest Acceptable Bound	
Year	Report	% Base	GPCD	% Base	GPCD
2010	1	96.4%	**231.70**	100%	**240.30**
2012	2	92.8%	**223.00**	96.4%	**231.70**
2014	3	89.2%	**214.40**	92.8%	**223.00**
2016	4	85.6%	**205.70**	89.2%	**214.40**
2018	5	82.0%	**197.10**	82.0%	**197.10**

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CARLSBAD WATER
RECYCLING FACILITY
6220