PADRE DAM
Municipal Water District

FACILITIES DEVELOPMENT AND OPERATIONS COMMITTEE AND SPECIAL BOARD OF DIRECTORS MEETING

Date: **Monday, May 23, 2022** **Time: 4:00 pm**

Location: **Customer Service Center, Board Room, 9300 Fanita Parkway, Santee and Videoconference**

Committee Members: Director Peasley, Chair
Director Pommering

Staff Members: Allen Carlisle, CEO/General Manager
Kyle Swanson, Assistant General Manager
Paul Clarke, Director of Operations and Water Quality
Mark Niemiec, Director of AWP
Rob Northcote, Plant Manager
Michael Hindle, Engineering Manager
Jimmy Vargas, Operations Manager

Committee Purpose: The purpose of the Facilities Development & Operations Committee is to develop, for the Board's consideration at a future board meeting: A) Policies for the implementation of programs and facilities required to ensure reliable and cost effective water service, recycled water service, and wastewater service systems for District customers; B) Policies relative to long range planning, supply development, environmental interests of the District, and oversee implementation of those policies; C) Policies to sustain the District's mission to provide safe and reliable water supplies, water recycling supplies, and wastewater operations; and D) Policies to support implementation of the strategic plan.

Committees of the Board:

Committees of less than a quorum of the Board may be created to study and advise the full Board regarding certain areas of concern.

Directors that are not on the committee may attend only as observers unless the agenda indicates that a special board meeting has also been noticed as required by law, at which the Board will discuss items on the agenda but not take any action. Whenever a standing committee meeting is also noticed as a special Board meeting, it shall be conducted as a committee meeting and Directors that are not on the committee may participate in discussions upon recognition by the committee chair, but only members of the committee are entitled to make, second or vote on any motion of the committee. Any actions taken by the committee pursuant to the posted agenda shall be deemed recommendations of the committee for the full Board to consider at a future Board meeting.

The Board retains all powers, privileges and duties to exercise and perform the business of the District, and committees of the Board are not empowered to act for the Board. Committee meetings are subject to the Ralph M. Brown Act. Full Board discussion and public comment on committee recommendations shall be encouraged prior to Board action.

A G E N D A

FACILITIES DEVELOPMENT AND OPERATIONS COMMITTEE
AND SPECIAL BOARD OF DIRECTORS MEETING
MONDAY, MAY 23, 2022 – 4:00 PM

NOTICE TO THE PUBLIC

The meeting will be held at the appointed meeting place, the Board Room at the District's Customer Service Center, located at 9300 Fanita Parkway in Santee.

The meeting is also being held virtually via Zoom pursuant to recent amendments to the Brown Act permitting virtual meetings and waiving certain teleconference requirements under certain circumstances. Some Board Members may attend the meeting virtually pursuant to such Brown Act amendments.

Register to watch the webinar via the link below:
https://us06web.zoom.us/webinar/register/WN_s2fHoMNlTuWetk82-RUkDA
After registering, you will receive a confirmation with a link to join the webinar.

For teleconference dial:
+1 (646) 568-7788
Webinar/Meeting ID:
836 8459 2113#
Enter # for participant ID

PUBLIC COMMENT INSTRUCTIONS

Members of the public may address the Board on any item on the agenda when the item is considered, or under "Opportunity for Public Comment" regarding items not on the posted agenda that are within the subject matter jurisdiction of the Board. If attending via Zoom, attendees must click the hand raise icon within the meeting platform and will be called on to unmute themselves when it is their turn to speak. If attending in person, fill out a "request to speak" form located near the entrance of the board room and give to the Board Secretary. Public comments are limited to 3 minutes.

Public comments may also be submitted in writing through the public comment e-form at least a half hour prior to the start of the meeting or mailed to the attention of Amy Pederson, Padre Dam, PO Box 719003, Santee, CA 92072. These public comment procedures supersede the District's normal public comment policies and procedures to the contrary.

The complete agenda package is available for public review at www.PadreDam.org. No action may be taken on any item not appearing on the posted agenda, except as provided by Gov. Code Section 54954.2. Any written materials provided to the Board within 72 hours of the meeting regarding any item on this agenda will be available for public inspection on the District's website. For questions or request for information related to this agenda contact Amy Pederson, Board Secretary, at 619.258.4614 or apederson@padre.org.

Upon request, this agenda will be made available in appropriate alternative formats to persons with disabilities, as required by Section 202 of the American with Disabilities Act of 1990. Any person with a disability who requires a modification or accommodation in order to participate in a meeting should contact our ADA Coordinator: Larry Costello at 619.258.4678 or lcostello@padre.org.

A G E N D A

- **CALL TO ORDER**

- **PLEDGE OF ALLEGIANCE**

- **OPPORTUNITY FOR PUBLIC COMMENT**
  Opportunity for members of the public to address the Board regarding items not appearing on this agenda and are within the jurisdiction of the Board (Gov. Code 54954.3)

- **ITEMS TO BE ADDED, WITHDRAWN OR REORDERED ON THE AGENDA**

- **REPORTS**
  The following items are reports and are placed on the Agenda to provide information to the Board Committee and the public. There is no action called for on these items. The Board Committee may engage in discussion upon which a specific subject matter is identified but may not take any action other than to place the matter on a future agenda.

1. COMPREHENSIVE FACILITIES MASTER PLAN UPDATE

Recommendation:
Hear report from consultant, Carollo Engineers, on the draft Comprehensive Facilities Master Plan Update; no action required.

2. NATIONAL POLLUTANT ELIMINATION DISCHARGE SYSTEM (NPDES) PERMIT RENEWAL UPDATE

Recommendation:
Hear staff report; no action required.

3. DEVELOPMENT UPDATE

Recommendation:
Hear staff report; no action required.

4. CAPITAL IMPROVEMENT PROJECTS (CIP) CONSTRUCTION UPDATE

Recommendation:
Hear staff report; no action required.

5. INFORMATIONAL REPORTS

The following reports are for note and file:

A. East County AWP Executive Overview Report
B. Quarterly Capital Improvement Program (CIP) Projects Budget Update

- **DIRECTORS COMMENTS**

  Directors' comments are to be related to District business which may be of interest to the Board. They are placed on the agenda to enable individual Board Members to convey information to the Board and the Public. There is to be no discussion or action taken on comments made by Board Members.

- **FUTURE AGENDA ITEMS**

- **ADJOURNMENT**

CERTIFICATION OF POSTING

I certify that on May 20, 2022, I posted a copy of the foregoing agenda at least 72 hours prior to the meeting, in accordance with Government Code Section 54954.2(a).

Amy Pederson

Amy Pederson, Board Secretary

PADRE DAM Municipal Water District **COMMITTEE AGENDA REPORT**	**Meeting Date:** 05-23-2022 **Dept. Head:** Kyle Swanson **Submitted by:** Michael Hindle, P.E. **Department:** Engineering **Approved by:** Allen Carlisle, CEO/GM

SUBJECT: COMPREHENSIVE FACILITIES MASTER PLAN UPDATE

RECOMMENDATION(S):

Hear report from consultant, Carollo Engineers, on the draft Comprehensive Facilities Master Plan Update; no action required.

ALTERNATIVE(S):

N/A

ATTACHMENT(S):

1. Draft Comprehensive Facilities Master Plan Update

FUNDING:

Requested amount: N/A
Budgeted amount: $578,606
Are funds available? ☒ Yes ☐ No
Project cost to date: $539,650

PRIOR BOARD/COMMITTEE CONSIDERATION: August 5, 2020 and July 21, 2021 Board Meetings

STRATEGIC PLAN IMPLEMENTATION:

This agenda item is consistent with the District's Strategic Plan and meets one or more of the following Strategic Goals: Provide safe, reliable water, recycled water and sewer services; Ensure fiscal health and competitively sustainable rates; Enhance customer communications and education; Increase water, wastewater and energy independence; Maintain workforce excellence; Expand park and recreation opportunities.

Reviewed by:		**Action Required:**		**Policy Updates:**		**Action Taken:**
Dept Head	☒	Motion	☐	Rules & Regulations	☐	As Recommended ________
Finance	☐	Resolution	☐			Reso/Ord. No. ________
Legal Counsel	☐	Ordinance	☐	Standard Practices & Policies	☐	Other ________
Standard Form	☐	None	☒			

EXECUTIVE SUMMARY:

The Five-Year Business Plan and Budget going before the Board on May 25, 2022 for Board consideration includes funding for Padre Dam Municipal Water District's (Padre Dam) Engineering Department to perform a study to identify and prioritize future Capital Improvement Program (CIP) projects and to satisfy jurisdictional agency requirements. Staff required consultant assistance to update the Master Plan and subsequently facilitated the Board's award of the professional engineering services agreement with Carollo Engineers at the August 5, 2020 Board meeting.

Carollo Engineers has completed data collection, analysis and summarized their findings in the draft Comprehensive Facilities Master Plan Update report which is provided as an attachment. Carollo Engineers will present a summary of the results from the draft Comprehensive Facilities Master Plan Update.

RECOMMENDATION(S):

Hear report from consultant, Carollo Engineers, on the draft Comprehensive Facilities Master Plan Update; no action required.

Attachment 1

Padre Dam Municipal Water District

MASTER PLAN UPDATE

Final Draft

MAY 2022

carollo®

Padre Dam Municipal Water District

MASTER PLAN UPDATE

FINAL DRAFT | May 2022

This document is released for the purpose of information exchange review and planning only under the authority of Ryan F. Orgill, May 17, 2022, California C-75802.

Contents

Tables

Figures

Abbreviations

AAD	average annual demand
ABS	acrylonitrile butadiene styrene
ACP	asbestos cement pipe
ADD	average day demand
ADWF	average dry-weather flow
AF	acre-feet
AFY	acre-feet per year
AMI	advanced metering infrastructure
AMR	automatic meter reading
BAM	below-ground asset manager
BNR	biological nutrient removal
BWF	base wastewater flow
Carollo	Carollo Engineers, Inc.
CCP	concrete cylinder pipe
CCTV	closed-circuit television
CFMP	Comprehensive Facilities Master Plan
CIP	capital improvement plan
CIPP	cured-in-place pipe
CML	cement mortar lined
CMLC	cement mortar lined and coated steel
CSTL	coated steel
CWA	County Water Authority
DIP	ductile iron pipe
d/D	depth to pipe diameter
District/PDMWD	Padre Dam Municipal Water District
DWF	dry weather flow
East County AWP	East County Advanced Water Purification
ECP	embedded cylinder pipe
EMGFM	East Mission Gorge Force Main
EMGPS	East Mission Gorge Pump Station
ENR	Engineering News Record
EPA	Environmental Protection Agency
EPS	extended period simulation
ESA	Eastern Service Area
Ewiiaapaayp	Ewiiaapaayp Band of Kumeyaay Indians
fps	feet per second

ft-msl	feet above mean sea level
FY	fiscal year
GIS	geographic information system
gpcd	gallons per capita day
gpd/ac	gallons per day per acre
gpm	gallons per minute
GWI	groundwater infiltration
HDPE	high-density polyethylene pipe
Helix	Helix Water District
HGL	hydraulic grade line
hp	horsepower
I-8	Interstate 8
IDM	inch-diameter-miles of pipe
IFP	Integrated Facilities Plan
I/I	infiltration and inflow
IPS	Influent Pump Station
JPA	Joint Powers Authority
LF	linear feet
Master Plan Update	update to the CFMP
MDD	maximum day demand
METRO	City of San Diego's Metropolitan Sewerage System
MG	million gallons
mgd	million gallons per day
MGTS	Metro Mission Gorge Interceptor
MinDD	minimum day demand
MinMD	minimum month demand
MMD	maximum month demand
MWD	Metropolitan Water District
n/a	not applicable
NPDES	National Pollutant Discharge Elimination System
PHD	peak hour demand
PRV	pressure reducing valve
psi	pounds per square inch
PRS	pressure reducing station
PVC	polyvinyl chloride
PWWF	peak wet-weather flow
RCP	reinforced concrete pipe
R&R	rehabilitation and replacement

RDII	rainfall derived infiltration and inflow
rpm	revolutions per minute
SANDAG	San Diego Association of Governments
SCADA	supervisory control and data acquisition
Senate Bill x7-7 or SBx7-7	Water Conservation Act of 2009
SIP	shelter-in-place
SOI	sphere of influence
SR-67	San Vicente Freeway (State Route 67)
SSO	sanitary sewer overflow
Sycuan	Sycuan Band of the Kumeyaay Nation
TAZ	traffic analysis zone
USGS	United States Geological Survey
UWMP	Urban Water Management Plan
V	volts
V&A	V&A Consulting Engineers
VCP	vitrified clay pipe
Viejas	Viejas Band of the Kumeyaay Indians
WaPUG	Wastewater Planning Users Group
WDF	water demand factor
WRF	water reclamation facility
WSA	Western Service Area
WWF	wet weather flow
WWFF	wastewater flow factors
WWTP	wastewater treatment plant

Chapter 1

INTRODUCTION

Padre Dam Municipal Water District (District/PDMWD) retained Carollo Engineers, Inc. (Carollo) on August 5, 2020 to perform a limited update to the District's 2015 Comprehensive Facilities Master Plan (CFMP) as a joint effort with the 2020 Urban Water Management Plan (UWMP), which provides the District with consistent and cohesive planning documents. The update to the CFMP (or Master Plan Update) addresses changes to demand and flow projections, refines and calibrates the hydraulic models, and adjusts the capital improvement plan (CIP) to reflect projects completed since the CFMP, verifies projects previously identified, and incorporates new projects based on the system analysis performed. The CIP is extended from 2040 to the year 2045 to maintain a 20-year planning horizon and to match the UWMP planning horizon.

The following Master Plan Update is intended to serve as an update to the CFMP. A list of references used to prepare the Master Plan Update is provided in Appendix A.

1.1 Background

The District prepared an Integrated Facilities Plan (IFP) in 2001 (PBS&J, 2001), which provided recommendations for the District's water, wastewater, and recycled water facilities to accommodate growth through the year 2020. The District recognized the need to prepare an update to the IFP through the development of the CFMP, which extended the planning horizon to year 2040 and addressed changes in water use and wastewater flows, identified repair and rehabilitation projects, and included a review of potential opportunities to expand the recycled water system. Since the development of the CFMP, per-capita water use and wastewater flows have continued to decrease due to water conservation efforts. In addition, the San Diego Association of Governments (SANDAG) has developed revised population projections, and future developments have changed within the City of El Cajon, City of Santee, and County of San Diego. As part of this Master Plan Update, potable water demands, recycled water demands, and wastewater flow projections were updated to reflect the latest changes within the District's boundaries including water use, wastewater flows, and land use data. The updated results and forecasts were used in both the Master Plan Update and 2020 UWMP to provide cohesive and sound planning documents.

As part of this Master Plan Update, the water, wastewater, and recycled water models have been updated with the District's latest geographic information system (GIS) and calibrated to reflect current operational conditions. Since the CFMP, the District added a new imported potable water supply connection through the County Water Authority (CWA), performed additional flow monitoring within the collection system, and considered the potential impacts to the existing recycled water system when the East County Advanced Water Purification (East County AWP) system comes online in 2025. The East County AWP Program is a joint effort with the District, the City of El Cajon, Helix Water District (Helix), and the County of San Diego and will enhance local potable water supplies by nearly 30 percent. The program is overseen by the East County AWP Joint Powers Authority (JPA), and the District is serving as the program administrator.

The District recognizes the importance of updating the recommendations listed in the CFMP to reflect the latest changes within the service areas and develop a revised CIP that confirms the timing and sizing of infrastructure improvements based on the latest demand and flow projections.

1.2 Goals and Objectives

The purpose of the Master Plan Update is to provide a revised CIP that reflects changes within the District's service area for both existing and future conditions through year 2045. The updated CIP assists the District in identifying and prioritizing projects in the most cost-effective and rate-responsible manner. The key objectives for the Master Plan Update are:

- Perform outreach activities to obtain the latest General Land Use Plan information from the City of El Cajon, City of Santee, and the County of San Diego.
- Update the existing and projected potable water demands, wastewater flows, and recycled water demands.
- Identify COVID-19-related impacts to potable demands and wastewater flows.
- Coordinate population and demand projections with the development of 2020 UWMP for consistency and cohesiveness.
- Deliver updated hydraulic models for the District's water, wastewater collection, and recycled water systems.
- Review and update the evaluation criteria for the District's potable, wastewater, and recycled water systems.
- Identify system deficiencies and improvements in the water, wastewater, and recycled water systems under both existing and future (year 2045) conditions.
- Prepare an updated CIP and Master Plan Report that summarizes the changes that have occurred since the development of the CFMP.
- Develop interactive water/sewer model viewers for District staff internal use, and interactive CIP planning tools.

1.3 Report Organization

The Master Plan Update report contains following chapters, which identify changes that have occurred since the CFMP.

- **Chapter 1 – Introduction**. This introductory chapter presents the project background, goals, and objectives of the Master Plan Update.
- **Chapter 2 –Land Use and Population**. This chapter presents a discussion of the study area, near-term and long-term land use, and population trends.
- **Chapter 3 – Demand and Flow Forecasts**. This chapter summarizes the historical potable water demands and wastewater flows and describes the demand-forecasting methodology for the revised projections. In addition, a summary will be included that compares historical data with data collected in year 2020, which was the year that COVID-19 stay at-home orders were in place. The chapter is concluded with a summary of the historical recycled water demands and estimated projections used in the 2020 UWMP.

- **Chapter 4 – Hydraulic Modeling**. This chapter discusses the water, wastewater, and recycled water models used for the analysis in the Master Plan Update. This chapter describes the modifications to the modeling network and systems controls using the latest GIS, As-Builts, and other relevant information provided by the District. In addition, this chapter describes the calibration methodology and summarizes the results for each system.
- **Chapter 5 – System Evaluation Criteria**. This chapter presents the criteria used to evaluate the water, wastewater, and recycled water systems and their facilities under existing and future conditions. Any revisions to the criteria that have occurred since the CFMP will be noted in this chapter.
- **Chapter 6 – Wastewater Collection System Evaluation**. This chapter describes the existing wastewater collection system and changes that have occurred since the development of the CFMP. Subsequently, the findings of the wastewater collection system evaluation under both existing and future flow conditions are described. Improvement projects are summarized and included in the wastewater system CIP.
- **Chapter 7 – Potable Water System Analysis**. This chapter describes the existing water distribution system and changes that have occurred since the development of the CFMP. Subsequently, the findings of the water system evaluation under both existing and future demand conditions are described. Improvement projects are summarized and included in the water system CIP.
- **Chapter 8 – Recycled Water System Evaluation**. This chapter describes the existing recycled water distribution system facilities and changes that have occurred since the development of the CFMP. Subsequently, the findings of the recycled water system evaluation under existing demand conditions are described. Since the future vision of the recycled water system may change with the addition of the East County AWP, potential considerations have been summarized in the chapter.
- **Chapter 9 – Capital Improvement Plan**. This chapter presents a prioritized comprehensive CIP for water, wastewater, and recycled water projects. Project cost estimates are included in this chapter along with the recommended phasing in two planning periods—near-term improvements for year 2025 and long-term improvements for year 2045, which aligns with the planning horizon of the Master Plan Update. In addition, a summary describing changes to the CIP since the development of the CFMP has been included.

1.4 Acknowledgements

Carollo wishes to acknowledge and thank all District staff for their support and oversight of this project:

- Mark Niemiec, P.E., Director of Engineering and Planning.
- Michael Hindle, P.E., Manager of District Projects.
- Robin Bier, P.E., Senior Engineer.
- Jimmy Vargas, Operations Manager.
- Rebecca Abbott, Development Services.

The following Carollo staff members were principally involved in this project:

- Jeff Thornbury, P.E., Principal-in-Charge.
- Amy Martin, Project Manager.
- Ryan Orgill, P.E, Project Manager/Project Engineer, Lead Modeler, and Wastewater Master Plan Lead.
- Aimee Zhao, Water Master Plan Lead.
- Ryan Hejka, P.E., Recycled Water Master Plan Lead.
- Cassidy Thornbury, Staff Engineer.
- Jose Castro, Staff Engineer.
- Mary Kate Forkan, Staff Engineer.
- Jackie Silber, Lead GIS Analyst.
- Matt Huang, P.E., Technical Advisor.
- Tim Loper, P.E., Technical Advisor.

Chapter 2

LAND USE AND POPULATION

This chapter presents the study area of the Master Plan Update, including the District's different service areas for the potable water, wastewater collection, and recycled water systems. The land use classifications, planned developments, and information obtained on future land use are discussed next. This chapter concludes with a description of the historical population trends within the District and projected populations for the planning period of the Master Plan Update. Changes that have occurred since the development of the CFMP have been described. Details presented in this chapter on new developments and population projections form the basis for the demand and flow projections presented in Chapter 3.

2.1 Study Area

The District is located 15 miles northeast of downtown San Diego and encompasses approximately 80 square miles. Figure 2.1 provides a map showing the study area limits of the Master Plan Update. As shown in the figure, the District is divided into two major service areas—the Western Service Area (WSA) and the Eastern Service Area (ESA).

The western border of the study area is defined by the Mission Trails Regional Park adjacent to the City of Santee, while the eastern border of the study area is formed by the Cleveland National Forest boundary. As depicted on Figure 2.1, the San Vicente Reservoir and El Capitan Reservoir are located north of the study area.

The District's water service area includes both the WSA and ESA, while the wastewater and recycled water service areas fall entirely within the WSA. The WSA consists of the City of Santee, a small portion of the City of El Cajon, and a small portion of the unincorporated county community of Lakeside. The unincorporated county communities of Alpine, Blossom Valley, Crest, Dehesa, Flinn Springs, and Harbison Canyon comprise the ESA.

For consistency with the CFMP, separate study areas were developed for the water, wastewater, and recycled water systems, which are described in the following subsections.

2.1.1 Water Study Area

The District's water study area includes both the ESA and the WSA service areas, as shown on Figure 2.2 . The ESA is approximately 60 square miles and about three times the size of the WSA, which is approximately 20 square miles. The ESA serves the Sycuan Band of the Kumeyaay Nation (Sycuan), which entered an agreement in 2018 with the District to receive potable water supply through a turnout located along Sycuan Road.

In addition, approximately 3 square miles of Tribal Lands for the Ewiiaapaayp Band of Kumeyaay Indians (Ewiiaapaayp), and the Viejas Band of Kumeyaay Indians (Viejas) are included in the water study area for this Master Plan Update. As shown on Figure 2.2, the Tribal Lands are located outside the ESA boundary. Ewiiaapaayp and Viejas have all expressed interest in receiving water from the San Diego CWA and/or Metropolitan Water District (MWD).

If agreements between those agencies and the Ewiiaapaayp and/or Viejas are reached, the water supply would be wheeled through the District's infrastructure. System evaluations for this Master Plan Update were performed with and without water being wheeled to the Tribal Lands outside of the District's ESA. In addition, the water study area includes the properties located adjacent to Interstate 8 (I-8) between the ESA and Viejas tribal lands. The District assumes that if water is wheeled to the Viejas tribal lands, then this I-8 corridor of properties would be annexed into the District.

Since the development of the CFMP, a parcel on the eastern side of the WSA that is located east of Santee and north of the California San Vicente Freeway (State Route 67 [SR-67]) is in the process of being de-annexed from the service area and will not be considered for future service area projections as shown on Figure 2.2.

2.1.2 Wastewater Study Area

The District's wastewater study area is approximately 20 square miles and is primarily located within the WSA. As shown on Figure 2.3, the areas that extend outside the WSA, but are within the District's sphere of influence (SOI), include a small section in Lakeside and a small section in El Cajon. The wastewater study area has remained consistent with the CFMP.

2.1.3 Recycled Study Area

The District's recycled water study area is approximately 20 square miles and is primarily included within the WSA. As shown on Figure 2.4, the areas that extend outside the WSA but are within the District's SOI include the Willowbrook Country Club, Sycamore Landfill, Carlton Oaks Country Club, Weston Development (formerly Castlerock), and a small section in the City of El Cajon. The recycled water study area has remained consistent with the CFMP.

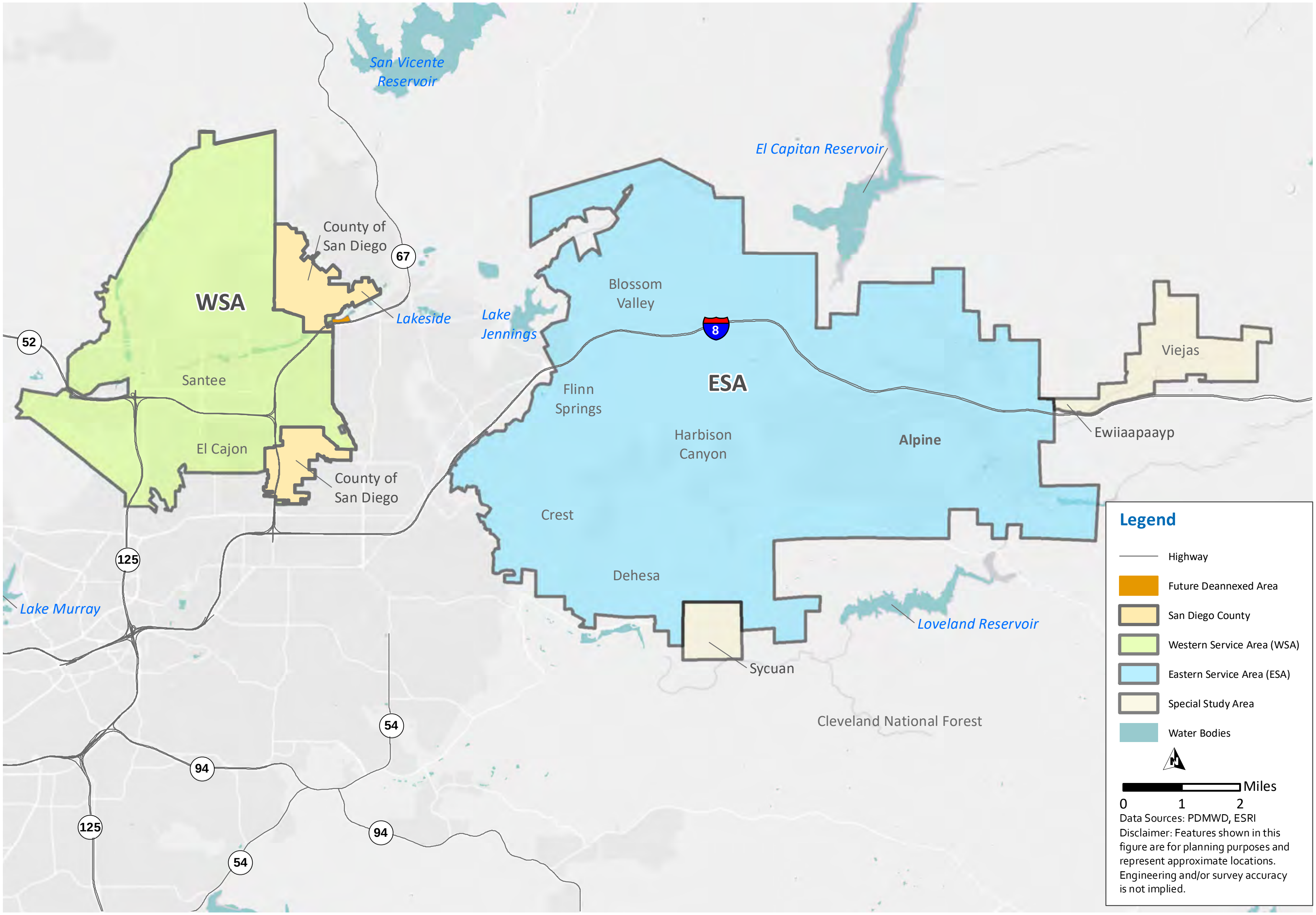
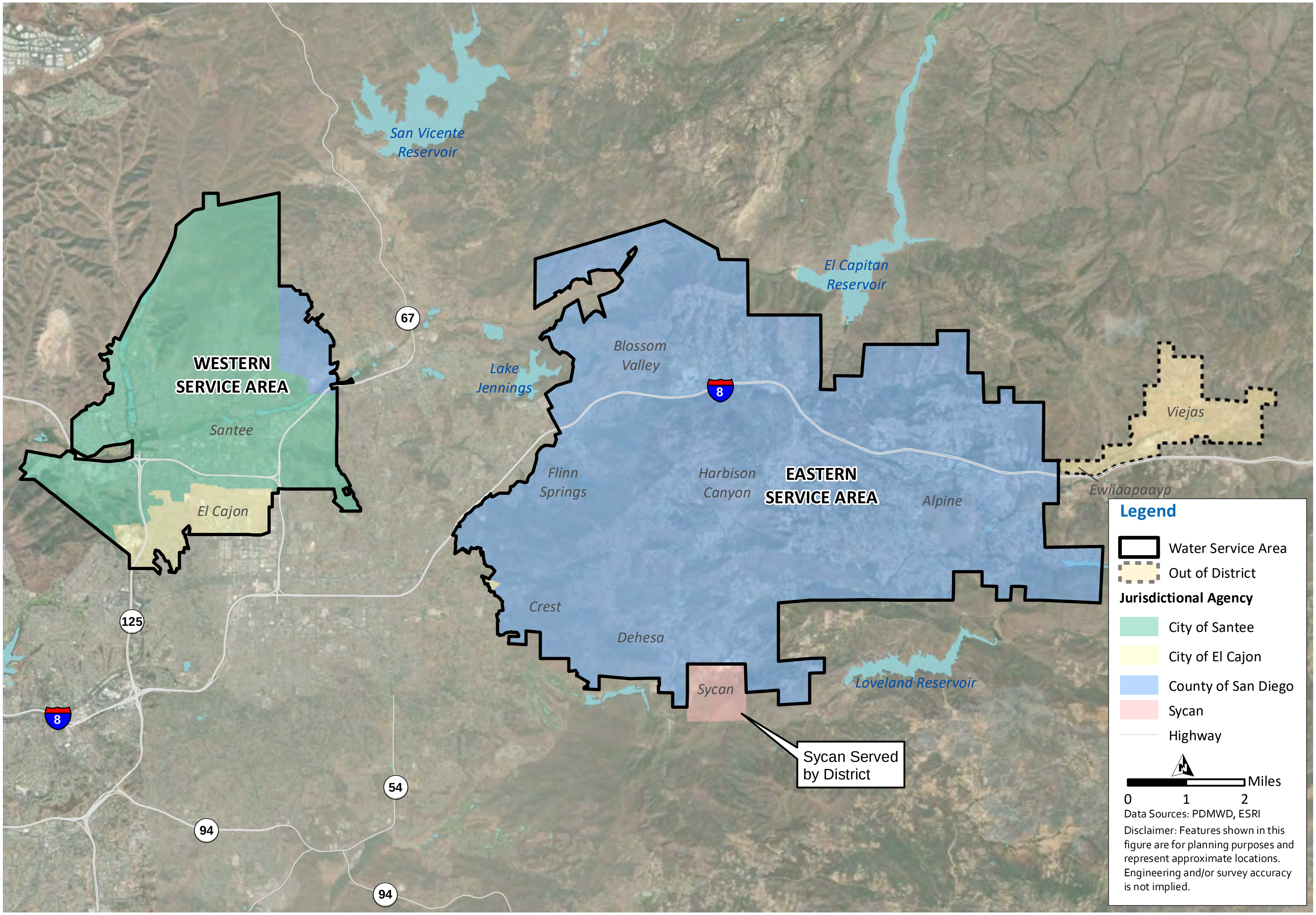


Figure 2.1 Study Area Overview


San Vicente Reservoir
El Capitan Reservoir
Lake Jennings
67
WESTERN SERVICE AREA
Santee
El Cajon
Blossom Valley
8
Viejas
Flinn Springs
Harbison Canyon
EASTERN SERVICE AREA
Alpine
Ewiiaapaayp
Crest
Dehesa
125
Sycan
Loveland Reservoir
Sycan Served by District
8
54
94
94
Legend
Water Service Area
Out of District
Jurisdictional Agency
City of Santee
City of El Cajon
County of San Diego
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Data Sources: PDMWD, ESRI
Disclaimer: Features shown in this figure are for planning purposes and represent approximate locations. Engineering and/or survey accuracy is not implied.

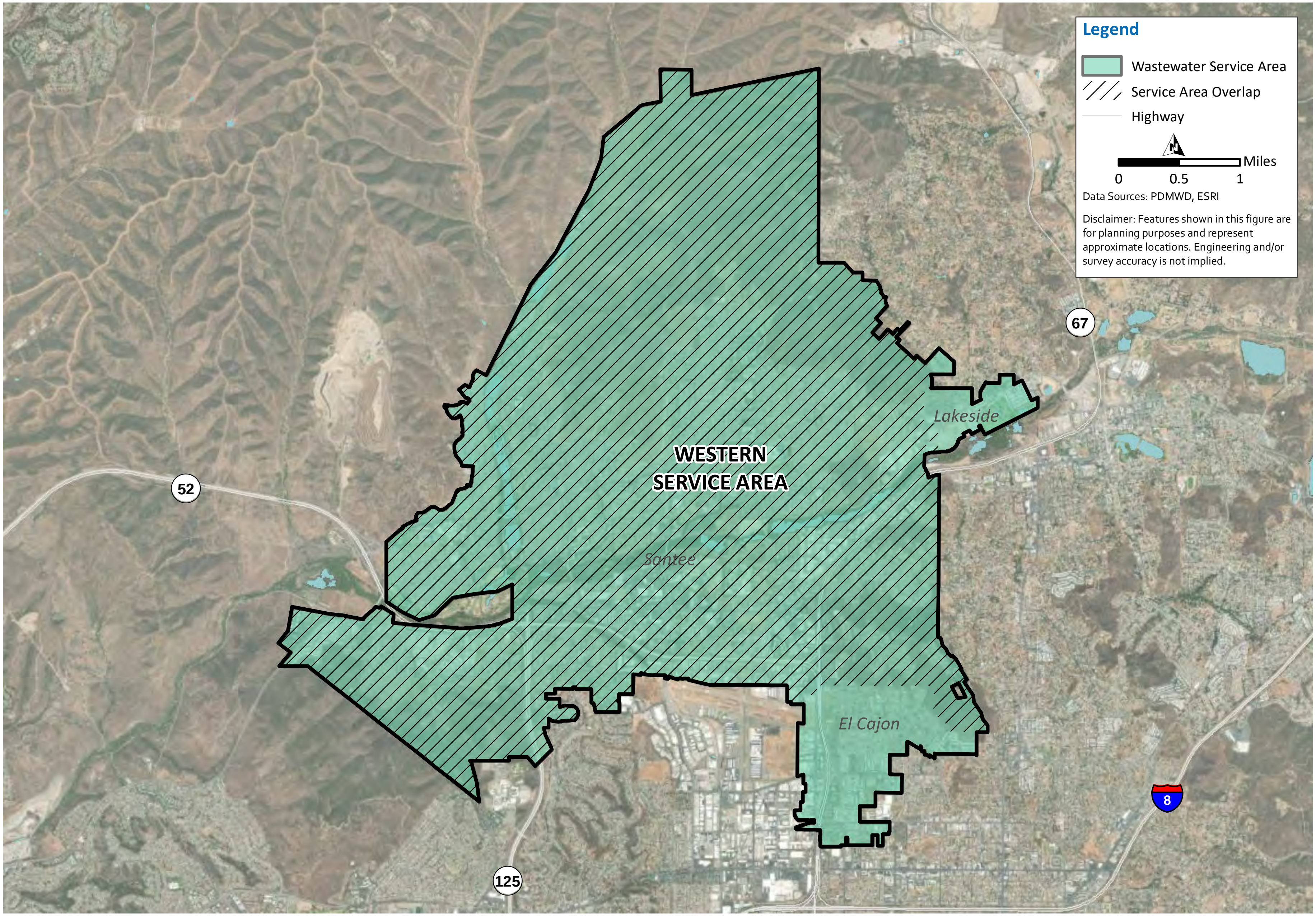


Figure 2.3 Wastewater Study Area

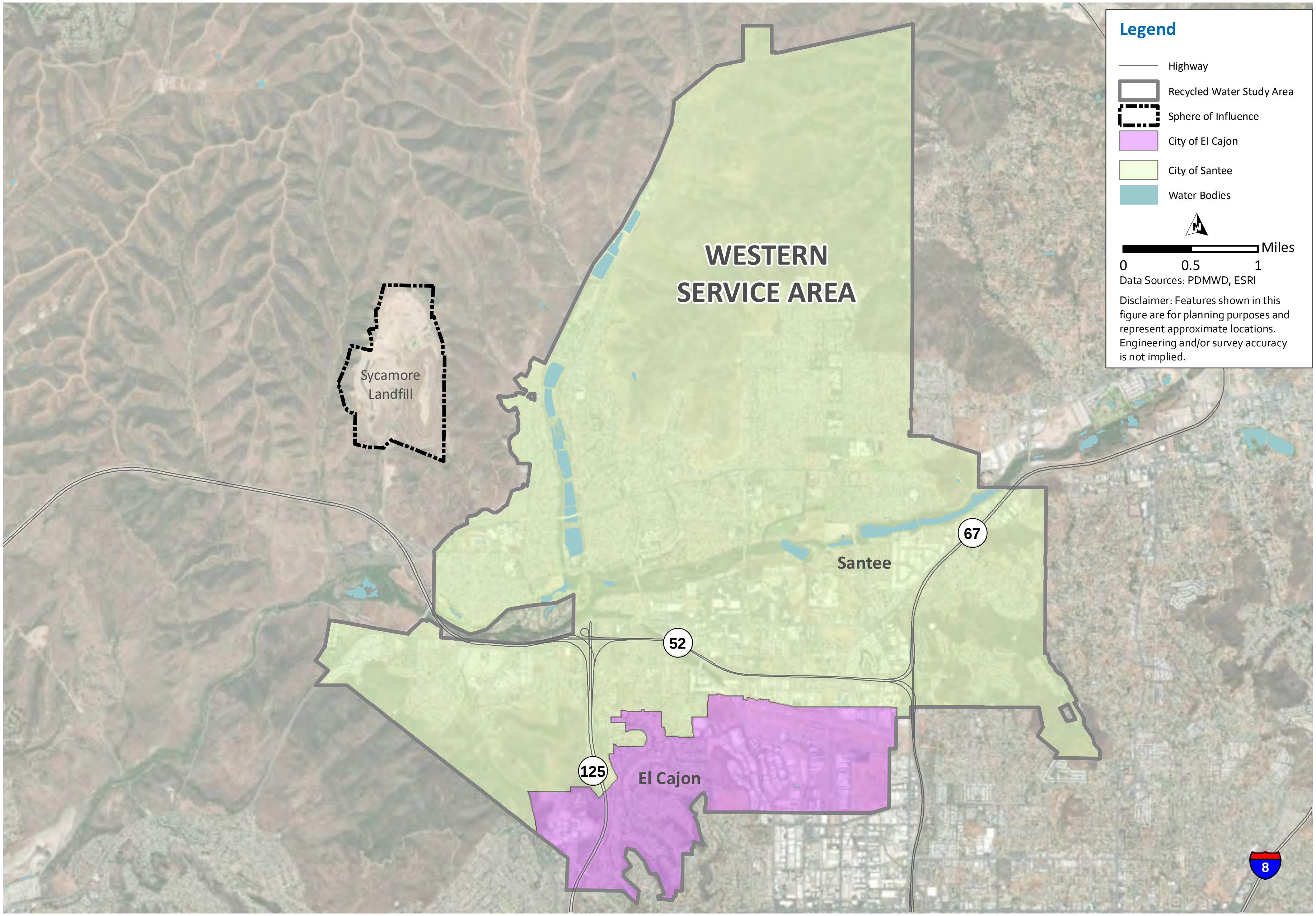


Figure 2.4 Recycled Water Study Area

2.2 Land Use

This section describes the existing land use, as well as the near-term and long-term planned developments within the Master Plan Update study areas. Land use information is an integral component in determining the amount of water use and wastewater generation within the District's service areas.

2.2.1 Existing Land Use

The District's existing land-use categories are based on the general plan categories provided by the County of San Diego, the City of Santee, and the City of El Cajon, which were most recently updated in the years of 2018 and 2019. To consolidate the categories, land uses from the County of San Diego, the City of Santee, and the City of El Cajon were grouped into the District's 11 categories, which is consistent with the land uses in the CFMP. The land-use categories and groupings are summarized in Table 2.1. The distribution of the land uses within the WSA and ESA and presented on Figure 2.5 and Figure 2.6.

Table 2.1 Land Use Categories and Groupings

District's Land-Use Category	District's Abbreviation	City of El Cajon's Land-Use Category(1)(2)	County of San Diego's Land-Use Category(1)	City of Santee's Land-Use Category(1)
High Density Residential	HDR	n/a	VR30, VR24, VR20, VR15, VR10.9, VR7.3	R7, R14, R22
Medium Density Residential	MDR	LR	VR4.3	R2
Low Density Residential	LDR	n/a	VR2.9, VR2	R1, R1A
Semi-Rural	SR	LLR	SR0.5, SR1	HL
Rural	RUR	n/a	SR2, SR4, SR10, RL20, RL40, RL80	n/a
Commercial	COM	n/a	C1, C2, C3, C4, C5	OP, NC, GC, TC, R-B
Industrial	IND	IP	I1, I2, I3	IL, IG
Public Land and Facilities	PUB	HS, JC, PI	Public Agency Lands, P/SP	PUB
Specific Plan Area	SPA	n/a	SPA	PD
Open Space	OS	ROAD	OSC, OSR	P, OS
Tribal Lands	TRL	n/a	TL	n/a
Airport	AP	SDA 6, AP	n/a	n/a

Notes:
Abbreviation: n/a - not applicable
(1) Details on the Land-Use Categories are in Appendix B.
(2) n/a implies that this land use category does not exist within the District's service area.

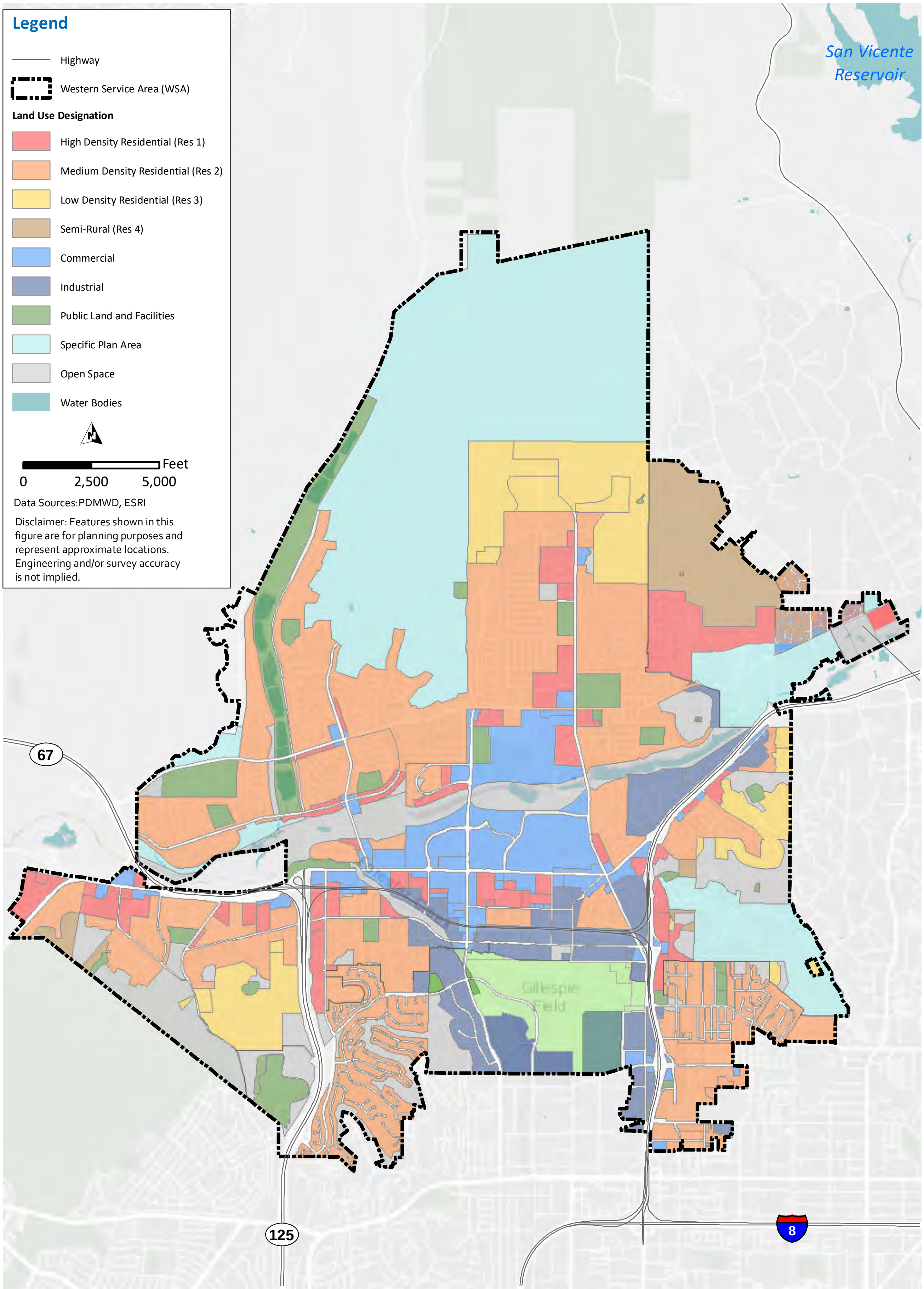


Figure 2.5 Existing Land Use in WSA

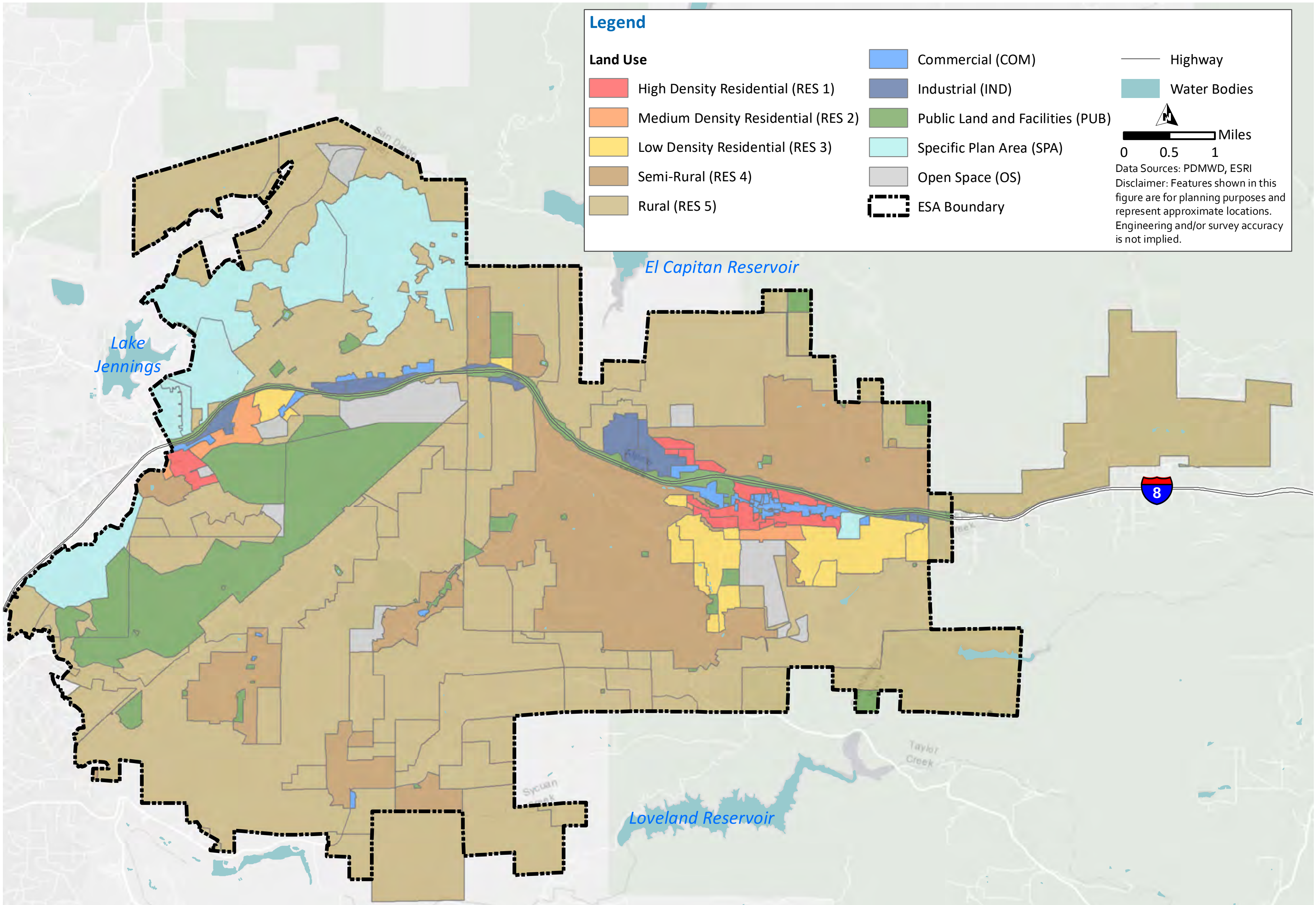


Figure 2.6 Existing Land Use in ESA

2.2.2 Future Developments

As part of this Master Plan Update, the District and Carollo coordinated with the City of Santee, the City of El Cajon, and the County of San Diego to discuss future developments, infill, and proposed redevelopment. The cities of Santee and El Cajon, as well as the County of San Diego have several proposed developments on record. Some of these future developments have been planned for several years, while others have contacted the cities or county within the last five years.

For this Master Plan Update, the future developments were identified as either near-term or long-term. The near-term developments are defined as those that have been in discussions with the planning agencies and are anticipated to be constructed by 2025. The long-term developments are defined as those that are anticipated to be constructed between 2025 and 2045. The timing of developments within the City of Santee may change due to the 2020 passage of Measure N, an initiative which requires voter approval of future zoning changes or development projects that "intensify use," with the term "intensify use" undefined. Since the impacts of Measure N are still unknown, the timing of the projects will remain consistent with the information provided by the City of Santee.

For planning purposes, only major developments that were defined as more than 5,000 square feet in size for non-residential developments or consisting of at least 20 residential units were identified separately as "Future Developments". Small developments were included as infill growth. This methodology is slightly more detailed than the CFMP, which included major developments that were more than one acre in size and consisted of at least 100 residential units. The remaining development was considered infill. The locations of the future developments identified for this Master Plan Update are shown on Figure 2.7, while the number of units and size of the developments are summarized in Table 2.2.

Table 2.2 Future Developments

Map ID(1)	Future Development Name(14)	Development Size		Estimated Population(2)	Build-Out Year(3)	Service Area(4)
		Units	Acres			
City of Santee(5)						
1	Walker Trails	67	-	192	2025	WSA
2	*Riverview*	*990*	*100*	*2,603*	*2045*	*WSA*
3	*Fanita Ranch(6)*	*3,008*	*2,640*	*9,686*	*2045*	*WSA*
4	Pinnacle Peak	113	5	323	2025	WSA
5	Lantern Crest Ridge (Phase II)	-	1	-	2045	WSA
6	Carlton Oaks Golf Course(7)	243	7	851	2045	WSA
7	Lunar Lane	-	0.2	-	2045	WSA
8	Prospect Estates II	53	-	152	2025	WSA
9	WoodSpring Suites	-	0.1	-	2045	WSA
10	Tower Glass	-	0.8	-	2025	WSA
11	Cornerstone	128	-	366	2025	WSA
12	Hattie Davidson Properties	113	-	323	2025	WSA

Map ID(1)	Future Development Name(14)	Development Size		Estimated Population(2)	Build-Out Year(3)	Service Area(4)
		Units	Acres			
13	Gondola Skate	-	0.7	-	2045	WSA
14	Jacor	-	0.1	-	2045	WSA
15	Railroad Workshop	-	0.1	-	2045	WSA
16	*Parkside (formerly Hillside Meadows)(14)*	*125*	-	*329*	*2045*	*WSA*
17	Sharp Medical Office Building	-	2	-	2025	WSA
18	*Weston (formerly Castlerock)(8)*	*415*	*208*	-	*2025*	*WSA*
City of El Cajon(9)						
19	Weld Distribution Center	-	3	-	2045	WSA
County of San Diego(10)						
20	*Alpine High School/Library(11)*	-	*70*	-	*2045*	*ESA*
21	South Coast Development	-	2	-	2045	*ESA*
22	*Rancho Palo Verde (Phase 2)*	*153*	-	*402*	*2045*	*ESA*
23	Creekside Meadows	65	-	171	2025	ESA
24	Alpine 21 Tentative Map	20	-	53	2045	ESA
25	Alpine Densification(12)	2,044	-	5,376	n/a	ESA
26	Sycuan(13)	-	-	-	2025	ESA
Total	**n/a**	**7,537**	**3,039**	**20,825**	**n/a**	**n/a**

Notes:
(1) Map ID corresponds with Figure 2.7.
(2) Unless otherwise noted, estimated population is determined by using SANDAG's average 2.86 persons per dwelling unit for developments constructed before 2035 and 2.63 persons per dwelling unit for developments constructed from 2035 and beyond (SANDAG, 2019).
(3) Build-out year is either 2025 or 2045. Future developments anticipated for construction beyond 2045 are not included in this Master Plan Update.
(4) Only future developments within the WSA service area will impact recycled water and sewer.
(5) Information provided by City of Santee. Timing of Santee may change due to Measure N. Since the effects are still unknown, City of Santee staff advised to assume it will not change the timing of the projects.
(6) Based on Fanita Ranch Water Supply Assessment. Population based on Water Supply Assessment assumption of 3.4 persons per dwelling unit for low-density single family residential and 3.1 persons per dwelling unit for medium-density single family residential.
(7) Based on Carlton Oaks Water Study. Population based on Water Study assumption of 3.5 persons per dwelling unit.
(8) As of October 2020, the Weston Development was almost built-out with approximately 5 homes remaining to be constructed. Thus, the population increase was assumed to be minor and not included in this table.
(9) Information provided by the City of El Cajon.
(10) Information provided by County of San Diego.
(11) No new information was available for the Alpine High School/Library. The size from the 2015 CFMP was assumed.
(12) Alpine densification includes changes to the General Plan number of dwelling units due to the Alpine Community Plan Village-Focused Alternative.
(13) Sycuan demand is received at a turnout based on a service agreement made with the District. The associated size and population are unknown.
(14) Developments previously identified in the CFMP are italicized. Riverview increased from 300 units to 990 units, Fanita Ranch increased from 1,380 units to 2,949 units, Parkside decreased from 163 units to 125 units, Weston decreased from 424 units to 415 units, Alpine High School/Library has remained unchanged, and Rancho Palo Verde is now planned for 153 units.

Map ID	Future Development Name	Map ID	Future Development Name
City of Santee		15	Railroad Workshop
1	Walker Trails	16	*Parkside (formerly Hillside Meadows)*
2	*Riverview*	17	*Sharp Medical Office Building*
3	*Fanita Ranch*	18	Weston (formerly Castlerock)
4	Pinnacle Peak	City of El Cajon	
5	Lantern Crest Ridge (Phase II)	19	Weld Distribution Center
6	Carlton Oaks Golf Course	County of San Diego	
7	Lunar Lane	20	Alpine High School/Library
8	Prospect Estates II	21	*South Coast Development*
9	Wood Spring Suites	22	*Rancho Palo Verde (Phase 2)*
10	Tower Glass	23	Creekside Meadows
11	Cornerstone	24	Alpine 21 Tentative Map
12	Hattie Davidson Properties	25	Alpine Densification
13	Gondala Skate	26	Sycuan
14	Jacor		

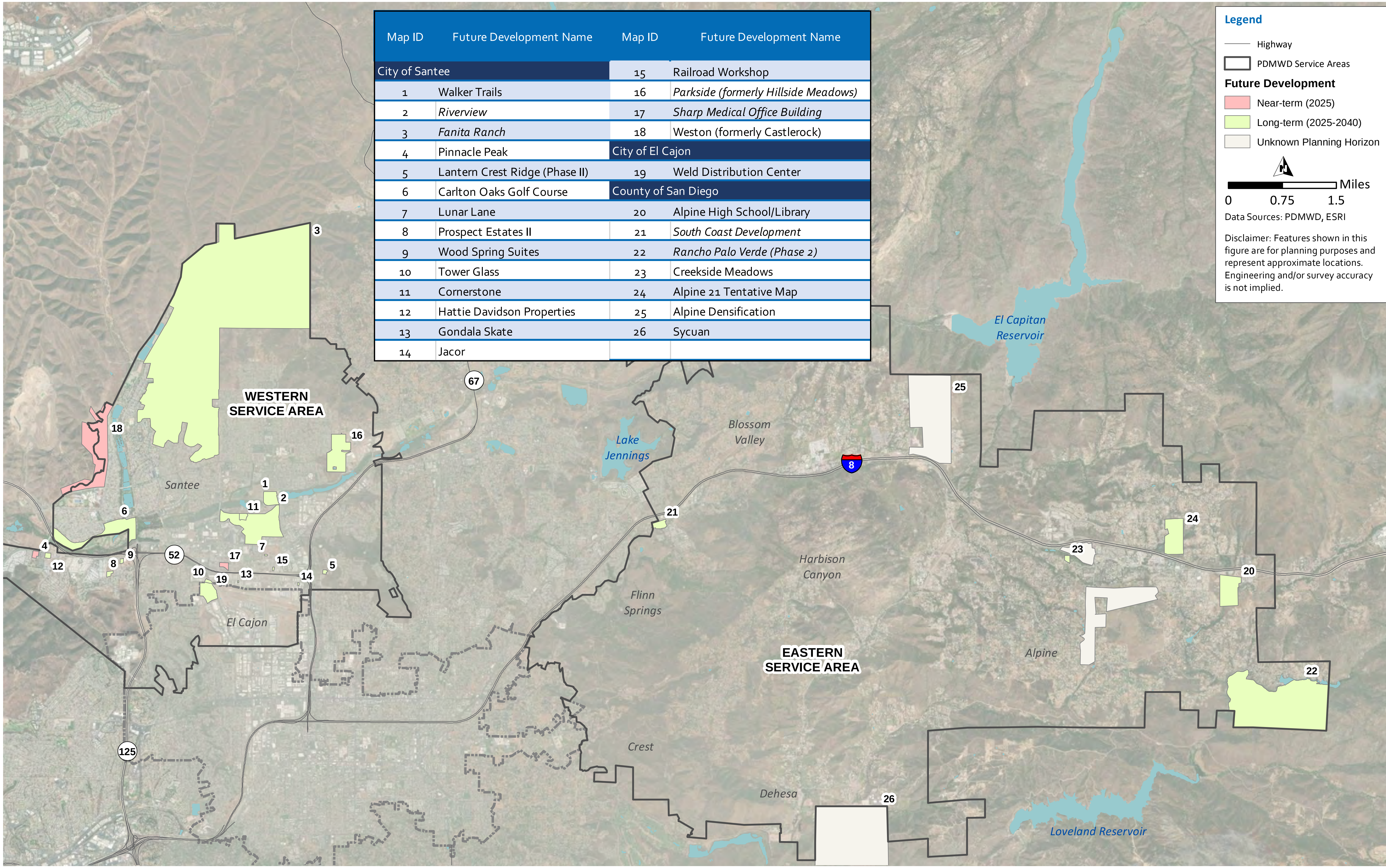


Figure 2.7 Future Developments

As shown in Table 2.2, a total of 25 major developments and 1 service agreement were identified. Of those 25 developments, nine were identified as near-term (likely to be constructed by 2025), and 15 were identified as long-term (likely to be constructed between 2025 and 2045). In addition, the Sycuan demand was anticipated to occur in the near-term. Since the CFMP, the timing and size of future developments has changed. The CFMP identified 19 major developments that included 11 developments that were planned for completion by the year 2020 and 8 developments planned for completion by year 2040. Only six of the future developments have remained consistent with the Master Plan Update, which is denoted in Table 2.2. The timing and size of the developments have been updated based on discussions with the City of Santee, the City of El Cajon, and the County of San Diego.

Population estimates were listed for developments with a known number of residential units or available Water Supply Assessments or Water Studies. The Fanita Ranch population was calculated using the Water Supply Assessment assumption of 3.4 people per dwelling unit for low-density single family residential and 3.1 people per dwelling unit for medium-density single family residential. The Carlton Oaks Golf Course population was calculated using the Water Study assumption of 3.5 people per dwelling unit. All other developments used SANDAG's average population density of 2.86 people per dwelling unit for developments constructed before 2035 and 2.63 people per dwelling unit for developments constructed from 2035 and beyond (SANDAG, 2019).

It should also be noted that the Riverview Development (Map ID No. 2) is divided into eight subdevelopments due to the wide variety of planned land uses and size of this development (see Appendix D for a map showing the locations of each parcel). Parcel 2 on Figure 2.7 of the Riverview Development has been further divided, in which the west side of the parcel (Parc One) has already been constructed, and the east side of the parcel is still to be constructed. Since Parc One has been constructed, it is not included in the number of units and population in Table 2.2. Additionally, the Weston Development (formerly known as Castlerock) is almost completely constructed with approximately five units remaining, which are anticipated to be online by the near-term (2025).

As shown in Table 2.2 , the future developments are anticipated to result in 7,537 new residential units with an estimated population of 20,825 people. The District's total population projections are included in Section 2.3.

2.2.3 Future Land Use

For the Master Plan Update, future land uses include development in areas not defined by the future developments identified in the previous section. It is assumed that these projects will be built between 2025 and 2045 and will maintain the land-use designations as depicted on Figure 2.5 and Figure 2.6.

The Riverview Development is anticipated to change the land use of Parcel 8 from commercial to residential. This new residential area is planned for 520 new units. In addition, the County of San Diego is currently in the process of updating the Alpine Community Plan and anticipates land use changes within seven subareas (see Appendix D). Two of the subareas (Subareas 5 and 7) are not anticipated to require water from the District within the planning horizon of this Master Plan Update and are not included in this Master Plan Update. The County of San Diego recently completed an Environmental Impact Report for the Village-Focused alternative. Under this alternative, densification is expected to occur in three of the five subareas considered in this

Master Plan Update. This densification is anticipated to re-designate the general plan residential uses to more dense residential uses and increase the total number of dwelling units in these subareas by 2,044 dwelling units, which have been included in Table 2.2. Since the County of San Diego has not yet determined which alternative will be constructed, this densification can change in the future.

2.3 Population Growth Projections

This section describes the District's current population as well as projected population throughout the planning horizon.

2.3.1 Existing Population

As of January 1, 2019, the total existing population within the entire District's service area was estimated to be 92,045 people (SANDAG, 2019). The population within each service area is summarized in Table 2.3.

Table 2.3 Population by Study Area

Study Area	Service Area	Area (square miles)	Existing Study Area Population
Potable Water(1)	ESA & WSA	80	92,045
Recycled Water(1)	WSA	20	63,035
Wastewater(2)	WSA	20	72,597

Notes:
(1) Source: SANDAG's 2019 estimates for WSA Water and ESA Water.
(2) Source: SANDAG Series 14 2020 estimate for WSA Sewer.

2.3.2 Projected Population

The population projections within the District used data from SANDAG Series 14 - 2050 Regional Growth Forecasts (Series 14), which was performed on a traffic analysis zone (TAZ) basis, as the baseline. Population forecast data from 2025 to 2045 was taken from the SANDAG TAZ polygons that fell within District boundaries. Some TAZ polygons were partially in the District service area and partially outside the service area. These populations were estimated based on the percentage that fell within the District boundary. Though SANDAG's Series 14 version 17 projections are not published yet, the previous version (Series 13) was published in 2013 and outdated.

Since the SANDAG Series 14 population projections is based on development information from 2017, adjustments were made to the population to accommodate major planned developments that were not identified in 2017 and changes to Fanita Ranch since 2017. Three large planned developments (Carlton Oaks Golf Course, Riverview, and Parkside) were not known at the time of the development of the SANDAG Series 14 population projections. In addition, at the time of the Series 14 version 17 development, Fanita Ranch was only planned for 1,395 residential units. Since then, the development has more than doubled to 3,008 residential units. Changes to the ESA population projections include the addition of the population from the Alpine Densification.

The following outlines the anticipated population adjustments included in this Master Plan Update:

- Carlton Oaks Golf Course is anticipated to have 243 residential units. Based on the Water Study assumption of 3.5 people per dwelling unit, the anticipated additional population from this development equates to 851 and was added to the population projection starting in year 2045.

- Riverview is anticipated to have 990 residential units. SANDAG included Parcel 2, which consists of 128 homes. Thus, the SANDAG Series 14 does not include the remaining 862 residential units, which equates to an additional anticipated population adjustment of approximately 2,267 based on SANDAG's 2.63 people per household for developments constructed after 2035. Thus, an additional 2,267 people were added to the population projection starting in year 2045.
- Parkside (formerly Hillside Meadows) is anticipated to have 125 units. Based on SANDAG's 2.63 people per household for developments constructed after 2035, this equates to a population of 329. Thus, an additional 329 people were added to the population projection starting in year 2045.
- Fanita Ranch is anticipated to have 3,008 residential units, which equates to a total population of 9,686 based on the Water Supply Assessment persons per household assumption of 3.4 people per dwelling unit for low density and 3.1 people per dwelling unit for medium density. SANDAG included the previously planned 1,395 residential homes, which equates to a population of 3,669 people based on SANDAG's 2.63 people per household. Thus, an additional 6,017 people were added to the population projections and phased starting in year 2030.
- Alpine Densification is anticipated to add an additional 2,044 dwelling units in the Village Focused alternative. Based on SANDAG's 2.63 people per household, this equates to a population of 5,376. Thus, an additional 5,376 people were added to the population projection and phased starting in year 2035.

Details of the population projections are included in Appendix C, including the SANDAG Series 14 projections and changes from the planned developments.

Population projections were developed in five-year increments over the planning horizon. The projected population for each subarea is presented in Table 2.4. The CFMP population is also shown for comparative purposes, which was based on SANDAG's Series 12 projections.

Table 2.4 Population Projections – Combined Service Area

Year(1)	WSA	ESA	Master Plan Update(1)	2015 CFMP Total(2)	Percent Change of Projections
2025	75,695	31,359	107,054	111,363	-4%
2030	78,149	33,243	111,392	114,828	-3%
2035	81,928	35,011	116,939	119,985	-3%
2040	83,620	37,486	121,106	121,163	-1%
2045	87,470	40,505	127,975	n/a	n/a

Notes:
(1) Source: SANDAG Series 14 Regional Growth Forecast and adjustments to planned developments.
(2) Source: SANDAG Series 12 Regional Growth Forecast.

As shown in Table 2.4, population within the District's combined service area is forecasted to increase to 127,975 by 2045.

The population projections for the District's water study area were based on data from SANDAG Series 14 2050 Regional Growth Forecasts and the adjustments based on planned developments. The population projections for the water study area are summarized in Table 2.5.

Table 2.5 Population Projections – Water Study Area Only

Year	Total Population(1)(3)	Growth (% per period)
2019(2)	92,045	NA
2025	95,134	3.4%
2030	99,342	4.4%
2035	107,008	7.7%
2040	111,020	3.7%
2045	118,441	6.7%

Notes:
(1) Baseline population include SANDAG Series 14 - 2050 Regional Growth Forecast. Population added to the baseline population to account for changes to Fanita Ranch, Carlton Oaks, River View, Parkview (Hillside Meadows), and the Alpine Densification.
(2) 2019 population based on SANDAG Current Estimates data.
(3) Differences in the total population estimates from Table 2.4 to Table 2.5 are due to the additional population served by the sewer system in the WSA.

As shown in Table 2.5, population within the District's water study area is forecasted to increase to 118,441 by 2045 with the largest increase between 2030 and 2035 due to the assumed construction of Fanita Ranch. A second large increase is anticipated between 2040 and 2045 due to the construction of Carlton Oaks Golf Course, River View, and Parkview.

Chapter 3

DEMAND AND FLOW FORECASTS

This chapter presents the District's existing and projected potable and recycled water demands and wastewater flows through the year 2045. Updates that have occurred since the development of the CFMP are described in the text below.

3.1 Potable Water Demands

This section describes the District's existing and projected potable water demand. The existing water demand section consists of a discussion of the historical water consumption, historical water supply, water loss, and peaking factors. The future water demand section consists of a description of per-capita water use, water demand factors (WDFs), the water demand projection through year 2045, and the anticipated phasing of demands. This chapter concludes with a discussion of water conservation measures and the anticipated impacts these measures will have on the District's future water demands.

3.1.1 Existing and Historical Water Consumption

Water demand consists of water that leaves the distribution system through metered and unmetered connections (such as fire hydrants). Additional unmetered flows contributing to water demand include maintenance flushing, reservoir cleaning, leaks at pipe joints, or breaks. The District meters all customer accounts, including temporary construction meters and, in some instances, separate irrigation meters. In addition, all supply turnouts and pump stations are metered. Water levels are monitored in reservoirs through level sensors. The District installed automatic meter reading (AMR) meters in 2011. As a result, the District and customers are able to track water demands and leaks.

A description of historical water consumption, water supply, and the estimated amount of water loss or unaccounted for water is presented below.

The District provided historical customer billing records for the period of 2013 through 2020. The customer classifications include various land-use types that can be summarized as follows:

- **Agriculture Accounts**: This category includes billing types: Agriculture with Special Agriculture Water Rate with One Residence (AS1).
- **Commercial Accounts**: This category includes the Commercial (COM) billing type.
- **Government Accounts**: This category includes the Government (GOV) billing type.
- **Lodging Accounts**: This category includes the Hotel/Motel/RV Park (HTL) billing type.
- **Irrigation Accounts**: This category includes billing type Irrigation-Potable (IRR) and (IRE) for commercial and Homeowners Associations. This category does not represent single family irrigation.

- **Residential Accounts**: This category includes billing types: Condominium/Townhome (CON), Multiple Dwelling (MDW), Mobile Home Park (MHP), Residential (RES), Rest Home/Rooming House (RH).
  - Between 2009 and 2013, the Residential billing type was further categorized into the following:
    - Residential 1: 0.01 to 0.51 acres (RE1).
    - Residential 2: 0.51 to 2.00 acres (RE2).
    - Residential 3: 2.0+ acres (RE3).
    - Residential 4: 1.5 equivalent dwelling units (EDUs) (RE4).
    - Residential 5: 2.0 EDUs (RE5).
  - The District revised the Residential billing categories starting in 2014:
    - Residential 1: (SF1).
    - Residential 2: (SF2).
    - Residential 3: (SF3).
- **Other Accounts**: This category includes the following District billing types: Construction Recycled using Potable Water (CNR), and Construction (CNS).

The average historical metered water use from 2013 through 2020 is approximately 9,656 acre-feet per year (AFY), which is summarized by billing classification in Table 3.1 and presented on Figure 3.1. This is a reduction of approximately 4,274 AFY (or 30 percent) in demand when compared to the CFMP historical average of 13,930 AFY from 2001 through 2012.

Table 3.1 Historical Annual Demand by Usage Type

Year	Annual Demand by Customer Class(1) (AFY)							Total Annual Demand(4) (AFY)
	Residential	Commercial	Agriculture	Irrigation	Government	Lodging	Other(2)	
2013	8,657	887	346	694	351	39	71	11,044
2014	9,081	1,091	388	549	356	40	76	11,581
2015	6,744	923	203	307	196	37	56	8,465
2016	7,078	939	181	371	200	40	60	8,870
2017	7,294	988	119	385	215	42	113	9,156
2018	7,749	1,038	131	452	212	42	122	9,746
2019	6,960	1,067	76	335	186	40	92	8,755
2020	7,752	1,057	103	431	176	44	65	9,628
Average	**7,664**	**999**	**193**	**440**	**236**	**41**	**82**	**9,656**
CFMP Average(3)	**10,864**	**943**	**855**	**707**	**418**	**44**	**100**	**13,930**

Notes:
(1) Based on bi-monthly potable water billing data from years 2013 through 2020 (excluding recycled water). Customer classification was consolidated from the 26 billing classifications the District uses for its billing system.
(2) Other category includes construction meters using potable water.
(3) Based on historical billing data from 2001 through 2012.
(4) Annual demand is based on a calendar year.

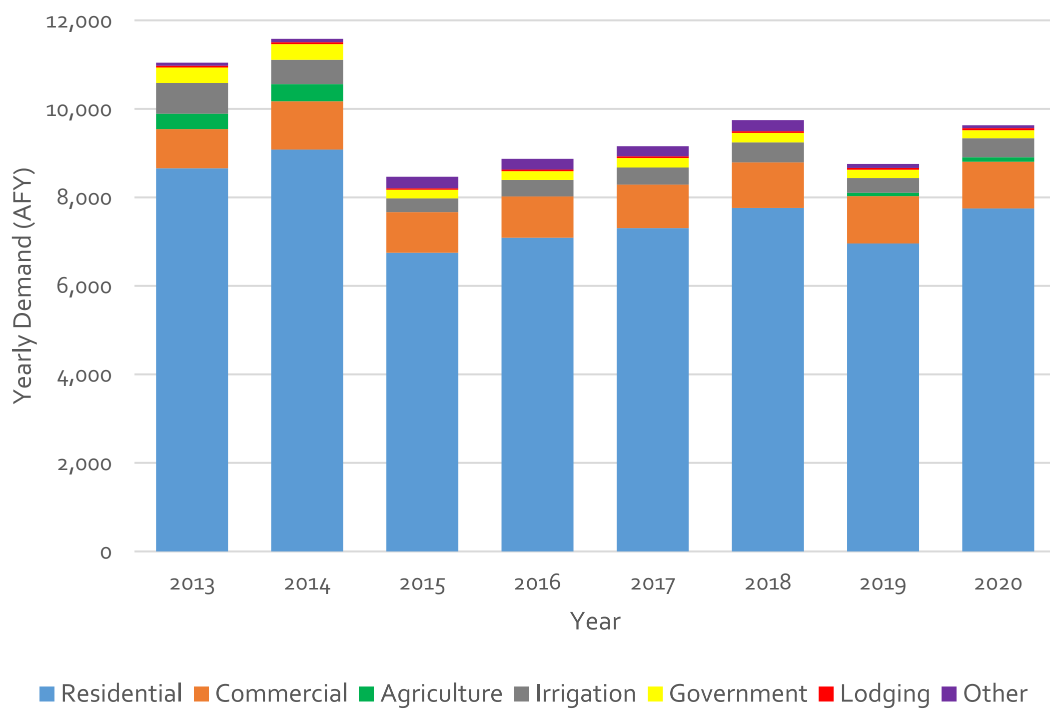


Figure 3.1 Annual Historical Demand by Customer Class

As shown in Table 3.1 and Figure 3.1, annual demand peaked in 2014 with a total usage of 11,581 AFY but declined by over 2,600 AFY (or nearly 25 percent) in 2015 due to mandatory restrictions. Since 2015, demands averaged 9,231 AFY between 2016 through 2020, which is consistently 30 percent below the historic annual average demand in the CFMP. The reduction in demand is likely a result of continued conservation by the District's customers since the 2015 CFMP. The District also implements water conservation programs throughout the year to promote conservation efforts throughout the region. The mandated restrictions and programs are described in further detail in the District's 2020 UWMP.

In addition, the District's demands during the COVID-19 pandemic were compared with historic data over the past 3-year period. Beginning March 19, 2020, Executive Order N-33-20 declared California in a state of emergency and ordered California residents to stay at home to limit the spread of COVID-19. As a result of the executive order, non-essential workers began working from home leading to slight increases in demands due to changes in residential water use patterns.

The breakdown of monthly water demands by billing classification for a 3-year period starting in 2018 is shown on Figure 3.2. This figure demonstrates the typical demand peaks in the summer months and low demands in the winter months from 2019 to 2020.

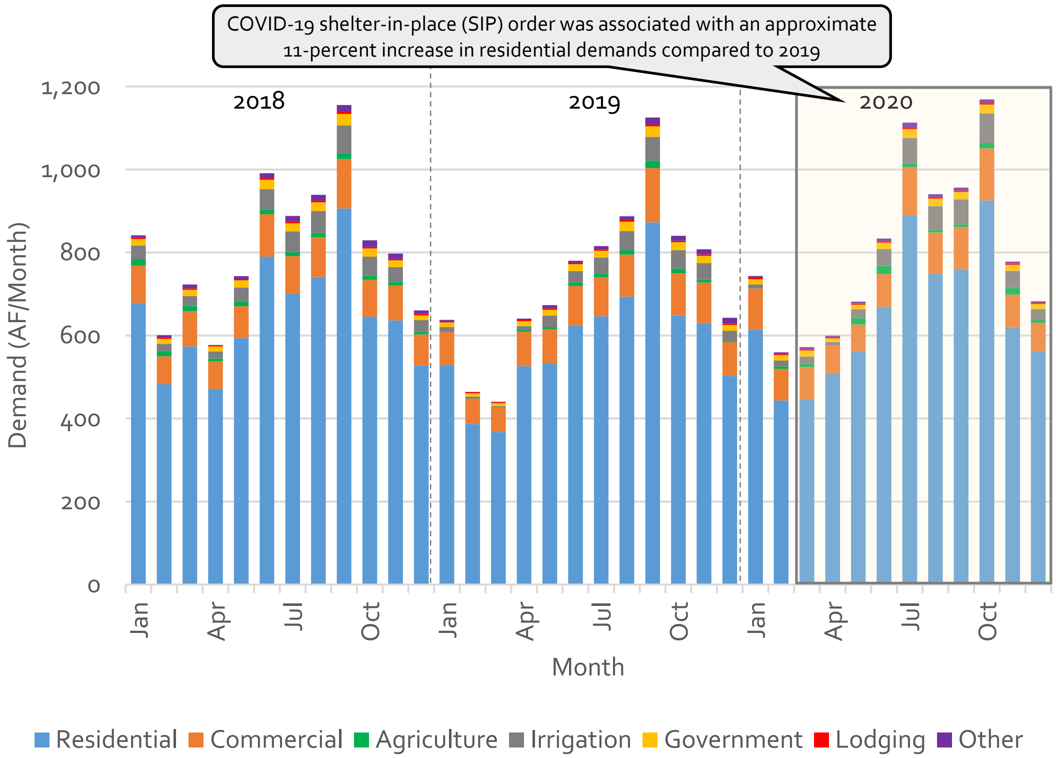


Figure 3.2 Monthly Historical Demand by Customer Class (3-Year Period)

As shown in Figure 3.2, the typical demand peaks in the summer months with lower demands in the winter months from 2019 to 2020. Typically, the summer months consist of June through September. However, a large peak in demand occurred in October 2020. The winter months consist of December through March, although there were above average demands in January of 2018 and 2020. Along with lower residential demands in the winter months, irrigation and agriculture demands are almost minimal due to conservation and rainfall. This figure demonstrates that conservation measures were able to help reduce demands between 2018 and 2019, but there was a rise in demands (approximately 10 percent), particularly residential, when the stay-at-home orders were put in place in 2020.

Since 2020 does not represent a year with typical demand patterns and use, existing demands in this Master Plan Update used 2019 as a baseline. A breakdown of the 2019 demands by use type are shown on Figure 3.3.

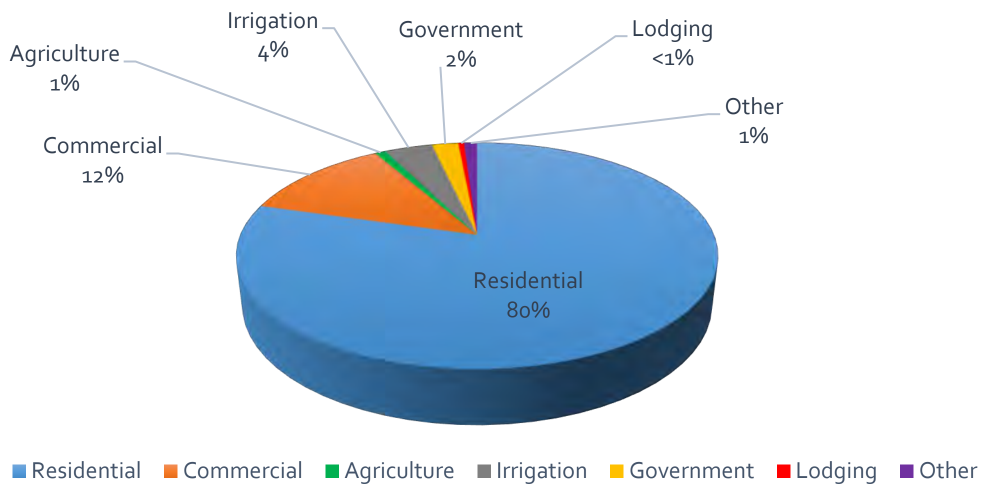


Figure 3.3 2019 Annual Demand Breakdown by Customer Class

As shown on Figure 3.3, residential demand accounted for 80 percent of the District's demands in 2019. Commercial and irrigation accounts were the two next largest consumers, representing roughly 12 percent and 4 percent of the District's demand, respectively. Agriculture, government, other, and lodging represented 1 percent, 2 percent, 1 percent, and less than 1 percent, respectively. The demand breakdown has remained relatively consistent with the CFMP. Residential and commercial demands have remained as the top usage categories, while agricultural and irrigation demands have continued to decline. Government, lodging, and other has remained relatively unchanged.

3.1.2 Historical Potable Water Supply

The District's sole source of potable water is imported water from the San Diego CWA. There are three connections from the CWA that serve the District: CWA Connection No. 4, CWA Connection No. 6, and CWA Connection No. 7. Connection No. 4 primarily supplies the WSA and Connection No. 6 primarily supplies the ESA. However, both Connections are hydraulically connected, and can supply both service areas. In June of 2019, the District completed the construction of the ESA Secondary Connection (CWA Connection No. 7). This connection project was constructed to supplement the supply source to the ESA in case of a failure in the El Capitan Pump Station or other pipelines.

The Camino Canada Interconnect serves as an interconnection between the District and Helix. The first monthly recorded transfer was in October 2015. The agreement does not guarantee water during emergencies but allows either district to provide surplus water supply. In addition, the District also has agreements to transfer water to Lakeside and Riverview for emergency water use through two emergency connections.

The District's potable water supply for 2013 through 2020 is presented in Table 3.2 and is illustrated on Figure 3.4.

Table 3.2 Historical Annual Imported Water Supply

Year	CWA No. 4 (AFY)	CWA No. 6 (AFY)	CWA No. 7 (3) (AFY)	Camino Canada Interconnect (AFY)	Total Imported Water (AFY)	Supply to Lakeside and Riverview(1)(2) (AFY)	Total Imported Water Used by District (AFY)
2013	5,949	5,663	0	0	11,612	12	11,599
2014	6,807	4,838	0	0	11,646	7	11,639
2015	4,178	4,784	0	14	8,977	10	8,967
2016	5,882	3,397	0	117	9,395	87	9,309
2017	5,002	4,563	0	125	9,691	8	9,683
2018	6,272	3,872	0	76	10,221	0	10,221
2019	4,337	4,548	212	34	9,131	4	9,127
2020	2,747	5,793	1,365	116	10,020	7	10,013
Average (2013-2018)	**5,682**	**4,520**	**0**	**55**	**10,257**	**21**	**10,236**
Average (2019-2020)	**3,542**	**5,170**	**788**	**75**	**9,576**	**5**	**9,570**

Notes:
(1) Water wheeled to Lakeside and Riverview water districts through the District's facilities (Lakeside and Riverview consolidated to form Lakeside Water District in 2007).
(2) Lakeside Water District constructed its direct connection to the CWA in 2011 and is only supplied emergency water from the District.
(3) CWA Connection No. 7 online June 2019.

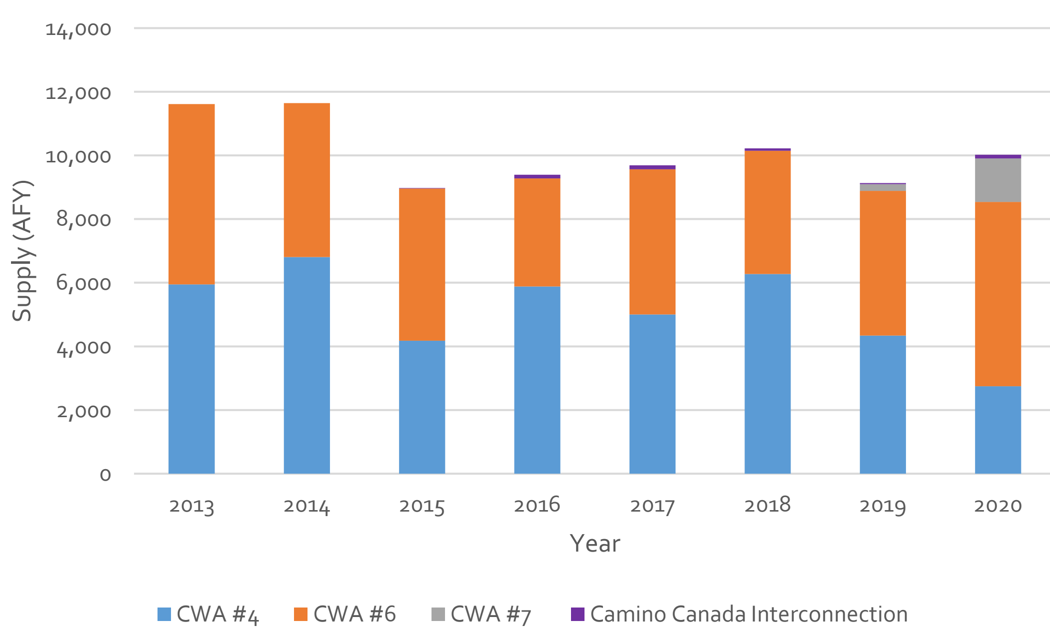


Figure 3.4 Historical Annual Total Imported Potable Water Supply

As shown in Table 3.2, the majority (or over 55 percent) of the District's supply came from the CWA Connection No. 4 between 2013 through 2018, while the CWA Connection No. 6 contributed approximately 44 percent of the supply. Since CWA Connection No. 7 came online, the District's imported water through Connection No. 4 reduced by nearly half. The District has received a varying amount of supply from the Camino Canada Interconnect, ranging from 0 AFY to 125 AFY, which is less than 1 percent of the District's total supply.

In addition to supplying the demands within the service area, the District has also conveyed water to Lakeside and Riverview. The District has provided a range from 0 AFY to 87 AFY to Lakeside and Riverview.

3.1.3 Unaccounted-for Water

The difference between water supply and consumption (billed to customers) is defined as unaccounted-for-water. Unaccounted-for water may be attributed to leaking pipes, unmetered or unauthorized water use, inaccurate meters, tank overflows, hydrant testing, system flushing, reservoir cleaning, and firefighting. The District's estimated historical unaccounted-for water is summarized in Table 3.3.

Table 3.3 Historical Annual Unaccounted-for Water (Imported Water)

Year	Demand (AFY)(1)	Supply (AFY)(2)	Unaccounted-For Water	
			Total (AFY)	(%)
2013	11,044	11,612	567	5%
2014	11,581	11,646	65	1%
2015	8,465	8,977	511	6%
2016	8,870	9,395	525	6%
2017	9,156	9,691	535	6%
2018	9,746	10,221	475	5%
2019	8,755	9,131	376	4%
2020	9,526	10,020	494	5%
Average	**9,643**	**10,086**	**444**	**4%**

Notes:
(1) From Table 3.1.
(2) From Table 3.2. Excludes wheeled water to Lakeside and Riverview.

The water loss for well-operated systems is typically less than 10 percent, and not many systems have water losses of less than 5 percent annually. As shown in Table 3.3, the District's average unaccounted-for water for years 2013 through 2020 is 4 percent. During the last 7 years, the District's water loss exceeded 5 percent in 2015, 2016, and 2017, but has improved since then. This historically low water loss percentage demonstrates that the District's system is well operated and maintained. For planning purposes, a water loss of 4 percent was used in this Master Plan Update. Average water loss has slightly increased since the 2015 CFMP, which reported losses ranging from 0 to 5 percent from 2001 through 2012, for an average of 3 percent.

3.1.4 Demand Forecasting Methodology

To use the most appropriate demand forecasting method, the water study area was divided into the two service area boundaries:

- WSA.
- ESA.

Based on a review of the available data for each service area, it was determined that the most accurate demand forecasting method is a combination of a population- and land-use-based demand forecasting methods. Population-based demand forecasting utilized a calculated per capita water use (see Section 3.1.4.1) while land-use-based demand forecasting was based on calculated WDFs (see Section 3.1.4.2). Demand forecasts for each service area are discussed and presented in Section 3.1.5. The projected water demands and existing demands for each service area were combined to calculate the total near-term (2025) and long-term (2045) water demands for the District.

3.1.4.1 Per Capita Water Use

Population-based demand forecasting utilizes population projections from the SANDAG data with an average per-capita water use to project future water use. These population projections are included in Appendix C. An average per-capita water use expressed in gallons per capita per day (gpcd) was developed for the ESA and WSA using 2019 historical billing records and 2019 SANDAG population estimates. As shown in Table 3.4, the per-capita water use varies greatly between the WSA and ESA service areas, with an average water use of approximately 80 and 108 gpcd, respectively.

Table 3.4 Historical Per Capita Water Use

Service Area		Water Use(1) (mgd)	Estimated Service Area Population(2)	Per-Capita Water Use (gpcd)
2015 CFMP	WSA	5.9	58,739	100
	ESA	4.3	28,455	150
	District-Wide Average	--	--	117
2020 Master Plan Update	WSA	5.0	63,035	80
	ESA	3.1	29,010	108
	District-Wide Average	--	--	88

Notes:
Abbreviation: mgd - million gallons per day.
(1) 2012 Billing Data for 2015 CFMP and 2019 Billing Data scaled to production for Master Plan Update.
(2) The population shown in this column represents only the population that is served potable water from the District (SANDAG, 2019). The 2015 CFMP used SANDAG's estimated population for 2012. See Appendix C.

As shown in Table 3.4, the District's per-capita water usage has significantly reduced between the 2015 CFMP and this Master Plan Update in both service areas. This is most likely due to the increased conservation triggered by the statewide drought and the District's conservation programs.

3.1.4.2 Water Demand Factors

A WDF is defined as the estimated amount of water usage per area for a certain land-use type. WDFs are typically expressed in gallons per day per acre (gpd/ac). These factors are used to estimate the average day demand (ADD) for potential development areas by multiplying the WDF with the total number of acres for each land-use category. WDFs were developed using 2019 billing records as part of this Master Plan Update to project demands for planned developments where land-use details are known at this time.

The following details the steps used to develop the WDFs for this Master Plan Update.

1. Map the District's 2019 billing data classifications with the GIS General Plan land-use categories for each service area to develop Master Plan Update-specific land-use designations.
2. Group General Plan land uses by new Master Plan Update land use category in Table 3.5.
3. Join 2019 billing data using the Location ID in GIS service connections.
4. Assign parcel with total billing data based on Assessor's Parcel Number (APN).
5. Select 2019 billing records with demands greater than zero gallons per minute (gpm) and calculate WDF, expressed in gpd/ac.
6. Calculate the average WDF for each land-use category.
7. Check calculated average WDF and compare to 2015 CFMP calculated WDF.
8. Summarize calculated and recommended WDFs for each land-use category.

Recommended WDFs are determined by rounding the calculated WDFs. The WDFs recommended for this Master Plan Update are presented in Table 3.5. The steps detailed above, as well as data illustrations, are provided as an example in Appendix D.

As shown in Table 3.5, the calculated WDFs for the District's land uses range between 223 gpd/ac for rural areas and 1,889 gpd/ac for high density residential areas. For conservative planning purposes, the recommended WDFs are rounded up from their calculated values. For example, the WDF in the high residential category was calculated to be 1,889 gpd/ac. For future water demand forecasting, a factor of 1,900 gpd/ac was used for currently vacant areas representing a high-density residential land-use category. As shown in Table 3.5, the WDFs utilized for the water demand forecast, range from 300 gpd/ac for rural and tribal lands to 1,900 gpd/ac for high-density residential land-use types.

Table 3.5 Water Demand Factors

Master Plan Update New Land-Use Category	Land-Use Type from Billing Data	City of Santee Land-Use Category(1)(2)	City of El Cajon Land-Use Category(1)(2)	County of San Diego Land-Use Category(1)	WDF Used in 2015 CFMP (gpd/ac)	Calculated WDF Master Plan Update (gpd/ac)	Recommended Master Plan Update WDF (gpd/ac)
High-Density Residential	MDW	R7, R14, R22	n/a	VR30, VR24, VR20, VR15, VR10.9, VR7.3	2,000	1,889	1,900
Medium-Density Residential	CON/MDP/RH	R2	LR	VR4.3	1,500	1,114	1,200
Low-Density Residential	SF1	R1, R1-A	n/a	VR2.9, VR2	1,000	407	500
Semi-Rural	SF2	HL	LLR	SR0.5, SR1	500	490	500
Rural	SF3	n/a	n/a	SR2, SR4, SR10, RL20, RL40, RL80	250	223	300
Commercial	COM, HTL	OP, NC, GC, TC, R-B	n/a	C1, C2, C3, C4, C5	1,000	1,439	1,500
Industrial	COM	IL, IG	IP	I1, I2, I3	1,000	773	800
Mixed Use	n/a	PD	n/a	SPA	1,500	847	900
Open Space	n/a	P/OS	OS, ROAD	OS-C, OS-R	0	445	500(4)
Public Land and Facilities	GOV	PUB	HS, JC, PI	P/SP	1,500	313	400
Airport	n/a	n/a	SDA 6, AP	n/a	1,500	353	400

Notes:

(1) Land-Use Categories are described in the Santee General Plan (Santee, 2012), El Cajon General Plan (El Cajon, 2019) and the San Diego County General Plan (San Diego, 2011). Land-Use Categories are summarized in Appendix B. The land use maps for these agencies were most recently updated in 2018 and 2019.

(2) NA indicates that the land-use category is not within the District's service area.

(3) Based on discussions with District staff and tribal lands located in rural areas, it was decided to match the tribal lands' WDF with the Rural WDF.

(4) If the open space is not a park, it is recommended to use 0 gpd/ac.

Several of the WDFs were similar between the 2015 CFMP and this Master Plan Update. However, the recommended WDF for this Master Plan Update had significant decreases from the 2015 CFMP for Low-Density Residential, Public Land and Facilities, and Airport and larger increases for Commercial and Open Space. The changes in low-density residential are likely due to conservation efforts and the decrease in per capita water use. Due to lack of billing information for specific categories at the time, the 2015 CFMP did not have calculated values for public land and facilities, airport, and open space. The values assumed in the CFMP were based on typical Southern California values, while the values used in this Master Plan Update were calculated based on billing data. The open space land use in this Master Plan Update also includes parks, which changes the Open Space WDF from 0 to 500 gpd/ac. However, if the open space is not a park, it is recommended to use 0 gpd/ac, consistent with the 2015 CFMP.

3.1.4.3 Peaking Factors

Peaking factors are typically used to determine the water demands for conditions other than ADD conditions. Peaking factors account for fluctuations in demands on a seasonal or hourly basis. For example, during hot summer days, water use is typically higher than on a cold winter day due to increased irrigation demands.

The peaking factors determined in this report include factors for maximum day demand (MDD), minimum day demand (MinDD), maximum month demand (MMD), and minimum month demand (MinMD) periods. Peaking factors are determined using the water-system demands for a selected period and dividing the quantity by the ADD. The MDD factor, for example, is determined by comparing the water demand for the day of the year with the highest daily water demand to the ADD.

Monthly Peaking Factors

Monthly peaking factors represent the seasonal demand variation on a monthly basis, such as the MMD and MinMD peaking factors. In the absence of daily production data (or daily imported water totals) for an entire calendar year, these factors were established from historical billing data. The District's monthly peaking factors are summarized in Table 3.6.

As shown in Table 3.6, the recommended peaking factors for MMD and MinMD conditions based on historical data from 2013 through 2020 are 1.3 and 0.5, respectively. These factors represent typical values observed by many other water agencies in Southern California.

Table 3.6 Monthly Peaking Factors

Year	ADD (mgd)(1)	MMD Month	MinMD Month	MMD		MinMD	
				mgd	Peaking Factor	mgd	Peaking Factor
2013	10.4	July	February	13.9	1.3	6.4	0.6
2014	10.4	July	December	13.1	1.3	6.2	0.6
2015	8.0	August	December	9.7	1.2	6.3	0.8
2016	8.4	August	January	11.2	1.3	5.8	0.7
2017	8.7	July	February	10.8	1.2	4.8	0.6
2018	9.1	August	December	11.5	1.3	6.2	0.7
2019	8.2	August	February	11.0	1.4	4.9	0.6

Year	ADD (mgd)[1]	MMD Month	MinMD Month	MMD		MinMD	
				mgd	Peaking Factor	mgd	Peaking Factor
2020	8.9	August	March	11.6	1.3	6.2	0.7
Average	**9.0**	**n/a**	**n/a**	**11.6**	**1.3**	**5.8**	**0.7**
Master Plan Update	**n/a**	**n/a**	**n/a**	**n/a**	**1.3**	**n/a**	**0.5**

Notes:
(1) Historical production data provided by District.

Daily Peaking Factors

The maximum day peaking factor represents the ratio of the largest daily demand observed in one year to the ADD for the same year. This factor can then be applied to the ADD of future planning years to project maximum day water demands. The estimated MDD is commonly used for planning purposes to establish water supply, storage, and pumping capacity requirements. The peaking factors calculated in this section should be reevaluated prior to designing the facilities.

Due to the lack of daily production data sufficient to calculate the MDD, a similar methodology was used from the 2015 CFMP, where the MDD is calculated by applying a 30-percent increase to the MMD, which is typical for water agencies in Southern California. Based on the recommended MMD peaking factor of 1.3 listed in Table 3.6, a MDD peaking factor of 1.7 is calculated. In addition, the MinDD peaking factor was established at 0.4.

3.1.5 Future Water Demand Projection

Demand projections were developed using a combination of General Plan information, Specific Plans, vacant land information, per-capita water use, and WDFs. Due to the variety in available data and geographic characteristics, the Water Study Area was divided into the following two service areas:

- WSA.
- ESA.

The near-term (2025) demands and long-term (2045) demands for each of these subareas were calculated using a combination of the methodologies described in Sections 3.1.4.1 and 3.1.4.2.

3.1.5.1 WSA

The WSA existing average daily demand of 5.0 mgd was determined using 2019 billing records from customers that fall within the WSA boundary and scaled up to account for water loss. As presented in Table 3.4, the per-capita water use in the WSA is approximately 80 gpcd. Typically, existing demands are decreased incrementally over the planning periods in anticipation of meeting water-use conservation targets defined in agency-specific UWMPs. For conservative planning purposes, existing demands in the WSA will be maintained at the 2019 consumption level through the planning horizon since the District-wide average per-capita water use is already significantly lower than the 2020 UWMP conservation targets indicating significant conservation has already occurred.

The near- and long-term demands for the WSA were calculated based on future developments and their corresponding dwelling units and/or gross acreage. For residential developments, the number of dwelling units was converted to a population using SANDAG's average of 2.86 people per dwelling unit for developments constructed before 2035 and 2.63 people per dwelling unit for developments constructed from 2035 and beyond (SANDAG, 2019). Residential water demands were calculated using 80 gpcd, the per-capita water use for the WSA as defined in Table 3.4. For non-residential demands, the water demands were calculated using the WDFs listed in Table 3.5 and the future developments' gross acreage. The future developments identified during meetings with the City of Santee's Planning Department and the City of El Cajon's Planning Department are listed in Table 3.7.

Table 3.7 Future Developments Within WSA

Map ID	Future Development Name	Development Size		Estimated Population(1)	Demand Factor(2)		Total Demand	Build-Out Year(3)
		Units	Acres		gpcd	gpd/ac	mgd	
City of Santee(4)								
1	Walker Trails	67	-	192	80	-	<0.1	2025
2	Riverview	990	100	2,603	80	1,500	0.2	2045
3	Fanita Ranch	3,008	2,640	9,686	Water Supply Assessment		1.4	2045
4	Pinnacle Peak	113	5	323	80	-	<0.1	2025
5	Lantern Crest Ridge (Phase II)	-	1	-	-	1,500	<0.1	2045
6	Carlton Oaks Golf Course	243	7	851	Water Study		0.2	2045
7	Lunar Lane	-	0.2	-	-	800	<0.1	2045
8	Prospect Estates II	53	-	152	80	-	<0.1	2025
9	WoodSpring Suites	-	0.1	-	-	1,500	<0.1	2045
10	Tower Glass	-	0.8	-	-	800	<0.1	2025
11	Cornerstone	128	-	366	80	-	<0.1	2025
12	Hattie Davidson Properties	113	-	323	80	-	<0.1 29	2025
13	Gondola Skate	-	0.7	-	-	800	<0.1	2045
14	Jacor	-	0.1	-	-	800	<0.1	2045
15	Railroad Workshop	-	0.1	-	-	800	<0.1	2045
16	Parkside (formerly Hillside Meadows)	125	-	329	80	-	<0.1	2045
17	Sharp Medical Office Building	-	2	-	-	1,500	<0.1	2025
18	Weston (formerly Castlerock)	415	208	-	2015 CFMP Demand(5)		0.2	2025

Map ID	Future Development Name	Development Size		Estimated Population(1)	Demand Factor(2)		Total Demand	Build-Out Year(3)
		Units	Acres		gpcd	gpd/ac	mgd	
City of El Cajon								
19	Weld Distribution Center	-	3	-	-	800	<0.1	2045
Totals by 2045	**n/a**	**5,255**	**2,967**	**14,824**	**n/a**	**n/a**	**2.0**	**n/a**

Notes:
(1) Estimated population is determined by using SANDAG's average 2.86 persons per dwelling unit for build out year 2025 and 2.63 persons per dwelling unit for build out year 2045 with the exception of Fanita Ranch and Carlton Oaks Golf Course. Fanita Ranch population based on Water Supply Assessment assumption of 3.4 persons per dwelling unit for low density single family and 3.1 persons per dwelling unit for medium density single family. Carlton Oaks used an assumption of 3.5 people per dwelling unit.
(2) Demand Factors correspond to either per capita water demand (Table 3.4) or WDFs (Table 3.5).
(3) Build-out year is either 2025 or 2045.
(4) Timing of Santee projects may change due to impacts of Measure N. Since the effects are currently unknown, City of Santee staff advised to assume it will not change the timing of the projects.
(5) Weston demand based on 2015 CFMP estimated demand, which equates to 224 AFY. Part of the development is online with a demand of 45 AFY in 2019. Remaining projected demand of 179 AFY included in the planned developments in this Master Plan Update.

As listed in Table 3.7, the future WSA developments alone would result in an estimated population increase of approximately 14,824 people, resulting in a population of approximately 77,859 in the WSA by 2045. The population projection in Table 2.4 for the WSA is predicted to be 75,839. Since the estimated population growth based on future developments exceeds the adjusted 2045 SANDAG population projection, it was assumed that the developments would account for all future growth within the WSA during the planning horizon of this Master Plan Update. As mentioned in Chapter 2, Measure N may change the timing of the developments in the City of Santee and potentially push some of these future developments beyond the planning horizon of this Master Plan Update. However, since the impact of Measure N is unknown at this time, it was assumed that the timing of the developments will stay as is. The future water demands by planning phase (2025 or 2045) for the WSA are presented in Table 3.8.

Table 3.8 Future Water Demands by Planning Phase Within WSA

Demand Type	Existing Demand (mgd)	2025 Demand (mgd)	2045 Demand (mgd)	Demand Increase (mgd)
Existing	5.0	5.0	5.0	0.0
Future Developments	0.0	0.3	2.2	2.2
Infill Demand	0.0	0.0	0.0	0.0
WSA Demand Totals	**5.0**	**5.3**	**7.2**	**2.2**

As shown in Table 3.8, the water demands within the WSA are expected to increase to approximately 5.3 mgd by the year 2025, and to 7.2 mgd by the year 2045. The largest development within the next 25 years is Fanita Ranch. Based on the Water Supply Assessment, this development is projected to increase the District's water demands by approximately 1.4 mgd through planning year 2045. The projected demand for Fanita Ranch may be conservative based on the per capita water usage seen in the District in recent years. However, for conservative planning purposes of the distribution system infrastructure, the demand projections provided in the Fanita Ranch Water Supply Assessment (February 2020) were used.

Over the planning period, growth within the WSA is expected to increase the District's water demand by 2.2 mgd. This equates to a demand increase of 44 percent compared to the existing demand within the WSA.

3.1.5.2 ESA

The ESA existing average daily demand of 3.1 mgd was determined using 2019 billing records from customers that fall within the ESA boundary, which includes approximately 0.1 mgd from Sycuan, and scaled up to account for water loss. As presented in Table 3.9, the per-capita water use in the ESA is 108 gpcd. Similar to the WSA, the existing demands within the ESA were kept steady at 2019 consumption levels through 2045 since the District-wide average per-capita water use is already significantly lower than the 2020 UWMP conservation targets indicating significant conservation has already occurred. Near- and long-term demands for the ESA were calculated using a combination of future developments and population projections listed in Chapter 2.

Table 3.9 Future Developments Within the ESA

Map ID	Future Development Name	Development Size		Estimated Population(1)	Demand Factor(2)		Total Demand (mgd)	Build-Out Year(3)
		Units	acres		gpcd	gpd/ac		
County of San Diego								
20	Alpine High School/ Library(4)	-	70	-	-	400	<0.1	2045
21	South Coast Development	-	2	-	-	1,500	<0.1	2045
22	Rancho Palo Verde (Phase 2)(5)	153	-	402	Water Study		0.1	2045
23	Creekside Meadows	65	-	171	108	-	<0.1	2025
24	Alpine 21 Tentative Map	20	-	53	108	-	<0.1	2045
25	Alpine Densification	2,044	-	5,376	-	-	0.6	n/a
26	Sycuan	-	-	-	-	-	0.3	2025
Totals by 2045	**n/a**	**2,282**	**72**	**6,002**	**n/a**	**n/a**	**1.0**	**n/a**

Notes:
(1) Estimated population is determined by using SANDAG's average 2.86 persons per dwelling unit for build out year 2025 and 2.63 persons per dwelling unit for build out year 2045.
(2) Demand Factors correspond to either per capita water demand (Table 3.4) or WDFs (Table 3.5).
(3) Build-out year is either 2025 or 2045.
(4) Updated information on Alpine High School/Library was not available and assumed the same projected demand as 2015 CFMP. The expansion will occur on an as needed basis.
(5) Rancho Palo Verde Phase 2 demand based on Rancho Palo Verde Water Study (December 2020).

As listed in Table 3.9, implementation of the future developments in the ESA will result in a population increase of approximately 6,000 people. Since this is significantly less than the ESA population projections growth of 12,800 people, a population-based approach was used to determine the overall projected demands within the ESA. Infill demand for each census tract was calculated by subtracting the estimated 2045 future developments demand from the population-based demand. The future water demands by planning phase (2025 or 2045) for the ESA are presented in Table 3.10.

Table 3.10 Future Water Demands by Planning Phase Within ESA (W/O Ewiiaapaayp, Viejas, and I-8 Corridor)

Demand Type	Existing Demand (mgd)	2025 Demand (mgd)	2045 Demand (mgd)	Demand Increase (mgd)
Existing	3.1	3.1	3.1	0.0
Future Development	0.0	0.32	1.0	1.0
Infill Demand	0.0	0.3	0.8	0.8
ESA Demand Totals	**3.1**	**3.7**	**4.9**	**1.8**

As shown in Table 3.10, the water demands within the ESA are expected to increase to approximately 3.7 mgd by the year 2025 and to 4.9 mgd by the year 2045. Sycuan demands are anticipated to increase from approximately 0.1 mgd to 0.3 mgd by 2025. The largest development within the next 25 years is the Alpine Densification. The land use change is projected to increase the District's water demands by approximately 0.6 mgd through planning year 2045. Over the planning period, growth within the ESA is expected to increase the District's water demand by 1.8 mgd. This equates to a demand increase of 58 percent compared to the existing demand within the ESA.

3.1.5.3 Local Tribal Lands

As mentioned previously, approximately 4 square miles of local Tribal Lands for the Sycuan, Ewiiaapaayp, and Viejas tribes are included in the water study area for this Master Plan Update. Since the 2015 CFMP, the Sycuan have been connected and are included in the ESA demands in Section 3.1.5.2. The Ewiiaapaayp and Viejas tribes have all expressed interest in receiving water from the CWA and/or MWD. If agreements are reached between the water agency wholesalers and the tribes, the water supply would be wheeled through the District's infrastructure. In the event that water is supplied to the Ewiiaapaayp and Viejas, the District also anticipates connecting additional customers along the I-8 Corridor that are located between the District's service area boundary and the Ewiiaapaayp and Viejas tribal lands. The Ewiiaapaayp, Viejas, and adjacent I-8 Corridor are shown on Figure 2.1. The following preliminary demand estimates are associated with the Ewiiaapaayp, Viejas, and adjacent I-8 Corridor. These demands were presented in the 2015 CFMP and were not updated for the 2020 Master Plan Update.

- Ewiiaapaayp and Viejas: 2.0 mgd.
- I-8 Corridor: 0.07 mgd.

The combined water demand estimated for the Ewiiaapaayp, Viejas, and adjacent I-8 Corridor at the time of this Master Plan Update preparation is 2.07 mgd. The future water demands by planning phase (2025 or 2045) for the ESA, including the Ewiiaapaayp, Viejas, and I-8 Corridor, are summarized in Table 3.11.

Table 3.11 Future Water Demands by Planning Phase Within ESA (With Ewiiaapaayp, Viejas, and I-8 Corridor)

Demand Type	Existing Demand (mgd)	2025 Demand (mgd)	2045 Demand (mgd)	Demand Increase (mgd)
Existing	3.0	3.0	3.0	0.0
Future Development	0.0	0.3	1.0	1.0
Infill Demand	0.0	0.3	0.8	0.8
Total ESA	**3.1**	**3.7**	**4.9**	**1.8**
Ewiiaapaayp, Viejas, and I-8 Corridor	0.0	2.1	2.1	2.1
Total ESA plus Ewiiaapaayp, Viejas, and I-8 Corridor	**3.1**	**5.8**	**7.0**	**4.0**

Notes:
(1) Difference in the totals is due to internal rounding.

As shown in Table 3.11, the water demands within the eastern water study area are expected to increase to approximately 5.8 mgd by the year 2025, and 7.1 mgd by the year 2045. Over the planning period, the ESA, including the Ewiiaapaayp, Viejas, and I-8 Corridor, of the District's water demand is expected to increase by 126 percent, with about 46 percent of the growth from the ESA and 54 percent from outside the District.

3.1.5.4 District Projected Potable Water Demand Summary

The District's future average annual water demands for the Water Study Area (including both the WSA and ESA) based on demand type are presented in Table 3.12 and graphically depicted on Figure 3.5.

Table 3.12 Total Future Potable Water Demands by Type

Demand Type	Existing Demand (mgd)	2025 Demand (mgd)	2045 Demand (mgd)	Demand Increase	
				mgd	%
Existing	8.0	8.0	8.0	0.0	n/a
Future Development	0.0	0.3	2.9	2.9	n/a
Infill Demand	0.0	0.4	0.9	0.9	n/a
Total	**8.1**	**9.0**	**12.1**	**4.0**	**49%**
Ewiiaapaayp, Viejas, and I-8 Corridor	0.0	2.1	2.1	2.1	n/a
Total ESA plus Ewiiaapaayp, Viejas, and I-8 Corridor Demand	**8.1**	**11.0**	**14.2**	**6.0**	**74%**

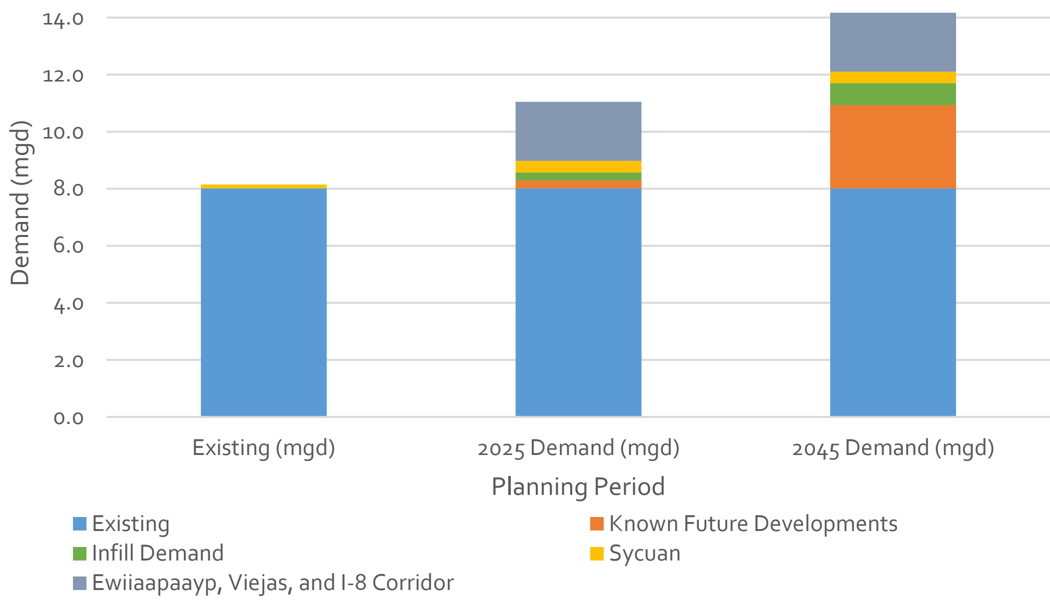


Figure 3.5 District Future Water Demands by Type

As shown in Table 3.12 and Figure 3.5, the District's future water demands, excluding the anticipated Ewiiaapaayp, Viejas, and I-8 Corridor demand, are expected to increase from approximately 8.1 mgd to 9.0 mgd by the year 2025, and to 12.1 mgd by the year 2045. Over the 2045 planning horizon, the existing demands are expected to increase by approximately 49 percent. The majority of this increase in water demands is attributed to new planned developments.

With the inclusion of the anticipated Ewiiaapaayp, Viejas, and I-8 Corridor demand of 2.1 mgd, the District's future water demand is projected to increase to approximately 11.0 mgd by the year 2025 and to 14.2 mgd by the year 2045. The demand equates to approximately a 74 percent increase from existing to year 2045.

3.1.6 Water Conservation

The District's water conservation and education efforts began in the mid-1970s during a statewide drought. The conservation program was expanded and vigorously promoted during the severe drought from 1987 to 1992. The District continues to be committed to water conservation as a method of reducing imported water demands. The District's water conservation drought response measures were incorporated into a written Water Shortage Contingency plan and adopted by the Board as part of the 2020 UWMP. This was done help the District manage its water supply during both normal and drought conditions.

The District participated in the development and implementation of water-use efficiency programs and water-conservation measures, including programs run through the CWA and MWD. The District also assists customers with the implementation of water waste prevention ordinances all to install regulations that conserve water at a customer level.

The District reports compliance with the water conservation Demand Management Measures (DMMs) that it has committed to use good-faith efforts to implement. These DMMs include:

1. Metering with commodity rates for all new connections and retrofit of existing connections.
2. Large landscape conservation programs and incentives.
3. Public information programs.
4. School education programs.
5. Conservation programs for commercial, industrial, and institutional accounts.
6. Wholesale agency programs.
7. Conservation pricing.
8. Water conservation coordinator.
9. Water waste prohibition.

The District's 2020 UWMP explains that the District maintains compliance with all the DMMs. As the District continues to pursue and improve upon water conservation and implementation of the nine DMMs, per-capita water use is anticipated to continue to decrease as it has been over the past 5 years.

Having these programs available does not guarantee large water savings with minimal effort. The actual implementation of these programs by District customers determines how much water is being saved by the current program. This will require that the District continues to be proactive in marketing and educating customers as to the benefits of installing water-efficient devices and changing water-use habits.

3.1.6.1 Master Plan Update and 2015 UWMP and CFMP Water Demand Projection Comparison

Beginning in 2008, the District experienced a significant decline in water demands. For this Master Plan Update, it was assumed that typical per-capita consumption rates would remain at these lower levels, even without the mandatory Water Conservation Act of 2009 (Senate Bill X7-7 or SB X7-7) limits established in the District's 2020 UWMP.

Figure 3.6 compares the projected water demand, including near-term annexation, developed for this Master Plan Update to the 2020 CWA UWMP projected supplies with and without conservation.

As shown in Figure 3.6, the Master Plan Update projected demands for 2045 are anticipated to restore the District's total demand back to 2007 levels.

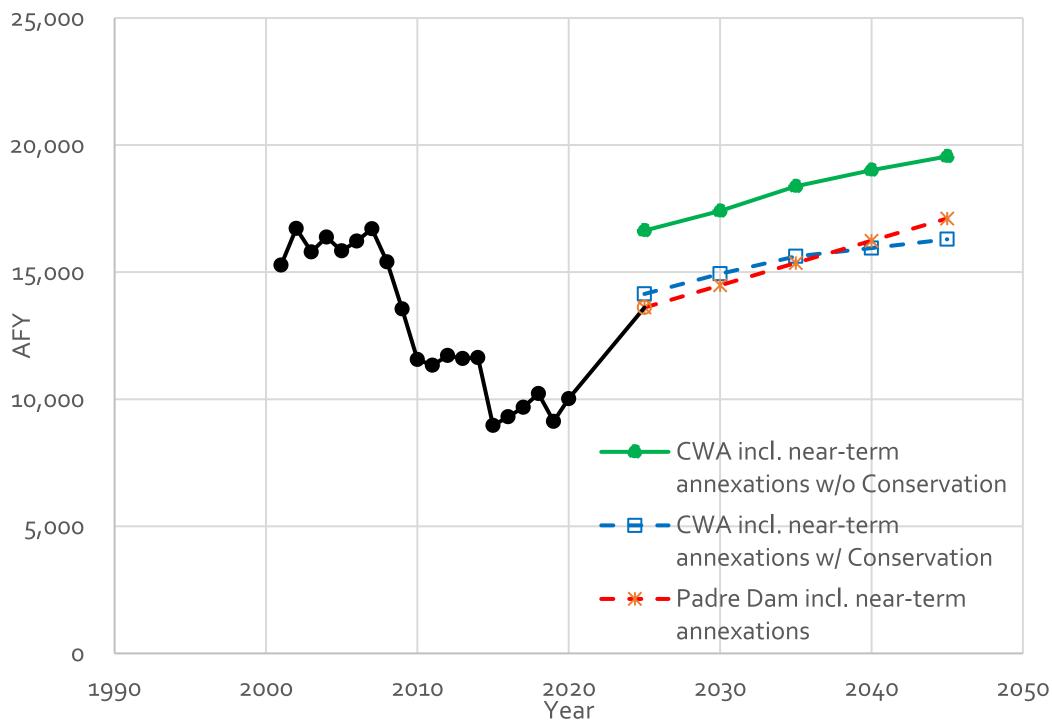


Figure 3.6 Master Plan Update Projected Water Demand Comparison to 2020 CWA UWMP Projections

As shown in Figure 3.6 the CWA demands without conservation projections is expected to exceed the projects from this Master Plan Update's projections without conservation considerations. The existing customers have conserved enough to reduce annual demands and in this Master Plan's projections it is expected to closely resemble projections for CWA's demand with conservation.

However, when including conservation in CWA's demand projections after 2035 it is expected to be lower than this Master Plan Updates projections. With CWA's conservation considerations the CWA's demand projections will be less than this Master Plan Updates projections by around 500 acre-feet (AF) and 1,000 AF in 2040 and 2045, respectively.

3.2 Wastewater

This section describes the District's existing and projected wastewater flows. This section includes a discussion of the various flow components present in wastewater and summarizes the historical flow-monitoring data that was used as part of this Master Plan Update. The existing wastewater flow section summarizes the current flows generated within the District sewer service area, and the future wastewater flow section consists of the wastewater flow projections through 2045 and the anticipated phasing of the projected flows.

3.2.1 Wastewater Flow Components

As a way to help the reader understand the wastewater flow components, this section describes and provides definitions of commonly used terminology in the wastewater collection system analysis and evaluations conducted as part of this project. This section defines the terminology used for hydraulic analysis of the wastewater collection system. Wastewater flows vary according to the season. Dry weather flow (DWF) or base flow is flow generated by routine water usage in the residential, commercial, business, and industrial sectors of the collection system.

Groundwater infiltration (GWI) is an additional component of DWF. GWI enters the sewer system when the pipeline depth is lower than the groundwater. Undetected leaks in the potable water system can create localized conditions that contribute to GWI. Defects such as cracks, misaligned joints, and broken pipelines allow groundwater to infiltrate into the collection system.

Wet weather flow (WWF) includes inflow from storm water runoff and infiltration from rising ground water or saturated soil conditions. The storm water infiltration and inflow (I/I) comprise the WWF component. The response in the sewer system to rainfall is seen immediately (as with inflow) or within hours after the storm (as with infiltration).

The various flow components are described in detail below:

- **Base Wastewater Flow (BWF)**: The BWF is the flow generated by the District's customers. The flow has a diurnal pattern that varies depending on the type of use. Commercial and industrial patterns, though they vary depending on the type of use, typically have consistently higher flows during business hours and lower flows at night. Furthermore, the diurnal flow pattern experienced during a weekend may vary from the diurnal flow experienced during a weekday.
- **Average Dry-Weather Flow (ADWF)**: The ADWF is the average flow that occurs on a daily basis during the dry-weather season. The ADWF includes the BWF generated by the District's residential, commercial, and industrial users, plus the dry-weather GWI component. For the District, the ADWF was estimated based on the available flow-monitoring data from 2020.
- **Groundwater Infiltration**: GWI, one of the components of I/I, is associated with extraneous water entering the sewer system through subsurface defects in pipes and manholes. GWI is related to the condition of the sewer pipes, manholes, and groundwater levels. GWI may occur throughout the year, although rates are typically higher in the late winter and early spring. Dry-weather GWI (or base infiltration) cannot easily be separated from BWF by flow measurement techniques. Therefore, dry-weather GWI is typically grouped with BWF to define the ADWF.
- **Infiltration and Inflow**: All wastewater collection systems have some I/I, although the characteristics and severity vary by region and individual collection system. Infiltration is defined as storm water flows that enter the sewer system by percolating through the soil and then through defects in pipelines, manholes, and joints. Examples of infiltration entry points are cracks in pipelines, misaligned joints, and root penetration. Inflow is defined as storm water that enters the sewer system via a storm drain cross connection, leaky manhole covers or pickholes, or cleanouts. Examples of inflow entry points are roof drain and downspout connections, and illegal storm drain connections. If too much

I/I enters the sewer system, such that the sewer system is operating at or above its capacity, sanitary sewer overflows could occur.

- **Peak Wet Weather Flow (PWWF) (Design Flow)**: PWWF is the highest observed flow that occurs following a design storm event. Wet-weather I/I causes flows in the collection system to increase. PWWF is typically used for designing sewers and lift stations. Therefore, the PWWF and the "Design Flow" are synonymous and will be used interchangeably throughout this report.

3.2.2 Flow-Monitoring Data

This section describes the temporary flow monitoring program conducted as part of this study. The data and results from the flow monitoring program are summarized and discussed.

3.2.2.1 Flow Monitoring Sites

The District contracted with V&A Consulting Engineers (V&A) to conduct a sanitary sewer flow monitoring program within the District's wastewater collection system. The purpose of the flow monitoring program was to establish the baseline sewer flows at the flow monitoring sites, measure the peak flow and characteristics of the subject pipes during the monitoring period, and quantify I/I at the flow monitoring sites. The flow monitoring program was conducted for a period of eight weeks, which occurred from February 27, 2020, to April 23, 2020. The "Sewer Flow Monitoring and Inflow/Infiltration Study" prepared by V&A summarizes the flow monitoring program. A copy of the report is included in Appendix E.

Flow Monitoring Sites and Tributary Areas

A total of 25 open-channel flowmeters were installed at locations selected by the District.

Table 3.13 lists the flow monitoring locations and the diameters for the sewers where the meters were installed. The 25 flow monitoring locations, as well as the tributary area to each site, are shown on Figure 3.7.

Figure 3.8 provides a schematic illustration of the flow monitoring locations. Not all basins could be continuously isolated during this study due to the District's diversion structures and cross connections to the County of San Diego and within the District's system.

Flowmeter Installation and Flow Calculation

Hach 902 flowmeters were used for the flow monitoring program. Hach 902 meters use submerged sensors with a pressure transducer to collect depth readings and an ultrasonic Doppler sensor to determine the average fluid velocity. The ultrasonic sensor emits high frequency sound waves, which are reflected by air bubbles and suspended particles in the flow. The sensor receives the reflected signal and determines the Doppler frequency shift, which indicates the estimated average flow velocity. The sensor is typically mounted at a manhole inlet to take advantage of smoother upstream flow conditions. The sensor may be offset to one side to lessen the chances of fouling and sedimentation where these problems are expected to occur. Manual level and velocity measurements were taken during installation of the flowmeters and again when they were removed and were compared to simultaneous level and velocity readings from the flowmeters to verify proper calibration and accuracy. The pipeline diameter was also verified to accurately calculate the flow cross-section. The continuous depth and velocity readings were recorded by the flowmeters on 15-minute intervals.

Table 3.13 2020 Flow-Monitoring Locations

Site	Pipe Diameter (inches)	Manhole ID	Location
1A	21	2779	8301 Mission Gorge Road
1B	15	2779	8301 Mission Gorge Road
3A	15	54	Carlton Oaks Country Club Golf Course
3B	8	445	8928 Carlton Oaks Drive
4	24	3000	8922 Carlton Hills Boulevard
5A	15	577	Padre Dam Customer Service Center, east of south end of Lake 1
5C	15	473	Fanita Parkway, east of north end of Lake 5
7A	24	3041	Carlton Oaks Drive west of Fanita Parkway
7B	12	1711	9457 Carlton Oaks Drive
8B	12	25	Cuyamaca Street, in median next to Phil's Barbeque
8C	10	1899	10041 Mission Gorge Road
8E	18	3536	Riverview Parkway and Town Center Parkway
10A	24	3095	9805 Prospect Avenue
10C	10	520	1664 Magnolia Avenue at east end of runway
10D	8	532	1664 Magnolia Avenue
11	15	1965	Annie Lane and Annie Way
12A	15	3342	Rio Seco School near River Park Drive
12B	15	892	9539 Cottonwood Avenue
12C	12	1258	10135 Woodrose Avenue
12D	18	3295	South end of Park Center Drive
13	10	3244	Lakeside Sports Complex at sewer line "A"
14A	8	1945	North end of Lake Murray Boulevard
16A	24	2989	Carlton Oaks Country Club Golf Course
16B	18	16	Planter by Rubio's patio on Town Center Parkway
16C	8	242	Northcote Road and Woodside Avenue

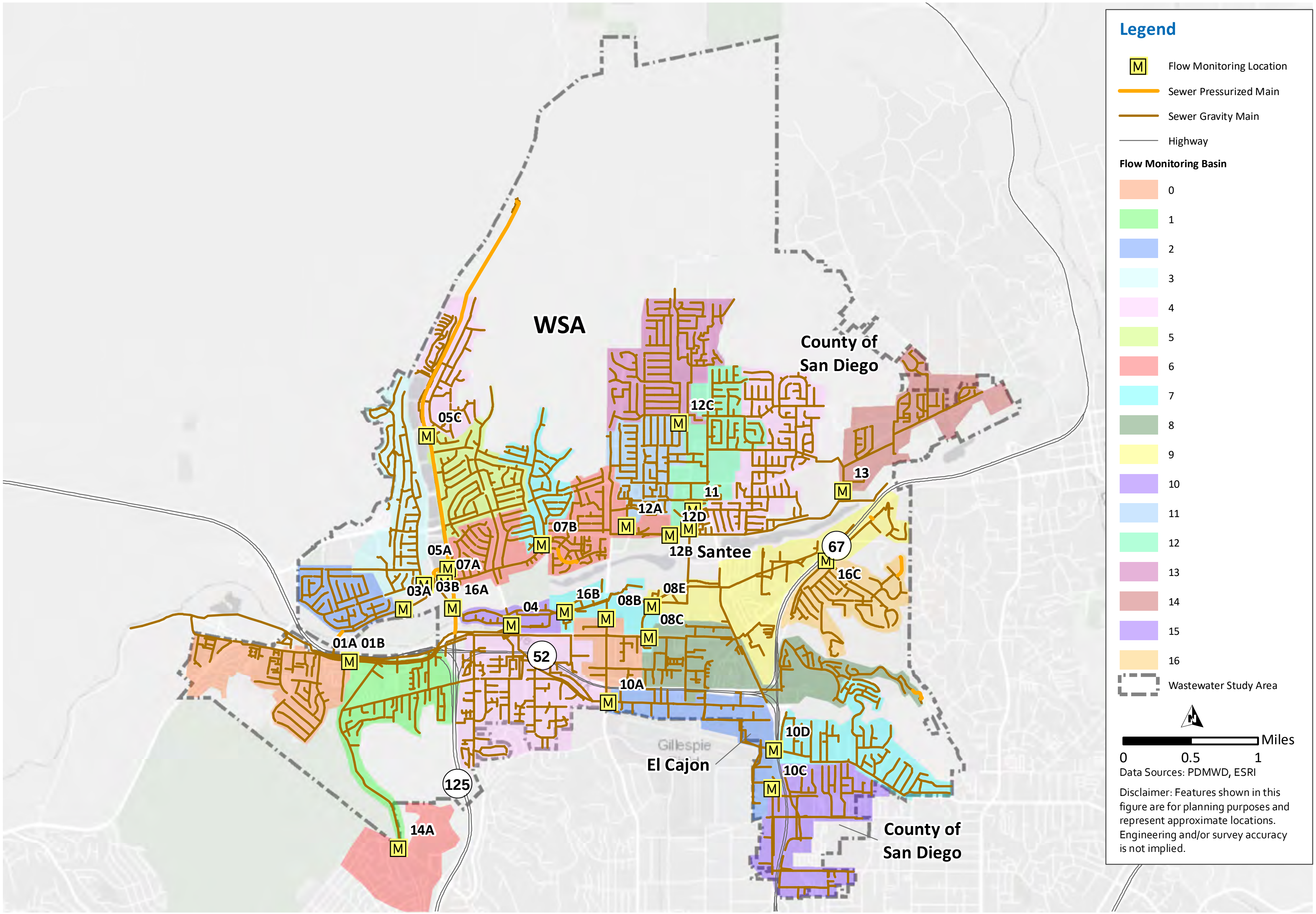


Figure 3.7 2020 Flow Monitoring Locations

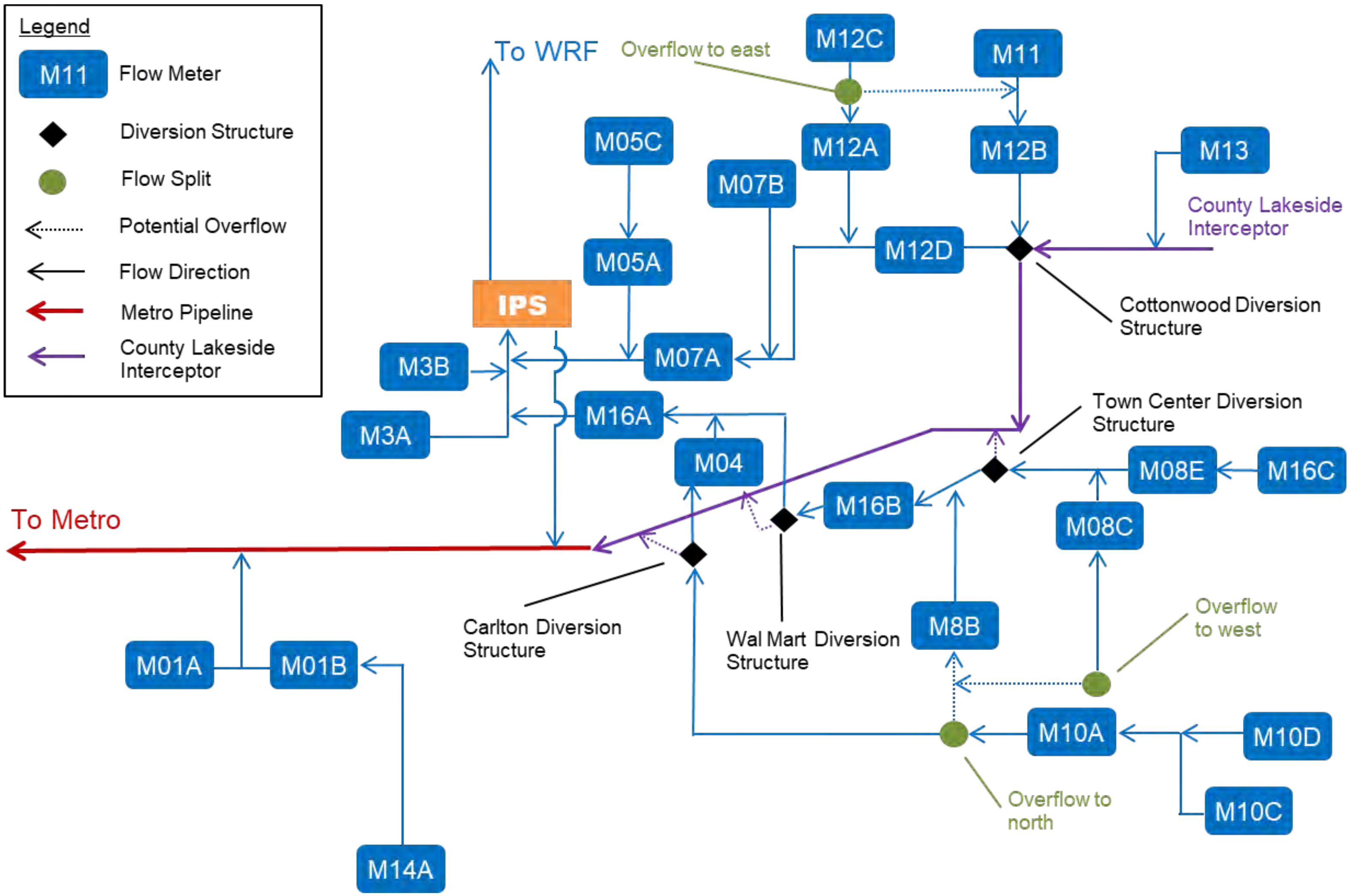


Figure 3.8 2020 Flow Monitoring Schematic

3.2.3 Flow Monitoring Results

This section summarizes the results of the flow monitoring program, including DWF data, rainfall data, and WWF data.

3.2.3.1 Dry Weather Data

During the flow monitoring period, depth and velocity data were collected at each meter at 15-minute intervals. Carollo aggregated the 15-minute data to hourly data for use in the hydraulic model. Characteristic dry weather 24-hour diurnal flow patterns for each site were developed based on the hourly data. This hourly flow data was then used to calibrate the hydraulic model for the observed DWFs during the flow monitoring period.

Due to the COVID-19 and the SIP order placed in the state of California near the middle of the flow monitoring study, there are two sets of ADWF data. The ADWF prior to March 20, 2020 when the SIP was enacted, represents typical wastewater flows pre-COVID. The ADWF after March 20, 2020 represents SIP flow conditions. Table 3.14 summarizes the average DWFs at each meter for both pre-SIP and post-SIP.

Hourly patterns for weekday and weekend flows vary and are separated to better understand DWF. V&A used the data from days least affected by rainfall to estimate the weekday and weekend DWFs. In addition, V&A provided estimates for the average weekday and weekend levels and velocities at each site, which are used in DWF calibration. Table 3.14 summarizes the DWFs at each meter.

Table 3.14 DWF Summary

Site	Pre-SIP ADWF(1)(mgd)					Post-SIP ADWF(1)(mgd)					SIP Delta
	Mon-Thur	Fri	Sat	Sun	Overall	Mon-Thur	Fri	Sat	Sun	Overall	
1A	0.29	0.28	0.31	0.34	0.30	0.28	0.28	0.30	0.31	0.29	-3%
1B	0.10	0.10	0.11	0.12	0.11	0.12	0.12	0.13	0.13	0.12	18%
3A	0.08	0.08	0.07	0.08	0.08	0.09	0.09	0.09	0.10	0.09	24%
3B	0.14	0.14	0.15	0.16	0.15	0.17	0.17	0.18	0.18	0.17	17%
4	1.01	0.98	1.02	1.16	1.03	1.05	1.04	1.10	1.12	1.07	3%
5A	0.17	0.17	0.18	0.20	0.18	0.22	0.22	0.23	0.23	0.22	28%
5C	0.09	0.08	0.09	0.11	0.09	0.13	0.13	0.13	0.14	0.13	49%
7A	1.83	1.81	2.00	2.10	1.89	1.87	1.90	1.95	1.96	1.90	1%
7B	0.11	0.11	0.13	0.14	0.12	0.14	0.14	0.16	0.17	0.15	25%
8B	0.11	0.12	0.12	0.12	0.12	0.09	0.09	0.10	0.09	0.09	-21%
8C	0.23	0.21	0.23	0.24	0.23	0.25	0.25	0.26	0.26	0.25	12%
8E	0.36	0.35	0.33	0.34	0.35	0.37	0.38	0.37	0.38	0.37	7%
10A	0.69	0.66	0.68	0.73	0.69	0.78	0.77	0.77	0.80	0.78	14%
10C	0.44	0.46	0.47	0.49	0.46	0.50	0.48	0.50	0.51	0.50	10%
10D	0.14	0.14	0.15	0.14	0.14	0.13	0.13	0.14	0.14	0.13	-8%
11	0.23	0.21	0.24	0.25	0.23	0.26	0.27	0.27	0.29	0.27	16%
12A	0.39	0.38	0.41	0.43	0.40	0.47	0.47	0.47	0.48	0.47	18%
12B	0.41	0.41	0.45	0.51	0.43	0.58	0.57	0.60	0.61	0.59	37%

Site	Pre-SIP ADWF(1)(mgd)					Post-SIP ADWF(1)(mgd)					SIP Delta
	Mon-Thur	Fri	Sat	Sun	Overall	Mon-Thur	Fri	Sat	Sun	Overall	
12C	0.24	0.24	0.29	0.30	0.26	0.31	0.30	0.32	0.31	0.31	22%
12D	0.83	0.84	0.87	0.91	0.85	1.04	1.04	1.05	1.07	1.04	23%
13	0.11	0.11	0.10	0.11	0.11	0.12	0.12	0.12	0.12	0.12	12%
14A	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	0.04	4%
16A	1.72	1.70	1.70	1.75	1.72	1.44	1.67	1.43	1.43	1.47	-14%
16B	0.81	0.83	0.82	0.87	0.82	0.86	0.85	0.87	0.86	0.86	5%
16C	0.12	0.12	0.13	0.14	0.12	0.13	0.13	0.14	0.14	0.13	6%
IPS Total In	3.53	3.47	3.50	3.68	3.54	3.48	3.79	3.83	3.57	3.58	1%
IPS to WRF	1.97	1.95	1.86	1.80	1.92	1.82	1.85	1.72	1.53	1.77	-8%
IPS to Metro	1.57	1.52	1.64	1.79	1.60	1.63	1.90	2.11	2.04	1.80	-12%

Notes:
Abbreviations: IPS - Influent Pump Station; WRF - water reclamation facility.
(1) Source: Sewer Flow Monitoring and Inflow/Infiltration Station, V&A Consulting Engineers, Inc. (2021).

The variation of wastewater flows in the District are included in Appendix E.

3.2.3.2 Rainfall Data

Over the course of the flow monitoring period, several significant rainfall events occurred. Table 3.15 summarizes the total rainfall recorded over the entire flow monitoring period. Two classifiable events occurred: March 12 is classified as a 6-year, 6-hour storm event, while April 10 is classified as a 25-year, 24-hour storm event.

Table 3.15 Rainfall Event Summary

Storm Event	Rainfall Depth(1)(2)(inches)
March 1 - March 3, 2020	0.20
March 8 - March 11, 2020	1.43
March 12 - March 15, 2020	2.52
March 16 - March 20, 2020	1.75
April 6 - April 11, 2020	6.95
Total Monitoring Period (February 24 - April 24)	**14.01**

Notes:
(1) Source: Sewer Flow Monitoring and Inflow/Infiltration Station, V&A Consulting Engineers, Inc. (2021).
(2) Rainfall depth is the average of the seven rainfall gauges used for the flow monitoring study.

3.2.3.3 WWF Data

V&A evaluated the flow monitoring data to quantify the collection system's response to wet weather events. The rainfall event that captured the largest I/I response during the flow monitoring period was selected for the I/I analysis; this rainfall occurred on April 10, 2020.

The metric typically used to quantify the severity of the system’s I/I is the R-value. The R-value is defined as the percentage of rainfall volume that makes it into the collection system as I/I.

Table 3.16 summarizes the R-values for each flow monitoring basin. As shown in Table 3.16, the R-Values vary from 5.4 percent in basin 7B to 0.2 percent in Basin 12B. In general, an R-Value of 5 percent or more is usually considered indicative of a significant I/I response.

The R-Value for each basin is determined by isolating I/I associated with individual flow monitoring basins and calculating the ratio of the volume of water that enters the system as I/I versus the volume of rainfall that fell over the flow monitoring basin tributary area. However, Basins 4, 8B, and 16B were combined due to diversion structures and cross-connections. As shown in Figure 3.9, Basin 7B has the largest amount of I/I relative to the other basins. Figure 3.9 shows the locations of basins with higher rates of I/I as documented by V&A.

Table 3.16 I/I Analysis (V&A)

Metering Basin	Total I/I(1) (gallons)	Total I/I per-IDM(1) (gallon/IDM/ inch-rain)	Total I/I per-Acre(1) (R-Value, %)	Total I/I per-ADWF(1) (MG/ADWF/ inch-rain)	Final Total I/I Ranking(1)
1A	1,999,280	5,800	3.0%	0.91	2
1B	1,271,193	2,548	1.1%	2.50	9
3A	920,070	3,019	2.6%	1.63	6
3B	1,124,266	2,617	1.8%	1.06	8
4/8B/16B	3,819,223	3,685	2.4%	0.90	7
5A	3,394,847	2,470	3.5%	5.34	4
5C	741,978	1,167	1.7%	1.15	13
7B	1,734,305	6,820	5.4%	1.95	1
8C	1,717,609	4,343	2.2%	1.12	5
8E	999,540	1,490	0.7%	0.64	15
10A	1,527,936	1,444	0.9%	2.56	11
10C	2,005,096	5,995	3.2%	0.69	3
10D	320,815	1,027	0.6%	0.35	17
11	1,274,289	2,122	1.7%	0.79	12
12A	892,133	835	0.8%	0.89	16
12B	309,575	310	0.2%	0.22	20
12C	1,506,255	2,457	2.0%	0.82	10
13	202,289	665	0.3%	0.27	19
14A	192,496	1,925	0.4%	0.70	14
16C	193,027	668	0.4%	0.23	18

Notes:
Abbreviations: IDM - inch-diameter-miles of pipe, MG - million gallons
(1) Source: Data provided by V&A Sewer Flow Monitoring and Inflow/Infiltration Study.

Basin 7B has shown the largest amount of I/I entering the collection system. Further investigation is recommended to identify the source(s). Further investigation is also recommended for Basins 1A, 5A and 4/8B/16B since they all had consistently high I/I rankings.

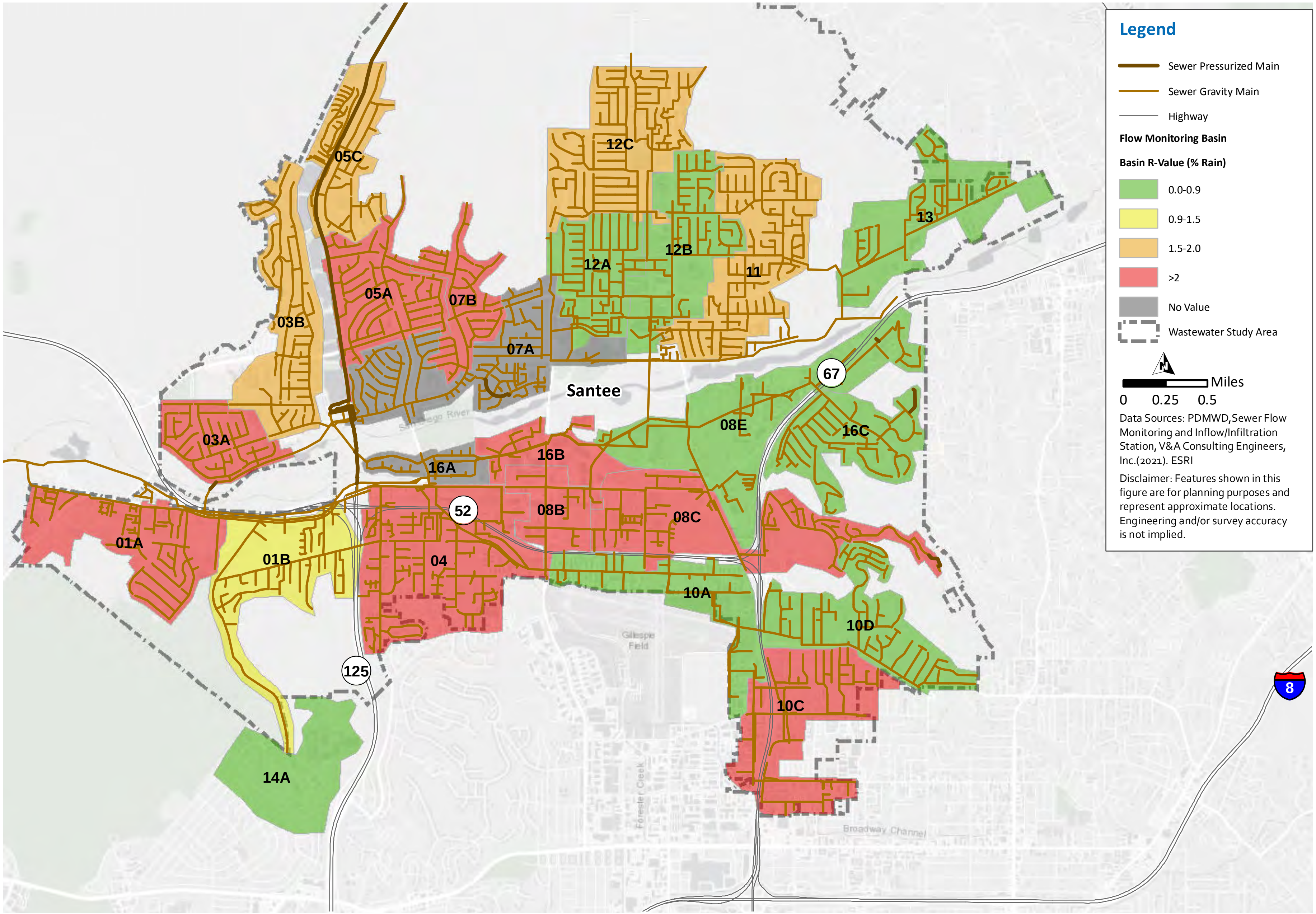


Figure 3.9 2020 RDII Temperature Map

3.2.4 Wastewater Design Flows

This section summarizes the District's historic flows and presents the methodology for the calculation of DWFs and WWFs used to model the existing and future system.

3.2.4.1 Existing Flows

Based on analysis of historical records provided by the District, the daily average influent flow at the Ray Stoyer WRF was estimated to be roughly 2.00 mgd. This is the amount of wastewater that is pumped from the IPS to the Ray Stoyer WRF, at a near constant rate. The remaining wastewater flow that is not pumped to the WRF is diverted to the Metro Mission Gorge Interceptor (MGTS). The flow diverted to Metro was estimated to be 1.67 mgd in 2019. The estimated wastewater ADWF for the District's service area (including areas that do not flow to the Ray Stoyer WRF) is 3.67 mgd.

3.2.4.2 Existing Per Capita Wastewater Generation

The District's ADWF for 2020 was divided by the District's estimated sewer service population. The ADWF for 2020 was estimated to be 3.67 mgd and the population for 2020 was estimated to be 72,597. Therefore, the District's average per capita wastewater generation was estimated at 50 gpcd. This a 10 gpcd reduction (17 percent) compared to the 2015 CFMP per capita value which was 60 gpcd. This reduction is assumed to be due to the effects of water conservation and increased water efficiency in new developments.

3.2.4.3 Wastewater Unit Flow Factors

To estimate the amount of flow per acre generated by each land use category, wastewater flow factors (WWFF) were developed and are a correlation between land use and sewer generation. These flow factors are based on the average wastewater flow generated for each land use type.

WWFF provide a method to estimate the average quantity of flow per acre for each type of land use. The flow factors are expressed in gpd/ac. The flow factors were developed using the following procedure:

- Average flows for each flow metering tributary area were derived from the flow monitoring data.
- Using GIS information, the acres for each existing land use type contained in each flow monitoring tributary area were calculated. Land use identified as vacant or on septic were excluded from existing estimates and added under future scenarios.
- Preliminary WWFF for each land use type were estimated based on the previous Master Plan.
- The WWFF for each flow metering tributary were then balanced (adjusted up or down) to match the calculated average flows from each tributary to the measured flows during the flow monitoring period.
- Once the WWFF for each flowmeter tributary area were balanced, the weighted average of the coefficients for each existing land use type was calculated based on the acreage contribution from each metering tributary area.
- The weighted average WWFF were then adjusted for the entire developed sewer service area until they matched the total metered ADWF of 3.67 mgd. The adjusted WWF are considered representative of the wastewater generation by land use for the entire service area and can be used to project future wastewater flows.

The calibrated WWFF developed for the Master Plan Update are summarized in Table 3.17. These flow coefficients are less than those in the previous 2015 CFMP. The reduction of wastewater generation can be contributed to a number of reasons, including conservation due to state-wide mandates to address drought conditions, promotion of efficient plumbing fixtures, ongoing water restrictions, and a water rate increase. The water rate increase promotes water conservation and occurred after the completion of the 2015 CFMP. In the 2015 CFMP it was assumed that for nonresidential future developments that a WWFF of 800 gpd/acre was used. This Master Plan Update calculates a more accurate WWFFs based on land use types to be used for future development projects.

Table 3.17 WWFFs

Land Use Type	Wastewater Factors (gpd/ac)
High Residential	1,670
Medium Residential	720
Semi-Rural	150
Commercial	760
Public Land/Facilities	110
Low Residential	190
Mixed Use	520
Industrial	340
Airport	60

3.2.4.4 Future ADWF

Based on review of available data, it was determined that the most accurate forecasting methodology for sewer flow included a combination of population and land use flow factors. Future development wastewater flow projections were based on Specific Plans, land use, and WWFF. These flows were then added to the appropriate planning year, based on input from the District and from the City of El Cajon, City of Santee, and County of San Diego.

For Near Term (2025) and Long Term (2045) flows, a combination of projected population, and the wastewater per capita flow rate were utilized to estimate infill. Future development flows were developed based on flow projections from Specific Plans and land use. Wastewater flows for future developments are presented in Table 3.18. Table 3.19 summarizes the project ADWF. It should be noted that flows from the Fanita Ranch development will not flow through the District's collection system and will tie in directly to the WRF via a new pump station and force main.

Table 3.18 ADWF Projections for Future Developments

Map ID(1)	Development Name	Development Size		Estimated Population(2)	WWFF(3)		Total ADWF (mgd)	Year Built-Out
		Dwelling Units	Acres		gpcd	gpd/ac		
City of Santee								
1	Walker Trails	67	20.4	192	50	n/a	<0.001	2025
2	Riverview	990	100	2,603	n/a	n/a	0.127	2045
3	Fanita Ranch(4)	2,949	2,640	7,756	Sewer Study		0.591	2045
4	Pinnacle Peak	113	5	323	50	n/a	0.016	2025
5	Lantern Crest Ridge (Phase II)	0	0.7	50	50	n/a	0.003	2045
6	Carlton Oaks Golf Course(5)	243	7	0	Sewer Study		0.059	2045
7	Lunar Lane	0	0.2	0	n/a	340	0.000	2045
8	Prospect Estates II	53	3.4	152	50	n/a	0.008	2025
9	WoodSpring Suites	0	0.1	0	n/a	760	<0.001	2045
10	Tower Glass	0	0.8	0	n/a	340	0.000	2025
11	Cornerstone	128	5.9	366	50	NA	0.018	2025
12	Hattie Davidson Properties	113	3.7	323	50	NA	0.016	2025
13	Gondola Skate	0	0.7	0	n/a	340	<0.001	2045
14	Jacor	0	0.1	0	n/a	340	<0.001	2045
15	Railroad Workshop	0	0.1	0	n/a	340	<0.001	2045
16	Parkside (formerly Hillside Meadows)	125	80.8	329	50	n/a	0.016	2045
17	Sharp Medical Office Building	0	2	0	n/a	760	0.002	2025
18	Weston (formerly Castlerock)	415	207.6	0	0	0	<0.001	2025
City of El Cajon								
19	Weld Distribution Center	0	3	0	n/a	340	0.001	2045
Total		**5,195.7**	**3,081**	**12,732**	**n/a**	**n/a**	**0.858**	**n/a**

Notes:
(1) See Figure 3.5.
(2) 2.86 Persons per du if project completed <2035 and 2.63 Persons per du if projected completed >2035.
(3) Population based WWFF = 50 gpcd, commercial WWFF= 760 gpd/ac, industrial WWFF = 340 gpd/ac.
(4) Fanita Ranch ADWF = 591,158 gpd, per sewer study for this site development project.
(5) Carlton Oaks Golf Course = 58,962 gpd, per sewer study for this site development project.

Table 3.19 Wastewater Flow Projections

Planning Year	Estimated ADWF (mgd)	Estimated PWWF (mgd)	Peaking Factor
Existing (2020)	3.67	13.76	3.75
Near Term (2025)	3.73	13.88	3.72
Long Term (2045)	4.47	15.30	3.42

3.2.4.5 Design Storm

For wastewater collection systems, the PWWF (or design flow) is typically estimated through the use of a peaking factor, a peak I/I allowance, or by routing a "design storm" through a calibrated hydraulic model. Of these three methods, the most accurate way to develop a PWWF estimate is to route a design storm through the calibrated hydraulic model.

In California, it is an industry standard to use a 10-year, 24-hour design storm to analyze wastewater collection system performance during PWWF conditions. A 10-year, 24-hour event was utilized for the 2015 CFMP. However, for the purposes of this Master Plan Update, the District opted to use the April 2020 rainfall event as the design storm rather than the 10-year, 24-hour event, which is a more conservative approach. As previously mentioned, the April 2020 rainfall event was classified as a 25-year, 24-hour event by V&A. For more detailed information on the rainfall events captured by the temporary flow monitoring program, refer to Appendix E.

3.2.4.6 Existing and Projected PWWF

Wet weather I/I occur during and after rainfall events will increase flows in the collection system and cause PWWF, which is the highest hourly flow, after the design storm event. The District's sewers and lift stations were evaluated based on their capacity to convey the PWWF.

Throughout the system, the existing PWWF was derived using the hydraulic modeling results. This was accomplished by routing the April 2020 design storm through the hydraulic model, which was calibrated to both dry weather and wet weather conditions. Detailed information regarding the calibration of the District's hydraulic model is provided in Chapter 5. Similarly, the future PWWF was derived by routing the April 2020 design storm through the hydraulic model. Peak I/I rates for future growth areas (e.g., vacant areas within the existing service area and growth areas outside of the current service area) were developed based on a peak I/I rate of 1,000 gpd/ac. Table 3.19 summarizes the estimated PWWF for each planning year. As shown in Table 3.19, the PWWF is estimated to increase from 13.76 mgd under existing conditions to 15.30 mgd by 2045.

3.3 Recycled Water

This section presents a discussion of the estimated existing recycled water demand.

First, the District's historical recycled water customer and Santee Lake demands are summarized, followed by a discussion of the top recycled water customer list, followed by a presentation of the recycled water peaking factors and diurnal patterns.

3.3.1 Existing and Historical Demands

The District provided historical customer billing records per account for the period 2001 through 2019. The historical recycled water demands are summarized in Table 3.20 and presented on Figure 3.10. As shown in Table 3.20, the District served recycled water to 243 customers in 2019, with a combined demand of nearly 789 AF or 0.7 mgd.

Table 3.20 Historical Recycled Water Demands

Year	Recycled Water Demand (mgd)	Recycled Water Demand (AFY)	Number of Customers
2001	0.58	647	148
2002	0.62	698	153
2003	0.61	685	171
2004	0.69	778	176
2005	0.66	743	182
2006	0.77	859	179
2007	0.77	862	183
2008	0.71	792	187
2009	0.72	805	197
2010	0.66	739	201
2011	0.69	776	211
2012	0.80	898	214
2013	0.84	936	215
2014	0.92	1,025	225
2015	0.67	747	232
2016	0.79	889	237
2017	0.75	837	242
2018	0.88	987	241
2019	0.70	789	243
Average (Last 5 Years)	**0.76**	**850**	**239**

As seen in Table 3.20 the average historical average recycled water customer use is 850 AFY or 0.76 mgd. Recycled water demands from 2001 to 2019 for the Santee Lakes are shown in Table 3.21. The recycled water to the Santee Lakes in 2019 was 1,207 AFY, or 1.08 mgd.

Table 3.21 Santee Lakes Demands

Year	Recycled Water Demand (mgd)	Recycled Water Demand (AFY)
2001	1.08	1,215
2002	0.81	904
2003	1.29	1,443
2004	1.09	1,216
2005	0.97	1,086
2006	0.96	1,079
2007	0.98	1,096
2008	0.72	804
2009	0.73	813
2010	0.92	1,031
2011	1.01	1,117
2012	0.93	1,036
2013	0.84	936
2014	0.92	1025
2015	0.67	747
2016	1.01	1,136
2017	1.04	1,166
2018	0.87	973
2019	1.08	1,207
Average (Last 5 Years With Data)	**0.99**	**1,104**

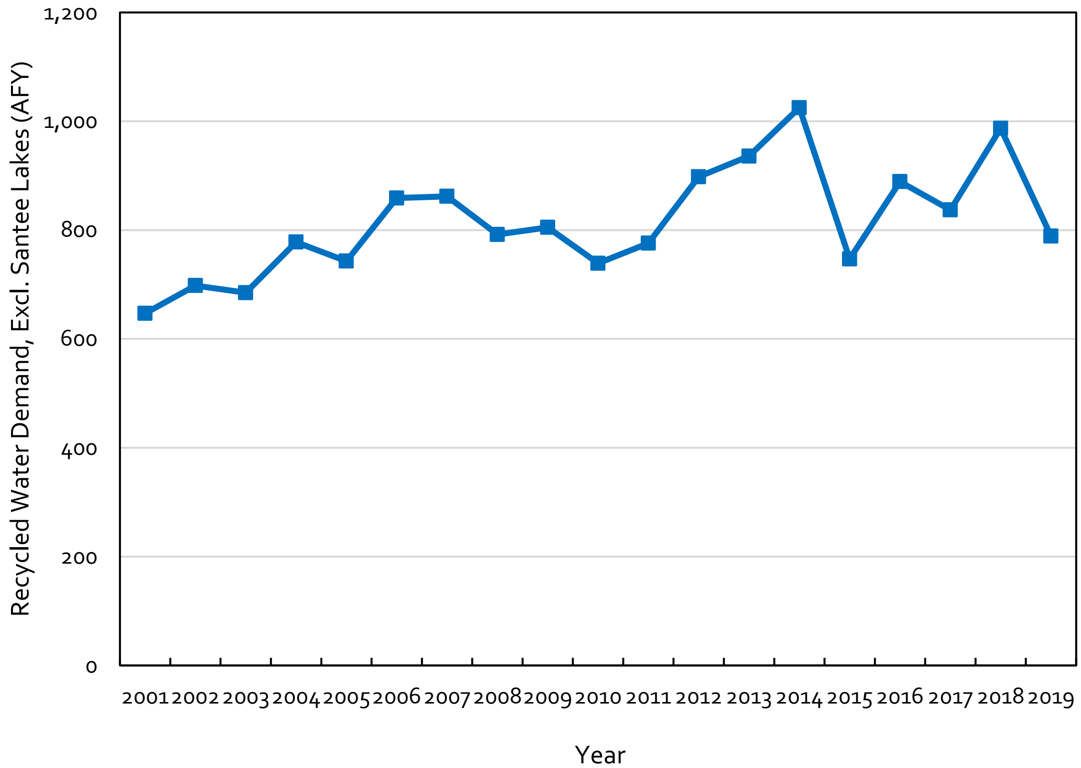


Figure 3.10 Historical Recycled Water Demands

Locations for the District's existing recycled water customer meters are shown on Figure 3.11. As of December 2019, the District provided recycled water through 242 meter accounts. The makeup of the District's customer base is mostly irrigation in nature, with the exception of the Sycamore Landfill, which uses recycled water for dust control and rock crushing; the District's Operations Yard which uses recycled water for dust control and storage bin washdown; and the Ray Stoyer WRF, which uses recycled water for washing equipment. The District's top 25 existing recycled-water customers are listed in Table 3.22. Metered connections 26 to 242 are generally smaller and are represented as a single line item in Table 3.22.

The locations of the top 10 recycled water customers are numbered on Figure 3.11. The numbers on the map correlate with the rank of water use listed in Table 3.22.

Table 3.22 Top Existing Recycled Water Customers

Map ID/ Rank	Customer Name	2019 Demand(1) (AFY)
1	Sycamore Landfill	106.0
2	Santee Lakes Irrigation - Park and Lakeshore Loop	62.2
3	District's Ray Stoyer WRF Plant Use	39.0
4	020309-2400550 San Diego County General Services (451 Riverview Parkway, 92071)	38.1
5	Santana High School	20.3
6	Caltrans (from GIS meter is at Magnolia and Prospect landscaped area adjacent to freeway)	14.8
7	Caltrans South of State Route 52 West of Cottonwood Avenue	14.6
8	Caltrans-State Route 125 (Prospect adjacent to State Route 125)	13.7
9	West Hills Park	13.6
10	Caltrans East of State Route 125. North of Prospect Avenue Meter to the East	12.6
11	Caltrans South of State Route 52 West of Cuyamaca Avenue	10.8
12	City of Santee, Cuyamaca Street Field	10.8
13	KRC Property Management, Inc. (Riverview Parkway 11, 92071)	8.7
14	Navy Housing	8.6
15	Caltrans, Cuyamaca Street State Route 52 North	8.6
16	Town Center Ball Field	8.5
17	Caltrans South of State Route 52 East of Cottonwood Avenue	8.4
18	Town Center Ball Field	8.2
19	Town Center Ball Field	7.9
20	Santee Lakes Irrigation - Dump Station in Park	7.9
21	Cajon Park School	7.5
22	City of Santee, Big Rock Road, 92071	7.4
23	Riverwalk Homeowners Association	7.1
24	City of Santee, Woodglen Vista Drive - Rw	6.8
25	Riverwalk Homeowners Association	6.5
Metered Subtotal		**458.5**(2)
26-242		330.5
Metered Total		**789**(2)
	Santee Lakes	1,207(3)
Total 2019 Recycled Water Demand (Including the Santee Lakes Unmetered Connection)		**1,996**

Notes:
(1) 2019 Monthly Billing Data.
(2) Santee Lakes demand is not included in the metered totals, because it is not metered.
(3) Santee Lakes demand is not metered. It is measured as the difference between the Ray Stoyer WRF effluent and the total in billing data.

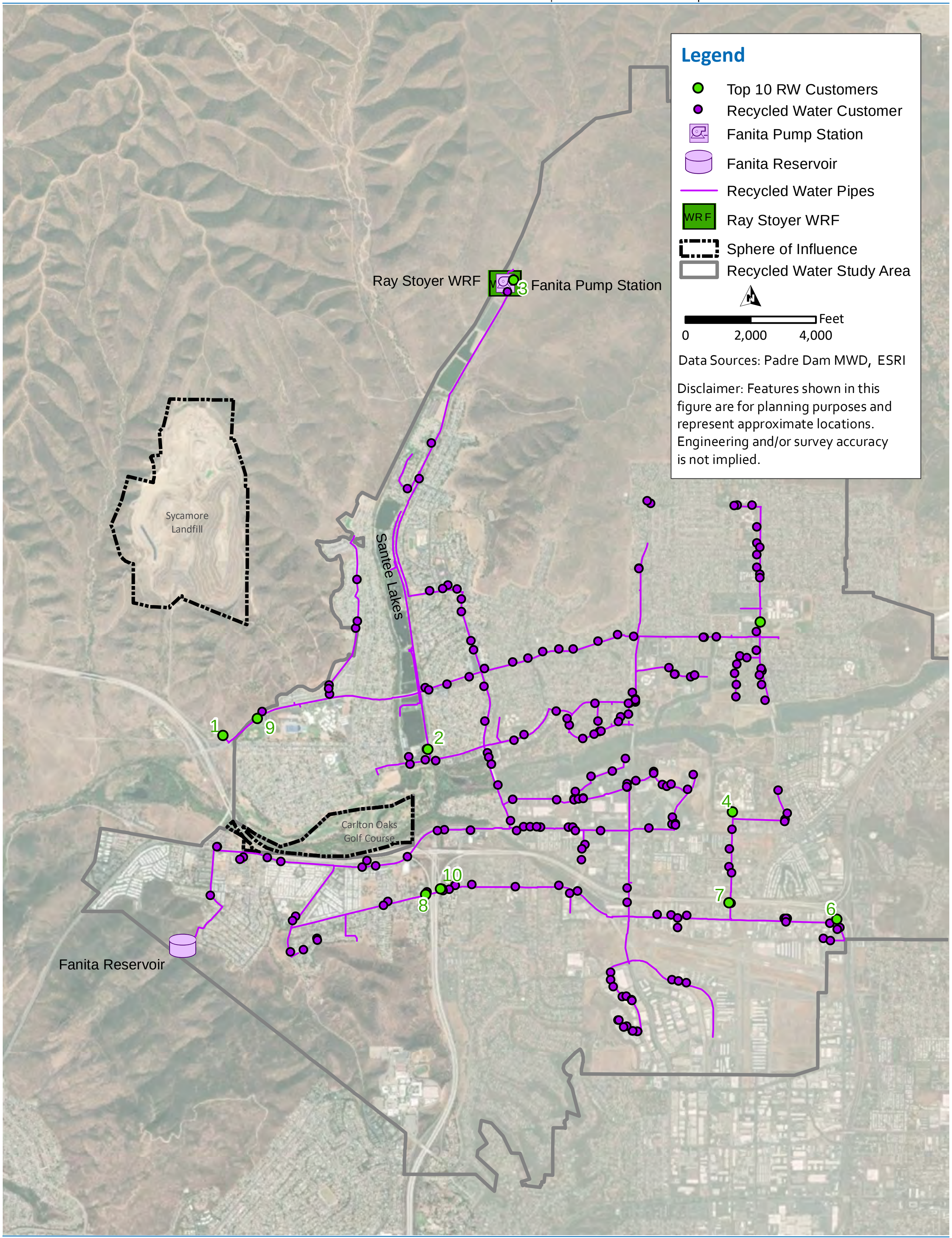


Figure 3.11 Existing Recycled Water Customers

3.3.2 Peaking Factors

Peaking factors are used to estimate water demands for conditions other than average annual demand (AAD) conditions. Peaking factors are used to account for fluctuations in demands on a seasonal and hourly basis.

3.3.2.1 Recycled Water Peaking Factors

As discussed previously, the majority of the District's existing recycled-water customer base is irrigation in nature. During hot summer days, water use is typically higher than on a cold winter day because of increased irrigation demands. Common peaking factors include multipliers to scale AAD to MDD, and MMD conditions. In recycled water systems, the MDD factors are typically like the MMD factors, as irrigation sprinkler systems are often changed on a seasonal basis rather than a daily basis, unless moisture sensors are used. Additionally, data for MDD conditions is difficult to estimate on a per-user basis since billing data is collected monthly for each user. The recycled meters are in an advanced metering infrastructure (AMI), which outputs hourly consumption. The 2015 CFMP evaluated this data for top users, and AMI is only used on a case-by-case basis due to its difficulty to work with.

Based on the historical data from the District, a MMD peaking factor for irrigation customers was estimated. Table 3.23 displays a summary of historical information used in the development of the MMD peaking factor including the AAD and MMD for years 2001 through 2019.

As shown in Table 3.23, the MMD to AAD peaking factors range from 1.61 to 2.25 over the 19-year period from 2001 to 2019. Variations for each year could be attributed to differing weather conditions, rainfall distribution, and customer mix. Based on the data presented in Table 3.23, the 5-year average MMD to AAD peaking factor of 1.82 was rounded to 2.0 for planning purposes described in this report.

Table 3.23 Historical Recycled Water Peaking Factors for Irrigation Customers(1)

Year	Average Demand (AF/month)	MMD (AF/month)	MMD Peaking Factor
2001	52	99	1.91
2002	56	92	1.64
2003	54	103	1.91
2004	58	120	2.07
2005	56	111	1.97
2006	63	110	1.76
2007	66	108	1.63
2008	61	98	1.61
2009	63	110	1.75
2010	55	116	2.12
2011	58	109	1.89
2012	66	131	1.97
2013	77	174	2.25
2014	75	120	1.60

Year	Average Demand (AF/month)	MMD (AF/month)	MMD Peaking Factor
2015	56	94	1.69
2016	67	133	1.99
2017	62	115	1.86
2018	73	123	1.68
2019	60	112	1.88
Average (Last 5 Years)	64	115	1.82
Used in Master Plan Update	-	-	**2.0**

Notes:
(1) Source: 2001 through 2019 Billing Data.

3.3.2.2 Hourly Peaking Factors and Diurnal Curves

Regular variations in recycled water demands also occur during a 24-hour period. Recycled water systems are characterized by substantial variations in demand during the day. Recycled water systems and areas that have substantial outdoor irrigation typically experience peak demand periods late at night through the early morning hours. However, the District's highest recycled water user, Sycamore Landfill, has the highest demands during the day which is unusual. Diurnal demand patterns for individual users can vary depending on their usage types.

As part of the calibration for the recycled water hydraulic model, diurnal patterns were developed for the top 10 recycled water customers listed in Table 3.22. These patterns were developed form the District's AMI smart meters using the 2019 meter data. A few of the top 10 customers experienced hourly peaking factors as high as 5.0 times the daily average flow during the nighttime irrigation hours. All other billing meters used a general diurnal pattern that was derived from the supervisory control and data acquisition (SCADA) data less the top 10 users from the AMI meters. The general diurnal pattern is presented on Figure 3.12 and has a peak hour peaking factor of 2.2 times the daily average flow. The diurnal patterns for the top 10 users are presented in Appendix F.

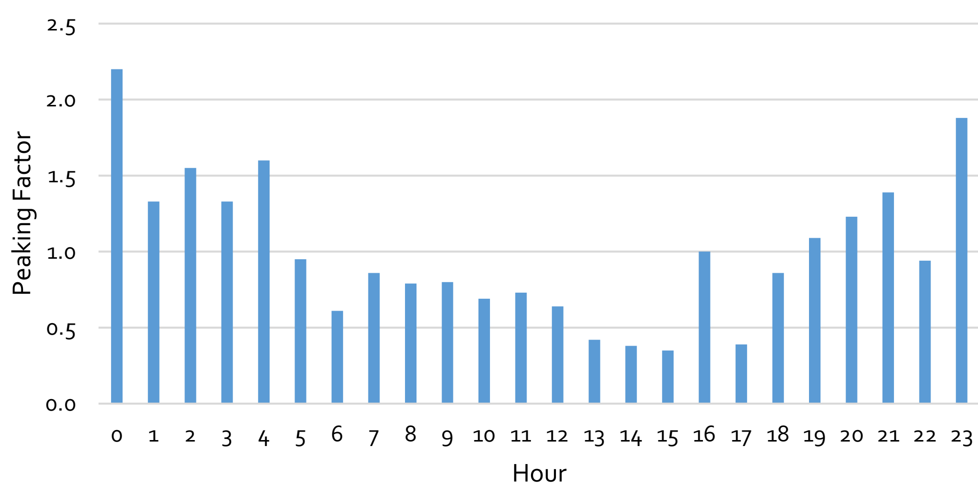


Figure 3.12 General Diurnal Pattern

3.3.2.3 Summary of Peaking Factors

A summary of the recycled water peaking factors used in this Master Plan Update is presented in Table 3.24.

Table 3.24 Recycled Water Peaking Factors

Demand Condition	Peaking Factor
Average Annual Demand (AAD)	1.0
Maximum Month Demand (MMD)	2.0
Maximum Day Demand (MDD)(1)	2.0
Peak Hour Demand (PHD)	Varies by Customer, See Appendix F for large customers and Figure 3.12 for a general demand pattern

Notes:
(1) MDD and MMD peaking factors are typically similar for recycled water systems.

3.3.3 Future Demand Projections

The District's 2020 UWMP lists the future recycled water demand as 1,232 AFY or 1.1 mgd. The District is not planning to expand the existing distribution system. Any increase in demand is assumed to come from the existing customers. To model potential deficiencies in the system, the future projection demand was set at the approximate design capacity of the existing system. The Santee Lakes will no longer be served by the recycled water distribution system once the East County AWP begins operation. The District is considering maintaining their current recycled water system as it currently is. This section of the report evaluates these three future demand conditions:

1. Expanding the customers on the recycled system to supply a demand of 1,232 AFY or 1.1 mgd.
2. Maintaining the recycled water system demands as they currently are, for an irrigation demand of 850 AFY or 0.76 mgd.

Chapter 4

HYDRAULIC MODELING

This chapter discusses the review and updates for the existing District hydraulic models for water, recycled water, and wastewater. In addition, this chapter details how the projected demands and wastewater flows developed in Chapter 3 were added to the existing models.

4.1 Potable Water System Hydraulic Model

A potable water system hydraulic model is a simplified representation of the real potable water distribution system. Potable system models can assess the capacity of a distribution system. In addition, potable water models can perform "what if" scenarios to assess the impacts of future developments and land use changes. The District's potable water system hydraulic model was constructed using a multi-step process utilizing data from a variety of sources. This chapter summarizes the hydraulic model update process, including a description of the modeled distribution system, the hydraulic model elements, and the model calibration process.

4.1.1 Potable Water Hydraulic Modeling Software

There are several software applications for network analysis with a variety of capabilities and features. The selection of a particular model is generally dependent upon user preference, the requirements of the particular distribution system, and the cost associated with the software.

The District's potable water model was developed in H_2ONET® Water in 2001 by PBS&J. In 2005, the model was converted to InfoWater™, by Innovyze® (formerly MWH Soft). Since then, Carollo had updated the InfoWater™ Water model for the 2015 CFMP. InfoWater™ is a fully dynamic geospatial water modeling and management software application that is built to run within the Esri ArcGIS software platform. The District's existing water system model uses InfoWater™. As part of this Master Plan Update, the water system hydraulic model was upgraded to the InfoWater Pro software. A screenshot of the existing water system model is depicted on Figure 4.1. The hydraulic modeling engine for the InfoWater® software package uses the Environmental Protection Agency's (EPA's) EPANET model, which is widely used throughout the world for planning, analysis, and design related to potable water distribution systems. InfoWater® consists of multiple products that work together to bring a graphical approach to the analysis and design of potable water collection systems. The program includes seamless integration with GIS data.

The District's water hydraulic model represents the main components of the water system including pipelines, pump stations, storage reservoirs, and pressure reducing stations (PRS).

4.1.2 Data Collection and Validation

The primary source for the update of the hydraulic model was the District's distribution system GIS data. The District's GIS data was digitized according to as-built documents by District staff. Street centerlines were obtained from public data sources and were used for reference during model updates. Additionally, District staff provided details on the District's facilities including operation setpoints and capacities. Section 4.1.3 describes the facilities included in the model. Figure 4.1 shows a screenshot of the modeled potable water distribution system.

The existing water hydraulic model was reviewed and compared to the GIS in the early stages of this Master Plan Update project. The comparison outlined areas of discrepancies between the existing model and the GIS, resulting in the model updates listed in the next section. After Carollo's update, District staff verified that the hydraulic model contains all major existing potable water pipelines.

4.1.3 Elements of the Hydraulic Model

The following provides a brief overview of the major elements of the hydraulic model and the required input parameters associated with each.

- **Junctions**: Locations where pipe sizes change or where pipelines intersect are represented by junctions in the hydraulic model. Required input for junctions includes elevation and demand, if any.
- **Pipes**: Transmission mains and distribution system piping are represented as pipes in the hydraulic model. Input parameters for pipes include length (which was auto calculated based on the To/From Node), friction factor (e.g., Hazen-Williams C-value as listed in Table 4.1), To/From Nodes, diameter, and the spatial alignment.

Table 4.1 Hazen-Williams C-Values

Pipe Material	C-value(1)
ACP	
Prior to 1976	120
1976-1991	130
1991-present	140
PVC	
Prior to 1986	130
1986-present	140
CCP	120, 130
CML Steel	120, 130
El Capitan CML Lining	130
Build-Out System	120 for all pipe materials

Notes:
Abbreviations: ACP - asbestos cement pipe; PVC - polyvinyl chloride; CCP - concrete cylinder pipe; CML - cement mortar lined.
(1) C-value of a pipeline is impacted the condition of the pipe.
(2) No change to C-values listed in CFMP.

- **Storage Tanks**: Storage tanks are used to represent distribution system reservoirs. Input parameters for storage tanks include base elevation, maximum/minimum water levels, tank diameter, and initial water level.
- **Pumps**: Pumps are included in the hydraulic model as links. Input parameters for pumps include pump curves and operational controls.
- **Reservoirs**: Reservoirs represent areas where flow enters the system. For potable modeling, a reservoir typically represents a water source. The District's CWA connections are modeled as fixed-head reservoirs combined with valves to set flow rate. Input data includes hydraulic grade elevation for the reservoir and the associated flow control valve flow settings and/or controls.
- **Valves**: Special valves, such as pressure-reducing, flow-control, or pressure sustaining valves are included in the hydraulic model. The input parameters include diameter and valve type (e.g., pressure reducing). Gate valves are typically not included in hydraulic models.

The District's hydraulic model consists of the following components:

- 2,660 junctions.
- 360 miles of pipeline.
- 49 pumps.
- 29 storage tanks.
- 30 valves (ranging from 4-inch diameter to 24-inch diameter.
- 3 reservoirs.

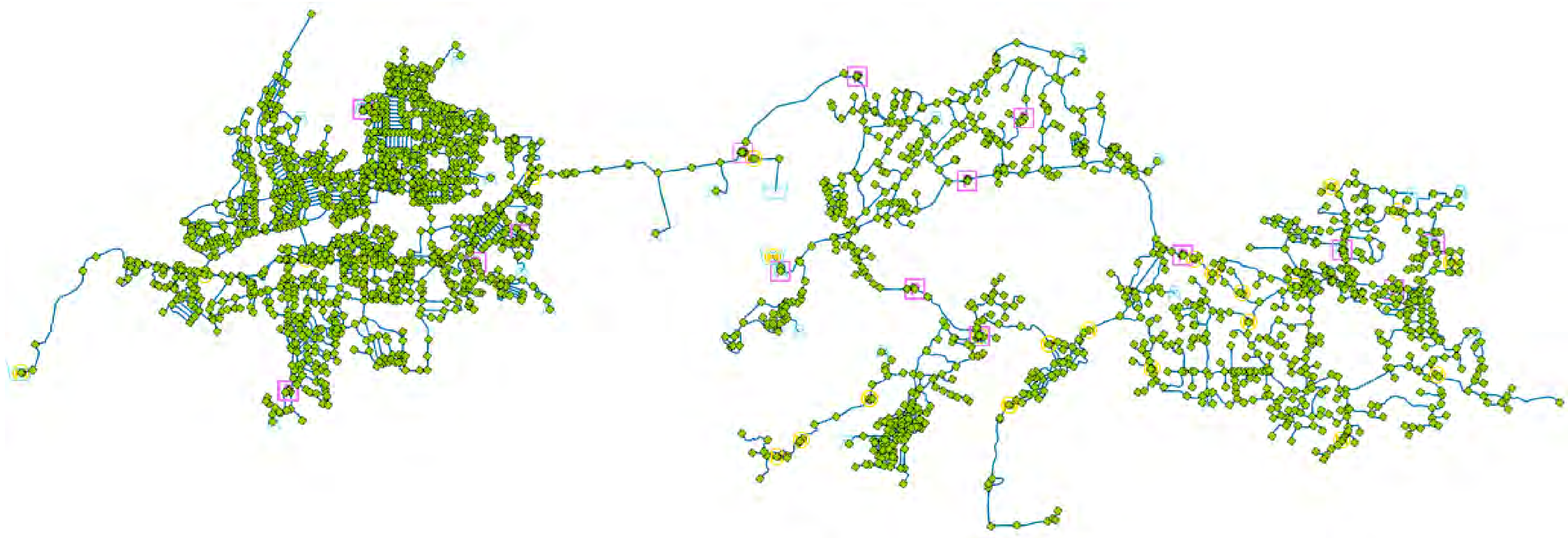


Figure 4.1 Existing Water System Model

4.1.4 Hydraulic Model Update

The model update process consisted of nine steps, as described below:

- **Step 1**: The District's GIS shapefiles for the potable water system were obtained.
- **Step 2**: The GIS data was reviewed and compared to the existing hydraulic model. Pipeline diameter and alignments updated as needed.
- **Step 3**: New distribution system pipeline constructed since the 2015 CFMP was imported into the modeling software and verified. Elevations were added to the connecting junctions based on United States Geological Survey (USGS) data.
- **Step 4**: All new major facilities, such as the Secondary Connection (CWA No. 7) and the Mountain View Connector Pipeline, were added to the model using their GIS locations and as-built drawings.
- **Step 5**: All the major facilities such as tanks, reservoirs, pumps, and specialty valves operational data was updated as needed based on District staff input. This includes pump on/off setpoints, pump capacities, valve types, valve setpoints, and tank dimensions.
- **Step 6**: Potable water demands were updated using 2019 billing records and spatially distributed using water service connection feature class in GIS. The 2019 demands were allocated to the appropriate model junctions, using the methods described in Section 4.1.5. The total average annual demand allocated was 5,662 gpm or 8.15 mgd.
- **Step 7**: Valve setpoints for San Diego CWA supply connections set to 2019 system demands.
- **Step 8**: The hydraulic model contains certain run parameters that need to be set by the user at the beginning of the project. These include time steps, reporting parameters, output units, and head loss equations. Once the run parameters were established, the model was debugged to ensure that it ran without errors or warnings.

The following scenarios were created in the District's hydraulic potable water model:

- Three 2019 demand sets were created for system evaluations:
  - MDD (9,959 gpm or 14.24 mgd).
  - ADD (5,662 gpm or 8.15 mgd).
  - MinDD (2,264 gpm or 3.26 mgd).
- Future demand sets for near-term known developments in 2025 were created:
  - MDD (10,625 gpm or 15.30 mgd).
  - ADD (6,250 gpm or 9.00 mgd).
  - MinDD (2,500 gpm or 3.60 mgd).
- Future demand sets for long-term growth through 2045 were created:
  - MDD (14,288 gpm or 20.57 mgd).
  - ADD (8,405 gpm or 12.10 mgd).
  - MinDD (3,362 gpm or 4.84 mgd).

4.1.5 Potable Water Demand Allocation

Determining the quantity of water demanded by District customers and how they are distributed throughout the distribution system is a critical component of the hydraulic modeling process.

Various techniques can be used to allocate water demands within the system. The preferred method is driven by the type of available information. Two common methodologies are the geocoded billing data method and the land use method. The geocoded billing data method uses the District's meters addresses from the billing database to spatially allocate the average annual water demand of each customer in the billing meter shapefile. In the land use method, the land use acreages are multiplied by a WDF to obtain a spatial distribution of approximate water demands. The geocoded billing data method was used to allocate the demands for this Master Plan Update. Through the use of the District's 2019 billing records, billing consumption was spatially allocated based on the GIS water service meter geodatabase provided by the District. Once the demands were represented spatially throughout the water service area, demands were distributed to the model nodes. The demands were then scaled up to account for the water loss in 2019. This average was determined to be representative of present day demands under normal, non-drought conditions, as discussed in Chapter 3. Scaling the demands to match the supply is normal practice in hydraulic modeling, to account for system losses that are not captured in the billing data.

Since the hydraulic model was not developed to represent each individual customer's service lateral, there was not a specific model node for each billing meter. To allocate the demands from the GIS billing meters onto the model nodes, the Thiessen polygon demand distribution method was used. The Thiessen polygon method involves using a GIS formula that generates a polygon around each of the model demand nodes. The demands from any billing meter that overlays a Thiessen polygon was applied to that demand node.

The existing annual supply is 8.15 mgd, or 5,662 gpm. Applying an MDD peaking factor of 1.7 (see Chapter 3), the MDD was estimated to be 9,959 gpm, or 14.24 mgd.

The hydraulic modeling software has the option of assigning 10 different demand types for each demand node. As part of the potable water demand update, 4 of the 10 different demand types were used to help identify the source of the demands in the hydraulic model. The description and demand allocated to the model for each demand type are as follows:

- **Demand Type 1**: This demand type was used to update demands for the existing system potable consumption (5,363 gpm). Note that this demand does not include the potable water used for irrigation.
- **Demand Type 2**: This demand type was used to update demands for the existing system to account for potable irrigation water (298 gpm).
- **Demand Type 3**: This demand type was used to represent the long-term (2045) known developments (2,213 gpm).
- **Demand Type 4**: This demand type was used to distribute the long-term (2045) infill (532 gpm). This demand type was distributed over the nodes within the County of San Diego ESA based on the census tract analysis performed in Section 3.1.6. This distribution, across the county's census tracts, occurred for both the 2025 planning period and the 2045 planning period.

Each of the four demand types used were input as ADD. The demands were entered into the hydraulic model as ADD and multiplied the MDD peaking factor in Section 3.1.4 (1.7) to calculate the MDD demand. The hydraulic model was set up with the capability of adjusting the hourly variation through diurnal patterns. Different classes of water users require supply from the distribution system at different times of the day. A diurnal curve, or demand pattern, simplifies the typical variation of hourly demands for the District's customers over the course of a day. In general, typical diurnal curves vary for residential, commercial, and landscape irrigation water users, and will vary for individual users.

A diurnal curve is a pattern of hourly multipliers that are applied to the ADD to simulate the variation in demand that occurs throughout the day. The District's SCADA data was used to create the updated diurnal curves by pressure zone in the hydraulic model (see Appendix G). An example of one of the calculated diurnal curves, the system-wide-diurnal curve, is depicted on Figure 4.2. One of the District's largest potable water users is the Rios Canyon Avocado Ranch. Since the water demand pattern for the avocado ranch varies significantly from the other users, a separate diurnal curve was developed for use in the hydraulic modeling. The Rios Canyon Avocado Ranch diurnal curve is shown on Figure 4.3.

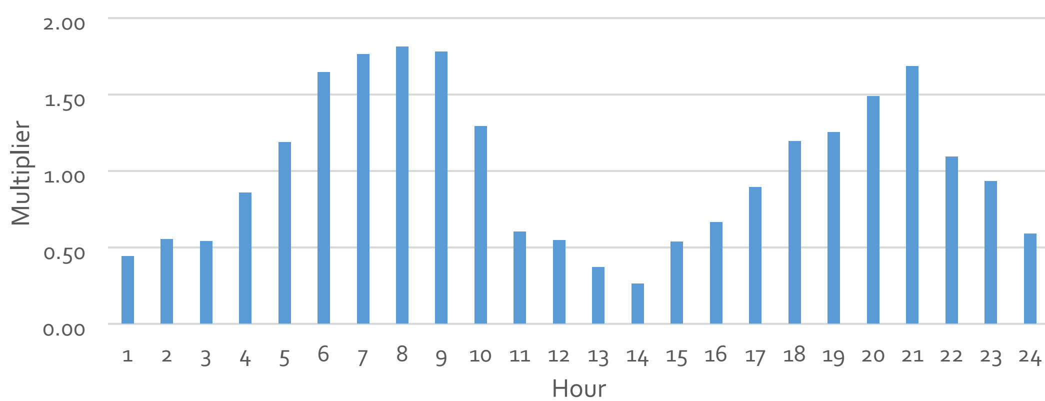


Figure 4.2 Potable Water System-Wide Diurnal Curve

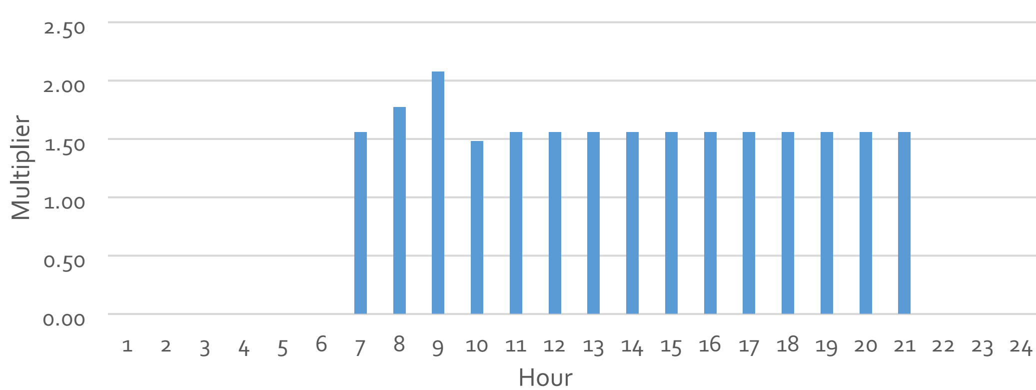


Figure 4.3 Rios Canyon Avocado Ranch Diurnal Curve

4.1.6 Hydraulic Model Calibration

The purpose of a water system hydraulic model is to predict how a water distribution system will respond under a given set of conditions. One way to test the accuracy of the hydraulic model is to create a set of known conditions in the water system and then compare the results observed in the field against the results of the hydraulic model simulation using the same conditions. Fire flow tests conducted in the field on the water system can yield a profound tool in verifying data used in the hydraulic model and a greater understanding of how the water system operates.

Field testing can indicate errors in the data used to develop the hydraulic model or show that a condition might exist in the field not otherwise known. Valves, which are reported as being open, might be closed (or vice versa), an obstruction could exist in a pipeline, or pressure settings for a PRS may be slightly different than noted. Field testing can also correct erroneous model data such as incorrect pipeline diameters or connections. Data obtained from the field tests can be used to determine appropriate roughness coefficients for each pipeline, as roughness coefficient can vary with age and pipe material. Other parameters can also be adjusted to generate a calibrated model.

The calibration process for the District's water distribution system hydraulic model consisted of two parts, a macro calibration and an extended period simulation (EPS) calibration, both compared with the District's SCADA data. Fire flow calibration was not included in the scope of services of this Master Plan. The following sections summarize the calibration process and results. Aside from a few specific cases noted in the following subsections, no discrepancies were encountered during model calibration that hadn't already been addressed during the model update process.

4.1.6.1 Macro Calibration

Initially, the model was run under existing demand conditions and necessary adjustments were made to produce reasonable system pressures and reservoir level fluctuations. Such adjustments include modifications of pipeline connectivity, operational controls, ground elevations, and facility characteristics.

The macro calibration process involved several steps to verify that the model produces reasonable results:

- **Transmission Main Connectivity**. Using the connectivity features of the modeling software, the connectivity of the water mains within the distribution system was verified. Problems found using the connectivity locators were reviewed to determine whether adjustments were needed to the connectivity of the model. Output reports of pipeline flow characteristics, such as head loss (feet per thousand feet) and velocity (feet per second [fps]) were also used to locate problem areas where additional adjustments could be necessary.
- **System Pressures**. The macro calibration compared the model output to the typical pressures observed within the distribution system in pounds per square inch (psi). This process was used to locate major errors in model creation, elevations, or connectivity, as well as changes that reflect how operational controls of the system should be implemented in the model.
- **Facility Characteristics**. Hydraulic model results were compared to data provided by the District to verify that facility attributes entered into the model, such as the physical

characteristics of the tanks and pumps, produced results comparable to what the District experiences.

4.1.6.2 EPS Calibration

The extended period calibration is intended to calibrate the EPS capabilities of the hydraulic model by closely matching the model pressures and flows to field conditions over a 24-hour period of similar demand and system boundary conditions. The primary varied parameters for this calibration were operational controls and PRS setpoints, although other parameters were also adjusted as calibration results were generated. From the calibration period, August 23, 2019, was selected to be used for the 24-hour EPS calibration day. This was chosen because it was a higher demand period. Additionally, the diurnal pattern used in the model was calculated from this day. The calculated daily demand for the calibration day was about 12.4 mgd (8,600 gpm), which is roughly 1.53 times higher than the existing ADD (8.1 mgd). For the EPS calibration, the ADD was adjusted by multiplying the demands on all demand nodes up to match this estimated demand condition during the calibration day. The EPS calibration compared model simulated pump station flows, discharge pressures, reservoir levels, and storage tank levels obtained from SCADA. The model calibration results of all comparison points are included in Appendix G, while an example calibration result for the East Victoria Reservoir level is shown on Figure 4.4.

Figure 4.4 East Victoria Reservoir Calibration

As shown in Figure 4.4, the model simulated data closely matches the trend and magnitude of the SCADA data. Overall, taking into account all the calibration graphs, the trends seen in the SCADA data were consistent with the predicted planning level modeling results. Some notable model modification and observations from the EPS model calibration include:

- The Gravity (Pressure) Zone tanks follow the general trend seen in SCADA but some areas need refinement, such as Fletcher Hills and Cuyamaca Reservoirs. In the next Master Plan, it is recommended to install pressure loggers to gain a better understanding of pressures throughout the zone and refine the C-factors of the pipelines.
- The Wholesale Zone tanks follow the general trend seen in SCADA. However, since this does not impact the system, no adjustments or recommendations are needed.
- The Blossom Valley Pressure Zone tanks follow the general trend seen in SCADA. However, since the ESA Secondary Connection was not available in the historian SCADA, assumptions were made for the on/off times based on levels in the East County Square Reservoir. The lack of data for the ESA Secondary Connection during this time period resulted in incomplete data for the diurnal development. For this reason, the West Victoria diurnal curve was used for this pressure zone. During 2020 and 2021, the District isolated a pipeline on Cordial Road to perform pipeline work. Thus, the calibration and diurnal curve within this zone should be revisited when the pipeline construction is completed, and historian data is available.

4.1.6.3 Potable Water Calibration Summary

In summary, the calibration results indicate the model generally predicts conditions similar to those observed in the field. The Gravity and Blossom Valley pressure zones should be reevaluated in the future to refine the diurnal pattern and calibration.

Based on the results of the calibration, it can be concluded that the model is calibrated to EPS conditions. Utilizing the available field data and input from District staff, the model represents the District's distribution system and system operations to a level suitable to support the District's future hydraulic modeling analysis.

As previously noted, fire flow calibration was not included in the scope of this Master Plan. The District should consider including fire flow tests in their next Master Plan update, in order to further refine the accuracy of the model. Fire flow tests help determine the head loss across the system, thus allowing the refining of pipe roughness in the model.

4.2 Recycled Water

This section summarizes the hydraulic model development process, including a summary of the modeling software, a description of the modeled distribution system, the hydraulic model elements, the model creation process, and the model calibration process.

4.2.1 Recycled Water Hydraulic Modeling Software

The District's existing recycled water model was built in-house by District staff in about 2008 by importing GIS into InfoWater™ software, by Innovyze® (formerly MWH Soft) and adding a tank, pumps, demand, diurnal curves, flow control from the WRF, and logic and controls. The model was developed as an "all-pipe" model for the pressurized distribution piping. Piping to the Santee Lakes is not modeled. InfoWater™ is a fully dynamic geospatial water modeling and management software application that is built to run within the Esri ArcGIS software platform. The model was updated during preparation of the 2015 CFMP. The District's existing recycled water system model uses the latest version of InfoWater™. As with the potable water model, the recycled water system hydraulic model was upgraded to the InfoWater Pro software as well.

4.2.2 Data Collection and Validation

The primary sources for the update of the hydraulic model were the as-built drawings for existing pipelines and drawings for planned pipeline projects for the backbone system. Street centerlines were obtained from public data sources and were used for reference during model development.

4.2.3 Elements of the Hydraulic Model

The major elements of the recycled water hydraulic model are depicted on Figure 4.5. The District's recycled water hydraulic model consists of the following components:

- 369 junctions.
- 31 miles of pipeline.
- 3 pumps.
- 1 storage tank.
- 1 valve.

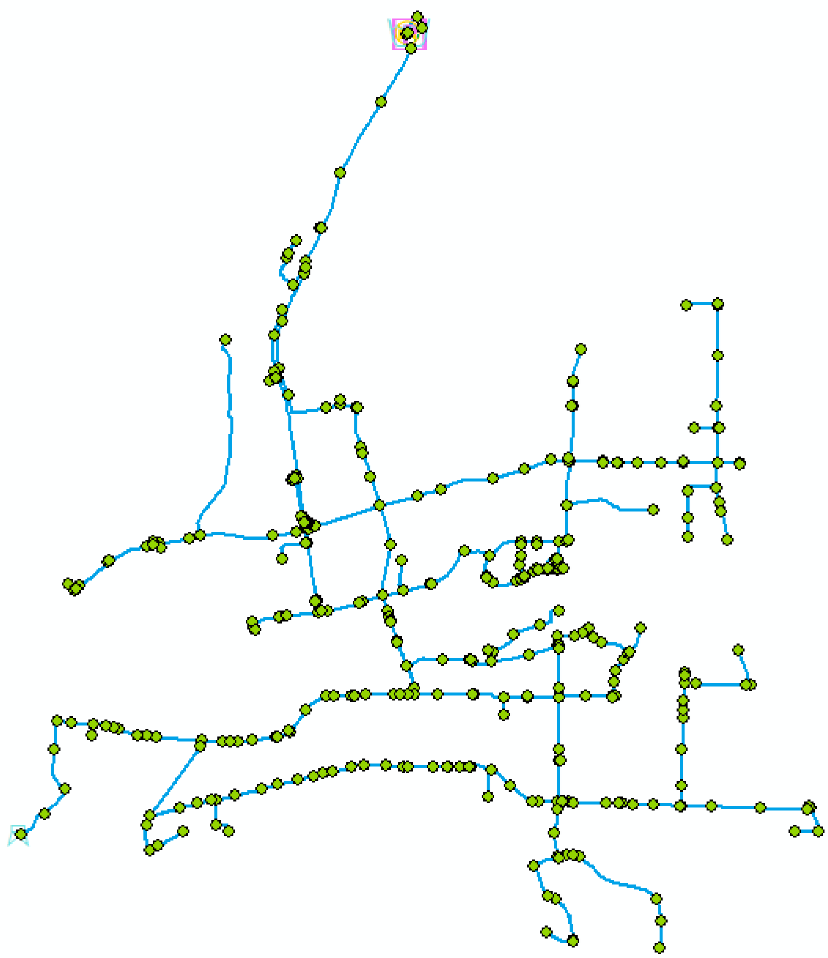


Figure 4.5 Existing Recycled Water System Model

4.2.4 Hydraulic Model Development and Updates

To develop and update the District's recycled water hydraulic model, the following steps were performed:

- **Step 1**: The District's GIS shapefiles for the recycled water system were obtained.
- **Step 2**: The GIS data was reviewed and compared to the existing hydraulic model. Pipeline diameter and alignments updated as needed.
- **Step 3**: New distribution system pipeline constructed since the 2015 CFMP was imported into the modeling software and verified. Elevations were added to the connecting junctions based on USGS.
- **Step 4**: The modeled controls were reviewed and updated where appropriate.
- **Step 5**: Recycled water demands were updated using 2019 billing records and spatially distributed to the appropriate junctions within the model.
- **Step 6**: The modeled run parameters were reviewed/updated, and the model was debugged to ensure that it ran without errors or warnings.

The District's recycled model was updated five years ago during the 2015 CFMP. During that time, the model was used for planning purposes. A few minor changes have been made to the pipe network of the model based on the District's GIS database, as well as discussions with the District:

- **Additions**. One new 8-inch diameter pipeline slightly over 1 mile in length was installed in 2019 to supply the expansion of the Weston Development.
- **Modifications**. A few pipeline segments had incorrect diameters in the hydraulic model when compared to the District's GIS data. District staff confirmed the correct diameter, and the pipelines were update accordingly in the model. Additional comparison between the District's GIS and hydraulic model resulted in the population of data in several pipe segments that were missing the pipeline material and installation dates.

4.2.5 Recycled Water Model Calibration

An EPS model calibration was performed to confirm that the hydraulic model is working as intended. For the EPS calibration, the model simulated results are compared at hourly intervals for a 24 (1 day) period of time. The SCADA data provided by the District included:

- Reservoir level for the Fanita Terrace Reservoir provided in feet.
- Potable water supplemental pumping data (gpm). This supply was not used during the calibration data and thus was not used as a calibration point.

Additionally, AMI data was provided by the District. The AMI data was used to create diurnal patterns of the District's top recycled water users, as described in Chapter 3. Between the SCADA data and AMI, there were many gaps in data points. Both sets of data were compared to find a date that had the most complete set of data. Also, by calibrating to a day with high demand on the recycled water system, the model calibration is more precise. August 26, 2019, was chosen for the calibration day because it had the best overlap of SCADA data and AMI data.

As discussed in Chapter 3, the AMI data was used to create diurnal patterns for the top 10 users. However, there was no complete set of data for AMI and SCADA and consequently a general diurnal pattern could not be developed for the remaining users using AMI. The remaining users' diurnal pattern was calculated by calculating the hourly demand based on the following equation:

- Hourly Demand = Hourly Supply (SCADA) – Hourly Amount Stored (SCADA) – Top 10 User Hourly Demand (AMI).

The resulting Hourly Demand was used as the "General Diurnal Pattern" and is presented in Chapter 3. The "General Diurnal Pattern" shows that customers noted in the billing system as "irrigation" are day users of recycled water. This finding was verified by checking AMI data for several large irrigation users.

The recycled water system was calibrated to the District's available SCADA data. The Fanita Terrace Reservoir level calibration graph is shown on Figure 4.6. As shown on Figure 4.6, the model simulated data matches well to the field measured data.

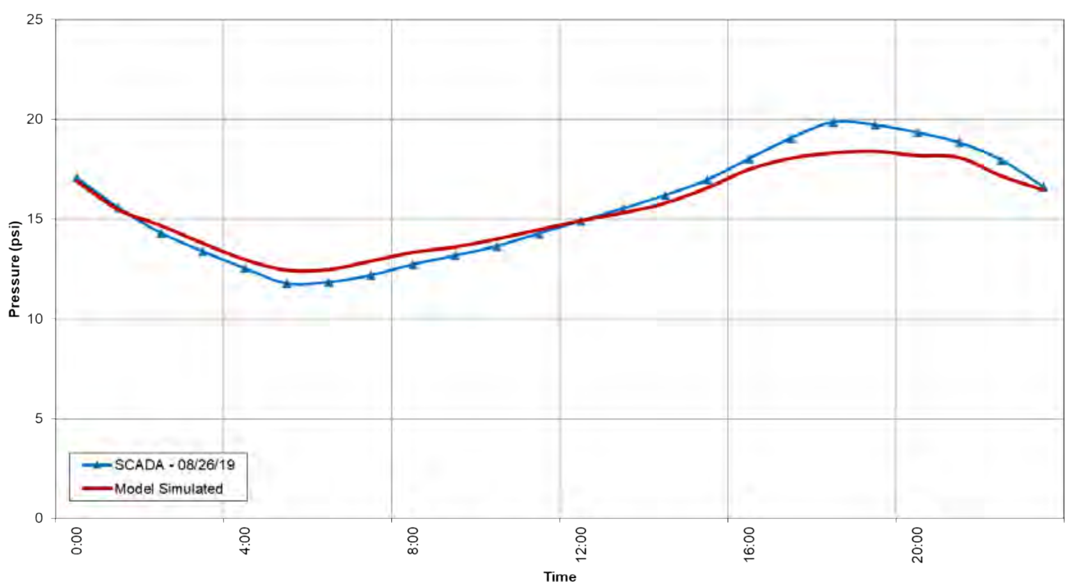


Figure 4.6 Fanita Terrace Reservoir Level Calibration Graph

4.3 Wastewater Model

This section describes the development and calibration of the District's collection system hydraulic model. A detailed summary of the hydraulic model calibration steps, standards, and results for both dry- and wet-weather conditions is also provided.

A sewer collection system model is a simplified representation of the real sewer system. Sewer system models can assess the conveyance capacity for a collection system. In addition, sewer system models can perform "what if" scenarios to assess the impacts of future developments and land-use changes. The District's collection system hydraulic model was constructed using a multi-step process utilizing data from a variety of sources. This section summarizes the hydraulic model development process, including a summary of the modeling software selection, a description of the modeled collection system, the hydraulic model elements, and the model creation process.

4.3.1 Wastewater Hydraulic Modeling Software

There are several software applications for network analysis with a variety of capabilities and features. The selection of a particular model is generally dependent upon user preference, the requirements of the particular collection system, and the cost associated with the software.

The District's existing sewer hydraulic model was built in-house by District staff, and updated in 2015 by Carollo as part of the CFMP. The District's existing hydraulic model is an "all-pipe" model. In other words, the model includes all the District's active wastewater collection system sewers, diversions, and lift stations. The model also includes some County-owned facilities and a portion of the Lakeside Interceptor that lies within the District's sewer service area boundary. The District's wastewater collection system hydraulic model does not include County facilities that are outside the District's sewer service area.

The model was previously updated in 2015 to reflect changes in ADWF, wastewater use, and WWF patterns, and to estimate future wastewater flows.

The District's sewer system hydraulic model was developed in InfoSWMM®, by Innovyze® (formerly MWH Soft). InfoSWMM® is a fully dynamic geospatial wastewater and stormwater modeling and management software application that is built to run within the Esri ArcGIS software platform. The hydraulic modeling engine for the InfoSWMM® software package uses the EPA's Storm Water Management Model, which is widely used throughout the world for planning, analysis, and design related to stormwater runoff, combined sewers, sanitary sewers, and other drainage systems. InfoSWMM® routes flows through the model using the Dynamic Wave method, which solves the complete Saint Venant, one-dimensional equations of fluid flow.

The District's sewer system model uses InfoSWMM®.

4.3.2 Data Collection and Validation

The existing model system was updated using the District's sewer system GIS database and water billing data as well as new and/or updated as-builts. Figure 4.7 shows the modeled wastewater collection system.

4.3.3 Elements of the Wastewater Hydraulic Model

The following provides a brief overview of the major elements of the hydraulic model and the required input parameters associated with each:

- **Junctions**: Sewer manholes, cleanouts, as well as other locations where pipe sizes change or where pipelines intersect are represented by junctions in the hydraulic model. Required inputs for junctions include rim elevation, invert elevation, and surcharge depth (used to represent pressurized systems). Junctions are also used to represent locations where flows are split or diverted between two or more downstream links.
- **Pipes**: Gravity sewers and force mains are represented as pipes in the hydraulic model. Input parameters for pipes include length, friction factor (e.g., Manning's n for gravity mains, Hazen-Williams C for force mains), invert elevations, diameter, and force main designation.

- **Storage Nodes**: For sewer system modeling, storage nodes typically are used to represent lift station wet wells (although other storage basins, etc. can be modeled as storage nodes). Input parameters for storage nodes include invert elevation, wet well depth, and wet well cross section.
- **Pumps**: Pumps are included in the hydraulic model as links. Input parameters for pumps include pump curves and operational controls.
- **Outfalls**: Outfalls represent areas where flow leaves the system. For sewer system modeling, an outfall typically represents the connection to the influent pump station or headworks of a wastewater treatment plant (WWTP).
- **Rain Gauges**: Rain gauges are input into the hydraulic model to simulate historical or theoretical hourly rainfall events.
- **Inflows**: The following are the three types of wastewater flow sources that can be injected into individual model junctions (and storage nodes):
  - External: External inflows can represent any number of flows into the collection system, such as metered flow data or groundwater inflow. External inflows are applied to a specific model junction by applying a baseline flow value and a pattern that varies the flow by hour, day, or month of the year.
  - Dry Weather: Dry weather inflows simulate base sanitary wastewater flows and represent the average flow. The DWFs can be multiplied by up to four patterns that vary the flow by month, day, hour, and day of the week (e.g., weekday or weekend). The dry weather diurnal patterns are adjusted during the dry weather calibration process.
  - Rainfall Derived Infiltration and Inflow (RDII): RDII flows are applied in the model by assigning a unit hydrograph and a corresponding tributary area to a given junction. The unit hydrograph consists of several parameters that are used to adjust the volume of RDII that enters the system at a given location. These parameters are adjusted during the wet weather calibration process.

The District's existing sewer hydraulic model consists of the following components:

- 4,258 junctions.
- 4,296 pipeline segments.
- 179 miles of collection system sewer pipelines (including the Lakeside Interceptor and influent pump station force main).
- 4 diversion structures.
- 6 lift stations (including the East Mission Gorge Pump Station).

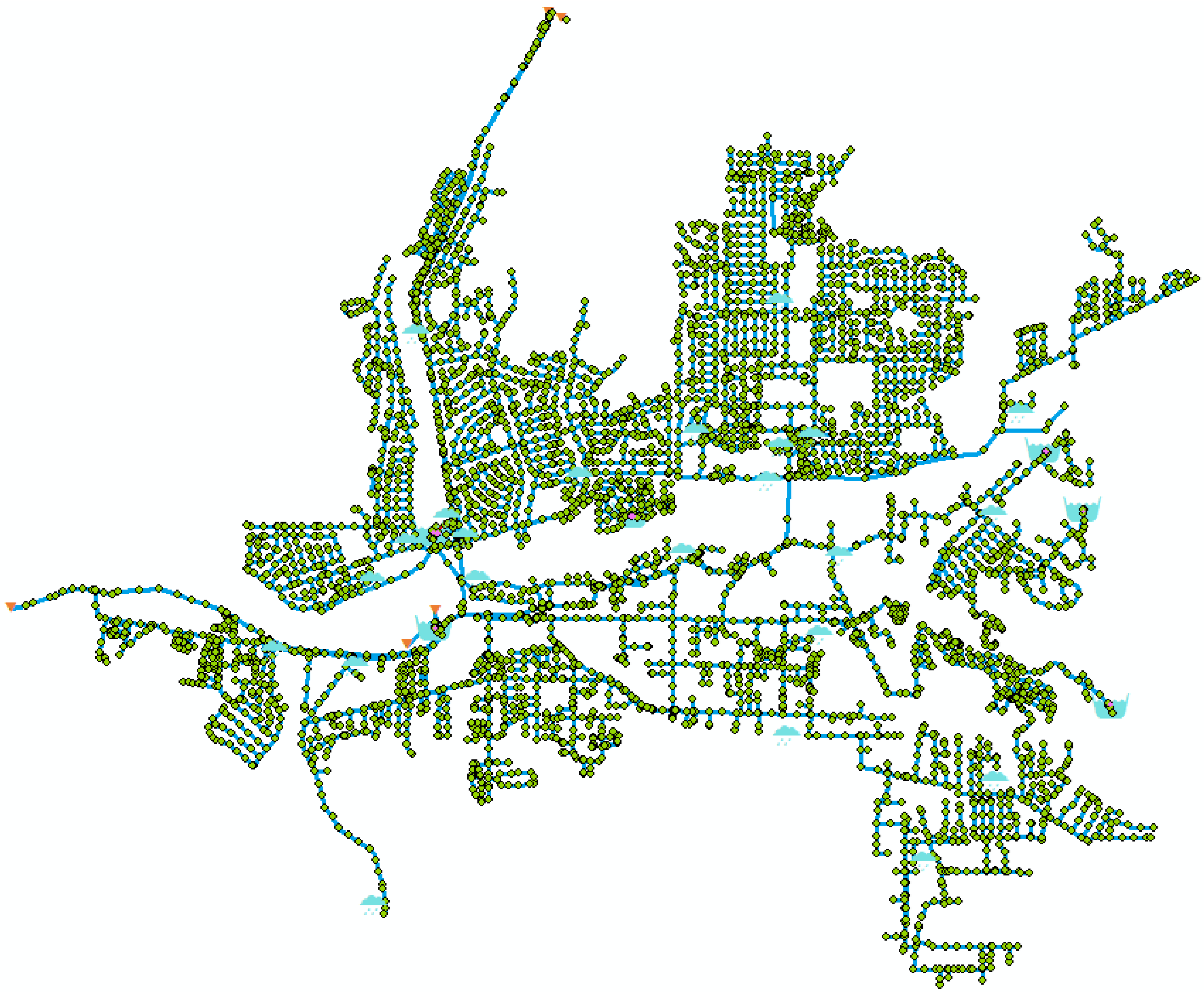


Figure 4.7 Wastewater Collection System Model

4.3.4 Hydraulic Model Update

The model update process consisted of six steps, as described below:

- **Step 1**: The District's GIS shapefiles for the wastewater collection system were obtained.
- **Step 2**: The GIS data was reviewed and compared to the existing hydraulic model. Pipeline diameter and alignments updated as needed.
- **Step 3**: New collection system pipeline constructed since the 2015 CFMP was imported into the modeling software and verified.
- **Step 4**: The physical/operational parameters of several major facilities were reviewed/updated. Major facilities that were added/updated in the model consist of the following:
  - The Trans-River siphon was updated against available record drawings as well as recent planning studies available relevant to the siphon.
  - Two of the District's diversion structures (Walmart and Carlton Hills) have been upgraded since the completion of the 2015 CFMP. These structures were updated based on available record drawings, and input from District staff.
  - The Lakeside Interceptor was extended out further west than in the 2015 CFMP hydraulic model. In addition, the East Mission Gorge Pump Station was included in the model.
- **Step 5**: Dry weather wastewater flows and I/I parameters were reallocated to the appropriate model junctions based off of 2019 water billing data and the flow monitoring program data. These flows were scaled up or down, as necessary, to match the DWFs recorded during the flow monitoring period.
- **Step 6**: The hydraulic model contains certain run parameters that need to be set by the user at the beginning of the project. These include run dates, time steps, reporting parameters, output units, and flow routing method. Once the run parameters were established, the model was debugged to ensure that it ran without errors or warnings.

4.3.5 Wastewater Load Allocation

Determining the quantity of base wastewater flows generated by a municipality and how they are distributed throughout the collection system is a critical component of the hydraulic modeling process. Various techniques can be used to assign wastewater flows to individual model junctions, depending on the type of data that is available. Adequate estimates of the volume of wastewater are important in maintaining and sizing sewer system facilities, both for present and future conditions. Baseline wastewater loads were allocated (assigned to specific nodes) in the hydraulic model based on a combination of water billing records and land use data provided by the District, as well as the flow data from the temporary flow monitoring program. The following steps outline the wastewater load allocation process:

- **Step 1**: The District's service area was broken up into sewershed areas using GIS techniques. In a "skeletonized" (i.e., truncated model) model, a sewershed will usually encompass a particular subdivision or grouping of lots. In an all-pipe model, such as the District's hydraulic model, a sewershed could be as small as a few parcels. Each sewershed represents the geographic area that contributes flows into a single model node (i.e., manhole), and was developed using GIS based on the District's parcel and sewer pipeline shapefiles.

- **Step 2**: One approach for estimating the existing dry weather wastewater flow associated with each loading polygon is using land use designations, WWFFs, and land use area.
  - The wastewater generation rates of each existing customer will vary from an average WWFF (significantly in some cases). For this reason, water billing records are considered preferable to the land use-based load allocation method for existing DWFs. For this project, water consumption billing records by parcel were available. For each parcel within the collection system service area, the annual average water consumption for January and February of 2019 was calculated in GIS. Winter water demand is used because landscape water use is minimal and most closely reflect ADWF. The parcel demands were then merged with the sewershed in GIS and the total demand for each loading polygon was calculated.
  - Water-billing records were not available for a small portion of the District's wastewater service area in the City of El Cajon, which is served by a neighboring water agency. Wastewater flows were allocated in this area using typical WWFFs summarized in Chapter 3.
- **Step 3**: Once the existing wastewater flows were allocated into the model, they were adjusted as needed during model calibration to closely match the DWFs recorded during the flow monitoring program. This adjustment accounts for the "return to sewer" ratio, which was estimated to be approximately 87 percent of winter water demand for the District's service area.

4.3.5.1 Other Model Updates

Several other additions/modifications were made to the hydraulic model as part of the model update process, including:

- As part of any master-planning project, multiple scenarios are used to simulate different flow conditions, for both current flow conditions and future flow conditions. The District's existing hydraulic model contains several scenarios including the "Base" scenario, the 2020 existing dry and WWF calibration scenarios, and a future scenario. As part of the model update process, five additional model scenarios were added for model calibration purposes. In addition, some additional scenarios were added to represent the design storm condition, and future conditions. The scenarios are summarized below:
  - 2020 DWF: This scenario was used for DWF calibration.
  - 2020 DWF (Lockdown): This scenario was used for DWF calibration during the pandemic-related SIP which began March 19, 2020.
  - 2020 WWF: This scenario was used for WWF calibration purposes
  - 2020 PWWF: This scenario represents the existing PWWF condition both with diversions and without diversions.
  - 2045 PWWF: Represents the 2045 peak-flow condition.
- Information fields were created in the model to identify which flow monitor a group of collection system facilities are associated with (e.g., 7A, 13, etc.), and database queries/query sets were created for each flow-monitoring basin.
- Custom diurnal patterns for each flow-monitoring basin were created based on the flow data collected during the temporary flow-monitoring program. The custom diurnal

patterns include both weekday and weekend flow conditions and were adjusted during the model calibration process until wastewater flows at each monitoring site closely matched the flow-monitoring data.

- Review/update facility data for each sewer lift station (e.g., pump curves, operational controls, wet-well characteristics), as needed.

Each diversion structure was reviewed, and facility data were input for each structure. Each structure was modeled differently, based on how the structure is known to operate.

4.3.6 Wastewater Hydraulic Model Calibration

Hydraulic model calibration is a crucial component of the hydraulic modeling effort. Calibrating the model to match data collected during the flow monitoring program ensures that the model is accurately simulating conditions experienced in the field. The calibration process consists of calibrating to both dry and wet weather conditions.

For this project, DWF monitoring was conducted at 25 metering sites for a period of approximately two months. DWF calibration provides an accurate depiction of base wastewater flow generated within the study area. The WWF calibration consists of calibrating the hydraulic model to a specific storm event or events to accurately simulate the peak and volume of I/I into the sewer system. The amount of I/I is essentially the difference between the WWF and DWF components.

4.3.6.1 Wastewater Calibration Standards

The hydraulic model was calibrated in accordance with international modeling standards. The Wastewater Planning Users Group (WaPUG), a section of the Chartered Institution of Water and Environmental Management, has established generally agreed upon principles for model verification. The DWF and WWF calibration focused on meeting the recommendations on model verification contained in the "Code of Practice for the Hydraulic Modeling of Sewer Systems," published by the WaPUG (WaPUG 2002), as summarized below:

- **Dry Weather Calibration Standards**: Dry weather calibration should be carried out for two dry weather days and the modeled flows and depths should be compared to the field measured flows and depths. Both the modeled and field measured flow hydrographs should closely follow each other in both shape and magnitude.

  In addition to the shape, the flow hydrographs should also meet the following criteria as a general guide:
  - The timing of flow peaks and troughs should be within one hour.
  - The peak flow rate should be within the range of ±10 percent.
  - The volume of flow (or the average rate of flow) should be within the range of ±10 percent. If applicable, care should be taken to exclude periods of missing or inaccurate data.
- **Wet Weather Calibration Standards**: The model-simulated flows should be compared to the field-measured flows. The flow hydrographs for both events should closely follow each other in both shape and magnitude, until the flow has substantially returned to DWF rates.

In addition to the shape, the flow hydrographs should also meet the following criteria as a general guide:

- The timing of the peaks and troughs should be similar to the duration of the events.
- The peak flow rates at significant peaks should be in the range of +25 percent to -15 percent and should be generally similar throughout.
- The volume of flow (or the average flow rate) should be within the range of +20 percent to -10 percent.

The WaPUG recommends that, for WWF calibration, the use of a single calibration period incorporating a number of rainfall events should be considered whenever possible. In other words, if the flow-monitoring program captured several back-to-back storms, it may be preferable to use the back-to-back storms events as the calibration storms, as opposed to calibrating to two separate storms that have occurred weeks or months apart.

4.3.6.2 Macro Calibration

The initial calibration process consisted of a macro calibration. Initially, Carollo ran the model under the existing ADWF conditions, and necessary adjustments were made to produce reasonable system flows. Such adjustments included modifications of pipeline connectivity, inverts, facility characteristics, and lift station characteristics.

4.3.6.3 DWF Calibration

The DWF calibration process consists of several elements, as outlined below:

- **Divide the system into areas tributary to each flowmeter**. The first step in the calibration process was to divide the District into flowmeter tributary areas. Twenty-five tributary areas were created for the 2020 flow-monitoring program, based on flowmeter locations. A map showing the locations of each flow-monitoring site and their associated tributary area are provided in Chapter 3 along with a schematic of the flowmeters.
- **Define flow volumes within each area**. The next step was to define the flow volumes within each area, which was accomplished in the flow allocation step.
- **Create diurnal patterns to match the temporal distribution of flow**. A diurnal curve is a pattern of hourly multipliers that are applied to the ADWF to simulate the variation in flow that occurs throughout the day. To match the flows throughout the week, a weekday and a weekend diurnal pattern was established for each flowmeter. The diurnal patterns were initially developed based on the flow monitoring data and adjusted as part of the calibration process until the model simulated flows closely matched the field measured flows. Figure 4.8 shows the calibrated weekday and weekend diurnal patterns for the area tributary to Site M01. Similar diurnal curves were developed for each of the 2020 flowmeters and respective tributary areas. These additional curves are available in Appendix H. As previously mentioned, two separate sets of diurnal patterns were developed, one set for pre-COVID lockdown conditions, and one set for COVID "SIP" conditions.

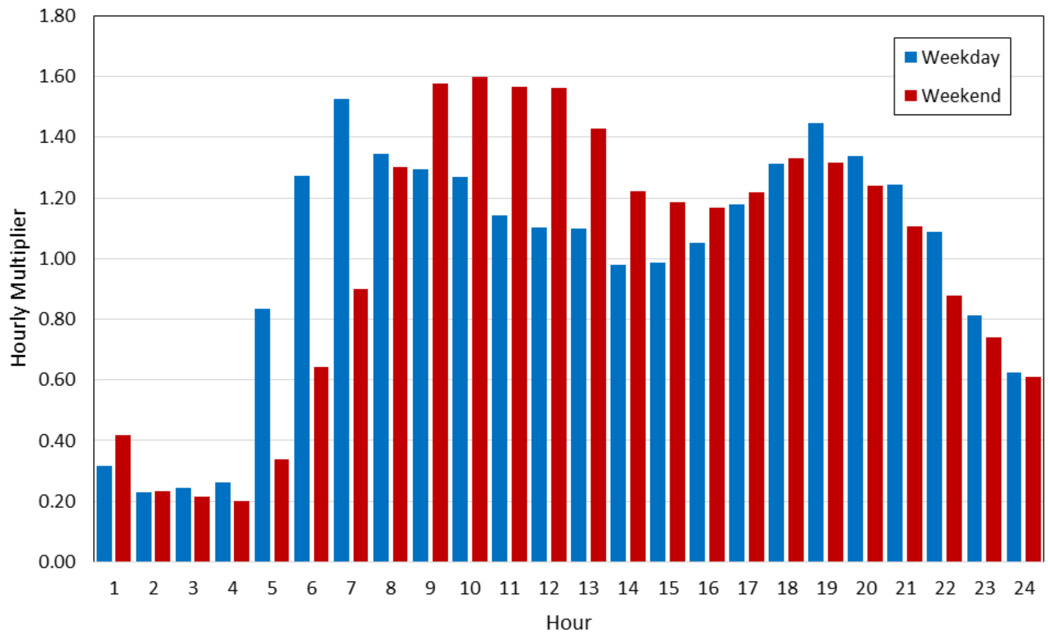


Figure 4.8 Calibrated Diurnal Pattern for Site 1A (Pre-Lockdown)

- **Adjust model variables to match field-measured velocity and flow depths**.
  Once the model-simulated flows acceptably matched the field-measured flows, the model-simulated velocity and flow depth were compared to the field-measured velocity and flow depth. Adjustments were made to various model parameters until the modeled and measured velocity and depth closely matched one another. The primary variable parameters for this process are pipeline roughness (Manning's n) and sediment buildup in the pipe, although other parameters can also be adjusted as calibration results are generated.

  Manning's n roughness coefficients, or n values, have industry-accepted ranges based on several variables. Roughness coefficients increase over time, depending on the construction methods, installation quality, system maintenance, and other environmental factors. There can be certain factors within the District's collection system that can result in roughness coefficients that differ from the typical range. For example, pipeline bellies, joint misalignment, cracks, and debris (e.g., root intrusion, etc.) can lead to increased turbulence in a pipe, thus increasing the Manning's n factor.

  If the model is unable to reasonably match the field-measured flow depth and velocity without leaving the acceptable range of Manning's n roughness coefficients, further investigation is conducted to help determine the cause of the discrepancy. Some issues that could cause such a discrepancy can include errors in the slope or diameter of a pipeline, downstream blockages, pipeline sags, and, in some cases, influences from downstream lift station operations.

  The District's original hydraulic model included two assumptions for Manning's n roughness coefficients. A coefficient of 0.011 was used for plastic pipe, and 0.013 was used for flow through vitrified clay pipe (VCP) and other similar materials. As part of the ADWF calibration, these values were adjusted only if necessary to match field measured velocities. Generally, values between 0.01 and 0.02 were used.

Appendix H includes a detailed DWF calibration summary sheet for each of the flowmeter sites for the 2020 flow-monitoring program. Each calibration sheet provides plots that compare the model-simulated and field- measured flow, velocity, and level data for both weekday and weekend conditions. An example of the DWF calibration for Site 1B is shown on Figure 4.9.

4.3.6.4 DWF Calibration Discussion

Overall, DWF calibration for both pre-COVID lockdown and SIP was successful and modeled flow volumes and peaks were calibrated within 10 percent of the 2020 measured data. Depth and velocities were modeled satisfactorily. Some meters exhibited discrepancies between the modeled depth and velocity and the measured depth and velocity, however, upon discussion with District staff, it was determined that the modeled levels/velocities for these few meters were satisfactory for the purposes of this Master Plan Update.

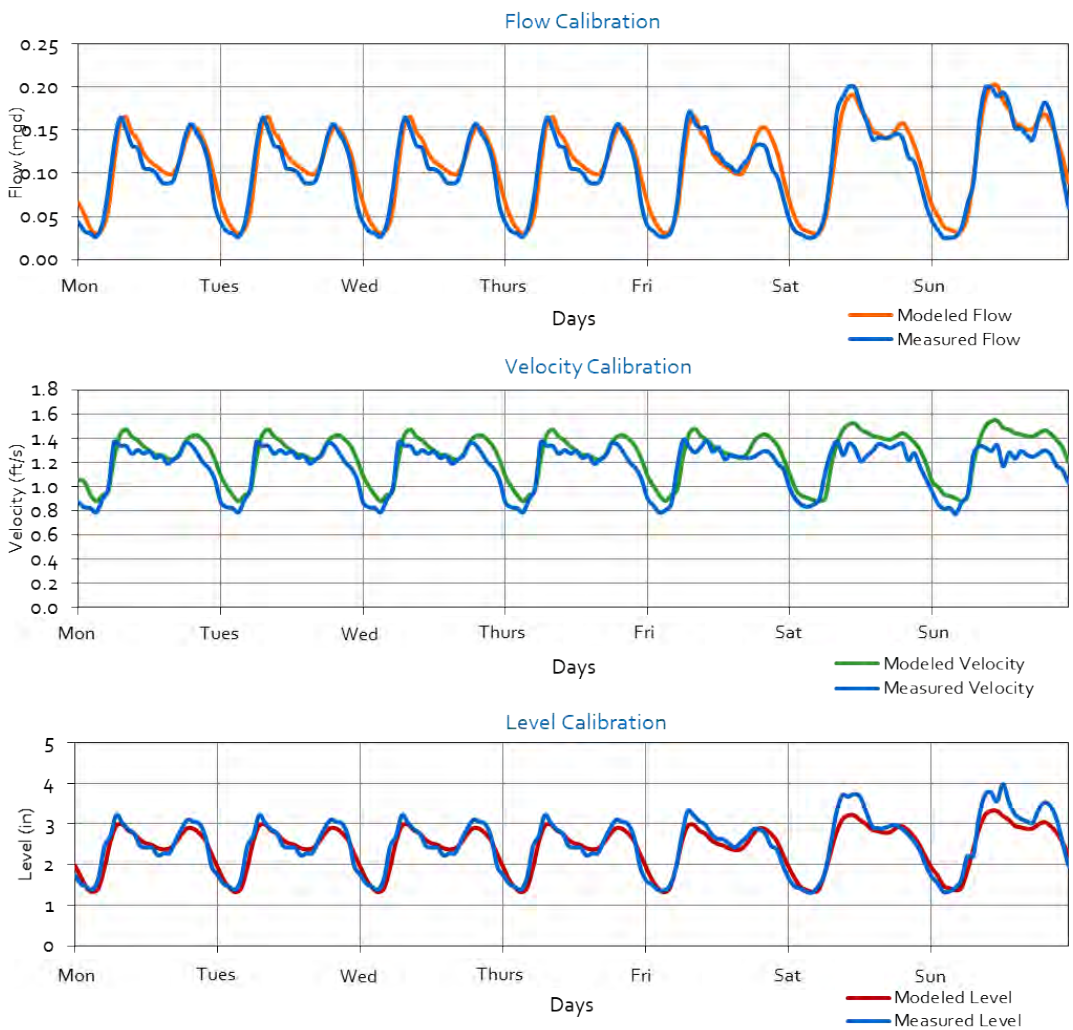


Figure 4.9 DWF Calibration Results for Meter M1B

4.3.6.5 WWF Calibration

The WWF calibration enables the hydraulic model to accurately simulate I/I entering the collection system during a large storm. As outlined below, the WWF calibration process consists of several elements:

- **Identify calibration rainfall events**. The WWF calibration process consists of running model simulations during the rainfall events captured during the 2020 flow monitoring program. For this master plan, the model was calibrated for the period of April 6, 2020 through April 12, 2020. During this period, two wet weather events occurred. The goal of any WWF calibration is to capture and characterize a system's response to a significant rainfall event, preferably during wet antecedent moisture conditions.
  - The selection of a particular calibration storm or group of storms is based on a review of flow and rainfall data. In this case, the model was run from April 6, 2020, to April 12, 2020, and was calibrated to the main rainfall event that occurred during the flow monitoring period.
  - In order to run a model simulation for the April 2020 rainfall event, the hourly rainfall data was input into the model.
- **Define RDII tributary areas**. For the WWF calibration, RDII flows are superimposed on top of the DWF. The model calculates RDII by assigning "RDII Inflows" to each node in the model. RDII inflows consist of both a unit hydrograph and the total area that is tributary to the model node. The RDII tributary areas were calculated in GIS using the loading polygons. The tributary area provides a means to transform hourly rainfall depth from the rainfall hyetographs into a rainfall volume. The rainfall volume is transformed into actual RDII flows using the unit hydrograph, as described in the next step.
- **Create I/I parameter database and modify to match field measured flows**. The main step in the WWF calibration process involves creating a custom unit hydrograph for the District service area using the "RTK Method," which is widely used in collection system master planning. Using the RTK Method, the RDII unit hydrograph is the summation of three separate triangular hydrographs (short term, medium term, and long term), which are each defined by three parameters: R, T, and K. R represents the fraction of rainfall over the sewershed that enters the collection system; T represents the time to peak of the hydrograph; and K represents the ratio of time to recession to the time to peak. Therefore, there are a total of nine separate variables associated with a unit hydrograph.

  Figure 4.11 shows the shape of an example unit hydrograph. The hydrograph utilizes the R-values (percent of rainfall that enters the collection system) calculated for each basin to simulate I/I. The nine variables in each unit hydrograph were initially set based on engineering judgment and then adjusted until the model-simulated flows (both peak flows and average flows) matched closely with the field-measured flows.

  As with the dry weather calibration, the wet weather calibration process compared the measured flow data with the model output. Comparisons were made for average and peak flows as well as the temporal distribution of flow until flows returned to their baseline levels. According to the WaPUG criteria, a hydraulic model is generally considered to be satisfactorily calibrated to WWF conditions if the modeled peak flows are within +25 percent to -15 percent of the field measured data, and if the average modeled flows are within +20 percent to -10 percent of the field measured data.

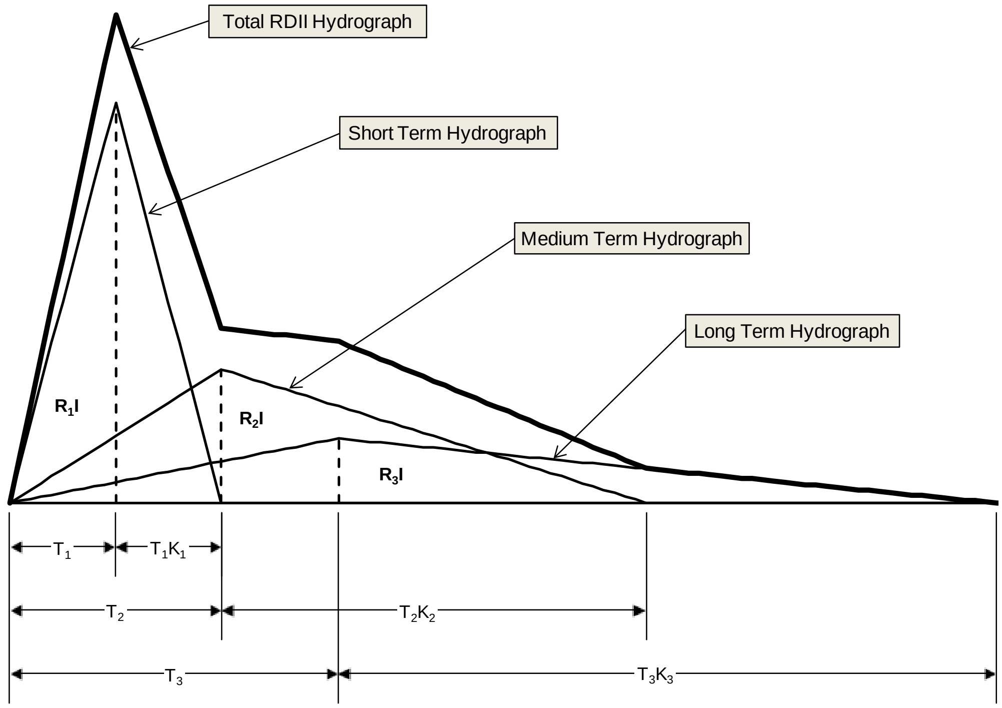


Figure 4.10 Example RDII Unit Hydrograph

- **Refine model variables to match field-measured velocity and flow depths**. After the model was satisfactorily calibrated for WWF, the model-simulated velocities and flow depths were checked against the field measured velocities and flow depths during the calibration storms. Refinements were made to the various model parameters so that the modeled and measured velocity and depth are reasonably close. If any adjustments were made to Manning's n values or other parameters, the ADWF calibration was rechecked to ensure the flow depth and velocities were still well below ADWF conditions.

Included in Appendix H is a detailed WWF-calibration summary sheet for each of the 25 flowmeter sites. Each calibration sheet provides plots that compare the model-simulated and field-measured flow, velocity, and level data for the calibration storms. An example of the WWF calibration for Site M01 is shown on Figure 4.11.

4.3.6.6 WWF Calibration Discussion

The WWF calibration was conducted using 2020 flow-monitoring data. Calibration was successful, and WWF volumes and peaks at all flowmeters were calibrated within the tolerances identified by the WaPUG. As with DWF calibration, some minor level and velocity discrepancies were shown in the data.

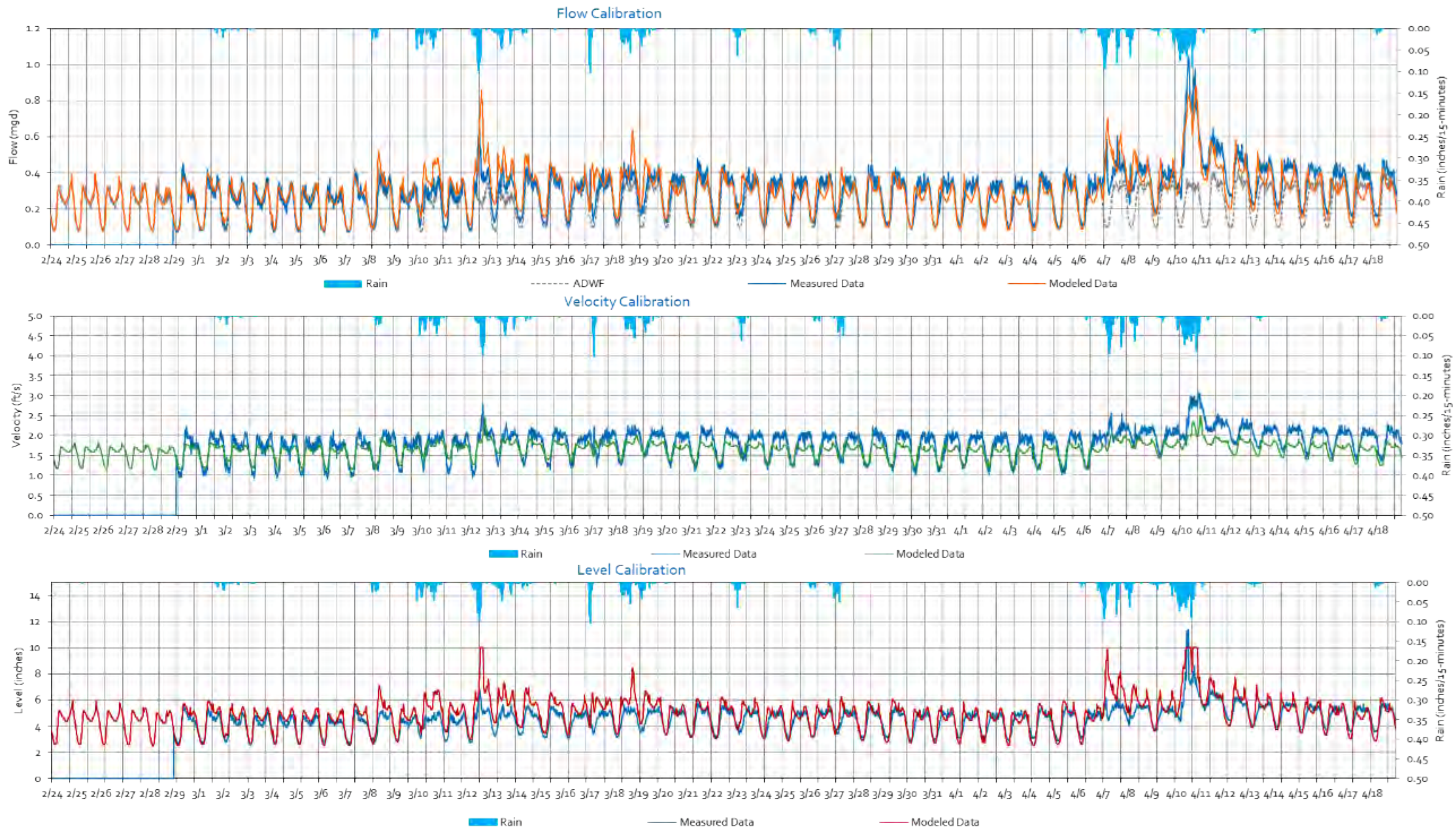


Figure 4.11 WWF Calibration Results for Site 1B

Chapter 5

SYSTEM EVALUATION CRITERIA

This chapter presents the planning criteria and methodologies used to evaluate the existing potable water system, wastewater system, and recycled water system and the associated facilities to identify existing system deficiencies and size future improvements and expansions in Chapters 6, 7, and 8 and to define capital improvement projects in Chapter 9.

Based on discussions with the District, it was determined to use the same criteria that was outlined in the CFMP. However, it is recommended that the District review fire flow criteria with local fire authorities in future Master Plan Updates. Additional fire flow criteria have been added for the potable water system analysis.

5.1 Potable Water System Evaluation Criteria

The District's water system is evaluated under a range of normal and emergency operating conditions and demand scenarios. The normal operating conditions are:

- ADD.
- PHD.
- MDD.
- MDD Plus Fire Flow.

Distribution system evaluation criteria are required to determine the performance of the District's water system under the range of operating conditions as discussed above and to identify system deficiencies and improvement projects. Under each operating condition, the capacities and performance of the water system are compared to the evaluation criteria to determine which pipelines or water facilities need to be upgraded or replaced. The evaluation criteria for the potable water system consist of the following categories:

- System Pressure.
- Pipeline Velocity.
- Storage Volume.
- Pump Station Capacity.

The evaluation criteria used for the evaluation of the District's potable water system are summarized in Table 5.1. Detailed descriptions for each evaluation criteria are provided following the table.

Table 5.1 Potable Water System Evaluation Criteria

Description	Value(1)	Units
Maximum Pressure		
Without Individual Pressure Regulator at Meter	80	psi
With Individual Pressure Regulator at Meter	150	psi
Minimum Pressure		
PHD	40	psi
MDD + Fire Flow	20	psi
Pipeline Criteria		
Maximum Velocity with ADD	5	fps
Maximum Velocity with PHD	8	fps
Maximum Velocity with MDD + Fire Flow	10	fps
Hazen-Williams C-Factor		
Pipelines 12 inches in Diameter or Less	120	N/A
Pipelines Greater than 12-inches in Diameter	130	N/A
Minimum Size for Pipeline Replacement	8	inches
Fire Flow Requirements(1)(2)		
Low Density Residential, Rural, and Semi-Rural	1,500	gpm for 2 hours
Medium Density Residential	2,000	gpm for 2 hours
High Density Residential	2,500	gpm for 3 hours
Commercial	3,500	gpm for 4 hours
Industrial	3,500	gpm for 4 hours
Parks and Open Space	1,000	gpm for 1 hour
Storage Volume(2)		
Operational(1)	30% of MDD	MG
Fire Fighting Storage	Maximum Fire Flow in Zone	MG
Emergency(3)	300% ADD	MG
Gravity Zone Emergency	200% ADD	MG
Pump Station Capacity(2)		
Normal Conditions – Zones with Gravity Storage	Meet MDD + Fire Flow with largest unit out of service by pressure zone	gpm
Normal Conditions – Pumped Water Service Zones	<u>Zones with More than 2,200 Dwelling Units</u> Meet PHD + Fire Flow with largest unit out of service by pressure zone <u>Zones with Less than 2,200 Dwelling Units</u> Meet Fire Flow with largest unit out of service by pressure zone	gpm

Description	Value(1)	Units
Emergency Condition – Power Outage	Meet MDD with backup power	gpm
Emergency Condition – Earthquake	Meet ADD with largest unit out of service	gpm

Notes:
(1) Per Water Agencies' Standards Design Guidelines for Water and Sewer Facilities (September 2014). Values may be reduced with the use of fire sprinklers. Criteria for future developments may vary based on local requirements.
(2) The fire flow criteria listed here are for master planning purposes only. Revised from *Padre Dam MWD Capacity and Design Criteria for Water Pumping Stations and Water Storage Tanks* (March 2004).
(3) Not applied to the Gravity Zone.

5.1.1 Potable Water System Pressures

Minimum system pressures are evaluated under both PHD and MDD plus fire flow conditions. The minimum pressure criterion for PHD demand conditions is 40 psi, while the minimum pressure criterion under MDD with fire flow conditions is 20 psi. The pressure analysis is limited to demand nodes, because only locations with service conditions need to meet such pressure requirements. Lower pressures are only acceptable for junctions at water system facilities and on transmission mains. However, no pressure shall be less than 5 psi to avoid potential water quality issues.

Maximum system pressures are evaluated under ADD conditions. The maximum pressure criterion for normal ADD conditions is 80 psi for service connections without individual pressure reducing valves (PRVs). In areas where the maximum pressure exceeds 80 psi, individual PRVs are required on service connections. However, the system pressure shall generally not exceed 150 psi. In the areas of the District's system where pressure exceeds 150 psi, higher class pipes designed for higher pressures have been installed.

5.1.2 Potable Water Pipeline Velocities

Pipeline velocities are evaluated using three different maximum velocity criteria for selected flow conditions under both existing and future demand scenarios. For transmission and distribution pipelines, a maximum velocity of 5 fps and 8 fps was used for ADD and PHD conditions, respectively. Fire hydrant laterals are excluded from these criteria, as higher velocities are acceptable. Under fire conditions, velocities of up to 10 fps were allowed. Ideally, all transmission and distribution pipelines should have maximum velocities less than 8 fps in order to minimize head loss. However, higher velocities in existing pipelines are not, by themselves, sufficient justification for pipeline replacement.

5.1.3 Potable Water Storage Capacity

The total storage required for a water system is evaluated in three components.

- Storage for operational use.
- Storage for firefighting.
- Storage for emergencies.

These three components are determined for each pressure zone to evaluate the ability of the water system to meet the storage criteria on both a zone by zone basis, as well as a system wide basis. These three storage requirements are discussed in more detail in the following text.

- **Operational Storage.** Operational storage is defined as the quantity of water that is supplied to meet daily fluctuations in demand beyond the quantity of water that is supplied daily. It is necessary to coordinate the production rates of water sources and the available storage capacity in a water system to provide a continuous flow of treated water supply to the system. Water systems are often designed to supply the average flow on the day of maximum demand. Water storage is then used to supply water for peak hour flows that may occur throughout the day. This operational storage is continuously replenished throughout the day to maintain water quality. The American Water Works Association recommends an operational supply volume ranging from one quarter to one third of the demand experienced during one maximum day. It is recommended that pressure zones in the District's water system have operational storage of 30 percent of the MDD supplied by that reservoir.
- **Fire Flow Storage.** The governing fire department typically provides the required minimum fire flow rate and duration for new construction projects based on building materials and size. Through the planning process, District staff determines if fire storage is required for a pressure zone. The values provided in Table 5.1 are utilized for master planning purposes and are based on typical values for water utilities. Fire flow storage is determined based on the single greatest fire flow requirement (flow and duration) within each zone.
- **Emergency Storage.** Storage is also required to meet system demands during emergencies. Emergencies cover a wide range of rare but probable events, such as water contamination, failure at a water treatment plant, power outages, transmission pipeline ruptures, several simultaneous fires, and earthquakes. The volume of water that is needed during an emergency is usually based on the estimated amount of time expected to elapse before the disruptions caused by the emergency are corrected. The occurrence and magnitude of emergencies is difficult to predict. The District's recommended emergency storage is set to three days of ADD per pressure zone except for the Gravity Zone. The recommended emergency storage for the Gravity zone is two days of ADD because it has gravity flow available from wholesale storage and CWA 4 and 6 through the five Santee turnouts.

5.1.4 Potable Water Pump Station Capacity

The District's Capacity and Design Criteria for Water Pumping Stations and Water Storage Tanks Guideline (District, 2004) defines pump station capacity requirements based on the number of dwelling units within the pressure zone. For zones with less than 2,200 dwelling units, pump stations shall be capable of providing domestic fire flow (minimum 1,500 gpm) in addition to any capacity needed for subsequent pump stations that pump into higher zones. For zones with over 2,200 dwelling units, pump stations shall be capable of meeting MDD + fire flow recharge over a three day period. Similar to pump stations in smaller pressure zones, additional capacity shall be included to provide for subsequent pump stations that pump water to higher pressure zones. Both small and large pressure zone pump stations shall be capable of meeting the demand requirements with the largest pump out of service (firm capacity).

For this Master Plan Update (and similar to the CFMP), the capacity and design criteria were modified to reflect system conditions typically evaluated as part of a master plan. The criteria include the sizing of pump stations under normal demand conditions using MDD and PHD for zones with and without gravity storage, respectively. Each station shall have sufficient capacity to meet the required MDD and the maximum zone fire flow with the largest unit out of service or based on the available backup power.

In addition, pump stations shall be sized to maintain a reasonable level of service during emergency conditions. Pump stations shall be able to meet MDD during a power outage using backup power supplies only. MDD is selected as the governing demand condition as rolling blackouts most likely occur during summertime when energy demand in Southern California peaks due to extensive use of air conditioning systems. ADD is selected as the governing demand condition for an earthquake scenario as reduced water deliveries would be acceptable during catastrophic conditions.

5.2 Wastewater System Evaluation Criteria

The capacity of the District's wastewater system was evaluated based on the planning criteria defined in this section. The planning criteria address the collection system capacity, gravity sewer pipe slopes, and maximum allowable depth of flow within a sewer.

The evaluation criteria used for the evaluation of the District's sewer system is summarized in Table 5.2. Detailed descriptions for each evaluation criteria are provided following the table.

5.2.1 Manning's n Coefficient

The Manning's n coefficient is a friction coefficient that varies with respect to pipe material, size of pipe, depth of flow, smoothness of joints, root intrusion, and other factors. For sewer pipes, the Manning's n coefficient typically ranges between 0.011 and 0.017, with 0.013 being a typical value. Based on Water Agencies' Standards Design Guidelines, a Manning's n factor of 0.011 is used for acrylonitrile butadiene styrene (ABS), ACP, high-density polyethylene pipe (HDPE), PVC, and Techite pipes, and a factor of 0.013 is used for ductile iron pipe (DIP) (lined), reinforced concrete pipe (RCP), and VCP. The Manning's roughness coefficients presented in Table 5.2 were assigned by pipe material in the hydraulic model. The Manning's n factor was refined as necessary during model calibration to accurately simulate field-measured levels and velocities.

5.2.2 Flow-Depth Criteria

The primary criterion used to identify capacity deficient sewers or to size new sewer improvements is the maximum flow depth to pipe diameter (d/D) ratio. The d/D value is defined as the depth of flow (d) in a pipe during peak (design) flow conditions divided by the pipe's diameter (D). Based on Carollo's experience, District staff input, and industry standards, the following criteria were recommended.

- **Flow Depth for Existing Sewers.** Maximum flow-depth criteria for existing sanitary sewers are established based on several factors, including the acceptable risk tolerance of the utility, local standards and codes, and other factors. Using a conservative d/D ratio when evaluating existing sewers may lead to unnecessary replacement of existing pipelines. Conversely, lenient flow-depth criteria could increase the risk of sanitary sewer overflows (SSOs). Ultimately, the maximum allowable flow-depth criteria should be established to be as cost effective as possible, while at the same time reducing the risk of SSOs to the greatest extent possible.

Based on discussions with District staff, it was decided that PWWFs would be allowed to surcharge to within 5 feet of the manhole rim.

A capacity deficient sewer (i.e., system bottleneck) raises the hydraulic grade line (HGL) of upstream sewers, leading to backwater conditions. The greater the capacity deficiency, the higher the water levels will surcharge upstream of the bottleneck pipeline (or pipelines). The hydraulic model is used to determine "backwater" pipelines in order to specify which specific pipelines are the actual root causes of the capacity deficiency. Capital projects are proposed to provide greater flow capacity for the deficient sewers, which eliminates the backwater conditions that cause surcharging.

- **Flow Depth for New Sewers.** When sizing new sewer pipelines, it is common practice to adopt variable flow depth criteria for various pipe sizes. Design d/D ratios typically range from 0.5 to 0.92, with the lower values typically used for smaller pipes, which may experience flow peaks greater than design flow or blockages from debris, paper, or rags. For pipelines less than 12 inches in diameter, the maximum d/D value is 0.5 or 50 percent of the pipeline depth. For pipelines 12 inches and larger, the maximum d/D is 0.75 under any flow condition.

Table 5.2 Wastewater System Evaluation Criteria

Minimum Slopes for New Circular Pipes(1)			
Pipe Size (inches)	**Minimum Slope (feet/feet)(2,3)**	**Calculated Flow at Maximum d/D(3)**	
		d/D	**Maximum Flow (mgd)**
6	0.0068(4)	0.50	0.15
8	0.0040(4)	0.50	0.25
10	0.0028(4)	0.50	0.38
12	0.0021(4)	0.75	0.96
15	0.0018(4)	0.75	1.62
18	0.0011(2)	0.75	2.06
21	0.0009(2)	0.75	2.84
24	0.0008(2)	0.75	3.70
27	0.0007(2)	0.75	4.68
30	0.0006(2)	0.75	5.79

Flow Depth, d/D	
Maximum Flow Depth for Existing Sewers	
PWWF	5 feet Below Manhole Rim
Maximum Flow Depth for New Sewers	
Pipe Diameter (inches)	**Maximum d/D Ratio (during Peak Flows)**
Less than 12	0.50
Larger than or equal to 12	0.75

Head Loss in Existing Pipelines	
Pipe Material	**Manning's n Coefficient**
ABS	0.011
ACP	0.011
Cured-In-Place Pipe	0.011
DIP (lined)	0.013
HDPE	0.011
PVC	0.011
RCP	0.013
Techite	0.011
VCP	0.013
Lift Stations and Force Mains	
Minimum Velocity	3 fps
Maximum Velocity	7 fps
Lift Station Capacity	Firm Capacity under Peak flows

Notes:
(1) Per Water Agencies' Standards Design Guidelines for Water and Sewer Facilities (September 2014).
(2) Recommended minimum slope for flows at a velocity greater than or equal to 2 fps.
(3) Calculated flow is determined using the minimum slope and maximum allowable d/D.
(4) Slope and flow for pipe diameters 6 inches to 15 inches are from Water Agencies' Standards Design Guidelines.
(5) Calculated flow is determined using the minimum slope, maximum allowable d/D, and a Manning's n coefficient of 0.013.

5.2.3 Design Velocities and Minimum Slope

To minimize the settlement of sewage solids, it is standard practice in the design of gravity sewers to specify that a minimum velocity of 2 fps be maintained when the pipeline is half full. At this velocity, the sewer flow will typically provide self-cleaning for the pipe. Due to hydraulics of a circular conduit, velocity of half-full flow in pipes approaches the velocity of nearly full flow in pipes.

Table 5.2 lists the recommended minimum slopes and their corresponding maximum flows for maintaining self-cleaning velocities (equal to or greater than 2 fps) when the pipe is flowing at its maximum depth (d/D ratio).

5.2.4 Changes in Pipe Size

When a smaller sewer joins a large one, the invert of the larger sewer should be lowered sufficiently to maintain the same energy gradient. An approximate method for securing these results is to place the 0.8 depth point of both sewers at the same elevation. For planning purposes and designing new pipes, and in the absence of field data, sewer crowns are typically matched at the manholes.

5.2.5 Lift Stations and Force Mains

Industry standard practice is to require that sewage lift stations have sufficient capacity to pump the PWWF with the largest pump out of service (firm capacity).

Force main piping should be sized to provide a minimum velocity of 3 fps at the design flow rate of the lift station and no more than 7 fps. For the determination of head loss, the Hazen Williams Equation is used with a C factor of 100.

5.3 Recycled Water System Evaluation Criteria

This section presents the evaluation criteria that was used to analyze the District's existing recycled water system. The criteria discussed includes system pressures, pipelines velocities, storage reservoirs volumes, and pump station capacities. Since the District does not anticipate significantly expanding the recycled water system, the criteria are based on an existing system analysis.

A list of recommended criteria used in the evaluation of the District's recycled water system is presented in Table 5.3.

5.3.1 System Pressure

The recycled water system pressure is ideally designed to be slightly lower than the potable water system pressure. This pressure differential reduces the risk of potable water contamination from recycled water, in the event that an adjacent recycled water main break. However, this requirement often cannot be met due to the following two reasons:

1. System pressures in water systems vary, and pressure zone boundaries of potable and recycled water systems do not overlap.
2. It is preferred to maintain a static pressure in the recycled water system of approximately 80 psi to meet the operating requirements for most sprinkler systems. However, the minimum pressure in potable water systems is typically 40 psi.

Criteria for future expansion segments was removed since the District does not anticipate expanding the system. However, the CFMP does include additional criteria for expansion segments if needed.

5.3.2 Recycled Water Pipeline Velocities

The maximum velocity criteria used for existing pipelines was 8 fps under PHD conditions. Ideally, all transmission and distribution pipelines should have maximum velocities less than 8 fps to minimize head loss. However, higher velocities in existing pipelines are not, by themselves, sufficient justification for pipeline replacement.

5.3.3 Recycled Water Storage Capacity

The total storage required for a recycled water system is evaluated in operational storage. The operational storage is defined as the quantity of water that is required to meet daily fluctuations in demand beyond the quantity of water that is produced on a daily basis. It is necessary to coordinate the production rates of recycled water sources and the available storage capacity in a recycled water system to provide a sufficient buffer to meet the diurnal variations in demand for the system. Water storage is then used to supply water for peak hour flows that may occur throughout the day. This operational storage is replenished during off peak hours when the demand is lower.

Per the Water Agencies' Standards, recycled water reservoirs shall be designed to have one MDD volume.

Table 5.3 Recycled Water System Evaluation Criteria

Description	Value[(1)]	Units
Maximum Pressure		
Without Individual Pressure Regulator at Meter	80	psi
With Individual Pressure Regulator at Meter	150	psi
Minimum Pressure		
Static	60	psi
PHD	40	psi
Pipeline Criteria		
Maximum Velocity with PHD	8	fps
Hazen-Williams C-Factor		
Pipelines 12 inches in Diameter or Less	120	n/a
Pipelines Greater than 12-inches in Diameter	130	n/a
Minimum Size for Pipeline Replacement	6	inches
Storage Volume[(1)]		
Operational	100% of MDD	MG
Pump Station Capacity[(1)]		
Normal Conditions – Zones With Gravity Storage	Meet MDD with largest unit out of service by pressure zone	gpm
Normal Conditions – Zones Without Gravity Storage	Meet PHD with largest unit out of service by pressure zone	gpm

Notes:
(1) Per Water Agencies' Standards Design Guidelines for Water and Sewer Facilities (September 2014). Values may be reduced with the use of fire sprinklers.

5.3.4 Recycled Water Pump Station Capacity

Per the Water Agencies' Standards, recycled water pump stations shall meet MDD in pressure zones with gravity storage and PHD in zones without gravity storage. This criterion reflects conditions typically evaluated as part of a master plan. Each station shall have sufficient capacity to meet the required demands with the largest unit out of service.

In addition, pump stations shall be sized to maintain a reasonable level of service during emergency conditions. Pump stations shall be able to meet MDD during a power outage using backup power supplies only. MDD is selected as the governing demand condition as rolling blackouts most likely occur during summertime when energy demand in Southern California peaks due to extensive use of air-conditioning systems.

Chapter 6

WASTEWATER COLLECTION SYSTEM EVALUATION

This chapter presents an overview of the District's existing and future wastewater collection system. This chapter presents a summary of the wastewater collection system evaluation and summarizes the recommended improvements. This chapter is divided into the following sections:

- **Existing Wastewater Collection System:** This section provides a detailed description of the existing wastewater collection system facilities.
- **Collection System Capacity Evaluation:** This section discusses the hydraulic evaluation of the sewer collection system and the proposed projects that mitigate capacity deficiencies and sized to serve future users.
- **Proposed Improvements:** Capacity improvements were developed based on the results of the collection system capacity evaluation. The proposed improvements will provide the collection system with sufficient capacity to convey peak flows through the planning horizon of this Master Plan Update.

The CIP that summarizes the costs for the recommended improvement projects detailed in this chapter is provided in Chapter 9 of this Master Plan Update.

6.1 Existing Wastewater Collection System

The District's wastewater collection system consists of sewer mains, lift stations, and flow diversions that collect and convey wastewater to the District's WRF, which is located north of the City of Santee off Sycamore Canyon Road. Figure 6.1 presents the District's existing wastewater collection system. The oldest part of the District's collection system was constructed in 1957. Expansion of the collection system has continued to the present day.

The District's wastewater collection system drains primarily from east to west. Approximately 2 mgd of wastewater is pumped to the Padre Dam WRF through the IPS, and the remaining wastewater flow that reaches the IPS is pumped to the City of San Diego's Metropolitan Sewerage System (METRO) for treatment and disposal at the METRO Point Loma WWTP. The District's wastewater collection system also includes diversion structures that direct a portion of the District's wastewater flow upstream of the IPS to the MGTS via the County of San Diego's Lakeside Interceptor. The District also operates a diversion structure that can divert flow from the Lakeside Interceptor to the District sewer system, to maximize recycled water production at the WRF. The location of the Lakeside Interceptor, with respect to the District's collection system, is shown on Figure 6.1. In addition, a few smaller sewer basins near the western edge of the District's wastewater service area flow directly to the MGTS.

The District has joint ownership of the Lakeside Interceptor with San Diego County Sanitation District (formerly Lakeside Sanitation District and Alpine Sanitation District), although

San Diego County Sanitation District operates and maintains it. The current agreement between the District and the San Diego County Sanitation District has not been revised since its inception in 1975, at which time the Lakeside Sanitation District and the Alpine Sanitation District were distinct agencies. According to the agreement, the District discharges only the volume of flow that is allowed to be discharged to METRO by the agreement with the City of San Diego.

6.1.1 Ray Stoyer WRF

The Ray Stoyer WRF was first built in 1962 and quickly became renowned for its reuse of treated wastewater effluent in a series of recreational lakes downstream. The WRF was last upgraded in 1997 to produce Title 22 recycled water for irrigation use as well as for the recreational Santee Lakes system. Padre Dam plans to expand their recycled water use program with the implementation of a potable reuse program, and the Ray Stoyer WRF will be decommissioned after the implementation of the East County AWP project.

The current treatment process at the WRF consists of primary sedimentation, biological nutrient removal (BNR) including phosphorous and nitrogen removal, and secondary clarification. Tertiary treatment consists of alum addition, rapid mix, flocculation, and sedimentation, followed by denitrifying filtration and chlorination. The effluent from this process is sent to the Santee Lakes or to recycled water customers.

6.1.2 East County AWP Project

The East County AWP is a partnership between the District, Helix, the County of San Diego (County), and the City of El Cajon (El Cajon). It is governed by the East County AWP JPA, which consists of the District, the County, and El Cajon. The East County AWP Project is a potable reuse project focused on creating a new local source of water supply for East San Diego County. The initial phase of the East County AWP Project will include treatment for up to 16 mgd of wastewater at a new WRF located near the existing Ray Stoyer WRF, and the production of up to 11.5 mgd of purified water.

The new WRF will be equipped to receive raw wastewater from the District's existing IPS's high lift pumps, although the majority of flow into the new WRF would normally be pumped from the East Mission Gorge Pump Station (EMGPS) to the WRF. In addition, flows from the planned Fanita Ranch development would be conveyed directly to the new WRF through a planned lift station located near the new WRF.

The new WRF will include screening at a headworks facility, primary clarifiers, an equalization tank, secondary treatment through a four-stage Bardenpho for BNR, secondary clarifiers, granular media filters, chlorine disinfection at the existing Ray Stoyer chlorine contact basin, odor control system, and several pump stations.

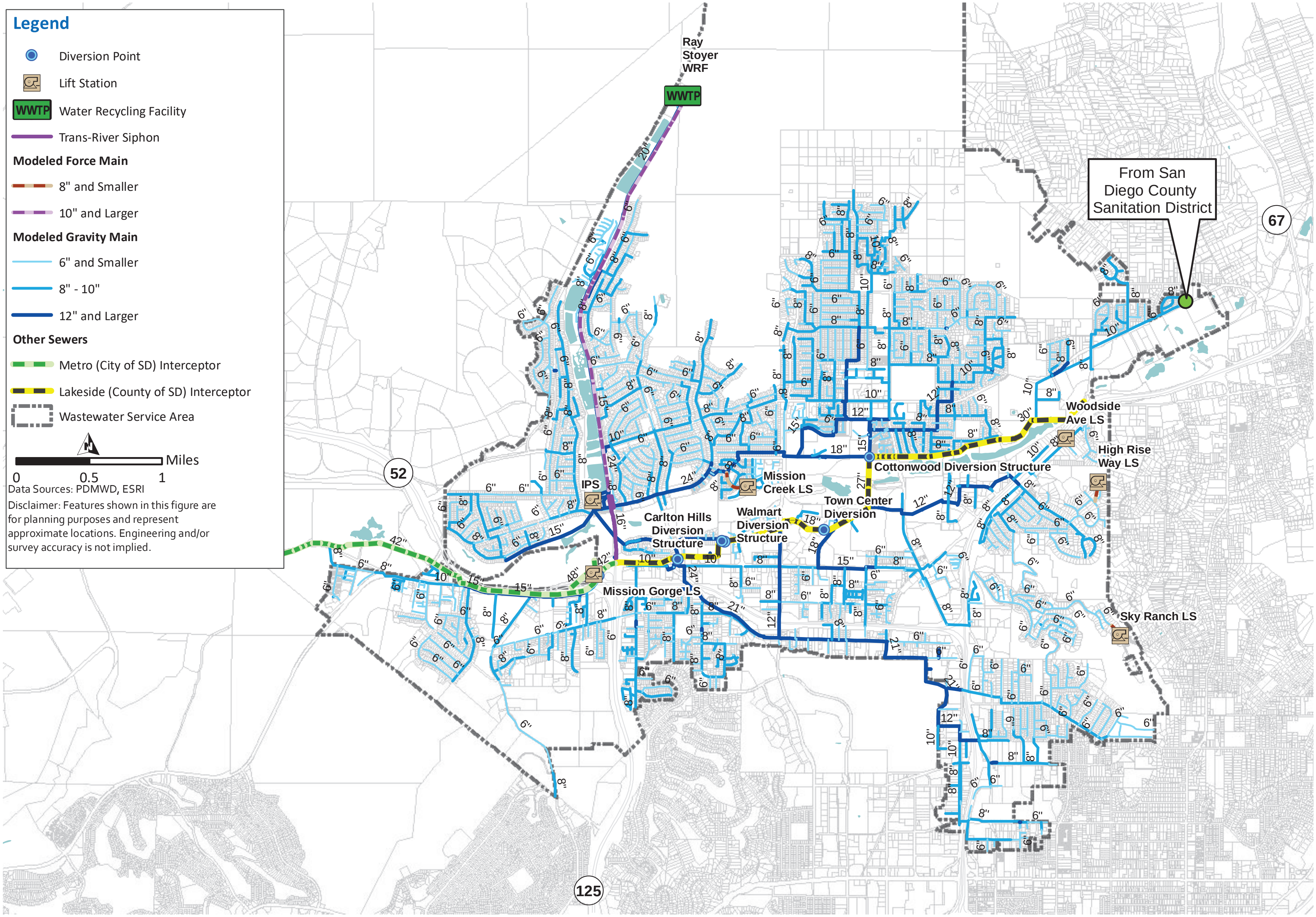


Figure 6.1 Existing Wastewater Collection System Facilities

6.1.3 Gravity Mains

The District's existing sanitary sewer collection system is comprised of roughly 175 miles of gravity collection system pipe ranging from less than 6 to 30 inches in diameter. Table 6.1 presents a summary by diameter of the sewers in the collection system. This table includes the District sewers only. As shown in Table 6.1, roughly 84 percent of the system is 8 inches in diameter and smaller, with most of the system (roughly 49 percent) being 6 inches and smaller.

Table 6.1 Collection System Gravity Pipeline Summary

Diameter (inches)	Length (feet)	Percent of System (by length)
6 and Smaller	424,655	49.2%
8	299,973	34.8%
10	35,631	4.1%
12	20,174	2.3%
15	25,018	2.9%
16	385	0.0%
18	16,846	2.0%
21	12,605	1.5%
24	26,505	3.1%
27	406	0.0%
30	506	0.1%
Total	**862,704**	**100.0%**

The age and condition of the collection system facilities will impact the quantity of I/I allowed to enter the system. Typically, older sewer pipes have a greater potential of allowing significant I/I into the collection system.

6.1.4 Lift Station and Force Mains

The District operates and maintains five wastewater lift stations throughout the District service area. Figure 6.1 shows the locations of each lift station and the area that it services, while Table 6.2 summarizes the available design data for the District's lift stations.

Table 6.2 Lift Station Summary

Name	Capacity (gpm)	Total Dynamic Head (feet)	Pump Motor	Number of Pumps	Force Main Diameter (inches)
High Rise	125	85	10 hp 1,750 rpm 460 V 3 phase	2	4
Mission Creek	600	65	20 hp 1,800 rpm 460 V 3 phase	2	6

Name	Capacity (gpm)	Total Dynamic Head (feet)	Pump Motor	Number of Pumps	Force Main Diameter (inches)
Sky Ranch	118	83	7.5 hp 1,770 rpm 480 V 3 phase	2	4
Woodside Avenue	100	10	2.7 hp 1,750 rpm 230 V 3 phase	2	4
IPS High Lift	1,740	200	150 hp 1,750 rpm 460 V 3 phase	2	20
IPS Low Lift	1,850	54	50 hp 1,150 rpm 460 V 3 phase	4	24

Abbreviations: hp- horsepower; rpm - revolutions per minute; V - volts.

A summary of each lift station is presented below:

- **High Rise Lift Station:** The High Rise Lift Station is located on High Rise Way near Canyon Park Drive. The lift station consists of 6-foot diameter wet well with a depth of 15.05 feet and two 10-hp, 125-gpm pumps. The High Rise Lift Station conveys raw wastewater through an 800 feet of 4-inch diameter force main.
- **Mission Creek Lift Station:** The Mission Creek Lift Station is located on River Park Drive near Cuyamaca Street. The lift station consists of 12-foot diameter wet well with a depth of 18.81 feet and two 20-hp, 600-gpm pumps. The Mission Creek Lift Station conveys raw wastewater through an 1,120 feet 6-inch diameter force main.
- **Sky Ranch Lift Station:** The Sky Ranch Lift Station is located on Ocotillo Street near Mariposa Street. The lift station consists of 12-foot diameter wet well with a depth of 18.67 feet and two 7.5-hp, 118-gpm pumps. The Sky Ranch Lift Station conveys raw wastewater through a 110 feet 4-inch diameter force main.
- **Woodside Lift Station:** The Woodside Lift Station is located on private property near Woodside Avenue and Woodside Terrace. The lift station consists of two 2.7-hp, 100-gpm pumps. The Woodside Lift Station conveys raw wastewater through an 80-foot, 4-inch diameter force main.
- **IPS Lift Station:** The IPS is located on Carlton Oaks Drive near Fanita Parkway. The lift station consists of four 50-hp, 1,850-gpm pumps (low-head pumps) and two 150 hp, 1,740-gpm pumps (high head pumps). The low head pumps lift all the inflow approximately two stories. One high head pump handles 2 mgd of flow and lifts it an additional 178 feet through a 20-inch diameter force main to the WRF. The remaining flow that is not pumped by the high-head pump (flow in excess of 2 mgd) is diverted to the MGTS via the Trans-River Siphon.
- **EMGPS:** The EMGPS is currently owned and operated by the City of San Diego and serves as a wet weather management station for the MGTS. According to the City of

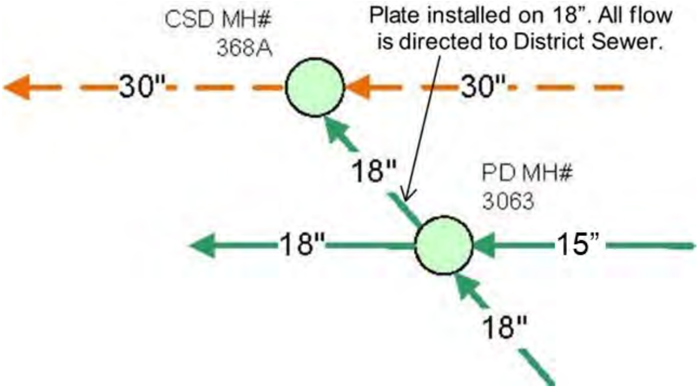
San Diego, the current peak wet weather design flow to the MGTS is 48 mgd and the capacity of the MGTS is 28 mgd. As part of the East County AWP Project, the East County AWP JPA will take over ownership and operation of the EMGPS. The JPA will use the pump station to divert up to 14.5 mgd of the MGTS flow to the new AWP facilities via a new force main. The existing East Mission Gorge Force Main (EMGFM) will continue to convey intermittent wastewater flows that exceed the capacity of the City of San Diego's MGTS during wet weather high flow events. Additionally, the EMGFM will also serve as an emergency failsafe pipeline to convey wastewater flows during times when the infrastructure at the East County AWP Project is nonoperational.

6.1.5 Diversion Structures

There are four diversion structures that divert flow from District sewers into the Lakeside Interceptor. Each structure is unique and is constructed differently. Each structure is described below:

- **Cottonwood Diversion Structure:** In 2009, the District completed a $1 million project to upgrade the Cottonwood diversion structure. During the design to enhance the structure's operational flexibility, District engineers also determined that the potential existed to obtain wastewater flow from the County. This was significant because it would allow the District to equalize wastewater flow to the District's WRF during low-flow periods (night). The Cottonwood diversion structure uses two automated knifegate valves positioned as shown on Figure 6.2. County flow can be diverted to the IPS at night by opening the upstream valve. This valve would normally be closed during the day to prevent peak flow from the County to enter the District's system. By closing the downstream automated knifegate, wastewater will rise in elevation and pass over a weir and flow into the County trunk line.
- **Walmart Diversion Structure:** The Walmart Diversion Structure was upgraded to an automated diversion structure in 2018. The structure consists of a single 18-inch pipe that conveys sewage to a gravity manhole with two 18-inch outlet pipes. One outlet pipe leads to the Interceptor and the other to the IPS via the District's gravity collection system. Flow is directed to either of the outlet pipes by actuating the 18-inch knife gate valves. Additionally, the old diversion structure gravity manhole located immediately upstream of the new automated structure has a section of 18-inch pipe that has part of its top portion removed. In this way, any flow coming that surcharges due to an unforeseen issue with the automated diversion structure would spill over the sides of this connector pipe and fall to the bottom of the manhole, where it will drain through another outlet pipe and into the Lakeside Interceptor. An illustration of these updates and the new pipe configuration can be seen on Figure 6.3.
- **Carlton Hills Diversion Structure:** The Carlton Hills diversion structure is located just north of the intersection of Carlton Hills Boulevard and Mission Gorge Road. As shown on Figure 6.4, the manhole is configured with one inlet pipe and two outlet pipes; one of which conveys flows to the IPS and the other conveys flows to the Lakeside Interceptor. Each outlet pipe is equipped with a stop gate. A knife gate was recently installed to allow for automated operation of the diversion structure. The structure typically conveys flows to the District's IPS.

Town Center Diversion Structure: The Town Center diversion structure is located at the intersection of Town Center Parkway and Riverview Parkway. According to the as-built drawings for this structure, plates can be installed on either outlet pipes. According to District staff, the current and planned operation of this diversion structure is to have a plate installed on the 18-inch pipeline to the Lakeside Interceptor (see



- Figure 6.5), and, therefore, all flow is directed to the District's sewer.

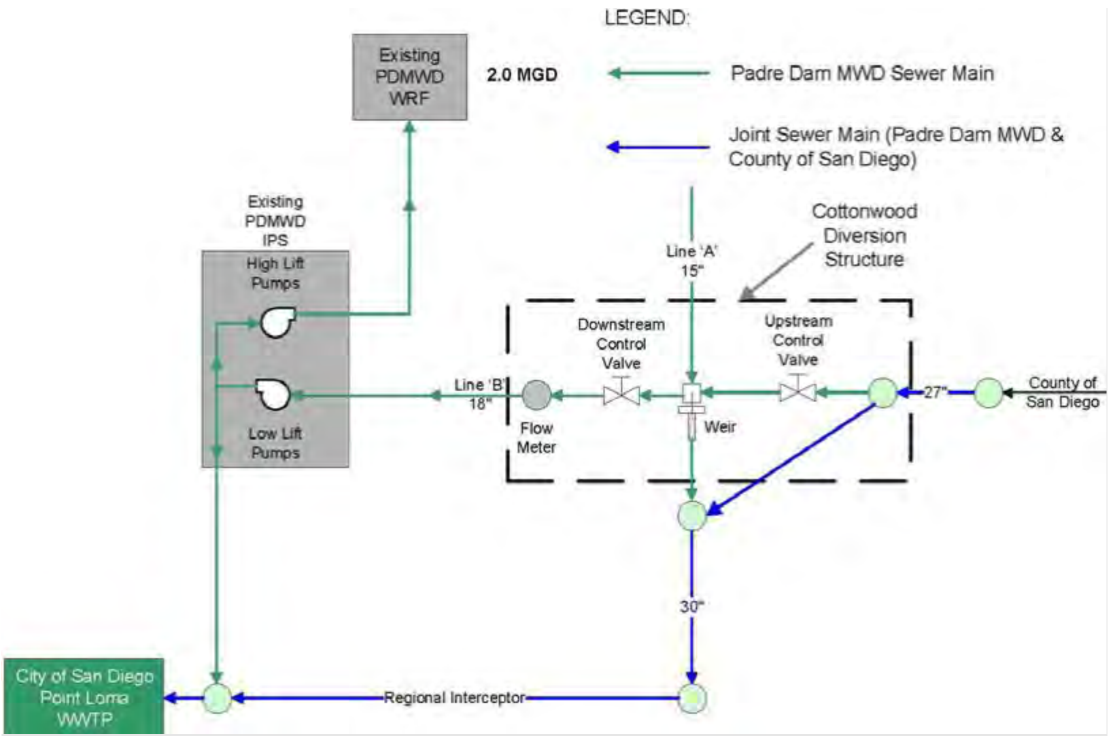


Figure 6.2 Cottonwood Diversion Structure Schematic

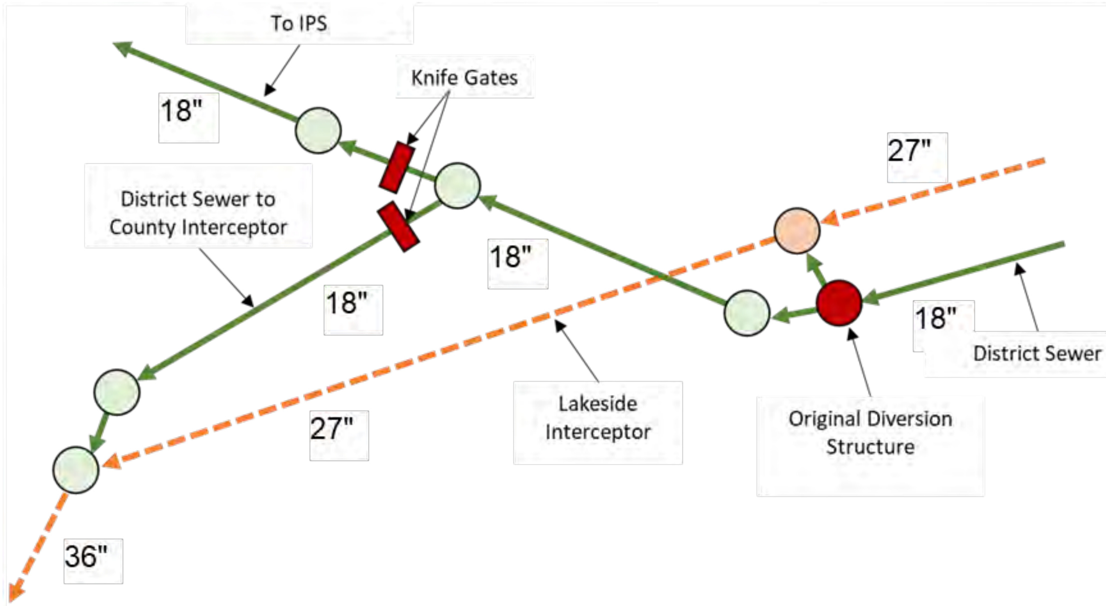


Figure 6.3 Walmart Diversion Structure Illustration and Schematic

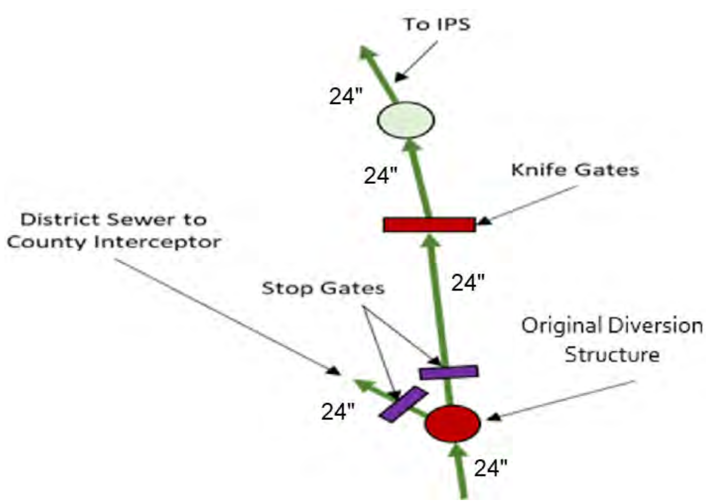


Figure 6.4 Carlton Hills Diversion Structure Schematic

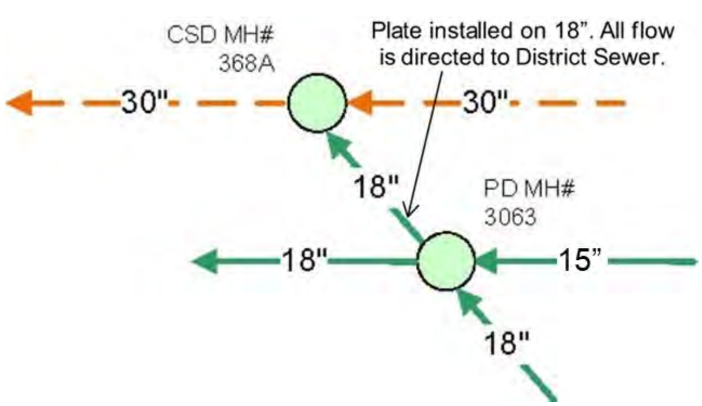


Figure 6.5 Town Center Diversion Structure Schematic

6.2 Collection System Capacity Evaluation

This section summarizes the results of the collection system capacity evaluation under existing and future peak flow conditions.

6.2.1 Existing System Analysis

This section discusses the evaluation of existing wastewater collection system facilities and identifies current system deficiencies under existing PWWF conditions.

6.2.1.1 Collection System Capacity Analysis

Following the DWF and WWF calibration, which is described in Chapter 4, the District's hydraulic model was used to perform a capacity analysis of the existing wastewater collection system. This evaluation involves identifying areas in the collection system where flow restrictions are present or where pipe capacity is inadequate to convey design flows. Sewers that lack sufficient capacity to convey design flows create bottlenecks in the collection system that can potentially contribute to SSOs. The wastewater collection system was evaluated based on the planning criteria presented in Chapter 5. Additionally, all flows were modeled without diversion into the Lakeside Interceptor (i.e., all flows to the IPS), as this is the most conservative approach for infrastructure sizing.

Gravity Sewer System Analysis

For the existing sewer collection system, the PWWF was routed through the hydraulic model. Both a 10-year, 24-hour design storm event, and the April 2020 (25-year, 24-hour storm) were routed through the hydraulic model, as discussed in Chapter 5. The model simulated flow depths (d/D ratios) were compared against the planning criteria described in Chapter 5.

Note that the pipelines within the vicinity of manholes that exceed the allowable d/D threshold are not necessarily capacity deficient. In some cases, a surcharged condition within a given pipeline segment is due to backwater effects created by a downstream bottleneck. An illustration of backwater effects is shown on Figure 6.6. For this reason, the hydraulic model was analyzed to identify the pipeline segments that are the cause of the surcharged conditions.

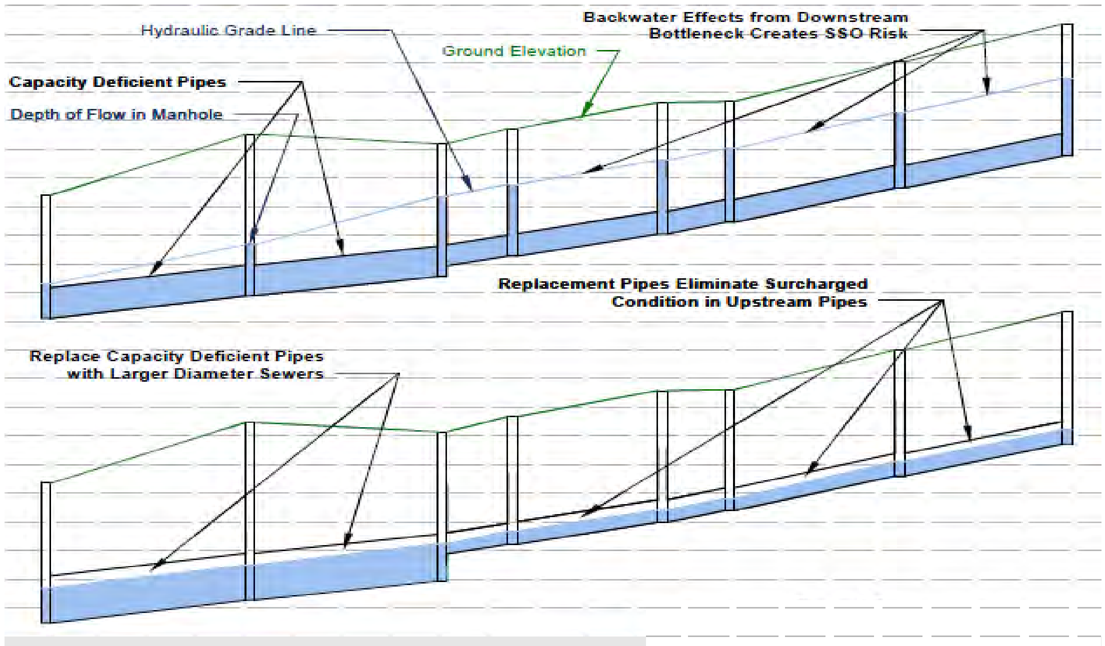


Figure 6.6 Sample Illustration of Backwater Effects in a Sewer

Following the completion of the existing system analysis, improvement projects and alternatives were identified in order to mitigate existing system capacity deficiencies. The capacity deficient sewers tend to throttle the peak flows downstream in the collection system. As these capacity limitations are corrected, peak flows in the downstream collection system typically increase. This increase of flow can lead to additional "secondary" capacity deficiencies. Figure 6.7 illustrates the location of the existing system deficiencies.

Lift Station Analysis

The District's hydraulic model includes four sewer lift stations and the IPS. The EMGPS is also included in the District's hydraulic model, but was not evaluated as part of this Master Plan Update. The modeled lift stations were evaluated to determine if they have sufficient capacity to convey existing PWWFs without any diversions into the Lakeside Interceptor. Lift stations with an influent PWWF above the existing firm capacity were flagged as deficient. Table 6.3 summarizes the results of the lift station evaluation.

The IPS Low Lift was flagged as deficient under the existing PWWF condition, based on the assumption that the District's diversions to the Lakeside Interceptor are inactive (meaning all of the District's peak flows will be conveyed to the IPS). With existing capacity improvements implemented, the hydraulic model indicated that the IPS Low Lift has an insufficient capacity to convey potential PWWF (without diversions to the MGTS). However, additional modeling scenarios showed that the IPS Low Lift pumps had sufficient capacity to convey the existing PWWF if the District's diversion structures are utilized. For this reason, no capacity upgrades are recommended for the IPS Low Lift Pumps.

Table 6.3 Lift Station Capacity Evaluation

Name	Pump No.	Capacity (gpm)	Total Capacity (gpm)	Total Capacity (mgd)	Firm Capacity(2) (gpm)	Firm Capacity(2) (mgd)	Existing PWWF(1) (mgd)	Future PWWF(3) (mgd)
High Rise	1 2	125 125	250	0.36	125	0.18	0.01	0.01
Mission Creek	1 2	600 600	1,200	1.73	600	0.86	0.11	0.11
Sky Ranch	1 2	118 118	236	0.34	118	0.17	0.01	0.01
Woodside Avenue	1 2	100 100	200	0.29	100	0.14	0.01	0.01
IPS High Lift	1 2	1,740 1,740	3,480	5.0	1,740	2.5	2.0	2.0
IPS Low Lift	1 2 3 4	1,850 1,850 1,850 1,850	7,400	10.8	5,550	8.1	10.7	11.2

Notes:
(1) PWWF represents inflow to pump station without any diversions to the Lakeside Interceptor.
(2) Firm Capacity is defined as the pump station capacity with the largest unit out of service.
(3) Future PWWF for the High Lift pump station assumes that the WRF will continue to treat 2.0 mgd, as is the current practice.

Trans-River Siphon Analysis

Carollo analyzed the capacity of the existing Trans-River Siphon. The updated hydraulic model was utilized to determine how much flow could be routed through the siphon's two barrels without flooding upstream gravity sewers (this assumes that the siphon barrels are clean and free of sediment). The hydraulic analysis confirmed that the capacity of the siphon with both barrels in operation, free of sediment, is approximately 8.8 mgd, which is consistent with the capacity analysis conducted in 2018 by Woodward and Curran. Similar to the IPS Low Lift Pumps, the siphon does not have sufficient capacity to convey the existing PWWF (11.2 mgd), assuming the District's diversion structures are not utilized. However, additional modeling analysis showed that with the District's diversion structures in use, the flow through the Trans-River Siphon can be kept below the existing capacity of 8.8 mgd. Therefore, no capacity related improvements to the Trans-River Siphon are recommended.

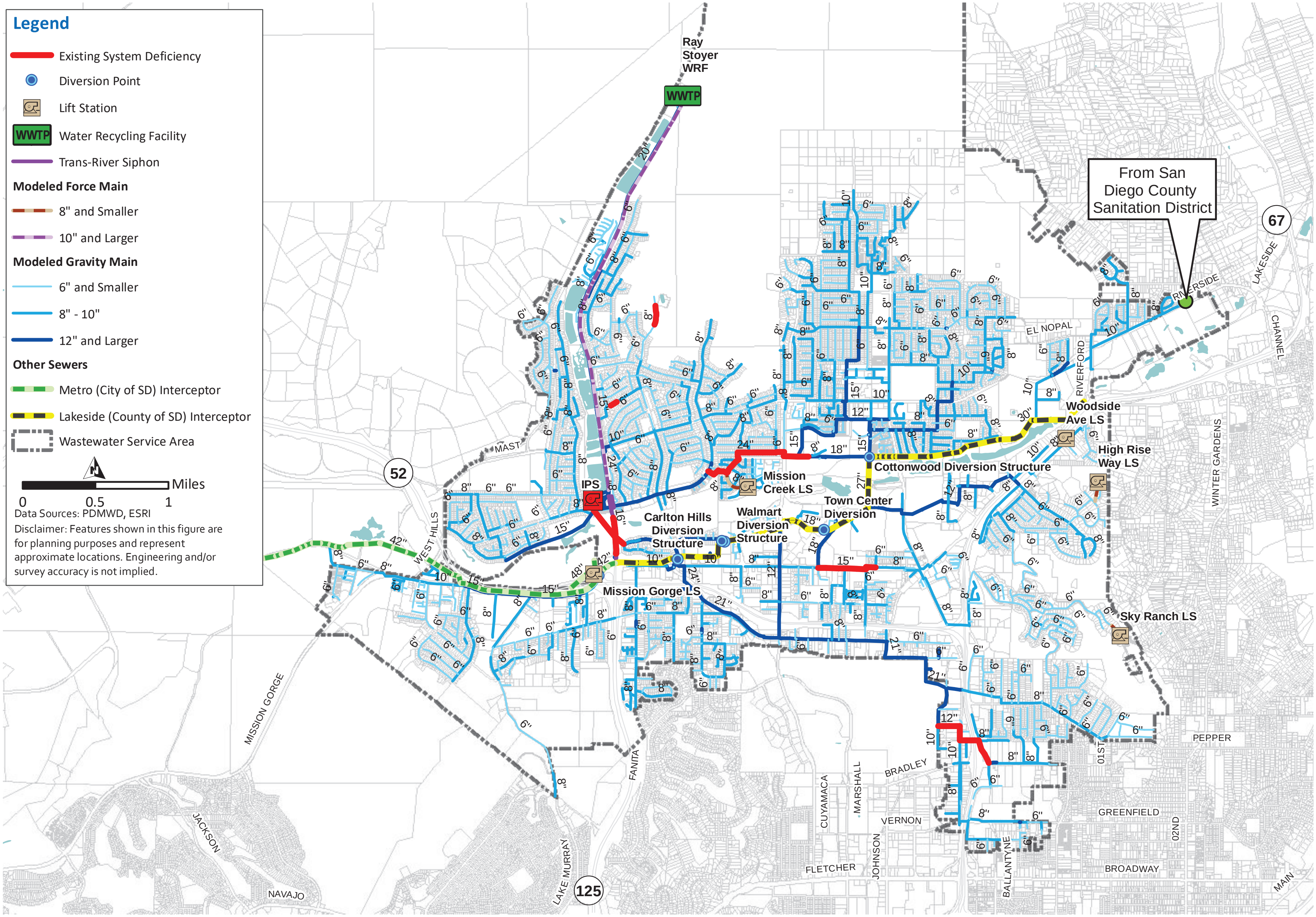


Figure 6.7 Collection System Deficiencies

6.2.2 Future System Analysis

This section outlines the evaluation of the District's wastewater collection system under future peak-flow conditions.

6.2.2.1 Collection System Capacity Analysis

The capacity of the future sewer collection system was evaluated similarly to the existing collection system. This section identifies the wastewater collection system infrastructure required to serve future growth within the District's service area through the year 2045. Additionally, the future system evaluation was conducted to confirm that improvements identified to convey existing PWWFs will also handle future flows.

As previously stated in Chapter 3, the projected ADWF for the District wastewater service area is projected to increase from 3.67 mgd to 4.47 mgd by 2045, an increase of 0.8 mgd. Additionally, all flows were modeled without diversion into the Lakeside Interceptor, as this is the most conservative approach for infrastructure sizing.

Gravity Sewer System Analysis

The future system analysis showed no additional capacity deficient pipelines under year 2045 conditions.

Lift Station Analysis

As with the existing system analysis, the District's modeled lift stations were checked against the near-term and long-term PWWF conditions without any diversion into the Lakeside Interceptor. Table 6.3 summarizes the future system lift station capacity evaluation. As shown in Table 6.3, no additional lift station capacity deficiencies were flagged. Similar to the existing system analysis, the IPS Low Lift Pumps were flagged in Table 6.3, however, with the District's diversion structures in operation, the Low Lift Pump Station should have sufficient capacity to convey the 2045 PWWF.

Trans-River Siphon Analysis

Similar to the existing system analysis, the Trans-River Siphon does not have enough capacity to convey the future PWWF without diversions. However, with diversions, the siphon's capacity (8.8 mgd) should be sufficient to convey the projected PWWF.

6.2.3 Rehabilitation and Repair

As part of the 2015 CFMP, a below-ground asset manager (BAM) model was developed to determine rehabilitation and replacement (R&R) needs. This Master Plan Update did not include any updates to the BAM model, therefore the R&R projects recommended in the 2015 CFMP were pulled forward into this Master Plan Update. It is recommended that the District perform a more comprehensive review of R&R needs for gravity sewers as part of the next Master Plan Update.

Additionally, the 2015 CFMP included a condition assessment for three critical facilities: the Mission Creek Lift Station, High Rise Lift Station, and the IPS. Since the completion of the 2015 CFMP, the District rehabilitated the Mission Creek Lift Station. The recommended improvements for the High Rise Lift Station were categorized as "in-house" improvements in the 2015 CFMP, and therefore these projects are not included as recommendations in this Master Plan Update. The recommended improvements to the IPS cited in the 2015 CFMP are assumed to be included in the contract for the AWP project and are therefore not included as recommendations in this Master Plan Update.

6.3 Proposed Improvements

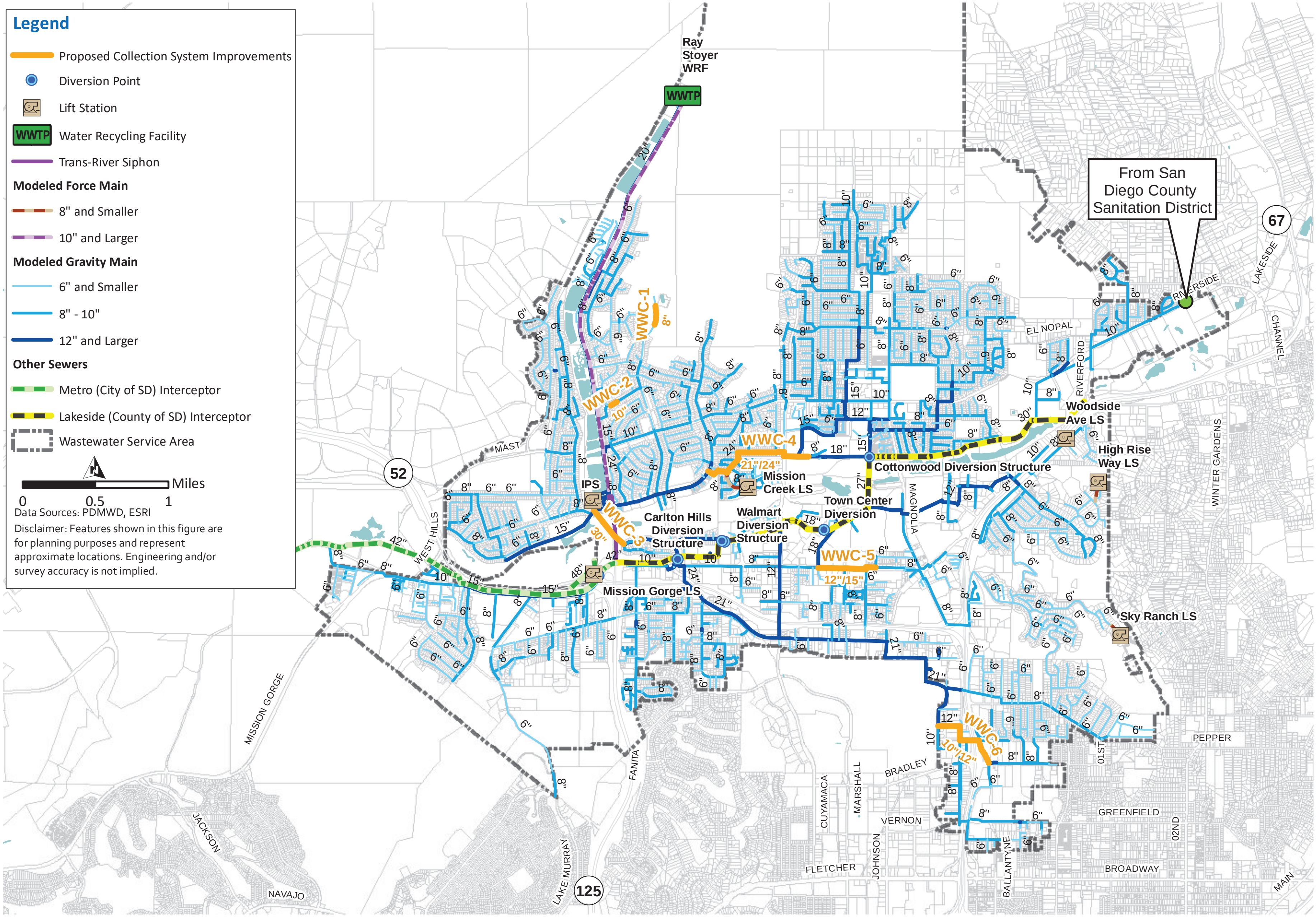
This section highlights the improvements recommended to mitigate existing and future system deficiencies described in this chapter. The recommended improvements are summarized in Table 6.4 and shown on Figure 6.8. The columns used in Table 6.4 refer to the following:

- **Improvement ID:** Assigned unique identifier associated with each improvement project. This is an alphanumeric number that starts with one letter indicating the type of improvement (WWC = Capacity Improvements, WWR = Rehabilitation Improvements, WWO = Other Miscellaneous Improvements) and continues with a number and a letter.
- **Type of Improvement:** Gravity pipelines, lift stations, and force mains.
- **Street Description:** Street in which the improvement is proposed.
- **Limits:** Description of the beginning and end of a proposed pipeline project.
- **Existing Size:** This is the size of the existing pipeline/facility. It represents the diameter of the existing pipelines (inches) or the total capacity of lift stations (mgd).
- **Proposed Size:** This is the size of the proposed improvement. It represents the diameter of the proposed pipelines (inches), or the total capacity of lift stations (mgd).
- **Replace/New/Rehabilitate:** Indicates whether the proposed improvement is a replacement pipeline, parallel pipeline, new facility, or a rehabilitation project.
- **Length:** Estimated length of the proposed improvement (in feet). It should be noted that the length estimates do not account for re-routing the alignment to avoid unknown conditions.

Table 6.4 Recommended Improvements

Project ID	Description		Existing Size	Proposed Size	Replace/ New	Quantity
Capacity Related CIPs						
Gravity Mains			Diam. (in)	Diam. (in)		Length (ft)
Project WWC-1: Carlton Hills Sewer						
WWC-1A	Carlton Hills Blvd.	North of Carlton Hills Blvd parallel to Swanton Dr.	6	8	Replace	700
Project WWC-2: Carita Sewer						
WWC-2A	Carita Rd.	West of Carita Court	8	10	Replace	260
Project WWC-3: Carlton Oaks Trunk Sewer						
WWC-3A	Willowgrove Ave	Northwest of Willowgrove Ave to Carlton Oaks Drive (at the Calle del Verde intersection)	24	30	Replace	1,650
Project WWC-4: Town Center Sewer						
WWC-4A	Mesa Ave.	River Park Dr. to Cuyamaca St.	18	21	Replace	900
WWC-4B	Cuyamaca St	Runs parallel to northbound Cuyamaca	18	21	Replace	170
WWC-4C	Abbeyfield Rd	Cuyamaca St to west of Nicole way	18	24	Replace	2,700
WWC-4D	Between Abbeyfield Rd and Mission Creek Dr	Between Abbeyfield Rd and Mission Creek Dr (south of Abbeyfield Rd)	18	24	Replace	150
WWC-4E	Between Abbeyfield Rd and Mission Creek Dr	Between Abbeyfield Rd and Mission Creek Dr (north of Mission Creek Dr)	21	24	Replace	100
WWC-4F	Mission Creek Dr	Northeast of Rock Glen Way toWintercreek Pl	21	24	Replace	660
WWC-4G	Wintercreek Pl	Mission Creek Dr to end of cul-de sac	21	24	Replace	340
WWC-4H	Mast Park & Disc Golf Course	Near west end of Wintercreek Pl cul-de-sac to Carlton Oaks Dr	18	24	Replace	440
Project WWC-5: Mission Gorge Sewer						
WWC-5A	Mission Gorge Rd	4th St to Cottonwood Ave	8	12	Replace	350
WWC-5B	Cottonwood Ave	Across Mission Gorge Rd	8	12	Replace	80
WWC-5C	Mission Gorge Rd	Cottonwood Ave to Tamberly Way	10	15	Replace	2,700
Project WWC-6: Magnolia Avenue Sewer						
WWC-6A	Graves Ave	East Bradely Ave to north entrance of Countryside Village Apts	8	10	Replace	900
WWC-6B	San Vicente Fwy	San Vicente Fwy Crossing	8	12	Replace	700
WWC-6C	Magnolia Ave	North of Denny Way to south of Airport Drive	10	12	Replace	530
WWC-6D	Between Magnolia ave and Wind Ave	N. Magnolia Ave to Wing Ave	10	12	Replace	780
Lift Stations						
WWC-13	Fanita Ranch	Fanita Ranch pump station	--	--	New	--
Rehabilitation/Replacement Related CIPs						
WWR-2	6-inch Pipeline Rehabilitation/Replacement	Pipeline Rehabilitation/Replacement Program[4]	6	6	Replace	27,100
WWR-3	8-inch Pipeline Rehabilitation/Replacement	Pipeline Rehabilitation/Replacement Program[4]	8	8	Replace	18,200
WWR-4	10-inch Pipeline Rehabilitation/Replacement	Pipeline Rehabilitation/Replacement Program[4]	10	10	Replace	2,200
WWR-5	12-inch Pipeline Rehabilitation/Replacement	Pipeline Rehabilitation/Replacement Program[4]	12	12	Replace	500
WWR-6	14-inch Pipeline Rehabilitation/Replacement	Pipeline Rehabilitation/Replacement Program[4]	14	14	Replace	100
WWR-7	15-inch Pipeline Rehabilitation/Replacement	Pipeline Rehabilitation/Replacement Program[4]	15	15	Replace	1,700
WWR-8	16-inch Pipeline Rehabilitation/Replacement	Pipeline Rehabilitation/Replacement Program[4]	16	16	Replace	200
WWR-9	18-inch Pipeline Rehabilitation/Replacement	Pipeline Rehabilitation/Replacement Program[4]	18	18	Replace	200
WWR-10	21-inch Pipeline Rehabilitation/Replacement	Pipeline Rehabilitation/Replacement Program[4]	21	21	Replace	150
WWR-11	24-inch Pipeline Rehabilitation/Replacement	Pipeline Rehabilitation/Replacement Program[4]	24	24	Replace	250
WWR-12	30-inch Pipeline Rehabilitation/Replacement	Pipeline Rehabilitation/Replacement Program[4]	30	30	Replace	50
WWR-13	Sewer Lift Station Rehabilitation	Sewer Lift Station Rehabilitation	--	--	Rehab	--
WWR-14	Sewer Manhole Rehabilitation	Sewer Manhole Rehabilitation	--	--	Rehab	--
WWR-15	Siphon and Sludge Main Improvements	Siphon and Sludge Main Improvements	--	--	Rehab	--

Project ID	Description		Existing Size	Proposed Size	Replace/ New	Quantity
Other Related CIPs						
WWO-1	AWP Sewer Projects Participation	AWP Sewer Projects Participation	--	--	Misc	--
WWO-2	County Trunk Sewer Participation	County Trunk Sewer Participation	--	--	Misc	--
WWO-3	Access Control, Security & Fire System Maint & Monitoring	Access Control, Security & Fire System Maint & Monitoring	--	--	Misc	--
WWO-4	HVAC Improvement	HVAC Improvement	--	--	Misc	--
WWO-5	Site Paving As Needed	Site Paving As Needed	--	--	Misc	--
WWO-6	WRF Decommissioning	WRF Decommissioning	--	--	Misc	--
WWO-7	WRF Mechanical	WRF Mechanical	--	--	Misc	--
WWO-8	WRF Electrical	WRF Electrical	--	--	Misc	--
WWO-9	WRF Instrumentation	WRF Instrumentation	--	--	Misc	--
WWO-10	Energy Efficiency Projects	Energy Efficiency Projects	--	--	Misc	--
WWO-11	Ops Yard Phase 3 Improvements	Ops Yard Phase 3 Improvements	--	--	Misc	--


Legend
Proposed Collection System Improvements
Diversion Point
Lift Station
WWTP Water Recycling Facility
Trans-River Siphon
Modeled Force Main
8" and Smaller
10" and Larger
Modeled Gravity Main
6" and Smaller
8" - 10"
12" and Larger
Other Sewers
Metro (City of SD) Interceptor
Lakeside (County of SD) Interceptor
Wastewater Service Area
Miles
0
0.5
1
Data Sources: PDMWD, ESRI
Disclaimer: Features shown in this figure are for planning purposes and represent approximate locations. Engineering and/or survey accuracy is not implied.
Ray Stoyer WRF
WWTP
From San Diego County Sanitation District
WWC-1
WWC-2
WWC-3
WWC-4
WWC-5
WWC-6
21"/24"
12"/15"
10"/12"
IPS
Mission Creek LS
Carlton Hills Diversion Structure
Walmart Diversion Structure
Town Center Diversion
Cottonwood Diversion Structure
Mission Gorge LS
Woodside Ave LS
High Rise Way LS
Sky Ranch LS
MAST
EL NOPAL
RIVERFORD
RIVERSIDE
LAKESIDE
CHANNEL
WINTER GARDENS
MAGNOLIA
WEST HILLS
MISSION GORGE
JACKSON
NAVAJO
LAKE MURRAY
FANITA
CUYAMACA
MARSHALL
JOHNSON
BRADLEY
VERNON
FLETCHER
BALLANTYNE
GREENFIELD
BROADWAY
PEPPER
1ST
2ND
MAIN
52
67
125

6.3.1 Collection System Capacity Improvements

For the majority of the District, the existing wastewater collection system contains sufficient capacity to convey the PWWF without exceeding capacity criteria discussed in Chapter 5. The analysis showed that there are no deficiencies under dry-weather conditions, but there are six alignments in the gravity sewer collection system that requires upsizing to address capacity deficiencies under PWWF conditions. These sewers will need to be replaced by larger diameter sewers, or parallel sewers will need to be constructed to bypass flow around hydraulically deficient sewers. The decision on whether to upsize or parallel a particular sewer should be confirmed during the preliminary design of each proposed project, based on the condition of the existing pipeline, pipeline velocities during DWF conditions, pipeline slopes, and other relevant factors. The capital improvement projects are shown on Figure 6.8 and referenced in Table 6.4. Project upgrades range in size from 8 inches in diameter to 30 inches in diameter. The majority of the proposed capacity projects require replacing existing pipelines with larger diameter sewers. The following summarizes the purpose and locations of existing facilities that would need to be upgraded in order to accommodate existing and future PWWFs:

- **Carlton Hills Sewer (Project WWC-1):** This project is located near where Carlton Hills Boulevard ends and the future Fanita Ranch development will begin. Based on PWWF modeling conditions, it is recommended that the 6-inch diameter pipeline in Carlton Hills Boulevard be replaced with an 8-inch diameter sewer. An approximate length of 700 feet is recommended for this project.
- **Carita Sewer (Project WWC-2):** This project replaces 260 linear feet (LF) of sewer and is located in the west side of Carita Road near Fanita Parkway and Carita Court. A new 10--inch diameter sewer line is proposed to replace the existing 8-inch diameter pipe.
- **Carlton Oaks Sewer (Project WWC-3):** This project extends approximately 1,650 feet across the Carlton Oaks Golf Club course from Willowgrove Avenue to the intersection of Calle del Verde and Carlton Oaks Drive (Manhole 3001). Improvements include replacing the existing 24-inch diameter sewer with a 30-inch diameter sewer from Willowgrove Avenue to Calle del Verde.
- **Town Center Sewer (Project WWC-):** This project with approximately 5,460 feet of pipeline extends from west of River Park Drive (in the Town Center Park), north on Cuyamaca Street, west on Abbeyfield Road, south onto Mission Creek Drive and then west onto Wintercreek Place, terminating at Carlton Oaks Drive. On River Park Drive and a segment of Cuyamaca Street, a 21-inch diameter sewer line will replace the existing 18-inch diameter sewer pipes. On Abbeyfield Road from Cuyamaca Street to west of Nicole Way, the existing 18-inch diameter sewer line should be replaced with a 24-inch diameter sewer line. Between Abbeyfield Road and Mission Creek Drive and extending southeast onto Wintercreek Place, the existing 18-inch/21-inch diameter sewer line will be replaced by a 24-inch diameter line. Additionally, a short reach of existing 18-inch sewer main located on the east end of the Wintercreek Place cul-de-sac extending to Carlton Oaks Drive should be replaced with a 24-inch diameter main.
- **Mission Gorge Sewer (Project WWC-5):** This project with approximately 3,130 feet of pipeline is recommended for replacement. This recommended replacement section is in Mission Gorge Road extending from 4th Street to Riverview Parkway. The eastern reach is an existing 8-inch diameter pipe, which should be replaced with a 12-inch diameter

pipeline. The western reach is an existing 10-inch diameter pipe that should be replaced by a 15-inch diameter pipe.

- **Magnolia Avenue Sewer (Project WWC-6):** This project is broken into three reaches, the southern reach (WWC-6A), the eastern reach (WWC-6B), and the northern reach (WWC-6C and WWC-6D). This project extends from Graves Avenue at the southern intersection with East Bradley Avenue, north to the northern end of Countryside Village Apartments, west under SR-67, north along North Magnolia Avenue to Ferguson Fire and Fabrication, and then west to Wing Avenue.

  The southern reach has an existing 8-inch diameter sewer line that should be replaced with a 10-inch diameter line. The eastern reach also has an existing 8-inch diameter sewer line that should be replaced by a 12-inch diameter line. Lastly, the northern reach has an existing 10-inch diameter sewer line that should be replaced by a 12-inch diameter line. This project will include 2,910 feet of new pipeline to replace the existing sewer lines.

6.3.2 Rehabilitation and Repair Projects

As described in the CFMP, approximately 95.0 miles of pipeline were targeted for rehabilitation or replacement. Of the 95.0 miles, approximately 90 percent (451,500 feet) consisted of 6-inch and 8-inch diameter pipe. While the BAM model provided a good budgetary planning estimate of possible costs, when all the pipes are determined to have reached their useful life, each segment should be inspected with closed-circuit television (CCTV), or the District's CCTV database should be referenced before any pipeline replacement or rehabilitation occurs. Not all pipelines that have reached their useful life will ultimately require rehabilitation or replacement based solely on pipe age. Based on the results of the CCTV evaluation conducted in 2015, it was estimated that approximately 10-percent of the pipelines targeted for rehabilitation or replacement would require projects to be implemented. Costs associated with the R&R program are presented in Chapter 9 and use the assumption that approximately 10-percent of the 95 miles of sewer would need to be rehabilitated or replaced within the planning period. Gravity sewer rehabilitation and repair projects are identified by the project's IDs of WWR-2 through WWR-12 and referenced in Table 6.4.

The County of San Diego Sanitation District currently has an improvement project referred to as "County San Diego River Basin Sewer Improvements." This project aims to improve the existing trunk sewer system that is located in the District's service area. The District is coordinating with the County on this improvement project since the facilities are jointly owned and the improvement costs will be funded by both agencies.

Three additional rehabilitation and repair related projects that have been included in the District budget are listed below and referenced in Table 6.4:

- Ongoing Sewer Lift Station Rehabilitation (Project WWR-12).
- Ongoing Sewer Manhole Rehabilitation (Project WWR-13).
- Siphon and Sludge Main Improvements (Project WWR-14).

6.3.3 Other Projects

This section lists the additional projects identified by the District as planned projects and referenced in Table 6.4.

- AWP Sewer Projects Participation (Project WWO-1).
- County Trunk Sewer Participation (Project WWO-2).
- Access Control, Security & Fire System Maintenance & Monitoring (Project WWO-3).
- HVAC Improvement (Project WWO-4).
- Site Paving as Needed (Project WWO-5).
- WRF Decommissioning (Project WWO-6).
- WRF Mechanical (Project WWO-7).
- WRF Electrical (Project WWO-8).
- WRF Instrumentation (Project WWO-9).
- Energy Efficiency Projects (Project WWO-10).
- Operations Yard Phase 3 Improvements (Project WWO-11).

6.4 Project Prioritization

All the capacity improvements listed in the previous section are related to existing PWWF conditions, with future growth having a minimal effect on the system. When fully implemented, the capital projects identified will allow for the collection system to reliably convey PWWFs through fiscal year (FY) 2045. Prioritizing the required capital improvements for the District's sewer system is an important aspect of this study. The improvement projects were prioritized based on the following factors:

- Upgrading existing facilities to mitigate current capacity deficiencies.
- Phasing projects according to the severity of the capacity deficiency (i.e., the relative impact of the deficiency on HGL of the system upstream of the deficiency.
- Planning for pipeline rehabilitation projects based on remaining useful life.

Based on these factors, each project was categorized as either a "near-term" or "long-term" project. Near-term projects are targeted for implementation through FY 2032. Long-term projects are targeted for implementation from FY 2033 through FY 2045.

- **Near-Term Projects (Fiscal Years 2023-2032).** Improvements targeted for the near term include capacity-deficient sewers that should be replaced in the early stages of the District's CIP.
- **Long-Term Projects (Fiscal Years 2033-2045).** The second phase targets the gravity sewer R&R projects as described in the 2015 CFMP and Section 6.3.2.

Chapter 7

POTABLE WATER SYSTEM ANALYSIS

This chapter presents an overview of the changes to the District's existing and future potable water distribution systems, water supplies, and storage facilities. In this chapter, the changes since the 2015 CFMP to the water systems are identified and evaluated. Based on the system evaluation results, improvement projects identified in the 2015 CFMP to address the identified deficiencies are verified. This chapter is divided into the following sections:

- **Existing System Description.** This section discusses changes since the 2015 CFMP to facilities that make up the existing potable water system.
- **Existing System Analysis.** This section presents the findings and improvement recommendations for the water system under existing demand conditions.
- **Future System Analysis.** This section presents the findings and improvement recommendations for the water system under future demand conditions with the existing system recommendations in place.
- **Recommendations.** This section summarizes the improvement recommendations, which are prioritized and phased in the CIP described in Chapter 9 of this Master Plan Update.

7.1 Existing Water System

Currently, the potable water facilities that provide service to meet existing demands within the District's WSA and ESA includes three imported water connections, 29 water storage reservoirs, 13 potable water pump stations, 20 PRS, and approximately 400 miles of pipeline. Information regarding the existing water system is discussed in further detail in the 2015 CFMP, while changes to the system since 2015 are described in the section below.

In addition to the potable water distribution facilities, the El Capitan-San Diego CWA Interconnection facilities are utilized to convey water from the CWA No. 4 and CWA No. 6 connections to the WSA, ESA, and Lakeside Water District via an emergency connection. The interconnect facilities consist of the El Capitan pipeline and the Charles Price, Lakeview, and Los Coches Reservoirs. Prior to 2010, the interconnection facilities were referred to as wholesale facilities when the District wheeled water to Lakeside and Riverview Water Districts. Additionally, since 2015, the District added the ESA Secondary Connection, which is a new interconnect (CWA No. 7) from CWA into the ESA.

7.1.1 Pressure Zones

Water systems are typically divided into different hydraulic regions, known as pressure zones, to maintain adequate pressures throughout the distribution system due to varying topography. An HGL is established for each pressure zone, and the high water levels in reservoirs are set to maintain these HGLs. The District's service area ranges in ground elevation from approximately 300 feet above mean sea level (ft-msl) in the western portion of the service area to about 2,700 ft-msl in the eastern portion of the service area.

The District's distribution system is divided into 19 major pressure zones. The HGLs, reservoirs, pump stations, and PRS of each pressure zone are listed in Table 7.1. The WSA contains 6 of the 19 pressure zones, while the ESA contains the remaining 13 pressure zones. The distribution system is presented in Figure 7.1 and Figure 7.2.

Table 7.1 Existing Pressure Zones

Pressure Zone(1)	HGL (ft-msl)	Storage Reservoirs(2)	Pump Stations (Zone Inflow)(2)	PRS(3) (Zone Inflow)
WSA				
Gravity	629	Baron Klostermann(4) Carlton Hills(4) Cuyamaca Fletcher Hill Sunrise		
Sycamore	880	Magnolia Summit	Cuyamaca	
Grossmont	900	Grossmont	Grossmont	
Northcote	884	Northcote	Northcote	
Sky Ranch 1180	1180	Sky Ranch	Sky Ranch	
Sky Ranch 1020	1,020			Sky Ranch
ESA				
Blossom Valley	1,054	Blossom Valley East County Square	El Capitan ESA Secondary Connection	
Mountain Top	1,446	Mountain Top	Rios Canyon	
Chocolate Summit	1,447	Chocolate Summit Galloway Valley(4)	Flinn Springs	
Harbison Canyon	1,173			Harbison Canyon Almyra
Dehesa Valley	776			Sycuan
Alpine West	1,755			South Grade Alpine Trails
Oak Creek	1,785	Oak Creek	Oak Creek	
West Victoria	2,050	Alpine Heights West Victoria	Arnold Way	
Alpine Pacific	2,287	Alpine Pacific	West Victoria	
Viejas Mountain	2,646	Viejas Mountain North(4) Viejas Mountain	East Victoria	Victoria Drive
East Victoria	2,287	East Victoria Spanish Bit(4)	Alpine	Via Dieguenos
La Cresta Heights South	1,785	Crest East Crest West La Cresta Heights	Mountain Top	Sage Mountain
Valley View	1,328			Shadow Mt. No. 1 La Cresta(4)

Notes:
(1) Table only includes major pressure zones and does not include sub zones within that major pressure zone.
(2) Does not include El Capitan - CWA Interconnection (three storage reservoirs and one pump station) and ESA Secondary Connection reservoir.
(3) Does not include PRS located within a major pressure zone.
(4) Facility is offline or inactive.

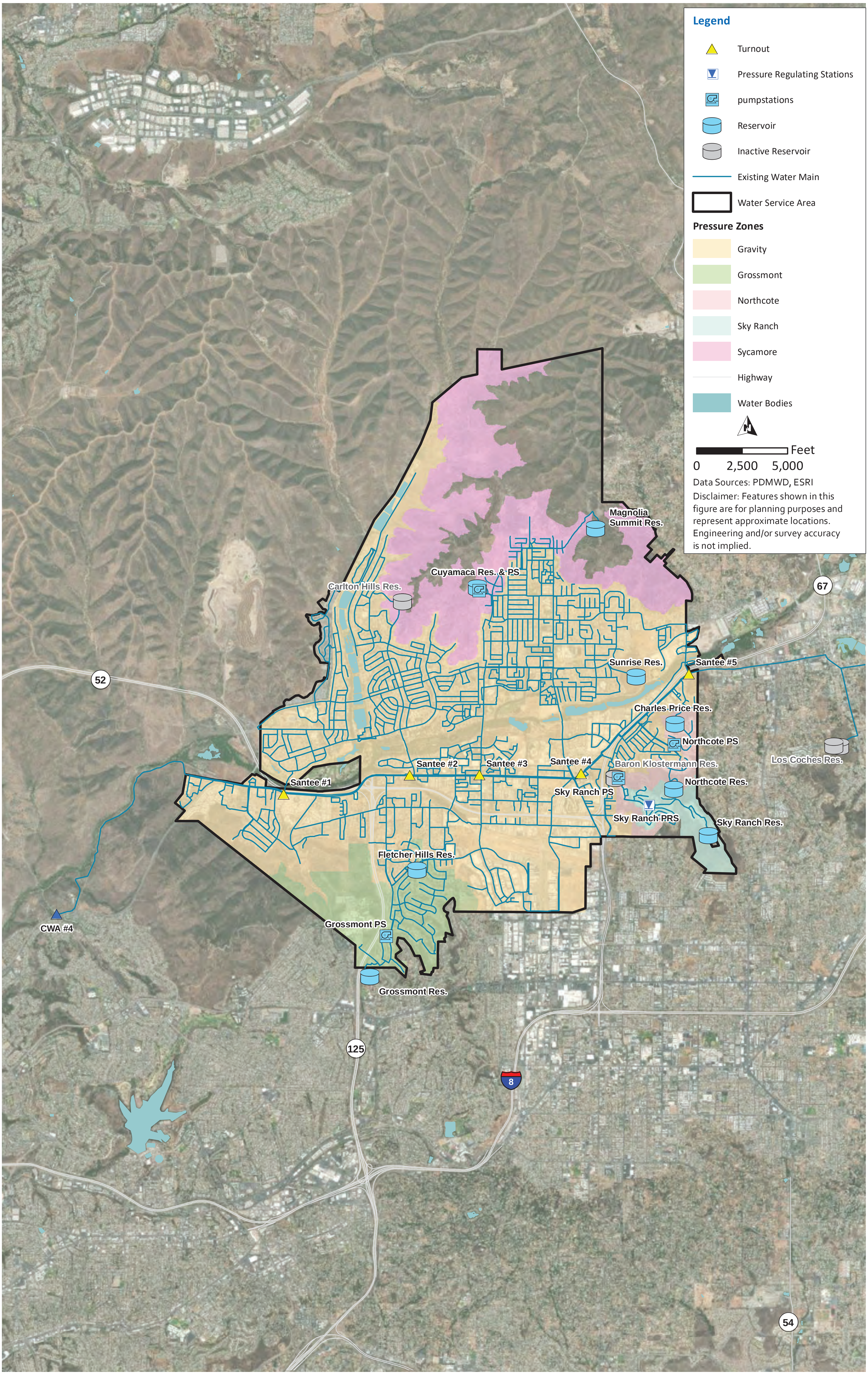


Figure 7.1 Existing Distribution System - WSA

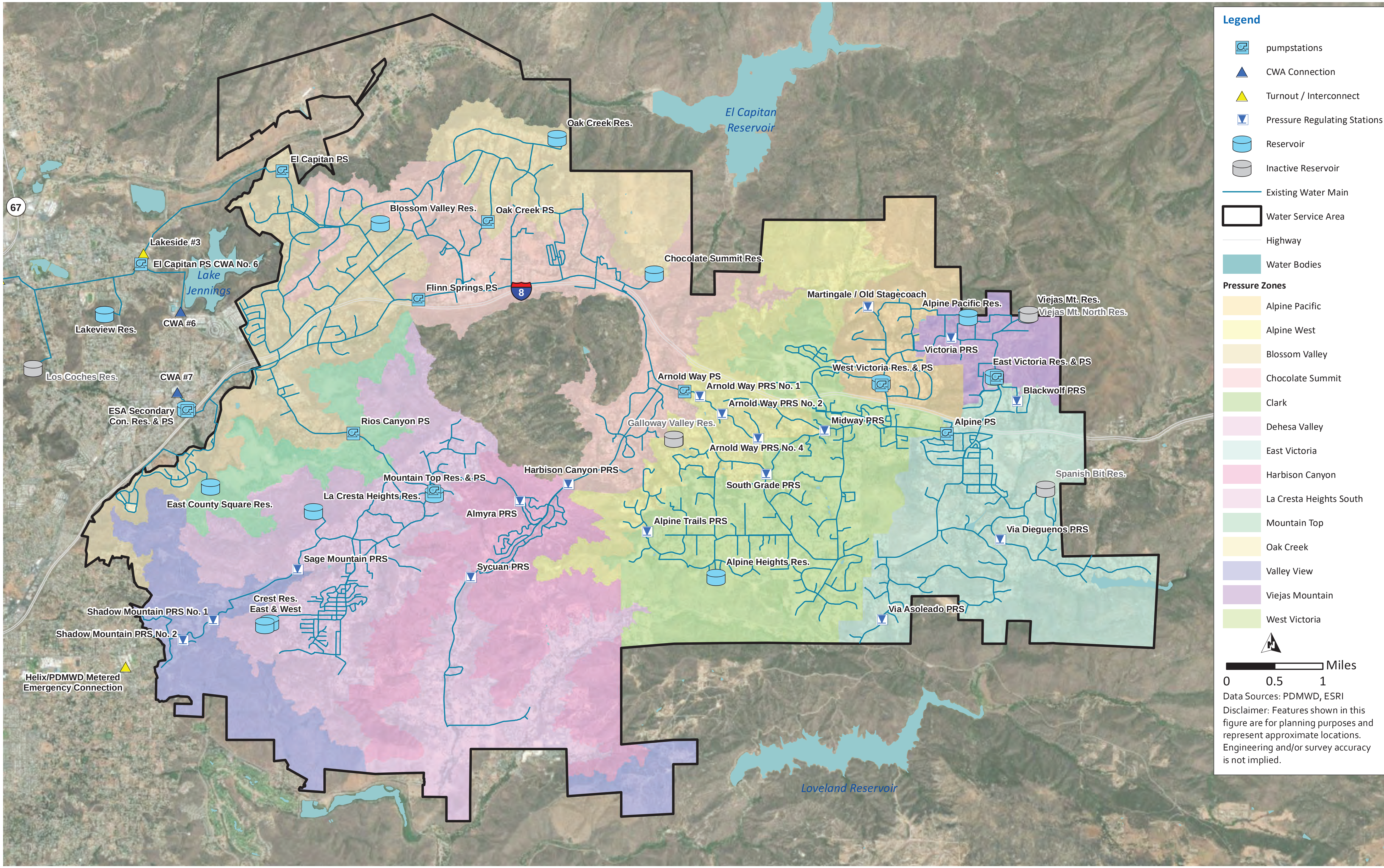


Figure 7.2 Existing Distribution System - ESA

The existing (2019) water demands within each zone are presented in Table 7.2. As shown in Table 7.2 the majority (61.5 percent) of the District's existing demand is in the WSA despite the much smaller service area. The gravity zone has the highest demand of all 19 zones with 4.4 mgd, which equates to 54.5 percent of the District's system-wide demand. A hydraulic profile of the existing water distribution system in the WSA and ESA is shown on Figure 7.3 and Figure 7.4. These hydraulic profiles illustrate hydraulic connectivity of the distribution system facilities in each pressure zone as well as the ground elevation of zone boundaries and system facilities.

Table 7.2 Existing Major Pressure Zone Demands

Name	2019 ADD (mgd)(1)	2019 MDD (mgd)(2)	Percentage of Total Demand (%)	2012 ADD (mgd)(3)	ADD Difference between 2012 and 2019 (mgd)	Percent Difference (%)
WSA						
Gravity	4.44	7.55	54.5%	5.13	-0.69	-13.5%
Grossmont	0.29	0.50	3.6%	0.40	-0.11	-27.5%
Northcote	0.06	0.10	0.7%	0.09	-0.03	-33.3%
Sky Ranch 1020	0.09	0.16	1.1%	n/a	0.09	n/a
Sky Ranch 1180	0.03	0.05	0.4%	0.14	-0.11	-78.6%
Sycamore	0.10	0.17	1.2%	0.14	-0.04	-28.6%
Subtotal WSA	**5.01**	**8.52**	**61.5%**	**5.90**	**-0.89**	**-15.1%**
ESA						
Alpine Pacific	0.12	0.20	1.5%	0.18	-0.06	-33.3%
Alpine West	0.06	0.10	0.7%	0.13	-0.07	-53.8%
Blossom Valley	0.55	0.94	6.8%	1.07	-0.52	-48.6%
Chocolate Summit	0.43	0.72	5.2%	0.58	-0.15	-25.9%
Dehesa Valley	0.18	0.31	2.2%	0.08	0.10	125.0%
East Victoria	0.38	0.65	4.7%	0.53	-0.15	-28.3%
Harbison Canyon	0.07	0.12	0.9%	0.09	-0.02	-22.2%
La Cresta Heights South	0.27	0.47	3.4%	0.35	-0.08	-22.9%
Mountain Top(4)	<0.01	<0.01	<0.1%	<0.01	<0.01	<0.1%
Oak Creek	0.14	0.23	1.7%	0.18	-0.04	-22.2%
Valley View	0.05	0.08	0.6%	0.06	-0.01	-16.7%
Viejas Mountain	0.08	0.13	0.9%	0.08	0.00	0.0%
West Victoria	0.81	1.38	10.0%	0.95	-0.14	-14.7%
Subtotal ESA	**3.14**	**5.33**	**38.5%**	**4.28**	**-1.14**	**-26.6%**
Total	**8.15**	**13.86**	**100%**	**10.18**	**-2.03**	**-19.9%**

Notes:
(1) 2019 average annual demand allocated in the model from billing data with 4-percent water loss included which is discussed in Chapter 3 of this Master Plan Update.
(2) Existing ADD multiplied by MDD peaking factor of 1.7.
(3) 2012 average annual demand allocated in the model from billing data with a 2.6-percent water loss included.
(4) There is only one customer within the Mountain Top Zone.

7.1.2 Pipelines

The District's distribution system consists of almost 400 miles of pipeline ranging from 1-inch to 60-inches in diameter. Most of the pipes less than 3-inches are distribution lines in the Santee Lakes Park, piping to appurtenances, and yard piping. Some are laterals serving two to three customers. Table 7.3 presents a breakdown of pipelines by diameter and material. Figure 7.6 is graphically depicts the pipelines by material type.

Table 7.3 Potable Water Pipeline Length by Diameter and Material Type(1)(2)

Diameter (inches)	ACP Length (miles)	PVC Length (miles)	CCP Length (miles)	CMLC Length (miles)	Other (various materials) Length (miles)	Total (miles)
< 6	6.0	3.9	0.0	0.1	0.0	9.9
6	37.8	4.7	0.0	0.1	0.0	42.7
8	95.4	51.9	0.0	1.0	0.3	148.6
10	54.9	27.5	0.0	2.4	0.1	85.0
12	23.1	14.8	0.1	1.3	0.5	39.8
14	13.5	1.5	0.0	0.2	0.2	15.4
16	2.8	8.8	1.4	0.8	0.6	14.4
18	2.4	0.9	0.0	0.6	0.2	4.1
20	0.2	0.7	4.5	2.0	0.0	7.5
24	0.0	0.1	1.7	0.2	0.0	2.1
27	0.0	0.0	1.3	0.0	0.0	1.3
30	0.0	0.0	2.5	0.5	0.0	3.1
33	0.0	0.4	2.0	0.0	0.0	2.4
36	0.0	0.1	1.2	11.4	0.0	12.7
42	0.0	0.0	0.0	1.0	0.0	1.0
48	0.0	0.0	0.0	0.1	0.0	0.1
60	0.0	0.0	0.0	1.3	0.0	1.3
Total	**236.1**	**115.3**	**14.7**	**23.1**	**1.9**	**391.1**

Notes:
Abbreviation: CMLC = cement mortar lined and coated steel.
(1) Source: PDMWD's GIS database.
(2) All lengths are rounded to the nearest tenth of a mile.

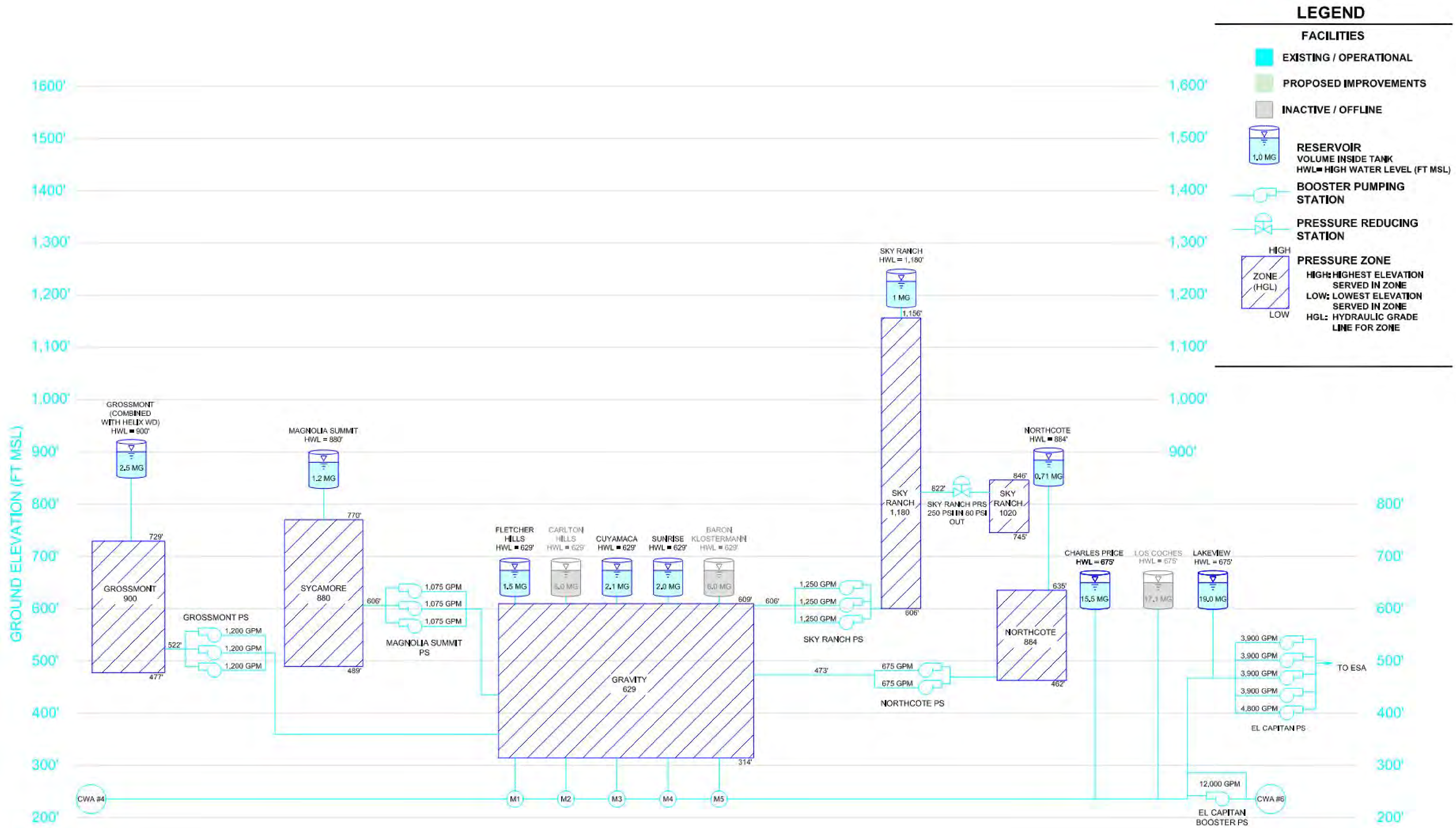


Figure 7.3 Existing Potable Water System Hydraulic Profile - WSA

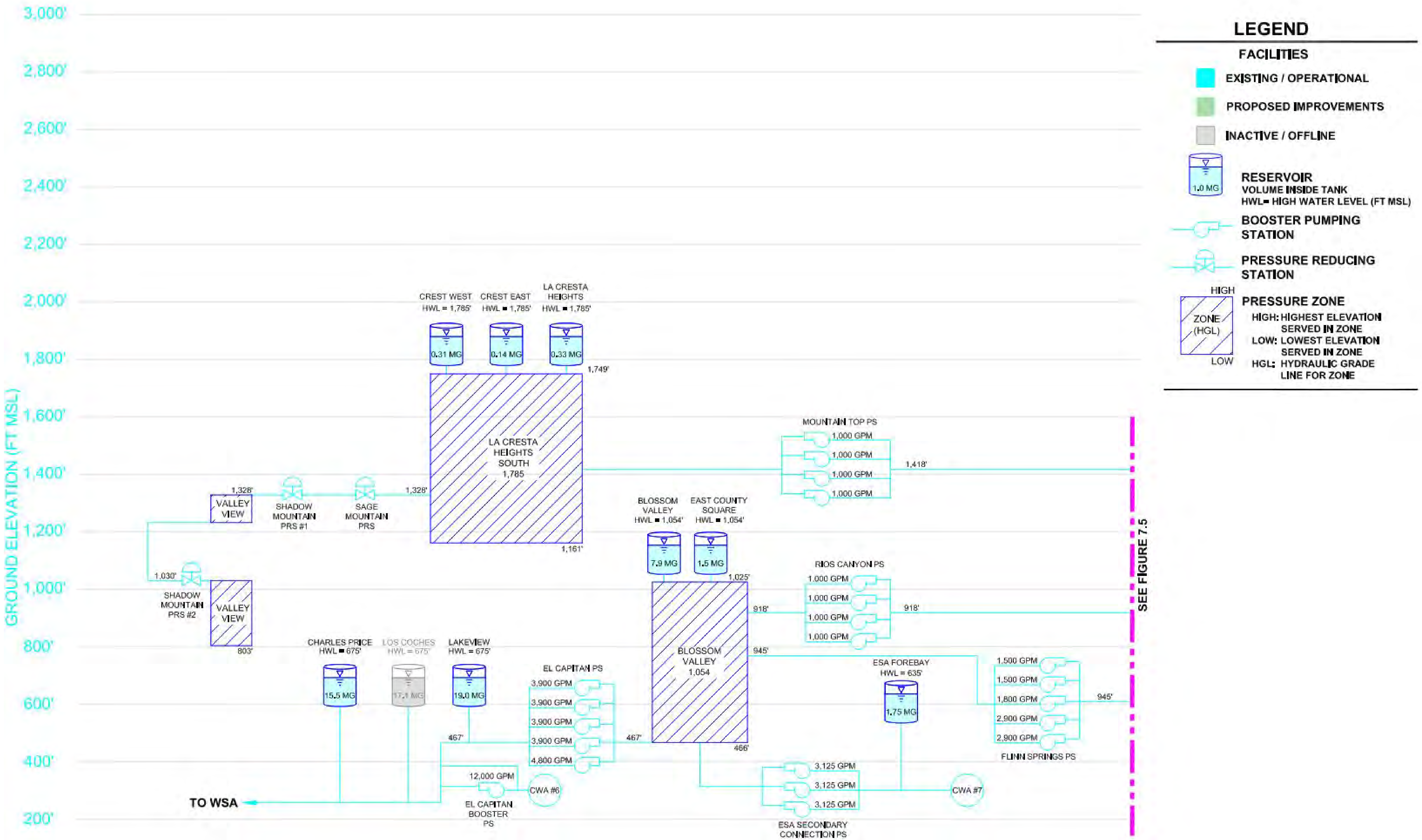


Figure 7.4 Existing Potable Water System Hydraulic Profile - ESA

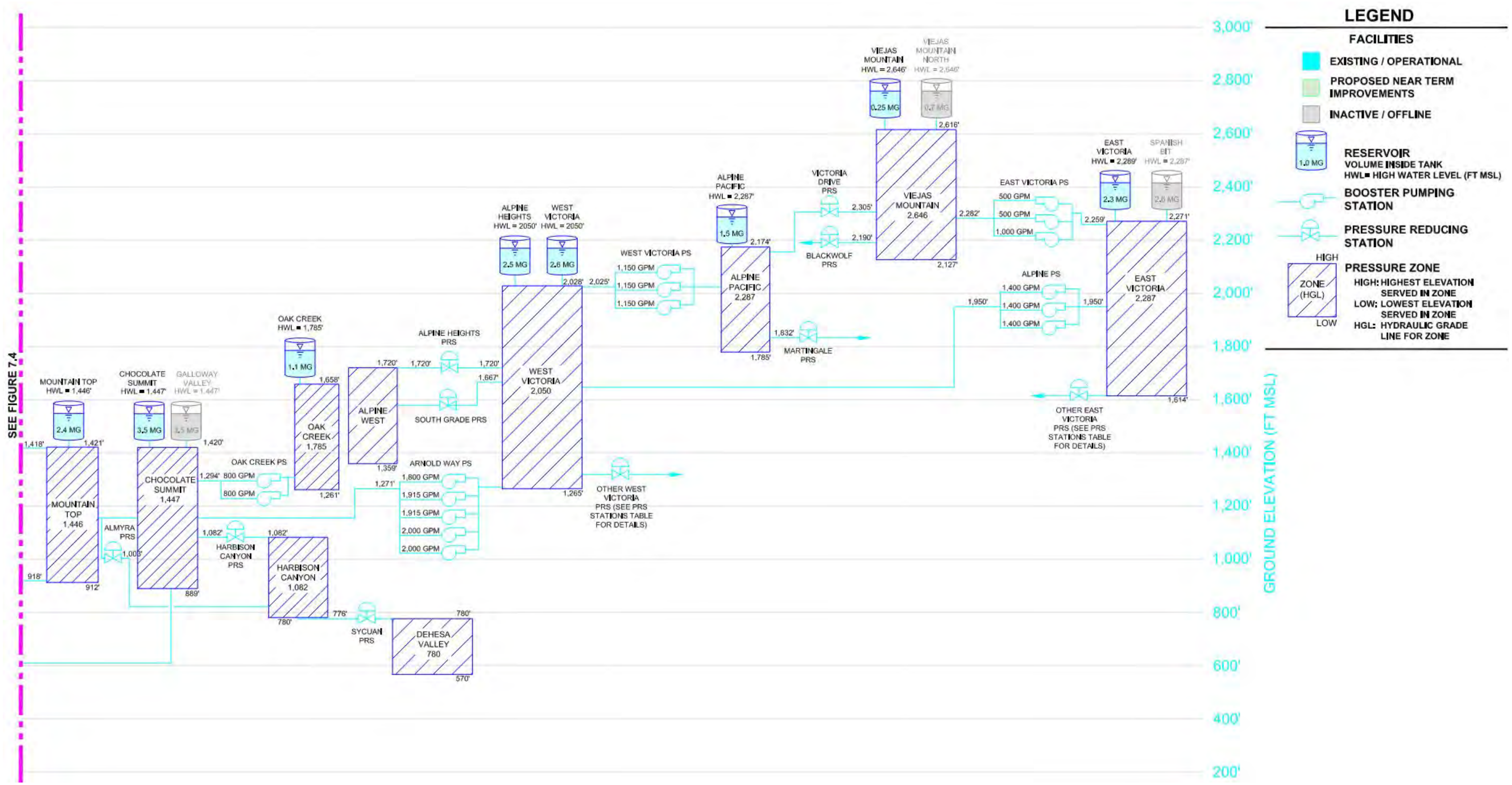


Figure 7.5 Existing Potable Water System Hydraulic Profile - ESA

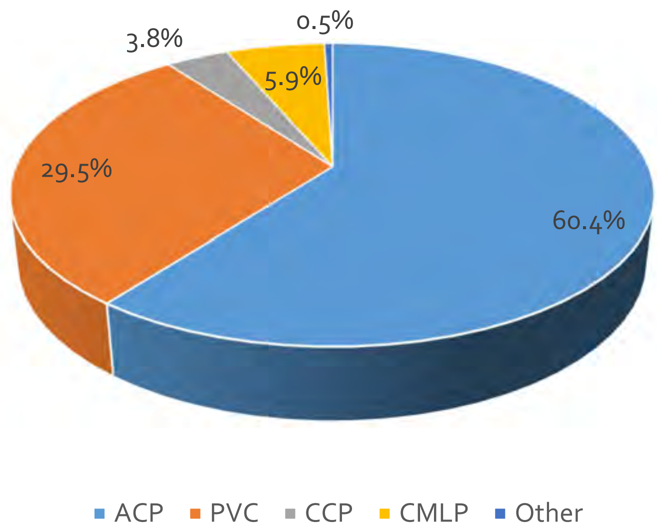


Figure 7.6 Potable Water Pipelines by Material Type

The pipeline length distribution by installation year and material is summarized in Table 7.4 and depicted on Figure 7.7. According to the District's GIS database, which was used for these summaries, approximately 23 percent of the potable water distribution pipelines were installed prior to 1971. The system was then expanded rapidly in the subsequent decades, adding approximately 60 percent of the existing potable water pipelines from 1971 through 2000.

Table 7.4 Potable Water Pipelines Length by Installation Year and Material Type(1)(2)(3)

Diameter (in)	ACP Length (miles)	PVC Length (miles)	CCP Length (miles)	CMLC Length (miles)	Other Length (miles)	Total (miles)
1950 and prior	0.0	0.0	0.0	5.6	0.0	5.6
1951-60	33.7	1.5	0.0	0.0	0.0	35.2
1961-70	38.1	2.0	11.3	1.3	0.0	52.8
1971-80	88.3	4.0	3.2	7.2	0.6	103.3
1981-90	60.6	10.8	0.2	2.5	0.0	74.2
1991-00	13.2	39.8	0.0	3.9	0.1	57.1
2001-10	1.6	40.5	0.0	0.3	0.5	42.9
2011-20	0.0	16.0	0.0	2.0	0.7	18.7
Unknown	0.6	0.7	0.0	0.1	0.0	1.4
Total	**236.1**	**115.3**	**14.7**	**23.1**	**1.9**	**391.1**

Notes:
(1) Source: PDMWD's GIS database.
(2) Installation year based on construction plan signature date from PDMWD.
(3) All lengths are rounded to the nearest tenth of a mile.

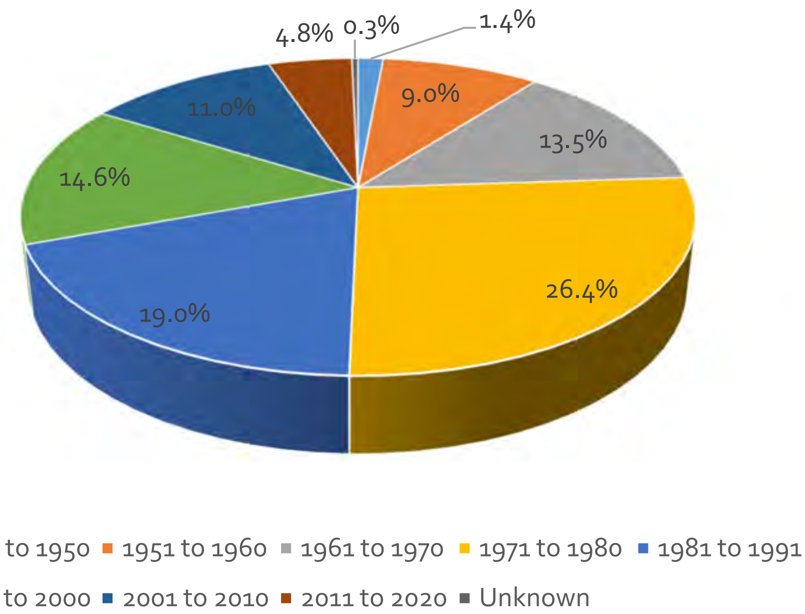


Figure 7.7 Potable Water Pipelines by Installation Year

7.1.3 Booster Pump Stations

The District's potable water distribution system contains 15 potable water pump stations that move water between pressure zones. One pump station delivers flow from CWA No. 6 to the El Capitan-CWA Interconnect, 4 pump stations are located within the WSA, and 10 pump stations are located within the ESA. Table 7.5 summarizes the capacity of each pump station and locations are shown on Figure 7.1 and Figure 7.2.

Table 7.5 Potable Water Pump Stations(1)

Name	From Zone	To Zone	Total Capacity (gpm)	Firm Capacity(2) (gpm)
WSA				
Grossmont Pump Station	Gravity	Grossmont	3,600	2,400
Northcote Pump Station	Gravity	Northcote	1,350	675
Sky Ranch Pump Station	Gravity	Sky Ranch	3,750	2,500
Cuyamaca Pump Station (Magnolia)	Gravity	Sycamore	3,225	2,150
ESA				
Alpine Pump Station No. 5	West Victoria	East Victoria	4,200	2,800
Arnold Way Pump Station No. 4	Chocolate Summit	West Victoria	9,630	7,630
East Victoria Pump Station No. 6	East Victoria	Viejas Mountain	2,000	1,000

Name	From Zone	To Zone	Total Capacity (gpm)	Firm Capacity[(2)] (gpm)
El Capitan Pump Station No. 1	El Capitan-CWA Interconnect System	Blossom Valley	20,400	15,600
ESA Secondary Connection Pump Station	CWA No. 7	Blossom Valley	9,375	6,250
Flinn Springs Pump Station No. 3	Blossom Valley	Chocolate Summit [(4)]	10,600	7,700
Mountain Top Pump Station No. 7	Mountain Top	La Cresta Heights	4,000	3,000
Oak Creek Pump Station No. 8	Chocolate Summit	Oak Creek	1,600	800
Rios Canyon Pump Station No. 2	Blossom Valley	Mountain Top [(4)]	4,000	3,000
West Victoria Pump Station No. 9	West Victoria	Alpine Pacific	3,450	2,300
El Capitan-CWA Interconnect Pump Station				
El Capitan Booster Pump Station No. 6[(3)]	CWA No. 6	El Capitan-CWA Interconnect System	12,000	0

Notes:
(1) Source: PDMWD.
(2) Firm Capacity is the pumping capacity with the largest pump out of service.
(3) 8,000 gpm flows by gravity from CWA No. 6 to the El Capitan CWA Interconnect system. El Capitan Booster Pump Station increases flow to 12,000 gpm.

7.1.4 Storage Reservoirs

Water distribution systems rely on stored water to help equalize fluctuations between supply and demand. The District has established storage criteria, which determines the storage required within each pressure zone so that there is adequate water supply available for firefighting, emergency, or unplanned outages of a major source of supply, and to meet demands. Currently, the District's water system has nine (9) reservoirs in the WSA, 16 reservoirs in the ESA, and four (4) terminal storage reservoirs along the El Capitan-CWA Interconnect. The Mountain View Connector Pipeline connects the Chocolate Summit and Mountain Top zones; however hydraulic improvements need to be made to fully move flow from one zone to the other. Detailed information for each potable water reservoir is summarized in Table 7.6.

Table 7.6 Potable Water Storage Reservoirs

Name	Zone	HGL (feet)	Maximum Depth (feet)	Storage Volume (MG)
WSA				
Baron Klostermann[(1)]	Gravity	629	24	6.00
Carlton Hills[(1)]	Gravity	629	24	6.00
Cuyamaca	Gravity	629	24	2.10

Name	Zone	HGL (feet)	Maximum Depth (feet)	Storage Volume (MG)
Fletcher Hills	Gravity	629	24	1.50
Sunrise	Gravity	629	24	2.00
Magnolia Summit	Sycamore	880	29	1.20
Northcote	Northcote	884	24	0.71
Grossmont	Grossmont	900	20	2.50
Sky Ranch	Sky Ranch	1,180	30	1.00
WSA Subtotal				23.01
WSA Active Subtotal				11.01
ESA				
Blossom Valley	Blossom Valley	1,054	27	7.90
East County Square	Blossom Valley	1,054	27	1.50
Mountain Top	Mountain Top	1,446	26	2.40
Chocolate Summit	Chocolate Summit	1,447	25	3.50
Galloway Valley (1)	Chocolate Summit	1,447	27	3.50
Crest East	La Cresta Heights South	1,785	9	0.14
Crest West	La Cresta Heights South	1,785	14	0.31
La Cresta Heights (Jerry Johnson)	La Cresta Heights South	1,785	14	0.33
Oak Creek	Oak Creek	1,785	26	1.10
Alpine Heights	West Victoria	2,050	25	2.50
West Victoria	West Victoria	2,050	25	2.60
Alpine Pacific	Alpine Pacific	2,287	27	1.50
East Victoria	East Victoria	2,287	27	2.30
Spanish Bit(1)	East Victoria	2,287	27	2.60
Viejas Mountain	Viejas Mountain	2,646	29	0.25
Viejas Mountain North(1)	Viejas Mountain	2,646	25	0.70
ESA Subtotal				33.13
ESA Active Subtotal				26.33
Total District Storage				**56.14**
Total District Active Storage				**37.34**
El Capitan-CWA Interconnect				
Lakeview	El Capitan-CWA Interconnect	675	25	19.0
Los Coches(1)	El Capitan-CWA Interconnect	675	25	17.1
Charles Price	El Capitan-CWA Interconnect	675	25	15.5
ESA SCP Forebay	CWA No. 7	635		1.75
El Capitan-CWA Interconnect Subtotal				53.35

Name	Zone	HGL (feet)	Maximum Depth (feet)	Storage Volume (MG)
Total Storage				**109.49**
Total Active Storage				**73.59**

Notes:
(1) Facility is offline or inactive,

As shown in Table 7.6, the District has 56 MG of effective storage volume. The majority of this is in the ESA, with 33 MG of storage (59 percent of total), while the remaining 23 MG (41 percent) of storage is located in the WSA. In addition to the effective storage, 53 MG of terminal storage is available along the El Capitan-CWA Interconnect. The terminal storage reservoir capacity equates to approximately 49 percent of the effective storage capacity.

The District's demands have decreased since 2007 and the system requires active management to maintain water quality. For these reasons, the District only operates approximately 67 percent (37 MG) of their total available storage.

7.1.5 Pressure Reducing Stations

PRS allow distribution systems to transfer water from higher pressure zones to lower pressure zones without exceeding the allowable pressures in the lower zones or completely draining the pressure out of the higher zone. Water is transferred through a valve that reduces the pressure to a specified pressure setting (pressure-reducing feature), while maintaining the pressure in the upper pressure zones (pressure-sustaining feature).

The pressure-sustaining feature prevents transfer of water into the lower pressure zone if the pressure in the upper zone drops below a certain level. This helps prevent a problem or emergency in the upper pressure zone from draining too much water into the lower pressure zone.

The District utilizes PRS that transfer water between pressure zones as shown on the hydraulic profile drawings. The characteristics of the PRS are summarized in Table 7.7, while their locations are depicted on Figure 7.1 and Figure 7.2.

Table 7.7 Existing Pressure Reducing Stations

Name	From Zone	To Zone	No. of Valves	Valve Sizes	Pressure Setpoint
WSA					
Sky Ranch	Sky Ranch HGL 1,180’	Sky Ranch HGL 1,020’	1	6	80
ESA					
Almyra	Mountain Top	Harbison Canyon	2	4; 8	103
Alpine Trails Road	West Victoria	Alpine West	1	12	27
Arnold Way No. 1	West Victoria	Reduced West Victoria	3	8; 2; 3	125
Arnold Way No. 2	West Victoria	Reduced West Victoria	3	6; 2; 3	80

Name	From Zone	To Zone	No. of Valves	Valve Sizes	Pressure Setpoint
Arnold Way No. 3	West Victoria	Reduced West Victoria	3	6; 2; 3	N/A
Arnold Way No. 4	West Victoria	Reduced West Victoria	2	8; 2	100
Blackwolf	Viejas Mountain	Reduced Viejas Mountain	4	6; 2; 0.75; 4	116
Harbison Canyon	Chocolate Summit	Harbison Canyon	4	8; 4; 2; 4	40
Martingale/Old Stagec oach	Alpine Pacific	Reduced Alpine Pacific	4	6;3;1;3	80
Midway Drive	West Victoria	Reduced West Victoria	2	6; 2	45
Via Asoleado (Palo Verde)	East Victoria	Reduced East Victoria	3	8; 2; 6	60
Sage Mountain	La Cresta Heights	Reduced La Cresta Heights	2	2; 8	54
Shadow Mountain No. 1	La Cresta Heights	Valley View	3	8; 2; 6	40
Shadow Mountain No. 2	Valley View	Reduced Valley View	3	8; 2; 6	90
South Grade	West Victoria	Alpine West	3	8; 3; 4	45
Sycuan	Harbison Canyon	Dehesa Valley	5	8; 6; 2; 1; 3	60
Via Dieguenos	East Victoria	Reduced East Victoria	2	6; 2	55
Victoria Drive	Viejas Mountain	Reduced Viejas Mountain	2	6; 3	50

Notes:
(1) Source: PDMWD

7.2 Existing System Analysis

The goal of the existing system analysis is to evaluate the existing distribution system under various operating conditions utilizing the evaluation criteria described in Chapter 5 and the existing system demands listed in Table 7.2. The following analyses are described in this section:

- Existing Water Supply Analysis.
- Existing System Pressure Analysis.
- Existing Pipeline Velocity Analysis.
- Existing Fire Flow Analysis.
- Existing Storage Analysis.
- Existing Pump Station Analysis.

7.2.1 Existing Water Supply Analysis

Currently, 100 percent of the District's potable water system is supplied by the CWA No. 4, No. 6, and No. 7 connections. CWA No. 4 can supply up to 19 mgd, CWA No. 6 can supply up to 18 mgd, and CWA No. 7 can supply up to 12 mgd. CWA No. 4 and CWA No. 6 connections deliver water directly to the District's El Capitan-CWA Interconnect facilities, which convey water into the WSA and ESA. The CWA No. 7 connection delivers water to the ESA Secondary Connection Reservoir and is pumped through the Secondary Connection Pump Station to the Blossom Valley pressure zone.

The number of days of available storage in the District's distribution system was evaluated under three failure scenarios. The three scenarios evaluated are consistent with the 2015 CFMP. Since the District added a new CWA connection, the first scenario was updated to include all CWA connections. The scenarios evaluated include:

1. Failure of all three CWA connections.
   a. Supply would come only from District storage.
2. Failure of CWA No. 4 connection.
   a. WSA would be supplied by CWA No. 6 and ESA could be supplied by CWA No. 6 and/or No. 7.
3. Failure along the ESA transmission main (failure located east of the wholesale reservoirs and CWA No. 6).
   a. ESA would be supplied by CWA No. 7 only and WSA would be supplied by CWA No. 4 and No. 6. This scenario evaluated ESA only.

The District exchanges water with Helix Water District and Lakeside Water District through two emergency connections. As a result of a main pipe failure, the District has isolated a portion of the ESA system to replace pipelines and is currently using the Helix interconnect to supply the East County Reservoir. In 2020, approximately 84 AFY was transferred from Helix through the Camino Canada emergency interconnect. No transfers or exchanges were made to or from Lakeside Water District.

The District's 2014 Water Supply Reliability Analysis evaluated the impact of introducing local water supply flows from a future potential indirect potable reuse project. The three scenarios above also evaluated assuming potable reuse supply from the East County AWP project. The demand sets utilized for the analysis are as follows:

- 2019 ADD: 8.15 mgd.
- 2019 MDD: 13.86 mgd.
- 2019 MinDD: 3.26 mgd.

During the local emergency supply analysis without a local supply source, it is assumed that existing facilities are online, and that available water could be moved to any zone as needed except during Scenario 3. The evaluation assumptions are listed in Table 7.8.

Table 7.8 Local Emergency Supply Evaluation Assumptions

Assumption	MDD (mgd)	ADD (mgd)	MinDD (mgd)
Reservoir Levels at time of Failure (% full)	70%	40%	40%
Total Storage Available During Failure	Operating Storage + Emergency Storage		
2019 Demands			
WSA	8.52	5.01	2.00
ESA	5.33	3.14	1.26
Total	**13.86**	**8.15**	**3.26**
Helix Emergency Connection	0.7 mgd		
Emergency Rationing/Conservation during Failure	None		
Proposed Local Supply (District Flows Only)	3.57 mgd		

The results for the supply failure analysis without considering a local supply source are presented in Table 7.9.

Table 7.9 Existing System Supply Evaluation - Without Local Supply

Failure Scenario		Likelihood of Occurrence	Days of Service		
			MDD	ADD	MinDD
1	All Three CWA Connections Fail	Least Likely	5	5	11
2	CWA No. 4 Fails	Likely	Indefinite	Indefinite	Indefinite
3	ESA Transmission Main Fails	Most Likely	Indefinite	Indefinite	Indefinite

As shown in Table 7.9, if all of the District's CWA connections fail (Scenario 1) and, assuming the reservoirs are 70 percent full at the moment of failure, the District would be able to provide water service for five days under 2019 MDD conditions. If only CWA No. 4 fails (Scenario 2), then the District would be able to provide water service for an indefinite number of days under 2019 MDD conditions. For the third failure scenario, in which the ESA is only supplied by CWA No. 7, the District would be able to provide water service for an indefinite number of days under 2019 MDD conditions.

The previous evaluation presented in Table 7.9 was taken a step further through the introduction of a local drought-resistant supply project. For this analysis, it was assumed that the East County Advanced Water Purification (AWP) project would be implemented. In the 2015 CFMP, this was evaluated under two potential local supply project capacities, which were assumed to be 2,464 AFY (or 2.2 mgd) and 10,976 AFY (or 9.8 mgd). For this Master Plan Update and based on advancements of the East County AWP design, the potential local supply project capacity of 4,000 AFY or 3.57 mgd was assumed, and the District's overall storage was compared to overall demand on a simplified systemwide basis. AWP water is conveyed from Lake Jennings by CWA No. 6 and No. 7. The evaluation results for the failure analysis considering a new 3.57-mgd local supply source are presented in Table 7.10.

Table 7.10 Existing System Supply Evaluation - With 3.57 mgd of Local Supply

Failure Scenario		Likelihood of Occurrence	Days of Service		
			MDD	ADD	MinDD
1	All Three CWA Connections Fail	Least Likely	7	9	Indefinite
2	CWA No. 4 Fails	Likely	Indefinitely	Indefinite	Indefinite
3	ESA Transmission Main Fails	Most Likely	Indefinite	Indefinite	Indefinite

As shown in Table 7.10, if all of the District's CWA connections fail (Scenario 1) and assuming the reservoirs are 70 percent full at the moment of failure, the District would be able to provide water service for seven days under 2019 MDD conditions. If only the CWA No. 4 fails (Scenario 2) under 2019 MDD conditions, then the District would be able to provide water service for an indefinite number of days. For the third failure scenario in which the ESA is only supplied by CWA No. 7 and WSA is only supplied by CWA No. 4, flow from CWA and the District's available storage will provide an indefinite number of days of water service under 2019 MDD conditions.

Based on the existing system supply reliability analysis presented herein, the following conclusions can be made:

- The 3.57 mgd of local water supply anticipated from the East County AWP project Table 7.8 would nearly double the days of water service during the most severe scenario when both CWA connections fail (Scenario 1).
- The duration of water service, when the ESA transmission main fails, increases greatly with the addition of a local supply project in the WSA, because water can be supplied to CWA No. 7 which is directly connected to ESA via Blossom Valley Zone.
- The assumed local water supply project would not change water availability under Scenarios 2 and 3 and does not substantially change the water supply under Scenario 1.

7.2.2 Existing System Pressure Analysis

Based on the evaluation criteria listed in Chapter 5, the system pressures were evaluated for the entire distribution system under existing demand conditions. The hydraulic model was used to identify areas with pressures above 150 psi under ADD conditions, while MDD conditions were used to identify areas with pressures below 40 psi.

7.2.2.1 High Pressures

Maximum pressures occur during low demand conditions. When conducting the analysis of the existing system using the hydraulic model, several areas with pressures greater than 150 psi were identified in the WSA and ESA (most located in the ESA). Figure 7.8 and Figure 7.9 illustrate the predicted maximum pressures for WSA and ESA, respectively. The areas with high pressures are similar to the 2015 CFMP, where it was determined that the high pressures are the result of high static head conditions.

For the most part, the distribution system was designed to handle the given pressures of 200 psi and above. In some cases, the pressures exceed the pressure class of the pipe or the pressure class is not attributed in GIS and requires further research. Even where the system was designed to handle higher pressures, the District wants to reduce pressure to extend the life of the system, reduce pressures on the customer side, and reduce water losses if any leaks are present.

The 2015 CFMP identified 3.6 miles of pipeline where pressures exceed the pressure class of the pipeline and recommended replacing these pipes at the end of their useful lives rather than earlier as part of the CIP. This was the District's preferred alternative because of cost considerations, no history with operational issues, and the low water loss. Thus, no specific improvements were recommended since these pipelines will be addressed through R&R projects.

A potential new project is to address operating and surge pressures above the pressure class of the 10-inch ACP transmission main in Harbison Canyon Road upstream from the Harbison Canyon PRS. The high pressures would be introduced by the Mountain View Connector Pipeline when the Rios Canyon Pump Station is running and the Mountain Top Reservoir isolation valve is closed.

When the 2015 CFMP was prepared, much of the GIS database didn't include pressure class. For those cases pressure class was assumed to be 150. Since then, pressure class has been attributed for most pipelines. The next Master Plan should review all the pressure class related projects against this new information.

7.2.2.2 Low Pressures

Minimum pressures occur during PHD conditions or while tanks are filling which are captured during an MDD EPS. These conditions were simulated using a 24-hour MDD EPS run with the hydraulic model. Instances of low pressures in the existing system were minimal and are shown on Figure 7.10 and Figure 7.11. The areas with low pressures are similar to the 2015 CFMP and the District confirmed that the low pressures are representative of current field conditions. It was determined that most of the low pressures are the result of low static head conditions where little can be done to increase the pressures. Where low pressures are typical, residents have private pumps.

No specific improvements were recommended for the nodes where low static head was not the issue since no pipelines with significant head loss were identified. In addition, the proposed maximum velocity, and fire flow projects discussed later will improve the system pressures.

Under existing MDD conditions, the hydraulic model identified some isolated areas with pressures less than 40 psi. Some of the low pressures are caused by insufficient static head. No pipelines were identified as having significant head loss that would lead to low pressures. No specific near-term projects are recommended to increase system pressures as these system pressures are primarily driven by low static head. In some of the identified areas, customers have private pumps. Where there are low pressure complaints in these areas, it is recommended that system rezoning occur if feasible.

7.2.3 Existing Pipeline Velocity Analysis

The hydraulic model was used to identify distribution mains that exceed the maximum velocity criteria for various demand conditions. It should be noted that the analysis was not applied to pipelines related to facilities. The hydraulic analysis identified two pipe segments that exceed the maximum velocity criteria of 8 fps under 2019 MDD conditions within the WSA and are shown on Figure 7.12. Two improvement recommendations were made to mitigate these high velocities not previously identified by the 2015 CFMP and are summarized below:

- **Woodside Avenue (Project WC-10).** Replace and upsize approximately 200-feet of 12-inch diameter pipeline along Woodside Avenue northeast of North Magnolia Avenue with a 20-inch diameter pipe.
- **Fanita Drive (Project WC-11).** Replace and upsize approximately 400-feet of 8-inch diameter pipeline along Fanita Drive between Farrington Drive and Paseo Ladera with a 14-inch diameter pipe.

In addition, the hydraulic analysis identified two pipe segments that exceed the maximum velocity criteria of five fps under 2019 ADD conditions. The results were reviewed for each of these pipelines, and it was determined that these high velocities are temporary. Thus, no recommendations are made to mitigate high velocities under 2019 ADD conditions.

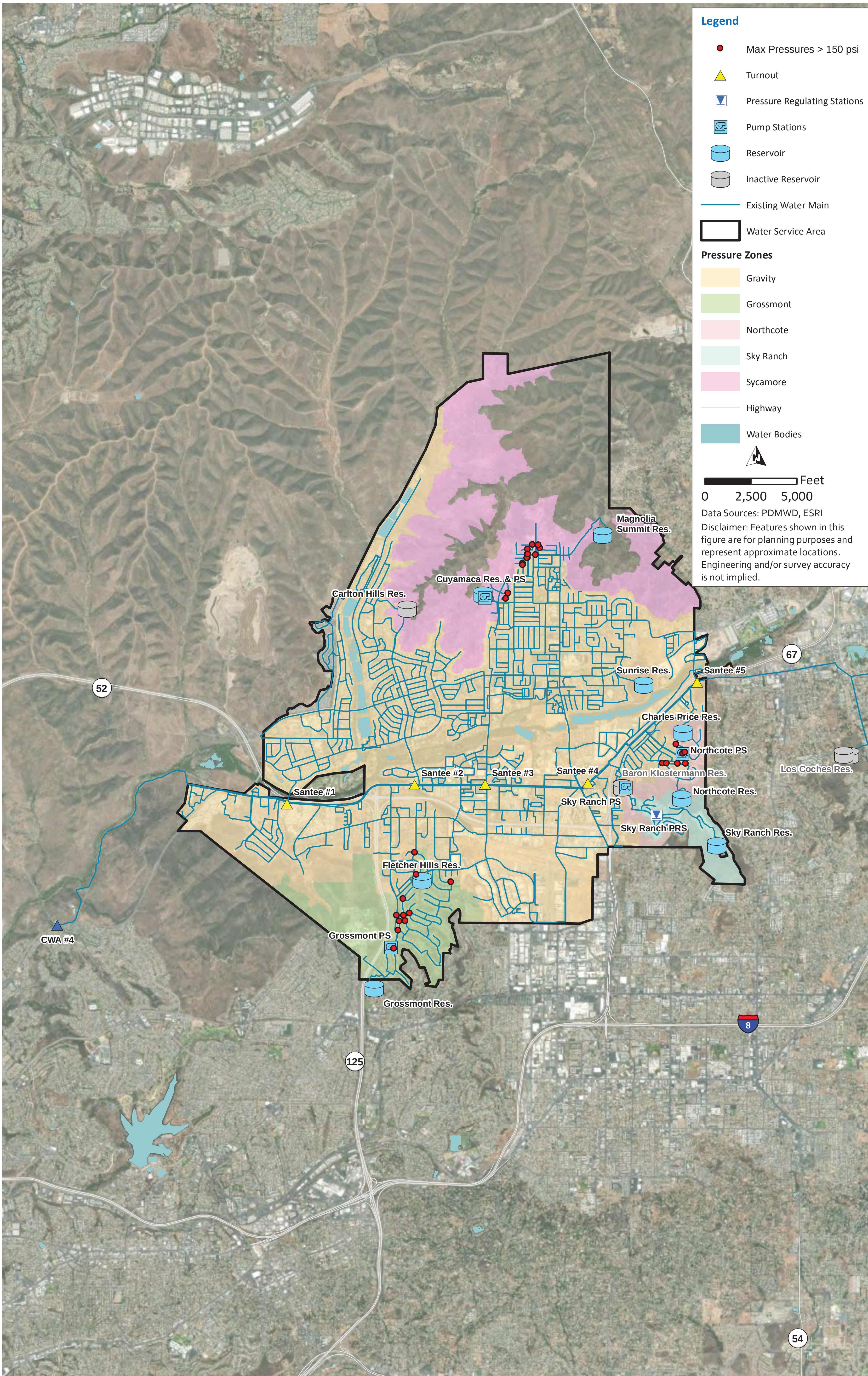


Figure 7.8 Maximum Pressures under 2019 ADD Conditions - WSA

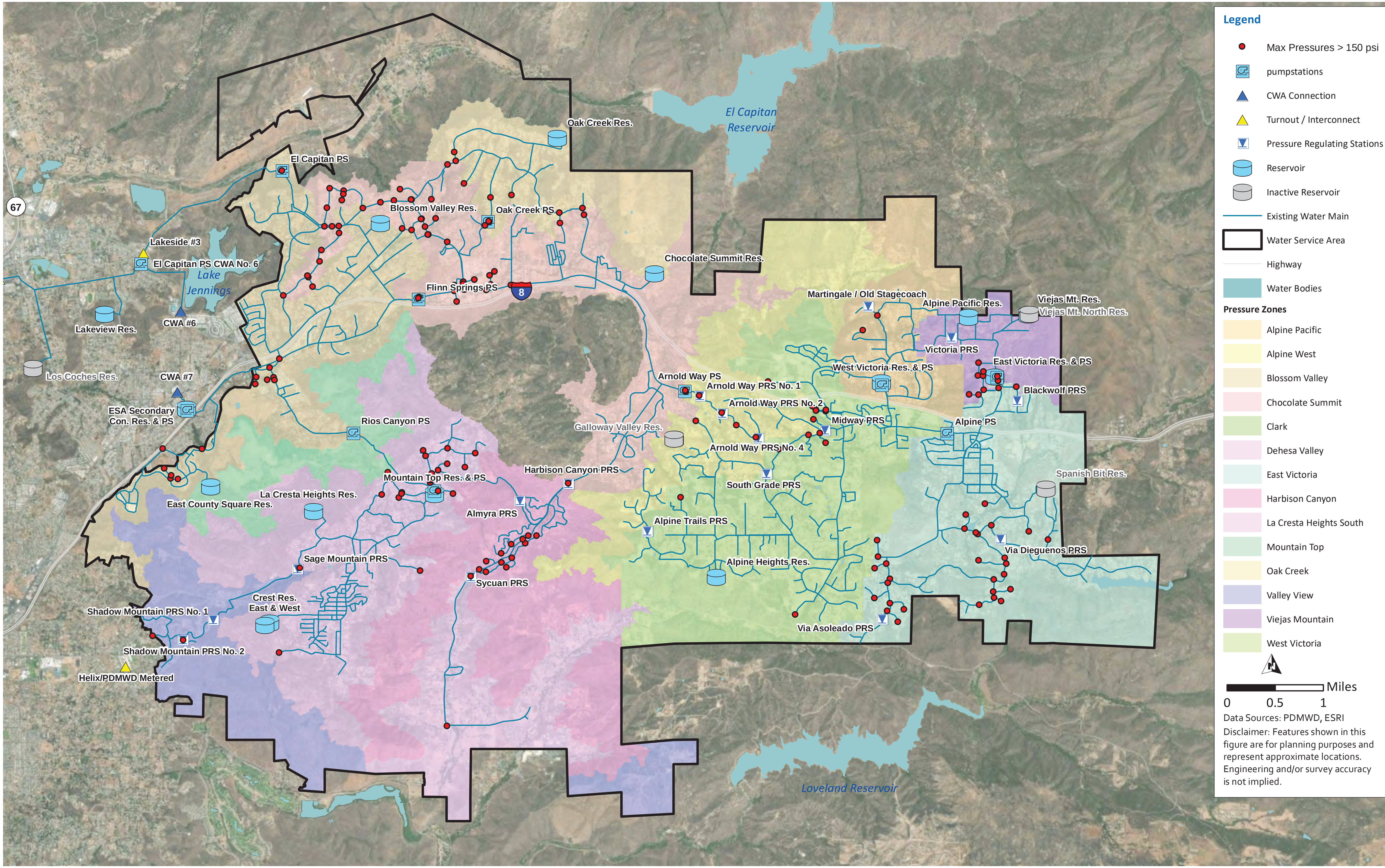


Figure 7.9 Maximum Pressures under 2019 ADD Conditions - ESA

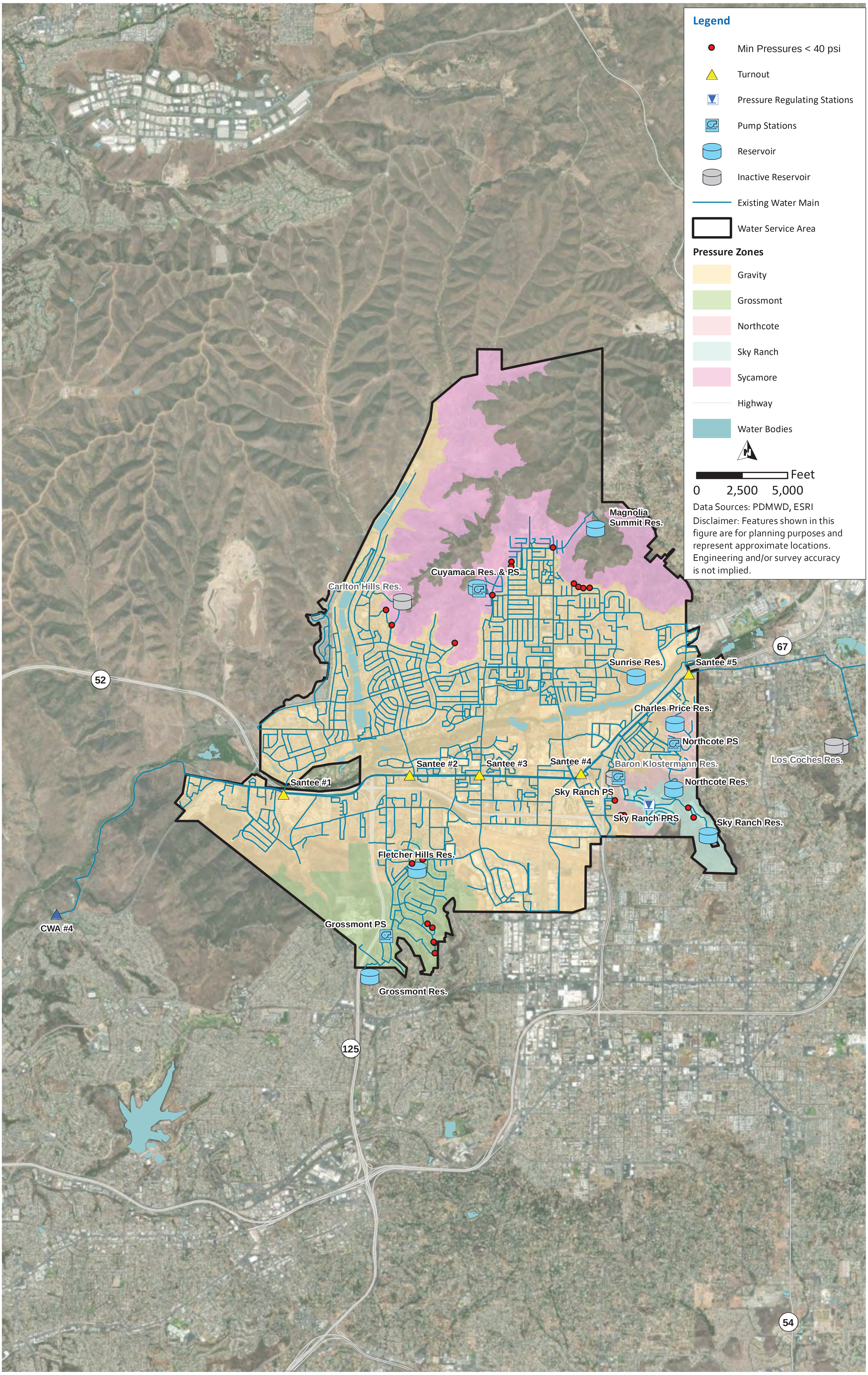


Figure 7.10 Minimum Pressures under 2019 MDD Conditions - WSA

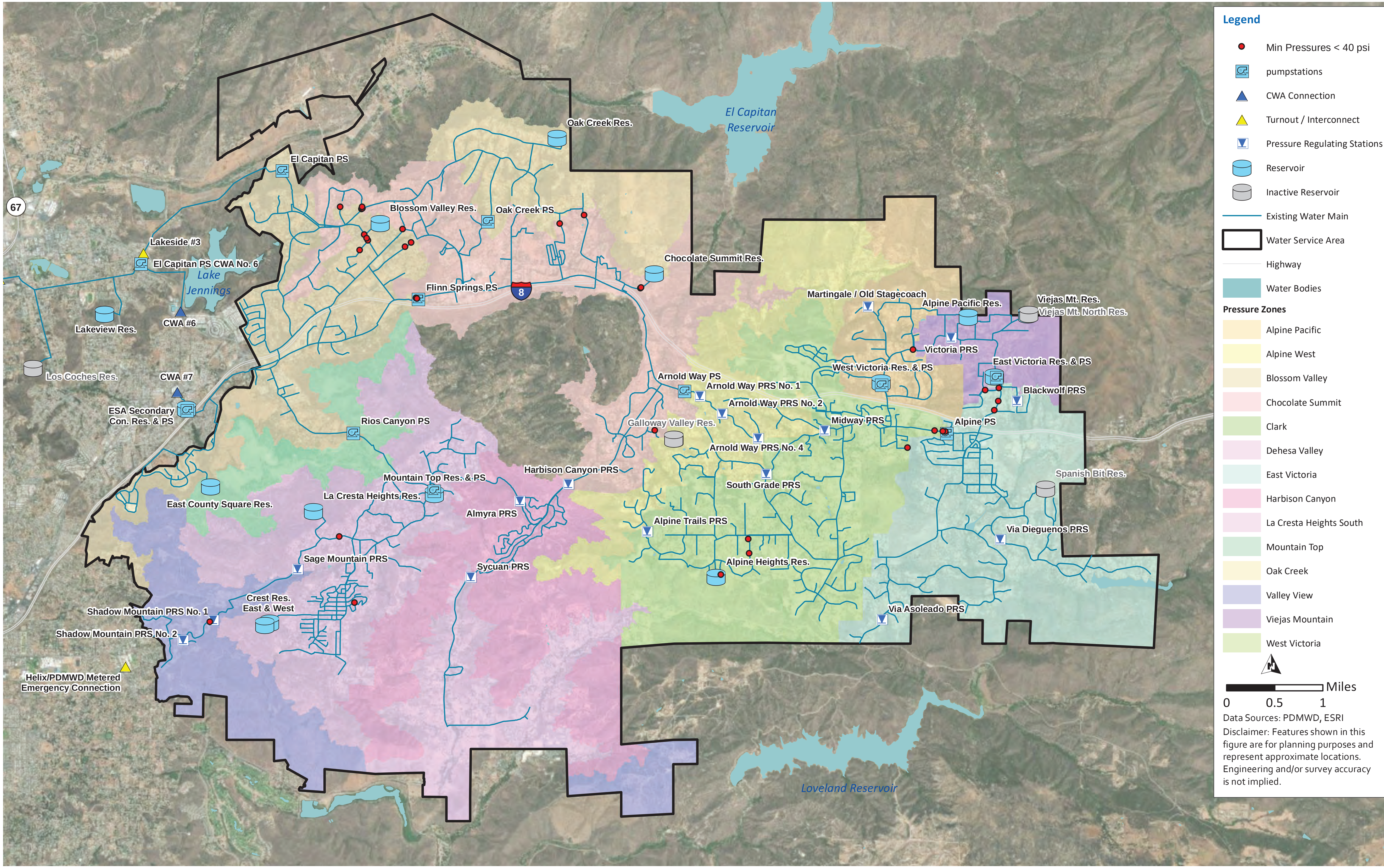
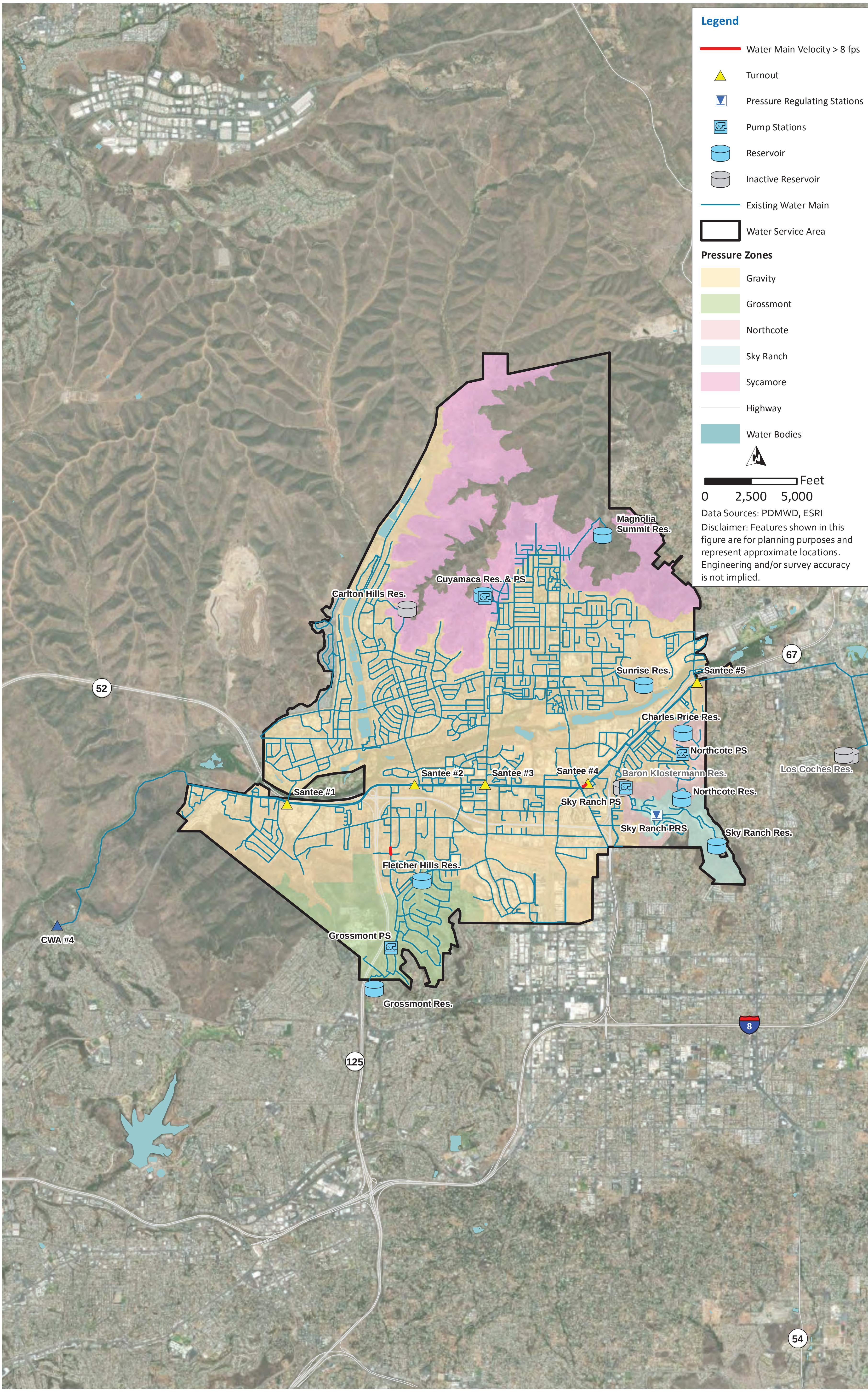


Figure 7.11 Minimum Pressures under 2019 MDD Conditions - ESA


Legend
Water Main Velocity > 8 fps
Turnout
Pressure Regulating Stations
Pump Stations
Reservoir
Inactive Reservoir
Existing Water Main
Water Service Area
Pressure Zones
Gravity
Grossmont
Northcote
Sky Ranch
Sycamore
Highway
Water Bodies
Feet
0 2,500 5,000
Data Sources: PDMWD, ESRI
Disclaimer: Features shown in this figure are for planning purposes and represent approximate locations. Engineering and/or survey accuracy is not implied.
Magnolia Summit Res.
Cuyamaca Res. & PS
Carlton Hills Res.
Sunrise Res.
Santee #5
67
52
Charles Price Res.
Northcote PS
Los Coches Res.
Santee #2
Santee #3
Santee #4
Baron Klostermann Res.
Santee #1
Northcote Res.
Sky Ranch PS
Sky Ranch PRS
Sky Ranch Res.
Fletcher Hills Res.
CWA #4
Grossmont PS
Grossmont Res.
8
125
54

7.2.4 Existing Fire Flow Analysis

A fire flow analysis was completed utilizing the evaluation criteria discussed in Chapter 5. The existing system was evaluated to determine if hydrants can maintain a residual pressure above 20 psi while meeting MDD and required fire flow. A hydrant's required fire flow ranged from 1,500 gpm to 3,500 gpm based on the corresponding land-use category.

Modeled residual pressures less than 20 psi under 2019 MDD plus fire flow for the WSA and ESA are shown Figure 7.13 and Figure 7.14. The hydraulic modeled fire flow deficiencies included deficiencies identified in the 2015 CFMP as well as some new fire flow deficiencies.

The 2015 CFMP identified 23 fire flow improvement projects. Since then, one fire flow project (Project FFE-3) has been completed leaving 22 projects. The remaining projects were incorporated into the model to verify the sizing. The updated hydraulic analysis identified eight previously recommended projects requiring modifications in order to meet fire flow demands.

In addition to the 2015 CFMP fire flow projects, the hydraulic analysis identified 14 new fire flow improvements. The 2015 CFMP and new fire flow improvement projects are summarized in Table 7.11.

The 2015 CFMP fire flow improvement Firebrand Way to Via Dieguenos through mountain road (Project FFE-18) is no longer recommended. Instead, it is recommended that the District bypass the Via Dieguenos PRS and open the Camino del Vecino valve.

Table 7.11 Proposed Fire Flow Improvements

Project ID	Description	Type	Existing Diameter (inches)	Proposed Diameter (inches)	Length of Pipeline(1) (feet)
FFE-01A	Windmill View Road between Flying Hills Court and northwest of Lakeridge Lane	Replace	8	12	2,300
FFE-01B	Lakeridge Lane at Windmill View Road to the end to end of street	Replace	6	10	500
FFE-02	Connect the 16-inch pipe to the 6-inch pipe at 8733 Magnolia Avenue	New	--	12	100
FFE-04	Santana Street from El Nopal to end of street	Parallel	--	10	2,300
FFE-05	From end of 10-inch pipe on Fanita Parkway to end of street	Replace	6	10	4,900
FFE-06	Woodside Terrace from Woodside Avenue to Los Senderos Drive	Parallel	--	8	1,400
FFE-07	Flinn Springs Road to hydrant on Shanteau Drive	Replace	6	10	1,300
FFE-08	Hawley Road to north most hydrant on Valle De Paz Road	Replace	6	8	1,100

Project ID	Description	Type	Existing Diameter (inches)	Proposed Diameter (inches)	Length of Pipeline[(1)] (feet)
FFE-09	Viewside Lane from Dunbar Lane to end of street	New	--	8	2,700
FFE-10	North Victoria Drive to 8-inch pipe on Sneath Way	Replace	4	8	1,000
FFE-11	Anderson Road to east most hydrant on Zumbrota Road	Replace	6	10	1,500
FFE-12	1867 Lilac Lane to Alpine Heights Road	Replace	6	12	2,200
FFE-13	Snowden Place from St. George Drive to hydrant	Replace	2	8	400
FFE-14A	Alegria Drive at Lento Lane to Beech Place hydrant at end of Bonita Place and North Park Drive	Replace	4	8	1,200
FFE-14B	Beech Place between Suncrest Boulevard and Park Drive	Replace	4	8	800
FFE-14C	Park Drive from Beech Place to North hydrant	Replace	4	8	300
FFE-14D	Bonita Place between Beech Place and Park Drive	Replace	4	8	500
FFE-14E	Lento Lane between West Drive and continue west	Replace	4	8	700
FFE-15A	La Cresta Boulevard to Lathrop Lane on Highline Trail	Replace	4	8	600
FFE-15B	Highline Trail to end of street on Canyon Drive	Replace	4	8	500
FFE-16	Stoneridge Road at Mountain View Road to hydrant	Replace	4	8	800
FFE-17A	Complete loop on Marshall Road and Marshall Way	New	--	8	300
FFE-17B	Eltinge Drive from Marshall Road to Marshall Way	Replace	6	10	700
FFE-19	Flinn Springs Road to Towne Lane on Oak Creek Road	Replace	8 & 6	12	2,300
FFE-20	Bay Meadows Drive at Hialeah Lane to Alpine Boulevard hydrant	New	--	8	200
FFE-21	Blue Lilac Lane to Alpine Estates Place	New	--	8	700
FFE-22A	Frances Drive from Harbison Canyon Road to Rosalie Way	Replace	8	10	400

Project ID	Description	Type	Existing Diameter (inches)	Proposed Diameter (inches)	Length of Pipeline[(1)] (feet)
FFE-22B	Rosalie Way from Frances Drive to La Cresta Trail	Replace	8	10	700
FFE-22C	Post Trail from Rosalie Way to south	Replace	6	8	300
FFE-23	Marshall Road at Marquand Court to hydrant	Parallel	--	10	1,000
FFE-24	Cecilwood Drive at Tuthill Way to northeast to end of 8-inch pipe	Replace	8	10	800
FFE-25	Sanfred Court at Lafe Drive to north	Replace	8	10	200
FFE-26	La Cresta Boulevard/La Cresta Road between southeast of Mountain View Road and Hamlet Drive	Replace	4	8	400
FFE-27	Lilac Lane	Replace	4	8	300
FFE-29	South Grade Road	Replace	8	12	2,700
FFE-30	Keith Street between Wycliffe Street and Princess Joann Road	New	--	8	300
FFE-31	Rancho Summit	Parallel	--	10	600
FFE-32	Driftwood Creek Road between Quail Canyon Road and south to hydrant	Replace	8	12	1,100
FFE-33	Quail Canyon Road between northeast of Tombstone Creek Road and Post Oak Lane	Replace	8	10	700
FFE-34	Bon Vue Drive between Oak Creek Road and Toya Lane	Replace	6	8	1,400
FFE-35	Hale Drive south of Victoria Drive	Replace	8	10	1,600
FFE-36	Galloway Valley Road between Harbison Canyon Road and Alpine Trail Road	Replace	8	10	1,600
FFE-37	Camino del Vecino between Camino Christina and north to 10-inch pipe	Replace	8	10	1,200

Notes:
(1) Pipeline lengths were rounded up to the nearest 100-feet.

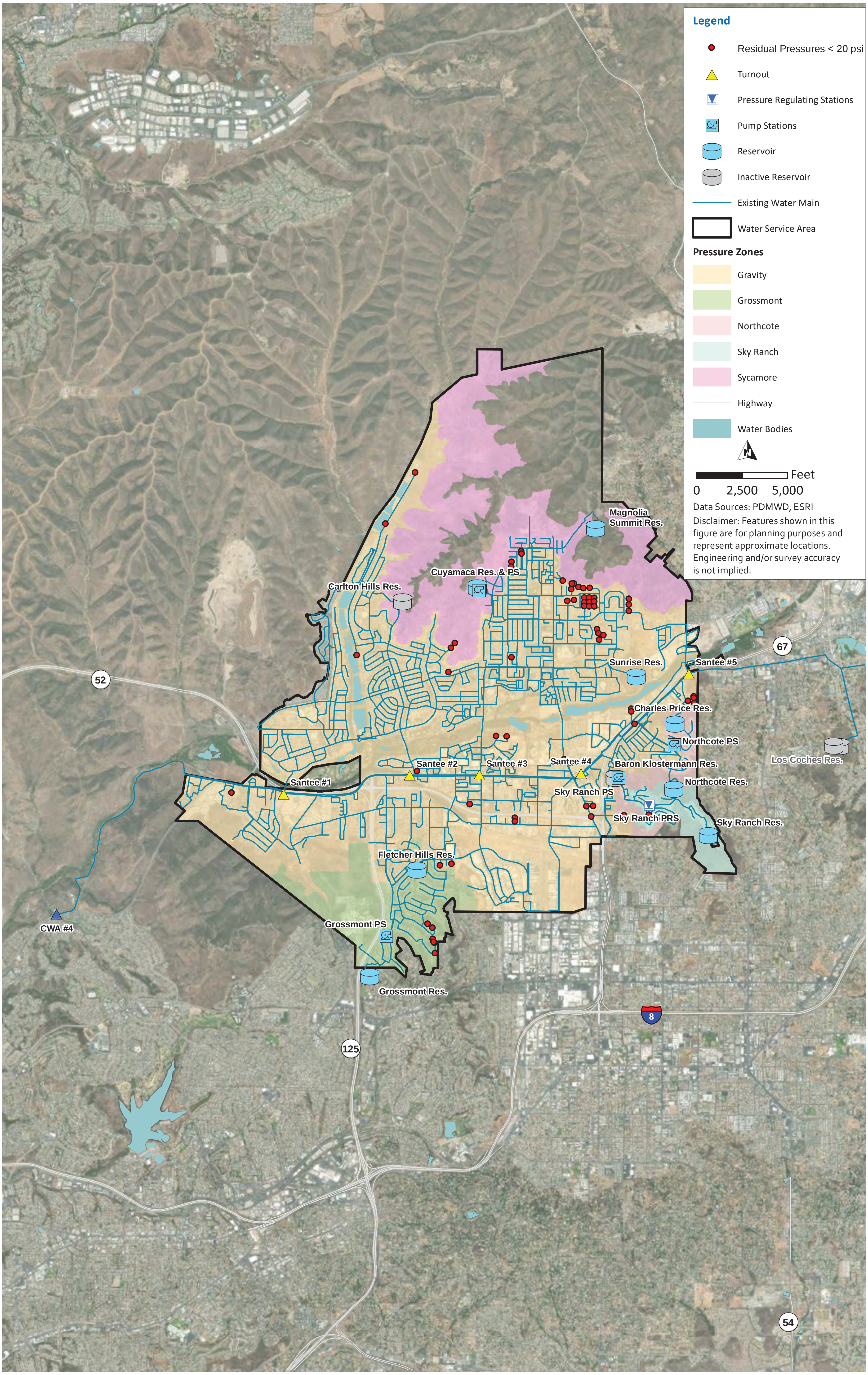


Figure 7.13 Residual under 2019 MDD plus Fire Flow Conditions - WSA

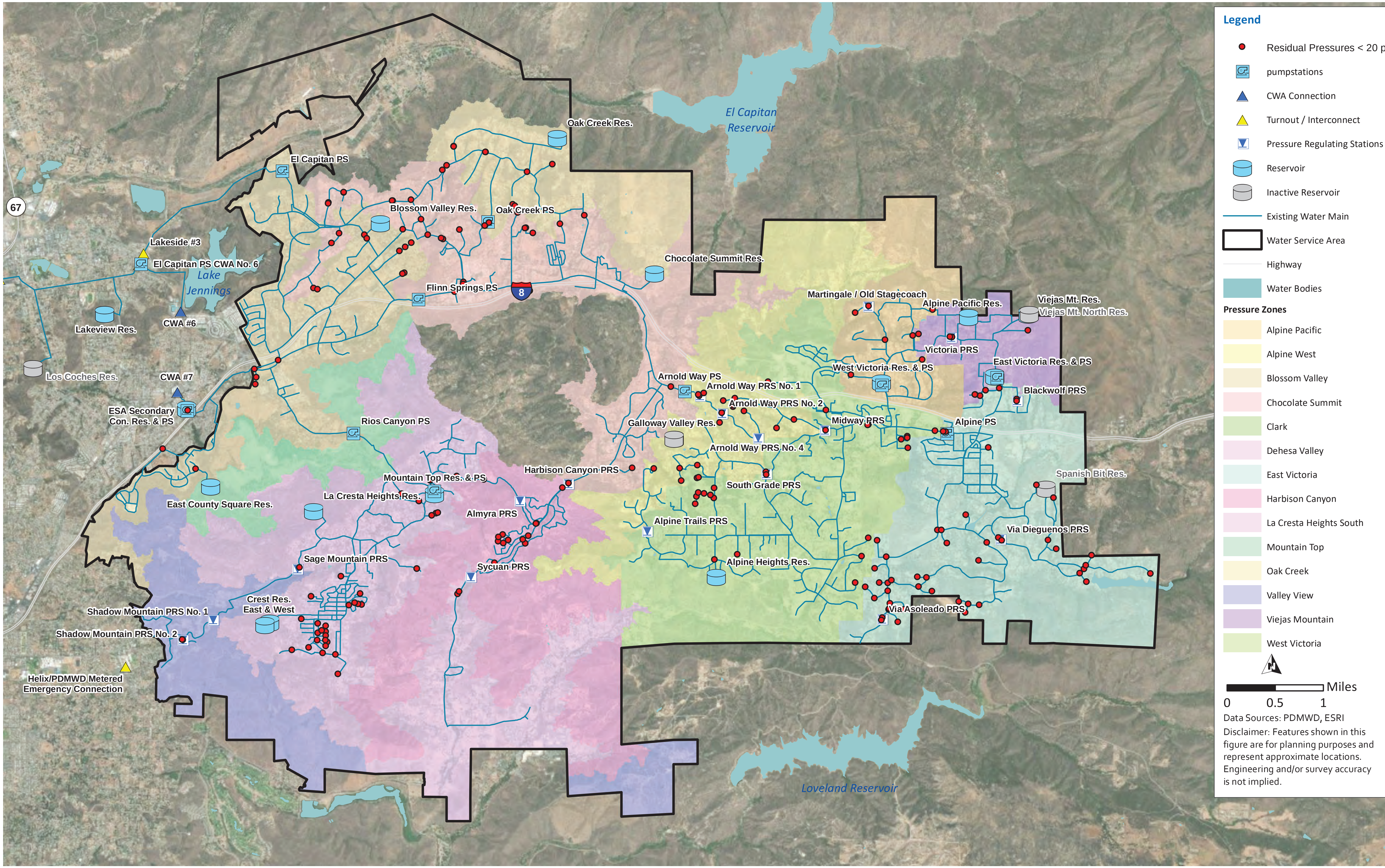


Figure 7.14 Residual under 2019 MDD plus Fire Flow Conditions - ESA

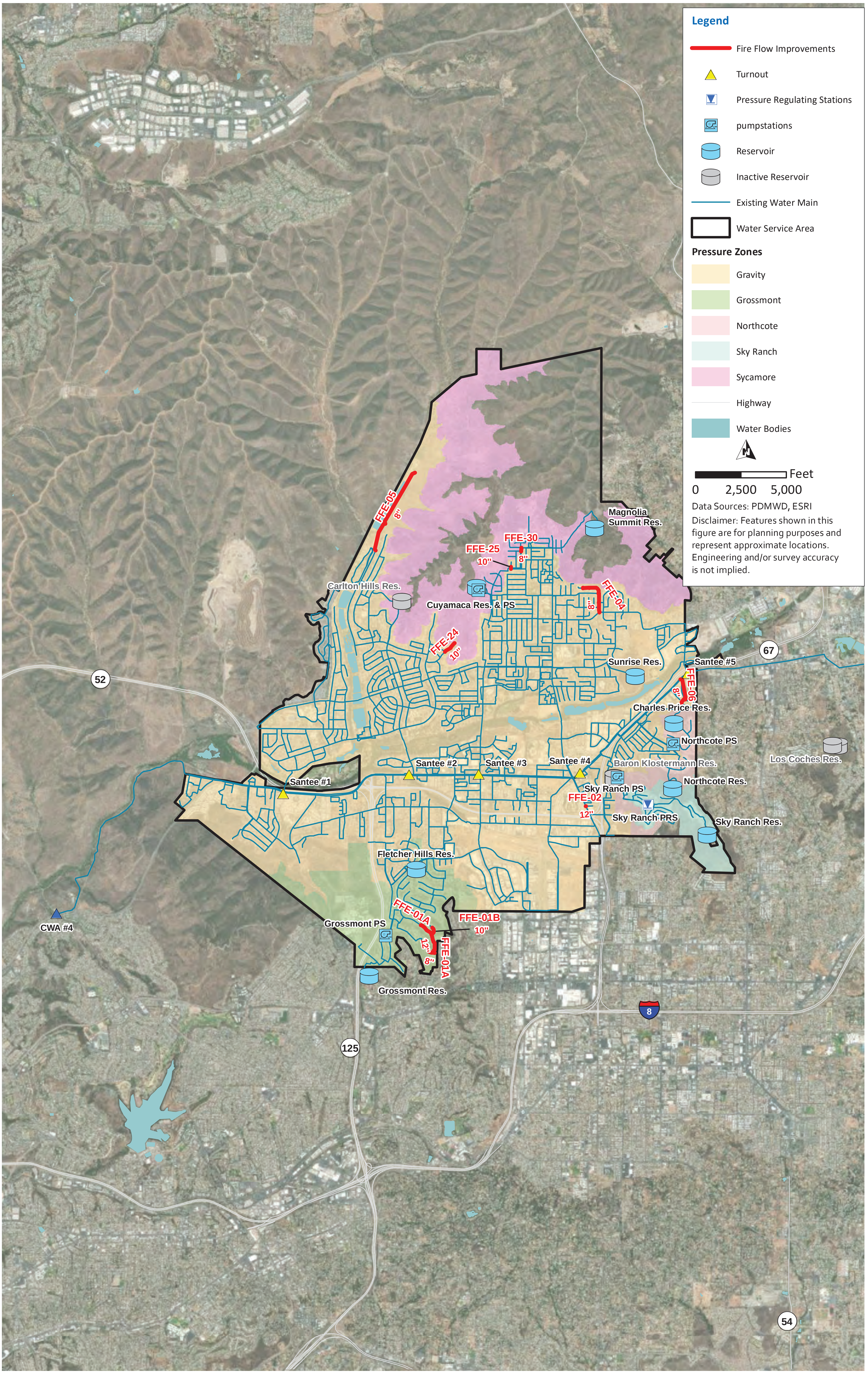


Figure 7.15 2019 Fire Flow Improvements - WSA

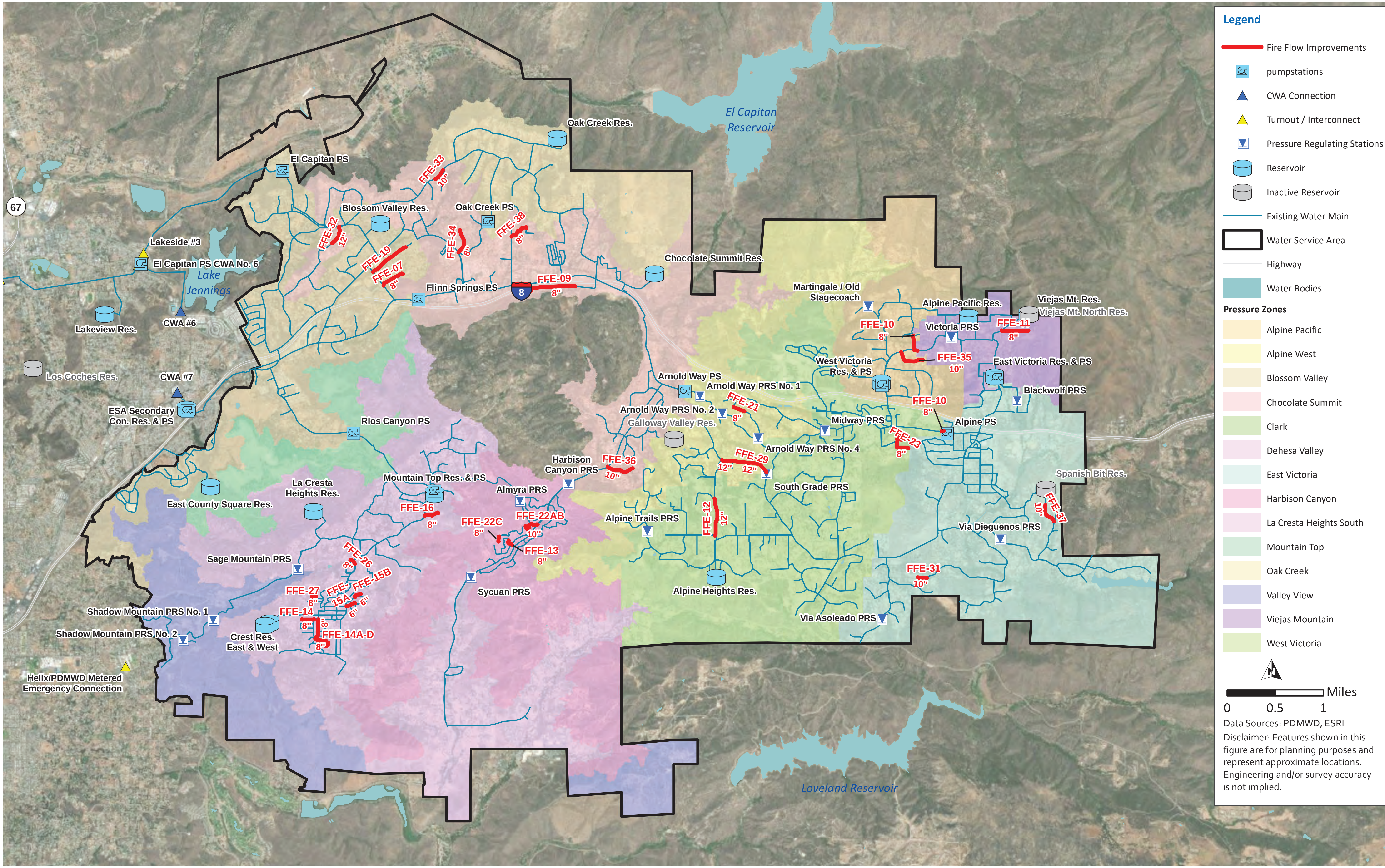


Figure 7.16 2019 Fire Flow Improvements - ESA

7.2.5 Existing Storage Analysis

The storage analysis evaluates the existing storage capacity based on the evaluation criteria listed in Chapter 5. The results of this analysis are summarized in Table 7.12, while details of this analysis are presented in Appendix I.

As shown in the example below, the existing and future user benefit allocation is based on the storage deficiency created under existing and future demand conditions. For facilities that benefit all zones, the existing and future user benefit is based on the ratio of existing and future demands throughout all zones.

Example:

Existing Zone Storage Capacity: 0.78 MG
Required Storage Capacity (Existing Conditions): 2.55 MG
Required Storage Capacity (Future Conditions): 3.29 MG
Existing Storage Deficit (2.55 MG - 0.78 MG): 1.77 MG
Future Storage Deficit (3.29 MG - 2.55 MG): 0.74 MG
Proposed Storage Capacity: 2.50 MG
Existing User Benefit (1.77 MG/2.5 MG): 71 Percent
Future User Benefit (0.74 MG/2.5 MG): 29 Percent

There are nine reservoirs within the existing WSA water system that have a total capacity of 23 MG. The storage evaluation demonstrated that a surplus of 7.5 MG is available for future use in the WSA. There is a 0.51 MG storage deficiency in the Sky Ranch 1020. As shown in Table 7.12, the following storage improvements are recommended for the WSA:

- **Sky Ranch 1020:** The storage deficit of 0.51 MG within the Sky Ranch 1020 is mitigated by the Sky Ranch PRV between the two Sky Ranch zones. The Sky Ranch 1180 has a surplus of 0.69 MG that is sufficient to mitigate the deficit in the Sky Ranch 1020 zone.
- **Gravity:** The 2015 CFMP stated that the District planned to repurpose the existing Sunrise Reservoir (2.0 MG) to recycled water and replace it with the new 3.0 MG Mesa Reservoir (Projects WS-3 and WC-4). The District no longer plans to repurpose Sunrise Reservoir, thus 2015 CFMP Projects WS-3 and WC-4 are no longer needed.

There are 16 reservoirs within the existing ESA water system that have a total capacity of 33.10 MG. The storage evaluation demonstrated that a surplus of 14.8 MG is available for future use in the ESA. However, there is a storage deficit of 1.24 MG in the La Cresta Heights South pressure zone. As shown in Table 7.12, the following storage improvements are recommended for the ESA:

- **Alpine West:** The storage deficit of 0.44 MG within the Alpine West zone is mitigated by the West Victoria zone via the South Grade PRS and Alpine Trail PRS. The West Victoria Zone has a surplus of 1.41 MG that is more than sufficient to mitigate the deficit in the Alpine West zone.
- **Oak Creek:** The storage deficit of 0.22 MG within the Oak Creek zone is mitigated by pumping from the Chocolate Summit zone through the Oak Creek Pump Station.
- **Harbison Canyon:** The storage deficit of 1.10 MG within the Harbison Canyon is mitigated by the Harbison Canyon PRV via the Chocolate Summit pressure zone. The 2015 CFMP recommended a new 2.5 MG Harbison Canyon Reservoir (Project WS-6) but this project is no longer recommended because of the zone transfers. Harbison Canyon

can also receive flow from the Mountain Top Reservoir via the Almyra PRS. For the storage analysis, it was assumed that Mountain Top Reservoir would supply La Cresta Heights and Valley View, and Chocolate Summit and Galloway Reservoirs would supply the Chocolate Summit, Harbison Canyon, and Dehesa Valley zones.

- **Dehesa Valley:** The storage deficit of 1.47 MG within the Dehesa Valley is mitigated by a combination of surplus storage available in the Chocolate Summit zone and the PRS to Harbison Canyon and then to Dehesa Valley (via the Sycuan PRV). Chocolate Summit Reservoir has sufficient surplus storage to meet the deficits in Oak Creek, Harbison Canyon and Dehesa Valley zones. The 2015 CFMP recommended a new 2.5 MG Harbison Canyon Reservoir (Project WS-6) but this project is no longer recommended because of the zone transfers.
- **La Cresta Heights South and Valley View:** Currently, the storage deficit of 1.03 MG within the La Cresta Heights South is mitigated by excess storage capacity and pumping from the Mountain Top Reservoir. The Mountain Top Reservoir serves primarily as a forebay to the pump station as there is only one customer in the Mountain Top zone. In the future, the storage deficit will be mitigated by the development of the new 2.0 MG Crest South Reservoir (Project WS-7 and WC-9) in the La Cresta Heights South zone and was previously identified in the 2015 CFMP. However, this update recommends reducing the volume from 2.5 MG to 2.0 MG. This proposed reservoir will mitigate both the 1.03-MG deficit in La Cresta Heights South and the 0.4 MG deficit in the Valley View zone.

Table 7.12 2019 System Storage Analysis

Pressure Zone	Existing Storage Capacity (MG)	2019 MDD[1] (mgd)	Total Storage Required (MG)	Zone Deficit/Surplus[2] (MG)	Zone Transfer/Recommendation	Zone Transfer/Proposed Storage Capacity (MG)	Updated Zone Deficit/Surplus (MG)
WSA							
Sky Ranch 1180	1.00	0.05	0.31	0.69	To Sky Ranch 1020	-0.51	-0.51
Sky Ranch 1020	0.00	0.16	0.51	-0.51	From Sky Ranch 1180	0.51	0.51
Sky Ranch Grouped Subtotal	***1.00***	***0.21***	***0.82***	***0.82***		0.51	***0.00***
Grossmont	2.50	0.50	1.26	1.24			
Grossmont Zone Subtotal	***2.50***	***0.50***	***1.26***	***1.24***			
Northcote	0.71	0.10	0.45	0.26			
Northcote Zone Subtotal	***0.71***	***0.10***	***0.45***	***0.26***			
Sycamore	1.20	0.17	1.19	0.01			
Sycamore Zone Subtotal	***1.20***	***0.17***	***1.19***	***0.01***			
Gravity	17.60	7.55	11.99	5.61			
Gravity Zone Subtotal	***17.6***	***7.55***	***11.99***	***5.61***			
ESA							
Viejas Mountain	0.95	0.13	0.45	0.50			
Viejas Mountain Zone Subtotal	***0.95***	***0.13***	***0.45***	***0.50***			
East Victoria	5.07	0.65	2.18	2.89			
East Victoria Zone Subtotal	***5.07***	***0.65***	***2.18***	***2.89***			
Alpine Pacific	1.50	0.20	0.60	0.90			
Alpine Pacific Zone Subtotal	***1.50***	***0.20***	***0.60***	***0.90***			
West Victoria	5.10	1.38	3.69	1.41	To Alpine West via PRS	-0.44	0.97
Alpine West	0.00	0.10	0.44	-0.44	From West Victoria via PRS	0.44	0.00
West Victoria Grouped Subtotal	***5.10***	***1.48***	***4.13***	***0.97***		0.4	***0.97***

Pressure Zone	Existing Storage Capacity (MG)	2019 MDD(1) (mgd)	Total Storage Required (MG)	Zone Deficit/Surplus(2) (MG)	Zone Transfer/Recommendation	Zone Transfer/Proposed Storage Capacity (MG)	Updated Zone Deficit/Surplus (MG)
Blossom Valley	9.40	0.94	2.78	6.62			
Blossom Valley Zone Subtotal	***9.40***	***0.94***	***2.78***	***6.62***			
Oak Creek	1.10	0.23	1.32	-0.22	From Chocolate Summit Zone via Oak Creek Pump Station	0.22	0.00
Oak Creek Zone Subtotal	***1.10***	***0.23***	***1.32***	***-0.22***		***0.22***	***0.00***
Chocolate Summit	7.00	0.72	2.33	4.67	To Oak Creek, Harbison Canyon and Dehesa Valley Zones	-2.78	1.88
Harbison Canyon	0.00	0.12	1.10	-1.10	From Chocolate Summit Zone	1.00	0.00
Dehesa Valley	0.00	0.31	1.47	-1.47	From Chocolate Summit Zone	1.47	0.00
Chocolate Summit Grouped Subtotal	***7.00***	***1.15***	***4.90***	***2.10***			***1.88***
Mountain Top	2.40	<0.01	0.18	2.22			
Mountain Top Zone Subtotal	***2.40***	***<0.01***	***0.18***	***2.22***			
La Cresta Heights South	0.78	0.47	1.81	-1.03	Proposed Crest South Reservoir 2.0 MG (Project WS-7) To Valley View via PRS	2.00 -0.40	0.58
Valley View	0.00	0.08	0.40	-0.40	From La Cresta Heights South via PRS	0.40	0.00
La Cresta Heights S. Grouped Subtotal	***0.78***	***0.55***	***2.20***	***-1.42***			***0.58***

7.2.6 Existing Water-Age Analysis

Potable water usage within the District's service area has been decreasing in response to statewide drought conditions, increasing water costs, and customer's water scarcity awareness. This decrease in system demand, or water conservation, has presented challenges for District staff as they respond to slower reservoir cycles, longer transmission times, and ultimately increased water age. This increase in water age can adversely affect water quality, possibly causing the presence of nitrifying bacteria, an increase in water temperatures, and the degradation of chloramine residual. The findings of the existing water age analysis are discussed in the Water Age Analysis Technical Memorandum which is included in Appendix J.

7.2.7 Existing Pump Station Analysis

The pump station analysis evaluates the existing pump station capacities based on the evaluation criteria listed in Chapter 5. These pump station evaluation criteria define that the firm capacity of the pump station shall be able to supply MDD of the zone it feeds into (including upstream zones), as well as the maximum fire-flow demand in that zone.

The results of the pump station analysis are summarized in Table 7.13, while details are presented in Appendix K. The District currently has 15 pump stations with a combined capacity of nearly 72,000 gpm. The firm pumping capacity of these 15 pump stations is about 51,600 gpm or 74 mgd.

The same methodology listed in Section 7.2.5 was utilized to determine existing and future user benefit of new or upgraded pump stations. If there was a surplus in proposed capacity, it was applied to the future user benefit.

There are four pump stations in the WSA. As shown in Table 7.13, the following pump station improvements are recommended for the WSA:

- **Northcote Zone:** There is a pumping deficiency of about 1,400 gpm in the Northcote Zone. To resolve this deficit, it is recommended that the existing Northcote pump station be replaced with a new pump station with three pumps each with a capacity of 1,050 gpm (Project WPS-3). This proposed project will increase the firm pumping capacity of Northcote Pump Station to 2,100 gpm.

There are nine pump stations in the ESA. As shown in Table 7.13, the following pump station improvements are recommended for the ESA:

- **Viejas Mountain Zone:** There is a pumping deficiency of about 590 gpm in the Viejas Mountain Zone. The East Victoria Pump Station is responsible for supplying Viejas Mountain Zone and was recently upgraded. Thus, it is unlikely that the District will upsize East Victoria Pump Station in the near term. However, if needed it is recommended that the District upgrade the East Victoria Pump Station with portable pump hookups in the near-term. That way in the case that an East Victoria Pump Station's pump fails or is taken out of service for maintenance the District can supply Viejas Mountain Zone during emergency conditions. The 2015 CFMP recommended that the District purchase two portable pumps (Project RPS-1) as part of reliability analysis. These portable pumps have been purchased. To resolve this deficit in the long term, it is recommended that the existing pump station is upgraded with an additional 1,000 gpm pump bringing (Project WPS-5). This recommendation will increase East Victoria Pump Station's firm capacity to 2,000 gpm.

- **East Victoria Zone:** There is a pumping deficiency of about 1,250 gpm in the East Victoria Zone. To resolve this deficit, it is recommended that a new Alpine South Pump Station (Project RPS-4A) be constructed with three pumps each with a capacity of 900 gpm and associated pipeline (Project R-4A) which consists of approximately 2,000 feet of 12-inch diameter pipe. The proposed Alpine South Pump Station will have move water from West Victoria to East Victoria. The proposed Alpine South Pump Station project was identified in the 2015 CFMP as a reliability improvement.
- **Oak Creek Zone:** There is a pumping deficiency of about 2,860 gpm in the Oak Creek Zone. To resolve this deficit, it is recommended that the existing Oak Creek Pump Station be replaced with a new pump station with three pumps each with a capacity of 1,850 gpm (Project WPS-7). The new Oak Creek Pump Station will have a firm capacity of 3,700 gpm.
- **Alpine West Zone:** The pump station capacity analysis shows that the Alpine West Zone experiences a surplus. The District's 2015 CFMP identified reliability projects that would help resolve this deficit. The Arnold Way Pump Station is the only pump station that feeds water supply from the lower pressure zones to the Alpine West, West Victoria, Alpine Pacific, East Victoria, and Viejas Mountain pressure zones. The following improvements are recommended to provide redundancy in case of an outage of Arnold Way Pump Station, alleviate current conveyance constraints in the Arnold Way Transmission Main:
  - Construct a new Galloway Pump Station with three 1,450 gpm pumps, resulting in a firm pumping capacity of 2,900 gpm (Project RPS-2) and associated pipeline (Project R-2) which consists of approximately 2,400 feet of 16-inch diameter pipe. The proposed Galloway Pump Station would move water from Chocolate Summit Zone to Alpine West Zone.
  - Construct a new Alpine West Pump Station with three 1,400 gpm pumps, resulting in a firm capacity of 2,800 gpm (Project RPS-3), associated pipeline (Project R-3) that consists of approximately 1,300 feet of 12-inch diameter pipe and a new 1.0-MG Alpine West Reservoir (Project RS-3). The proposed Alpine West Pump Station would move water from Alpine West Zone to West Victoria Zone. This portion of the project can be phased later than the Galloway Pump Station and pipeline.

Table 7.13 2019 Pumping Station Analysis

Discharge Pressure Zone	Firm Pump Station Capacity (gpm)	2019 MDD (gpm)[1]	Total Required Capacity (gpm)	2019 Capacity Balance (gpm)	Recommendation	Additional/Total Firm Capacity (gpm)
WSA						
Sky Ranch 1020						
Sky Ranch 1180						
Sky Ranch Grouped Subtotal	***2,500***	***144***	***1,500***	***1,000***		***2,500***
Grossmont						
Grossmont Zone Subtotal	***2,400***	***345***	***1,500***	***900***		***2,400***
Northcote					Replace Northcote Pump Station with three pumps each with a design flow of 1,050 gpm (Project WPS-3)	2,100
Northcote Zone Subtotal	***675***	***69***	***2,069***	***-1,394***		***2,100***
Sycamore						
Sycamore Zone Subtotal	***2,150***	***119***	***1,500***	***650***		***2,150***
Gravity						
Gravity Zone Subtotal	***n/a***	***5,243***	***0***	***0***		***0***
ESA						
Viejas Mountain					Upgrade East Victoria Pump Station with an additional pump at 1,000 (Project WPS-5)	1,000
Viejas Mountain Zone Subtotal	***1,000***	***90***	***1,590***	***-590***		***2,000***
Alpine Pacific						
Alpine Pacific Zone Subtotal	***2,300***	***140***	***1,640***	***660***		***2,300***
East Victoria					Construct a new Alpine South Pump Station with three pumps each with a capacity of 900 gpm (Projects RPS-4A and R-4A)	1,800
East Victoria Zone Subtotal	***2,800***	***452***	***4,042***	***-1,242***		***4,600***

Discharge Pressure Zone	Firm Pump Station Capacity (gpm)	2019 MDD (gpm)[1]	Total Required Capacity (gpm)	2019 Capacity Balance (gpm)	Recommendation	Additional/Total Firm Capacity (gpm)
West Victoria					New Alpine West Pump Station with three pumps each with a capacity of 1,400 gpm (Projects RPS-3, R-3, and RS-3)	2,800
Alpine West					New Galloway Pump Station with three pumps each with a capacity of 1,450 gpm (Projects RPS-2 and R-2)	2,900
West Victoria Zone Subtotal	***7,630***	***1,026***	***5,208***	***2,422***		***13,330***
Blossom Valley						
Blossom Valley Zone Subtotal	***21,850***	***653***	***7,205***	***14,645***		***21,850***
Oak Creek					Replace Oak Creek Pump Station with three pumps each with a capacity of 1,850 (Project WPS-7)	3,700
Oak Creek Zone Subtotal	***800***	***160***	***3,660***	***-2,860***		***3,700***
Chocolate Summit						
Harbison Canyon						
Dehesa Valley						
Chocolate Summit Grouped Subtotal	***7,700***	***800***	***6,169***	***1,531***		***7,700***
Mountain Top						
Mountain Top Zone Subtotal [2]	***3,000***	***1***	***1,882***	***1,118***		***3,000***
Valley View						
La Cresta Heights South						
La Cresta Heights S Grouped Subtotal	***3,000***	***381***	***1,881***	***1,119***		***3,000***

Notes:
(1) MDD Peaking Factor is 1.7.
(2) Rios Canyon Pump Station is sized to supply LCH zone.

7.3 Future System Analysis

The goal of the future system analysis is to evaluate the water distribution system under various operating conditions utilizing the evaluation criteria summarized in Chapter 5 and the future demand projections described in Chapter 3.

The following analyses are described in this section:

- Future Water Supply Analysis.
- System Reliability Analysis.
- Future Pressure Zone Analysis.
- Future System Pressure Analysis.
- Future Pipeline Velocity Analysis.
- Future Fire Flow Analysis.
- Future Storage Analysis.
- Future Pump Station Analysis.

The future system analysis was conducted with the water demand projected for year 2045 without the tribal land demands, unless noted differently. As listed in Table 7.17, the ADD and MDD projected for year 2045 are 12.1 mgd and 20.6 mgd, respectively. The future demands were added to the existing potable water hydraulic model. It was assumed that all existing system improvements identified in Section 7.1.2 and reliability system improvements described under Section 7.3.3 are installed for the future system analyses described below. The future demands, existing system improvements, and reliability projects were incorporated into the hydraulic model that was used for some of the future system analysis and sizing of improvement projects described in the following subsections.

7.3.1 Future Water-Supply Analysis

As previously described in Section 7.2.1, 100 percent of the District's potable water system is supplied by CWA through three connections (4, 6, and 7).

Similarly, as described under the existing system water-supply analysis (see Section 7.2.1), the District's local supply emergency evaluation was evaluated under future demand conditions. The AWP water would be supplied from Lake Jennings via CWA No. 6 and/or No. 7. This analysis determined the number of days of available storage in the District's distribution system under the following three failure scenarios:

- Scenario 1: Failure of all CWA connections.
- Scenario 2: Failure of CWA connection No. 4.
- Scenario 3: Failure along the ESA transmission main (failure located east of the wholesale reservoirs and CWA No. 6). Therefore, only CWA No. 7 would be available to supply ESA, and CWA No. 4 would supply WSA.

The demand sets utilized for the analysis are as follows:

- 2045 ADD: 12.11 mgd.
- 2045 MDD: 20.58 mgd.
- 2045 MinDD: 4.84 mgd.

During the local emergency supply analysis without a local supply source, and that available water could be moved to any zone as needed, except during Scenario 3. The evaluation assumptions are listed in Table 7.14.

Table 7.14 Local Emergency Supply Evaluation Assumptions - Future

Assumption	MDD (mgd)	ADD (mgd)	MinDD (mgd)
Reservoir Levels at time of Failure (% full)	70%	40%	40%
Total Storage Available During Failure	Operating Storage + Emergency Storage		
2045 Demands			
WSA	12.20	7.18	2.87
ESA	8.38	4.93	1.97
Total	**20.58**	**12.11**	**4.84**
Helix Emergency Connection	0.7 mgd		
Emergency Rationing/Conservation during Failure	None		
Proposed Local Supply (District Flows Only)	3.57 mgd		

The results for the supply failure analysis without considering a local supply source are presented in Table 7.15.

Table 7.15 Future System Supply Evaluation - Without Local Supply

	Failure Scenario	Likelihood of Occurrence	Days of Service		
			MDD	ADD	MinDD
1	All Three CWA Connection Fails	Least Likely	2	2	4
2	CWA Connection No. 4 Fails	Likely	Indefinite	Indefinite	Indefinite
3	ESA Transmission Main Fails	Most Likely	5	Indefinite	Indefinite

As shown in Table 7.15, if all three of the District's CWA connections fail (Scenario 1) and, assuming the reservoirs are 70 percent full at the moment of failure, the District would be able to provide water service for two days under 2045 MDD conditions. If only CWA No. 4 fails (Scenario 2), then the District would be able to provide water service for an indefinite number of days under year 2045 MDD conditions. For the third failure scenario, in which the ESA is isolated from all supply sources, the District's available storage will only provide five days of water service under year 2045 MDD conditions.

The previous evaluation presented in Table 7.15 was taken a step further through the introduction of a local drought-resistant supply project. For this analysis, it was assumed that the East County Advanced Water Purification project would be implemented. In the 2015 CFMP, this was evaluated under two potential local supply project capacities of 2.2 mgd and 9.8 mgd were assumed. For this update, the potential local supply capacity of 4,000 AFY or 3.57 mgd was assumed, and the District's overall storage was compared to overall demand on a simplified system-wide basis. It was assumed that available water could be moved to any zone as needed except during Scenario 3. The evaluation results for the failure analysis considering a new 3.57-mgd local supply source are presented in Table 7.16.

Table 7.16 Future System Supply Evaluation - With Local Supply

Failure Scenario		Likelihood of Occurrence	Days of Service		
			MDD	ADD	MinDD
1	All Three CWA Connection Fails	Least Likely	3	3	13
2	CWA #4 Fails	Likely	Indefinite	Indefinite	Indefinite
3	ESA Transmission Main Fails	Most Likely	Indefinite	Indefinite	Indefinite

As shown in Table 7.16, if both District's CWA connections fail (Scenario 1) and, assuming the reservoirs are 70 percent full at the moment of failure, the District would be able to provide water service for three days under year 2045 MDD conditions. If only the CWA No. 4 fails (Scenario 2) during year 2045 MDD conditions, then the District would be able to provide water service for an indefinite number of days. For the third failure scenario in which the ESA is isolated from all supply sources, the District's available storage will only provide two days of water service under year 2045 MDD conditions.

The evaluation results for the failure analysis considering a new 3.57 mgd local supply source are presented in Table 7.16. If all three of the District's CWA connections fail (Scenario 1) and, assuming the reservoirs are 70 percent full at the moment of failure, the District would be able to provide water service for three days under existing MDD conditions. If only CWA No. 4 fails (Scenario 2) under 2045 MDD conditions, then the District would be able to provide water service for an indefinite number of days. For the third failure scenario in which the ESA is isolated from all supply sources, the District's available storage will be able to provide water service for an indefinite number of days of under 2045 MDD conditions.

Based on the existing system supply reliability analysis presented herein, the following conclusions can be made:

- The 3.57 mgd of local water supply anticipated from the East County AWP project would not create a substantial difference if all three CWA connections fail (Scenario 1).
- The duration of water service when the ESA transmission main fails almost double with the addition of a local supply project in the WSA for ADD and MDD scenario.
- The assumed local water supply project would not change water supply availability under Scenario 2 and Scenario 3.

7.3.2 Future Pressure Zone Analysis

The District's existing distribution system is divided into 19 pressure zones. The WSA, which has a less drastic elevation change than the ESA, currently contains 6 of the 19 pressure zones. As some of the future developments incorporated are anticipated to be located at higher elevations, one additional pressure zone has been added to the WSA, the Fanita Ranch pressure zone. Due to the elevation range within the Fanita Ranch development, this pressure zone will likely be divided into two separate zones. The ESA, which is more mountainous, with a steeper terrain, currently contains 13 pressure zones. The future developments anticipated in the ESA are not expected to create additional pressure zones.

A description of the District's future pressure zone HGLs and demand within each of the zones is presented in Table 7.17. In addition, hydraulic profiles of the future water distribution systems in the WSA and ESA are shown on Figure 7.17, and Figure 7.18, respectively.

It should be noted that the actual delineation and HGLs of future pressure zones are subject to change and strongly depend on the final development layout and grading. As this information is not available at the time of this report preparation, the future zone HGLs and demands listed in Table 7.17 were used for water-system planning purposes.

Table 7.17 Future Pressure Zones - HGLs and 2045 Demands

Zone	HGL (feet)	2045 ADD (mgd)	2045 MDD (mgd)	Percentage of Projected Demands (%)
WAS				
Fanita Ranch (NEW)	1,230	1.44	2.45	11.9%
Gravity	629	5.16	8.77	42.7%
Grossmont	900	0.29	0.49	2.4%
Northcote	884	0.06	0.10	0.5%
Sky Ranch 1020	1,020	0.09	0.15	0.7%
Sky Ranch 1190	1,180	0.03	0.05	0.2%
Sycamore	880	0.10	0.17	0.8%
Subtotal	***n/a***	***7.18***	***12.20***	***59.3%***
ESA				
Alpine Pacific	2,287	0.14	0.24	1.2%
Alpine West	1,720	0.07	0.12	0.6%
Blossom Valley	1,785	0.60	1.02	5.0%
Chocolate Summit	1,447	0.75	1.28	6.2%
Dehesa Valley	776	0.47	0.80	3.9%
East Victoria	2,287	0.76	1.29	6.3%
Harbison Canyon	1,082	0.07	0.12	0.6%
La Cresta Heights South	1,054	0.35	0.60	2.9%
Mountain Top	1,446	<0.01	<0.01	<0.1%
Oak Creek	1,785	0.15	0.26	1.2%
Valley View	1,328	0.12	0.20	1.0%
Viejas Mountain	2,646	0.15	0.26	1.2%
West Victoria	1,900	1.29	2.19	10.7%
Subtotal	***n/a***	***4.93***	***8.38***	***40.7%***
Total	**n/a**	**12.11**	**20.58**	**100%**

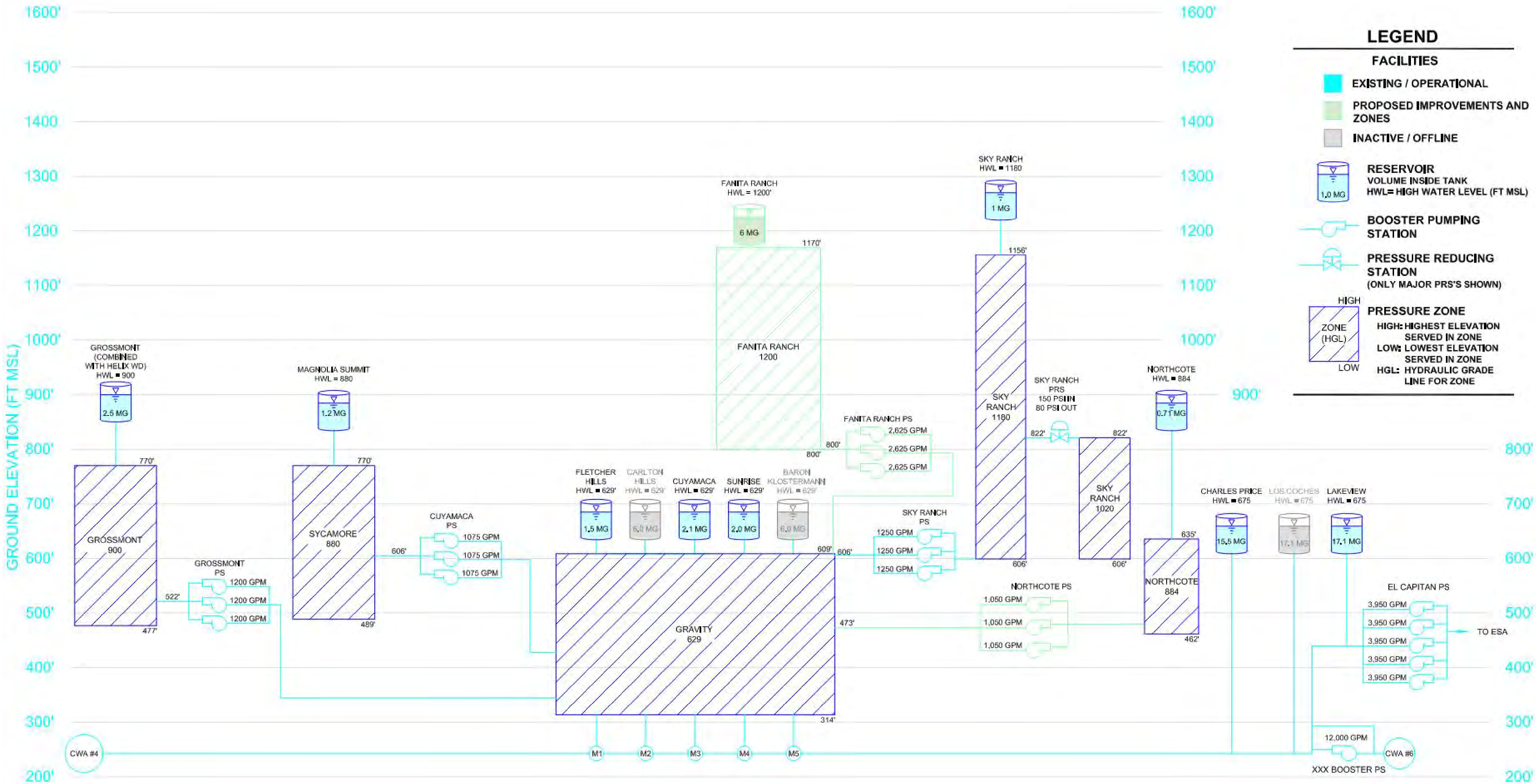


Figure 7.17 Future Potable Water System Hydraulic Profile - WSA

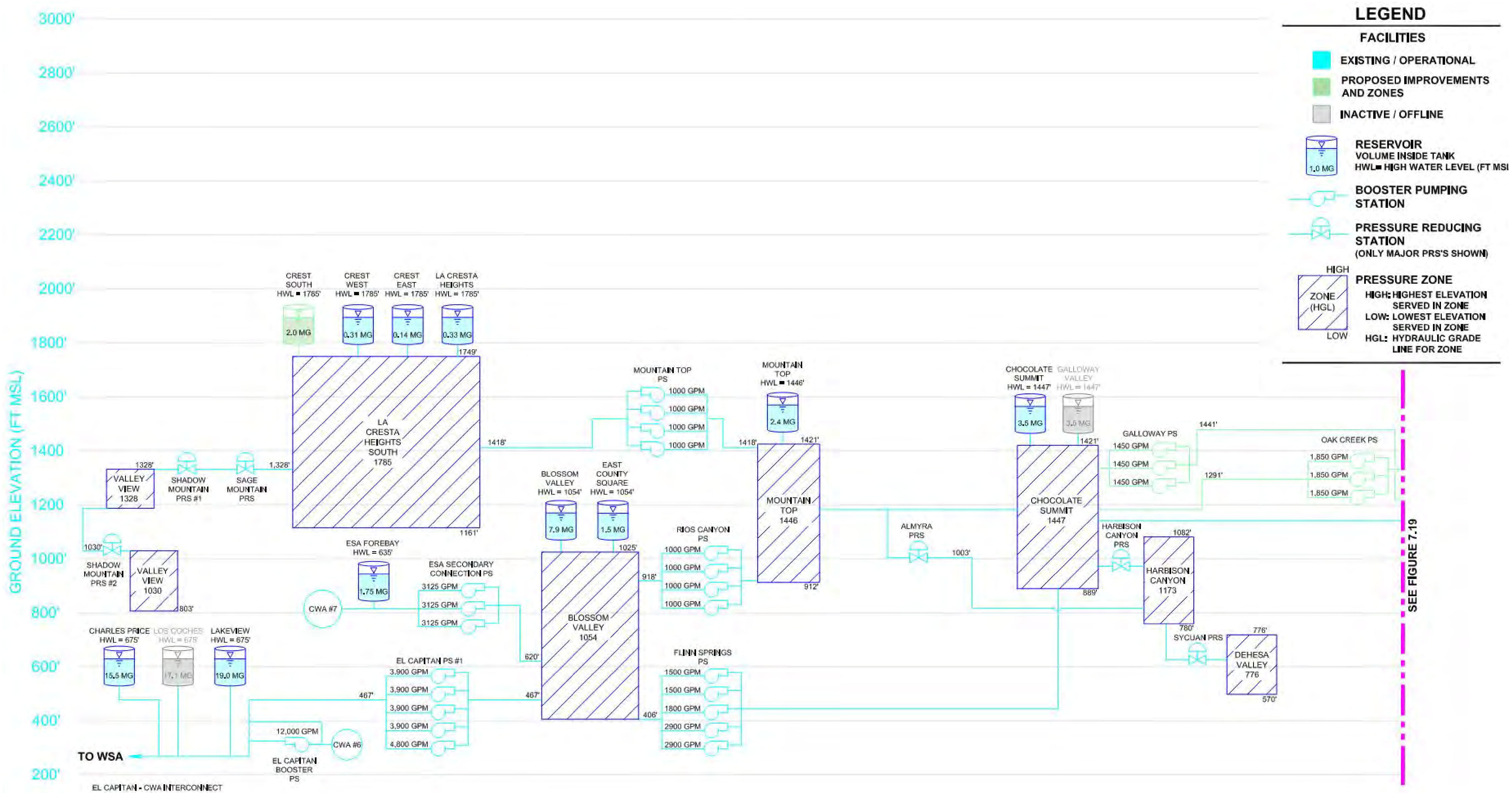


Figure 7.18 Future Potable Water System Hydraulic Profile - ESA

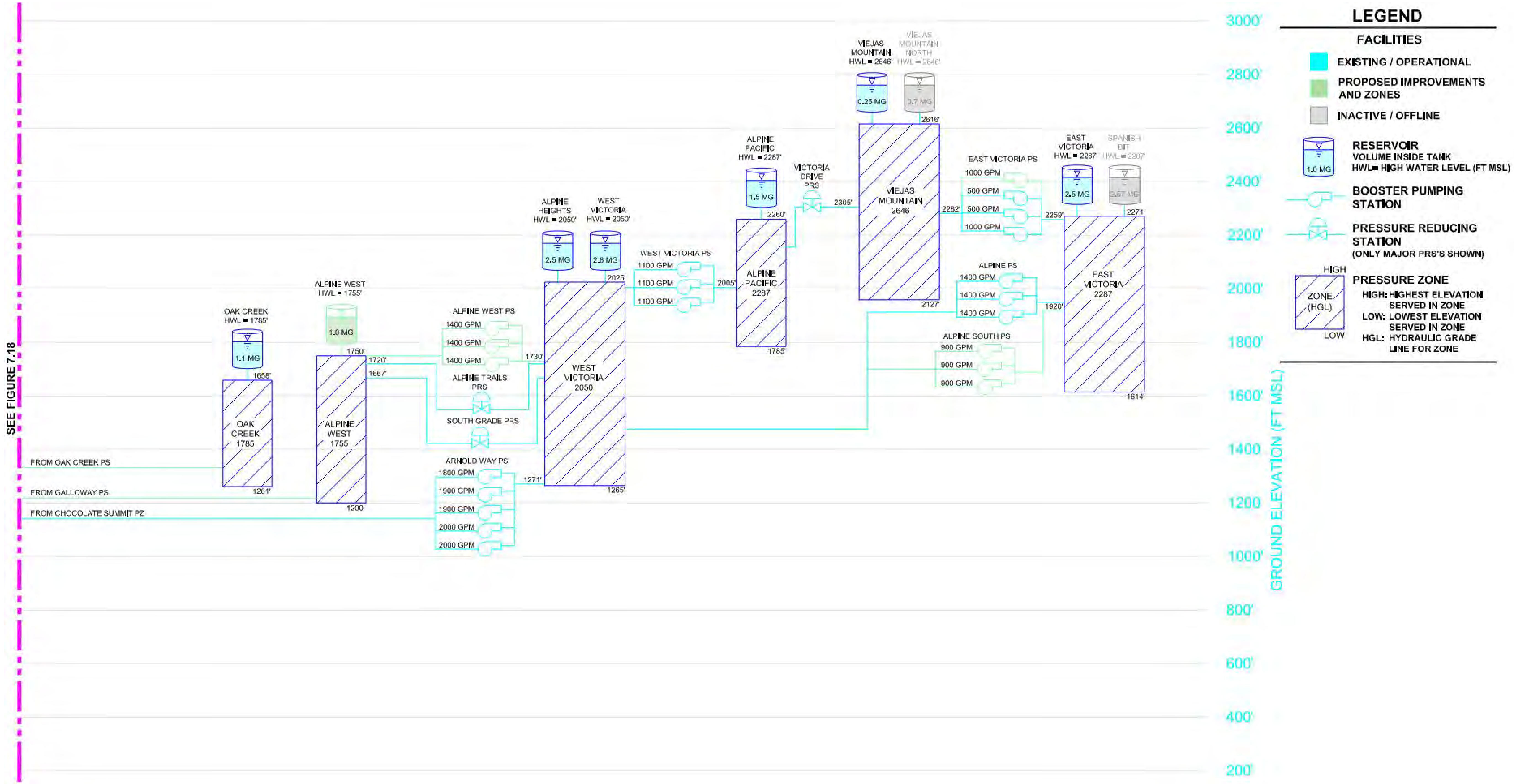


Figure 7.19 Future Potable Water System Hydraulic Profile - ESA

7.3.3 Reliability Analysis

The 2015 CFMP included a reliability analysis that identified several reliability projects to address system vulnerabilities within the WSA and ESA. Since the 2015 CFMP the District has completed the ESA Secondary Connection (R-1 pipeline, storage tank, and pump station), Viewside Lane Pipeline Replacement (RI-6), Portable Pumps (RPS-1) and the Mountain View Connector (R-4B) recommended projects. The Ridge Hill Pipeline Replacement (R-1A) is under construction. Since an update was not conducted as part of this Master Plan Update, the remaining recommendations from the initial reliability analysis have not changed. The remaining reliability improvements are summarized in Table 7.18, while the locations of the WSA and ESA reliability improvements are shown on Figure 7.21 and Figure 7.22, respectively. See the 2015 CFMP for detailed descriptions on the recommended reliability improvements. It was assumed that the reliability improvements would be implemented prior to 2045 with the exception Project R-5.

Table 7.18 Reliability Improvements Summary

Project ID	Description	Details
Pipelines - I-8 Highway Crossing[(2)]		
RI-2	At East Victoria Drive	Approximately 600 feet of 14-inch diameter pipeline with casing
RI-3	At Tavern Road	Approximately 1,200 feet of 10-inch diameter pipeline with casing
RI-4	At West Victoria Drive	Approximately 600 feet of 16-inch diameter pipeline with casing
RI-5	At Olde Highway 80, near Olde Highway 80 and Dunbar Lane	Approximately 1,200 feet of 30-inch diameter pipeline
RI-7	Between Blossom Valley Road and Chimney Rock Lane at the end of Chimney Rock Lane	Approximately 500 feet of 10-inch diameter pipeline with casing
RI-8	Between Blossom Valley Road and Olde Highway 80 at Pecan Park Lane	Approximately 500 feet of 8-inch diameter pipeline with casing
RI-9	At the north end of Labrador Lane	Approximately 600 feet of 24-inch diameter pipeline with casing
RI-10	Between Chocolate Summit Drive and Alpine Boulevard, East of Dunbar Lane and I-8	Approximately 500 feet of 10-inch diameter pipeline with casing
Pipelines		
R-2A	New Galloway Pump Station pipeline from Chocolate Summit Zone to Alpine West Zone	Approximately 1,500 feet of 16-inch diameter pipeline
R-2B[(3)]	Summerhill View from Summerhill Point to Galloway Valley Res. 18-inch Pipe	Approximately 1,000 feet of 18-inch diameter pipeline
R-2C[(3)]	La Force Road from Sky Mesa Road to North Alpine Trail Road	Approximately 1,600 feet of 12-inch diameter pipeline
R-3[(3)]	New Alpine West Pump Station pipeline from Alpine West Zone to West Victoria Zone	Approximately 1,300 feet of 12-inch diameter pipeline

Project ID	Description	Details
R-4A	New Alpine South Pump Station pipeline from West Victoria Zone to East Victoria Zone	Approximately 2,300 feet of 12-inch diameter pipeline
R-5	Alpine Pacific to East Victoria Pipeline Connector	Approximately 3,000 feet of 12-inch diameter pipeline
R-6(4)	El Capitan Pipeline - R&R	Approximately 26,400 feet of 36-inch diameter pipeline
Pump Stations		
RPS-2	New Galloway Pump Station	Three pumps each with a 1,450-gpm pumping capacity
RPS-3	New Alpine West Pump Station	Three pumps each with a 1,400-gpm pumping capacity
RPS-4A	New Alpine South Pump Station	Three pumps each with a 900-gpm pumping capacity
Storage Reservoirs		
RS-3	New Alpine West Reservoir	1.0 MG

Notes:
(1) Source: 2015 Comprehensive Facilities Master Plan.
(2) Highway crossings were installed prior to Caltrans construction of the interstate; therefore, the pipelines are lacking the protective casings currently used in the construction of these crossing types.
(3) Project not previously identified in the 2015 CFMP but required for facilities identified in the 2015 CFMP to connect to the system.
(4) A detailed condition assessment study will evaluate potential risks of failure and associated consequences of failure for the pipeline (Project PM-3). Through this study, the District will be able to determine the extent of rehabilitation, repair, and/or replacement needed to ensure reliable operation of the system.

7.3.4 Future System Pressure Analysis

As part of the system-pressure evaluation, the future distribution system was analyzed with the hydraulic model to identify areas with pressures above 150 psi under ADD conditions, while MDD conditions were used to identify areas with pressures below 40 psi.

7.3.4.1 High Pressures

Based on the modeling analysis under year 2045 ADD conditions, several areas with high pressures greater than 150 psi were identified in the WSA and ESA. The majority of the high -pressure areas that were identified in the existing system also occurred in the future system analysis. The new high-pressure areas identified were a result of the elevation changes in the infill areas with future developments. It is assumed that these future developments will be designed with sufficient pipe classes and PRS to mitigate the negative impact of high-pressure pipes.

As discussed earlier the 2015 CFMP evaluated three alternatives to mitigate the impacts of high pressures. The selected alternative is to replace pipelines with high pressures when the pipelines reach the end of their useful life. Alternative 3 was selected based on cost considerations, no operational issues related to high pressures, and the District's low water loss. Thus, no separate projects were recommended to mitigate the high pressures.

7.3.4.2 Low Pressures

Based on the modeling analysis under 2045 MDD conditions, no new low -pressure areas with pressures below 40 psi were identified.

7.3.5 Future Pipeline Velocity Analysis

The hydraulic model was used to evaluate pipeline velocities in the future system with future system demands.

Based on the modeling analysis under 2045 MDD conditions, no new high velocity pipelines with velocities greater than 8 fps were identified. However, several new areas of high velocity were identified under 2045 ADD conditions within the ESA and are shown in Figure 7.20. These deficiencies were reviewed to determine if recommendations are needed. The following summarizes the velocity deficiencies and recommendations:

- Approximately 3,700 feet of 14-inch diameter pipe along East Victoria Drive between Alpine Boulevard and East Victoria Pump Station exceeds the maximum velocity criteria of 5 fps under 2045 ADD conditions. Due to the temporary nature and the lack of associated pressure deficiencies, no recommendation was made to mitigate this velocity deficiency.
- Approximately 3,700 feet of 14-inch diameter pipe along Alpine Boulevard between Victoria Drive and the Alpine Pump Station exceeds the maximum velocity criteria of 5 fps under 2045 ADD conditions. Based on the location of the pipeline, the high velocities are likely a result of operational conditions of the pump station. No improvements are recommended to mitigate the high velocities.

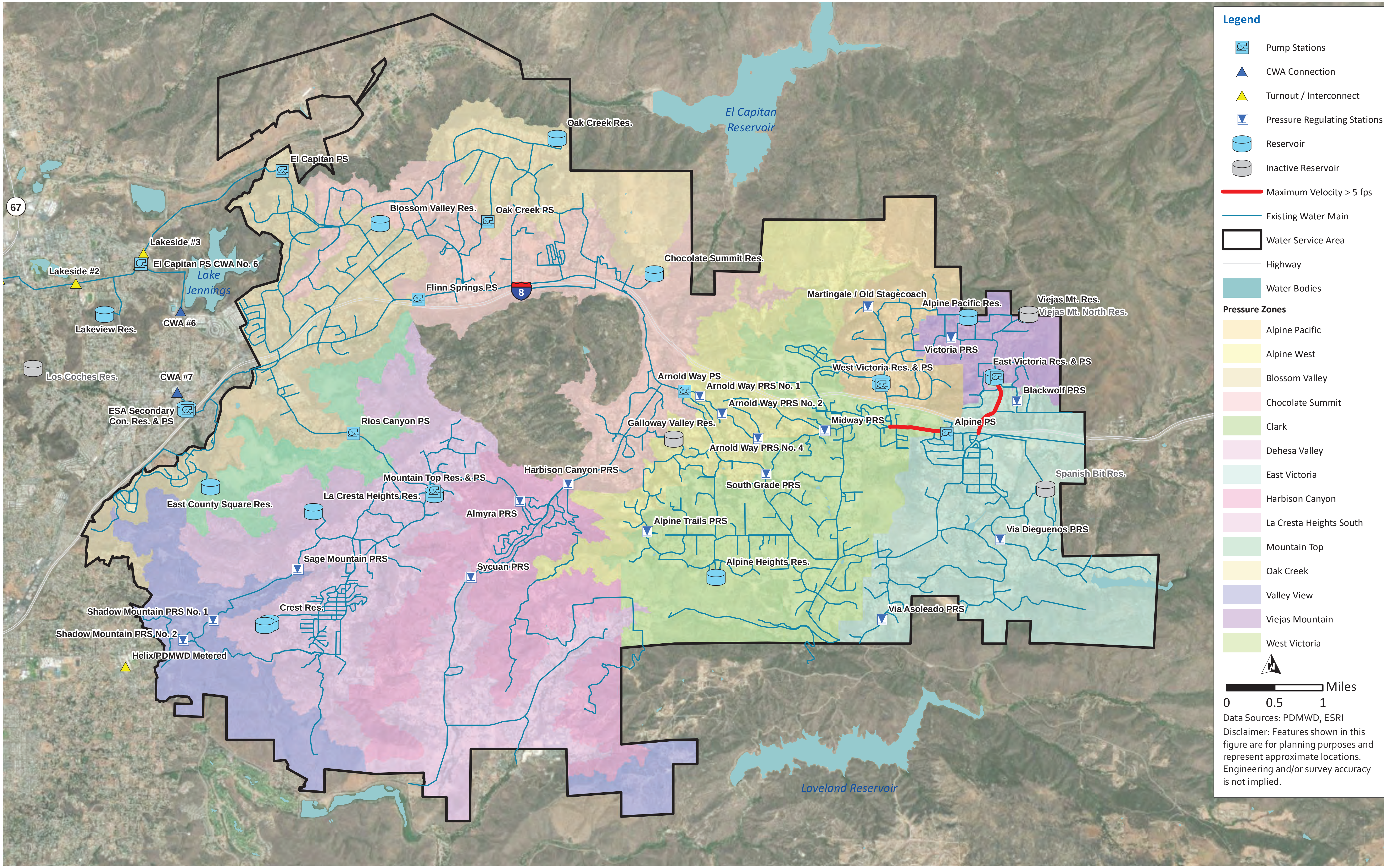


Figure 7.20 Maximum Velocity under 2045 ADD Conditions - ESA

7.3.6 Future Fire Flow Analysis

The hydraulic model was used to evaluate the conveyance capacity of the future distribution system to meet the fire flow requirements listed in Chapter 5 with a minimum residual pressure of 20 psi.

The 2045 fire flow analysis identified three additional fire flow deficiencies not previously identified in the 2019 system analysis. The analysis assumes that the District has implemented all 2019 fire flow improvements and future developments were modeled as point demands, will be adequately sized for the required fire flow. The following summarizes the velocity deficiencies and recommendations:

- It is recommended that approximately 600 feet of 6-inch diameter pipe along Linda Vern Court needs to be replaced and upsized with an 8-inch diameter pipeline (Project FFE-38).
- It is recommended that approximately 600 feet of 8-inch diameter pipe along Northcote Road between Canyon Park Drive and Gold Street needs to be replaced and upsized with a 10-inch diameter pipeline (Project FFE-39).
- It is recommended that approximately 500 feet of 10-inch diameter pipe along Harbison Canyon Road between Alpine Way and Hunter Pass be replaced and upsized with a 16-inch diameter pipeline (Project FFE-40).

7.3.7 Future Storage Analysis

A future storage analysis was completed using year 2045 demands and the evaluation criteria listed in Chapter 5. The results on this analysis are summarized in Table 7.19, while details of this analysis are presented in Appendix I.

As shown in the Table 7.6, the District currently has 25 reservoirs with 56.0 MG of effective storage. Based on the evaluation criteria and projected demands, the total required storage is 48.3 MG. Although the total system storage is sufficient, some pressure zones have deficiencies that cannot be accommodated by a storage surplus from higher zones.

Table 7.19 2045 System Storage Analysis

Pressure Zone	Existing Storage Capacity (MG)	2045 MDD (mgd)	Total Storage Required (MG)	Zone Deficit/ Surplus (MG)	Zone Transfer/Recommendation	Zone Transfer/ Proposed Storage Capacity (MG)	Updated Zone Deficit/Surplus (MG)
WAS							
Fanita Ranch	0.00	2.45	5.90	-5.90	New Fanita Ranch Res. (Project WS-1)	6.0	0.1
Fanita Ranch Zone Subtotal	***0.00***	***2.45***	***5.90***	***-5.90***		***6.0***	***0.1***
Sky Ranch 1180	1.00	0.05	0.31	0.69	Transfer to 1020 zone	-0.5	0.18
Sky Ranch 1020	0.00	0.16	0.51	-0.51	Transfer from 1180 zone	0.5	0.00
Sky Ranch Grouped Subtotal	***1.00***	***0.21***	***0.82***	***0.18***		***0.0***	***0.18***
Grossmont	2.50	0.50	1.26	1.24			
Grossmont Zone Subtotal	***2.50***	***0.50***	***1.26***	***1.24***			
Northcote	0.71	0.10	0.45	0.26			
Northcote Zone Subtotal	***0.71***	***0.10***	***0.45***	***0.26***			
Sycamore	1.20	0.17	1.19	0.01			
Sycamore Zone Subtotal	***1.20***	***0.17***	***1.19***	***0.01***			
Gravity	17.60	8.77	13.79	3.81			
Gravity Grouped Zone Subtotal	***17.60***	***8.77***	***13.79***	***3.81***			
ESA							
Viejas Mountain	0.95	0.26	0.72	0.23			
Viejas Mountain Grouped Subtotal	***0.95***	***0.26***	***0.72***	***0.23***			
East Victoria	5.07	1.29	3.51	1.56			
East Victoria Zone Subtotal	***5.07***	***1.29***	***3.51***	***1.56***			
Alpine Pacific	1.50	0.23	0.66	0.84			
Alpine Pacific Zone Subtotal	***1.50***	***0.23***	***0.66***	***0.84***			

Pressure Zone	Existing Storage Capacity (MG)	2045 MDD (mgd)	Total Storage Required (MG)	Zone Deficit/ Surplus (MG)	Zone Transfer/Recommendation	Zone Transfer/ Proposed Storage Capacity (MG)	Updated Zone Deficit/Surplus (MG)
West Victoria	5.10	2.20	5.38	-0.28	From Alpine West via new pump station (Project RPS-3)	0.28	0.00
Alpine West	0.00	0.12	0.42	-0.42	New Alpine West Res. 1.0 MG (Project RS-3) To West Victoria via new pump station (Project RPS-3)	1.00 -0.28	0.30
West Victoria Grouped Subtotal	***5.10***	***2.32***	***5.80***	***-0.70***		***1.00***	***0.30***
Blossom Valley	9.40	1.02	2.96	6.44			
Blossom Valley Zone Subtotal	***9.40***	***1.02***	***2.96***	***6.44***		***0.0***	
Oak Creek	1.10	0.26	1.37	-0.27	From Chocolate Summit via pump station	0.27	0.00
Oak Creek Subtotal	1.10	0.26	1.37	-0.27		0.27	0.00
Chocolate Summit	7.00	1.27	3.46	3.54	To Harbison Canyon via PRS To Dehesa Valley via PRS To Oak Creek via Pump Station From Mountain Top via Mt. View Connector	-1.10 -2.49 -0.27 0.32	0.00
Harbison Canyon	0.00	0.12	1.10	-1.10	From Chocolate Summit via PRS	1.10	0.00
Dehesa Valley	0.00	0.80	2.49	-2.49	From Chocolate Summit via PRS	2.49	0.00
Chocolate Summit Grouped Subtotal	***7.00***	***2.20***	***7.05***	***--0.05***		***0.05***	***0.00***
Mountain Top	2.40	<0.01	0.18	2.22	To Chocolate Summit via Mt. View Connector	-0.32	1.89
Mountain Top Zone Subtotal	***2.40***	***<0.01***	***0.18***	***2.22***		***-0.32***	***1.89***

Pressure Zone	Existing Storage Capacity (MG)	2045 MDD (mgd)	Total Storage Required (MG)	Zone Deficit/ Surplus (MG)	Zone Transfer/Recommendation	Zone Transfer/ Proposed Storage Capacity (MG)	Updated Zone Deficit/Surplus (MG)
La Cresta Heights South	0.78	0.60	2.07	-1.29	Crest South Res. 2.0 MG (Project WS-7) To Valley View via PRS	2.00 -0.60	0.11
Valley View	0.00	0.20	0.60	-0.60	From La Cresta Heights South via PRS	0.60	0.00
La Cresta Heights S. Grouped Subtotal	***0.78***	***0.80***	***2.67***	***-1.89***		***2.00***	***0.11***

In the WSA, there are nine reservoirs within the existing WSA water system that have a total capacity of 23.0 MG. The storage evaluation estimates a 6.0 MG storage deficit in the WSA. As shown in Table 7.19, the following storage improvements are recommended for the WSA:

- **Fanita Ranch Zone:** The estimated storage deficit for the Fanita Ranch PZ is 5.9 MG. For planning purposes, a new 6.0 MG Fanita Ranch Reservoir (Project WS-1) is proposed to serve both the 1200 and 800 HGL zones within this development. Alternatively, storage could be provided from two separate reservoirs. The final sizing and siting will need to be determined once the development layout is prepared.

In the ESA, there are 16 reservoirs within the existing ESA water system that have a total capacity of 33 MG. The storage evaluation demonstrated that a surplus of 8.4 MG is available for future use in the ESA. However, there are storage deficits in the West Victoria/Alpine West, Oak Creek, Harbison Canyon/Dehesa Valley/Chocolate Summit, and La Cresta Heights South/Valley View Zones. As shown in Table 7.19, the following storage improvements are recommended for the ESA:

- **West Victoria and Alpine West Zones:** The estimated storage deficit for the West Victoria and Alpine West Zones is 0.7 MG. The 0.7 MG storage deficit in the West Victoria Zone was decided to be resolved with a new storage reservoir in the Alpine West zone. The 2015 CFMP recommended a 1.0 MG Alpine West Reservoir (Projects RS-3 and R-3) which will relieve the deficit and provide reliability between the two zones. Thus, this project is still recommended.
- **Oak Creek:** The storage deficit of 0.27 MG within the Oak Creek zone is mitigated by pumping from the Chocolate Summit zone through the Oak Creek Pump Station.
- **Chocolate Summit, Harbison Canyon, Dehesa Valley Zones:** The estimated storage deficit for the Chocolate Summit/Harbison Canyon/Dehesa Valley Zones is 0.05 MG. The 0.05 MG storage deficit in the Chocolate Summit Zone can be met with a transfer from the Mountain Top Zone via Mountain View Connector.
- **La Cresta Heights South and Valley View Zones**: The estimated future storage deficit for the La Cresta Heights South and Valley View Zones is 1.9 MG. The 2015 CFMP recommended a 2.5 MG Crest South Reservoir. Based on the updated analysis, the proposed storage volume can be reduced to 2.0 MG Crest South Reservoir (Project WS-7) is proposed in the La Cresta Heights South Zone.

7.3.8 Future Water Age Analysis

Potable water usage within the District's service area has been decreasing in response to statewide drought conditions, increasing water costs, and customer's water scarcity awareness. This decrease in system demand, or water conservation, has presented challenges for District staff as they respond to slower reservoir cycles, longer transmission times, and, ultimately, increased water age. This increase in water age can adversely affect water quality, possibly causing the presence of nitrifying bacteria, an increase in water temperatures, and the degradation of chloramine residual. A future water age analysis was completed and findings from this analysis are included in separate technical memorandum that is included in Appendix J.

7.3.9 Future Pump Station Analysis

The pump station analysis evaluates the future required pump station capacities based on the evaluation criteria listed in Chapter 5. These criteria define that the firm capacity of the pump station shall be able to supply MDD of the pressure zone it feeds into (including upstream Zones), as well as the maximum fire-flow demand in that zone.

The results of the pump station analysis are summarized in Table 7.20, while details are presented in Appendix K.

There are four pump stations in the WSA. As shown in Table 7.20, the following new pump station improvements are recommended to accommodate growth in the WSA:

- **Fanita Ranch Zone:** There is a pumping requirement of about 5,200 gpm in the Fanita Ranch Zone. To meet this requirement, it is recommended that three 2,625 gpm pumps are installed at the future Fanita Ranch Pump Station (Project WPS-1). This pump station will result in a firm pumping capacity of 5,250 gpm. The sizing of this station is subject to change pending the future development layout. This entire pump station (100 percent) is allocated as future user benefit.

There are nine pump stations in the ESA. The deficits shown in the table below are addressed in the existing pump station analysis in the earlier part of this chapter.

7.4 Recommendations

The recommendations identified in this chapter are summarized in this section. Detailed cost estimates for each of these recommendations are included in the CIP of this Master Plan Update (see Chapter 9). Based on the analysis of the existing water system under existing and future demand conditions, Table 7.21 summarizes the recommended improvement projects. Figure 7.21 and Figure 7.22 illustrate the locations of the recommended improvement projects. Note that the development related projects are preliminary. It was assumed that the recommended rehabilitation/replacement projects and miscellaneous projects from the 2015 CFMP will remain unchanged along with District planned projects and are listed below:

- Rehabilitation/Replacement Related Projects:
  - 6-inch Pipeline Rehabilitation/Replacement (Project WRLT-6).
  - 8-inch Pipeline Rehabilitation/Replacement (Project WRLT-8).
  - 10-inch Pipeline Rehabilitation/Replacement (Project WRLT-10).
  - 12-inch Pipeline Rehabilitation/Replacement (Project WRLT-12).
  - 14-inch Pipeline Rehabilitation/Replacement (Project WRLT-14).
  - 16-inch Pipeline Rehabilitation/Replacement (Project WRLT-16).
  - 18-inch Pipeline Rehabilitation/Replacement (Project WRLT-18).
  - 20-inch Pipeline Rehabilitation/Replacement (Project WRLT-20).
  - 24-inch Pipeline Rehabilitation/Replacement (Project WRLT-24).
  - 30-inch Pipeline Rehabilitation/Replacement (Project WRLT-30).
  - 33-inch Pipeline Rehabilitation/Replacement (Project WRLT-33).
  - 36-inch Pipeline Rehabilitation/Replacement (Project WRLT-36).
  - Condition Assessment and R&R (Reservoirs 25 years and older) (Project WRS-1).
  - Condition Assessment and R&R (Reservoirs less than 25 years old) (Project WRS-2).
  - Surge tank rehabilitation and maintenance (Project WRS-3).
  - Blossom Valley Reservoir Roof Replacement (Project WRS-4).
  - Jerry Johnson Reservoir Refurb/Coating (Project WRS-5).
  - Reservoir Refurb/Coating (Project WRS-6).

  - Condition Assessment and R&R - Pump Station (pump stations > 10,000 gpm) (Project WRPS-1).
  - Condition Assessment and R&R - Pump Station (pump stations 5,000 to 10,000 gpm) (Project WRPS-2).
  - Condition Assessment and R&R - Pump Station (pump stations < 5,000 gpm) (Project WRPS-3).
  - Water Pump Replacement (Project WRPS-4).
  - Pump Station Improvements, Phase 2 (Project WRPS-5).
- Reliability Related Projects:
  - I-8 Crossing at East Victoria Drive (Project RI-1).
  - I-8 crossing at Tavern Road (Project RI-2).
  - I-8 Crossing at West Victoria Drive (Project RI-3).
  - I-8 crossing at Olde Highway 80, near Olde Highway 80 and Dunbar Lane (Project RI-4).
  - I-8 crossing between Blossom Valley Road and Chimney Rock Lane at the end of Chimney Rock Lane (Project RI-5).
  - I-8 crossing between Blossom Valley Road and Olde Highway 80 at Pecan Park Lane (Project RI-6).
  - I-8 crossing at the north end of Labrador Lane (Project RI-7).
  - I-8 crossing between Chocolate Summit Drive and Alpine Boulevard east of Dunbar Lane and I-8 (Project RI-8).
  - New Galloway Pump Station pipeline from Chocolate Summit Zone to Alpine West Zone (Project R-2A).
  - Summerhill View from Summerhill Point to Galloway Valley Reservoir 18-Inch Pipe (Project R-2B).
  - La Force Road from Sky Mesa Road to North Alpine Trail Road (Project R-2C).
  - New Alpine West Pump Station pipeline from Alpine West Zone to West Victoria Zone (Project R-3).
  - New Alpine South Pump Station pipeline from West Victoria Zone to East Victoria Zone (Project R-4A).
  - East Victoria Pipeline Connector (Project R-5).
  - El Capitan Pipeline - Concrete Lining (Project R-6).
  - Harbison Canyon Road Pipeline (Project R-7).
  - Galloway Pump Station (Project PRS-2).
  - Alpine West Pump Station (Project PRS-3).
  - Alpine South Pump Station (Project PRS-4A).
  - Alpine West Reservoir (Project RS-3).
- Miscellaneous Projects:
  - Erosion control and landscaping at 33 existing sites (Project PM-1).
  - PRS Installations (Project PM-8).
  - Access Control, Security & Fire System Maintenance & Monitoring (Project PM-9).
  - Blowoff Installation (Project PM-10).
  - HVAC Improvement (Project PM-11).
  - Poly Service Replacement ESA (Project PM-12).
  - Poly Service Replacement WSA (Project PM-13).
  - SCADA Upgrades at District Facilities – Water (Project PM-14).

- Security Enhancements - Field Sites (Project PM-15).
- Site Paving as Needed (Project PM-16).
- Valve Replacement Contracted – Water (Project PM-17).
- Valve Replacement ESA – Water (Project PM-18).
- Valve Replacement WSA – Water (Project PM-19).
- External Mandates (Project PM-20).
- Developer General (Project PM-21).
- Operations Yard Phase 3 Improvements (Project PM-22).
- Evaluate cathodic protection system and model the system in GIS (Project PM-2).
- El Capitan Pipeline Condition Assessment and Study (Project PM-3).
- Existing AMR Meters R&R (Project PM-4).
- ESA Backbone (steel pipe) Condition Assessment and Study (Project PM-5).
- Pipeline Condition Assessment (Project PM-6).

Table 7.20 2045 Pump Station Analysis

Discharge Pressure Zone	Firm Pump Station Capacity (gpm)	2045 MDD[1] (gpm)	Total Required Capacity (gpm)	Capacity Balance (gpm)	Recommendation	Additional/Total Firm Capacity (gpm)
WSA						
Fanita Ranch					New Fanita Ranch Pump Station with three pumps each with a capacity of 2,625 gpm (Project WPS-1)	5,250
Fanita Ranch Zone Subtotal	***0***	***1,705***	***5,205***	***-5,205***		***45***
Sky Ranch 1020						
Sky Ranch 1180						
Sky Ranch Zone Subtotal	***2,500***	***144***	***1,500***	***1,000***		
Grossmont						
Grossmont Zone Subtotal	***2,400***	***345***	***1,500***	***900***		
Northcote					Upgrade Northcote Pump Station by adding two additional pumps each with a design flow of 750 gpm (Project WPS-3) Northcote's existing 675 gpm pump is now included in firm capacity	750 675
Northcote Zone Subtotal	***675***	***69***	***2,069***	***-1,394***		***2,100***
Sycamore						
Sycamore Zone Subtotal	***2,150***	***119***	***1,500***	***650***		
Gravity						
Gravity Zone Subtotal	***0.0***	***6,091***	***0.0***	***0.0***		

Discharge Pressure Zone	Firm Pump Station Capacity (gpm)	2045 MDD[1] (gpm)	Total Required Capacity (gpm)	Capacity Balance (gpm)	Recommendation	Additional/Total Firm Capacity (gpm)
ESA						
Viejas Mountain					Upgrade East Victoria Pump Station with an additional pump at 1,000 (Project WPS-5)	1,000
Viejas Mtn Zone Subtotal	***1,000***	***182***	***1,682***	***-682***		***2,000***
Alpine Pacific						
Alpine Pacific Zone Subtotal	***2,300***	***162***	***1,500***	***700***		
East Victoria					New Alpine South Pump Station with three pumps each with a capacity of 900 gpm (Projects RPS-4A and R-4A)	1,800
East Victoria Zone Subtotal	***2,800***	***897***	***4,578***	***-1,778***		***4,600***
West Victoria					New Alpine West Pump Station with three pumps each with a capacity of 1,400 gpm (Projects RPS-3, R-3, and RS-3)	2,800
Alpine West					New Galloway Pump Station with three pumps each with a capacity of 1,450 gpm (Projects RPS-2 and R-2)	2,900
West Victoria Zone Subtotal	***7,630***	***1,608***	***6,349***	***1,281***		***13,300***
Blossom Valley						
Blossom Valley Zone Subtotal	***21,850***	***712***	***9,319***	***12,531***		***21,850***
Oak Creek					Upgrade Oak Creek Pump Station with two additional pumps each with a capacity of 2,100 gpm (Project WPS-7). Oak Creek's existing 800 gpm is now included in firm capacity	2,100 800
Oak Creek Zone Subtotal	***800***	***178***	***3,678***	***-2,878***		***22***

Discharge Pressure Zone	Firm Pump Station Capacity (gpm)	2045 MDD[1] (gpm)	Total Required Capacity (gpm)	Capacity Balance (gpm)	Recommendation	Additional/Total Firm Capacity (gpm)
Chocolate Summit						
Harbison Canyon						
Dehesa Valley						
Chocolate Summit Zone Subtotal	***7,700***	***1,525***	***5,773***	***1,927***		
Mountain Top						
Mountain Top Zone Subtotal	***3,000***	***1***	***1,500***	***1,500***		
Valley View						
La Cresta Heights South						
La Cresta Heights S Zone Subtotal	***3,000***	***555***	***2,055***	***945***		

Notes:
(1) MDD Peaking Factor is 1.7.

Table 7.21 Recommended Potable Water System Project

Project ID	Description	Existing Size	Proposed Size	Replace/New	Quantity
Water System Capacity Improvements					
Transmission Mains - Capacity		**Diameter (inches)**	**Diameter (inches)**		**Length (feet)**
WC-9	Pipeline to New Crest South Reservoir	--	16	New	1,700
WC-10	Woodside Avenue northeast of North Magnolia Avenue	8	20	Replace	200
WC-11	Fanita Drive between Farrington Drive and Paseo Ladera	8	14	Replace	400
Transmission Mains - Development		**Diameter (inches)**	**Diameter (inches)**		**Length (feet)**
DEV-1	Magnolia HDR Development	--	8	New	700
DEV-2A	River View Development	--	8	New	1,800
DEV-2B	River View Development	--	12	New	4,700
DEV-4	Fanita Ranch Development	--	16	New	9,700
DEV-5	Pinnacle Peak Development	--	8	New	300
DEV-15	Alpine High School/Library Development	--	16	New	4,700
DEV-16	South Coast Development	--	12	New	600
DEV-18A	Hillside Meadows Development (WSA)	--	8	New	1,400
DEV-18B	Hillside Meadows Development (WSA)	--	12	New	2,700
DEV-20	Unknown Developer (ESA)	--	14	New	4,500
DEV-22	Unknown Developer (ESA)	--	12	New	15,600
DEV-23	Unknown Developer (ESA)	--	12	New	4,700
DEV-24	Unknown Developer (ESA)	--	12	New	6,700
DEV-25	Unknown Developer (ESA)	--	12	New	38,500
DEV-26	Unknown Developer (ESA)	--	12	New	20,200
DEV-27	Unknown Developer (ESA)	--	8	New	2,500
DEV-28	Unknown Developer (ESA)	--	8	New	4,600
DEV-29	Unknown Developer (ESA)	--	12	New	2,300
DEV-30	Unknown Developer (ESA)	--	12	New	4,900
DEV-32	Unknown Developer (ESA)	--	8	New	1,700
DEV-33	Unknown Developer (ESA)	--	8	New	2,000
DEV-35	Alpine Densification Development	--	8	New	1,700
DEV-36	Jacor Development	--	8	New	400
DEV-37	Weld Distribution Center Development	--	8	New	800
DEV-38	Tower Glass Development	--	8	New	600
DEV-39	Cornerstone Development	--	8	New	300
DEV-40	Hattie Davidson Development	--	8	New	300
DEV-41	Prospect Estates II Development	--	8	New	300
DEV-42	WoodSpring Suites Development	--	8	New	300
DEV-43	Carlton Oaks Development	--	8	New	400

Project ID	Description	Existing Size	Proposed Size	Replace/New	Quantity
DEV-44	Lunar Lane Development	--	8	New	400
DEV-45	Sharp Medical Office Building Development	--	8	New	300
DEV-46	Gondola Skate Development	--	8	New	200
DEV-47	Railroad Workshop Development	--	8	New	100
DEV-48	Lantern Crest Ridge Phase II Development	--	8	New	200
DEV-49	Creekside Meadows Development	--	8	New	400
DEV-50	Alpine Tentative Map Development	--	8	New	1,200
DEV-51	Rancho Palo Verde Development	--	12	New	5,700
Fire Flow Improvements		**Diameter (inches)**	**Diameter (inches)**		**Length (feet)**
FFE-01A	Windmill View Road between Flying Hills Court and northwest of Lakeridge Lane	8	12	Replace	2,300
FFE-01B	Lakeridge Lane at Windmill View Road to end of street	6	10	Replace	500
FFE-02	Connect the 16-Inch Pipe to the Junction at 8733 Magnolia Avenue	--	12	New	100
FFE-04	Santana Street From El Nopal to end of street	--	10	Parallel	2,300
FFE-05	From end of 10-inch pipe on Fanita Parkway to end of street	6	10	Replace	4,900
FFE-06	Woodside Terrace from Woodside Avenue to Los Senderos Drive	--	8	Parallel	1,400
FFE-07	Flinn Springs Road to hydrant on Shanteau Drive	6	10	Replace	1,300
FFE-08	Hawley Road to northmost hydrant on Valle De Paz Road	6	8	Replace	1,100
FFE-09	Viewside Lane from Dunbar Lane to end of street	--	8	New	2,700
FFE-10	North Victoria Drive to 8-inch pipe on Sneath Way	4	8	Replace	1,000
FFE-11	Anderson Road to eastmost hydrant on Zumbrota Road	6	10	Replace	1,500
FFE-12	1867 Lilac Lane to Alpine Heights Road	6	12	Replace	2,200
FFE-13	Snowden Place from St. George Dr to hydrant	2	8	Replace	400
FFE-14A	Alegria Drive at Lento Lane to Beech Place Hydrant at end of Bonita Place and North Park Drive	4	8	Replace	1,200
FFE-14B	Beech Place between Suncrest Boulevard and Park Drive	4	8	Replace	800
FFE-14C	Park Drive from Beech Place to north hydrant	4	8	Replace	300
FFE-14D	Bonita Place between Beech Place and Park Drive	4	8	Replace	500
FFE-14E	Lento Lane between West Drive and continue west	4	8	Replace	700
FFE-15A	La Cresta Boulevard to Lathrop Lane on Highline Trail	4	8	Replace	600
FFE-15B	Highline Trail to end of street on Canyon Drive	4	8	Replace	500
FFE-16	Stoneridge Road at Mountain View Road to hydrant	4	8	Replace	800
FFE-17A	Complete Loop on Marshall Road and Marshall Way	--	8	New	300
FFE-17B	Eltinge Drive from Marshall Road to Marshall Way	6	10	Replace	700
FFE-19	Flinn Springs Road to Towne Lane on Oak Creek Road	8 & 6	12	Replace	2,300
FFE-20	Bay Meadows Drive at Hialeah Lane to Alpine Boulevard hydrant		8	New	200
FFE-21	Blue Lilac Lane to Alpine Estates Place	--	8	New	700
FFE-22A	Frances Drive from Harbison Canyon Road to Rosalie Way	8	10	Replace	400
FFE-22B	Rosalie Way FRP, Frances Drive to La Cresta Trail	8	10	Replace	700
FFE-22C	Post Trail from Rosalie Way to south	6	8	Replace	300

Project ID	Description	Existing Size	Proposed Size	Replace/New	Quantity
FFE-23	Marshall Road at Marquand Court to hydrant	--	10	Parallel	1,000
FFE-24	Cecilwood Drive at Tuthill Way to northeast to end of 8-inch pipe	8	10	Replace	800
FFE-25	Sanfred Court at Lafe Drive to north	8	10	Replace	200
FFE-26	La Cresta Boulevard/La Cresta Road between southeast of Mountain View Road and Hamlet Drive	4	8	Replace	400
FFE-27	Lilac Lane	4	8	Replace	300
FFE-29	South Grade Road	8	12	Replace	2,700
FFE-30	Keith Street between Wycliffe Street and Princess Joann Road	--	8	New	300
FFE-31	Rancho Summit	--	10	Parallel	600
FFE-32	Driftwood Creek Road between Quail Canyon Road and south to hydrant	8	12	Replace	1,100
FFE-33	Quail Canyon Road between northeast of Tombstone Creek Road and Post Oak Lane	8	10	Replace	700
FFE-34	Bon Vue Drive between Oak Creek Road and Toya Lane	6	8	Replace	1,400
FFE-35	Hale Drive south of Victoria Drive	8	10	Replace	1,600
FFE-36	Galloway Valley Road between Harbison Canyon Road and Alpine Trail Road	8	10	Replace	1,600
FFE-37	Camino del Vecino between Camino Christina and north to 10-inch pipe	8	10	Replace	1,200
FFE-38	Linda Vern Court	6	8	Replace	600
FFE-39	Northcote Road between Canyon Park Drive and Gold Street	8	10	Replace	600
FFE-40	Harbison Canyon Road between Alpine Way and Hunter Pass	10	16	Replace	500
Booster Pump Stations		**Power (hp)**	**Power (hp)**		
WPS-1	New Fanita Ranch Pump Station	--	840	New	
WPS-3	Upgrade Northcote Pump Station	--	400	Replace	
WPS-5	Upgrade East Victoria Pump Station	--	180	Upgrade	
WPS-7	Upgrade Oak Creek Pump Station	--	600	Replace	
Storage Reservoirs		**Volume (MG)**	**Volume (MG)**		
WS-1	New Fanita Ranch Reservoir	--	6.0	New	
WS-7	New Crest South Reservoir	--	2.0	New	

Project ID	Description	Existing Size	Proposed Size	Replace/New	Quantity
Rehabilitation Repair/Replacement Projects					
Distribution System		**Diameter (inches)**	**Diameter (inches)**		**Length (feet)**
WRLT-6	6-inch pipeline R&R	6	8	Replace	42.500
WRLT-8	8-inch pipeline R&R	8	8	Replace	71,300
WRLT-10	10-inch pipeline R&R	10	10	Replace	34,600
WRLT-12	12-inch pipeline R&R	12	12	Replace	10,400
WRLT-14	14-inch pipeline R&R	14	14	Replace	9,000
WRLT-16	16-inch pipeline R&R	16	16	Replace	4,700
WRLT-18	18-inch pipeline R&R	18	18	Replace	1,700
WRLT-20	20-inch pipeline R&R	20	20	Replace	900
WRLT-24	24-inch pipeline R&R	24	24	Replace	800
WRLT-30	30-inch pipeline R&R	30	30	Replace	300
WRLT-33	33-inch pipeline R&R	33	33	Replace	800
WRLT-36	36-inch pipeline R&R	36	36	Replace	12,300
Storage Reservoirs		**Frequency**	**Quantity**		**Unit**
WRS-1	Condition Assessment Report and R&R (reservoirs 25 years and older)	10 Years	38	R&R	reservoirs
WRS-2	Condition Assessment Report and R&R (reservoirs less than 25 years old)	10 Years	12	R&R	reservoirs
WRS-3	Surge Tank Rehabilitation and Maintenance		4	R&R	tanks
WRS-4	Blossom Valley Reservoir Roof Replacement		1	R&R	reservoirs
WRS-5	Jerry Johnson Reservoir Refurb/Coating		1	R&R	Facility
WRS-6	Reservoir Refurb/Coating		1	R&	Facility
Booster Pump Stations		**Frequency**	**Quantity**		**Unit**
WRPS-1	Pump Station R&R (pump stations>10,000 gpm)	5 Years	10	R&R	Facility
WRPS-2	Pump Station R&R (pump stations 5,000 to 10,000 gpm)	5 Years	5	R&R	Facility
WRPS-3	Pump Station R&R (pump stations <5,000 gpm)	5 Years	50	R&R	Facility
WRPS-4	Water Pump Replacement	20 Years	45	R&R	Facility
WRPS-5	Pump Station Improvements, Ph 2	--	--	R&R	Facility

Project ID	Description	Existing Size	Proposed Size	Replace/New	Quantity
Reliability Projects					
Reliability - Pipelines		**Diameter (inches)**	**Diameter (inches)**		**Pipe Length (feet)**
RI-2	I-8 Crossing at East Victoria Drive	14	14/30	Upgrade	600
RI-3	I-8 Crossing at Tavern Road	10	10/21	Upgrade	1,200
RI-4	I-8 Crossing at West Victoria Drive	16	16/30	Upgrade	600
RI-5	I-8 Crossing at Olde Highway 80, near Olde Highway 80 and Dunbar Lane	30	30/48	Upgrade	1,200
RI-7	I-8 Crossing between Blossom Valley Road and Chimney Rock Lane at the end of Chimney Rock Lane	10	10/21	Upgrade	500
RI-8	I-8 Crossing between Blossom Valley Road and Olde Highway 80 at Pecan Park Lane	8	8/16	Upgrade	500
RI-9	I-8 Crossing at the north end of Labrador Lane	24	24/42	Upgrade	600
RI-10	I-8 Crossing between Chocolate Summit Drive and Alpine Boulevard, east of Dunbar Lane and I-8	20	10/21	Upgrade	500
R-1A	Ridge Hill Road Pipeline	16	16	Replace	1,700
R-2A	New Galloway Pump Station Pipeline from Chocolate Summit Zone to Alpine West Zone	--	16	New	1,500
R-2B	Summerhill View from Summerhill Point to Galloway Valley Reservoir 18-inch pipe	12	18	Replace	1,000
R-2C	La Force Road from Sky Mesa Road to North Alpine Trail Road	--	12	New	1,600
R-3	New Alpine West Pump Station Pipeline from Alpine West Zone to West Victoria Zone	--	12	New	1,300
R-4A	New Alpine South Pump Station Pipeline from West Victoria Zone to East Victoria Zone	--	12	New	2,300
R-5	East Victoria Pipeline Connector	--	12	New	3,000
R-6	El Capitan Pipeline - Concrete Lining	--	36	New	26,400
Reliability - Pump Stations		**Quantity**	**Power (hp)**		**Quantity**
RPS-2	Galloway Pump Station	--	560	New	--
RPS-3	Alpine West Pump Station	--	540	New	--
RPS-4A	Alpine South Pump Station	--	300	New	--
Reliability - Storage Reservoirs		**Volume (MG)**	**Volume (MG)**		
RS-3	Alpine West Reservoir	--	1.0	New	--

Project ID	Description	Existing Size	Proposed Size	Replace/New	Quantity
Miscellaneous/District Recommended Projects					
Facility Maintenance		**Frequency**	**Quantity**		**Unit**
PM-1	Erosion Control and Landscaping at 33 Existing Sites	20 Years	33	Misc.	per facility
PM-8	PRS Installations				
PM-9	Access Control, Security & Fire System Maintenance & Monitoring				
PM-10	Blowoff Installation				
PM-11	HVAC Improvement				
PM-12	Poly Service Replacement ESA				
PM-13	Poly Service Replacement WSA				
PM-14	SCADA Upgrades at District Facilities - Water				
PM-15	Security Enhancements - Field Sites				
PM-16	Site paving as needed				
PM-17	Valve Replacement Contracted - Water				
PM-18	Valve Rplc ESA - Water				
PM-19	Valve Rplc WSA - Water				
PM-20	External Mandates				
PM-21	Developer General				
PM-22	Ops Yard Phase 3 Improvements				
Condition Assessments, Studies and Plans		**Frequency**	**Quantity**		**Unit**
PM-2	Evaluate Cathodic Protection System and model the system in GIS	--	1	--	per study
PM-3	El Capitan Pipeline Condition Assessment and Study	--	26,400	--	per foot
PM-4	Existing AMR Meters R&R	Annual	25	Annual	per year
PM-5	ESA Backbone (steel pipe) Condition Assessment and Study	--	57,000	--	per foot
PM-7	Pipeline Condition Assessment	5% per year	500	5% per year	miles

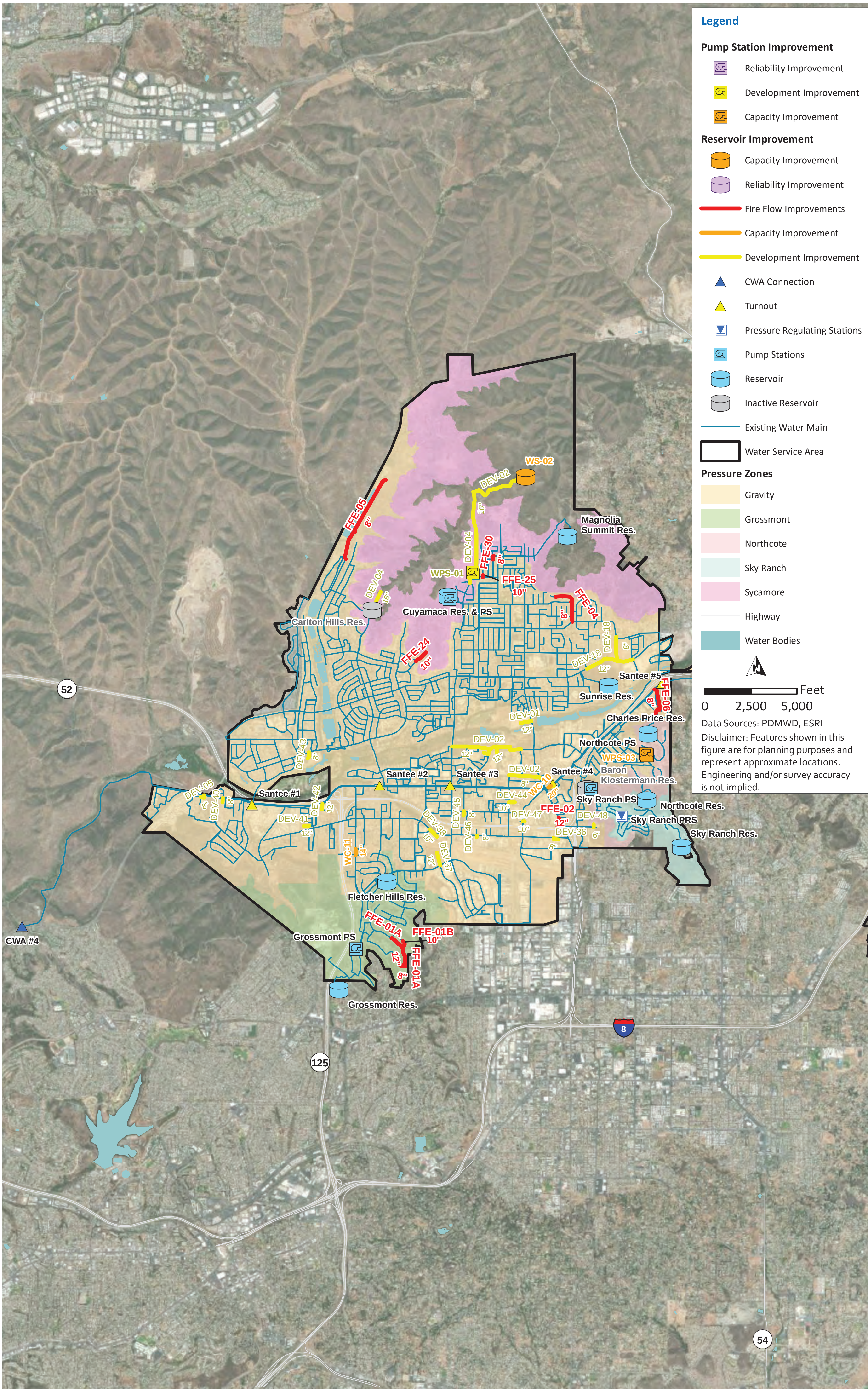


Figure 7.21 Recommended Improvement Projects – WSA

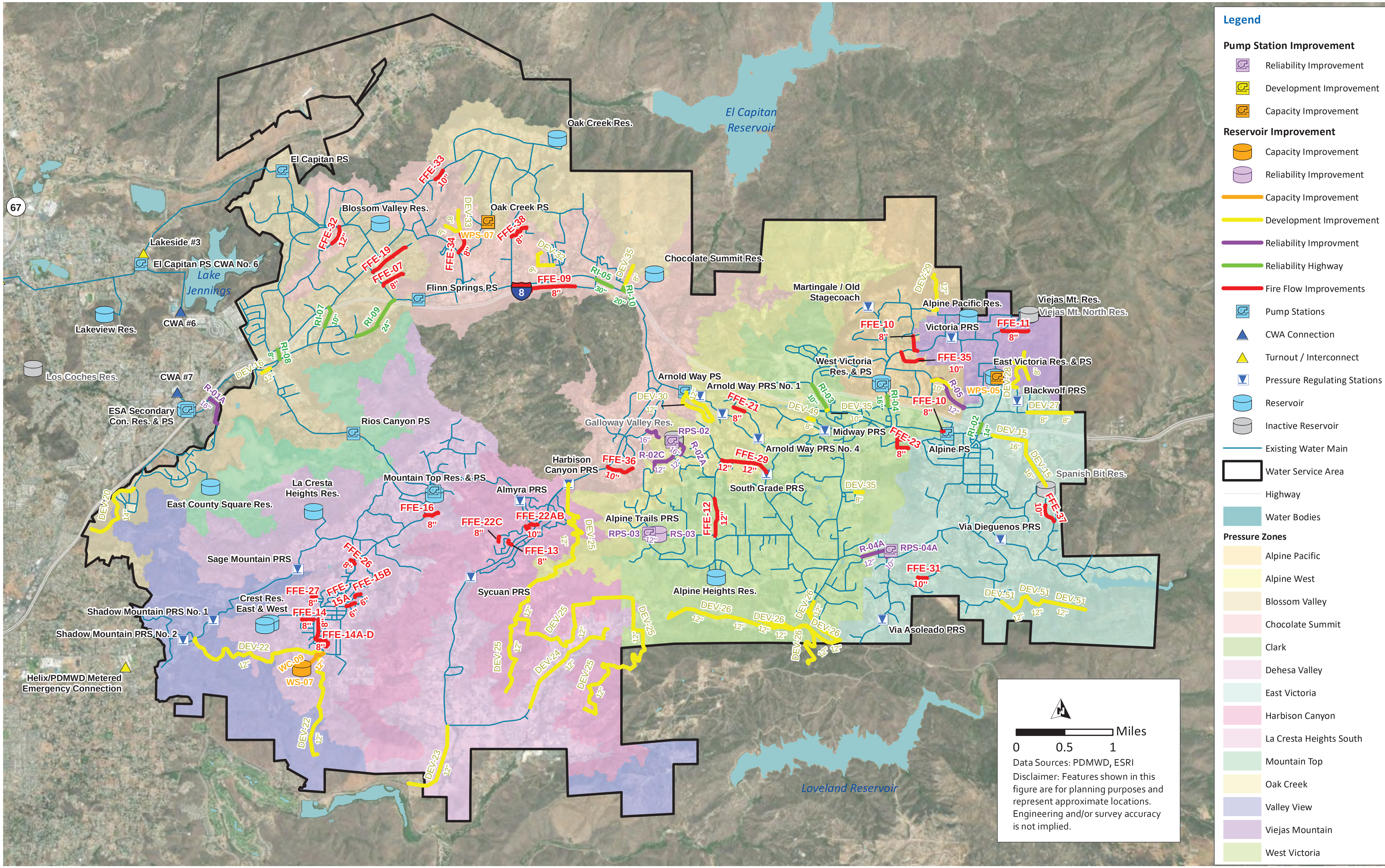


Figure 7.22 Recommended Improvement Projects - ESA

Chapter 8

RECYCLED WATER SYSTEM EVALUATION

This chapter describes the evaluation of the existing recycled water system to maximize service to existing customers identified in Chapter 3. The evaluation and sizing criteria described in Chapter 5 were used to size and cost any replacement or expansion. This chapter is divided into the following sections:

- **Existing Recycled Water System.** This section discusses the facilities that make up the existing recycled water system.
- **Supply Analysis.** The current capacity of the Ray Stoyer WRF is described along with the existing recycled water demand and discharge to Santee Lakes. Potential supply alternatives to meet future recycled water demands are also discussed.
- **Storage Analysis.** This section discusses existing storage capacity based on the evaluation criteria described in Chapter 5.
- **Pump Station Analysis.** The pump station analysis discusses existing pump station capacity based on the evaluation criteria described in Chapter 5.
- **Recycled Water Hydraulic Model.** The recycled water system hydraulics are analyzed in this section. The results of the minimum pressure, maximum pressure, and maximum velocity analysis are discussed.
- **Conclusions and Recommendations**. This section summarizes the recommendations that result from this chapter.

The CIP for the recommended recycled water system expansions is described in Chapter 9 of this CFMP.

8.1 Existing Recycled Water System

The District's existing recycled water system delivers recycled water to its existing customers through approximately 31 miles of "purple pipe" within the District's WSA is depicted on Figure 8.1. As shown on Figure 8.1, the key recycled water system facilities include the Ray Stoyer WRF, Fanita Pump Station which pumps recycled water effluent from the WRF, Potable Supplement Pump station which pumps potable water to the Fanita Terrace Reservoir, and the Fanita Terrace Reservoir. It should be noted that the District does not plan to extend its recycled water system to the ESA; therefore, it was not considered in this Master Plan update.

Figure 8.1 shows the existing recycled water system, as used in the hydraulic model. As part of this report the hydraulic model was updated, and some segments were added and modified based on the District's current GIS. The segments that were added are shown in green and consist of new pipelines to serve the Weston Development. The two segments in orange had incorrect diameters which were corrected as part of this recycled water system analysis.

As described in Chapter 3, the District's recycled water customer base and its associated demand steadily increased from since 2001 to 2014. However, due to conservation efforts, recycled water demands slightly decreased from the peak of 1,025 AFY in 2014. In 2019, the District served

242 customers with a combined recycled water demand of 789 AFY which is approximately 12 percent lower than the average of the previous 5 years (850 AFY). For analysis of the recycled water system, in this report, the average demand of the last 5 years of 850 AFY was used.

In 2019, approximately 1,207 AFY was distributed to the Santee Lakes for replenishment. Hence, the combined recycled water use of landscape irrigation and replenishment of Santee Lakes in 2019 was 1,996 AFY, or 1.78 mgd. However, for the analysis of the recycled water system, an average of the previous 5 years was used. The 5 year average flow to Santee Lakes was 1,104 AFY and thus the combined recycled water use of landscape irrigation and replenishment of Santee Lakes is 1,954 AFY or 1.74 mgd.

Currently, the District recycles about approximately 2 mgd of its average annual wastewater flow. Approximately 10 percent (0.2 mgd) of influent wastewater is lost through the water recycling processes in the form of sludge and solids, which are pumped to Point Loma for treatment and disposal. Recycled water from the Ray Stoyer WRF is either sent to the Santee Lakes for replenishment or pumped to the District's purple pipe distribution system to serve its Title 22 customers. Excess recycled water from the Santee Lakes is discharged into Sycamore Creek in accordance with the California Regional Water Quality Control Board National Pollutant Discharge Elimination System (NPDES) permit CA0107492.

8.1.1 Pipelines

The District's existing recycled water distribution system consists of approximately 31 miles of pipeline ranging from 2 to 20 inches in diameter. Table 8.1 presents a breakdown of pipelines by diameter and material type.

Table 8.1 Recycled Water Distribution System Pipelines

Diameter (in)	Pipeline Length(1) (feet) by Material Class			Total (feet)	Total (mi)
	PVC	ACP	Other(2)		
2	2,580	0	0	2,580	0.5
4	12,100	210	0	12,310	2.3
6	41,820	19,290	910	62,020	11.7
8	27,240	5,060	560	32,860	6.2
10	2,690	0	0	2,690	0.5
12	13,820	11,720	100	25,640	4.9
14	0	0	20	20	0.0
16	25,080	2,350	1,280	28,710	5.4
18	170	3,590	0	3,760	0.7
20	7,310	0	0	7,310	1.4
24	350	470	0	820	0.2
Total (feet)	**133,160**	**42,690**	**2,870**	**178,720**	**n/a**
Total (mi)	**25.2**	**8.1**	**0.5**	**n/a**	**33.7**

Notes:
(1) All lengths are rounded to 10 feet. Pipe data is from the District's recycled water GIS files.
(2) Small pipeline segments that were made with various materials are categorized under Other. The various materials include the following: CMLC & CSTL = cement mortar lined and coated steel; steel; CML & ECP = cement mortar lined and coated steel & embedded cylinder pipe; DIP = ductile iron pipeline, ABS.

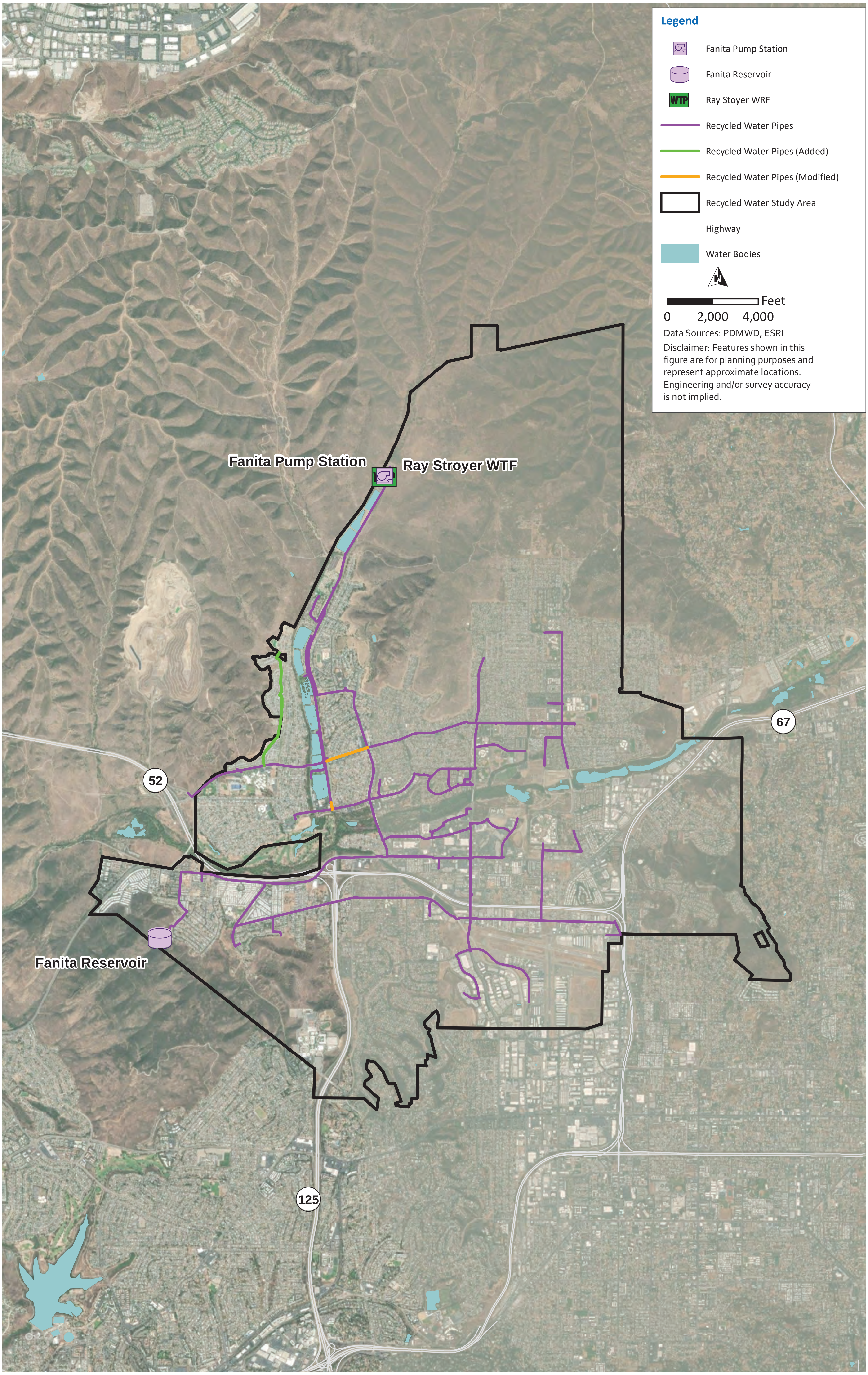


Figure 8.1 Existing Recycled Water System

As shown in Table 8.1, most of the District's transmission and distribution mains consist of 6-inch to 8-inch diameter pipelines (17.7 miles or 57 percent). Many of the pipelines (23.9 miles or 77 percent) are PVC. The distribution of pipeline material type is graphically shown on Figure 8.2. Small diameter pipes with diameters of 2 to 4-inch make up 2.7 miles or 8 percent of the recycled water distribution system. These small pipes and are located at various dead-end locations that serve customer meters. There is one stretch of 4-inch diameter pipe in the distribution network that is not a dead end, which helps loop water through the recycled water distribution system. This 4-inch diameter pipe is located on Mission Grove Road between Carlton Hills Boulevard and Cuyamaca Street. Other than these small diameter pipes, the rest of the recycled water system consists of pipes 6-inch diameter or greater.

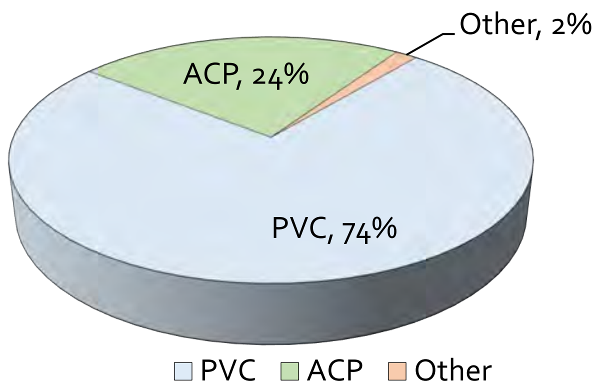


Figure 8.2 Pipelines by Material Type

Padre Dam's Water Recycling Facility began operations in 1962 with a 1.0 mgd facility that supplied the Santee Lakes. In 1997 the Ray Stoyer WRF was expanded to 2.0 mgd Title 22 tertiary treatment facility. Approximately 16 miles of new pipelines were constructed to convey Title 22 recycled water to customers in the District's WSA. In addition, the Fanita Terrace Reservoir and approximately 12 miles of existing potable water pipes were converted to recycled water use. Since then the system was expanded an additional 5 miles. The length of pipeline by material and installation year are summarized in Table 8.2 and are graphically shown on Figure 8.3.

Table 8.2 Pipelines by Installation Year and Material Type

Material	Pipeline Length(1) (feet) by Installation Year(2)							
	1958 to 1970	1971 - 1980	1981 - 1990	1991 - 2000	2001 - 2010	2011 - 2020	**Total (feet)**	**Total (mi)**
PVC	260	0	4,810	110,040	9,020	9,040	**133,170**	**25.2**
ACP	26,080	6,580	6,950	1,270	1,820	0	**42,700**	**8.1**
Other	0	0	0	2,890	0	0	**2,890**	**0.5**
Total (feet)	**26,340**	**6,580**	**11,760**	**114,200**	**10,840**	**9,040**	**178,760**	**n/a**
Total (mi)	**5.0**	**1.2**	**2.2**	**21.6**	**2.1**	**1.7**	**n/a**	**33.9**

Notes:
(1) All lengths are rounded to nearest 10 feet. Pipe data is from the District's recycled water GIS files.
(2) Installation year based on construction plan signature date from the District.

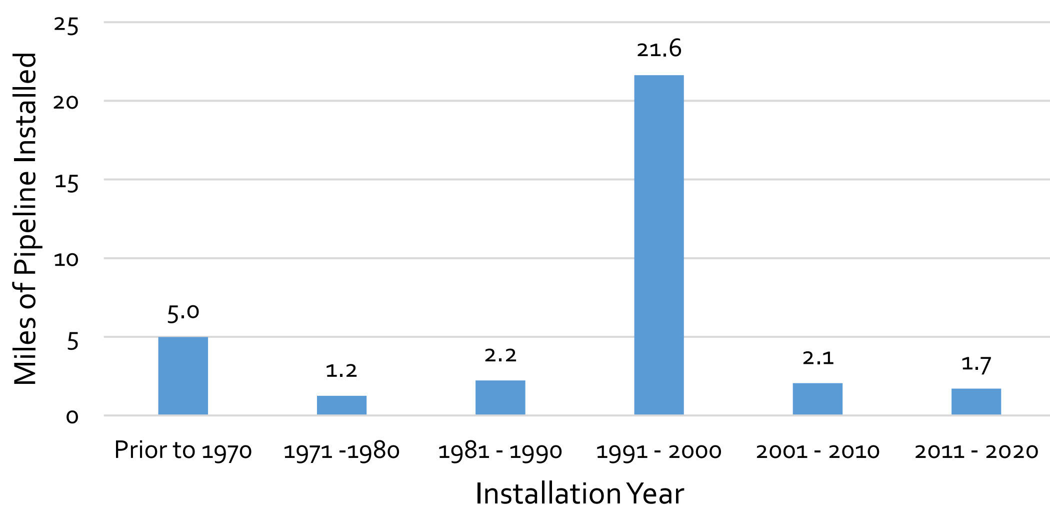


Figure 8.3 Pipelines by Installation Year

The anticipated life of the recycled water system was determined by calculating the useful life of each pipeline segment. The useful life of pipelines varies and is influenced by materials, soil conditions, installation quality, pressure, and many other factors. A simplistic approach was taken to determine the remaining useful life of the recycled water pipelines. Consistent with the 2015 CFMP, an assumption was made that regardless of the material, each pipeline segment would have a useful life of approximately 80 years. Based on a useful life of 80 years, the anticipated replacement date for each pipeline segment was calculated. The anticipated replacement of each pipeline segment was grouped by decade and is presented on Figure 8.4.

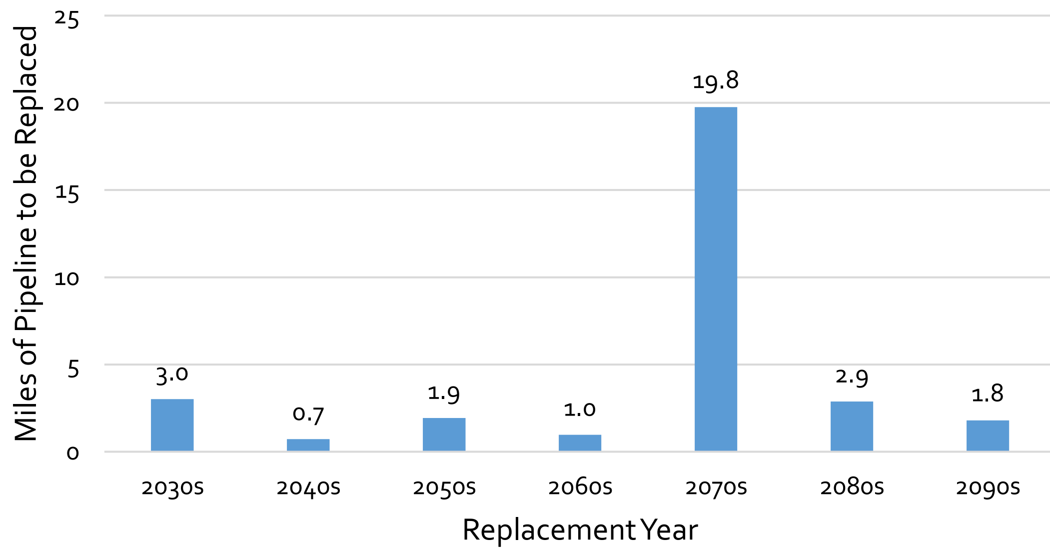


Figure 8.4 Pipelines by Expected Replacement Decade

As shown on Figure 8.4, none of the recycled water system pipelines reach the end of their useful life until 2030 at the earliest. The majority of pipelines, approximately 20 miles, will reach the end of their useful life in the 2070s.

8.1.2 Pumping Stations

The District has two recycled water pump stations in the WSA. The Fanita Pump Station, which supplies water from the WRF into the 635 pressure zone of the recycled water distribution system, has two pumps, each with a capacity of 2.0 mgd. One pump serves as a spare. Additional space is available at the site for a future expansion of this pump station. The WSA also contains a potable water make-up pump station, which is referred to as the Potable Supplement Pump Station. The Potable Supplement Pump Station pumps water from the potable water system, through an air gap, into the Fanita Terrace Reservoir when supplemental water is needed. The Potable Supplement Pump Station has two pumps, each with a capacity of 2.0 mgd. One pump serves as a spare. This pump station is manually controlled and used on an as needed basis.

8.1.3 Reservoirs

Recycled water distribution systems rely on stored water to help equalize fluctuations between supply and demand. The Fanita Terrace Reservoir is a 1.5-MG recycled water reservoir in the WSA that serves the 635 pressure zone during peak hour demands. The reservoir has a base elevation of 610 feet and maximum depth of 25 feet.

8.2 Supply Analysis

The Ray Stoyer WRF has the current capacity to provide 2.0 mgd of recycled water within the WSA. As discussed in Section 8.1, the District's historical average 5 year ADD was about 1,954 AFY (or 1.74 mgd), which includes about 1 mgd of discharge into the Santee Lakes. The 5-year ADD of the recycled water irrigation demand is 0.76 mgd as shown on Table 3.20. Based on the historical average 5 year ADD and a peaking factor of 2.0, the MDD is approximately 1.52 mgd, therefore, recycled water demand can be met under MDD conditions by minimizing flow to the Santee Lakes and supplementing the recycled water flow by utilizing potable water as a make-up supply as needed.

Recycled water demands were projected in Section 3.3.3 of this Report. The recommended supply alternatives to meet future recycled water demands that were evaluated include:

1. **Scale up the recycled water customer demands ADD to 1.1 mgd.** The District does not plan to expand the recycled water distribution system piping. However, the demand in the existing distribution system is projected to increase to a future ADD of 1.1 mgd, or MDD of 2.2 mgd. Additionally, the East County AWP project is expected to supply the Santee Lake demands at a maximum of 1.1 mgd. For modeling purposes, the capacity of the existing recycled water distribution system was evaluated using 2 mgd (1.1 mgd by a 2.0 peaking factor). Recycled water can be met under MDD conditions by supplementing the recycled water flow by utilizing potable water as a make-up supply as needed from the Potable Supplement Pump Station. The flow to the Santee Lakes can be supplied by the East County AWP.

8.3 Storage Analysis

The storage analysis evaluates the existing storage capacity based on the evaluation criteria described in Chapter 5. Based on the District's standards, recycled water reservoirs shall be sized to have a volume of at least one MDD. The storage evaluation for existing conditions and future demand alternatives are presented in Table 8.3.

As shown in Table 8.3, the District currently has an existing recycled water storage capacity of 1.5 MG at the Fanita Terrace Reservoir. With an existing storage requirement of 1.52 MG (equal to one multiplied by the existing MDD of 1.52 mgd, the existing system storage is slightly deficient for existing conditions, however both the Fanita Pump Station and the Potable Supplement Pump Station have more than enough capacity to make up the 0.02 MG deficit.

The future system analysis which involves scaling up the recycled water ADD to 1.1 mgd which results in a storage deficit of 0.7 MG. If the District expands their recycled water system, they should consider building additional recycled water storage or plan on increased potable water supplements during MDD conditions. The Potable Supplement Pump Station has enough capacity to supply this deficit.

Table 8.3 Storage Capacity Evaluation

Zone	MDD (mgd)	Total Required Storage (MG)(1)	Existing Storage (MG)	Balance with Existing Storage (MG)	Future Storage (MG)	Balance with Future Storage (MG)
Existing System Analysis						
Zone 635	1.52	1.52	1.5	-0.2	n/a	n/a
Future System Analysis – Scale up customer demands to ADD of 1.1 mgd.						
Zone 635	**2.2**	2.2	1.5	-0.7	1.0	0.3

Note:
(1) Based on storage criteria presented in Chapter 5. Santee Lakes demand is not included in the storage analysis. Also in the future Santee Lakes will be supplied by the East County AWP rather than by recycled water.

8.4 Hydraulic Analysis

The calibrated recycled water hydraulic model used a flow control valve at the Fanita Pump Station to replicate the customer demands on the calibration day (see Chapter 4). For the model analysis, this control valve was set to open, which allows the pumps at the Fanita Pump Station to control the flow of recycled water that is entering the recycled water distribution system.

The controls that were on the Fanita Pump Station are as shown on Table 8.4. The pump station is set up to maintain the level in Fanita Terrace Reservoir between 11 feet and 20 feet. If the level at the reservoir drops quickly (below 9 feet) the second pump will kick on to provide additional flow to the recycled water system.

Table 8.4 Fanita Pump Station Model Controls

Recycled Water Effluent Pump	Open Setting	Closed Setting
Pump 1	Fanita Terrace Reservoir Level <= 11 feet	Fanita Terrace Reservoir Level > 20 feet
Pump 2	Fanita Terrace Reservoir Level <=9 feet	Fanita Terrace Reservoir Level > 20 feet

The controls from Table 8.4 were used to simulate maximum pressures, minimum pressures, and maximum velocities for the recycled water system analysis.

The following scenarios were analyzed using the hydraulic model:

- Existing system.
- Future demand scenario where customer ADD was scaled up to 1.1 mgd.

Hydraulic results from the existing and future recycled water system analyses are presented in the following sections.

8.4.1 Maximum Pressure

Maximum pressures occur during low demand conditions when tank levels are high and the HGL in the pressure zone is high. This situation was simulated using a 24-hour ADD run with the hydraulic model. The maximum pressure occurs during the daytime hours when the hourly demand on the recycled system is minimal.

8.4.1.1 Existing System Results

The resulting maximum pressures are shown on Figure 8.5. As shown on Figure 8.5 there are many locations where the maximum pressure is greater than 120 psi. In these locations, the high pressure is due to static head. The highest pressures seen are 135 psi at in the lowest elevation areas. Figure 8.5 shows the pressure class of the pipeline in the recycled water system. There are some locations where the GIS data is missing pressure ratings. The district should confirm that the pressure ratings of the unknown pipes.

There is one section of pipe in the system where the pressure rating is 100 psi and the maximum pressures seen in the recycled water system is greater than 100 psi. This section of pipe is a 12-inch diameter pipe on Fanita Parkway between the north side of Lake 5 and the intersection of Fanita parkway and Carlton Oaks Drive. The length of pipeline is 6,050 feet and should be replaced with a pipe material rated at 150 psi or greater.

8.4.1.2 Future System Results

The resulting maximum pressures are similar to the existing system results shown on Figure 8.5. In the future, there are still many locations where the maximum pressure is greater than 120 psi. The highest pressures seen are 140 psi at in the lowest elevation areas. There are no additional recommendations due to high pressures resulting from the future system maximum pressure analysis.

8.4.2 Minimum Pressures

Minimum pressures occur during high demand conditions when tank levels are low and the HGL in the pressure zone is low. This situation was simulated using a 24-hour MDD run with the hydraulic model. In a recycled water system, the minimum pressure occurs during the nighttime irrigations hours when the hourly demand on the recycled system is maximum. The minimum pressure model run used the controls from Table 8.4.

An additional model run was performed to evaluate the minimum pressures in the recycled water distribution system when the Fanita Reservoir is empty. In this model run the pump controls from Table 8.4 were modified to allow the Fanita Reservoir to empty. The pumps were set to be off until the tank was empty.

8.4.2.1 Existing System Results

When the model was run with Fanita Reservoir active, and the controls described in Table 8.4: All pressures at demand locations in the recycled water system are greater than 40 psi and thus there are no minimum pressure deficiencies for the existing system analysis.

When the model was run with Fanita Reservoir empty: Some locations in the recycled water system experienced pressures less than 30 psi (as low as 25 psi). Figure 8.6 show the locations of the low pressure in the recycled water distribution system when the Fanita Reservoir is empty. The district should notify customers in these locations of reduced pressures when they bring the Fanita Reservoir offline.

8.4.2.2 Future System Results

The increase in customer demands did not noticeably impact the minimum pressures at demand locations in the recycled water system and thus the conclusions are similar to Section 8.4.2.1 for the existing system.

8.4.3 Maximum Velocities

Maximum velocities occur during high demand conditions when multiple users are demanding water from the recycled water system at once. This situation was simulated using a 24-hour MDD run with the hydraulic model.

8.4.3.1 Existing System Results

All velocities in the recycled water system are less than 5 fps and thus there are no velocity deficiencies for the existing system analysis. The maximum velocity criteria is 8 fps as established in Table 5.3 of this report.

8.4.3.2 Future System Results

All velocities in the recycled water system are less than 5 fps and thus there are no velocity deficiencies for the future system analysis.

8.5 Conclusions and Recommendations

The current recycled water system has no hydraulic deficiencies but is at its limit on storage capacity. The District does not have the storage capacity to expand their system to any more customers. If the District decides to expand their recycled water system to supply an ADD of 1.1 mgd, then the District will need to expand their recycled water storage or plan on supplementing the recycled water system demand with potable water during peak water usage. However, since the East County JPA is planning to implement the AWPF, the District isn't pursuing expansion of its recycled water system. The recommended recycled water system projects are summarized in Table 8.5.

The recycled water system pipeline infrastructure will not need to undergo any major replacements until year 2030 and would require a budget to start major replacements circa 2050. The R&R projects identified in this Master Plan update are listed below:

- 8-inch Pipeline Rehabilitation/Replacement (Project RWP-1).
- 6-inch Pipeline Rehabilitation/Replacement (Project RWP-2).
- 12-inch Pipeline Rehabilitation/Replacement (Project RWP-3).
- Fanita Terrace Reservoir (Project RWS-1).

Other projects consist of District planned projects and are listed below:

- AWP Recycled Water Projects (Project RWO-1).
- RW Decommissioning (Project RWO-2).
- RW Pipe Pipeline Replacement due to Condition (if required) (Project RWO-3).
- Well Pump Refurbishment (if required) (Project RWO-4).
- Access Control, Security & Fire System Maintenance & Monitoring (Project RWO-5).
- HVAC Improvement (Project RWO-6).
- Site Paving as Needed (Project RWO-7).
- WRF Decommissioning (Project RWO-8).
- WRF Mechanical (Project RWO-9).
- WRF Electrical (Project RWO-10).
- WRF Instrumentation (Project RWO-11).
- Operations Yard Phase 3 Improvements (Project RWO-12).

Table 8.5 Recommended Recycled Water System Projects

Project ID	Description	Existing Size	Proposed Size	Replace/ New	Quantity
Rehabilitation Repair/Replacement Projects[(1)]					
Distribution System		**Diameter (inches)**	**Diameter (inches)**		**Length (feet)**
RWP-1	8 inch Pipeline Rehabilitation/Replacement	8	8	Replace	2,100
RWP-2	6 inch Pipeline Rehabilitation/Replacement	6	6	Replace	13,800
RWP-3	12 inch Pipeline Rehabilitation/Replacement	12	12	Replace	3,700
Storage Reservoirs		**Volume (MG)**	**Volume (MG)**		
RWS-1	Fanita Terrace Reservoir	--	--	Rehab	--
Other Projects					
RWO-1	AWP Recycled Water Projects	--	--	Misc	--
RWO-2	RW Decommissioning	--	--	Misc	--
RWO-3	RW Pipe Pipeline Replacement due to Condition (if required)	--	--	Misc	--
RWO-4	Well Pump Refurbishment (if required)	--	--	Misc	--
RWO-5	Access Control, Security & Fire System Maint & Monitoring	--	--	Misc	--
RWO-6	HVAC Improvement	--	--	Misc	--
RWO-7	Site Paving As Needed	--	--	Misc	--
RWO-8	WRF Decommissioning	--	--	Misc	--
RWO-9	WRF Mechanical	--	--	Misc	--
RWO-10	WRF Electrical	--	--	Misc	--
RWO-11	WRF Instrumentation	--	--	Misc	--
RWO-12	Ops Yard Phase 3 Improvements	--	--	Misc	--

Note:
(1) Pipeline replacement lengths and diameters are pulled from Figure 8.4 source data.

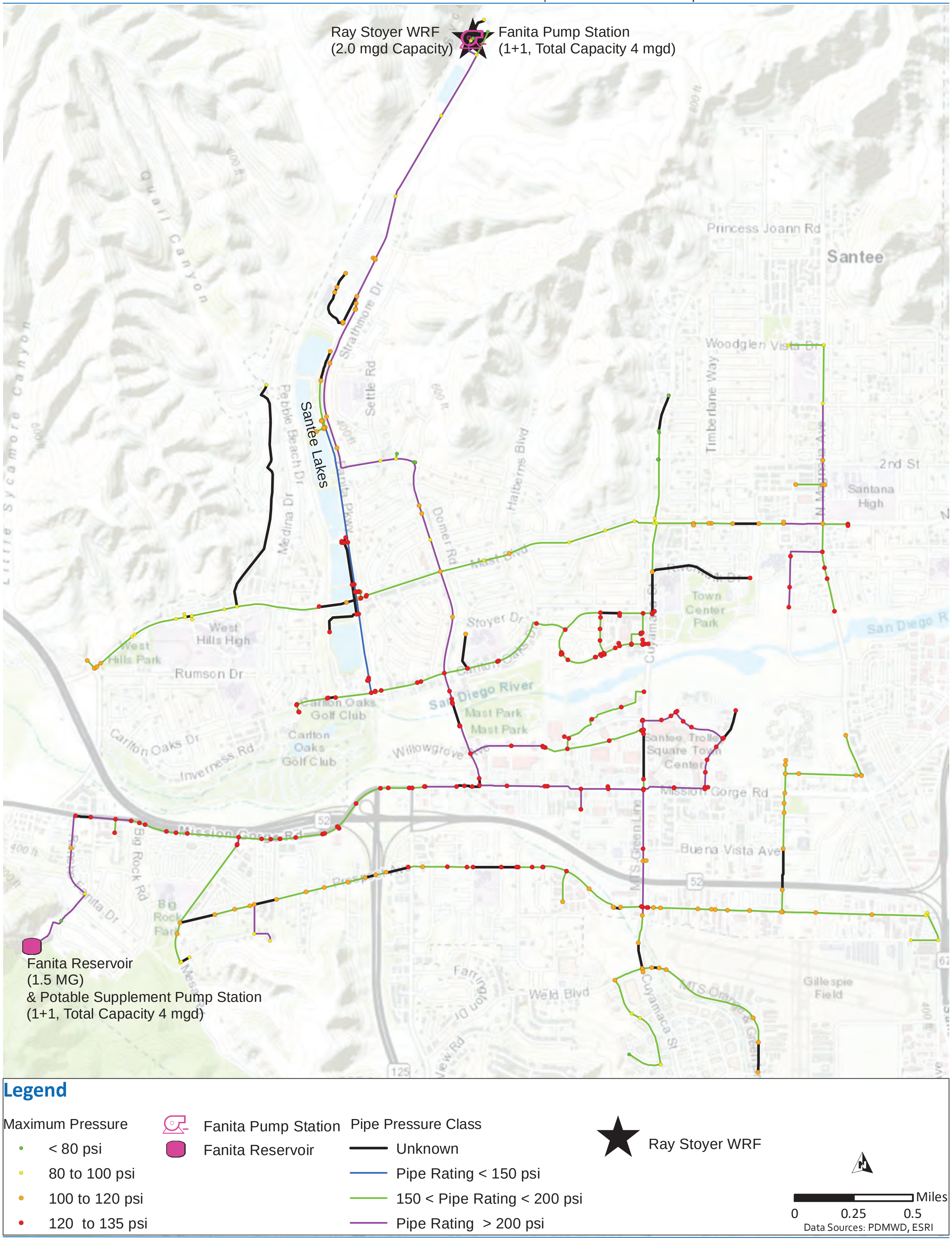


Figure 8.5 Existing Recycled Water System Maximum Pressure

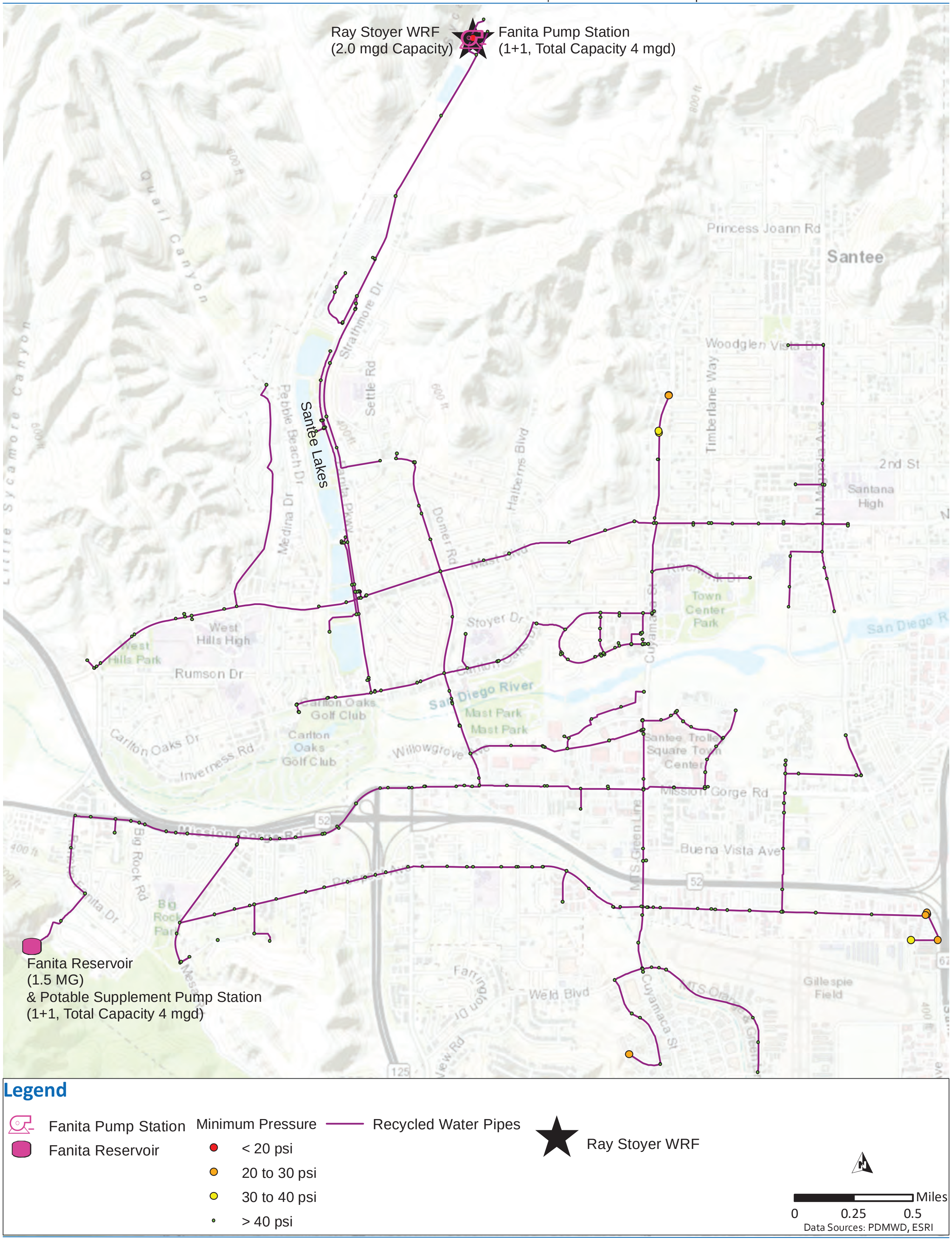


Figure 8.6 Existing Recycled Water System Minimum Pressure - Fanita Reservoir Empty

Chapter 9

CAPITAL IMPROVEMENT PLAN

This chapter presents the recommended CIP for the potable water, recycled water, and wastewater collection systems. In addition, the estimated capital cost of serving potable water to the Tribal Lands and Special Study Areas (see Chapter 2) are presented herein.

The proposed CIP presents improvement projects based on the water, recycled water, and wastewater system evaluations described in Chapters 6, 7, and 8 of this Master Plan Update. The planning horizon of this master plan is year 2045. This CIP is divided into two phases, the near-term CIP through year 2025 and a long-term CIP through year 2045.

This chapter starts with a summary of the cost-estimating assumptions. Subsequently, the wastewater, potable water, and recycled water CIPs are presented. The 2015 CFMP included CIP projects required to serve the Tribal Lands and Special Study Areas. The chapter is concluded with a Combined CIP that presents the total estimated cost of all three systems, with and without water service to the Tribal Lands and Special Study Areas.

9.1 Cost Estimating Assumptions

The cost estimates presented in this Master Plan Update are opinions developed by escalating the 2015 CFMP costs, information obtained from previous studies, and Carollo's experience on other similar projects. The costs are based on an Engineering News Record (ENR) Construction Cost Index 12,704 (ENR Los Angeles, October 2021).

The construction costs are representative of system facilities under normal construction conditions and schedules. Costs have been estimated for public works construction.

9.1.1 Cost Estimating Accuracy

The cost estimates presented in the CIP have been prepared for general master-planning purposes and for guidance in project evaluation and implementation. Final costs of a project will depend on actual labor and material costs, competitive market conditions, final project scope, implementation schedule, and other variable factors such as preliminary alignment generation, investigation of alternative routings, and detailed utility and topography surveys.

The Association for the Advancement of Cost Engineering defines an Order of Magnitude Estimate, deemed appropriate for master plan studies, as an approximate estimate made without detailed engineering data. It is normally expected that an estimate of this type would be accurate within plus 50 percent to minus 30 percent. This section presents the assumptions used in developing order-of-magnitude cost estimates for the recommended facilities.

9.1.2 Capital Cost Development

Capital costs developed for this Master Plan Update are estimated by multiplying the estimated construction cost with various markups. The various cost components used in the development of capital cost estimates are described below.

9.1.2.1 Baseline Construction Cost

This is the total estimated construction cost, in dollars, of the proposed improvement projects. Baseline construction costs were calculated by multiplying the estimated number of units by the unit cost, such as length of pipeline times the average cost per lineal foot of pipeline. The majority of unit construction costs used for this Master Plan Update are presented in Section 9.1.3.

9.1.2.2 Estimated Construction Cost

Contingency costs must be reviewed on a case-by-case basis because they will vary considerably with each project. Consequently, it is appropriate to allow for uncertainties associated with the preliminary layout of a project. Such factors as unexpected construction conditions, the need for unforeseen mechanical items, and variations in final quantities are a few of the items that can increase project costs for which it is wise to make allowances in preliminary estimates. To assist the District in making financial decisions for these future construction projects, contingency costs will be added to the planning budget as percentages of the total construction cost, divided into two categories: Estimated Construction Cost and Capital Improvement Cost.

Since knowledge about site-specific conditions of each proposed project is limited at the master-planning stage, a 30-percent contingency was applied to the Baseline Construction Cost to account for unforeseen events and unknown conditions. This contingency accounts for unknown site conditions such as poor soil, unforeseen conditions, environmental mitigations, and other unknowns and is typical for master planning projects. The Estimated Construction Cost for the proposed wastewater, potable water, and recycled water system improvements consists of the Baseline Construction Cost plus the 30-percent construction contingency.

9.1.2.3 Capital Improvement Cost

Other project construction contingency costs include costs associated with engineering, construction-phase professional services, and project administration. Engineering services associated with new facilities include preliminary investigations and reports, right-of-way acquisition, foundation explorations, preparation of drawings and specifications for construction, surveying and staking, sampling of testing material, and start-up services. Construction-phase professional services cover such items as construction management, inspection during construction, engineering support services, and materials testing. Finally, there are project administration costs, which cover such items as legal fees, environmental/California Environmental Quality Act compliance requirements, financing expenses, administrative costs, and interest during construction.

The cost of these items can vary, but, for the purpose of this study, it is assumed that the other project contingency costs will equal approximately 27.5 percent of the Estimated Construction Cost.

As shown in the following sample calculation of the capital improvement cost, the total cost of all project construction contingencies (construction, engineering services, construction management, and project administration) is 65.8 percent of the baseline construction cost. Calculation of the 65.8 percent is the overall markup on the baseline construction cost to arrive at the capital improvement cost. It is not an additional contingency.

Example:

Baseline Construction Cost	**$1,000,000**
Construction Contingency (30 percent)	$300,000
Estimated Construction Cost	**$1,300,000**
Engineering Cost (10 percent)	$130,000
Construction Management (10 percent)	$130,000
Project Administration (7.5 percent)	$97,500
Capital Improvement Cost	**$1,657,500**

9.1.3 Unit Construction Cost

Due to the large number of types of projects presented in this Master Plan Update, there are many unit construction costs utilized. The following unit construction costs are presented below:

- Pipeline Cost (see Table 9.1).
- Pump Station Cost (see Table 9.2).
- Reservoir Cost (see Notes: New Construction costs based on October 2021 Los Angeles ENR data).
- Miscellaneous Unit Costs (see Notes: New Construction costs based on June 2021 20-City ENR data).

It should be noted that these unit costs, along with some project-specific unit costs, are listed in the detailed summary CIP tables presented at the end of this chapter. Consistent with typical master-planning cost estimating, pipeline materials are not specified at this time. Storage reservoirs are assumed to be steel cylindrical tanks, as concrete reservoirs are typically more costly. Pump stations costs are based on total hp. For conservative planning purposes, no differentiation is made between new pump stations or pump station upgrades, as the condition of existing pump stations that can require upgrades can vary greatly.

Table 9.1 Unit Construction Costs – Pipelines

Diameter (inches)	Unit Construction Cost ($/LF)
Potable and Recycled Water Mains(1)	
4	$125
6	$185
8	$190
10	$240
12	$250
16	$335
18	$380
20	$415
24	$475

Diameter (inches)	Unit Construction Cost ($/LF)	
Potable and Recycled Water Mains[(1)]		
30	$500	
36	$590	
42	$715	
48	$780	
Sewer Gravity Main	New Construction[(1)]	Rehabilitation[(1,2)]
4	$170	$140
6	$170	$140
8	$175	$145
10	$180	$150
12	$190	$155
14	$200	$165
15	$205	$170
16	$210	$175
18	$220	$180
20	$275	$225
21	$285	$235
24	$310	$255
27	$350	$285
30	$390	$320
33	$440	$360
36	$490	$400
42	$575	$470
48	$625	$510
54	$670	$545

Notes:
(1) New Construction costs based on October 2021 Los Angeles ENR data.
(2) Rehabilitation cost is lower than new construction. Assuming that 50 percent of pipelines can be rehabilitated in-place at 75 percent of the cost of new construction, the remaining 50 percent will be replaced at the cost of new construction, which yields a composite R&R cost of 81.5 percent of the full pipeline replacement cost.

Table 9.2 Unit Construction Costs – Potable/Recycles Water Pump Stations

Station Size (hp)	Unit Construction Cost[(1)] ($/hp)
300 and Less	$5,000
301 to 500	$4,000
More than 500	$3,000

Notes:
(1) New Construction costs based on June 2021 20-City ENR data.

Table 9.3 Unit Construction Costs – Storage Reservoir

Volume (MG)	Unit Construction Cost(1) ($/gallon)
Less than 1	$2.50
1 to 3	$2.00
3 to 5	$1.75
5 to 10	$1.25

Notes:
(1) New Construction costs based on October 2021 Los Angeles ENR data.

Table 9.4 Unit Costs – Miscellaneous Items

Type	Unit Construction Cost(1) ($/unit)
Potable/Recycled Water CIP	
Storage Reservoir Condition Assessment and Rehabilitation	$300,000/reservoir
Reservoir Roof Replacement (BV)	$7,000,000/reservoir
Surge Tank Replacement	$100,000/tank
Pump Station Rehabilitation (small: <5000 gpm)	$75,000/facility
Pump Station Rehabilitation (medium: 5,000-10,000 gpm)	$125,000/facility
Pump Station Rehabilitation (large: >10,000 gpm)	$180,000/facility
Erosion Control and Landscaping	$60,000/site
Lining of El Capitan Pipeline	50 percent of new construction
Pipeline Condition Assessment and Study (El Capitan Pipeline and ESA Backbone)	$10 per lineal foot plus $50,000 for the Report
Pipeline Condition Assessment Program	$25,000/mile
AMR Program R&R	$30,000/year

Notes:
(1) New Construction costs based on October 2021 Los Angeles ENR data.

9.1.4 CIP Phasing

This CIP is divided into three phases, the near-term 1 from fiscal year (FY) 2023 through FY 2027, near-term 2 from FY 2028 through FY 2032 and the long-term from FY 2033 through FY 2045. The near-term phase one and near-term phase 2 was selected to align with PDMWD's two 5-year budget cycles.

9.2 Wastewater System CIP

The improvement projects included in the wastewater system CIP are a compilation of the recommendations made in Chapter 6 of this Master Plan Update. The wastewater system CIP includes the following project categories:

- Conveyance Capacity Improvements.
- R&R.
- Other.

The 2015 CFMP included WRF treatment capacity upgrades but those projects are now covered under the East County AWP project. A detailed list of wastewater CIP projects with project descriptions, sizing, and cost estimating information is provided at the end of this chapter in Table 9.10. The phasing assumptions and cost summaries are presented below.

9.2.1 Wastewater System CIP by Phase

The wastewater system CIP summary is presented by improvement category and phase in Table 9.5, while the phasing is graphically shown on Figure 9.1.

As shown in Table 9.5, the total recommended wastewater CIP is $35.6 million, with $27.2 million allocated to the near-term and $8.4 million to the long-term phase. This equates to an average expenditure of roughly $1.5 million per year.

Table 9.5 Wastewater CIP by Facility Type and Phase

Improvement Category	Near Term 1 FY 2023-2027(1)(2) ($, million)	Near Term 2 FY 2028-2032(1)(2) ($, million)	Long-Term FY 2033-2045(1)(2) ($, million)	Total Wastewater CIP(1)(2) ($, million)
Conveyance Capacity	$2.1	$5.9	$0.0	$8.0
R&R Improvements	$8.6	$0.0	$8.4	$17.0
Other	$10.7	$0.0	$0.0	$10.7
Wastewater Total(3)	**$21.3**	**$5.9**	**$8.4**	**$35.6**
Total Annual Cost	*$4.3*	*$1.2*	*$0.6*	*$1.5*
Developer Cost	$0.0	$0.4	$0.0	$0.4
District Funded Cost(3)	$21.3	$5.5	$8.4	$35.2
Annual District Cost(3)	*4.3*	*$1.1*	*$0.6*	*$1.5*

Note:
(1) Estimated Construction Cost includes a 30 percent contingency of the baseline construction cost.
(2) Total project costs include a 10 percent markup for engineering, a 10 percent markup for construction management and a 7.5 percent markup for project administration of the estimated construction cost.
(3) Numbers may vary slightly due to rounding.

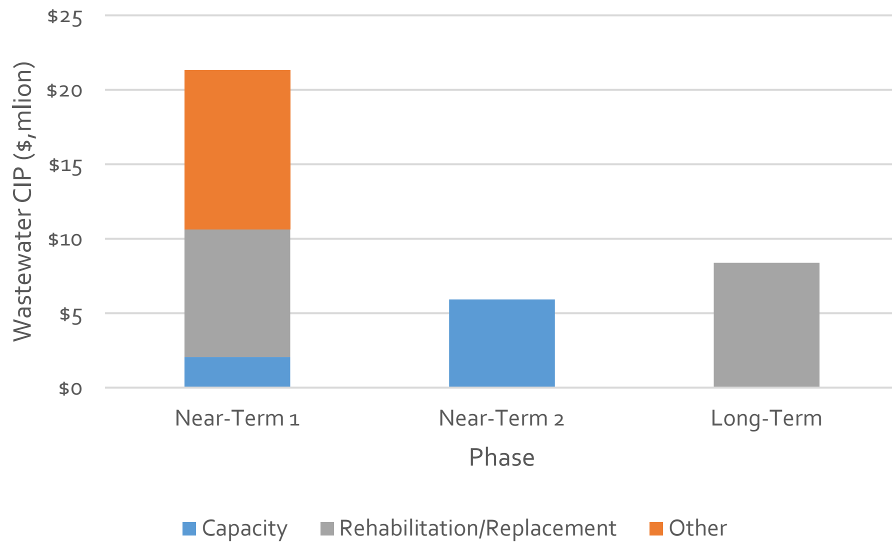


Figure 9.1 Wastewater System CIP by Facility Type and Phase

9.2.1.1 Near-Term Projects

As shown in Table 9.5, the combined cost of near-term capacity related improvement projects is $8.0 million or 22 percent of the total wastewater CIP. As shown in Table 9.10, the key near-term capacity projects are:

- WWC-1 (Carlton Hills Sewer).
- WWC-2 (Carita Sewer).
- WWC-3 (Carlton Oaks Trunk Sewer).
- WWC-4 (Town Center Sewer).
- WWC-5 (Mission Gorge Sewer).
- WWC-6 (Magnolia Avenue Sewer).

As these capacity improvement projects directly impact system performance and eliminate the risk of SSOs, it is recommended that these are placed in the near-term phase. The identified capacity improvement projects were wet weather driven; no dry weather capacity projects were needed. The combined costs of near-term R&R related projects is $8.6 million or 24 percent of the total wastewater CIP. Finally near-term other related projects which include District planned projects account for $10.7 million or 30 percent of the total wastewater CIP.

9.2.1.2 Long-Term Projects

The long-term CIP includes age-based pipeline R&R. This CIP includes pipeline rehabilitation projects rolled over from the near-term phases. The long-term R&R related projects accounts for $8.4 million or 24 percent of the total wastewater CIP.

9.2.2 Wastewater CIP by Improvement Category

The wastewater CIP through FY 2045 is graphically depicted by improvement category on Figure 9.2. Most of the CIP costs are comprised of R&R (48 percent), while other and capacity-related projects comprise a smaller portion of the total wastewater CIP at 30 percent and 22 percent, respectively.

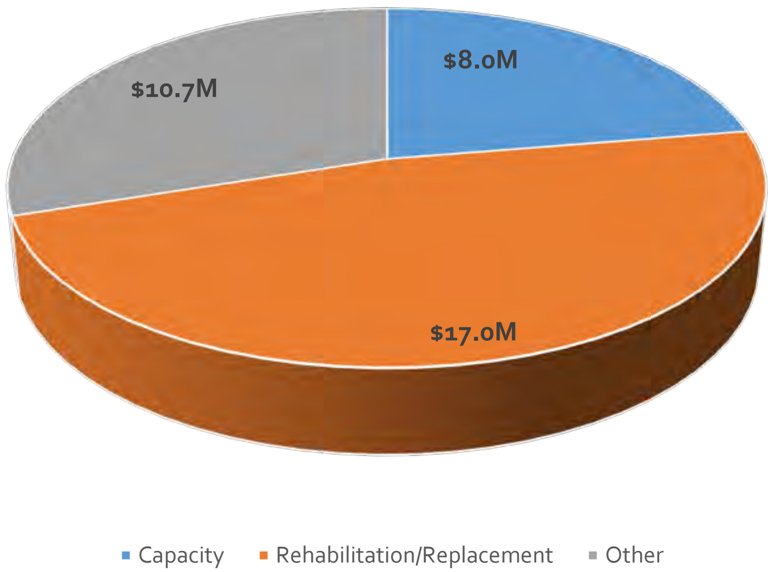


Figure 9.2 Wastewater System CIP by Improvement Category

9.3 Potable Water System CIP

The improvement projects included in the potable water CIP are a compilation of the recommendations made in Chapter 7 of this Master Plan Update. The water system CIP includes the following project categories:

- Capacity Improvements.
- Replacement and Rehabilitation (R&R).
- Reliability Improvements.
- Miscellaneous.

A detailed list of potable water CIP projects with project descriptions, sizing, and cost estimating information is provided at the end of this chapter in Table 9.11. The key near-term project phasing assumptions and cost summaries are presented below.

9.3.1 Potable Water CIP by Phase

The potable water system CIP is summarized by improvement category and phase in Table 9.6, while the phasing is graphically shown on Figure 9.3.

Table 9.6 Potable Water CIP by Facility Type and Phase

Improvement Category	Near-Term 1 FY 2023-2027(1,2) ($, millions)	Near-Term 2 FY 2028-2032(1,2) ($, millions)	Long-Term FY 2033-2045(1,2) ($, millions)	Total Potable Water CIP(1,2) ($, millions)
Capacity	$1.2	$24.1	$99.3	$124.6
R&R	$5.9	$13.9	$120.7	$140.4
Reliability	$17.8	$6.6	$26.3	$50.7
Miscellaneous	$14.8	$6.1	$8.8	$29.7
Potable Water Total(3)(4)	**$39.7**	**$50.6**	**$255.1**	**$345.3**
Total Annual Cost	*$7.9*	*$10.1*	*$19.6*	*$15.0*
Developer Cost	$1.2	$1.4	$89.5	$92.1
District Cost	$38.5	$49.2	$165.6	$253.3
District Annual Cost	*$7.6*	*$9.8*	*$12.7*	*$11.0*

Note:
(1) Estimated Construction Cost includes a 30 percent contingency of the baseline construction cost.
(2) Total project costs include a 10 percent markup for engineering, a 10 percent markup for construction management and a 7.5 percent markup for project administration of the estimated construction cost.
(3) Numbers may vary slightly due to rounding.
(4) Total cost includes projects that are partially funded by developers and the District.

As shown in Table 9.6, the total potable water CIP is $345.3 million, where $39.7 million (11 percent) is allocated to the near-term 1, $50.6 million (15 percent) is associated with near-term 2, and $255.1 million (74 percent) is allocated to the long-term phase. It is anticipated that approximately $2.6 million of near-term phases and $89.5 million of long-term projects will be developer funded. Without developer funding, this equates to an average expenditure of $11.0 million per year over the entire potable water CIP. As shown in Figure 9.3, most of the potable water projects are planned for the long-term phase. The cost of the potable water reliability, R&R, and miscellaneous projects, for the most part, were developed in the 2015 CFMP.

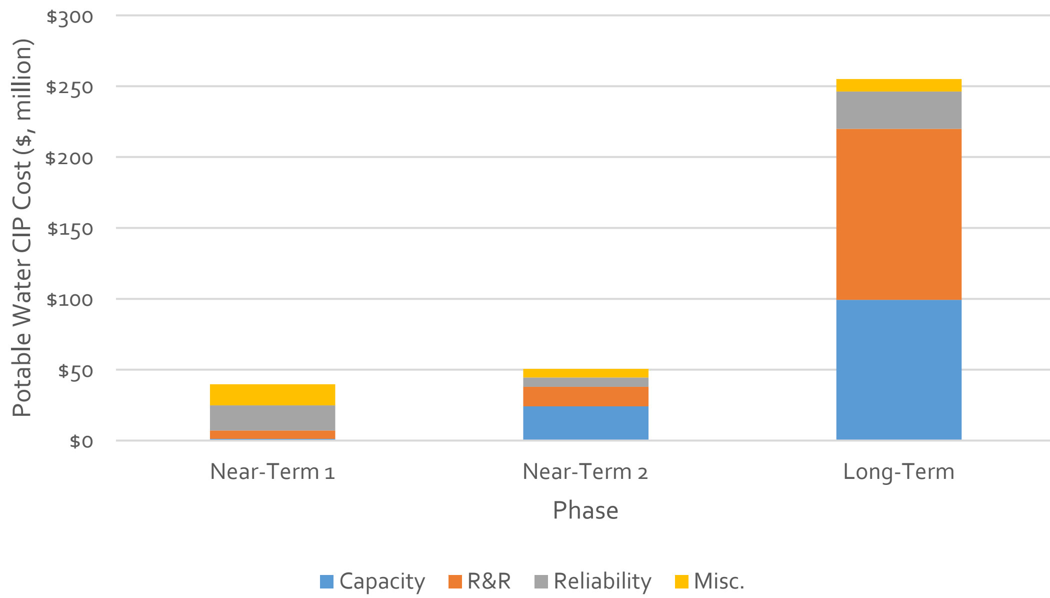


Figure 9.3 Potable Water CIP by Improvement Category and Phase

9.3.1.1 Near-Term Projects

As shown in Table 9.6, the near-term capacity related projects are $25.3 million (28 percent) of the near-term potable water CIP. The capacity related projects consist of three transmission main projects, one storage reservoir project, two pump station related projects, and 13 fire flow projects, and one storage reservoir. The cost of potable water near-term reliability and R&R projects are $24.3 million (27 percent), $19.7 million (22 percent), respectively. The potable water reliability, R&R, and miscellaneous projects, for the most part, were developed in the 2015 CFMP. The near-term reliability projects include eight pipeline highway crossing projects, one transmission main projects, a pump station, and the purchasing of two portable pumps. The near-term rehabilitation projects consist of annual storage reservoir and pump station projects.

A notable change since the 2015 CFMP, is that all pipeline rehabilitation projects are moved to the long-term phase. In the 2015 CFMP, an age-based analysis was used to estimate of the remaining useful of pipelines. This method does not necessarily indicate the actual conditions. To determine the priority and urgency of pipeline replacements, pipeline condition assessments need to be conducted in the near-term and long-term phases to gather the necessary data to prioritize the age-based pipeline replacements. The District's near-term strategy was to focus on developing an asset management system which will facilitate a comprehensive assessment of their existing infrastructure. The program will help the District identify pipelines that are in poor condition and reaching the end of useful life. Miscellaneous projects make up the smallest part of near-term projects at just $20.9 million (23 percent). The miscellaneous projects consist of facility maintenance, condition assessments, and studies and plans. Table 9.11 includes details on all recommended near-term potable water projects.

9.3.1.2 Long-Term Projects

Most of the long-term potable water CIP costs are R&R related improvements with a total cost of nearly $120.7 million (47 percent) followed by capacity related projects at $99.3 million

(39 percent). The R&R projects consists of approximately 36 miles of pipeline rehabilitation, storage reservoir, and pump stations. As discussed earlier all near-term R&R projects according to the 2015 CFMP were moved to the long-term phase for this Master Plan Update. The total pipeline R&R length remains unchanged from the 2015 CFMP.

Approximately $87.3 million of long-term capacity projects are developer related. All development driven projects should be completed based on the timing of new development within the service area. This philosophy helps to provide pipelines that have sufficient capacity to convey 2045 flows. The locations of the new development transmission mains are conceptual and are likely to change during the pre-design and design phase of project implementation. The locations shown are based on 2015 CFMP with some slight modifications and are intended to assist in the development of probable construction costs. In addition to future developer funded transmission mains, it is anticipated that a new 6.0 MG storage tank and pump station are required to support future development.

Approximately $13.5 million of the long-term capacity projects is dedicated to fire flow improvements, where $3.2 million is allocated to future users. The long-term fire flow improvements consist of approximately 4.5 miles on new and replaced pipelines.

Approximately $26.3 million of long-term potable water projects are for reliability related projects. The long-term reliability projects were identified in the 2015 CFMP. Finally, approximately $8.8 million of long-term potable water projects are for miscellaneous type projects that were identified in the 2015 CFMP. Table 9.11 includes details on all recommended long-term potable water projects. Potable Water CIP by Improvement Category

The potable water CIP through 2045 by improvement type is graphically depicted on Figure 9.4. As shown on Figure 9.4, R&R projects makes up $140.4 million (41 percent) of the potable water CIP. Capacity projects make up $124.6 million (36 percent) of the potable water CIP, reliability and miscellaneous projects make up $50.7 million (15 percent), and $29.7 million (9 percent), respectively, of the potable water CIP.

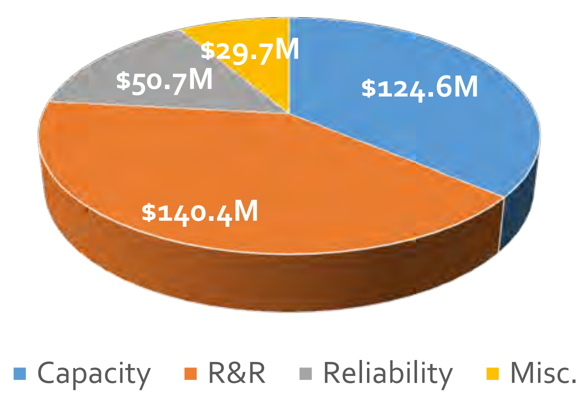


Figure 9.4 Potable Water CIP by Improvement Category

9.4 Recycled Water System CIP

The improvement projects included in the recycled water CIP are a compilation of the recommendations made in Chapter 8 of this Master Plan Update. The recycled water system CIP includes the following project categories:

- Capacity.
- R&R.
- Miscellaneous.

A detailed list of recycled water CIP projects with project descriptions, sizing, and cost estimating information is provided at the end of this chapter in Table 9.12.

9.4.1 Recycled Water CIP by Phase

The recycled water system CIP is presented by improvement category and phase in Table 9.7.

As shown in Table 9.7, the total recycled water CIP is $15.5 million, with $8.8 million allocated in the near-term and $6.8 million allocated to the long-term phase.

Table 9.7 Recycled Water CIP by Facility Type and Phase

Improvement Category	Near-Term 1 FY2023-2027(1)(2) ($, million)	Near-Term 2 FY 2028-2032(1)(2) ($, million)	Long-Term FY 2033-2045(1)(2) ($, million)	Total Recycled Water CIP(1)(2) ($, million)
Capacity	$0.0	$0.0	$0.0	$0.0
R&R Improvements	$0.0	$0.0	$6.8	$6.8
Miscellaneous	$8.8	$0.0	$0.0	$8.8
Recycled Water Total(3)	**$8.8**	$0.0	**$6.8**	**$15.5**
Total Annual Cost	*$1.8*	$0.0	*$0.5*	*$0.7*
Developer Cost	$0.0	$0.0	$0.0	$0.0
District Cost	$8.8	$0.0	$6.8	$15.5
District Annual Cost	*$0.7*	$0.0	*$0.5*	*$0.4*

Notes:
(1) Estimated Construction Cost includes a 30 percent contingency of the baseline construction cost.
(2) Total project costs include a 10 percent markup for engineering, a 10 percent markup for construction management and a 7.5 percent markup for project administration of the estimated construction cost.
(3) Numbers may vary slightly due to rounding.

9.4.1.1 Near-Term Projects

As shown in Table 9.7, the near-term other related projects are $8.8 million. The miscellaneous projects were identified by PDMWD and are the only near-term projects for the recycled water CIP. The current recycled water system has no hydraulic deficiencies but is limited on storage capacity. The recycled water system pipeline infrastructure will not need to undergo any major replacements until FY 2033.

9.4.1.2 Long-Term Projects

As shown in Table 9.7, the cost of the long-term improvement projects is $6.8 million. As shown in Table 9.12 the key long-term projects are RWP-1 through RWP-3.

9.4.1.3 Recycled Water CIP through Year 2045

The current recycled water system has no hydraulic deficiencies. Near-term recycled water CIP costs were identified by PDMWD. The total cost of the near-term recycled water projects is $8.8 million, with all costs allocated to other projects. As shown in Table 9.7, most of the recycled water costs are associated with the pipeline rehabilitation that start in FY 2033. The total cost of the long-term phase of the CIP is the highest at $6.8 million, with all costs allocated to pipeline rehabilitation.

9.5 Tribal Lands CIP

The improvement projects included in the CIP to potentially serve potable water to the Viejas Tribe and I-8 corridor areas east of Alpine, are a compilation of the recommendations described in the 2015 CFMP. As described in this Master Plan Update, only the projected demands for the Ewiiaapaayp, Viejas, and I-8 Corridor (Special Study Areas) triggered infrastructure improvement needs to wheel water through the District's system to serve these customers. The projected demands for Sycuan did not trigger any infrastructure improvement needs. No changes were made to the Tribal Lands related 2015 CFMP recommendations. The Tribal Lands water system CIP is presented by improvement category and phase in Table 9.8.

Table 9.8 Tribal Lands CIP by Facility Type and Phase

CIP ID(1)	Tribal Lands	Project Type	Capacity/Quantity	Project Name	Estimated Project Cost(1,2) ($, million)
T-1	Ewiiaapaayp, Viejas, and	Pump Station	1,400 gpm Additional 100 hp	Alpine South PS Upgrade	$0.8 M
T-2	I-8 Corridor	Pump Station	1,800 gpm Additional 200 hp	Galloway PS Upgrade	$1.7 M
T-3	Ewiiaapaayp, Viejas, and	Pump Station	1,750 gpm Additional 175 hp	Alpine West PS Upgrade	$1.5 M
T-4	I-8 Corridor	16-inch Pipeline	5,000 feet	Connection to Tribes and East Victoria PZ	$2.9 M
Total(3)					**$6.7 M**

Notes:
(1) Estimated Construction Cost includes a 30 percent contingency of the baseline construction cost.
(2) Total project costs include a 10 percent markup for engineering, a 10 percent markup for construction management and a 7.5 percent markup for project administration of the estimated construction cost.
(3) Numbers may vary slightly due to rounding.

As shown in Table 9.8, approximately 40 percent of the improvement costs are associated with the new 16-inch diameter pipeline that would bring water to a delivery point near the eastern end of the East Victoria pressure zone. In addition, the 2015 CFMP recommends three pump station upgrades are required. Due to the uncertainty of serving the Tribal Lands, these improvements are all included in the long-term phase in the comprehensive system CIP described in Section 9.6.

9.6 Comprehensive Systems CIP

The comprehensive systems CIP for the District's water, wastewater, and recycled water systems is summarized in Table 9.9 and graphically depicted on Figure 9.5. This combined CIP is presented without and with the Tribal Lands improvements. As shown in Table 9.9, the combined CIP costs for all three systems through planning FY 2045 is estimated to be about $396.5 million and $403.2 million without and with Tribal Lands projects, respectively.

Table 9.9 Comprehensive CIP by Facility Type and Phase

Utility System	Near-Term 1 FY 2023-2027 ($, million)	Near-Term 2 FY 2028-2032 ($, million)	Long-Term FY 2033-2045 ($, million)	Total CIP ($, million)
Wastewater(1)	$21.3	$5.9	$8.4	$35.6
Potable Water(2)	$39.7	$50.6	$255.1	$345.3
Recycled Water(3)	$8.8	$0.0	$6.8	$15.5
Total CIP without Tribal Lands(4)	$69.8	$56.5	$270.2	$396.5
Annual Cost	$14.0	$11.3	$20.8	$17.2
Tribal Lands(5)	$0.0	$0.0	$6.7	$6.7
Total with Tribal Lands(4)	$69.8	$56.5	$276.9	$403.2
Developer Cost	$1.2	$1.8	$89.5	$92.5
District Cost	$68.5	$54.7	$180.8	$304.1
District Annual Cost	$13.7	$10.9	$13.9	$13.2

Notes:
(1) See Table 9.5 for details.
(2) See Table 9.6 for details
(3) See Table 9.7 for details.
(4) Numbers may vary slightly due to rounding.
(5) See Table 9.8 for details.
(6) District cost does not include the proportion of project costs that are funded by developers and Tribal Land projects.

As shown in Table 9.9 and on Figure 9.5, the potable water system CIP comprises the largest portion of cost with $345.3 million (86 percent) of the total combined CIP, while the wastewater system CIP represents the second largest cost with $35.6 million (9 percent).

The phasing of the comprehensive CIP by system is depicted on Figure 9.6. As shown on this figure, about $69.8 million (17 percent) of project costs are included in near-term 1-phase, $56.5 million (14 percent) are included in near-term 2 phase and $276.9 million (69 percent) are scheduled for the long-term phase.

As listed in Table 9.9, it is anticipated that a combined total of approximately $1.2 million in developer funding will be provided within the near-term 1, $1.8 million in near-term 2, and $89.5 million within the long-term planning phase for total CIP. The District-Funded $304.1 million comprehensive CIP would equate to an average expenditure of $13.7 million per year in the near-term 1, $10.9 million in near-term 2, and $13.9 million per year in the long-term phase. In the future, the District anticipates increasing the annual CIP budget to account for inflation.

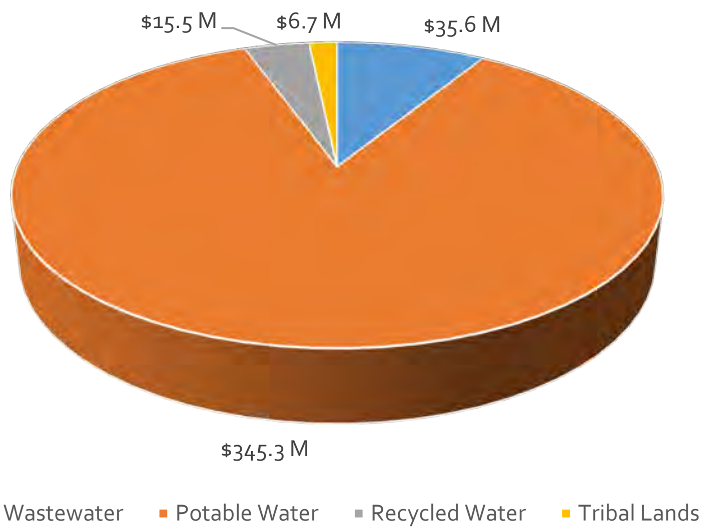


Figure 9.5 Comprehensive CIP Costs by System

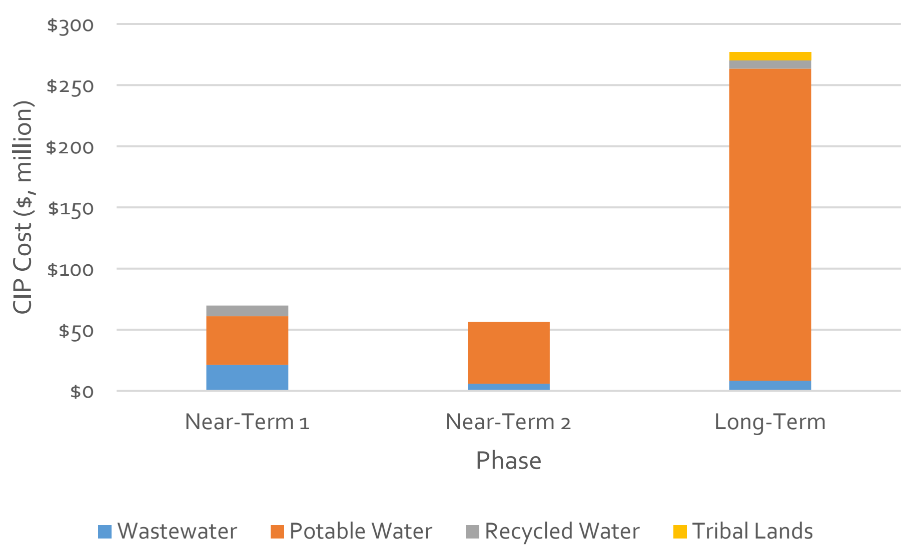


Figure 9.6 Comprehensive Systems CIP Costs by Phase

Table 9.10 Wastewater CIP

Project ID	Description		Existing Size	Proposed Size	Replace/ New	Quantity	Unit Cost[1] ($/unit)	Capital Improvement Cost[2][3][4] ($)	Near Term Project Phasing: FY 2023-27 ($)	Near Term Project Phasing: FY 2028-32 ($)	Near Term Project Phasing: Near Term FY 2023-2032 ($)	Long Term FY 2033-45 Project Phasing ($)	Future Users Benefit (%)	Reimbursement Category[2][3][4]: Existing System Improvments ($)	Reimbursement Category[2][3][4]: Future System Improvements ($)
Capacity Related CIPs															
Gravity Mains			Diam. (in)	Diam. (in)		Length (ft)									
Project WWC-1: Carlton Hills Sewer															
WWC-1A	Carlton Hills Blvd.	North of Carlton Hills Blvd parallel to Swanton Dr.	6	8	Replace	700	$180	$ 209,000	$ -	$ 209,000	$ 209,000	$ -	0%	$ 209,000	$ -
Project WWC-2: Carita Sewer															
WWC-2A	Carita Rd.	West of Carita Court	8	10	Replace	260	$190	$ 81,000	$ -	$ 81,000	$ 81,000	$ -	0%	$ 81,000	$ -
Project WWC-3: Carlton Oaks Trunk Sewer															
WWC-3A	Willowgrove Ave	Northwest of Willowgrove Ave to Carlton Oaks Drive (at the Calle del Verde intersection)	24	30	Replace	1,650	$1,000	$ 2,735,000	$ -	$ 2,735,000	$ 2,735,000	$ -	7%	$ 2,544,000	$ 191,000
Project WWC-4: Town Center Sewer															
WWC-4A	Mesa Ave.	River Park Dr. to Cuyamaca St.	18	21	Replace	900	$300	$ 448,000	$ -	$ 448,000	$ 448,000	$ -	7%	$ 417,000	$ 31,000
WWC-4B	Cuyamaca St	Runs parallel to northbound Cuyamaca	18	21	Replace	170	$300	$ 85,000	$ -	$ 85,000	$ 85,000	$ -	7%	$ 79,000	$ 6,000
WWC-4C	Abbeyfield Rd	Cuyamaca St to west of Nicole way	18	24	Replace	2,700	$325	$ 1,455,000	$ -	$ 1,455,000	$ 1,455,000	$ -	7%	$ 1,353,000	$ 102,000
WWC-4D	Between Abbeyfield Rd and Mission Creek Dr	Between Abbeyfield Rd and Mission Creek Dr (south of Abbeyfield Rd)	18	24	Replace	150	$325	$ 81,000	$ -	$ 81,000	$ 81,000	$ -	7%	$ 75,000	$ 6,000
WWC-4E	Between Abbeyfield Rd and Mission Creek Dr	Between Abbeyfield Rd and Mission Creek Dr (north of Mission Creek Dr)	21	24	Replace	100	$325	$ 55,000	$ -	$ 55,000	$ 55,000	$ -	7%	$ 51,000	$ 4,000
WWC-4F	Mission Creek Dr	Northeast of Rock Glen Way toWintercreek Pl	21	24	Replace	660	$325	$ 356,000	$ -	$ 356,000	$ 356,000	$ -	7%	$ 331,000	$ 25,000
WWC-4G	Wintercreek Pl	Mission Creek Dr to end of cul-de sac	21	24	Replace	340	$325	$ 184,000	$ -	$ 184,000	$ 184,000	$ -	7%	$ 171,000	$ 13,000
WWC-4H	Mast Park & Disc Golf Course	Near west end of Wintercreek Pl cul-de-sac to Carlton Oaks Dr	18	24	Replace	440	$325	$ 237,000	$ -	$ 237,000	$ 237,000	$ -	7%	$ 220,000	$ 17,000
Project WWC-5: Mission Gorge Sewer										$ -					
WWC-5A	Mission Gorge Rd	4th St to Cottonwood Ave	8	12	Replace	350	$200	$ 116,000	$ 116,000	$ -	$ 116,000	$ -	0%	$ 116,000	$ -
WWC-5B	Cottonwood Ave	Across Mission Gorge Rd	8	12	Replace	80	$200	$ 27,000	$ 27,000	$ -	$ 27,000	$ -	0%	$ 27,000	$ -
WWC-5C	Mission Gorge Rd	Cottonwood Ave to Tamberly Way	10	15	Replace	2,700	$215	$ 963,000	$ 963,000	$ -	$ 963,000	$ -	0%	$ 963,000	$ -
Project WWC-6: Magnolia Avenue Sewer															
WWC-6A	Graves Ave	East Bradely Ave to north entrance of Countryside Village Apts	8	10	Replace	900	$190	$ 283,000	$ 283,000	$ -	$ 283,000	$ -	0%	$ 283,000	$ -
WWC-6B	San Vicente Fwy	San Vicente Fwy Crossing	8	12	Replace	700	$200	$ 232,000	$ 232,000	$ -	$ 232,000	$ -	0%	$ 232,000	$ -
WWC-6C	Magnolia Ave	North of Denny Way to south of Airport Drive	10	12	Replace	530	$200	$ 176,000	$ 176,000	$ -	$ 176,000	$ -	0%	$ 176,000	$ -
WWC-6D	Between Magnolia ave and Wind Ave	N. Magnolia Ave to Wing Ave	10	12	Replace	780	$200	$ 259,000	$ 259,000	$ -	$ 259,000	$ -	0%	$ 259,000	$ -
Subtotals								*$ 7,982,000*	*$ 2,056,000*	*$ 5,926,000*	*$ 7,982,000*	*$ -*		*$ 7,587,000*	*$ 395,000*
Lift Stations															
WWC-13	Fanita Ranch	Fanita Ranch pump station	--	--	New	--	$0	$ -	$ -	$ -	$ -	$ -	100%	$ -	$ -
Subtotals								*$ -*			*$ -*	*$ -*		*$ -*	*$ -*
Capacity Related CIPs Total								**$ 7,982,000**	**$ 2,056,000**	**$ 5,926,000**	**$ 7,982,000**	**$ -**		**$ 7,587,000**	**$ 395,000**
Rehabilitation/Replacement Related CIPs															
Rehabilitation/Replacement			Diam. (in)	Diam. (in)		Length (ft)									
WWR-2	6-inch Pipeline Rehabilitation/Replacement	Pipeline Rehabilitation/Replacement Program[4]	6	6	Replace	27,100	--	$ 6,738,000	$ 2,331,000	$ -	$ 2,331,000	$ 4,407,000	0%	$ 6,738,000	$ -
WWR-3	8-inch Pipeline Rehabilitation/Replacement	Pipeline Rehabilitation/Replacement Program[4]	8	8	Replace	18,200	--	$ 4,525,000	$ 1,566,000	$ -	$ 1,566,000	$ 2,959,000	0%	$ 4,525,000	$ -
WWR-4	10-inch Pipeline Rehabilitation/Replacement	Pipeline Rehabilitation/Replacement Program[4]	10	10	Replace	2,200	--	$ 565,000	$ 195,000	$ -	$ 195,000	$ 370,000	0%	$ 565,000	$ -
WWR-5	12-inch Pipeline Rehabilitation/Replacement	Pipeline Rehabilitation/Replacement Program[4]	12	12	Replace	500	--	$ 138,000	$ 48,000	$ -	$ 48,000	$ 90,000	0%	$ 138,000	$ -
WWR-6	14-inch Pipeline Rehabilitation/Replacement	Pipeline Rehabilitation/Replacement Program[4]	14	14	Replace	100	--	$ 30,000	$ 10,000	$ -	$ 10,000	$ 20,000	0%	$ 30,000	$ -
WWR-7	15-inch Pipeline Rehabilitation/Replacement	Pipeline Rehabilitation/Replacement Program[4]	15	15	Replace	1,700	--	$ 494,000	$ 171,000	$ -	$ 171,000	$ 323,000	0%	$ 494,000	$ -
WWR-8	16-inch Pipeline Rehabilitation/Replacement	Pipeline Rehabilitation/Replacement Program[4]	16	16	Replace	200	--	$ 60,000	$ 21,000	$ -	$ 21,000	$ 39,000	0%	$ 60,000	$ -
WWR-9	18-inch Pipeline Rehabilitation/Replacement	Pipeline Rehabilitation/Replacement Program[4]	18	18	Replace	200	--	$ 65,000	$ 22,000	$ -	$ 22,000	$ 43,000	0%	$ 65,000	$ -
WWR-10	21-inch Pipeline Rehabilitation/Replacement	Pipeline Rehabilitation/Replacement Program[4]	21	21	Replace	150	--	$ 61,000	$ 21,000	$ -	$ 21,000	$ 40,000	0%	$ 61,000	$ -
WWR-11	24-inch Pipeline Rehabilitation/Replacement	Pipeline Rehabilitation/Replacement Program[4]	24	24	Replace	250	--	$ 109,000	$ 38,000	$ -	$ 38,000	$ 71,000	0%	$ 109,000	$ -
WWR-12	30-inch Pipeline Rehabilitation/Replacement	Pipeline Rehabilitation/Replacement Program[4]	30	30	Replace	50	--	$ 28,000	$ 10,000	$ -	$ 10,000	$ 18,000	0%	$ 28,000	$ -
WWR-13	Sewer Lift Station Rehabilitation	Sewer Lift Station Rehabilitation	--	--	Rehab	--	--	$ 569,000	$ 569,000	$ -	$ 569,000	$ -	0%	$ 569,000	$ -
WWR-14	Sewer Manhole Rehabilitation	Sewer Manhole Rehabilitation	--	--	Rehab	--	--	$ 268,000	$ 268,000	$ -	$ 268,000	$ -	0%	$ 268,000	$ -
WWR-15	Siphon and Sludge Main Improvements	Siphon and Sludge Main Improvements	--	--	Rehab	--	--	$ 3,300,000	$ 3,300,000	$ -	$ 3,300,000	$ -	0%	$ 3,300,000	$ -
Subtotals								*$ 16,950,000*	*$ 8,570,000*	*$ -*	*$ 8,570,000*	*$ 8,380,000*		*$ 16,950,000*	*$ -*
Rehabilitation/Replacement Related CIPs Total								**$ 16,950,000**	**$ 8,570,000**	**$ -**	**$ 8,570,000**	**$ 8,380,000**	**$ -**	**$ 16,950,000**	**$ -**
Other Related CIPs															
Other															
WWO-1	AWP Sewer Projects Participation	AWP Sewer Projects Participation	--	--	Misc	--	$3,500	$ 3,500,000	$ 3,500,000	$ -	$ 3,500,000	$ -	0%	$ 3,500,000	$ -
WWO-2	County Trunk Sewer Participation	County Trunk Sewer Participation	--	--	Misc	--	$3,680	$ 3,680,000	$ 3,680,000	$ -	$ 3,680,000	$ -	0%	$ 3,680,000	$ -
WWO-3	Access Control, Security & Fire System Maint & Monitoring	Access Control, Security & Fire System Maint & Monitoring	--	--	Misc	--	$89	$ 89,000	$ 89,000	$ -	$ 89,000	$ -	0%	$ 89,000	$ -
WWO-4	HVAC Improvement	HVAC Improvement	--	--	Misc	--	$75	$ 75,000	$ 75,000	$ -	$ 75,000	$ -	0%	$ 75,000	$ -
WWO-5	Site Paving As Needed	Site Paving As Needed	--	--	Misc	--	$63	$ 63,000	$ 63,000	$ -	$ 63,000	$ -	0%	$ 63,000	$ -
WWO-6	WRF Decommissioning	WRF Decommissioning	--	--	Misc	--	$1,321	$ 1,321,000	$ 1,321,000	$ -	$ 1,321,000	$ -	0%	$ 1,321,000	$ -
WWO-7	WRF Mechanical	WRF Mechanical	--	--	Misc	--	$283	$ 283,000	$ 283,000	$ -	$ 283,000	$ -	0%	$ 283,000	$ -
WWO-8	WRF Electrical	WRF Electrical	--	--	Misc	--	$189	$ 189,000	$ 189,000	$ -	$ 189,000	$ -	0%	$ 189,000	$ -
WWO-9	WRF Instrumentation	WRF Instrumentation	--	--	Misc	--	$94	$ 94,000	$ 94,000	$ -	$ 94,000	$ -	0%	$ 94,000	$ -
WWO-10	Energy Efficiency Projects	Energy Efficiency Projects	--	--	Misc	--	$815	$ 815,000	$ 815,000	$ -	$ 815,000	$ -	0%	$ 815,000	$ -
WWO-11	Ops Yard Phase 3 Improvements	Ops Yard Phase 3 Improvements	--	--	Misc	--	$586	$ 586,000	$ 586,000	$ -	$ 586,000	$ -	0%	$ 586,000	$ -
Subtotals								*$ 10,695,000*	*$ 10,695,000*	*$ -*	*$ 10,695,000*	*$ -*		*$ 10,695,000*	*$ -*
Other Related CIPs Total								**$ 10,695,000**	**$ 10,695,000**	**$ -**	**$ 10,695,000**	**$ -**	**$ -**	**$ 10,695,000**	**$ -**
Total Wastewater CIP								**$ 35,627,000**	**$ 21,321,000**	**$ 5,926,000**	**$ 27,247,000**	**$ 8,380,000**	**$ -**	**$ 35,232,000**	**$ 395,000**

Notes:

(1) ENR Los Angeles Construction Cost Index for October 2021 is 12,704.

(2) Estimated Construction Cost includes a 30% contingency of the baseline construction cost.

(3) Total project costs includes a 10% markup for engineering, a 10% markup for construction management and a 7.5% markup for project administration of the estimated construction cost.

(4) Total Mark-Up is 65.8% of the baseline construction costs.

Table 9.11 Potable Water CIP

Project ID	Description	Existing Size	Proposed Size	Replace/ New	Quantity	Unit Cost[1] ($/unit)	Capital Improvement Cost[2][3][4] ($)	Near Term Project Phasing: FY 2023-27 ($)	Near Term Project Phasing: FY 2028-32 ($)	Near Term Project Phasing: Near Term FY 2023-2032 ($)	Long Term FY 2033-45 Project Phasing ($)	Future Users Benefit (%)	Reimbursement Category[2][3][4]: Existing System Improvments ($)	Reimbursement Category[2][3][4]: Future System Improvements ($)
Water System Capacity Improvements														
Transmission Mains		**Diam. (in)**	**Diam. (in)**		**Length (ft)**	**$/ft**								
WC-9	Pipeline to new Crest South Reservoir	--	16	New	1,700	$355	$ 1,001,000	$ -	$ 1,001,000	$ 1,001,000	$ -	18%	$ 821,000	$ 180,000
WC-10	Woodside Ave. NE of N. Magnolia Ave.	12	20	Replace	200	$435	$ 144,000	$ -	$ 144,000	$ 144,000	$ -	0%	$ 144,000	$ -
WC-11	Fantia Dr. between Farrington Dr. and Paseo Ladera	8	14	Replace	400	$265	$ 176,000	$ -	$ 176,000	$ 176,000	$ -	0%	$ 176,000	$ -
Subtotal							*$ 1,321,000*	*$ -*	*$ 1,321,000*	*$ 1,321,000*	*$ -*		*$ 1,141,000*	*$ 180,000*
Transmission Mains - Developers		**Diam. (in)**	**Diam. (in)**		**Length (ft)**	**$/ft**								
DEV-1	Magnolia HDR Development	--	8	New	700	$200	$ 232,000	$ -	$ -	$ -	$ 232,000	100%	$ -	$ 232,000
DEV-2A	River View Development	--	8	New	1,800	$200	$ 597,000	$ -	$ -	$ -	$ 597,000	100%	$ -	$ 597,000
DEV-2B	River View Development	--	12	New	4,700	$265	$ 2,065,000	$ -	$ -	$ -	$ 2,065,000	100%	$ -	$ 2,065,000
DEV-4	Fanita Ranch Development	--	16	New	9,700	$355	$ 5,708,000	$ -	$ -	$ -	$ 5,708,000	100%	$ -	$ 5,708,000
DEV-5	Pinnacle Peak Development	--	8	New	300	$200	$ 99,000	$ -	$ -	$ -	$ 99,000	100%	$ -	$ 99,000
DEV-15	Alpine High School/Library Development	--	16	New	4,700	$355	$ 2,766,000	$ -	$ -	$ -	$ 2,766,000	100%	$ -	$ 2,766,000
DEV-16	South Coast Development	--	12	New	600	$265	$ 264,000	$ -	$ -	$ -	$ 264,000	100%	$ -	$ 264,000
DEV-18A	Hillside Meadows Development (WSA)	--	8	New	1,400	$200	$ 464,000	$ -	$ -	$ -	$ 464,000	100%	$ -	$ 464,000
DEV-18B	Hillside Meadows Development (WSA)	--	12	New	2,700	$265	$ 1,187,000	$ -	$ -	$ -	$ 1,187,000	100%	$ -	$ 1,187,000
DEV-20	Unknown Developer (ESA)	--	14	New	4,500	$265	$ 1,977,000	$ -	$ -	$ -	$ 1,977,000	100%	$ -	$ 1,977,000
DEV-22	Unknown Developer (ESA)	--	12	New	15,600	$265	$ 6,852,000	$ -	$ -	$ -	$ 6,852,000	100%	$ -	$ 6,852,000
DEV-23	Unknown Developer (ESA)	--	12	New	4,700	$265	$ 2,065,000	$ -	$ -	$ -	$ 2,065,000	100%	$ -	$ 2,065,000
DEV-24	Unknown Developer (ESA)	--	12	New	6,700	$265	$ 2,944,000	$ -	$ -	$ -	$ 2,944,000	100%	$ -	$ 2,944,000
DEV-25	Unknown Developer (ESA)	--	12	New	38,500	$265	$ 16,911,000	$ -	$ -	$ -	$ 16,911,000	100%	$ -	$ 16,911,000
DEV-26	Unknown Developer (ESA)	--	12	New	20,200	$265	$ 8,873,000	$ -	$ -	$ -	$ 8,873,000	100%	$ -	$ 8,873,000
DEV-27	Unknown Developer (ESA)	--	8	New	2,500	$200	$ 829,000	$ -	$ -	$ -	$ 829,000	100%	$ -	$ 829,000
DEV-28	Unknown Developer (ESA)	--	8	New	4,600	$200	$ 1,525,000	$ -	$ -	$ -	$ 1,525,000	100%	$ -	$ 1,525,000
DEV-29	Unknown Developer (ESA)	--	12	New	2,300	$265	$ 1,011,000	$ -	$ -	$ -	$ 1,011,000	100%	$ -	$ 1,011,000
DEV-30	Unknown Developer (ESA)	--	12	New	4,900	$265	$ 2,153,000	$ -	$ -	$ -	$ 2,153,000	100%	$ -	$ 2,153,000
DEV-32	Unknown Developer (ESA)	--	8	New	1,700	$200	$ 564,000	$ -	$ -	$ -	$ 564,000	100%	$ -	$ 564,000
DEV-33	Unknown Developer (ESA)	--	8	New	2,000	$200	$ 663,000	$ -	$ -	$ -	$ 663,000	100%	$ -	$ 663,000
DEV-35	Alpine Densification Development	--	8	New	1,700	$200	$ 564,000	$ -	$ -	$ -	$ 564,000	100%	$ -	$ 564,000
DEV-36	Jacor Development	--	8	New	400	$200	$ 133,000	$ -	$ -	$ -	$ 133,000	100%	$ -	$ 133,000
DEV-37	Weld Distribution Center Development	--	8	New	800	$200	$ 265,000	$ -	$ -	$ -	$ 265,000	100%	$ -	$ 265,000
DEV-38	Tower Glass Development	--	8	New	600	$200	$ 199,000	$ -	$ -	$ -	$ 199,000	100%	$ -	$ 199,000
DEV-39	Cornerstone Development	--	8	New	300	$200	$ 99,000	$ -	$ -	$ -	$ 99,000	100%	$ -	$ 99,000
DEV-40	Hattie Davidson Development	--	8	New	300	$200	$ 99,000	$ -	$ -	$ -	$ 99,000	100%	$ -	$ 99,000
DEV-41	Prospect Estates II Development	--	8	New	300	$200	$ 99,000	$ -	$ -	$ -	$ 99,000	100%	$ -	$ 99,000
DEV-42	Woodspring Suites Development	--	8	New	300	$200	$ 99,000	$ -	$ -	$ -	$ 99,000	100%	$ -	$ 99,000
DEV-43	Carlton Oaks Development	--	8	New	400	$200	$ 133,000	$ -	$ -	$ -	$ 133,000	100%	$ -	$ 133,000
DEV-44	Lunar Lane Development	--	8	New	400	$200	$ 133,000	$ -	$ -	$ -	$ 133,000	100%	$ -	$ 133,000
DEV-45	Sharp Medical Office Building Development	--	8	New	300	$200	$ 99,000	$ -	$ -	$ -	$ 99,000	100%	$ -	$ 99,000
DEV-46	Gondala Skate Development	--	8	New	200	$200	$ 66,000	$ -	$ -	$ -	$ 66,000	100%	$ -	$ 66,000
DEV-47	Railroad Workshop Development	--	8	New	100	$200	$ 33,000	$ -	$ -	$ -	$ 33,000	100%	$ -	$ 33,000
DEV-48	Lantern Crest Ridge Phase II Development	--	8	New	200	$200	$ 66,000	$ -	$ -	$ -	$ 66,000	100%	$ -	$ 66,000
DEV-49	Creekside Meadows Development	--	8	New	400	$200	$ 133,000	$ -	$ -	$ -	$ 133,000	100%	$ -	$ 133,000
DEV-50	Alpine Tentative Map Development	--	8	New	1,200	$200	$ 398,000	$ -	$ -	$ -	$ 398,000	100%	$ -	$ 398,000
DEV-51	Rancho Palo Verde Development	--	12	New	5,700	$265	$ 2,504,000	$ -	$ -	$ -	$ 2,504,000	100%	$ -	$ 2,504,000
Subtotal							*$ 64,871,000*	*$ -*	*$ -*	*$ -*	*$ 64,871,000*		*$ -*	*$ 64,871,000*
Fire Flow Improvements		**Diam. (in)**	**Diam. (in)**		**Length (ft)**	**$/ft**								
FFE-01A	Windmill View Rd. between Flying Hills Ct. and NW of Lakeridge Ln.	8	12	Replace	2,300	$265	$ 1,011,000	$ -	$ -	$ -	$ 1,011,000	0%	$ 1,011,000	$ -
FFE-01B	Lakeridge Ln. at Windmill View Rd. to the end to end of street	6	10	Replace	500	$250	$ 207,000	$ -	$ -	$ -	$ 207,000	0%	$ 207,000	$ -
FFE-02	Connect the 16" pipe to the junction at 8733 Magnolia Ave.	--	12	New	100	$265	$ 45,000	$ -	$ -	$ -	$ 45,000	0%	$ 45,000	$ -
FFE-04	Santana St. from El Nopal to end of street	--	10	Parallel	2,300	$250	$ 953,000	$ -	$ -	$ -	$ 953,000	0%	$ 953,000	$ -
FFE-05	From end of 10" pipe on Fanita Pkwy. to end of street	6	10	Replace	4,900	$250	$ 2,030,000	$ -	$ 2,030,000	$ 2,030,000	$ -	0%	$ 2,030,000	$ -
FFE-06	Woodside Ter. from Woodside Ave. to Los Senderos Dr.	--	8	Parallel	1,400	$200	$ 464,000	$ -	$ -	$ -	$ 464,000	0%	$ 464,000	$ -
FFE-07	Flinn Springs Rd. to hydrant on Shanteau Dr.	6	10	Replace	1,300	$250	$ 539,000	$ -	$ 539,000	$ 539,000	$ -	0%	$ 539,000	$ -
FFE-08	Hawley Rd. to north most hydrant on Valle De Paz Rd.	6	8	Replace	1,100	$200	$ 365,000	$ -	$ -	$ -	$ 365,000	0%	$ 365,000	$ -
FFE-09	Viewside Ln. from Dunbar Ln. to end of street	--	8	New	2,700	$200	$ 895,000	$ 895,000	$ -	$ 895,000	$ -	0%	$ 895,000	$ -
FFE-10	N. Victoria Dr. to 8" pipe on Sneath Way	4	8	Replace	1,000	$200	$ 332,000	$ 332,000	$ -	$ 332,000	$ -	0%	$ 332,000	$ -

Project ID	Description	Existing Size	Proposed Size	Replace/ New	Quantity	Unit Cost[1] ($/unit)	Capital Improvement Cost[2][3][4] ($)	Near Term Project Phasing: FY 2023-27 ($)	Near Term Project Phasing: FY 2028-32 ($)	Near Term Project Phasing: Near Term FY 2023-2032 ($)	Long Term FY 2033-45 Project Phasing ($)	Future Users Benefit (%)	Reimbursement Category[2][3][4]: Existing System Improvments ($)	Reimbursement Category[2][3][4]: Future System Improvements ($)
FFE-11	Anderson Rd. to east most hydrant on Zumbrota Rd.	6	10	Replace	1,500	$250	$ 622,000	$ -	$ -	$ -	$ 622,000	0%	$ 622,000	$ -
FFE-12	1867 Lilac Ln. to Alpine Heights Rd.	6	12	Replace	2,200	$265	$ 966,000	$ -	$ -	$ -	$ 966,000	0%	$ 966,000	$ -
FFE-13	Snowden Pl. from St. George Dr to hydrant	2	8	Replace	400	$200	$ 133,000	$ -	$ 133,000	$ 133,000	$ -	0%	$ 133,000	$ -
FFE-14A	Alegria Dr. at Lento Ln to Beech Pl. hydrant at end of Bonita Pl and North Park Dr.	4	8	Replace	1,200	$200	$ 398,000	$ -	$ 398,000	$ 398,000	$ -	0%	$ 398,000	$ -
FFE-14B	Beech Pl. between Suncrest Blvd. and Park Dr.	4	8	Replace	800	$200	$ 265,000	$ -	$ 265,000	$ 265,000	$ -	0%	$ 265,000	$ -
FFE-14C	Park Dr. from Beech Pl. to North hydrant	4	8	Replace	300	$200	$ 99,000	$ -	$ 99,000	$ 99,000	$ -	0%	$ 99,000	$ -
FFE-14D	Bonita Pl. between Beech Pl. and Park Dr.	4	8	Replace	500	$200	$ 166,000	$ -	$ 166,000	$ 166,000	$ -	0%	$ 166,000	$ -
FFE-14E	Lento Ln. between West Drive and continue West.	4	8	Replace	700	$200	$ 232,000	$ -	$ 232,000	$ 232,000	$ -	0%	$ 232,000	$ -
FFE-15A	La Cresta Blvd. to Lathrop Ln. on Highline Trl.	4	8	Replace	600	$200	$ 199,000	$ -	$ -	$ -	$ 199,000	0%	$ 199,000	$ -
FFE-15B	Highline Trl. to end of street on Canyon Dr.	4	8	Replace	500	$200	$ 166,000	$ -	$ -	$ -	$ 166,000	0%	$ 166,000	$ -
FFE-16	Stoneridge Rd. at Mountain View Rd. to hydrant	4	8	Replace	800	$200	$ 265,000	$ -	$ 265,000	$ 265,000	$ -	0%	$ 265,000	$ -
FFE-17A	Complete loop on Marshall Rd. and Marshall Way	--	8	New	300	$200	$ 99,000	$ -	$ -	$ -	$ 99,000	0%	$ 99,000	$ -
FFE-17B	Eltingle Dr. from Marshall Rd. to Marshall Way	6	10	Replace	700	$250	$ 290,000	$ -	$ -	$ -	$ 290,000	0%	$ 290,000	$ -
FFE-19	Flinn Springs Rd. to Towne Ln. on Oak Creek Rd.	8 & 6	12	Replace	2,300	$265	$ 1,011,000	$ -	$ 1,011,000	$ 1,011,000	$ -	0%	$ 1,011,000	$ -
FFE-20	Bay Meadows Dr. at Hialeah Ln. to Alpine Blvd. hydrant		8	New	200	$200	$ 66,000	$ -	$ 66,000	$ 66,000	$ -	0%	$ 66,000	$ -
FFE-21	Blue Lilac Ln. to AlpineEstates Pl.	--	8	New	700	$200	$ 232,000	$ -	$ -	$ -	$ 232,000	0%	$ 232,000	$ -
FFE-22A	Franees Dr. from Harbison Canyon Rd. to Rosalie Way	8	10	Replace	400	$250	$ 166,000	$ -	$ -	$ -	$ 166,000	0%	$ 166,000	$ -
FFE-22B	Rosalie Way frp, Franees Dr. to La Cresta Trl.	8	10	Replace	700	$250	$ 290,000	$ -	$ -	$ -	$ 290,000	0%	$ 290,000	$ -
FFE-22C	Post Trl. from Rosalie Way to South	6	8	Replace	300	$200	$ 99,000	$ -	$ -	$ -	$ 99,000	0%	$ 99,000	$ -
FFE-23	Marshall Rd. at Marquand Ct. to hydrant	--	10	Parallel	1,000	$250	$ 414,000	$ -	$ -	$ -	$ 414,000	0%	$ 414,000	$ -
FFE-24	Cecilwood Dr. at Tuthill Way to NE. to end of 8" pipe	8	10	Replace	800	$250	$ 332,000	$ -	$ -	$ -	$ 332,000	0%	$ 332,000	$ -
FFE-25	Sanfred Ct. at Lafe Dr. to N.	8	10	Replace	200	$250	$ 83,000	$ -	$ -	$ -	$ 83,000	0%	$ 83,000	$ -
FFE-26	La Cresta Blvd./La Cresta Rd. between SE of Mountain View Rd. and Hamlet Dr.	4	8	Replace	400	$200	$ 133,000	$ -	$ 133,000	$ 133,000	$ -	0%	$ 133,000	$ -
FFE-27	Lilac Ln.	4	8	Replace	300	$200	$ 99,000	$ -	$ 99,000	$ 99,000	$ -	0%	$ 99,000	$ -
FFE-29	S. Grade Rd.	8	12	Replace	2,700	$265	$ 1,187,000	$ -	$ 1,187,000	$ 1,187,000	$ -	0%	$ 1,187,000	$ -
FFE-30	Keith St. between Wycliffe St. and Princess Joann Rd.	--	8	New	300	$200	$ 99,000	$ -	$ 99,000	$ 99,000	$ -	0%	$ 99,000	$ -
FFE-31	Rancho Summit	--	10	Parallel	600	$250	$ 249,000	$ -	$ -	$ -	$ 249,000	0%	$ 249,000	$ -
FFE-32	Driftwood Creek Rd. between Quail Canyon Rd. and S. to hydrant	8	12	Replace	1,100	$265	$ 484,000	$ -	$ -	$ -	$ 484,000	0%	$ 484,000	$ -
FFE-33	Quail Canyon Rd. between NE of Tombstone Creek Rd. and Post Oak Ln.	8	10	Replace	700	$250	$ 290,000	$ -	$ -	$ -	$ 290,000	0%	$ 290,000	$ -
FFE-34	Bon Bue Dr. between Oak Creek Rd. and Toya Ln.	6	8	Replace	1,400	$200	$ 464,000	$ -	$ -	$ -	$ 464,000	0%	$ 464,000	$ -
FFE-35	Hale Dr. South of Victoria Dr.	8	10	Replace	1,600	$250	$ 663,000	$ -	$ -	$ -	$ 663,000	0%	$ 663,000	$ -
FFE-36	Galloway Valley Rd. between Harbison Canyon Rd. and Alpine Trail Rd.	8	10	Replace	1,600	$250	$ 663,000	$ -	$ -	$ -	$ 663,000	0%	$ 663,000	$ -
FFE-37	Camino del Vecino between Camino Christina and North to 10" pipe.	8	10	Replace	1,200	$250	$ 497,000	$ -	$ -	$ -	$ 497,000	0%	$ 497,000	$ -
FFE-38	Linda Vern Court	6	8	Replace	600	$200	$ 199,000	$ -	$ -	$ -	$ 199,000	100%	$ -	$ 199,000
FFE-39	Northcote Road between Canyon Park Drive and Gold Street	8	10	Replace	600	$250	$ 249,000	$ -	$ -	$ -	$ 249,000	100%	$ -	$ 249,000
FFE-40	Harbison Canyon Road between Alpine Way and Hunter Pass	10	16	Replace	4,700	$355	$ 2,766,000	$ -	$ -	$ -	$ 2,766,000	100%	$ -	$ 2,766,000
Subtotal							*$ 21,476,000*	*$ 1,227,000*	*$ 6,722,000*	*$ 7,949,000*	*$ 13,527,000*		*$ 18,262,000*	*$ 3,214,000*
Booster Pump Stations		**Power (HP)**	**Power (HP)**			**$/HP**								
WPS-1	New Fanita Ranch PS	--	840	New		$3,000	$ 4,177,000	$ -	$ -	$ -	$ 4,177,000	100%	$ -	$ 4,177,000
WPS-3	Replace Northcote PS	--	840	Replace		$4,000	$ 5,569,000	$ -	$ 5,569,000	$ 5,569,000	$ -	0%	$ 5,569,000	$ -
WPS-5	Upgrade East Victoria PS	--	180	Upgrade		$6,000	$ 1,790,000	$ -	$ -	$ -	$ 1,790,000	5%	$ 1,701,000	$ 89,000
WPS-7	Replace Oak Creek PS	--	780	Replace		$3,000	$ 3,879,000	$ -	$ 3,879,000	$ 3,879,000	$ -	0%	$ 3,879,000	$ -
Subtotal							*$ 15,415,000*	*$ -*	*$ 9,448,000*	*$ 9,448,000*	*$ 5,967,000*		*$ 11,149,000*	*$ 4,266,000*
Storage Reservoirs		**Volume (MG)**	**Volume (MG)**			**$/gallon**								
WS-1	New Fanita Reservoir	--	6.0	New		$1.50	$ 14,918,000	$ -	$ -	$ -	$ 14,918,000	100%	$ -	$ 14,918,000
WS-7	New Crest South Reservoir	--	2.0	New		$2.00	$ 6,630,000	$ -	$ 6,630,000	$ 6,630,000	$ -	18%	$ 5,437,000	$ 1,193,000
Subtotal							*$ 21,548,000*	*$ -*	*$ 6,630,000*	*$ 6,630,000*	*$ 14,918,000*	$ -	*$ 5,437,000*	*$ 16,111,000*
Capacity Improvements Total							**$ 124,631,000**	**$ 1,227,000**	**$ 24,121,000**	**$ 25,348,000**	**$ 99,283,000**		**$ 35,989,000**	**$ 88,642,000**

Project ID	Description	Existing Size	Proposed Size	Replace/ New	Quantity	Unit Cost[1] ($/unit)	Capital Improvement Cost[2][3][4] ($)	Near Term Project Phasing: FY 2023-27 ($)	Near Term Project Phasing: FY 2028-32 ($)	Near Term Project Phasing: Near Term FY 2023-2032 ($)	Long Term FY 2033-45 Project Phasing ($)	Future Users Benefit (%)	Reimbursement Category[2][3][4]: Existing System Improvments ($)	Reimbursement Category[2][3][4]: Future System Improvements ($)
Rehabilitation Repair/Replacement Projects														
Distribution System		**Diam. (in)**	**Diam. (in)**		**Length(ft)**	**$/ft**								
WRLT-6	6 inch Pipeline Rehabilitation/Replacement	6	8	Replace	42,500	$200	$ 14,089,000	$ -	$ -	$ -	$ 14,089,000	0%	$ 14,089,000	$ -
WRLT-8	8 inch Pipeline Rehabilitation/Replacement	8	8	Replace	71,300	$200	$ 23,636,000	$ -	$ -	$ -	$ 23,636,000	0%	$ 23,636,000	$ -
WRLT-10	10 inch Pipeline Rehabilitation/Replacement	10	10	Replace	34,600	$250	$ 14,337,000	$ -	$ -	$ -	$ 14,337,000	0%	$ 14,337,000	$ -
WRLT-12	12 inch Pipeline Rehabilitation/Replacement	12	12	Replace	10,400	$265	$ 4,568,000	$ -	$ -	$ -	$ 4,568,000	0%	$ 4,568,000	$ -
WRLT-14	14 inch Pipeline Rehabilitation/Replacement	14	14	Replace	9,000	$265	$ 3,953,000	$ -	$ -	$ -	$ 3,953,000	0%	$ 3,953,000	$ -
WRLT-16	16 inch Pipeline Rehabilitation/Replacement	16	16	Replace	4,700	$355	$ 2,766,000	$ -	$ -	$ -	$ 2,766,000	0%	$ 2,766,000	$ -
WRLT-18	18 inch Pipeline Rehabilitation/Replacement	18	18	Replace	1,700	$400	$ 1,127,000	$ -	$ -	$ -	$ 1,127,000	0%	$ 1,127,000	$ -
WRLT-20	20 inch Pipeline Rehabilitation/Replacement	20	20	Replace	900	$435	$ 649,000	$ -	$ -	$ -	$ 649,000	0%	$ 649,000	$ -
WRLT-24	24 inch Pipeline Rehabilitation/Replacement	24	24	Replace	800	$500	$ 663,000	$ -	$ -	$ -	$ 663,000	0%	$ 663,000	$ -
WRLT-30	30 inch Pipeline Rehabilitation/Replacement	30	30	Replace	300	$525	$ 261,000	$ -	$ -	$ -	$ 261,000	0%	$ 261,000	$ -
WRLT-33	33 inch Pipeline Rehabilitation/Replacement	33	33	Replace	800	$675	$ 895,000	$ -	$ -	$ -	$ 895,000	0%	$ 895,000	$ -
WRLT-36	36 inch Pipeline Rehabilitation/Replacement	36	36	Replace	12,300	$620	$ 12,640,000	$ -	$ -	$ -	$ 12,640,000	0%	$ 12,640,000	$ -
Subtotal							*$ 79,584,000*	*$ -*	*$ -*	*$ -*	*$ 79,584,000*		*$ 79,584,000*	*$ -*
Storage Reservoirs		**Frequency**	**Quantity**		**Unit**	**$/unit**								
WRS-1	Condition Assessment and R&R (Reservoirs 25 years and older)	10 Years	38	R&R	facility	$300,000	$ 18,996,000	$ -	$ -	$ -	$ 18,996,000	0%	$ 18,996,000	$ -
WRS-2	Condition Assessment and R&R (Reservoirs less than 25 years old)	10 Years	12	R&R	facility	$300,000	$ 6,067,000	$ -	$ -	$ -	$ 6,067,000	0%	$ 6,067,000	$ -
WRS-3	Surge tank rehabilitation and maintenance	--	4	R&R	facility	$100,000	$ 763,000	$ -	$ -	$ -	$ 763,000	0%	$ 763,000	$ -
WRS-4	Blossom Valley Reservoir Roof Replacement	--	1	R&R	facility	$7,000,000	$ 11,703,000	$ -	$ 11,703,000	$ 11,703,000	$ -	0%	$ 11,703,000	$ -
WRS-5	Jerry Johnson Reservoir Refurb/Coating	--	1	R&R	facility	--	$ 1,250,000	$ 1,250,000	$ -	$ 1,250,000	$ -	0%	$ 1,250,000	$ -
WRS-6	Reservoir Refurb/Coating	--	1	R&R	facility	--	$ 1,250,000	$ 1,250,000	$ -	$ 1,250,000	$ -	0%	$ 1,250,000	$ -
Subtotal							*$ 40,029,000*	*$ 2,500,000*	*$ 11,703,000*	*$ 14,203,000*	*$ 25,826,000*		*$ 40,029,000*	*$ -*
Booster Pump Stations		**Frequency**	**Quantity**		**Unit**	**$/unit**								
WRPS-1	Condition Assessment and R&R - Pump Station (PSs > 10,000 gpm)	5 Years	10	R&R	per facility	$180,000	$ 2,984,000	$ 328,000	$ 328,000	$ 656,000	$ 2,328,000	0%	$ 2,984,000	$ -
WRPS-2	Condition Assessment and R&R - Pump Station (PSs 5,000 to 10,000 gpm)	5 Years	5	R&R	per facility	$125,000	$ 1,036,000	$ 114,000	$ 114,000	$ 228,000	$ 808,000	0%	$ 1,036,000	$ -
WRPS-3	Condition Assessment and R&R - Pump Station (PSs < 5,000 gpm)	5 Years	50	R&R	per facility	$75,000	$ 6,216,000	$ 684,000	$ 684,000	$ 1,368,000	$ 4,848,000	0%	$ 6,216,000	$ -
WRPS-4	Water Pump Replacement	20 Years	45	R&R	per facility	$125,000	$ 9,323,000	$ 1,029,000	$ 1,029,000	$ 2,058,000	$ 7,265,000	0%	$ 9,323,000	$ -
WRPS-5	Pump Station Improvements, Ph 2	--	--	R&R	per facility	-	$ 1,200,000	$ 1,200,000	$ -	$ 1,200,000	$ -	0%	$ 1,200,000	$ -
Subtotal							*$ 20,759,000*	*$ 3,355,000*	*$ 2,155,000*	*$ 5,510,000*	*$ 15,249,000*		*$ 20,759,000*	*$ -*
Rehabilitation/Repair/Replacement Total							**$ 140,372,000**	**$ 5,855,000**	**$ 13,858,000**	**$ 19,713,000**	**$ 120,659,000**		**$ 140,372,000**	**$ -**
Reliability Projects														
Reliability - Pipelines		**Diam. (in)**	**Diam. (in)**	**Replace/New**	**PipeLength(ft)**	**$/unit**								
RI-2	I-8 Crossing at E. Victoria Dr.	14	14/30	Upgrade	600	$800	$ 796,000	$ -	$ 796,000	$ 796,000	$ -	0%	$ 796,000	$ -
RI-3	I-8 crossing at Tavern Rd.	10	10/21	Upgrade	1,200	$750	$ 1,492,000	$ -	$ 1,492,000	$ 1,492,000	$ -	0%	$ 1,492,000	$ -
RI-4	I-8 Crossing at W. Victoria Dr.	16	16/30	Upgrade	600	$1,070	$ 1,064,000	$ 1,064,000	$ -	$ 1,064,000	$ -	0%	$ 1,064,000	$ -
RI-5	I-8 crossing at Olde Highway 80, near Olde Highway 80 and Dunbar Ln.	30	30/48	Upgrade	1,200	$1,580	$ 3,143,000	$ -	$ 3,143,000	$ 3,143,000	$ -	0%	$ 3,143,000	$ -
RI-7	I-8 crossing between Blossom Valley Rd. and Chimney Rock Ln. at the end of Chimney Rock Ln.	10	10/21	Upgrade	500	$750	$ 622,000	$ -	$ 622,000	$ 622,000	$ -	0%	$ 622,000	$ -
RI-8	I-8 crossing between Blossom Valley Rd. and Olde Highway 80 at Pecan Park Ln.	8	8/16	Upgrade	500	$600	$ 497,000	$ -	$ 497,000	$ 497,000	$ -	0%	$ 497,000	$ -
RI-9	I-8 crossing at the north end of Labrador Ln.	24	24/42	Upgrade	3,000	$1,500	$ 7,459,000	$ 7,459,000	$ -	$ 7,459,000	$ -	0%	$ 7,459,000	$ -
RI-10	I-8 crossing between Chocolate Summit Dr. and Alpine Blvd., east of Dunbar Ln. and I-8	10	10/21	Upgrade	500	$750	$ 622,000	$ 622,000	$ -	$ 622,000	$ -	0%	$ 622,000	$ -
R-2A	New Galloway PS pipeline from Chocolate Summit Zone to Alpine West Zone	--	16	New	1,500	$355	$ 883,000	$ 883,000	$ -	$ 883,000	$ -	18%	$ 724,000	$ 159,000
R-2B	Summerhill View from Summerhill Point to Galloway Valley Res. 18" Pipe	12	18	Replace	1,000	$400	$ 663,000	$ 663,000	$ -	$ 663,000	$ -	18%	$ 544,000	$ 119,000
R-2C	La Force Road from Sky Mesa Road to N. Alpine Trail Rd.	--	12	New	1,600	$265	$ 703,000	$ 703,000	$ -	$ 703,000	$ -	18%	$ 576,000	$ 127,000
R-3	New Alpine West PS pipeline from Alpine West Zone to West Victoria Zone	--	12	New	1,300	$265	$ 572,000	$ -	$ -	$ -	$ 572,000	18%	$ 469,000	$ 103,000
R-4A	New Alpine South PS pipeline from West Victoria Zone to East Victoria Zone	--	12	New	2,300	$265	$ 1,011,000	$ -	$ -	$ -	$ 1,011,000	12%	$ 890,000	$ 121,000
R-5	East Victoria Pipeline Connector	--	12	New	3,000	$265	$ 1,318,000	$ -	$ -	$ -	$ 1,318,000	0%	$ 1,318,000	$ -
R-6	El Capitan Pipeline - Concrete Lining	--	36	New	26,400	$310	$ 13,565,000	$ -	$ -	$ -	$ 13,565,000	0%	$ 13,565,000	$ -
R-7	Harbison Canyon Road Pipeline	10	16	Replace	--	--	$ 1,750,000	$ 1,750,000	$ -	$ 1,750,000	$ -	0%	$ 1,750,000	$ -
Subtotal							*$ 36,160,000*	*$ 13,144,000*	*$ 6,550,000*	*$ 19,694,000*	*$ 16,466,000*		*$ 35,531,000*	*$ 629,000*

Project ID	Description	Existing Size	Proposed Size	Replace/ New	Quantity	Unit Cost[1] ($/unit)	Capital Improvement Cost[2][3][4] ($)	Near Term Project Phasing: FY 2023-27 ($)	Near Term Project Phasing: FY 2028-32 ($)	Near Term Project Phasing: Near Term FY 2023-2032 ($)	Long Term FY 2033-45 Project Phasing ($)	Future Users Benefit (%)	Reimbursement Category[2][3][4]: Existing System Improvments ($)	Reimbursement Category[2][3][4]: Future System Improvements ($)
Reliability - Pump Stations			**Power (HP)**	**Replace/New**	**Quantity**	**$/HP**								
RPS-2	Galloway Pump Station	--	700	New	--	$4,000	$ 4,641,000	$ 4,641,000		$ 4,641,000	$ -	18%	$ 3,806,000	$ 835,000
RPS-3	Alpine West Pump Station	--	540	New	--	$4,000	$ 3,580,000	$ -	$ -	$ -	$ 3,580,000	18%	$ 2,936,000	$ 644,000
RPS-4A	Alpine South Pump Station	--	300	New	--	$6,000	$ 2,984,000	$ -	$ -	$ -	$ 2,984,000	12%	$ 2,626,000	$ 358,000
Subtotal							*$ 11,205,000*	*$ 4,641,000*	*$ -*	*$ 4,641,000*	*$ 6,564,000*		*$ 9,368,000*	*$ 1,837,000*
Reliability - Storage Reservoirs		**Volume (MG)**	**Volume (MG)**	**Replace/New**		**$/gallon**								
RS-3	Alpine West Reservoir	--	1.0	New	--	$2.00	$ 3,315,000	$ -	$ -	$ -	$ 3,315,000	29%	$ 2,354,000	$ 961,000
Subtotal							*$ 3,315,000*	*$ -*	*$ -*	*$ -*	*$ 3,315,000*		*$ 2,354,000*	*$ 961,000*
Reliability Improvements Total							**$ 50,680,000**	**$ 17,785,000**	**$ 6,550,000**	**$ 24,335,000**	**$ 26,345,000**		**$ 47,253,000**	**$ 3,427,000**
Miscellaneous Projects														
Facility Maintenance/Operations/Other		**Frequency**	**Quantity**		**Unit**	**$/unit**								
PM-1	Erosion control and landscaping at 33 existing sites	20 Years	33		facility	$60,000	$ 3,282,000	$ 794,000	$ 598,000	$ 1,392,000	$ 1,890,000	0%	$ 3,282,000	$ -
PM-8	PRS Installations						$ 662,000	$ 662,000	$ -	$ 662,000	$ -	0%	$ 662,000	$ -
PM-9	Access Control, Security & Fire System Maint & Monitoring					$174	$ 174,000	$ 174,000	$ -	$ 174,000	$ -	0%	$ 174,000	$ -
PM-10	Blowoff Installation					$97	$ 97,000	$ 97,000	$ -	$ 97,000	$ -	0%	$ 97,000	$ -
PM-11	HVAC Improvement					$215	$ 215,000	$ 215,000	$ -	$ 215,000	$ -	0%	$ 215,000	$ -
PM-12	Poly Service Replacement ESA					$437	$ 437,000	$ 437,000	$ -	$ 437,000	$ -	0%	$ 437,000	$ -
PM-13	Poly Service Replacement WSA					$1,008	$ 1,008,000	$ 1,008,000	$ -	$ 1,008,000	$ -	0%	$ 1,008,000	$ -
PM-14	SCADA Upgrades at District Facilities - Water					$335	$ 335,000	$ 335,000	$ -	$ 335,000	$ -	0%	$ 335,000	$ -
PM-15	Security Enhancements - Field Sites					$268	$ 268,000	$ 268,000	$ -	$ 268,000	$ -	0%	$ 268,000	$ -
PM-16	Site Paving As Needed					$1,171	$ 1,171,000	$ 1,171,000	$ -	$ 1,171,000	$ -	0%	$ 1,171,000	$ -
PM-17	Valve Replacement Contracted - Water					$965	$ 965,000	$ 965,000	$ -	$ 965,000	$ -	0%	$ 965,000	$ -
PM-18	Valve Rplc ESA - Water					$403	$ 403,000	$ 403,000	$ -	$ 403,000	$ -	0%	$ 403,000	$ -
PM-19	Valve Rplc WSA - Water					$2,374	$ 2,374,000	$ 2,374,000	$ -	$ 2,374,000	$ -	0%	$ 2,374,000	$ -
PM-20	External Mandates					$1,697	$ 1,697,000	$ 1,697,000	$ -	$ 1,697,000	$ -	0%	$ 1,697,000	$ -
PM-21	Developer General					$683	$ 683,000	$ 683,000	$ -	$ 683,000	$ -	0%	$ 683,000	$ -
PM-22	Ops Yard Phase 3 Improvements					$1,608	$ 1,608,000	$ 1,608,000	$ -	$ 1,608,000	$ -	0%	$ 1,608,000	$ -
Subtotal							*$ 15,379,000*	*$ 12,891,000*	*$ 598,000*	*$ 13,489,000*	*$ 1,890,000*		*$ 15,379,000*	*$ -*
Condition Assessments, Studies and Plans		**Frequency/Rate**	**Quantity**		**Unit**	**$/unit**								
PM-2	Evaluate cathodic protection system and model the system in GIS	--	1		study	$100,000	$ 100,000	$ -	$ 100,000	$ 100,000	$ -	0%	$ 100,000	$ -
PM-3	El Capitan Pipeline Condition Assessment and Study	--	26,400		foot	$10	$ 314,000	$ -	$ 314,000	$ 314,000	$ -	0%	$ 314,000	$ -
PM-4	Existing AMR Meters R&R	Annual	25		year	$30,000	$ 750,000	$ -	$ 360,000	$ 360,000	$ 390,000	0%	$ 750,000	$ -
PM-5	ESA Backbone (steel pipe) Condition Assessment and Study	--	57,000		foot	$10	$ 620,000	$ -	$ 620,000	$ 620,000	$ -	0%	$ 620,000	$ -
PM-7	Pipeline Condition Assessment	5% per year	500		miles	$25,000	$ 12,500,000	$ 1,932,000	$ 4,068,000	$ 6,000,000	$ 6,500,000	0%	$ 12,500,000	$ -
Subtotal							*$ 14,284,000*	*$ 1,932,000*	*$ 5,462,000*	*$ 7,394,000*	*$ 6,890,000*		*$ 14,284,000*	*$ -*
Miscellaneous/District Recommended Projects Total							**$ 29,663,000**	**$ 14,823,000**	**$ 6,060,000**	**$ 20,883,000**	**$ 8,780,000**		**$ 29,663,000**	**$ -**
Total Potable Water CIP							**$ 345,346,000**	**$ 39,690,000**	**$ 50,589,000**	**$ 90,279,000**	**$ 255,067,000**		**$ 253,277,000**	**$ 92,069,000**

Notes:

(1) ENR Los Angelas Construction Cost Index for October 2021 is 12,704.

(2) Estimated Construction Cost includes a 30% contingency of the baseline construction cost.

(3) Total project costs includes a 10% markup for engineering, a 10% markup for construction management and a 7.5% markup for project administration of the estimated construction cost.

(4) Total Mark-Up is 65.8% of the baseline construction costs.

Table 9.12 Recycled Water CIP

Project ID	Description	Existing Size	Proposed Size	Replace/ New	Quantity	Unit Cost[1] ($/unit)	Capital Improvement Cost[2][3][4] ($)	Near Term Project Phasing FY 2023-27 ($)	Near Term Project Phasing FY 2028-32 ($)	Near Term Project Phasing Near Term FY 2023-2032 ($)	Long Term FY 2033-45 Project Phasing ($)	Future Users Benefit (%)	Reimbursement Category[2][3][4] Existing System Improvments ($)	Reimbursement Category[2][3][4] Future System Improvements ($)
Rehabilitation Repair/Replacement Projects														
Distribution System		**Diam. (in)**	**Diam. (in)**		**Length (ft)**	**$/ft**								
RWP-1	8 inch Pipeline Rehabilitation/Replacement	8	8	Replace	2,100	$200	$ 696,000	$ -	$ -	$ -	$ 696,000	0%	$ 696,000	$ -
RWP-2	6 inch Pipeline Rehabilitation/Replacement	6	6	Replace	13,800	$195	$ 4,460,000	$ -	$ -	$ -	$ 4,460,000	0%	$ 4,460,000	$ -
RWP-3	12 inch Pipeline Rehabilitation/Replacement	12	12	Replace	3,700	$265	$ 1,626,000	$ -	$ -	$ -	$ 1,626,000	0%	$ 1,626,000	$ -
Storage Reservoirs		**Vol. (MG)**	**Vol. (MG)**			**$/gal**								
RWS-1	Fanita Terrace Reservoir	--	--	Rehab	--	--	$ -	$ -	$ -	$ -	$ -	0%	$ -	$ -
Rehabilitation/Repair/Replacement Total							**$ 6,782,000**	**$ -**	**$ -**	**$ -**	**$ 6,782,000**		**$ 6,782,000**	**$ -**
Miscellaneous Projects														
RWO-1	AWP Recycled Water Projects	--	--	Misc	--	$1,600	$ 1,600,000	$ 1,600,000	$ -	$ 1,600,000	$ -	0%	$ 1,600,000	$ -
RWO-2	RW Decommissioning	--	--	Misc	--	$680	$ 680,000	$ 680,000	$ -	$ 680,000	$ -	0%	$ 680,000	$ -
RWO-3	RW Pipe Pipeline Replacement due to Condition (if required)	--	--	Misc	--	$0	$ -	$ -	$ -	$ -	$ -	0%	$ -	$ -
RWO-4	Well Pump Refurbishment (if required)	--	--	Misc	--	$0	$ -	$ -	$ -	$ -	$ -	0%	$ -	$ -
RWO-5	Access Control, Security & Fire System Maint & Monitoring	--	--	Misc	--	$23	$ 23,000	$ 23,000	$ -	$ 23,000	$ -	0%	$ 23,000	$ -
RWO-6	HVAC Improvement	--	--	Misc	--	$14	$ 14,000	$ 14,000	$ -	$ 14,000	$ -	0%	$ 14,000	$ -
RWO-7	Site Paving As Needed	--	--	Misc	--	$32	$ 32,000	$ 32,000	$ -	$ 32,000	$ -	0%	$ 32,000	$ -
RWO-8	WRF Decommissioning	--	--	Misc	--	$651	$ 5,778,000	$ 5,778,000	$ -	$ 5,778,000	$ -	0%	$ 5,778,000	$ -
RWO-9	WRF Mechanical	--	--	Misc	--	$139	$ 250,000	$ 250,000	$ -	$ 250,000	$ -	0%	$ 250,000	$ -
RWO-10	WRF Electrical	--	--	Misc	--	$93	$ 175,000	$ 175,000	$ -	$ 175,000	$ -	0%	$ 175,000	$ -
RWO-11	WRF Instrumentation	--	--	Misc	--	$46	$ 100,000	$ 100,000	$ -	$ 100,000	$ -	0%	$ 100,000	$ -
RWO-12	Ops Yard Phase 3 Improvements	--	--	Misc	--	$110	$ 110,000	$ 110,000	$ -	$ 110,000	$ -	0%	$ 110,000	$ -
Miscellaneous Total							**$ 8,762,000**	**$ 8,762,000**	**$ -**	**$ 8,762,000**	**$ -**		**$ 8,762,000**	**$ -**
Total Recycled Water CIP							**$ 15,544,000**	**$ 8,762,000**	**$ -**	**$ 8,762,000**	**$ 6,782,000**	**$ -**	**$ 15,544,000**	**$ -**

Notes:

(1) ENR Los Angelas Construction Cost Index for October 2021 is 12,704.

(2) Estimated Construction Cost includes a 30% contingency of the baseline construction cost.

(3) Total project costs includes a 10% markup for engineering, a 10% markup for construction management and a 7.5% markup for project administration of the estimated construction cost.

(4) Total Mark-Up is 65.8% of the baseline construction costs.

PADRE DAM Municipal Water District	
COMMITTEE AGENDA REPORT	**Meeting Date:** 05-23-2022 **Dept. Head:** Paul Clarke **Submitted by:** Paul Clarke **Department:** Operations **Approved by:** Allen Carlisle, CEO/GM

SUBJECT: NATIONAL POLLUTANT ELIMINATION DISCHARGE SYSTEM (NPDES) PERMIT RENEWAL UPDATE

RECOMMENDATION(S):

Hear staff report; no action required.

ALTERNATIVE(S):

Delay report to a future meeting.

ATTACHMENT(S):

None

FUNDING:

Requested amount: N/A
Budgeted amount: N/A
Are funds available? ☐ Yes ☐ No
Project cost to date: N/A

PRIOR BOARD/COMMITTEE CONSIDERATION: N/A

STRATEGIC PLAN IMPLEMENTATION:

This agenda item is consistent with the District's Strategic Plan and meets one or more of the following Strategic Goals: Provide safe, reliable water, recycled water and sewer services; Ensure fiscal health and competitively sustainable rates; Enhance customer communications and education; Increase water, wastewater and energy independence; Maintain workforce excellence; Expand park and recreation opportunities.

Reviewed by:		**Action Required:**		**Policy Updates:**		**Action Taken:**
Dept Head	☒	Motion	☐	Rules & Regulations	☐	As Recommended ______
Finance	☐	Resolution	☐			Reso/Ord. No. ______
Legal Counsel	☐	Ordinance	☐	Standard Practices & Policies	☐	Other ______
Standard Form	☐	None	☒			

EXECUTIVE SUMMARY:

The Ray Stoyer Water Recycling Facility (WRF) requires a National Pollutant Elimination Discharge System (NPDES) permit to operate from the Regional Water Quality Control Board (RWQCB). The previous permit expired in June of 2020 and the WRF had been operating under an extension from the RWQCB until the new permit was approved in February 2022. In December of 2019, District staff submitted the renewal application to the RWQCB and since that time, have been working with consultants HDR and Trussell Technologies, as well as RWQCB staff to renew the NPDES permit.

Staff will provide a report on the NPDES permit renewal which will include a description of the permit, the process to renew and will highlight some of the changes and some of the challenges that we foresee in complying with the new permit conditions.

RECOMMENDATION:

Hear staff report; no action required.

PADRE DAM Municipal Water District **COMMITTEE AGENDA REPORT**	**Meeting Date:** 05-23-2022 **Dept. Head:** Paul Clarke **Submitted by:** Tom Martin **Department:** Engineering **Approved by:** Allen Carlisle, CEO/GM

SUBJECT: DEVELOPMENT UPDATE

RECOMMENDATION(S):

Hear staff report; no action required.

ALTERNATIVE(S):

Table report to a future meeting.

ATTACHMENT(S):

None

FUNDING:

Requested amount: N/A
Budgeted amount:
Are funds available? ☐ Yes ☐ No
Project cost to date:

PRIOR BOARD/COMMITTEE CONSIDERATION:

STRATEGIC PLAN IMPLEMENTATION:

This agenda item is consistent with the District's Strategic Plan and meets one or more of the following Strategic Goals: Provide safe, reliable water, recycled water and sewer services; Ensure fiscal health and competitively sustainable rates; Enhance customer communications and education; Increase water, wastewater and energy independence; Maintain workforce excellence; Expand park and recreation opportunities.

Reviewed by:		**Action Required:**		**Policy Updates:**		**Action Taken:**
Dept Head	☒	Motion	☐	Rules & Regulations	☐	As Recommended ________
Finance	☐	Resolution	☐			Reso/Ord. No. ________
Legal Counsel	☐	Ordinance	☐	Standard Practices & Policies	☐	Other ________
Standard Form	☐	None	☒			

EXECUTIVE SUMMARY:

Hear staff report on various development projects throughout the District including:

- Laurel Heights
- Riverview Public Improvements
- Lantern Crest Ridge 2
- Alpine Family Apartments
- Quail Canyon Estates

RECOMMENDATION(S):

Hear staff report; no action required.

PADRE DAM Municipal Water District	
COMMITTEE AGENDA REPORT	**Meeting Date:** 05-23-2022 **Dept. Head:** Kyle Swanson **Submitted by:** Michael Hindle, P.E. **Department:** Engineering **Approved by:** Allen Carlisle, CEO/GM

SUBJECT: CAPITAL IMPROVEMENT PROJECTS (CIP) CONSTRUCTION UPDATE

RECOMMENDATION(S):

Hear staff report; no action required.

ALTERNATIVE(S):

N/A

ATTACHMENT(S):

None

FUNDING:

Requested amount: N/A
Budgeted amount:
Are funds available? ☐ Yes ☐ No
Project cost to date:

PRIOR BOARD/COMMITTEE CONSIDERATION:

STRATEGIC PLAN IMPLEMENTATION:

This agenda item is consistent with the District's Strategic Plan and meets one or more of the following Strategic Goals: Provide safe, reliable water, recycled water and sewer services; Ensure fiscal health and competitively sustainable rates; Enhance customer communications and education; Increase water, wastewater and energy independence; Maintain workforce excellence; Expand park and recreation opportunities.

Reviewed by:		**Action Required:**		**Policy Updates:**		**Action Taken:**
Dept Head	☒	Motion	☐	Rules & Regulations	☐	As Recommended ________________
Finance	☐	Resolution	☐	Standard Practices & Policies	☐	Reso/Ord. No. ___________________
Legal Counsel	☐	Ordinance	☐			Other ________________________
Standard Form	☐	None	☒			

EXECUTIVE SUMMARY:

Hear staff report summarizing the construction status for the following Capital Improvement Projects:

- Quail Canyon Pressure Reducing Station (JN 217042)
- Cordial Road Pipeline Replacement (JN 219026)
- Rios Canyon PS2 Surge Tank (JN 220005)
- Grossmont Tank Interior Recoating and Repairs (JN 218024)
- Sewer & Manhole Rehabilitation (JN 220010)
- Valve Replacement Project (JN 219029)

RECOMMENDATION(S):

Hear staff report; no action required.

PADRE DAM Municipal Water District **COMMITTEE AGENDA REPORT**	**Meeting Date:** 05-23-2022 **Dept. Head:** Mark Niemiec, P.E. **Submitted by:** Mark Niemiec, P.E. **Department:** Engineering **Approved by:** Allen Carlisle, CEO/GM

SUBJECT: EAST COUNTY AWP EXECUTIVE OVERVIEW REPORT

RECOMMENDATION(S):

Note and file; informational item only.

ALTERNATIVE(S):

N/A

ATTACHMENT(S):

1. East County AWP Project Executive Overview

FUNDING:

Requested amount: N/A
Budgeted amount:
Are funds available? ☐ Yes ☐ No
Project cost to date:

PRIOR BOARD/COMMITTEE CONSIDERATION:

STRATEGIC PLAN IMPLEMENTATION:

This agenda item is consistent with the District's Strategic Plan and meets one or more of the following Strategic Goals: Provide safe, reliable water, recycled water and sewer services; Ensure fiscal health and competitively sustainable rates; Enhance customer communications and education; Increase water, wastewater and energy independence; Maintain workforce excellence; Expand park and recreation opportunities.

Reviewed by:		**Action Required:**		**Policy Updates:**		**Action Taken:**
Dept Head	☒	Motion	☐	Rules & Regulations	☐	As Recommended ________
Finance	☐	Resolution	☐			Reso/Ord. No. ________
Legal Counsel	☐	Ordinance	☐	Standard Practices & Policies	☐	Other ________
Standard Form	☐	None	☒			

<u>EXECUTIVE SUMMARY</u>:

The quarterly East County Advanced Water Purification Executive Overview Report for May 2022 is attached. This report is intended to provide the Board with key project status updates.

Informational topics in the report include:

- Implementation Updates on Package 1, 2, 3 and 4
- East County AWP JPA Board Meeting Highlights
- Project Financials through Quarter 2 of Fiscal Year 2022
- Public Outreach highlights

The report uses graphics, text and breakout comments to provide a thorough overview and understanding of the current Project status.

<u>RECOMMENDATION(S)</u>:

Note and file; informational item only.

Attachment 1

East County Advanced Water Purification Joint Powers Authority

Executive Overview
May 2022

The East County Advanced Water Purification Program is a regional water and wastewater solution. This program is a collaborative partnership between Padre Dam Municipal Water District, the County of San Diego, the City of El Cajon, and Helix Water District. It will create a new, local, sustainable and drought proof drinking water supply using state-of-the-art technology to purify recycled water and diversify East County's water supply while reducing our dependence on imported water.

Implementation Updates




Package 1
Package 1 Design-Builder, AECOM/Lyles continues work in Phase 1 at a not-to-exceed amount of $14M. Components of Package 1 includes a 16 MGD water recycling facility, an 11.5 MGD advanced water purification facility, a solids handling facility, a product water pump station and a new visitor's center. Highlights include:

- Finalized 60% design drawings and specifications
- Completed review of the equipment procurement bid results and finalized major equipment selection list
- Completed review of the Phase 2 Project cost with the DB firm and negotiations on the contract lump sum price
- Completed work on Phase 2 contract amendment documents in collaboration with DB firm
- Responded to regulator comments received on the Draft Title 22 Engineering Report. Next version of the Report will be submitted in June 2022.

Package 2
Package 2 Design-Builder, Orion and GHD, continue work in Phase 1 at a not-to-exceed amount of $5.5M. Package 2 includes designing and constructing a 10-mile advanced water purification pipeline, dechlorination facility, water feature and inlet to Lake Jennings. Highlights include:

- Orion Construction completed geotechnical borings on Fanita Parkway to support the design of the Package 2 Segment 1 redesign and the AWP Potable Waterline.
- Received the Final Guaranteed Maximum Price on April 20th from Orion Construction
- Received the Final Cost Loaded Phase II baseline schedule from Orion Construction on April 25th.
- Orion Construction is scheduled to submit the Revised Final Water Feature and Final AWP Potable Water Pipeline Designs on May 2.

Package 3
Package 3 Design-Builder AECOM/Lyles continue work in Phase 1 at a not-to-exceed amount of $4.7M. Components of Package 3 are retrofits and capacity expansions of the Influent Pump Station and East Mission Gorge Pump Station (EMGPS), 3.5 mile force main, a 3 mile residuals bypass pipeline and a 1.7 million gallon a day lift station on for the residuals bypass system. Highlights include:

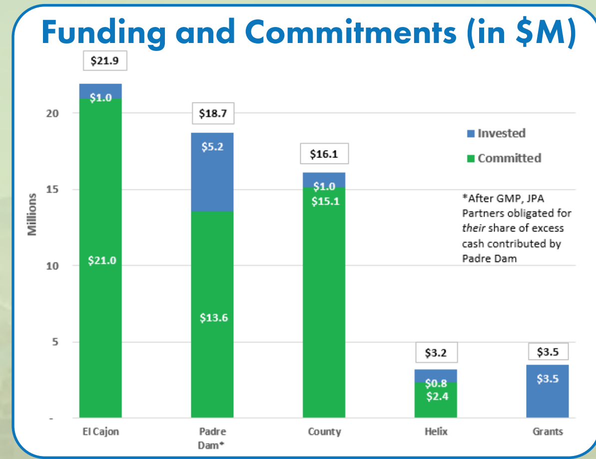
- Design-Builder has submitted the Final 60% Basis of Design Report and GMP/Lump Sum Cost for Phase 2.
- Design-Builder is addressing JPA comments on the Phase 2 Baseline Schedule.
- Revised horizontal and vertical alignments have been developed with the coordination of improvements on Fanita Parkway with Package 2, the City of Santee, and future expansion of Fanita Parkway by HomeFed.
- Progress continues for easement acquisition with property owners including the City of San Diego, HomeFed, Carlton Oaks Golf Course and others.
- Continuing to coordinate with all stakeholders as we prepare to transition to Phase 2.

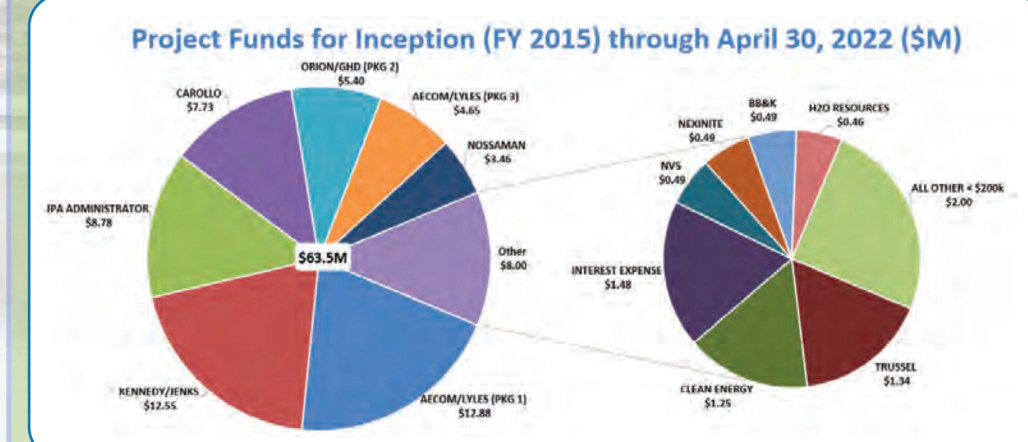
Package 4
Package 4 is a collaborative effort between the JPA and the City of San Diego to implement the provisions of the Residuals Management Agreement. The preliminary capital cost for Package 4 is $40M-$45M inclusive of contingency. Highlights include:

- Completed the CEQA analysis for Package 4 and issued the Draft Subsequent IS/MND for Public Review
- Continued progress on EMGFM wet weather flow analysis
- Continued coordination with the City of San Diego on the Final Condition Assessment Work Plan
- Design and Permitting coordination with Caltrans was initiated

Financial Highlights

This section highlights financial information for Fiscal Year 2022 through April 30, 2022.





FY 2022 Budget vs. Q3 Actuals (in $1,000s)

Approved budget is for the full Fiscal Year while actuals are through April 30, 2022.

	Budget	Actual	Amount Over (Under) Budgt
Interim Administrator	$ 2,928,053	$ 2,896,772	$ (31,280)
Design Builders	38,377,366	13,598,418	(24,778,947)
Professional Services	18,613,028	6,695,900	(11,917,128)
Equipment, Building, Utilities	12,250	5,501	(6,749)
Materials and Supplies	62,500	3,904	(58,596)
Administrative Expenses	1,983,458	52,984	(1,930,474)
Interest Expense	441,667	389,778	(51,889)
Total Expenditures	$ 62,418,322	$ 23,643,258	$ (38,775,064)

At the May 19, 2022 JPA Board Meeting the Board will consider approving Phase 2 work including final design and construction for Packages 1, 2 and 3. If approved, this will move the $950M program into construction and ultimately another step closer to providing this new water supply for our region.

Board Meeting Highlights

APPROVED

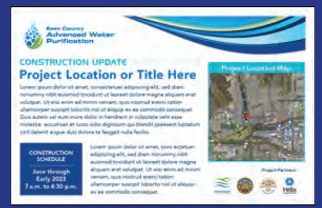
November 2021
At their November meeting the JPA Board approved the long-term Energy Recovery Strategic Approach, and purchase of the East Mission Gorge Pump Station. The Board also approved the East County AWP Joint Powers Authority Administrator and Operator agreement with the Padre Dam Municipal Water District.

February 2022
At their February mee. ng the JPA Board reelected Director Gobel as Chair of the Board and Director Anderson as Vice Chair of the Board. The Board also approved audited financials for Nov. 2019 - June 2021, amendments to JPA policies and procedures and au-thorized a loan agreement with ZFMU, II.

Public Outreach

The Outreach team continued work on the construction outreach plan and coordinating a timeline for what outreach will occur in different project areas. Additionally, the outreach team is progressing with the concepts for educational displays and exhibits in the future Visitor's Center and planning a groundbreaking event.

Legislative Tours



Construction Outreach Plan developed

Social Media Content

PADRE DAM Municipal Water District	
COMMITTEE AGENDA REPORT	**Meeting Date:** 05-23-2022 **Dept. Head:** Kyle Swanson **Submitted by:** Michael Hindle, P.E. **Department:** Engineering **Approved by:** Allen Carlisle, CEO/GM

SUBJECT: QUARTERLY CAPITAL IMPROVEMENT PROGRAM (CIP) PROJECTS BUDGET UPDATE

RECOMMENDATION(S):

Note and file; informational report only.

ALTERNATIVE(S):

N/A

ATTACHMENT(S):

1. CIP Projects Budget Update

FUNDING:

Requested amount: N/A
Budgeted amount: N/A
Are funds available? ☐ Yes ☐ No
Project cost to date: N/A

PRIOR BOARD/COMMITTEE CONSIDERATION:

STRATEGIC PLAN IMPLEMENTATION:

This agenda item is consistent with the District's Strategic Plan and meets one or more of the following Strategic Goals: Provide safe, reliable water, recycled water and sewer services; Ensure fiscal health and competitively sustainable rates; Enhance customer communications and education; Increase water, wastewater and energy independence; Maintain workforce excellence; Expand park and recreation opportunities.

Reviewed by:		**Action Required:**		**Policy Updates:**		**Action Taken:**
Dept Head	☒	Motion	☐	Rules & Regulations	☐	As Recommended ________
Finance	☐	Resolution	☐			Reso/Ord. No. ________
Legal Counsel	☐	Ordinance	☐	Standard Practices & Policies	☐	Other ________
Standard Form	☐	None	☒			

EXECUTIVE SUMMARY:

Attached is the CIP expenditures report through March 2022.

RECOMMENDATION(S):

Note and file; informational report only.

Attachment 1

CIP Projects Budget Update
FISCAL YEAR 2022
BUDGET VS ACTUAL
(thru March 2022)

					Current Fiscal Year						Cumulative		
Item #	Project	Job # / WO #	PM	Total 5 Yr. Bus. Plan Budget	FY '22 Budget	FY '22 Actual Spent (thru March 2022)	FY '22 Variance	FY '22 % Spent	Status	Comment(s)	Total Projected Budget	Project Expenditures to Date (ITD thru March 2022)	Total Project Variance
General CIP													
1	Trans-River Sewer Siphon & Sludge Main - Condition Assessment, Design, & Construction	217002 & 220027	KK	$2,802,000	$1,974,000	$8,496	$1,965,504	0.4%	D	The Board awarded the design to Weston at the Board meeting in April 2021. Weston has started the preliminary tasks for design development. Updated model was provided by the Master Plan consultant and preliminary design work is proceeding to evaluate feasibility for redundant future siphon.	$2,802,000	$781,419	$2,020,581
2	Quail Canyon Pressure Reducing Station	217042	MH / JO	$505,000	$323,000	$230,211	$92,789	71.3%	C	The NTP for construction was issued to Vidovich on November 18, 2020. Construction completion was originally anticipated to be in May 2021, however, contract time was extended to address piping/vault revisions and longer than anticipated material lead times. Construction is anticipated to be completed in April 2022.	$505,000	$420,798	$84,202
3	Grossmont Tank Rehabilitation	218024	MH / AS	$3,211,000	$3,024,000	$556,818	$2,467,182	18.4%	C	The Project was re-bid in April 2021. The Board awarded the construction contract to Pacific Tank on June 16, 2021. The Notice to Proceed and PreCon meeting was held on July 28,2021. Anticipated completion is August 2022.	$3,211,000	$776,239	$2,434,761
4	Tavern Rd & W. Victoria @ Hwy.8 Pipe Upgrades	218027	WL	$1,200,000	$1,092,000	$5,635	$1,086,365	0.5%	D	Project under design to upgrade pipelines at bridge crossings. Caltrans permit is required and staff is coordinating review/permitting.	$1,200,000	$113,262	$1,086,738
5	Potable Water Pipeline Condition Assessment	218034	MH / AS	$1,201,000	$793,000	$300,933	$492,067	37.9%	P	Indirect assessment completed. Costs to perform internal direct assessment is higher than anticipated and is no longer being pursued. However, external direct assessment (EDA) was performed in December 2021. Budget originally allocated for direct assessments will be utilized for additional indirect assessments. Additional indirect assessments is scheduled to take place in June 2022.	$1,201,000	$685,275	$515,725
6	Blossom Valley Reservoir Rehabilitation/Replacement	218035	AS	$1,526,000	$1,331,000	$23,785	$1,307,215	1.8%	P	Dudek completed the Feasibility Study that considered 7-alternatives. Staff prepared RFP for design services which was advertised January 2022 to solicit design engineering consultant firms. Proposals were submitted by four firms on March 3, 2022. Staff will evaluate proposals and request Board award the engineering design agreements on June 1, 2022.	$1,526,000	$198,953	$1,327,047
7	Pump Station Improvements	219004	WL	$2,398,000	$1,950,000	$85,950	$1,864,050	4.4%	C	The Board awarded the construction contract to Southern Contracting for six pump station sites. Staff will request the Board award the construction contracts at the regularly scheduled Board meeting on February 2, 2022. The notice to proceed was issued in March 2022 and anticipated construction completion is in March 2024.	$2,398,000	$611,958	$1,786,042
8	Cordial Road Pipeline Replacement	219026	WL	$3,986,000	$3,390,000	$2,273,124	$1,116,876	67.1%	C	Construction NTP was issued on January 28, 2021 and the original construction completion date was anticipated to be in late July 2021.Construction was delayed and staff negotiated a time extension with Ferreira. Three of four phases are complete and Ferreira is working on completing the final phase work in Camino Canada. The updated contract completion date is May 13, 2022.	$3,986,000	$3,030,281	$955,719
9	Contracted Valve Replacement	219029	AS	$1,179,000	$1,050,000	$47,139	$1,002,861	4.5%	C	Contracted Valve and 36-in. Transmission Main Valve Upgrades will be executed as a single project. Following issuance of the City of Santee traffic permit on June 2021, Staff advertised the project for bid in June 2021. Staff will request the Board award the construction contract to Burtech Pipeline on August 4, 2021. Project is delayed due to 40+ week lead time for the larger valves required for the project.	$1,179,000	$201,042	$977,958
10	Master Plan Update & UWMP 2020	219030	MH	$578,606	$250,000	$149,390	$100,610	59.8%	P	The Board awarded the engineering agreement to Carollo on August 5, 2020. Preliminary background research is complete and preliminary demand and population forecasts developed. Model calibration and analysis completed. The draft final document is complete and staff will provide the Board with an update at the FDOC meeting on May 23, 2022.	$578,606	$539,650	$38,956
11	Rios Canyon PS No. 2 Surge Tank	220005	AS	$820,000	$567,000	$494,579	$72,421	87.2%	C	Board awarded the Construction Contract on February 17, 2021 to M-Rae Engineering and the NTP issued on April 7, 2021. The construction of the surge tank, pressure relief valve, discharge plug valve, and air compressor is complete. The Contractor is coordinating final startup and commissioning. Project completion is anticipated to be in March of 2022.	$820,000	$733,726	$86,274
12	Sewer & Manhole Rehabilitation	220010	AS	$876,000	$767,000	$78,179	$688,821	10.2%	C	Staff advertised the project for bid in June 2021. The Board awarded the construction contract to Sancon on July 21, 2021. Construction will be completed in April 2022 and staff will complete project closure activities (mapping and model updates).	$876,000	$135,645	$740,355
13	I-8 Unencased Main Replacement	221007	WL	$618,000	$593,000	$41,016	$551,984	6.9%	D	Staff prepared and advertised RFP in July 2021 to solicit engineering design consultants. The Board awarded the engineering design contracts in November 2021. The team is working to prepare for initial submission of project information to Caltrans and development of 60% design plans and specifications.	$618,000	$46,550	$571,450
	TOTAL			**$20,172,606**	**$17,104,000**	**$4,295,256**	**$12,808,744**				**$20,900,606**	**$8,274,797**	**$12,625,809**
Capitalized Operations													
1	Blowoff Installation	208015	Ops	$27,000	$5,000	$0	$5,000	0.0%		Capitalized Operations.	$794,506	$785,528	$8,978
2	Annual Poly Service Replacement (ESA)	202032	Ops	$478,000	$107,000	$48,335	$58,665	45.2%		Capitalized Operations.	$1,430,022	$1,342,078	$87,944
3	Annual Poly Service Replacement (WSA)	202008	Ops	$972,000	$129,000	$183,046	($54,046)	141.9%		Capitalized Operations.	$3,509,525	$3,603,292	($93,767)
4	Annual Valve Replacement Program (ESA)	202034	Ops	$1,058,000	$147,000	$462,753	($315,753)	314.8%		Capitalized Operations.	$2,592,415	$3,112,268	($519,853)
5	Annual Valve Replacement Program (WSA)	99017	Ops	$1,241,000	$147,000	$378,781	($231,781)	257.7%		Capitalized Operations.	$8,024,467	$8,463,444	($438,978)
6	Ops Building HVAC Replacement	220015	Ops	$76,000	$0	$0	$0	0.0%		HVAC Upgrades for Ops Building	$76,000	$69,693	$6,307
7	SCADA Upgrades	218014	Ops	$214,000	$97,000	$0	$97,000	0.0%		SCADA upgrades at facilities	$214,000	$50,370	$163,630
	TOTAL			**$4,066,000**	**$632,000**	**$1,072,914**	**($440,914)**				**$16,640,935**	**$17,426,673**	**($785,739)**
	COMBINED TOTAL			**$24,238,606**	**$17,736,000**	**$5,368,170**	**$12,367,830**				**$37,541,541**	**$25,701,471**	**$11,840,070**

Status
- P Planning
- D Design
- C Construction
- PC Post Construction