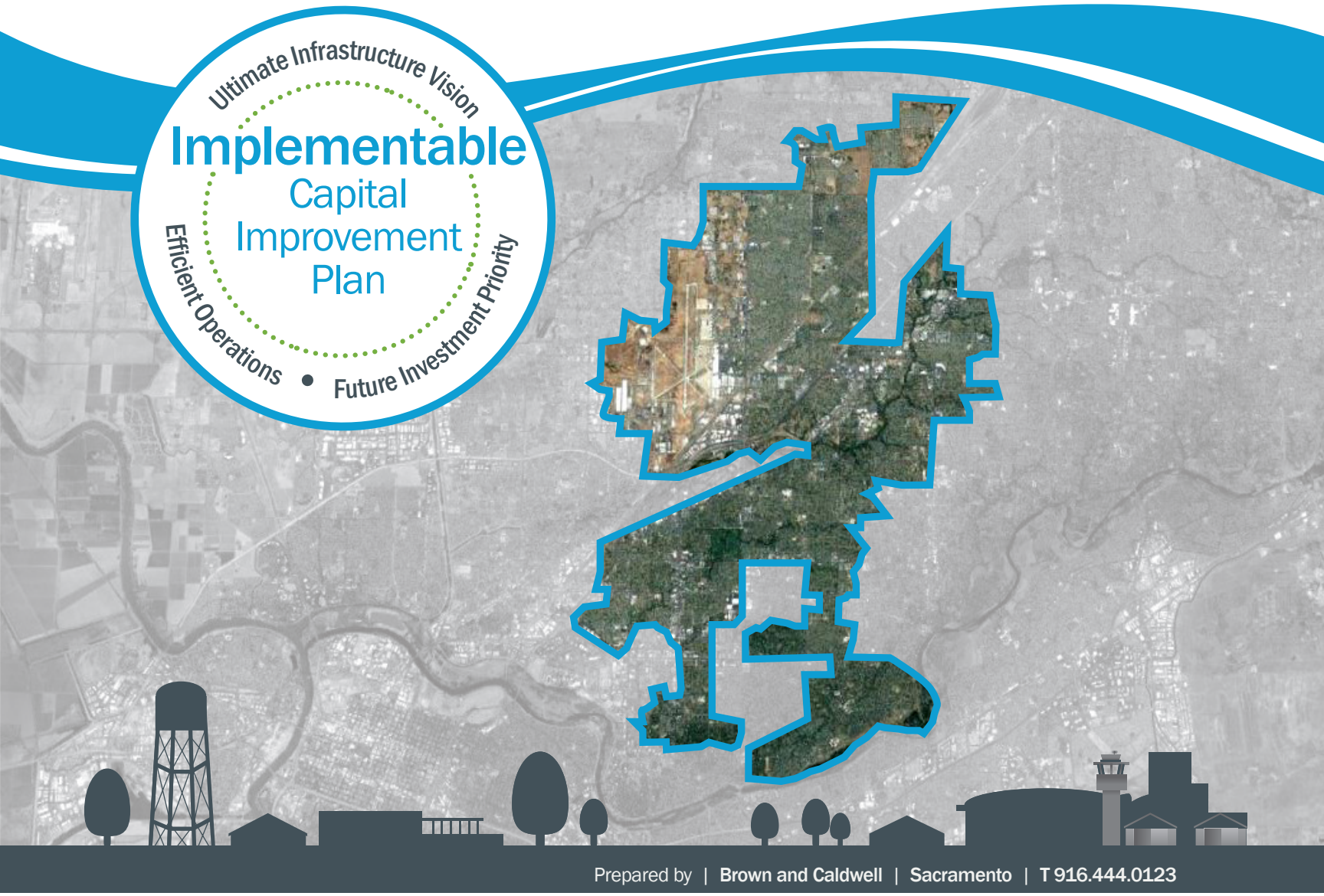
SACRAMENTO SUBURBAN WATER DISTRICT

Prepared for Sacramento Suburban Water District

Water System Master Plan

April 2017



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April 4, 2017

John Valdes
Sacramento Suburban Water District
3701 Marconi Avenue, Suite 100
Sacramento, CA 95821-5346

1017-148171

Subject: Submittal of the Water System Master Plan

Dear Mr. Valdes,

We are pleased to submit to you the final of the Water System Master Plan (WSMP). The WSMP has been updated as a result of the March 27, 2017 public Board meeting. The purpose of the WSMP is to update the water demand and supply analysis that was prepared for the 2009 WSMP as well as present the District's ultimate infrastructure vision and focus on what is critical to implement that vision. The capital improvement program (CIP) identifies the reinvestment priority for the future and information to shape policy decisions related to infrastructure and supply are provided.

Please let me know if you have any questions.

Very truly yours,

Brown and Caldwell,
a California Corporation

Melanie Holton, P.E.
Project Manager

Paul Selsky, P.E.
Vice President

MH:ds

Enclosure (1):
1. Water System Master Plan Sacramento Suburban Water District

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Water System Master Plan

Prepared for
Sacramento Suburban Water District
April 2017

Adopted by Sacramento Suburban Water District
Board of Directors on March 27, 2017

List of Board Members:

Robert P. Wichert, Division 3 – President
Craig M. Locke, Division 5 – Vice President
David A. Jones, Division 1
Neil W. Schild, Division 2
Kevin M. Thomas, Division 5

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List of Abbreviations

ac-ft	acre-feet
ac-ft/yr	acre-feet per year
ADD	average day demand
ACP	Antelope Conveyance Pipeline
AMF	American River at Folsom
AMP	Asset Management Plan
AASA	Arbors at Antelope Service Area
APN	assessor parcel number
ASR	aquifer storage and recovery
BMP	Best Management Practice
BPS	booster pump station
Cal Am	California American Water Company
CASGEM	California Statewide Groundwater Elevation Monitoring
cfs	cubic feet per second
CHWD	Citrus Heights Water District
CIP	capital improvement plan
City	City of Sacramento
CMMS	Computerized Maintenance Management System
COF	consequence of failure
Cr+6	Hexavalent Chromium
CTP	Cooperative Transmission Pipeline
CUWCC	California Urban Water Conservation Council
CVP	Central Valley Project
CWD	Carmichael Water District
District	Sacramento Suburban Water District
DU	dwelling units
DWR	Department of Water Resources
EPA	United State Environmental Protection Agency
EID	El Dorado Irrigation District
ET	evapotranspiration
Fe	iron
fps	feet per second
ft	feet
GIS	geographical information system
gpcd	gallons per capita per day
gpd/DU	gallons per day per dwelling unit
gpm	gallons per minute
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
GWMP	Groundwater Management Plan
Cr+6	Hexavalent Chromium
HGL	hydraulic grade line
IGSM	Sacramento County Integrated Groundwater and Surface Water Model
IIMM	International Infrastructure Management Manual
in	inch
IRCTS	Inactive Rancho Cordova Test Site
ISO	International Standardization Organization
IRWMP	Integrated Regional Water Management Plan
IT	Information Technology
LF	linear feet
LOF	likelihood of failure
LOS	level of service
LTWP	Long Term Well Plan
MBPSA	McClellan Business Park Service Area
MCL	maximum contaminant level
MDD	maximum day demand
MDD + FF	maximum day demand plus fire flow
MF	multi-family
MG	million gallons
mg/L	milligrams per liter
MGD	million gallons per day
Mn	Manganese
NSA	North Service Area
O&M	Operations and Maintenance
ODMS	Operations Data Management System
OEHHA	California Office of Environmental Health Hazard Assessment
PCWA	Placer County Water Agency
PF	peaking factor

PHD	peak hour demand
POU	place of use
PRV	pressure reducing valve
psi	pounds per square inch
PVC	polyvinyl chloride
R/R	rehabilitation and replacement
RLECWD	Rio Linda/Elverta Community Water District
ROF	risk of failure
RWA	Regional Water Authority
SEIR	Supplemental Environmental Impact Report
SCADA	supervisory control and data acquisition
SCWA	Sacramento County Water Agency
SF	single family
SGA	Sacramento Groundwater Authority
SGMA	Sustainable Groundwater Management Act
SJWD	San Juan Water District
SSA	South Service Area
SVE	soil vapor extraction
SWRCB	State Water Resources Control Board
TDS	total dissolved solids
UAW	unaccounted-for water
UIFR	unimpaired inflow into Folsom Reservoir
UP	under performing
USBR	United States Bureau of Reclamation
UWDF	unit water demand factor
UWMP	Urban Water Management Plan
WFA	Water Forum Agreement
WIDT	well investment decision tool
WSMP	Water System Master Plan
WTP	water treatment plant

Executive Summary

The overall objective of this WSMP is to provide a roadmap of needed capital improvements to meet water demands for the District. The approach for developing the WSMP consists of first defining the District's water needs and the groundwater and surface water supplies. This is followed by identifying and discussing conjunctive use strategies and water supply alternatives that both meet the District's current and expected needs and alternatives to possibly support groundwater banking and exchange operations that have the potential to benefit District ratepayers. The new infrastructure and rehabilitation and replacement (R/R) activities are analyzed and prioritized in an overall 15-year prioritized project list.

The District's intended staff use of this WSMP is to plan and budget for future facilities projects and capital improvements. This WSMP is not a funding document but rather a planning document to define infrastructure needs regardless of funding availability. The District's intended Board use of this WSMP is to utilize the information in the document to help make informed policy decisions. This WSMP is in alignment with the District's Strategic Plan.

Description of Existing Water System

The District is located in Sacramento County, north of the American River and serves a large suburban area including portions of Citrus Heights, Carmichael, North Highlands, City of Sacramento (City), Foothill Farms, and Antelope, as well as McClellan Business Park. Within the District are four service areas: the North Service Area (NSA), the Arbors at Antelope Service Area (AASA), McClellan Business Park Service Area (MBPSA), and the South Service Area (SSA). The term NSA is also used to describe a larger area consisting of the AASA, MBPSA, and the previously mentioned NSA.

The water system consists of a groundwater well field, ground level and elevated storage facilities, pumping facilities, 678 miles of water transmission and distribution pipelines, and interties with neighboring water agencies.

Water Requirements

Currently, the District has a population of 173,400 and 46,650 connections. The District is projected to reach buildout at 2031 with a population of 190,700 and a total number of connections of 50,250. The historical and projected population within the District is shown on Figure ES-1.

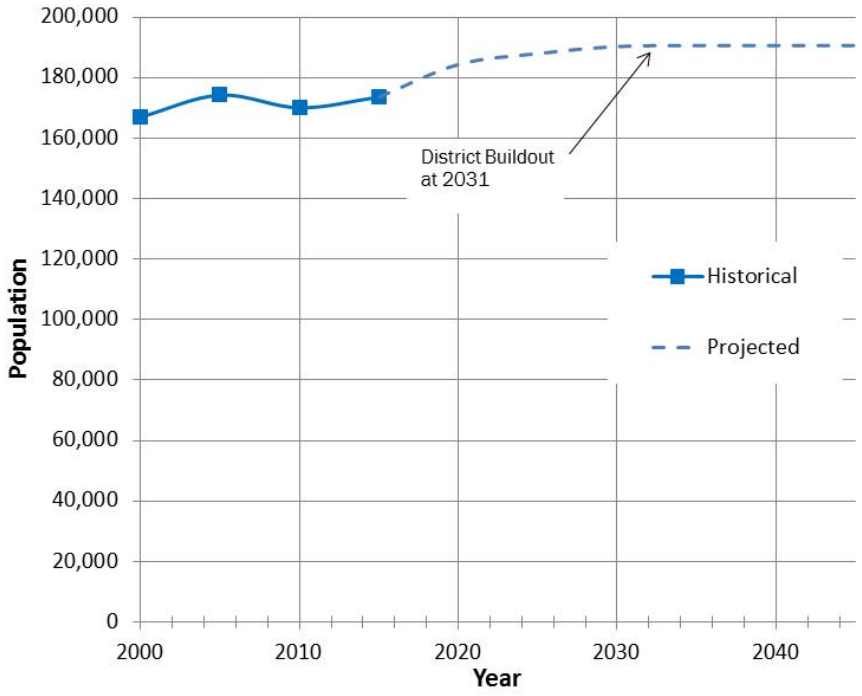


Figure ES-1. Historical and Projected Population

Buildout unit water demand factors (UWDFs) are developed by reviewing the District's historical water demand by customer category in comparison to the land area served and the number of connections by category. The assumed buildout UWDFs result in an overall buildout per capita demand that is slightly greater than the 2012 GPCD value and slightly less than the GPCD target as shown on Figure ES-2. It is assumed that the current decline in per capita water use due to the drought is temporary and will increase partially back to pre-drought levels.

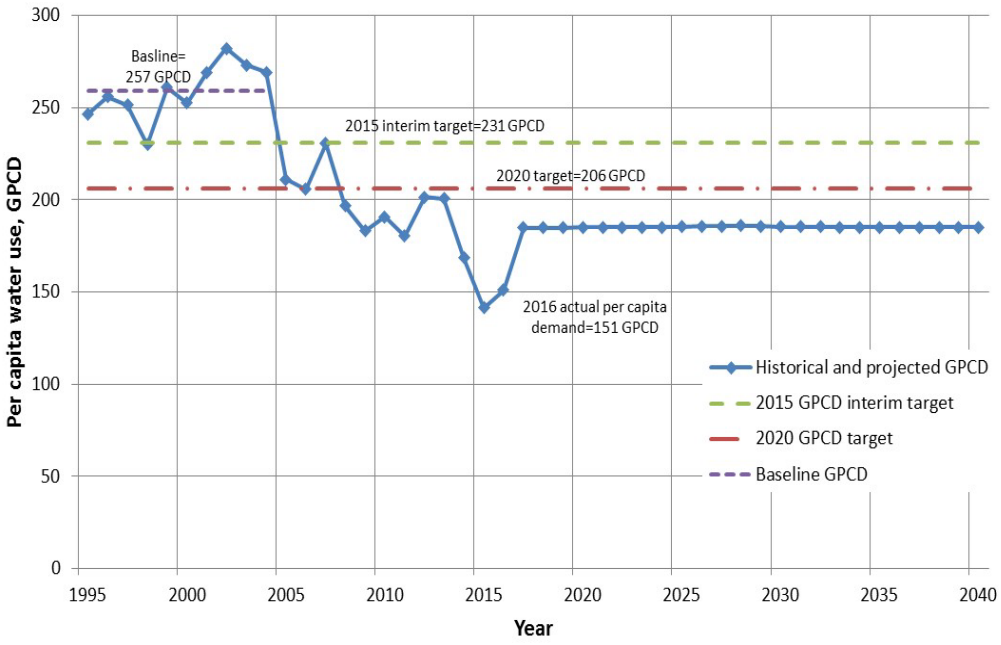


Figure ES-2. Historical and Projected GPCD vs Target GPCD

The buildout water demands are estimated by combining the estimate of the number of buildout connections for each customer category with the buildout water use per connection UWDF for each customer category. The District's buildout retail water demand is projected to be 39,577 acre-feet per year (ac-ft/yr). The District's historical water use by water supply source and projected water demand is shown on Figure ES-3.

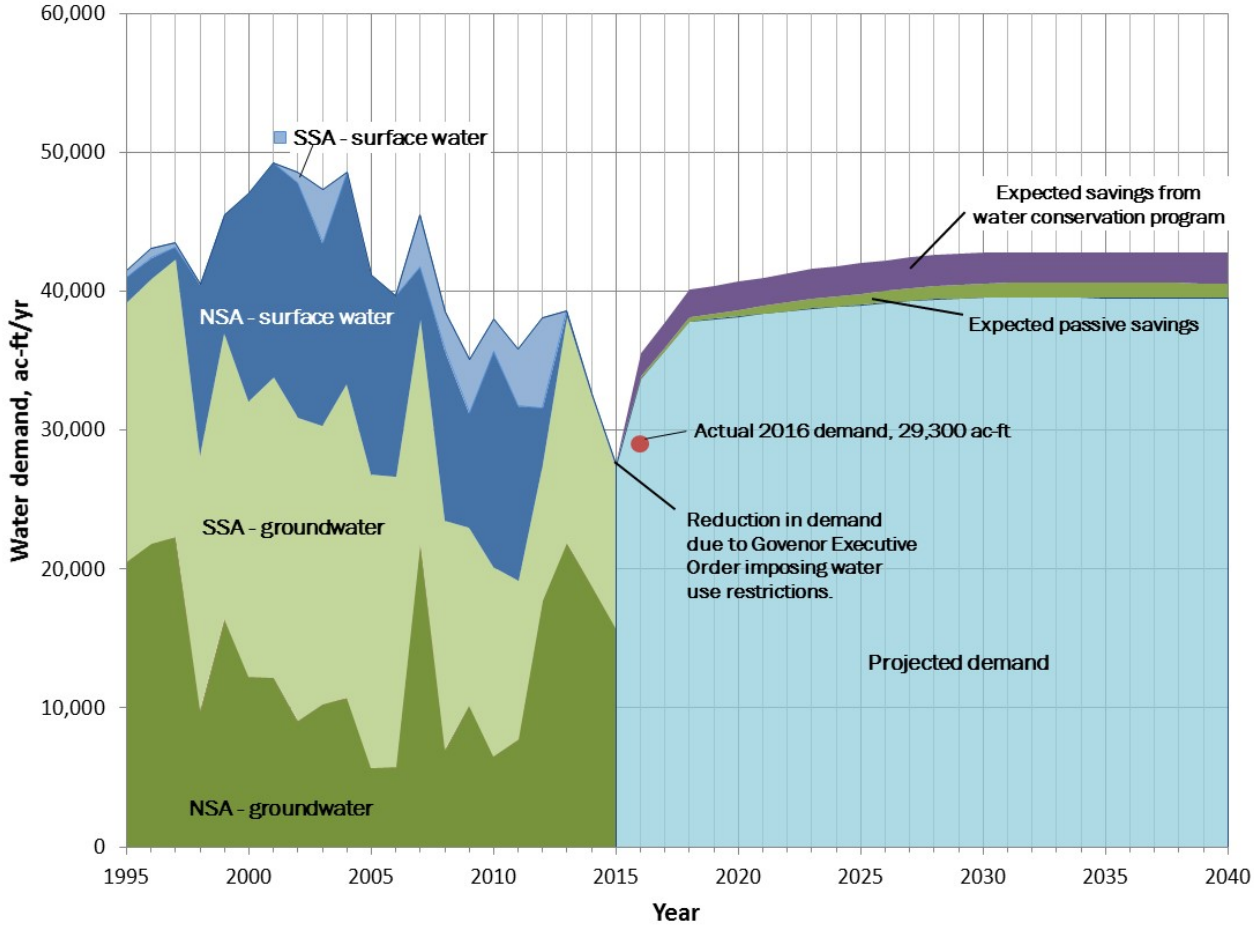


Figure ES-3. Water System Historical and Projected Water Demand

Note: Sales to other agencies not shown.

Water Supplies

Water supply for the District is currently derived from currently reliable active groundwater wells and intermittently purchased surface water.

The groundwater basin underlying the District is located in the North American Subbasin (DWR Basin Number 5-021.64) which is part of the larger Sacramento Valley Groundwater Basin. The groundwater in the southern portion of the North American Subbasin, the portion in Sacramento County, is currently managed by the Sacramento Groundwater Authority (SGA). The District is a participating agency in SGA. The District has an in-lieu groundwater recharge program in place. This program involves the importation of surface water to partially offset groundwater usage, which has resulted in the local recovery of groundwater levels in the NSA.

The groundwater quality is generally excellent such that most of the wells do not currently need any treatment other than disinfection. However, there are some wells that have iron and manganese treatment and several wells have been closed due to the presence of hexavalent chromium. There are several groundwater contaminant plumes. The trend to more stringent drinking water standards and the presence of contaminants within the groundwater basin are a potential threat to the District's groundwater supply. There is a possibility that all the District's groundwater wells may someday need to have treatment facilities.

The District purchases surface water from Placer County Water Agency (PCWA), the United States Bureau of Reclamation (USBR), and the City of Sacramento. The District uses available surface water typically in wet years to meet a substantial portion of its overall water demand.

The PCWA water is diverted at Folsom Reservoir through USBR facilities, treated at San Juan Water District's Peterson Water Treatment Plant (WTP), and delivered for use through the CTP and ACP to the NSA.

The City has an American River water right permit with a designated place of use (POU) referred to as "Area D". A portion of the District service area lies within Area D. The District purchases surface water from the City of Sacramento for use within the portion of the District's service area that is within Area D. This American River supply is treated at the City's E. A. Fairbairn WTP and delivered to the District via the City's Howe Avenue transmission main to an existing interconnection located near Enterprise Drive and Northrop Avenue in the SSA.

Since 1991, the NSA has received a nominal amount of Section 215 USBR Central Valley Project (CVP) water. Section 215 water is surplus or spilled for flood releases water available typically in winter and spring in wet and average climate years. This water is treated at the Peterson WTP and delivered via CTP and ACP for use within the NSA.

The District currently fluoridates its water supply for the SSA only. Having fluoridation for a portion of the District's service area results in limiting the District's operational flexibility. Fluoridated water supplies cannot be used to supply non-fluoridated systems and vice versa.

Alternatives to Meet District's Needs and Maximize Facility Value

Most of these alternatives to meet the District's needs are based on a continued conjunctive use strategy. The conjunctive use strategy consists of using available surface water in wet years and groundwater in dry years. The alternatives evaluated are as follows:

1) Use PCWA and City of Sacramento surface water plus District groundwater.
2) Use reduced PCWA surface water plus District groundwater.
3) Use District groundwater only.

The District has sufficient surface and groundwater supplies and invested in constructing infrastructure to meet its own needs and still have capacity to supply water to others. Some potential alternatives to supply water from the District to others are developed as follows:

1) Partner with other agencies to sell water.
2) Transfer the District's Area D surface water when available via groundwater substitution.
3) Transfer the District's PCWA surface water supply when available via groundwater substitution.
4) Supply water directly to downstream users.

A key decision is whether the District desires to solely provide for its own needs or if it would also like to generate revenue by selling water to other agencies. The information provided for the alternatives

to meet the District's needs and the alternatives to sell water to other agencies should be used by the District to help inform a policy direction.

The estimated cost, revenue, and net cost for these alternatives are summarized on Figure ES-4. The evaluation demonstrates that there are approaches to selling water to other agencies that would significantly reduce the net annual cost of water supply for the District's customers. The best approach to generate revenue by selling water to others consists of maximizing the number of years that the water sale is made, maximizing the sale cost of the water, and minimizing the cost of purchasing surface water for in lieu or active groundwater recharge. It is recommended that the District further advance approaches to using its infrastructure to generate revenue and reduce rate payer costs by participating in regional efforts and other actions. The combination of the District's advantages, the regional efforts to establish a groundwater bank, and the need for dry year water supply in other regions of the state and locally provides the District opportunities to use its existing infrastructure to generate revenue to reduce costs for its rate payers.

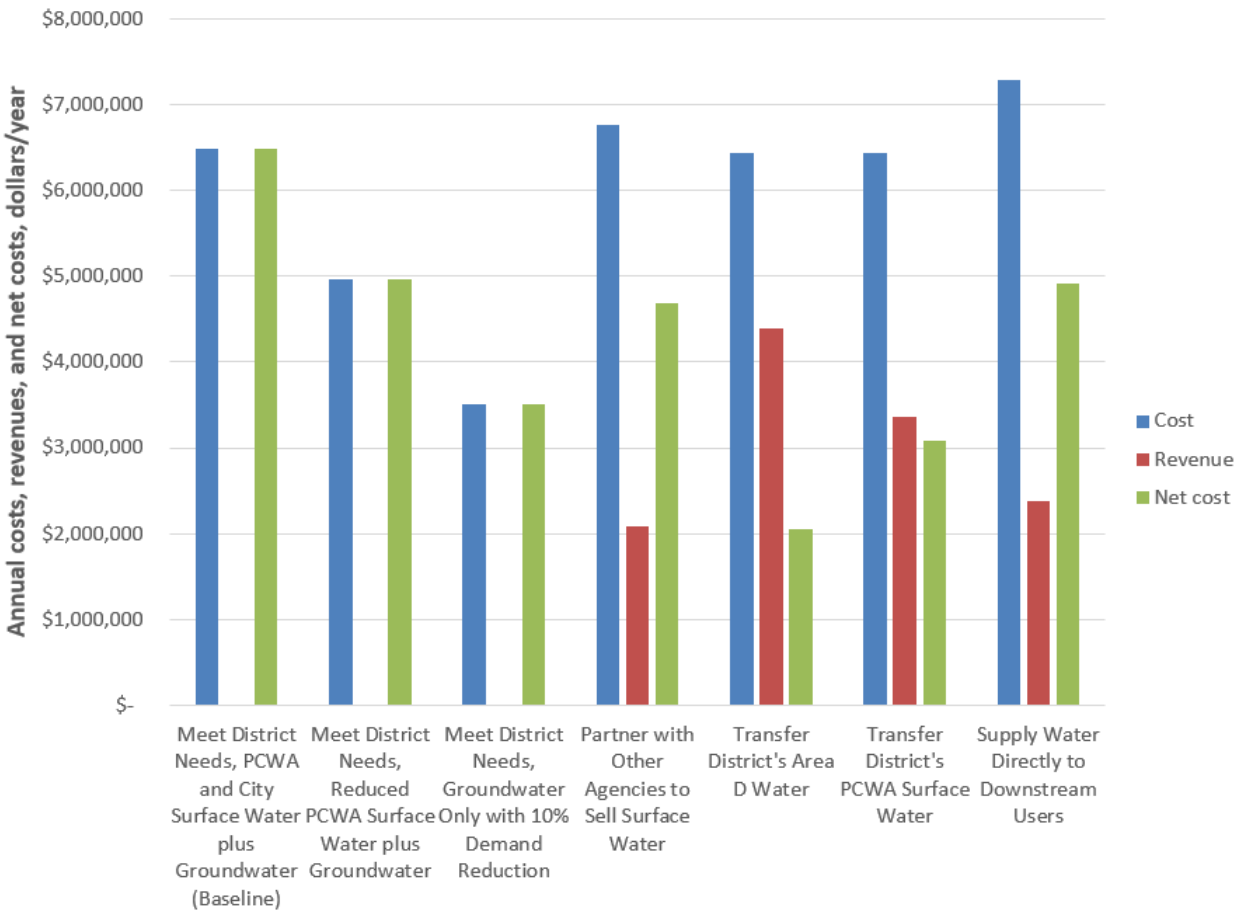


Figure ES-4. Alternatives Cost Summary

Asset Management

The District's AMPs were reviewed for completeness and appropriate cost and service life assumptions. Recommendations are provided related to AMP content, approach, and assumptions.

The following District AMPs were reviewed:

- Transmission Mains – January 2016
- Distribution Mains – Updated October 2014
- Buildings and Structures – Updated November 2011
- Reservoirs and Booster Stations – Updated October 2011
- Groundwater Well Facility - Updated August 2015
- Water Meter Asset Management Plan - Updated May 2015

Supply Facilities Analysis

The supply category consists of groundwater wells and other water supply projects. Well site destruction is also included. The Long Term Well Plan (LTWP) is a schedule for the replacement and rehabilitation of the District's existing groundwater wells so that water demands can be supplied by groundwater in the most efficient manner. The goals of this updated LTWP is as follows:

- Maintain groundwater well assets by developing a long-term rehabilitation and replacement plan.
- Result in the District's groundwater supply wells, in combination with storage booster pumping capacity, meeting a desired goal of 115 percent of peak hour water demand.
- Increase reliability and value of the groundwater supply system.

A risk analysis is developed to estimate well useful life and estimate costs for future replacement planning. The recommended well replacement plan will reduce the average age and number of wells in the system. A business case evaluation of having a well field with less wells compared to the current wellfield shows that the majority of the cost reduction is due to the smaller number of wells that would need to be rehabilitated and replaced and the reduction in costs would be $1.5 million per year.

A decision tool develops a discriminatory process to work towards an operationally and fiscally efficient well field. This decision tool allows for District staff to document and analyze investment decisions relative to the monetary and hydraulic value of the well asset.

Recommended supply facility improvements include new well projects to replace existing wells as they reach the end of their useful life and rehabilitation efforts are included for maintaining existing wells. Well site destruction and new land acquisition activities are also included.

Transmission Facilities Analysis

The transmission category consists of transmission pipelines typically greater than or equal to 16-in diameter and, generally, they are lacking individual service line connections. Transmission facility improvements related to completing the transmission backbone in the NSA is the dominating component of the transmission category in the recommended capital improvement plan (CIP).

Distribution Facilities Analysis

The distribution category consists of pipelines that are typically less than 16-in diameter. The recommended distribution main improvements are for the replacement of distribution pipelines at

useful life, focused on priority replacement areas. The District is currently replacing distribution pipelines at a rate of 1 percent per year. The 15-year recommended replacement rate is at a rate of less than 1.3 percent per year (46,000 linear feet [LF] per year).

Storage Facilities Analysis

The storage category consists of pipelines and booster pump stations. The adequacy of the District's storage is analyzed for each pressure zone. With the exception of the MBPSA, there is sufficient storage and well pumping capacity to meet peak hour demands. The District cannot meet its peak hour demand with its well pumping capacity alone.

Special Projects Analysis

The special projects category consists of buildings and structures, water meters, and SCADA. The water system is monitored and operated automatically using a Wonderware/Tesco Controls Supervisory Control and Data Acquisition (SCADA) system. Most of the system active wells are connected to the SCADA system. The areas where the SCADA system may be improved are classified into the following broad categories:

1. SCADA Alarm Management
2. Use of SCADA Data
3. Standardization of SCADA System
4. Optimization/Integration of SCADA System

Water meters include meters in the distribution system. There are approximately 10,000 services remaining to be metered. Rehabilitation and replacement of existing water meters include replacement of smaller meters (5/8-in to 2-in) and testing and rebuilding of larger meters (3-in and greater). The District is expected to be completely metered by 2022.

Hydraulic Modeling

The District's Infowater hydraulic model is utilized as a tool to help identify system deficiencies in the existing system and confirm the system will meet operational and performance criteria at buildout. The water system is analyzed under existing (2016) and buildout (2031) demand conditions and two supply scenarios (all groundwater and maximize surface water use). A scenario analyzing the impacts of exporting groundwater from the system for sales to others is also analyzed.

Capital Improvement Plan

A compilation of the projected discrete and annual average long term rehabilitation and replacement costs developed for each of the District's asset categories is illustrated on Figure ES-5. This does not include the District's debt service which will be completed in 2032.

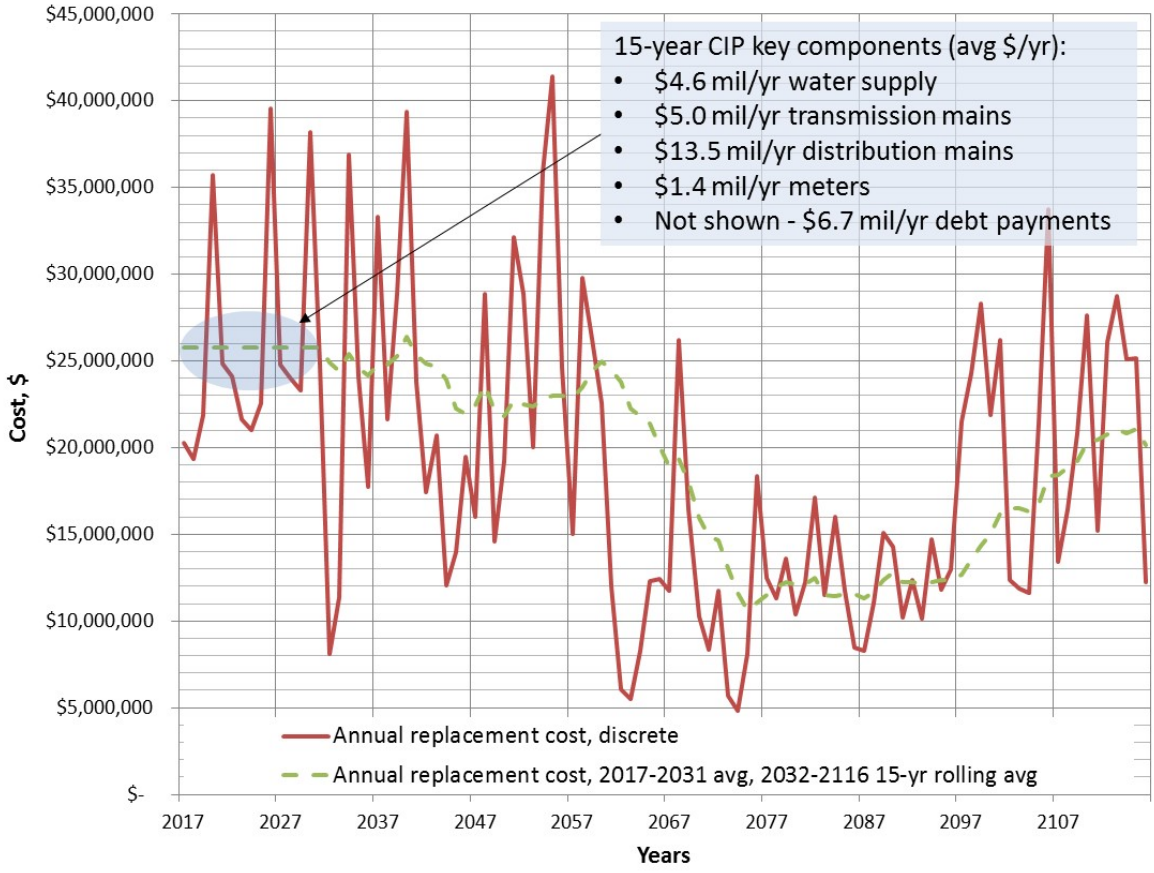


Figure ES-5. Total Projected Long Term Rehabilitation and Replacement Costs

Note: The District's debt service costs are not shown on this figure.

The ultimate system vision in shown on Figure ES-6. The District has three major actions to complete to implement the ultimate system vision:

1. Complete the Meter Installation Program – to be completed by 2022 to meet Water Forum and State Law requirements.
2. Complete the transmission main backbone – to enable the District to meet demands throughout the system with a more centralized supply system and less supply facilities.
3. Continue to consolidate the number of well sites – to reduce operation and maintenance (O&M) costs and enable cost efficient centralized treatment in the future, as necessary.

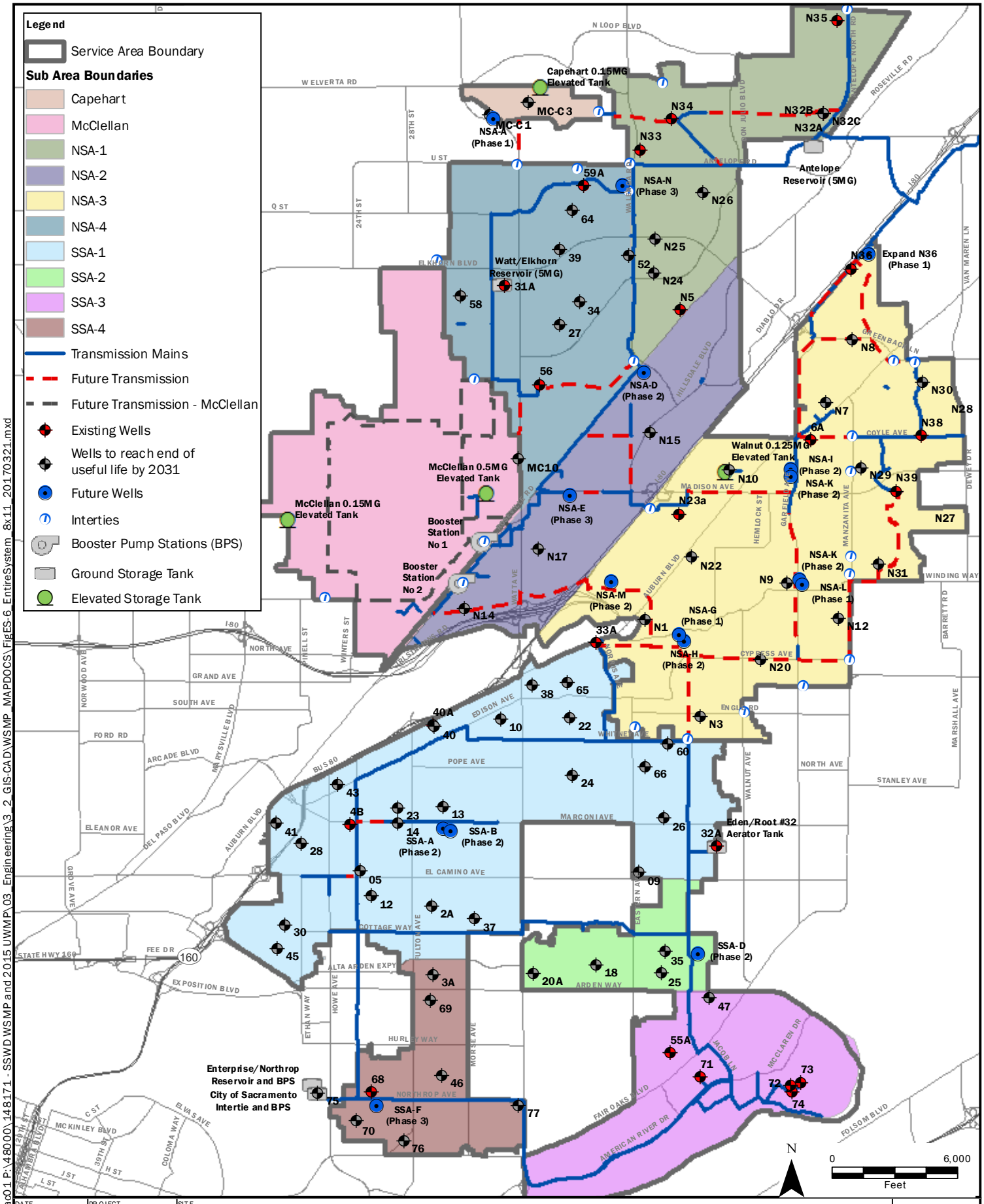
The District's capital needs for a 15-year period from 2017 through 2031 is based on the recommendations in this WSMP. Figure ES-7 illustrates the annual costs of projected capital projects (in 2016 dollars) as well as historical actual expenditures and future budgeted CIP expenditures.

Next Steps

Recommendations for items to develop to better inform the preparation of the next WSMP update as well as move forward in the implementation of this WSMP are provided. Key next step efforts are summarized as follows:

1. Continue tracking water demands to understand facility sizing needs.

2. Further analyze and engage in water supply revenue opportunities that provide a benefit to the rate payer.
3. Participate in regional efforts that lead to the improvement of the health of the groundwater basin and system reliability.
4. Refine asset management planning and implement sustainable infrastructure rehabilitation and replacement practices.
5. Implement processes recommended as part of the LTWP to cost affectively maintain the District's water supply facilities.
6. Complete backbone transmission system.



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3/21/17	148171	Water System Master Plan Sacramento Suburban Water District

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TITLE

Ultimate System Vision

Figure ES-6

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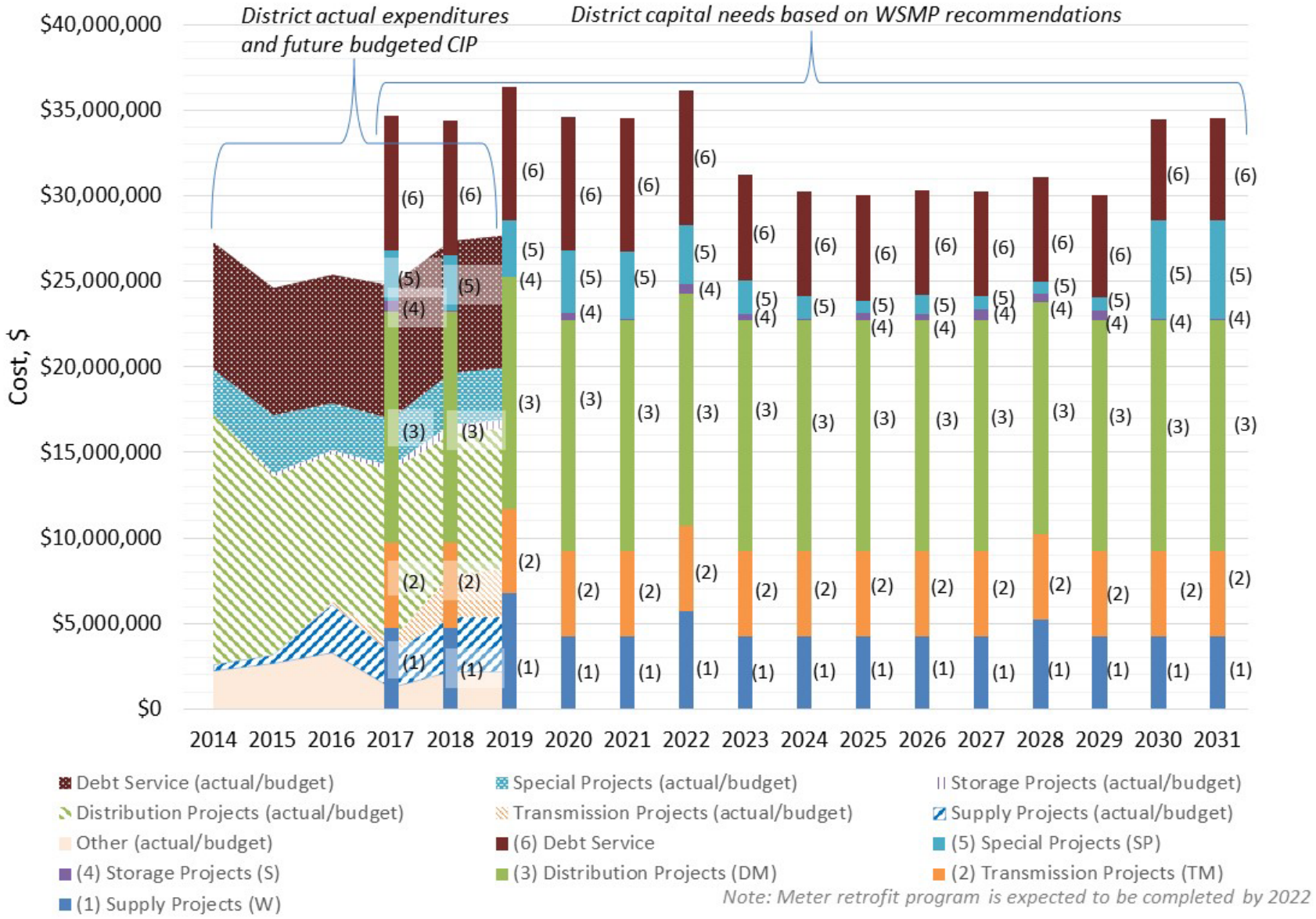

Figure ES-7. Capital Needs Assessment Total Annual Costs (Non-Escalated)