2015 URBAN WATER MANAGEMENT PLAN

Final Adopted Plan
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TABLE OF CONTENTS

TABLE OF CONTENTS I
LIST OF FIGURES IV
LIST OF TABLES V
LIST OF ATTACHMENTS VII

1.0 INTRODUCTION AND OVERVIEW 1
1.1 Background 1
1.2 System Overview 1
1.3 Content of the UWMP 3
1.4 Anticipated Document Use 3

2.0 PLAN PREPARATION 5
2-1. Basis for Preparing a Plan 5
2-2. Reporting Conventions 6
2-3. Coordination and Outreach 7

3.0 SYSTEM DESCRIPTION 9
3-1. Service Area 9
3-2. History and Governance 9
3-3. Climate 11
3-4. Demographics 13
3-5. Population 14
3-5-1. Current Population 14
3-5-2. Population Projections 15

4.0 SYSTEM WATER USE 21
4-1. Historical Water Use 21
4-2. Water Use By Customer Type 22
4-3. Projected Water Use 23
4-4. Distribution System Water Losses 25

4-5. Estimated Future Water Savings ... 26
4-6. Water Use for Lower Income Households ... 26
4-7. Data Provided to Wholesale Agency ... 28

5.0 BASELINES AND TARGETS ... 29
5-1. Baseline Per Capita Water Use ... 29
5-2. 2020 Water Use Target Calculation ... 36

6.0 SYSTEM SUPPLIES ... 39
6-1. San Juan Water District Background ... 39
6-2. Overview of Groundwater Supplies ... 41
6-2-1. Groundwater Basin Description ... 41
6-2-2. Recharge Facilities ... 44
6-2-3. Historical Groundwater Pumping ... 45
6-3. Stormwater Recovery ... 45
6-4. Wastewater and Recycled Water ... 45
6-4-1. Potential and Projected Recycled Water Use ... 47
6-5. Desalinated Water Opportunities ... 48
6-6. Exchanges or Transfers ... 48
6-7. Future Water Projects ... 49
6-8. Summary of Existing and Planned Sources of Water ... 50

7.0 WATER SUPPLY RELIABILITY ... 51
7-1. Surface Water Supply Reliability and Constraints ... 51
7-1-1. CVP Water Supply Reliability ... 51
7-1-2. Water Forum and Hodge Decision ... 52
7-1-3. SJWD Reliability Analysis ... 53
7-2. Groundwater Reliability and Constraints ... 59
7-3. Water Quality Constraints ... 59
7-3-1. Surface Water Quality ... 59

7-3-2. Groundwater Quality 59
7-3-3. Groundwater Quality Programs 61
7-3-4. Distribution System Water Quality 62
7-3-5. Water Quality Effects on Water Management Strategies and Supply Reliability .. 62
7-4. District Water Supply Reliability by Type of Year 64
7-5. Regional Supply Reliability 68

8.0 WATER SHORTAGE CONTINGENCY PLANNING 69
8-1. Stages of Action 69
8-2. Prohibitions on End Uses 71
8-3. Penalties, Charges, Other Enforcement of Prohibitions 72
8-4. Consumption Reduction Methods 73
8-5. Determining Water Shortage Reductions 74
8-6. Revenue and Expenditure Impacts 74
8-7. Resolution or Ordinance 75
8-8. Catastrophic Supply interruption 75
8-9. Minimum Supply Next Three Years 76

9.0 DEMAND MANAGEMENT MEASURES 77
9-1. Water Waste Prevention Ordinances 77
9-2. Metering 78
9-3. Conservation Pricing 78
9-4. Public Education and Outreach 78
9-5. Programs to Assess and Manage Distribution System Real Loss 78
9-6. Water Conservation Program Coordination and Staffing Support 79
9-7. Other Demand Management Measures 79
9-8. Planned Implementation to Achieve Water Use Targets 80
9-9. Consideration of Economic Impacts 80

10.0 PLAN ADOPTION, SUBMITTAL, AND IMPLEMENTATION 81

LIST OF FIGURES

Figure 1- 1. FOWD Location and Vicinity 2

Figure 3- 1. Fair Oaks Water District Service Area. 10
Figure 3-2. Monthly average temperatures within the District. 11
Figure 3-3. Monthly average rainfall and evapotranspiration. 12
Figure 3- 4. Screenshot of the District's boundary uploaded into the DWR Population Tool. ... 14
Figure 3-5. SACOG Traffic Analysis Zones. 18

Figure 4- 1. Historical water use from 2010 through 2015. 21
Figure 4- 2. Projections of total water use out to 2035 broken down by use type. 24

Figure 5- 1. Method for calculating baseline GPCD. 30

LIST OF TABLES

Table 2-1. Public Water Systems 5
Table 2-2. Plan Identification 6
Table 2-3. Agency Identification 6
Table 2-4. Water Supplier Information Exchange 7

Table 3-1. Population - Current and Projected 19

Table 4- 1. 2015 water use by customer type. 22
Table 4- 2. Projections of total water use out to 2035 broken down by use type. 23
Table 4- 3. Total water use projections out to 2035. 25
Table 4- 4. Water loss audit reporting for 2015. 25
Table 4- 5. Inclusions in water use projections. 26
Table 4- 6. Low income residential water use projections. 27
Table 4- 7. Surface water use projections provided to SJWD 28

Table 5- 1. Baseline period ranges (SB X7-7 Table 1) 30
Table 5- 2: Methods for population estimates (SB X7-7 Table 2) 31
Table 5- 3: Service area population (SB X7-7 Table 3) 31
Table 5- 4: Annual Gross Water Use (SB X7-7 Table 4) 32
Table 5- 5: Volume purchased from San Juan Water District entering distribution system (SBX7-7 Table 4-A) 33
Table 5- 6: Volume entering the distribution system for groundwater wells (SB X7-7 Table 4-A) 34
Table 5- 7: GPCD water use for 5- and 10-year baseline periods (SB X7-7 Table 5) 35
Table 5- 8: Summary of Baselines and GPCD Targets (DWR Table 5-1) 36
Table 5- 9. Confirmation of minimum reduction for 2020 target (SB X7-7 Table 7-F). 36
Table 5- 10: Assessment of 2015 Interim Compliance (SB X7-7 Table 9) 37

Table 6- 1. Existing District wells and well capacity 41
Table 6- 2: Groundwater volume pumped in recent years 45
Table 6- 3.Wastewater collected within the SASD service area (DWR Table 6-2) 47
Table 6- 4. Expected Future Water Supply Projects or Programs (DWR Table 6-7) 49
Table 6- 5. Actual 2015 retail water supplies (DWR Table 6-8) 50
Table 6- 6. Projected water supplies (DWR Table 6-9) 50

Table 7- 1. SJWD total 2015 water supplies (SJWD 2015 UWMP Table 6-8). 53
Table 7- 2. SJWD projected water supplies through 2040 (SJWD 2015 UWMP Table 6-9). 53
Table 7- 3. SJWD available supplies during various water years (SJWD 2015 UWMP Table 7-1).55
Table 7- 4. SJWD normal year projected water supplies and demands
(SJWD 2015 UWMP Table 7-2)... 56
Table 7- 5. SJWD single-dry year projected water supplies and demands
(SJWD 2015 UWMP Table 7-3)... 57
Table 7- 6. SJWD dry year projected water supplies and demands
(SJWD 2015 UWMP Table 7-5)... 58
Table 7- 8. Basis of water year data - Surface Water Supplies (DWR Table 7-1A). 65
Table 7- 9. Basis of water year data - Groundwater Supplies (DWR Table 7-1B)........................ 66
Table 7- 10. Normal year supply and demand projections (DWR Table 7-2). 67
Table 7- 11. Single-dry year supply and demand projections (DWR Table 7-3). 67
Table 7- 12. Multiple-dry year supply and demand projections (DWR Table 7-4). 67

Table 8- 1. Stages of water shortage contingency plan. 70
Table 8- 2. Restrictions and prohibitions on end uses. 71
Table 8- 3. Stages of water shortage contingency plan - consumption reduction methods. 73
Table 8- 4. Minimum supply next three years. 76

Table 10- 1. Notifications to Cities and Counties. 81

List of Attachments

Attachment A: .... UWMP Checklist Arranged by Subject
Attachment B: ....DWR Population Tool Output
Attachment C: ....SACOG Population Forecast by Traffic Analysis Zone (TAZ)
Attachment D: .... Documentation of Data Exchanged with San Juan Water District
Attachment E: ....Summary Report from AWWA Water Audit Software
Attachment F: Sacramento Groundwater Authority 2014 Groundwater Management Plan for the Sacramento County – North Basin
Attachment G: ....Fair Oaks Water District 2014 Consumer Confidence Report
Attachment H: .... Fair Oaks Water District Water Conservation Policy No. 6060
Attachment I: ....Fair Oaks Water District Rate and Fee Schedule
Attachment J: ....Fair Oaks Water District's CUWCC BMP Annual Reports for 2013-2014
Attachment K: .... Notification Letters Regarding UWMP Preparation and UWMP Public Hearing
Attachment L: .... Published Notices in the Sacramento Bee
Attachment M: .... Board Resolution Adopting the 2015 Urban Water Management Plan
Attachment N: .... DWR Standardized UWMP Tables for Retail Urban Water Suppliers
Attachment O: .... SB X7-7 Verification Form

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FAIR OAKS
WATER DISTRICT

1.0 INTRODUCTION AND OVERVIEW

1.1 Background

This Urban Water Management Plan (UWMP) has been prepared for the Fair Oaks Water District (District or FOWD) in compliance with Division 6, Part 2.6, of the California Water Code (CWC), Sections 10608 through 10657. The original bill requiring preparation of an UWMP was enacted in 1983. A significant amendment was made in 2009 by Senate Bill No. 7 (SBX7-7), the Water Conservation Act of 2009. SBX7-7, which became law in November 2009, requires increased emphasis on water demand management and requires the State to achieve a 20% reduction in urban per capita water use by December 31, 2020.

Urban water suppliers having more than 3,000 service connections or supplying more than 3,000 acre-feet per year for retail or wholesale are required to submit an UWMP every 5 years to the California Department of Water Resources (DWR). The UWMP deadline for the 2015 cycle is set for July 1, 2016. This 2015 UWMP is an update to the 2010 plan, which was submitted to DWR in September 2011.

DWR released the final 2015 UWMP Guidebook in March 2016 which has been updated from the 2010 version to reflect new legislation. The District's UWMP has been developed in close consultation with DWR's 2015 Guidebook and follows the recommended organization which has been modified from previous guidebooks.

1.2 System Overview

The District is a California special district providing retail sale of potable water primarily to residential and commercial customers. As of the end of 2015, the District serves 13,894 connections in the northeast portion of unincorporated Sacramento County, California.

Figure 1- 1 illustrates the District's service area which is approximately 6,240 acres. The service area is bounded by San Juan Avenue on the west, Madison and Pershing Avenues on the north, Walnut and Main Avenues on the east, and parts of Folsom Lake State Recreation Area and Sacramento County's American River Parkway on the south.

URBAN WATER MANAGEMENT PLAN

Fair Oaks Water District Location and Vicinity

FIGURE

1-1

Figure 1- 1. FOWD Location and Vicinity

1.3 Content of the UWMP

This UWMP addresses all subjects required by the Urban Water Management Planning Act ("Act") which permits "levels of water management planning commensurate with the numbers of customers served and the volume of water supplied." All applicable sections of the Act are discussed in this UWMP, and a completed copy of the 2015 Urban Water Management Plan Checklist organized by subject is included in Attachment A.

1.4 Anticipated Document Use

The District is committed to implementation of the projects, plans, and discussions provided within this document. The 2015 UWMP is intended to serve as a general, flexible, and open-ended document that periodically can be updated to reflect changes in water supply trends, and conservation and water use efficiency policies. This UWMP, along with other District planning documents, will be used by District staff to guide water use and management efforts through the year 2020, when the UWMP is required to be updated.

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2.0 PLAN PREPARATION

The District prepared this UWMP with the assistance of its consultant, Peterson Brustad, Inc. (PBI), as permitted by Section 10620(e) of the CWC. During the preparation of the UWMP, documents that have been prepared over the years by the District and other entities were reviewed and information from those documents incorporated, as applicable, into this UWMP.

The District is committed to the implementation of this UWMP concurrent with the scheduled activities required by the CWC. The District's staff will plan and implement responses identified in this document and other key planning efforts to proactively address water supply reliability challenges. Furthermore, the District's conservation coordinator oversees the implementation of Demand Management Measures (DMMs) through the District's participation in the California Urban Water Conservation Council's (CUWCC) Memorandum of Understanding (MOU).

2-1. Basis for Preparing a Plan

In accordance with CWC Sections 10617, 10620, and 10621, urban water suppliers with 3,000 or more service connections or supplying 3,000 or more acre-feet of water per year are required to prepare an UWMP every 5 years. The District is a retail urban water supplier that serves 13,894 connections as of the end of 2015. Total water production has ranged from 8,130 acre-feet (AF) per year to 12,259 AF per year between 2010 and 2015.

The District is categorized as a Public Water System (PWS) according to the California Health and Safety Code 116275. A PWS is defined as:

> *"…a system for the provision of water for human consumption through pipes or other constructed conveyances that has 15 or more service connections or regularly serves at least 25 individuals daily at least 60 days out of the year".*

Table 2-1. Public Water Systems

Public Water System Number	Public Water System Name	Number of Municipal Connections 2015	Volume of Water Supplied 2015
3410009	Fair Oaks Water District	13,894	8,130
	TOTAL	13,894	8,130
NOTES: Volume in acre-feet per year.			

For the purposes of the UWMP, the District is preparing its own document and is reporting solely on its service area, but has coordinated its plan with the plan of its wholesale supplier (San Juan Water District).

Table 2-2. Plan Identification

☑	Individual UWMP	
☐	Regional UWMP (RUWMP) *(checking this triggers the next line to appear)*	
	Select One:	
	☐	RUWMP includes a Regional Alliance
	☐	RUWMP does not include a Regional Alliance
NOTES:		

2-2. Reporting Conventions

The data reported in this UWMP remains consistent throughout the document in terms of the type of year and units of measure that are used for data. The District's water supply and demand data are all presented on a calendar year basis and in units of acre-feet (AF). The District is a retail agency and therefore has presented all data into the DWR standard tables that are prescribed for retailers.

Table 2-3. Agency Identification

Type of Agency (select one or both)	
☐	Agency is a wholesaler
☑	Agency is a retailer
Fiscal or Calendar Year (select one)	
☑	UWMP Tables Are in Calendar Years
☐	UWMP Tables Are in Fiscal Years
If Using Fiscal Years Provide Month and Day that the Fiscal Year Begins (dd/mm)	
1/1	
Units of Measure Used in UWMP (select from Drop down)	
Unit	AF

2-3. Coordination and Outreach

The 2015 UWMP requirements for agency coordination and public participation include specific timetables and requirements as presented in this section.

Wholesale and Retail Coordination

The District water supplies are primarily wholesale purchases from San Juan Water District (SJWD). When a water agency relies upon a wholesale agency for a water supply, both agencies are required to provide each other with information regarding projected water supply and demand. The District has coordinated with and provided SJWD with its projected wholesale water demand in 5-year increments for 20 years into the future as required by the CWC 10631.

Table 2-4. Water Supplier Information Exchange

The retail supplier has informed the following wholesale supplier(s) of projected water use in accordance with CWC 10631.
Wholesale Water Supplier Name *(Add additional rows as needed)*
San Juan Water District (SJWD)
NOTES:

In return, SJWD has supplied the District with data pertaining to water supply projections and water supply reliability.

Coordination with Other Agencies

SJWD also provides water to Citrus Heights Water District, Orange Vale Water Company, the City of Folsom (north of the American River), and San Juan Retail.

The San Juan Family of agencies are regularly involved in cooperative efforts to ensure long-term, reliable water supplies for their customers. Some of these efforts include:

- Water and energy efficiency programs such as the Water Efficient Landscape Garden and Baldwin Reservoir Solar Project.
- Capital improvement projects to meet state and federal regulations, protect water quality and ensure reliability of water supply infrastructure.
- Local and state advocacy work to protect water supplies and prevent rate increases for projects with no customer benefits.

Notice to Cities and Counties

CWC 10621(b) requires that agencies notify cities and counties to which they serve water that their UWMP is being updated and reviewed. The CWC specifies that this must be done at least 60-days prior to the public hearing. The District is contained completely within unincorporated Sacramento County and does not serve any portions of incorporated cities, however to ensure coordination with the surrounding communities, the District sent notices regarding their UWMP development to the County as well as to surrounding cities including the City of Citrus Heights, City of Folsom, and City of Rancho Cordova. Further discussion of notices to cities, counties, and the public is included in Chapter 10.0 of this UWMP.

3.0 SYSTEM DESCRIPTION

3-1. Service Area

As of the end of 2015, the District serves 13,894 connections in the northeast portion of Sacramento County, California. Figure 3- 1 illustrates the District's service area. The service area is approximately 6,050 acres and is entirely within the unincorporated area of Sacramento County. The service area is generally bounded by San Juan Avenue on the west, Madison and Pershing Avenues on the north, Walnut and Main Avenues on the east, and parts of Folsom Lake State Recreation Area and Sacramento County's American River Parkway on the south. It is almost entirely built out and is primarily a residential area.

Of the 13,894 current connections:

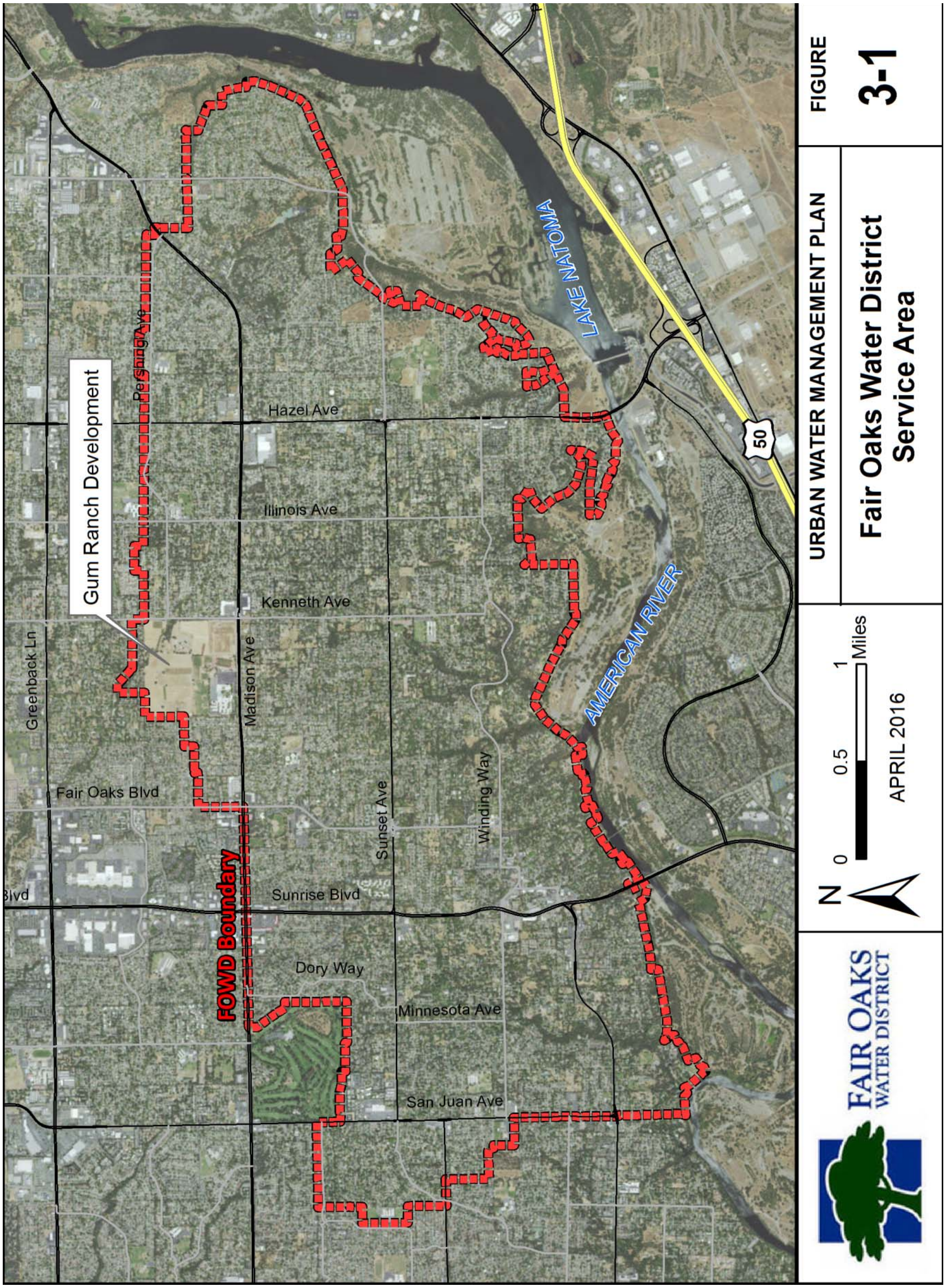
- 12,555 (90.4%) of the connections are single-family residential
- 616 (4.5%) of the connections are multi-family residential
- 308 (2.2%)of the connections are commercial
- 0 (0%) of the connections are industrial
- 102 (0.7%) of the connections are institutional
- 225 (1.6%) of the connections are for irrigation
- 88 (0.6%) of the connections are for fire protection

The only area planned for further development is the Gum Ranch development, an area north of Madison Avenue and east of Kenneth Way, which was annexed into the District's service area in 2007 and is scheduled to include 340 single-family homes by the year 2030. The only other future growth opportunities would involve small projects aimed to subdivide existing residential lots.

3-2. History and Governance

The District was founded in 1917 as the Fair Oaks Irrigation District. By 1979, residential development in the community had replaced all of the significant agricultural land. In July of that year, the Board of Directors passed a resolution declaring that "irrigation district" no longer described the District's actual functions and changed the name to Fair Oaks Water District.

Today, the District serves a population of roughly 35,000 people and serves this area with approximately 90% treated surface water purchased from the San Juan Water District (SJWD) and 10% with groundwater pumped from District-owned wells.


LAKE NATOMA
AMERICAN RIVER
Gum Ranch Development
FOWD Boundary
Greenback Ln
Pershing Ave
Madison Ave
Hazel Ave
Illinois Ave
Kenneth Ave
Fair Oaks Blvd
Sunset Ave
Winding Way
Sunrise Blvd
Dory Way
Minnesota Ave
San Juan Ave
50
N
0
0.5
1
Miles
APRIL 2016
FAIR OAKS
WATER DISTRICT
URBAN WATER MANAGEMENT PLAN
Fair Oaks Water District
Service Area
FIGURE
3-1

The District is governed by five board members. The board members are publicly elected to four-year staggered terms representing geographical divisions. The Board of Directors meets every month to make business decisions about District-related issues and policies and all Board meetings are open to the public. Additional board workshops and special board meetings are sometimes held to address specific topics that need extensive review or discussion.

3-3. Climate

The climate characteristics of the District include cool and humid winters and summers that are typically hot and dry. The Western Regional Climate Center (WRCC) maintains historic climate data for selected cities throughout the West. The Folsom Dam climate station is located approximately 10 miles from the District and was selected to provide representative climate data for the District service area. Thirty (30) years of historic data obtained from the WRCC web site (www.wrcc.dri.edu) for the Folsom Dam station was utilized for this climate data analysis.

In the winter, the lowest average monthly temperature is approximately 38 degrees Fahrenheit. The highest average monthly temperature reaches approximately 92 degrees Fahrenheit in the summer. Figure 3-2 presents the monthly average temperature based on historical data.

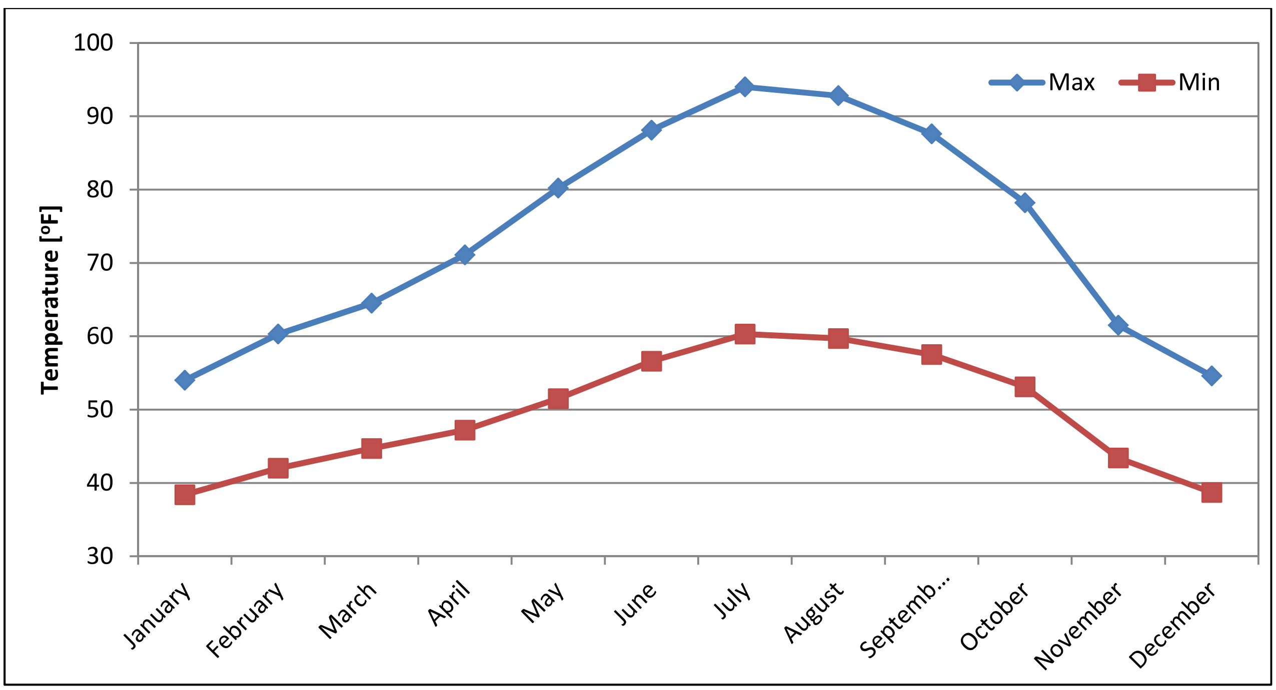


Figure 3-2. Monthly average temperatures within the District.
(Data Source: WRCC, Folsom Dam Station)

The rainy season is typically from November to March. Monthly precipitation during the winter months ranges from 3 to 4 inches. Low humidity occurs in the summer months from May to October. The moderately hot and dry weather during the summer months typically results in higher water demands.

The California Irrigation Management Information System (CIMIS) web site (www.cimis.water.ca.gov) tracks and maintains records of evapotranspiration (ETo) for select cities. ETo statistics used for this system come from the Fair Oaks station. ETo is a standard measurement of environmental parameters that affect the water use of plants. ETo is given in inches per day, month, or year and is an estimate of the evapotranspiration from a large field of well-watered, cool-season grass that is four- to seven-inches tall.

The monthly average ETo and monthly average precipitation are presented in inches in Figure 3-3. As the figure indicates, a greater quantity of water is evaporated during June, July and August in correlation to high temperatures and low humidity, which typically results in higher water demands.

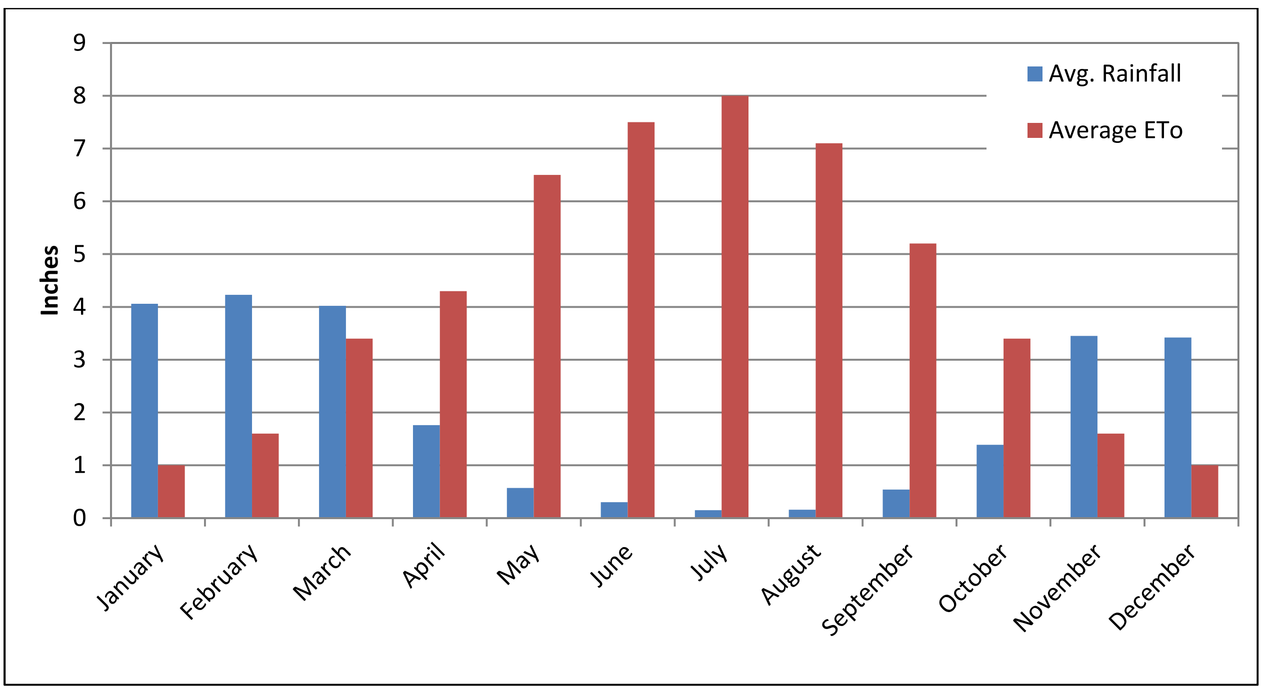


Figure 3-3. Monthly average rainfall and evapotranspiration.
(Rainfall Data Source: WRCC, Folsom Dam Station; ETo Data Source: CIMIS Fair Oaks Station)

3-4. Demographics

The Fair Oaks Census Designated Place (CDP) makes up the most of the District's service area and therefore was chosen as demographically representative of the District's service area. According to 2010 U.S. Census Data, the median age of Fair Oaks residents is 44.7 years. Fair Oaks CDP has an average household size of 2.43 and a median household income of $63,252.

The District's service area is primarily characterized by residential land use with some commercial and institutional connections. Approximately 95% of the land area is classified as residential use. The overall density of residential development within the District is relatively low with many of the lot sizes ranging from 1.0 to 1.5 acres. Population growth within the District is expected to remain moderate and would primarily require the subdivision of these larger lots. As mentioned previously, the only area planned for new development is the Gum Ranch development.

3-5. Population

3-5-1. Current Population

The DWR Population Tool is available on DWR's 2015 UWMP website[1] and was used to determine the current (2015) population as well as the population throughout the District's baseline period. The Population Tool determines service area population for census years by extracting U.S. Census data, at the block level, for District boundaries that existed at each Census year in the tool (1990, 2000, and 2010). For census blocks that straddle the service area boundary, the tool determines the percentage of the census block's land area that is within the service area boundary and applies that percentage to the census block population.

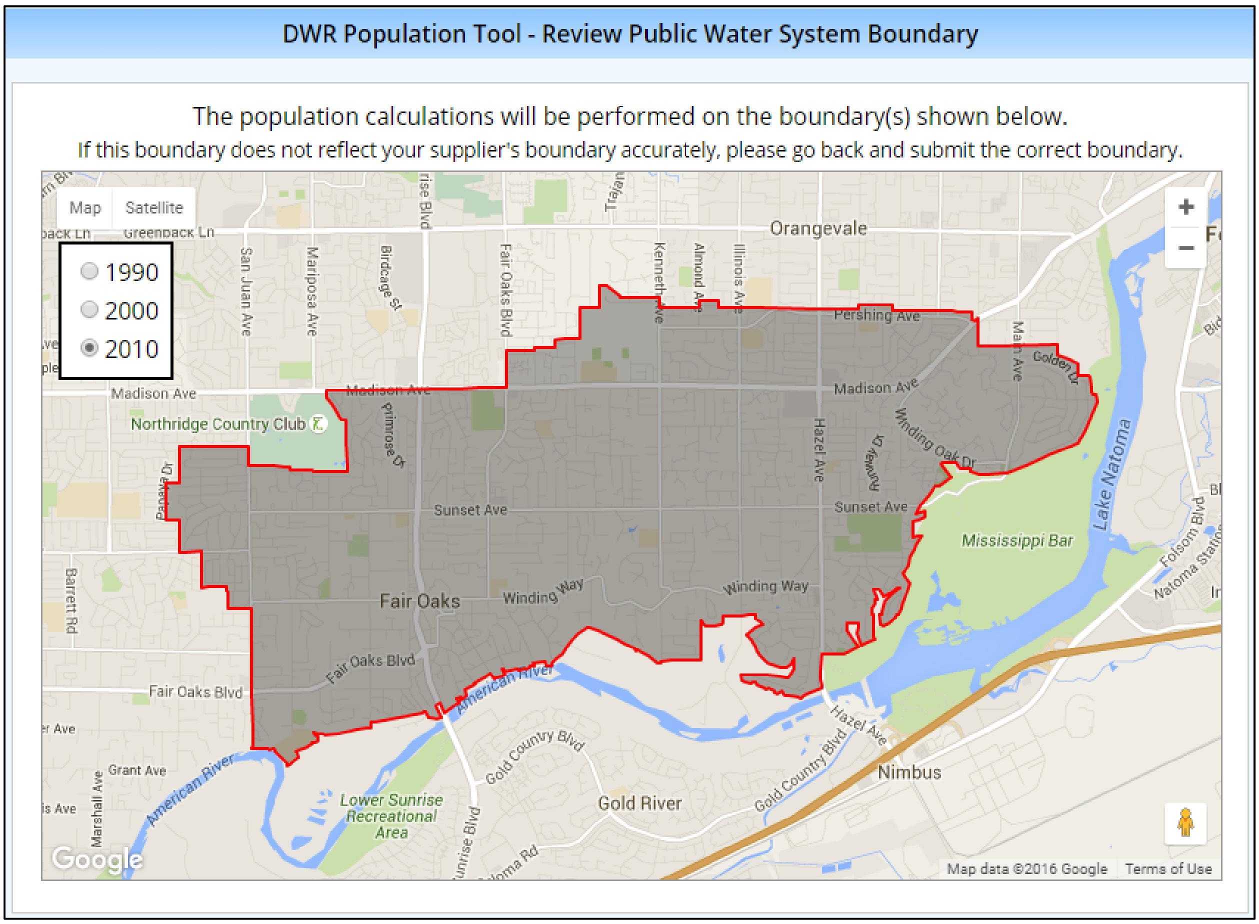


Figure 3- 4. Screenshot of the District's boundary uploaded into the DWR Population Tool.

[1] DWR Population Tool available at http://www.water.ca.gov/urbanwatermanagement/uwmp2015.cfm

For non-census years, including 2015, the population tool uses a Persons-per-Connection methodology. The tool calculates the 2015 Persons-per-Connection by creating a trend line of the Persons-per-Connection from the year 2000 to the year 2010 and continuing that trend to the year 2015.

The 2015 population within the District service area is estimated at 35,114 based on the DWR population tool. A summary of the input and output data from this tool is provided in Attachment B.

3-5-2. Population Projections

The District is fully built out and expects a low rate of population growth. Approximately 95% of the land area is classified as residential use. The overall density of residential development within the District is relatively low with many of the lot sizes ranging from 1.0 to 1.5 acres. In the future, some of these large lots may choose to split into multiple lots.

The one area within the District where new growth is expected is the Gum Ranch development. The Gum Ranch development includes an area north of Madison Avenue and east of Kenneth Way and was annexed into the District's service area in 2007 (see Figure 3- 1, previously presented). It involves approximately 340 new single family dwellings and this project is assumed to be partially built out by the year 2020 and fully built out by 2030.

Background and Methods of SACOG Population Projections

The Sacramento Area Council of Governments (SACOG) recently completed their 2016 update to the Metropolitan Transportation Plan/Sustainable Communities Strategy (2016 MTP/SCS). At their February 18, 2016 meeting, the SACOG Board of Directors adopted the 2016 MTP/SCS. As of the printing of this UWMP, population data has not yet been released to the general public, but was provided to the District on March 23, 2016[2] for use with this UWMP (Attachment C).

For all MTPs, regional growth projections must be developed and adopted by the SACOG Board of Directors. These projections are based on national and state projections and on current information on the region's economy and housing. The projections are primarily used to support the investments of future transportation infrastructure.

[2] SACOG. *Modeling Projections for 2012, 2020, and 2036*. Dated February 2016. Provided by SACOG via email correspondence on 3/23/16 (Attachment C).

SACOG worked with the Center for Continuing Study of the California Economy and the state departments of Housing and Community Development and Finance to refine these forecasts for use in the 2016 MTP/SCS.

As summarized by SACOG[3], the following were considered when developing the growth projections:

- The SACOG region job projections were based on projections of U.S. and California job growth and the competitive position of the SACOG region to capture a share of the state and national job growth.
- The SACOG population projections by age, sex, and ethnic group were developed based on the projected job growth starting with the actual regional population in 2008.
- The household projections are based on projecting forward the household formation trends of the current population by age and ethnic group. The preliminary household projections are demographic projections and do not reflect considerations of housing supply, income, and affordability.
- State and national trends account for the major differences between the 2008 Plan and the 2016 Plan. U.S. immigration and total population growth is lower than previously expected. In addition, California is now expected to get a smaller share of U.S. job and population growth than previously projected.
- The SACOG region's economy is expected to recover slowly with state budget deficits and gridlock restraining job growth in this major sector over the next decade. However, the SACOG region is still expected to outpace the state and nation in job growth to 2020 and 2036.

SACOG Population Projections within the District Boundary

SACOG generated parcel level population forecasts that underlie the 2016 MTP/SCS. The population forecasts use a 2012 base year and project populations for the years 2020 and 2036. The data is available in several different geographic breakdowns: Traffic Analysis Zones (TAZ), Regional Analysis Districts (RAD), Jurisdiction and Spheres of Influence, 2010 Census Designated Places (CDP), and ZIP Code Tabulation Areas (ZCTA).

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[3] SACOG. *Growth Projections for 2036*. Summary retrieved at <http://www.sacog.org/growth-projections-2036>. March 2016.

The SACOG projected population by TAZ was used to estimate the projected population increases within the FOWD boundary because the TAZs provided the greatest level of detail. The District completely contains 15 TAZs and partially contains 9 TAZs. Figure 3-5 overlays the District boundary onto the SACOG TAZ boundaries.

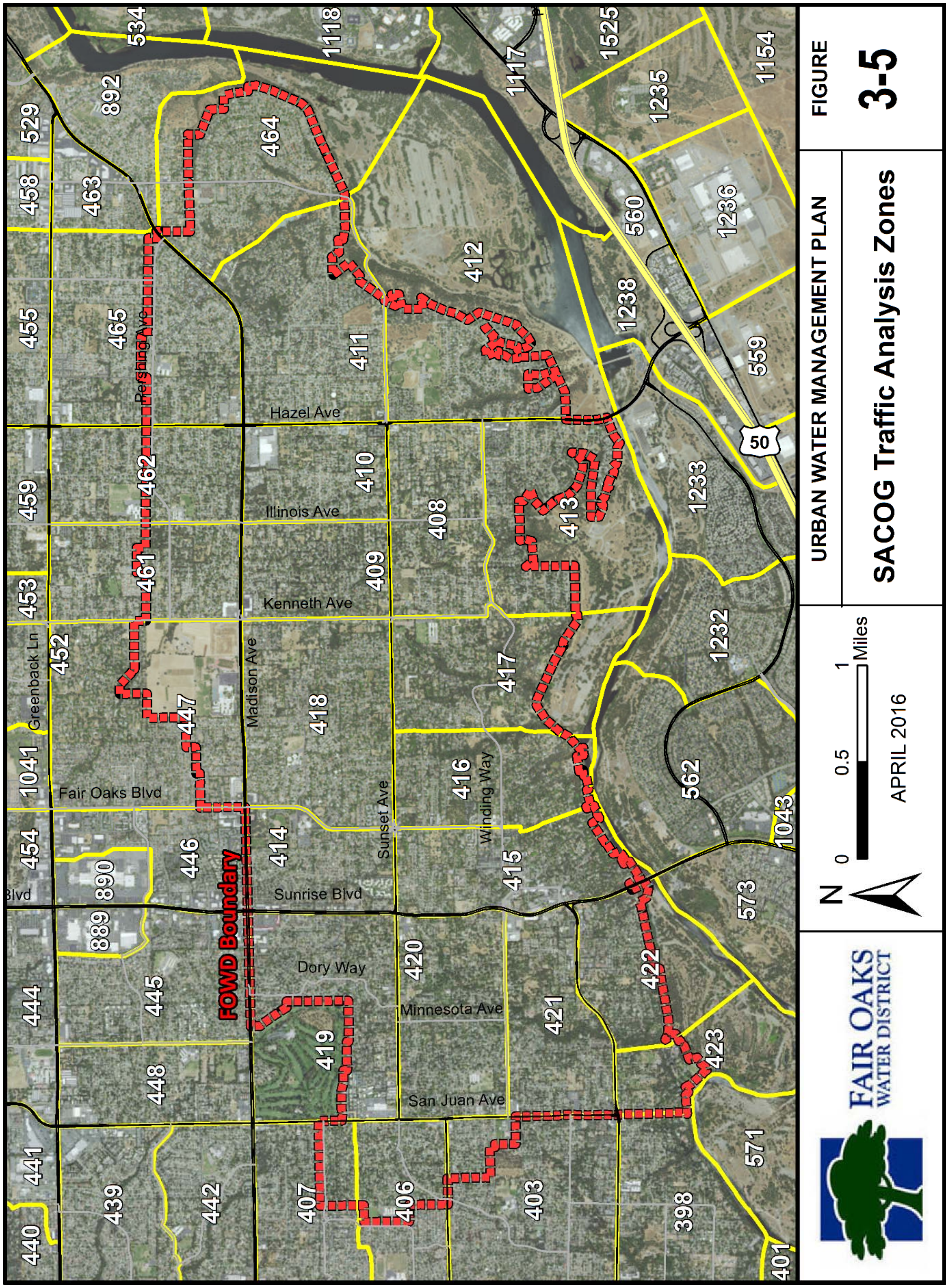

Figure 3-5. SACOG Traffic Analysis Zones.

Growth statistics for each TAZ were provided in the SACOG dataset. For TAZ boundaries that straddle the service area boundary, the percentage of the TAZ's land area that is within the service area boundary was determined using GIS software and that percentage was applied to the TAZ population (the same method that the DWR Population Tool uses on census blocks). For a TAZ that is 100% within the service area boundary, it was assumed that 100% of the associated TAZ population data was applicable to the District service area. For areas where the overlap was not exact, the area of overlap as a percentage was applied to the data to develop an estimate of applicable population.

The total population within the District service area was tabulated for SACOG's 2012, 2020, and 2036 analysis years. SACOG's anticipated population growth rate (%'s) within this timeframe was determined for the District's service area. A summary of this analysis and resulting growth rates (%'s) is provided in Attachment C.

The 2015 population established from DWR's population tool (Section 3-5-1) was used as the starting point for the growth projections, and SACOG annual growth rates (%'s) within the District were applied to project the population out to 2035 (Table 3-1).

Table 3-1. Population - Current and Projected

Population Served	2015	2020	2025	2030	2035	2040*(opt)*
	35,114	37,659	38,587	39,537	40,510	--
NOTES: 2015 population based on DWR Population Tool. Projections beyond 2015 based on SACOG estimated growth rates (%'s) within the District service area.						

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4.0 SYSTEM WATER USE

Section 10631 (e) of the Act requires that an evaluation of water use be performed for the District.

4-1. Historical Water Use

Historical water use data from 2010 to 2015 were analyzed to provide an overview of water use trends for the District. The historical water use data is based on the District's Public Water System Statistics reports submitted to Department of Water Resources (DWR).

Figure 4- 1 shows the total water use for the District from 2010 through 2015, broken down by the supply source (surface water vs. groundwater).

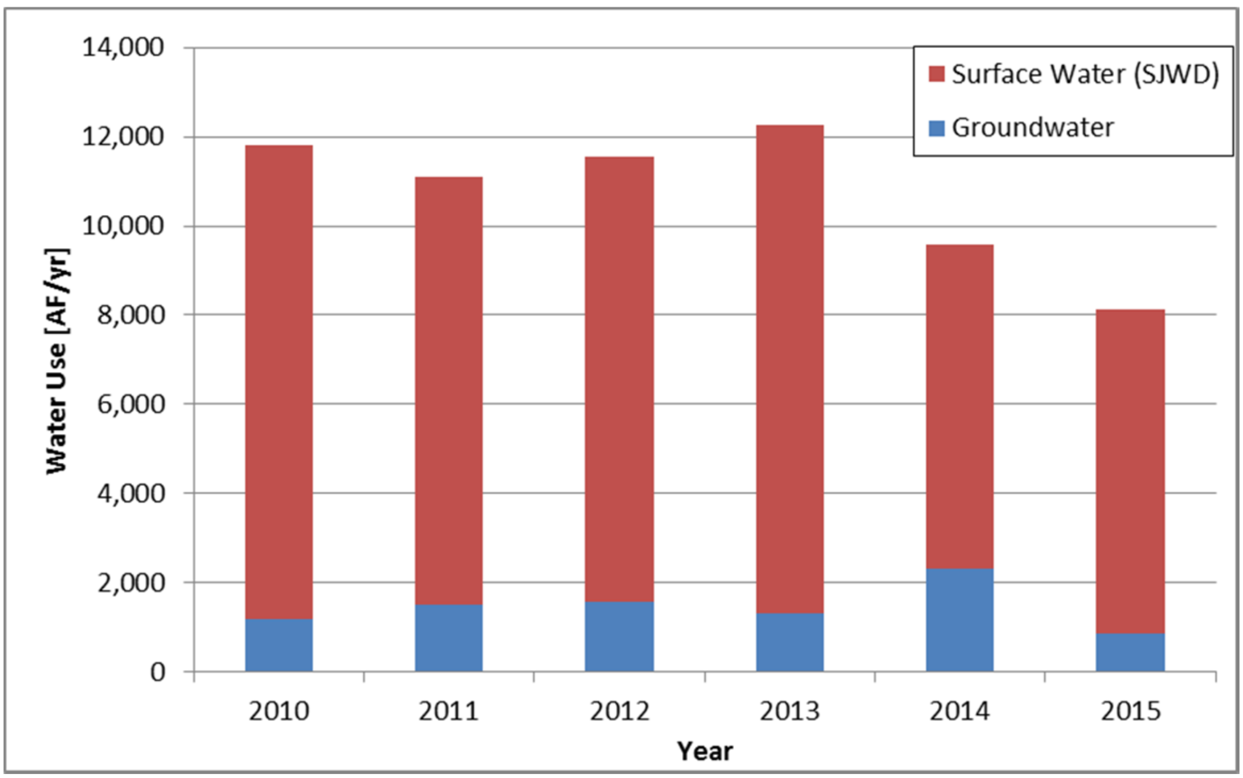

Figure 4- 1. Historical water use from 2010 through 2015.

4-2. Water Use By Customer Type

A breakdown of water use by customer type is provided in Table 4- 1 for 2015.

Table 4- 1. 2015 water use by customer type.

Use Type *(Add additional rows as needed)*	2015 Actual		
Use Drop down list *May select each use multiple times These are the only Use Types that will be recognized by the WUEdata online submittal tool*	Additional Description *(as needed)*	Level of Treatment When Delivered *Drop down list*	Volume
Single Family		Drinking Water	6,034
Multi-Family		Drinking Water	626
Commercial		Drinking Water	281
Institutional/Governmental		Drinking Water	266
Landscape		Drinking Water	361
Other	O&M	Drinking Water	13
Other	Unaccounted	Drinking Water	549
		TOTAL	8,130
NOTES: Units in acre-feet.			

The majority of the District's water use (82%) was in the residential sector (single family and multi-family). The District underwent a comprehensive upgrade to their meter program and has kept fully metered records since 2012. The non-metered deliveries primarily include fire flows. The proportions of water use by customer type have remained relatively consistent since 2010.

Water use in 2015 was approximately 30% lower than a typical year for the District as it was in the middle of a severe drought with mandatory water use restrictions.

Currently, no raw water or recycled water is provided by the District; all water is potable water.

4-3. Projected Water Use

Future water demands were estimated using SACOG's projected population rates and employment growth rates from the 2016 MTS/SCS (see discussion in Section 3-5-2). As was described in Section 3-5-2, SACOG's Traffic Analysis Zone (TAZ) data was used to determine population and employment growth rates within the District's service boundary.

Projected population growth rates were used to determine the growth for residential (single-family and multi-family) water use. Projected employment growth rates were used to determine the growth for commercial/institutional and landscape water use. Water use was projected for the years 2020, 2025, 2030, and 2035.

The 2020 water use projection was kept consistent with the District's 2020 target water use presented in Chapter 5.0. The 2020 target takes the baseline water use, which represents the District's typical water use based on an average over 10 years of historic data, and reduces it by 20%. The target in Chapter 5.0 is reported in gallons per capita per day (gpcd) and was converted to total acre feet per year using the District's projected population for 2020 (see Table 3-1, previously presented).

The proportions of water use by customer type have remained consistent since the District's began residential meter readings in 2012. The projections for total water use were broken down by customer type based on the average proportions seen in meter records from 2012 through 2015.

Table 4- 2 presents water use projections out to 2035 which are broken down by use type.

Table 4- 2. Projections of total water use out to 2035 broken down by use type.

Use Type *(Add additional rows as needed)*	Additional Description *(as needed)*	Projected Water Use *Report To the Extent that Records are Available*				
Use Drop down list *May select each use multiple times These are the only Use Types that will be recognized by the WUEdata online submittal tool*		2020	2025	2030	2035	2040-opt
Single Family		8,732	8,947	9,167	9,393	--
Multi-Family		807	827	847	868	--
Commercial		382	398	413	430	--
Institutional/Governmental		408	424	441	458	--
Landscape		474	493	513	533	--
Other	O&M	30	31	32	33	--
Other	Unaccounted	935	960	985	1,011	--
	TOTAL	11,768	12,080	12,398	12,726	--
NOTES: Units in acre-feet per year.						

Figure 4- 2 presents the same water use projections in graphical form.

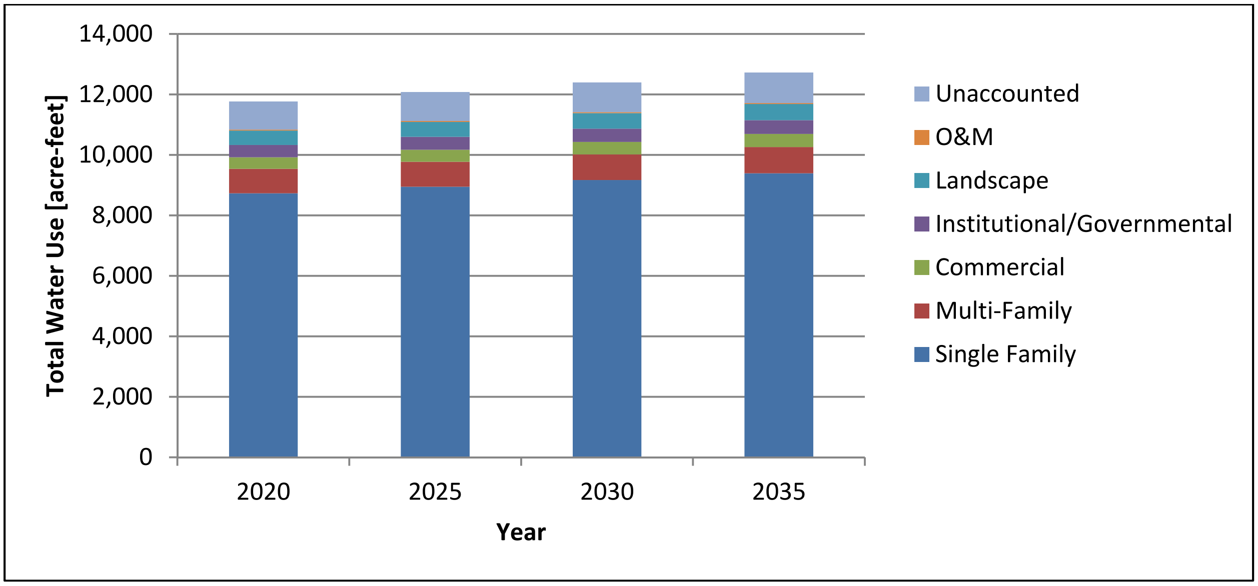

Figure 4- 2. Projections of total water use out to 2035 broken down by use type.

From the 2020 water use target, SACOG population growth rates were used to determine the growth in residential water use out to 2035. SACOG projected a 7.8% growth rate for the District's population between 2020 and 2036, which equates to 0.49% per year in this timeframe. This annual growth rate was applied to the 2020 single-family and multi-family water uses to determine projections out to 2035.

SACOG's projected employment growth rates were used to determine the growth for commercial/institutional and landscape service connections within the District service area out to 2035. SACOG projected a 12.5% growth rate for employment between 2020 and 2036, which equates to 0.78% per year in this timeframe. This annual growth rate was applied to the 2020 commercial, institutional, and landscape water uses to determine projections out to 2035.

Water use for O&M purposes and unaccounted for water was held consistent throughout the projections at 0.25% and 8%, respectively, of total water deliveries which is representative of the District's past water use records.

All projected water use is potable water. These water use projections also include system losses (see Section 4-4) and demand from low income housing (see Section 4-6). Recycled and raw water are not used and are not planned for use in the District's service area within the reported

2035 time horizon. The projections do not include any estimated future water savings that may result from implemented codes, standards, or ordinances (see Section 4-5).

Table 4- 3. Total water use projections out to 2035.

	2015	2020	2025	2030	2035	2040 *(opt)*
Potable and Raw Water *From Tables 4-1 and 4-2*	8,130	11,768	12,080	12,398	12,726	--
Recycled Water Demand *From Table 6-4*	0	0	0	0	0	--
TOTAL WATER DEMAND	8,130	11,768	12,080	12,398	12,726	--
NOTES: Units in acre-feet per year.						

4-4. Distribution System Water Losses

Distribution system water losses are the physical water losses from the water distribution system between the supply (either SJWD or groundwater well) and the point of customer consumption. For the 2015 UWMP, DWR requires that all water suppliers quantify their distribution system losses for the most recent 12-month period available using the American Water Works Association (AWWA) water audit method. The DWR *Water Audit Manual*, dated February 2016, was used as guidance for preparing a water audit on the District's 2015 water delivery data.

Table 4- 4. Water loss audit reporting for 2015.

Reporting Period Start Date (mm/yyyy)	Volume of Water Loss
01/2015	447
NOTES: Units in acre-feet per year.	

The full report summarizing the inputs and outputs from the AWWA water audit software is provided in Attachment E.

4-5. Estimated Future Water Savings

Water savings from codes, standards, ordinances, or transportation and land use plans (aka- “passive savings”) generally decrease customer water use and are allowed to be incorporated into the District’s demand projections.

The District is on track to achieve the 20% water use reduction by the year 2020 as required by SBX7-7 which is incorporated in the water use projections, however, the District’s conservation is being accomplished primarily through public outreach campaigns and not through formal adoption of codes, ordinances, etc.

The District plans to continue implementing the Best Management Practices (BMPs) that are outlined and discussed in Chapter 9.0, but has not included any “passive savings” in its water use projections.

Table 4- 5. Inclusions in water use projections.

Are Future Water Savings Included in Projections? (Refer to Appendix K of UWMP Guidebook) *Drop down list (y/n)*	No
If "Yes" to above, state the section or page number, in the cell to the right, where citations of the codes, ordinances, etc... utilized in demand projections are found.	n/a
Are Lower Income Residential Demands Included In Projections? *Drop down list (y/n)*	Yes

4-6. Water Use for Lower Income Households

Senate Bill 1087 requires that the water use projections of an UWMP include the projected water use for future single-family and multi-family lower income residential housing as identified in the housing element of any city and/or county in the service area of the supplier.

Housing elements rely on the Regional Housing Needs Allocation (RHNA) generated by the State Department of Housing and Community Development (HCD) to allocate the regional need for housing to the regional Council of Governments (COG) (or a HCD for cities and counties not covered by a COG) for incorporation into housing element updates. Before the housing element is due, the HCD determines the total regional housing need for the next planning period for each region in the state and allocates that need. The COGs then allocate to each local jurisdiction its “fair share” of the RHNA, broken down by income categories; very low, low, moderate, and above moderate, over the housing element’s planning period.

SACOG's *Regional Housing Needs Plan 2013-2021* was adopted on September 20, 2012. Four income categories are included in the Plan: very low income (less than 50% median family income [MFI]); low income (50% to 80% MFI); moderate income (80% to 120% MFI); and above moderate income (above 120% MFI).

SACOG identified the target proportion of low income households in unincorporated Sacramento County from 2013 to 2021 as 15.9% and very low income households as 22.7%. The aggregate of these low income categories includes 38.6% of new housing.

SACOG's 2016 MTS/SCS growth forecast includes growth projections for number of dwelling units out to 2036. As was described in Section 3-5-2, SACOG's Traffic Analysis Zone (TAZ) data was used to determine dwelling unit growth within the District's service boundary.

Since it is unknown what percentage of these new dwelling units are scheduled to be low income households, SACOG's aggregate target number for low income housing in the unincorporated Sacramento County was used. 38.6% of the new dwelling units that are expected within the District's service area were estimated to be in the low income categories. Table 4- 6 summarizes the projected water use for those low income households.

Table 4- 6. Low income residential water use projections.

Use Type	Projected Water Use			
	2020	2025	2030	2035
Single Family	69	149	224	300
Multi-Family	7	15	23	31
TOTAL	76	164	247	331
NOTES: Units in acre-feet/year.				

The District will not deny or condition approval of water services, or reduce the amount of services applied for by a proposed development that includes housing units affordable to lower income households unless one of the following occurs:

- The District specifically finds that it does not have sufficient water supply.
- The District is subject to a compliance order issued by the State Division of Drinking Water that prohibits new water connections.
- The applicant has failed to agree to reasonable terms and conditions relating to the provision of services.

4-7. Data Provided to Wholesale Agency

The District coordinated with its wholesale agency, SJWD, and provided them with both the population projections and the water use projections that are presented in Table 3-1 and Table 4- 2, respectively. The supporting documentation of the exchange of data with SJWD is included in Attachment D.

Table 4- 7 was also provided to SJWD which distinguishes the portion of the water use projections that are anticipated to be served by surface water (ie- SJWD water). The District's conjunctive use goal is to serve 90% of their demands with surface water and 10% of their demands with groundwater. The volumes listed in Table 4- 7 represent 90% of the District's total water use projections.

Table 4- 7. Surface water use projections provided to SJWD.

Type	Wholesaler	Contracted Volume	2020	2025	2030	2035
Surface Water	SJWD	Varies	10,591	10,872	11,158	11,453
NOTES: Units in acre-feet/year. Volumes listed only include projected surface water demands. Surface water demands represent 90% of the District's total demands.						

5.0 BASELINES AND TARGETS

This section includes documentation of the water use targets commensurate with enactment of the Water Conservation Act of 2009 (SB X7-7). The projected water use for each urban water supplier is required to be reduced by 20% from a calculated baseline gallons per capita per day (baseline GPCD) by the year 2020 as required by SB X7-7. Baselines and targets were established using DWR guidance published in the 2015 UWMP *Guidebook for Urban Water Suppliers* (March 2016), *Methodologies for Calculating Baseline and Compliance Urban Per Capita Water* Use (February 2016), and the SB X7-7 standard tables provided by DWR.

5-1. Baseline Per Capita Water Use

The first step in the process of determining the water use target is calculation of the baseline GPCD. Historic population estimated with the DWR population tool, as described in Section 3-5-1, was used along with historic water use data to calculate the baseline GPCD. The following baseline GPCD calculations are identified in SB X7-7 and were evaluated for this UWMP:

- **10-year Baseline –** Average water use over a continuous 10-year period ending no earlier than December 31, 2004 and no later than December 31, 2010.
- **5-year Baseline –** Estimate of average gross water use reported in GPCD and calculated over a continuous 5-year period ending no earlier than December 31, 2007 and no later than December 31, 2010.

SB X7-7 also identifies a baseline calculation option for recycled water users, but the District has never received or delivered any recycled water, so this option is not applicable.

The 10-year baseline was evaluated using water supply data from January 1, 1995 through December 31, 2004, and the 5-year baseline was evaluated using data from January 1, 2004 through December 31, 2008.

Table 5- 1 presents the base period ranges and a summary of 2008 water deliveries.

Table 5- 1. Baseline period ranges (SB X7-7 Table 1)

Baseline	Parameter	Value	Units
10- to 15-year baseline period	2008 total water deliveries	12,759	Acre Feet
	2008 total volume of delivered recycled water	0	Acre Feet
	2008 recycled water as a percent of total deliveries	0.00%	Percent
	Number of years in baseline period[1]	10	Years
	Year beginning baseline period range	1995	
	Year ending baseline period range[2]	2004	
5-year baseline period	Number of years in baseline period	5	Years
	Year beginning baseline period range	2004	
	Year ending baseline period range[3]	2008	

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

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

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

Calculating the baseline GPCD requires the following data for each of the baseline years: (a) service area population and (b) annual gross water use. Figure 5- 1 describes the overall method for baseline calculation.

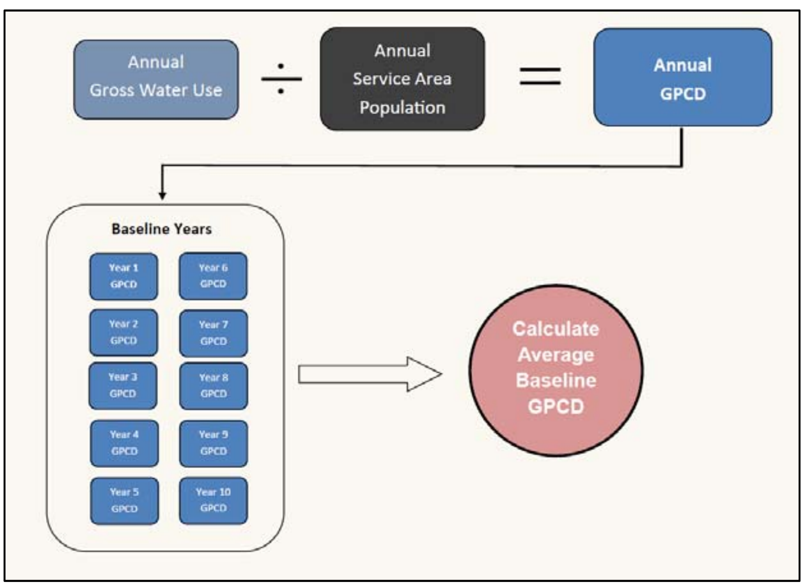

Figure 5- 1. Method for calculating baseline GPCD.
(Source: *2015 UWMP: Guidebook for Urban Water SuppliersI.* DWR, March 2016.)

There are several approved methods for calculating population within the service area in accordance with SB X7-7. The DWR Population tool was used for this study, as described in Section 3-5-1.

Table 5- 2: Methods for population estimates (SB X7-7 Table 2)

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

The service area populations within the 5-year and 10-year baseline periods, and the 2015 population, are presented in Table 5- 3.

Table 5- 3: Service area population (SB X7-7 Table 3)

Year		Population
10 to 15 Year Baseline Population		
Year 1	1995	36,021
Year 2	1996	36,139
Year 3	1997	36,252
Year 4	1998	35,981
Year 5	1999	35,940
Year 6	2000	35,869
Year 7	2001	35,807
Year 8	2002	35,823
Year 9	2003	35,979
Year 10	2004	36,075
5 Year Baseline Population		
Year 1	2004	36,075
Year 2	2005	36,095
Year 3	2006	36,181
Year 4	2007	36,154
Year 5	2008	36,352
2015 Compliance Year Population		
2015		35,114

Gross water use within the District was summarized over the 5-year and 10-year baseline periods for calculation of the baseline GPCD water use. The District does not deliver recycled water, place water in long-term storage reservoirs, export water to other urban suppliers, or deliver raw water for agricultural uses or for industrial processes. Therefore, the gross water use presented in Table 5- 4 includes all water entering the District's distribution system.

Table 5- 4: Annual Gross Water Use (SB X7-7 Table 4)

Baseline Year *Fm SB X7-7 Table 3*		**Volume Into Distribution System** *This column will remain blank until SB X7-7 Table 4-A is completed.*	**Deductions**					**Annual Gross Water Use**
			Exported Water	**Change in Dist. System Storage** (+/-)	**Indirect Recycled Water** *This column will remain blank until SB X7-7 Table 4-B is completed.*	**Water Delivered for Agricultural Use**	**Process Water** *This column will remain blank until SB X7-7 Table 4-D is completed.*	
10 to 15 Year Baseline - Gross Water Use								
Year 1	1995	14,890	-	-	-	-	-	14,890
Year 2	1996	14,076	-	-	-	-	-	14,076
Year 3	1997	14,253	-	-	-	-	-	14,253
Year 4	1998	12,515	-	-	-	-	-	12,515
Year 5	1999	14,424	-	-	-	-	-	14,424
Year 6	2000	14,377	-	-	-	-	-	14,377
Year 7	2001	15,148	-	-	-	-	-	15,148
Year 8	2002	14,067	-	-	-	-	-	14,067
Year 9	2003	12,573	-	-	-	-	-	12,573
Year 10	2004	14,153	-	-	-	-	-	14,153
10 - 15 year baseline average gross water use								**14,047**
5 Year Baseline - Gross Water Use								
Year 1	2004	14,153	-	-	-	-	-	14,153
Year 2	2005	12,454	-	-	-	-	-	12,454
Year 3	2006	12,023	-	-	-	-	-	12,023
Year 4	2007	12,432	-	-	-	-	-	12,432
Year 5	2008	12,759	-	-	-	-	-	12,759
5 year baseline average gross water use								**12,764**
2015 Compliance Year - Gross Water Use								
2015		8,130	-	-	-	-	-	**8,130**
* NOTE that the units of measure must remain consistent throughout the UWMP, as reported in Table 2-3								
NOTES: Units in acre-feet per year.								

FAIR OAKS WATER DISTRICT

Table 5- 5 and Table 5- 6 break down the sources of water entering the District's system over the baseline periods and differentiate between (a) surface water (SJWD) and (b) water from the District's groundwater wells.

Table 5- 5: Volume purchased from San Juan Water District entering distribution system (SBX7-7 Table 4-A)

Name of Source		San Juan Water District		
This water source is:				
☐	The supplier's own water source			
☑	A purchased or imported source			
Baseline Year *Fm SB X7-7 Table 3*		Volume Entering Distribution System	Meter Error Adjustment* *Optional (+/-)*	Corrected Volume Entering Distribution System
10 to 15 Year Baseline - Water into Distribution System				
Year 1	1995	14795	0	14,795
Year 2	1996	13766	0	13,766
Year 3	1997	13771	0	13,771
Year 4	1998	11924	0	11,924
Year 5	1999	14235	0	14,235
Year 6	2000	14018	0	14,018
Year 7	2001	15040	0	15,040
Year 8	2002	11456	0	11,456
Year 9	2003	12333	0	12,333
Year 10	2004	13841	0	13,841
5 Year Baseline - Water into Distribution System				
Year 1	2004	13841	0	13,841
Year 2	2005	12282	0	12,282
Year 3	2006	11178	0	11,178
Year 4	2007	11533	0	11,533
Year 5	2008	10534	0	10,534
2015 Compliance Year - Water into Distribution System				
2015		7257	0	7,257
** Meter Error Adjustment - See guidance in Methodology 1, Step 3 of Methodologies Document*				
NOTES: Volumes in acre-feet/year.				

Table 5- 6: Volume entering the distribution system for groundwater wells (SB X7-7 Table 4-A).

Name of Source		Groundwater Wells		
This water source is:				
☑	The supplier's own water source			
☐	A purchased or imported source			
Baseline Year *Fm SB X7-7 Table 3*		Volume Entering Distribution System	Meter Error Adjustment* *Optional (+/-)*	Corrected Volume Entering Distribution System
10 to 15 Year Baseline - Water into Distribution System				
Year 1	1995	95.2	0	95
Year 2	1996	309.6	0	310
Year 3	1997	481.8	0	482
Year 4	1998	591.0	0	591
Year 5	1999	188.5	0	189
Year 6	2000	359.0	0	359
Year 7	2001	107.6	0	108
Year 8	2002	2611.3	0	2,611
Year 9	2003	240.2	0	240
Year 10	2004	311.7	0	312
5 Year Baseline - Water into Distribution System				
Year 1	2004	311.7	0	312
Year 2	2005	171.7	0	172
Year 3	2006	845.2	0	845
Year 4	2007	898.9	0	899
Year 5	2008	2224.6	0	2,225
2015 Compliance Year - Water into Distribution System				
2015		873.0	0	873
** Meter Error Adjustment - See guidance in Methodology 1, Step 3 of Methodologies Document*				
NOTES: Volumes in acre-feet/year.				

The GPCD service area populations and annual gross water use over the 5-year and 10-year baseline periods were used to calculate the 5-year and 10-year average baseline GPCDs which are presented in Table 5- 7.

Table 5- 7: GPCD water use for 5- and 10-year baseline periods (SB X7-7 Table 5).

Baseline Year *Fm SB X7-7 Table 3*		Service Area Population *Fm SB X7-7 Table 3*	Annual Gross Water Use *Fm SB X7-7 Table 4*	Daily Per Capita Water Use (GPCD)
10 to 15 Year Baseline GPCD				
Year 1	1995	36,021	14,890	369
Year 2	1996	36,139	14,076	348
Year 3	1997	36,252	14,253	351
Year 4	1998	35,981	12,515	311
Year 5	1999	35,940	14,424	358
Year 6	2000	35,869	14,377	358
Year 7	2001	35,807	15,148	378
Year 8	2002	35,823	14,067	351
Year 9	2003	35,979	12,573	312
Year 10	2004	36,075	14,153	350
10-15 Year Average Baseline GPCD				**348**
5 Year Baseline GPCD				
Baseline Year *Fm SB X7-7 Table 3*		Service Area Population *Fm SB X7-7 Table 3*	Gross Water Use *Fm SB X7-7 Table 4*	Daily Per Capita Water Use
Year 1	2004	36,075	14,153	350
Year 2	2005	36,095	12,454	308
Year 3	2006	36,181	12,023	297
Year 4	2007	36,154	12,432	307
Year 5	2008	36,352	12,759	313
5 Year Average Baseline GPCD				**315**
2015 Compliance Year GPCD				
2015		35,114	8,130	207
NOTES: Annual gross water use in acre-feet/year.				

The 10-year baseline water use is calculated at 348 GPCD and the 5-year baseline water use is calculated at 315 GPCD. The water use in 2015 was 207 GPCD which is compared to the 2015 interim water use target in the following section.

5-2. 2020 Water Use Target Calculation

Retail suppliers must identify their 2020 demand reduction targets with one of four methods identified in SBX7-7:

<u>Target Method 1</u>: 80% of 10- to 15-year Baseline GPCD.

<u>Target Method 2</u>: The sum of the following performance standards:

- Indoor residential use
- Landscape use, including dedicated and residential meters or connections equivalent to the State Model Landscape Ordinance (70% of reference evapotranspiration)
- 10% reduction in baseline commercial, industrial institutional (CII) water use by 2020.

<u>Target Method 3</u>: 95% of Hydrologic Regional Target from the 20 x 2020 Water Conservation Plan

<u>Target Method 4</u>: Identify water savings obtained through approved practices and subtract them from the baseline GPCD.

Target Method 1 was used for calculating the District's 2020 water use target. A summary of the baseline periods and the target water uses is presented in Table 5- 8. The 2015 interim target is the value halfway between the baseline and the 2020 target water use.

Table 5- 8: Summary of Baselines and GPCD Targets (DWR Table 5-1)

Baseline Period	Start Year	End Year	Average Baseline GPCD*	2015 Interim Target *	Confirmed 2020 Target*
10-15 year	*1995*	*2004*	*348*	*314*	*279*
5 Year	*2004*	*2008*	*315*		
*All values are in Gallons per Capita per Day (GPCD)					

The calculated targets meet the reduction requirements of SB X7-7 as presented in Table 5- 9

Table 5- 9. Confirmation of minimum reduction for 2020 target (SB X7-7 Table 7-F).

5 Year Baseline GPCD *From SB X7-7 Table 5*	Maximum 2020 Target*	Calculated 2020 Target *Fm Appropriate Target Table*	Confirmed 2020 Target
315	299	279	279
** Maximum 2020 Target is 95% of the 5 Year Baseline GPCD*			

FAIR OAKS
WATER DISTRICT

Table 5- 10 confirms that the District succeeded in meeting its 2015 interim water usage compliance target and is on track to achieve its 2020 target. .

Table 5- 10: Assessment of 2015 Interim Compliance (SB X7-7 Table 9)

Actual 2015 GPCD	2015 Interim Target GPCD	Optional Adjustments *(in GPCD)*					2015 GPCD *(Adjusted if applicable)*	Did Supplier Achieve Targeted Reduction for 2015?
		Enter "0" if Adjustment Not Used			TOTAL Adjustments	Adjusted 2015 GPCD		
		Extraordinary Events	Weather Normalization	Economic Adjustment				
207	314	*From Methodology 8 (Optional)*	*From Methodology 8 (Optional)*	*From Methodology 8 (Optional)*	-	207	207	**YES**

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6.0 SYSTEM SUPPLIES

The District typically receives approximately 90% of its water supply from treated surface water from the American River though its wholesale supplier, San Juan Water District (SJWD). In addition, 6 groundwater wells supplement the surface water supply to meet conjunctive use objectives, peak demands and for emergency supply. Groundwater meets the remaining 10% of the District's water demands. The percentages of surface water and groundwater used by the District may change contingent on the development of regional conjunctive use efforts, local groundwater quality, and changing water quality regulations. The District will determine the appropriate mix of surface water and groundwater to meet the needs of its customers.

The District also has 5 interties with neighboring agencies for emergency purposes. The use of these interties is limited due to their conveyance capacities and the availability of water from these potential suppliers. For example, two neighboring districts with interties, Orange Vale Water Company and Citrus Heights Water District, also receive water from SJWD. If surface water from SJWD was to be interrupted, these districts would be unlikely to be able to provide FOWD with additional water.

6-1. San Juan Water District Background

SJWD was formed in 1954 and is a wholesaler and retailer of potable water. The wholesale area includes the service areas of the Citrus Heights Water District, Fair Oaks Water District, Orange Vale Water Company, and portions of the City of Folsom (north of the American River).

Before SJWD was formed, water was supplied to the area by the North Fork Ditch Company (the Company). The Company provided water for dredge mining along the American River and also sold water to Citrus Heights Irrigation District, Fair Oaks Irrigation District, and Orange Vale Water Company. Because many of the Company's facilities would be impacted with the construction of Folsom Dam, a committee was formed by residents of Citrus Heights Irrigation District, Fair Oaks Irrigation District, and Orange Vale Water Company to study the development of a publicly owned water supply system to continue supplying the area with wholesale water. The San Juan Suburban Water District (now SJWD) was formed by the acquisition of the Company including its pre-1914 water rights of 33,000 acre-feet (ac-ft) from the American River.

The Citrus Heights Water District, Fair Oaks Water District, Orange Vale Water Company and San Juan Water District are all considered to be members of the San Juan family of water agencies (San Juan Family).

SJWD diverts surface water from Folsom Reservoir. Surface water is then treated at the Sydney N. Peterson Water Treatment Plant (WTP), which is owned and operated by SJWD. The capacity of the Peterson WTP is 150 million gallons per day (MGD). After being treated at the Peterson WTP, water is conveyed to the 62 million gallon Hinkle Reservoir. Hinkle Reservoir provides water storage to meet fluctuations in demand and to provide emergency supply if the WTP is taken out of service. From the Hinkle Reservoir, water is distributed via pipelines to customers of SJWD. Two transmission pipelines provide treated surface water to the FOWD.

The District has a current wholesale water supply agreement with SJWD with a term through February 28, 2045. For the purposes of this UWMP, the District's surface water supplies from SJWD are assumed to be 15,000 acre-feet per year. Current SJWD surface water supply consists of the following:

1. **Pre-1914 Water Rights:** SJWD has a pre-1914 water right and a post-1914 water right with a combined maximum diversion rate of 75 cubic feet per second (cfs) up to a total of 33,000 acre-feet per year. The water rights are designated by the State Water Resources Control Board (SWRCB) as A005830 and S000656.
2. **Placer County Water Agency Contract:** SJWD's contract provides 25,000 acre-feet per year from Placer County Water Agency (PCWA). This contract extends through 2021 and places a first priority on use in Placer County, but allows any excess water to be used in Sacramento County. The "Warren Act" contract states that the PCWA water conveyed under the contract can only be used in Placer County, unless the place of use of PCWA's water rights is changed and the United States Bureau of Reclamation (USBR) agrees in writing to expand place of use. To date, SJWD has not requested that USBR provide this approval; therefore, it is assumed that SJWD cannot legally serve PCWA water to Sacramento County customers. SJWD is working on revising the Warren Act agreement to allow it to be served in Sacramento County.
3. **Central Valley Project (CVP) Water:** SJWD has one contract with the USBR for the diversion of 24,200 acre-feet of CVP water. The contract number with the USBR is No. 6-07-20-W1373-LTR1.

The District has two metered connections to the SJWD's transmission main system.

6-2. Overview of Groundwater Supplies

Within the District, groundwater is produced from 6 operating wells that vary in design capacity from 500 gallons per minute (gpm) to 2,700 gpm. The wells are located primarily in the central portion of the District's water system and are used to meet short-term water supply or maintain the District's water system pressure.

Table 6- 1 lists the existing active wells for the District. The District currently has a total capacity of 12,743 acre-feet per year and a firm normal year capacity of 8,388 acre-feet per year. The firm capacity was determined by assuming that the largest production well is offline.

Table 6- 1. Existing District wells and well capacity

Well No	Well Name	Design Capacity (gpm)	Design Capacity (Acre-Ft)
6	New York	1,000	1,613
7	Casa Bella	700	1,129
8	Fair Oaks Park	500	807
9	Northridge	1,000	1,613
10	Town	2,700	4,355
11	Heather	2,000	3,226
Total Capacity		7,900	12,743
Total Firm Capacity(1)		5,200	8,388

Note:

1. Total Firm Capacity assumes the District's largest production well is offline.

6-2-1. Groundwater Basin Description

California has 10 hydrologic regions as defined by DWR. The Sacramento River Hydraulic Region covers 27,200 square miles and stretches from the Sacramento-San Joaquin Delta to the Oregon border. The Sacramento River Hydraulic Region consists of 93 basins and sub basins. Within the Sacramento Valley, the North American Subbasin covers a total area of approximately 548 square miles and is bordered by the Feather and Sacramento Rivers to the west, Bear River to the north, American River on the south, and on the east by the Sierra Nevada mountains.

The Sacramento Groundwater Authority (SGA) manages the southern area of the North American Subbasin. The southern area has been designated by the Water Forum as the North Area Groundwater Basin (Basin). The Basin is bounded by the Sacramento River on the west, the

American River on the south, Folsom Reservoir on the east and the northern Sacramento County line on the north. The groundwater resources of Sacramento County have been extensively studied and reported by DWR and others.

In 1998, the SGA was formed to manage the Sacramento region's North Area Groundwater Basin (Basin), which includes the District service area. SGA was established in part by the Sacramento Area Water Forum (Water Forum). The Water Forum is a diverse group of local water utilities, business and agricultural leaders, and representatives from the environmental community that reached consensus on preserving the lower American River while ensuring a reliable water supply for the region. In 1999, the Water Forum members approved the Water Forum Agreement, which consists of a multitude of actions necessary to provide a regional solution to water shortages, environmental degradation along the American River, and groundwater contamination.

The SGA is a joint power authority authorized by an agreement signed by the County of Sacramento and the Cities of Citrus Heights, Folsom, and Sacramento. SGA has 16 board members, of which the District is a member. The mission of SGA is to manage, protect and sustain the groundwater resources of the Basin consistent with the Water Forum Agreement for the benefit of the water users within the Basin and to coordinate with other water management entities and activities throughout the region. In an effort to sustain the groundwater resources and coordinate with the 14 overlying water purveyors of the Basin, SGA prepared a Groundwater Management Plan (GMP). In December 2014, SGA adopted the current GMP. In addition to being a member of SGA and agreeing to the recommendations of the GMP, the District also decided to adopt this GMP for groundwater operations within their service area. The GMP is included in Attachment F.

The 2014 GMP discusses groundwater level trends based on long-term monitoring wells in the basin. The following is a summary of this discussion:

> Declining groundwater levels in the central area of the North Basin were a concern for local water resource managers for decades. Groundwater levels were dropping on a long-term average of more than a foot per year for several decades and a cone of depression formed in the center of the SGA. The current state of this depression is a substantial improvement over the situation in the mid-1990s when the depth to groundwater at the center of the depression was about twenty feet deeper than it is now. This improvement resulted largely from implementation of local groundwater management, especially conjunctive use operations. At this time, the groundwater depression is being managed to serve the groundwater cleanup effort associated with groundwater contamination at the former McClellan AFB.
>
> In general, the remainder of the North Basin does not show distinctive regional groundwater elevation patterns other than to mimic the local topography. This results in groundwater

generally flowing from east to west across the basin until it encounters the central groundwater depression.

DWR has monitored a series of domestic, irrigation and other observation wells in the North Basin for decades. Hydrographs depicting groundwater level trends in the North Basin's long-term monitoring wells show that groundwater elevations are now stable in the basin and even rising in some areas.

The North Basin's water resources were developed differently in the Western, Central and Eastern areas. Because of this, it is appropriate to discuss groundwater levels in each of these areas separately. The Basin is broken down into three specific areas and the groundwater levels are summarized below:

- Western Area – groundwater elevations are fairly stable over the period of record and that recent groundwater elevations ranged from about MSL to over 15 feet above MSL. Wells in the area typically experience only seasonal fluctuations. Long-term trends of increased or decreased levels are not evident in this area.
- Central Area – groundwater elevations currently range from about 10 feet above MSL in the southeastern corner of this area near the American River to about 30 feet below mean sea level (msl) near the center of the area. Historically, significant drawdown has been observed, about 80 feet in 35 years beginning when groundwater levels were measured in 1955. Groundwater levels in this area continued their steady decline until around the mid-1990s, when water levels stabilized due, in substantial part, to expanded conjunctive use operations. Water levels have continued to rise overall since that time, with slight declines during the 2007 through 2009 dry conditions experienced in the State.
- Eastern Area – The groundwater levels varies from one well to another and tend to mimic its rolling topography, higher near the American River and foothills, but declining away from the river and foothills. There were no notable changes in the recent groundwater elevations. Measured groundwater elevations have varied no more than two feet from October 1998 through 2012. The District is located within the Eastern Area.

SGA maintains a centralized database for the member agencies' groundwater facilities. SGA continually monitors groundwater level trends and has compiled groundwater-related data from water purveyors and DWR for inclusion in data storage and accounting tool. SGA maintains its Integrated Groundwater and Surface Water Model (IGSM), performs comprehensive data analysis, and the Data Management System. The Data Management System is a critical tool in SGA's monitoring program. The program includes the monitoring of groundwater elevations, monitoring of groundwater quality, providing locations of known groundwater contamination sites, monitoring and assessing the potential for land surface subsidence resulting from groundwater extraction, and developing a better understanding of the relationship between surface water and groundwater along the Sacramento and American Rivers.

Water bearing formations beneath the District occur in two major strata. The upper water-bearing units include the geologic formations of the Victor, Fair Oaks, and Laguna Formations and are typically unconfined. The lower water-bearing unit consists primarily of the Mehrten Formation, which exhibits confined conditions. The Mehrten Formation is the most productive fresh water-bearing unit in the eastern Sacramento Valley, though some of the permeable layers of the Fair Oaks Formation produce moderate amounts of water. Much of the recharge of these aquifer systems comes from the Sacramento and American Rivers and their tributaries where gravel deposits exist. To a lesser extent, aquifer recharge also occurs where the Mehrten Formation reaches the surface in the foothills in eastern Sacramento and western El Dorado County. Supply wells in the Sacramento Region draw water primarily form the Mehrten and Fair Oaks formations and typically produce 500-1,500 gpm of good to excellent quality water.

The North American Subbasin is not adjudicated and based on the DWR' official departmental bulletins, California's Groundwater Bulletin 118 Update 2003 and Bulletin 160, The California Water Plan Update 2013, the North American Subbasin is not specifically identified as a basin in a critically overdraft condition. The Bulletin 118 individual basin description for the North American Subbasin (February 2004) suggests that annual pumping exceeds the amount of water annually recharged, however, a detailed groundwater budget is not provided. SGA does not classify the Basin as overdrafted; however, it recognizes that groundwater levels fluctuate over time and that historic groundwater extractions have resulted in a net depletion of groundwater stored in the Basin.

In an effort to protect the groundwater resources of the Basin, the estimated average annual sustainable yield recommendation for the Basin is 131,000 acre-feet as established by the Water Forum. Although there are areas within the Basin that are experiencing decreased groundwater levels, the pumping extractions have not exceeded the safe yield. The SGA is implementing programs to sustain the viability of groundwater resources.

6-2-2. Recharge Facilities

The Basin is recharged by natural sources. Natural recharge occurs when groundwater producers use surface water in lieu of pumping groundwater. The Basin generally operates as a reservoir in which the net amount of water stored is increased in wet years allowing groundwater levels to rise. The reduction in groundwater pumping naturally recharges the Basin. Other natural sources of recharge for the Basin consist of percolation from surface water, precipitation, and infiltration from streams. The Basin is mainly recharged by areas along the American and Sacramento Rivers where extensive sand and gravel deposits are present.

6-2-3. Historical Groundwater Pumping

The District's conjunctive use goal has typically been to have approximately 10% of its water supplies come from groundwater. Table 6- 2 summarizes the District's total groundwater usage over the past 5 years.

Table 6- 2: Groundwater volume pumped in recent years

Groundwater Type *Drop Down List* *May use each category multiple times*	Location or Basin Name	2011	2012	2013	2014	2015
Alluvial Basin	Sacramento North Area Groundwater Basin	1516	1562	1319	2329	872
	TOTAL	1,516	1,562	1,319	2,329	872
NOTES: Volumes in acre-feet per year.						

No limitations have been encountered by the District in pumping groundwater during this time.

6-3. Stormwater Recovery

Stormwater within the District boundary is not currently recovered for reuse. To date, the District does not have future plans for initiating a stormwater recovery program.

6-4. Wastewater and Recycled Water

Municipal wastewater is generated in the District's service area from a combination of residential and commercial sources. The quantities of wastewater generated are generally proportional to the population and the water use in the service area.

The Sacramento Area Sewer District (SASD) is responsible for wastewater collection within the District's service area; the Sacramento Regional County Sanitation District ("Regional San") treats the wastewater at their Sacramento Regional Wastewater Treatment Plant (SRWWTP) in Elk Grove, CA.

Sacramento Regional County Sanitation District

Regional San was contacted in March 2016 in coordination with this UWMP, and the following provides a summary of wastewater treatment facilities and operations:

- All wastewater is treated at the SRWWTP in Elk Grove, CA. No wastewater is treated within the FOWD service area.

- Treated effluent is discharged to the Sacramento River via a diffuser at Freeport Blvd. No wastewater is discharged within the FOWD service area.
- SRWWTP currently uses secondary treatment, with chlorine disinfection and dechlorination using sulfur dioxide. A portion of the treated effluent undergoes additional treatment at the on-site Water Recycling Facility. Construction is underway to build new tertiary facilities with nutrient removal, filtration, and enhanced disinfection.
- SRWWTP received 46,328 MG (wastewater influent) in 2015.
- SRWWTP discharged 38,672 MG (wastewater effluent) in 2015.
- The onsite Water Recycling Facility produced 211 MG of recycled water in 2015.
- Regional San does not have any current recycled water activities in the FOWD service area and only operates a small, on-site recycled water program (0.5% of their total effluent) at the SRWWTP in Elk Grove.
- Regional San is currently developing several recycled water projects in the vicinity of the SRWTP to expand the use of recycled water. These projects are located in the southwest portions of the cities of Elk Grove and Sacramento.
- Currently, Regional San does not have any future plans (in the next 20 years) for recycled water in the Fair Oaks area.

Sacramento Area Sewer District

SASD was also contacted in March 2016 to estimate the volume of wastewater collected in their system for 2015. SASD does not meter wastewater running through their collection system and doesn't typically calculate this volume on an annual basis. They did however calculate the volume collected in their system for 2014 as part of a specific study that they were conducting that year. SASD stated that they would expect the volume collected in 2015 to be very similar to 2014 given that both years had a similar number of connections, similar population, and similar drought conditions. For the purposes of Table 6- 3, the 2014 data provided by SASD was used as an estimate of 2015 wastewater volume. SASD estimated that 32.5 billion gallons (99,739 acre-feet) of wastewater was collected in their system in 2014 (Table 6- 3).

Table 6- 3.Wastewater collected within the SASD service area (DWR Table 6-2)

☐	There is no wastewater collection system. The supplier will not complete the table below.					
100%	Percentage of 2015 service area covered by wastewater collection system *(optional)*					
100%	Percentage of 2015 service area population covered by wastewater collection system *(optional)*					
Wastewater Collection			**Recipient of Collected Wastewater**			
Name of Wastewater Collection Agency	Wastewater Volume Metered or Estimated? *Drop Down List*	Volume of Wastewater Collected in 2015	Name of Wastewater Treatment Agency Receiving Collected Wastewater	Treatment Plant Name	Is WWTP Located Within UWMP Area? *Drop Down List*	Is WWTP Operation Contracted to a Third Party? *(optional)* *Drop Down List*
Add additional rows as needed						
Sacramento Area Sewer District	Estimated	99,739	Sacramento Regional County Sanitation District	Sacramento Regional WWTP	No	No
Total Wastewater Collected from Service Area in 2015:		99,739				
NOTES: SASD volumes were not available for 2015. Volume of WW represents SASD's 2014 estimate for their entire service area. FOWD makes up approximately 3.5% of SASD's service area.						

The FOWD service area makes up approximately 3.5% of SASD's service area. Wastewater generated specifically within FOWD's service area is not known, but is estimated at 3.5% of SASD's 2014 total volume, or approximately 3,500 acre-feet per year.

6-4-1. Potential and Projected Recycled Water Use

As discussed in the previous section, there are currently no planned recycled water projects within the District service area. However, studies have been completed in the past to evaluate potential recycled water opportunities.

The Sacramento County Water Reclamation Study prepared in 1994 initiated an evaluation of the feasibility of recycled water use within the urban water districts of Sacramento County. Various markets for recycled water including agricultural irrigation, urban landscape irrigation, industrial water, groundwater recharge, and wetland enhancement were evaluated using economic and non-economic criteria. The report identified 27 users within the District that could utilize recycled water such as schools, parks, and churches. The total estimated demand was 806 acre-feet per year in 1994. These demands do not include residential landscape irrigation. Although 27 users were identified within the District service area, it is possible some of the users receive water from sources other than the District such as private groundwater wells. If recycled water was used at these sites, the total water demand of the District would not be reduced.

Although a potential recycled water demand of 806 acre-feet was identified within the District based on the 1994 study, the number may be much less based on dedicated irrigation accounts. In its recent CUWCC reports, the District has reported 112 metered accounts for dedicated irrigation with approximately 383 acre-feet of water delivered. The potential for recycled water demand is not anticipated to drastically increase since the District is close to build-out and schools and parks are already in place.

The extent to which recycled water is available in the future in the District's service area depends on the growth of the Regional San recycled water program. In the short-term, recycled water is not a viable option to reduce the District's total water demand because it is a significant distance from the source of recycled water at the SRWWTP in Elk Grove. The cost of conveying recycled water to the District's service area from the regional plant would be prohibitively expensive. Therefore, future use of recycled water within the District is not anticipated through 2035.

The only feasible way recycled water could be available to the District would be if Regional San built a satellite water reclamation facility north of the American River. However, it is not currently planned and unlikely that satellite reclamation plants would be built in the foreseeable future as part of Regional San's water recycling program.

6-5. Desalinated Water Opportunities

Desalination is viewed as a way to develop a local, reliable source of water that assists agencies to reduce their demand on surface water, reduce groundwater overdraft, and in some cases make unusable groundwater available for municipal uses. At this time, there are no identified projects within the District for desalination of seawater or impaired groundwater.

6-6. Exchanges or Transfers

At this time, the District does not anticipate participating in any transfer or exchange opportunities. However, the District continues to consider water exchange opportunities with neighboring purveyors, such as Carmichael Water District. One preliminary concept would include a new intertie and inline booster pump station that would provide a means for the two agencies to share water for an emergency or for other purposes. On a regional level, the RWA and SGA are exploring transfers and exchanges options that would benefit water agencies in the region, including the District. These transfer and exchange options include potential participation in the region's conjunctive use efforts such as groundwater banking and programmatic water transfers.

6-7. Future Water Projects

The District continually reviews practices that will provide its customers with adequate and reliable water supplies. The District's staff continues work to ensure safe water quality and that the District's water supply will meet its customers' present and future needs in an environmentally and economically responsible manner.

The District's projected water demands are discussed in Chapter 4.0. A relatively limited increase in water demand is expected through 2035, primarily due to the fact that the District is almost entirely built out. The purpose of the planned water supply projects are primarily to maintain the District's level of service by replacement or upgrades of aging facilities, support regional conjunctive use efforts, and provide water supply to developments on an as-needed basis as opposed to support large sustained population growth.

The District identified the following planned water supply projects:

- The Madison Well was constructed in 2014 and is anticipated to be equipped within the next year. The well will increase the District's groundwater pumping capacity by 1,100 gpm (1,774 AF/yr). The Madison well will primarily serve the proposed Gum Ranch development where approximately 340 new single family dwellings will be phased in over the next decade and will be fully built out by 2030. The Madison well will be completed and equipped in 2016.
- The District is considering a new groundwater well at the existing storage tank and booster pump station located at Skyway Drive. This project is currently in the long term planning phase, and the District anticipates drilling a pilot well to evaluate potential production yield by 2020.
- The District is considering a joint project with Orange Vale Water Company and Citrus Heights Water District to construct a water storage tank and booster pump station that would benefit the three districts. Further project discussion and negotiation have not progressed beyond the conceptual stage.

Table 6- 4. Expected Future Water Supply Projects or Programs (DWR Table 6-7)

Name of Future Projects or Programs	Joint Project with other agencies?		Description (if needed)	Planned Implementation Year	Planned for Use in Year Type *Drop Down List User may select more than one.*	Expected Increase in Water Supply to Agency *This may be a range*
	Drop Down List (y/n)	*If Yes, Agency Name*				
Add additional rows as needed						
Madison Well	No			2016	Average year	1,774 AF/year
Skyway Drive Well	No			2022	Average year	807 AF/year

FAIR OAKS WATER DISTRICT

6-8. Summary of Existing and Planned Sources of Water

Existing water sources were described in detail in Sections 6-1 and 6-2. The District's existing water supplies are listed in Table 6- 5. The projected, available water supplies are listed in Table 6- 6.

Table 6- 5. Actual 2015 retail water supplies (DWR Table 6-8)

Water Supply	Additional Detail on Water Supply	2015		
Drop down list *May use each category multiple times. These are the only water supply categories that will be recognized by the WUEdata online submittal tool*		Actual Volume	Water Quality *Drop Down List*	Total Right or Safe Yield *(optional)*
Add additional rows as needed				
Groundwater	See section 6-2	873	Drinking Water	8,338
Purchased or Imported Water	See section 6-1	7,257	Drinking Water	15,000
	Total	8,130		23,338
NOTES: Volumes in acre-feet per year.				

Table 6- 6. Projected water supplies (DWR Table 6-9)

Water Supply	Additional Detail on Water Supply	**Projected Water Supply** *Report To the Extent Practicable*									
		2020		**2025**		**2030**		**2035**		**2040** *(opt)*	
Drop down list *May use each category multiple times. These are the only water supply categories that will be recognized by the WUEdata online submittal tool*		Reasonably Available Volume	Total Right or Safe Yield *(optional)*	Reasonably Available Volume	Total Right or Safe Yield *(optional)*	Reasonably Available Volume	Total Right or Safe Yield *(optional)*	Reasonably Available Volume	Total Right or Safe Yield *(optional)*	Reasonably Available Volume	Total Right or Safe Yield *(optional)*
Add additional rows as needed											
Groundwater	Sec. 6-2	8,338	8,338	8,338	8,338	8,338	8,338	8,338	8,338	--	--
Purchased or imported water	Sec. 6-1	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	--	--
	Total	23,338	23,338	23,338	23,338	23,338	23,338	23,338	23,338	0	0
NOTES: Volumes in acre-feet per year. Groundwater is extracted from the North American subbasin as described in DWR Bulletin 118.											

To remain conservative with the estimate of the District's safe yield for its groundwater supplies, the District's planned wells (discussed in Section 6-7) were not included in the groundwater supply projections.

7.0 WATER SUPPLY RELIABILITY

For the purposes of this UWMP, reliability is a measure of water supply availability in various seasonal and climatic conditions, such as multiple year droughts. The combination of demand management and conjunctive supply options available to the District help to reduce the frequency and severity of shortages. The reliability of the District's water supply is dependent on the reliability of both surface water supplies and groundwater supplies. Surface water supplies are managed and delivered by San Juan Water District (SJWD), while the groundwater supplies are locally managed by the District with regional oversight provided by the Sacramento Groundwater Authority (SGA). The District's conjunctive use goals have typically been to serve 90% of its demands with surface water and 10% with groundwater. The following sections provide a discussion of the District's surface and groundwater supply reliability.

7-1. Surface Water Supply Reliability and Constraints

As previously noted, the District is a member agency of the San Juan Family and receives surface water from SJWD. The District coordinated with SJWD and exchanged information with them for the purposes of the 2015 UWMP. Confirmation of this coordination is provided in Attachment D.

The reliability of portions of SJWD's water supply is potentially limited by the following:

- Legal constraints that could result in United States Bureau of Reclamation (USBR) cutbacks on Central Valley Plan (CVP) supplies,
- Voluntary restrictions per the Water Forum Agreement terms

In response to these challenges, SJWD continues to develop and encourage projects and programs to ensure reliability now and into the future. The following subsections provide a brief summary of the various SJWD surface water supply contract sources, consideration of the terms of the Water Forum Agreement, and an analysis of SJWD supply reliability.

7-1-1. CVP Water Supply Reliability

Although SJWD has contracts with USBR for the delivery of CVP water, the contracted amount is not guaranteed each year. The amount of water available to the CVP contractors is based on the hydrologic conditions and operational flexibility opportunities within the CVP supplies. Each year USBR announces the water supply allocation for CVP water supplies. For example, SJWD's two USBR contracts are subject to reductions during drought periods.

7-1-2. Water Forum and Hodge Decision

Limitations on the amount of water that can be diverted from the American River have been defined by the Water Forum Agreement based on unimpaired flows to Folsom Reservoir. The Water Forum Agreement as it applies to the San Juan Consortium stipulates the following:

- "Most years" are defined as years when the projected March through November unimpaired inflow to Folsom Reservoir is greater than 950,000 acre-feet. In most years, SJWD may divert up to 82,200 acre-feet.
- "Drier years" are defined as years when the projected March through November unimpaired inflow to Folsom Reservoir is less than 950,000 acre-feet and equal to or greater than the 400,000 acre-feet. In drier years, SJWD will divert a decreasing amount of surface water from 82,200 ac-ft to 54,200 ac-ft in proportion to the decrease in unimpaired inflow to Folsom reservoir from 950,000 to 400,000 acre-feet. In drier years, SJWD plans to reduce its water demands and use groundwater to meet additional demands.
- "Driest years (conference years)" are defined as years when the projected March through November unimpaired inflow to Folsom Reservoir is less than 400,000 acre-feet. In the driest years, SJWD will reduce their diversion to 54,200 acre-feet, which is equivalent to their baseline amount (maximum diversion through 1995). In the driest years, SJWD will reduce its water demands and use groundwater to meet additional demands. SJWD will also meet with other Water Forum signatories to discuss how the available water should be managed to meet water purveyor demands and minimum flow requirements of the American River.

The Hodge decision can also legally constrain surface water diversions if minimum Hodge Flows in the Lower American River are not met. The Hodge decision was a judgment of the Superior Court for the County of Alameda (Environmental Defense Fund, Inc. vs. East Bay Municipal Utility District (EBMUD), Case No. 425955) that directed EBMUD to divert from the lower American River based on its CVP contractual entitlement only when specified flows would remain in the river. These flows came to be known as Hodge Flows. The Hodge Flows are 2,000 cfs from October 15 through the end of February, 3,000 cfs from March 1 through June 30, and 1,750 cfs from July 1 through October 14. "Below Hodge Conditions" refers to conditions when bypassing flow at Sacramento's Fairbairn WTP is less than the defined Hodge Flows. Although the Hodge Decision applies only to parties to that lawsuit, Water Forum signatories volunteer to observe the flow requirements when reasonable and feasible.

7-1-3. SJWD Reliability Analysis

The District has coordinated with SJWD as part of this UWMP effort. The tables presented in this section were provided by SJWD (see Attachment D) to describe their expected water supplies and supply reliability. Table 7- 1 presents SJWD's actual volume of water supplied in 2015 compared to its total right or safe yield for each of its water rights contracts. Note that the 2015 volumes represent dry-year conditions where supplies were reduced.

Table 7- 1. SJWD total 2015 water supplies (SJWD 2015 UWMP Table 6-8).

Water Supply	Additional Detail on Water Supply	2015		
		Actual Volume	Water Quality	Total Right or Safe Yield *(optional)*
Surface water	USBR CVP Folsom Lake	796	Raw Water	24,200
Surface water	Water Right	33,000	Raw Water	33,000
Surface water	Placer County Water Agency	10,000	Raw Water	25,000
	Total	43,796		82,200

NOTES:
1. USBR CVP Folsom Lake contract water is subject to CVP M&I Water Shortage Policy and 2015 supplies were reduced to 50% of historical use of CVP supply as calculated by USBR. According to USBR, San Juan's historical use of CVP supply is 1,593 AF (USBR, 2/24/2015).
2. In 2015, Folsom Reservoir inflow was projected to be below 400,000 AFY. Therefore the District's PCWA contract supply was reduced to 10,000 AF.
3. Supply volume in units of AF.

SJWD does not anticipate any of their available water supplies to change in the foreseeable future as presented in Table 7- 2.

Table 7- 2. SJWD projected water supplies through 2040 (SJWD 2015 UWMP Table 6-9).

Water Supply	Additional Detail on Water Supply	Projected Water Supply *Report To the Extent Practicable*				
		2020	**2025**	**2030**	**2035**	**2040** *(opt)*
		Reasonably Available Volume	Reasonably Available Volume	Reasonably Available Volume	Reasonably Available Volume	Reasonably Available Volume
Surface water	USBR CVP Folsom Lake	24,200	24,200	24,200	24,200	24,200
Surface water	Pre-1914 Right	33,000	33,000	33,000	33,000	33,000
Surface water	Placer County Water Agency	25,000	25,000	25,000	25,000	25,000
	Total	82,200	82,200	82,200	82,200	82,200

NOTES:
1. Projected water supply is for a normal year based on Sacramento Water Forum definition of Folsom Reservoir inflow projected above 950,000 AF.
2. Units are in AFY

SJWD made the following assumptions for calculating supply and demand during single- and multiple-dry year scenarios.

1. Assume that Folsom Reservoir inflows are projected to be between 400,000 AFY and 950,000 AFY (non-Conference years). SJWD intends on complying with the Water Forum Agreement, which can reduce total surface water diversion in proportion to the water level in Folsom Lake to a minimum of 54,200 AFY. Therefore, it is assumed that available supply will be the minimum of 54,200 AFY. The decrease in diversion amounts will be met by a combination of reductions of PCWA and USBR CVP supply, both contractually and at the District's discretion.
2. Water supply will not be available for the City of Roseville or for conjunctive use during a single dry year.
3. Assume that District's retail service area water demands will meet SBX7-7 objectives through implementation of demand management measures described in Chapter 9 of the UWMP.
4. The District wholesale customer agencies (including SJWD retail) will implement their respective Water Shortage Contingency Plans (WSCPs). This results in all wholesale customer agency demands being reduced by approximately 15%.
5. Wholesale customer agencies with groundwater supplies (FOWD and Citrus Heights Water District) will increase groundwater pumping to offset surface water supply.
6. Sacramento Suburban Water District (SSWD) groundwater will be provided to the SJWD through the Antelope Pump-Back Booster Station. This supply is only intended to be activated during dry years or when SJWD's surface water supplies are reduced. SSWD groundwater is estimated to provide an additional 5,300 AFY.

The tables on the following pages relate to reliability of SJWD water supplies during normal years, single-dry years, and multiple-dry years.

Table 7- 3. SJWD available supplies during various water years (SJWD 2015 UWMP Table 7-1).

Year Type	Base Year	Available Supplies if Year Type Repeats	
		Agency may provide volume only, percent only, or both	
		Volume Available	% of Average Supply
Average Year		82,200	100%
Single-Dry Year	1977	61,150	74%
Multiple-Dry Years 1st Year	1990	61,150	74%
Multiple-Dry Years 2nd Year	1991	55,100	67%
Multiple-Dry Years 3rd Year	1992	55,100	67%

NOTES:
1. Volume available is based on District water supply contracts only and does not include reductions due to Water Forum Agreement.
2. Average year assumes 100 percent availability of Water Right supply and contract supplies (based on Sacramento Water Forum definition of a normal year with Folsom Reservoir inflow projected above 950,000 AF).
3. For the purposes of this analysis, it is assumed that historical USBR CVP Folsom Lake usage is equal to the full contract amount.
4. The single- and first multiple-dry years assume Folsom Reservoir inflow projected to be between 400,000 and 950,000 AFY: 100 percent availability of Water Right supply, 75 percent availability of full USBR CVP Folsom Lake contract supply, and 100 percent availability of PCWA contract supply.
5. The second and third multiple-dry years assume Folsom Reservoir inflow projected to be below 400,000 AFY: 100 percent availability of Water Right supply, 50 percent availability of full USBR CVP Folsom Lake contract supply, and 10,000 AF of PCWA contract supply.
6. Volume is in AFY.

For a normal year, SJWD's projected water supplies and demands through 2040 do not result in any water supply shortages.

Table 7- 4. SJWD normal year projected water supplies and demands (SJWD 2015 UWMP Table 7-2).

	2020	2025	2030	2035	2040 *(Opt)*
Supply totals	82,200	82,200	82,200	82,200	82,200
Demand totals	29,846	64,895	70,616	76,398	82,200
Difference	52,354	17,305	11,584	5,802	0

NOTES:
1. Supply and demand volumes are in AFY.
2. Average year assumes 100 percent availability of Water Right supply and contract supplies (based on Sacramento Water Forum definition of a normal year for Folsom Reservoir inflow projected above 950,000 AF).
3. Demands are the total retail and wholesale service area demands as projected in Chapter 4 Tables 4-2a and 4-3a and include future conjunctive use program.

During dry years, SJWD anticipates that its water rights will be restricted, but expects demands to be met as presented in Table 7- 5 and Table 7- 6.

Table 7- 5. SJWD single-dry year projected water supplies and demands (SJWD 2015 UWMP Table 7-3).

	2020	2025	2030	2035	2040
Existing Supply Contracts					
Water Rights	33,000	33,000	33,000	33,000	33,000
USBR CVP Folsom Lake Contract	24,200	24,200	24,200	24,200	24,200
PCWA Contract	25,000	25,000	25,000	25,000	25,000
Total Supply Contracts	**82,200**	**82,200**	**82,200**	**82,200**	**82,200**
Dry Year Supply Reductions					
Water Rights	0	0	0	0	0
Water Forum Agreement Maximum Reductions(1)	-28,000	-28,000	-28,000	-28,000	-28,000
Total Existing Supplies	**54,200**	**54,200**	**54,200**	**54,200**	**54,200**
Demand					
Wholesale Demand(2)	51,055	52,813	54,495	56,235	57,997
20x2020 Reduction in Retail Demand(3)	-1,237	-1,309	-1,375	-1,444	-1,513
Reduction from WSCP(4)	-7,473	-7,726	-7,968	-8,219	-8,473
Demand w/ Conservation	**42,345**	**43,779**	**45,152**	**46,573**	**48,012**
Supply-Demand Balance	**11,855**	**10,421**	**9,048**	**7,627**	**6,188**
Supplemental Groundwater					
Additional Wholesale Groundwater Pumping(5)	0	0	0	0	0
Antelope Booster Pump-Back Station Groundwater (SSWD)(6)	0	0	0	0	0
Total Supplemental Groundwater	**0**	**0**	**0**	**0**	**0**

NOTES:

1. Assumes projected inflow to Folsom Reservoir is between 400,000 AFY and 950,000 AFY (non-Conference Year). SJWD is a signatory to the Water Forum Agreement which can reduce total surface water diversion in proportion to the water level in Folsom Lake to as low as 54,200 AF. The decrease in diversion amounts will be met by a combination of reductions of PCWA and USBR CVP supply, both contractually and at the District's discretion.
2. Projected wholesale water demands from Chapter 4, Table 4-3a, minus water supply to City of Roseville (4,000 AF).
3. Reduction needed to meet retail SBX7-7 compliance calculated in Chapter 5.
4. 15 percent reductions from wholesale demand by implementing WSCP Stage 3. See Chapter 8, Water Shortage Contingency Planning.
5. Groundwater supply from wholesale customer agencies used to replace surface water supply reductions per the Water Forum Agreement and the WSCP in Chapter 8.
6. SSWD groundwater via the Antelope Booster Pump-Back Station is intended to be provided during the summer months in dry years or when SJWD's surface water supplies are reduced.

Table 7- 6. SJWD dry year projected water supplies and demands (SJWD 2015 UWMP Table 7-5).

		2020	2025	2030	2035	2040 (Opt)
First year	Supply totals	54,200	54,200	54,200	54,200	54,200
	Demand totals	42,345	43,779	45,152	46,573	48,012
	Difference	11,855	10,421	9,048	7,627	6,188
Second year	Supply totals	54,200	54,200	54,200	54,200	54,200
	Demand totals	42,345	43,779	45,152	46,573	48,012
	Difference	11,855	10,421	9,048	7,627	6,188
Third year	Supply totals	54,200	54,200	54,200	54,200	54,200
	Demand totals	42,345	43,779	45,152	46,573	48,012
	Difference	11,855	10,421	9,048	7,627	6,188

NOTES:
1. Supply and demand volumes are in AFY.
2. Assumes Folsom Reservoir projected inflows to be between 400,000 AFY and 950,000 AFY (non-Conference years): the Water Forum Agreement reduces SJWD Folsom Lake diversions in proportion to lake levels to a minimum of 54,000 AF. Reduction will be met by a combination of reductions of PCWA and USBR CVP supply, both contractually and at the District's discretion.
3. Demands are the total retail and wholesale service area demands as projected in Chapter 4 Tables 4-2a and 4-3a and include retail water use reductions to meet SBX7-7, and implementation of WSCPs. Demand does not include conjunctive use.
4. Supply shortfall is expected to be met by supplemental groundwater pumping by SJWD wholesale customer agencies with pumping capability and SSWD groundwater via the Antelope Pump-Back Booster Station.
5. Based on DWR Table 7-4.

7-2. Groundwater Reliability and Constraints

The District's groundwater supply is assumed, and has historically proven to be, reliable under all hydrologic conditions. Under a dry and multiple-dry year scenario, it is assumed that groundwater use will increase to offset potential surface water supply reductions in accordance with the commitments of the Water Forum Agreement. Additional discussions on groundwater reliability are presented in Sections 6-2 and 7-4.

7-3. Water Quality Constraints

A summary of water quality issues and their impact to supply reliability is provided in this section.

As required by the Safe Drinking Water Act, the District provides annual Water Quality Reports to its customers; also known as Consumer Confidence Reports (CCR). This mandate is governed by the United States Environmental Protection Agency (USEPA) and the California Division of Drinking Water to inform customers of their drinking water quality. In accordance with the Safe Drinking Water Act, the District monitors regulated and unregulated compounds in its water supply and in years past, the water delivered to the District meets the standards required by the state and federal regulatory agencies. A copy of the District's 2014 CCR is included in Attachment G.

7-3-1. Surface Water Quality

The District receives treated surface water from SJWD. SJWD diverts American River water stored behind Folsom Dam and treats it with conventional filtration and chlorine disinfection at the Sydney N. Peterson WTP located west of Folsom Dam. SJWD tests its water for over 200 contaminants on a daily, weekly, monthly, and/or annual basis. SJWD is responsible for delivering treated surface water that meets state and federal standards to the District. The SJWD continues to provide high quality surface water to the District and there are no anticipated water supply impacts due to surface water quality issues.

7-3-2. Groundwater Quality

In general, the District's wells are of excellent water quality. Each of the District's groundwater wells is regularly sampled and confirmed to comply with Title 22 drinking water regulations. In addition, the SGA manages the Basin and conducts a comprehensive water quality monitoring program. SGA collects data from over 260 wells in the region for inclusion in the Data Management System. The Data Management System includes groundwater quality data from 1991 through the present. The groundwater quality issues facing the Basin were addressed in SGA's *Groundwater Management Plan: Sacramento County – North Basin* dated December 2014 (Attachment F) and are summarized below for the region. While most of the constituents listed do not impact the District's wells, information specific to the District is provided where appropriate.

Total Dissolved Solids (TDS)

TDS has a recommended secondary maximum contaminant level (MCL) drinking water standard (associated with the aesthetics of the water) of 500 milligrams per liter (mg/L). There were 255 distinct samples from wells analyzed as part of a 2011 Groundwater Quality Vulnerability Assessment. With respect to TDS, the quality of water in the basin is very good, with an average TDS of 268 mg/L.

Nitrates

The primary MCL for nitrate in drinking water is 45 mg/L. Tests have shown that nitrate levels in public supply wells are generally not of concern in the SGA area. Of 252 samples from public supply wells tested during the period, the average concentration was 11.5 mg/L with a maximum observed concentration of 51 mg/L.

Arsenic

The drinking water standard for arsenic is set at 10 ug/L. SGA member wells with elevated levels of arsenic are generally found in the western portion of the basin in the vicinity of Rio Linda/Elverta. Outside of this area, groundwater in the North Basin typically has arsenic at concentrations below 5 ug/L.

Hexavalent Chromium

A California MCL of 10 ug/L for Hexavalent Chromium became effective on July 1, 2014. As a result of the recent MCL, SGA obtained CrVI results from the California State Water Resources Control Board (SWRCB) Division of Drinking Water (DDW) database from 2001 into 2014. Of the 215 wells for which data are available, the average concentration is approximately 5.2 ug/L. Of the 215 wells, 19 have concentrations exceeding the MCL and another 25 are close to the MCL (>7.5 ug/L). The areas of biggest concern appear to the north of Interstate 80 near the communities of Rio Linda, Antelope, and North Highlands.

Iron

The secondary MCL for iron is 300 micrograms per liter (µg/L). In general, dissolved iron is not considered a significant problem in SGA-area public supply wells, but it is fairly routinely encountered. Of 196 distinct wells with available sample results, six wells were below the detection level of 10 ug/L. Of the wells with detections, 56 wells had concentrations exceeding the secondary MCL (SGA, 2011). Note that these represent the maximum detections observed in a given well, so the well may not routinely sample above these concentrations.

Manganese

The secondary MCL for manganese is 50 µg/L. In general, dissolved manganese is not a significant problem in the SGA public supply wells. With a distribution similar to the occurrence of iron, but to a lesser extent, wells in the SGA region produce water with elevated manganese concentrations. Of the 183 distinct wells sampled during the period, 55 wells were below the detection level of 10 ug/L. Of the remaining wells, 35 wells had concentrations exceeding the secondary MCL.

Contaminant Plumes

The identified plumes within the Basin north of the American River are from the former McClellan Air Force Base (AFB) and the Gencorp/Aerojet property. The McClellan AFB plume is down gradient from the District's wells and does not impact groundwater quality for the District.

The Aerojet contaminant plume originates from historical improper waste disposal from its 8,000 acre rocket propellant manufacturing facility located south of the American River. The primary contaminants of concern are trichloroethene (TCE) and perchlorate. The TCE component of the plume extends from the Aerojet property near Rancho Cordova, CA to north of the American River into the southern end of the District's service area. The Aerojet plume is a regulated Superfund site per the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and is closely monitored by water purveyors in the region and regulatory agencies including the USEPA, the Central Valley Regional Water Quality Control Board, and the Department of Toxic Substances Control.

Since the plume's discovery within the District's service area, Aerojet has installed a groundwater remedy that includes extraction and treatment of the contaminated groundwater. The remedy is designed specifically to intercept and capture the contaminant plume before it reaches the District's supply wells. A network of monitoring wells is also in place that are closely monitored by Aerojet and the District to ensure the installed remedy continues to protect the District's supply wells. Should the District's wells become contaminated in the future, provisions are in place to secure and provide replacement water supplies to offset the District's lost capacity.

7-3-3. Groundwater Quality Programs

The District has conducted a vulnerability assessment of its drinking water wells in the past and the groundwater sources were found to be most vulnerable to possible contamination from commercial urban activities such as active and historic gas stations, dry cleaners, leaking underground storage tanks, and sewer collection systems. The District continues to monitor its groundwater wells for the first indication of problems as part of its water management strategy.

Likewise, SGA supports and is involved in addressing water quality concerns of the Basin. Some of the programs and activities include:

- *Groundwater Quality Monitoring* – SGA has installed a series of shallow (less than 200 feet deep) monitoring wells in the basin funded by a Local Groundwater Assistance Grant from the Department of Water Resources. These wells serve as an early warning system for contaminants that could be migrating to greater depths, where the majority of municipal drinking water wells are completed. In addition, SGA has incorporated water quality data from wells within the United States Geological Survey (USGS) National Water Quality Assessment (NAWQA) program and worked with Air Force Real Property Agency (AFRPA) to identify a subset of monitoring wells located in and around the former McClellan AFB that will also be integrated into future SGA monitoring efforts.
- *Groundwater Resource Protection* – The first line of defense for groundwater resource protection is the prevention of contamination. Prevention measures include proper well construction and destruction practices, development of wellhead protection measures, protection of recharge areas, control of the migration and remediation of contaminated groundwater, and control of saline water intrusion. One protection measure is the establishment of the consultation zone. If a well's location is proposed within 2,000 feet (consultation zone) of a known contaminant plume, Sacramento County Environmental Management Department requires a special review of the permit by appropriate regulatory agencies.

7-3-4. Distribution System Water Quality

Distribution system water quality monitoring is performed for several water quality parameters in the District, including general physical parameters, presence of coliform bacteria, disinfectant and disinfection by-product levels, and corrosivity of the water by monitoring lead and copper levels at customers' water taps. All monitoring parameters and levels currently meet drinking water standards. The ability to continue to meet these standards is not expected to change in the foreseeable future and does not present a potential impact to water supply reliability.

7-3-5. Water Quality Effects on Water Management Strategies and Supply Reliability

The District has not experienced any significant water quality problems in the past. Although the District has not had water quality problems in the past, groundwater contamination is a specific water quality threat that may impact the District's planning and operational strategies for a safe and reliable water supply in the future. The District's plan is to mitigate for potential problems prior to any loss in supply. Currently and in the future, the District does not anticipate any reduction in supply due to water quality issues. The following describe water management strategies being implemented by the District in response to the threat of groundwater contamination.

- *Aerojet Plume:* The District's water management strategy related to the threat of groundwater contamination included successfully collaborating with Aerojet and regulatory agencies to install groundwater extraction and treatment facilities to treat and contain the TCE plume. Groundwater monitored wells continue to be installed and tested as part of the required remedy to measure plume migration and confirm capture. The District will also continue its involvement on the Groundwater Contamination Committee, through the SGA, to increase the awareness of groundwater contamination and the effects it would have on future drinking water supplies.

  The District has the right to beneficially use groundwater underlying the District service area to meet its customers' need for drinking water. Even if none of the District's wells are contaminated, Aerojet's extraction facilities may hinder the District's right to develop groundwater resources in the future. Per the Water Forum Agreement, the San Juan Family of water agencies (including the District) is committed to increasing its use of groundwater during drier years and therefore protection within the Basin is essential. Protection of the Basin must involve both the removal of contaminants and in-basin disposal alternatives for the treated groundwater to minimize the depletion of the Basin by excessive pumping for remediation purposes.

  It continues to be the District's opinion that any water extracted from the Basin, within the community of Fair Oaks, by Aerojet is subject to the prior water rights of the District. The District's six water supply wells draw groundwater from aquifers where contamination is present and from which Aerojet operates its groundwater extraction system. This groundwater must remain within the Basin and any water that leaves the Basin must be replaced, to the District, gallon for gallon by another source of supply.

- *Methyl Tertiary-Butyl Ether (MTBE):* Although MTBE has not been detected in any of the District's wells, there are a number of identified sites with leaky underground storage tanks (LUST) throughout the District's service area. Within the Basin, approximately 190 active LUST sites have been identified. In response to the MTBE contamination, the District filed a lawsuit in 2003 against nine oil and petroleum-related companies in conjunction with nine other litigants. The suit seeks funding from the responsible parties to pay for the investigation, monitoring, and removal of oxygenates from the Basin. As of 2010, the responsible parties are monitoring the groundwater and providing results to the District.

In conclusion, there are no projected impacts to water supply due to water quality issues.

7-4. District Water Supply Reliability by Type of Year

As mentioned earlier, the District has commitments to receive 15,000 acre-feet per year of surface water from SJWD. In the Water Forum Agreement, the San Juan family committed to providing supplemental water (groundwater use, water rationing, and conservation) to decrease their use of surface water during the dry and driest years. The reduction in SJWD's normal wholesale surface water supply of 82,200 acre-feet to 54,200 acre-feet during a single-dry year and multiple-dry years means that up to 6,614 acre-feet of supplemental water may be needed by the San Juan Family. It is assumed this supplemental water will be groundwater from San Juan wholesale member agency wells.

SJWD anticipates a reduction in supply during a single-dry year or multiple-dry year scenario as part of their compliance with the Water Forum Agreement. In their 2015 UWMP, SJWD made the assumption that wholesale customer agencies will implement their respective Water Shortage Contingency Plans and will reduce their demands by 15% during single-dry and multiple-dry year scenarios (see Section 7-1-3). Only in 2040 does SJWD anticipate needing to rely on the groundwater pumping of its member agencies to meet dry-year demands.

The District's water deliveries from SJWD have never been restricted in the past, but for the purposes of this UWMP and to remain consistent with SJWD's analysis, the District is assuming that their available surface water supply will be reduced by 15% during single-dry and multiple-dry years. Therefore, the entire 15,000 acre-feet of surface water is considered available to the District in a normal year, and 12,740 acre-feet of surface water is available in single-dry and multiple-dry year scenarios.

The San Juan Family is signatory to the Water Forum Agreement and each of the San Juan Family members share the responsibility for reduction of surface water supplies as well as increases in groundwater production when required. The District recognizes the Water Forum Agreement and understands the importance of using groundwater supplies during drier periods to offset the use of surface water.

As discussed in previous sections, the District's groundwater supply is assumed, and has historically proven to be, reliable under all hydrologic conditions. Under single-dry and multiple-dry year scenarios, it is assumed that groundwater use will increase to offset potential surface water supply reductions in accordance with the commitments of the Water Forum Agreement.

The District will also implement conservation measures defined in their water contingency shortage plan and as discussed in Chapter 8.0. At this time, the District anticipates meeting 90% of its water demands with surface water. In addition, the District may enter into an agreement with SJWD in the future to pump groundwater in-lieu of purchasing surface water to assist the San Juan Family in meeting its water demands.

An analysis of precipitation records was conducted to determine which years on record would be appropriate representations of a normal year, a single-dry year, and multiple-dry years. Historical precipitation data for the Folsom Dam gage (Station ID: FLD) was downloaded from the DWR California Data Exchange Center (CDEC)[4]. This gage had complete monthly precipitation records from 1955 to 2005 which was used as the period of record for the analysis. The following tables present the years that were selected as good representations of average years and dry years and the anticipated available supplies if these type of years repeat.

Table 7- 7. Basis of water year data - Surface Water Supplies (DWR Table 7-1A).

Year Type	Base Year	Available Supplies if Year Type Repeats	
		Agency may provide volume only, percent only, or both	
		Volume Available	% of Average Supply
Average Year	2001	15,000	100%
Single-Dry Year	1977	12,750	85%
Multiple-Dry Years 1st Year	1990	12,750	85%
Multiple-Dry Years 2nd Year	1991	12,750	85%
Multiple-Dry Years 3rd Year	1992	12,750	85%
Agency may use multiple versions of Table 7-1 if different water sources have different base years and the supplier chooses to report the base years for each water source separately. If an agency uses multiple versions of Table 7-1, in the "Note" section of each table, state that multiple versions of Table 7-1 are being used and identify the particular water source that is being reported in each table.			
NOTES: Surface Water (ie- Purchased SJWD Water). Volumes in acre-feet per year.			

[4] California Data Exchange Center (CDEC). *Folsom Dam Precipitation Data*. Period of Record 1955-Present. Available at: <http://cdec.water.ca.gov/cgi-progs/staMeta?station_id=FLD>.

Table 7- 8. Basis of water year data - Groundwater Supplies (DWR Table 7-1B).

Year Type	Base Year	Available Supplies if Year Type Repeats	
		Agency may provide volume only, percent only, or both	
		Volume Available	% of Average Supply
Average Year	2001	8,388	100%
Single-Dry Year	1977	8,388	100%
Multiple-Dry Years 1st Year	1990	8,388	100%
Multiple-Dry Years 2nd Year	1991	8,388	100%
Multiple-Dry Years 3rd Year	1992	8,388	100%
Agency may use multiple versions of Table 7-1 if different water sources have different base years and the supplier chooses to report the base years for each water source separately. If an agency uses multiple versions of Table 7-1, in the "Note" section of each table, state that multiple versions of Table 7-1 are being used and identify the particular water source that is being reported in each table.			
NOTES: Groundwater Supply (District wells). Volumes in acre-feet per year.			

The District did not project any increases in a single-dry year or multiple-dry year demand from a normal year demand. The District's water records indicate a similar trend. Although historically for the District demands slightly decreased during drier periods, the demands applied in the water supply reliability analysis remain constant for a single-dry year and multiple dry years.

It's likely that the District's surface water supplies are vulnerable to water shortages due to the climatic environment and changes in unimpaired flow to Folsom Reservoir. The groundwater supplies, however, are not as vulnerable and will be used when surface water supplies are decreased. Therefore, the District's overall water supplies are not expected to be impacted by changes in climate. Response to a future drought or other water shortages would follow the implementation of the appropriate stage of the District's Water Conservation Requirements and Enforcement Measures as discussed in Chapter 8.0.

The District's water availability analysis was completed for normal, single-dry, and multiple-dry years as presented in Table 7- 9, Table 7- 10, and Table 7- 11, respectively. The existing water supplies are not expected to change in the future and will remain constant through 2035.

Table 7- 9. Normal year supply and demand projections (DWR Table 7-2).

	2020	2025	2030	2035	2040 *(Opt)*
Supply totals (*autofill from Table 6-9)*	23,338	23,338	23,338	23,338	--
Demand totals *(autofill from Table 4-3)*	11,768	12,080	12,398	12,726	--
Difference	11,570	11,258	10,940	10,612	--
NOTES: Volumes in acre-feet per year.					

Table 7- 10. Single-dry year supply and demand projections (DWR Table 7-3).

	2020	2025	2030	2035	2040 (Opt)
Supply totals	21,138	21,138	21,138	21,138	--
Demand totals	11,768	12,080	12,398	12,726	--
Difference	9,370	9,058	8,740	8,412	--
NOTES: Volumes in acre-feet per year.					

Table 7- 11. Multiple-dry year supply and demand projections (DWR Table 7-4).

		2020	2025	2030	2035	2040 (Opt)
First year	Supply totals	21,138	21,138	21,138	21,138	--
	Demand totals	11,768	12,080	12,398	12,726	--
	Difference	9,370	9,058	8,740	8,412	--
Second year	Supply totals	21,138	21,138	21,138	21,138	--
	Demand totals	11,768	12,080	12,398	12,726	--
	Difference	9,370	9,058	8,740	8,412	--
Third year	Supply totals	21,138	21,138	21,138	21,138	--
	Demand totals	11,768	12,080	12,398	12,726	--
	Difference	9,370	9,058	8,740	8,412	--
NOTES: Volumes in acre-feet per year.						

7-5. Regional Supply Reliability

Section 10620(f) of the Act asks urban water suppliers to evaluate water management tools and options to maximize water resources and minimize the need for imported water from other regions. The District understands the limited nature of water supply in California and is committed to optimizing its available water resources. For this reason, the District has strived to maintain reliable water supply from local resources, namely the American River watershed (including Folsom Reservoir) and groundwater. The District maintains a robust portfolio of water supply options that provide for true conjunctive use of surface and groundwater resources.

Additionally, the District is committed to collaborating with neighboring water agencies, the San Juan Water District Family of water agencies, and other organizations that seek to promote the beneficial use of limited water resources in the Sacramento region. The District is a regular participant in regional water resources planning efforts, is signatory to the Water Forum Agreement, involved in the Water Forum Successor Effort, Regional Water Authority, and the Sacramento Groundwater Authority.

The District has implemented a comprehensive water conservation program including completion of meter retrofits on all of its water service connections. In an effort to expand the breadth of offered programs, the District partners with its wholesale supplier (San Juan Water District), energy utilities, and other agencies that support water conservation programs.

8.0 WATER SHORTAGE CONTINGENCY PLANNING

In 1991, the District developed and adopted a five stage water conservation plan (Resolution No. 9609). In 2001, the District modified the Water Conservation Requirements and Enforcement Measures and adopted the amended plan on June 12, 2001 (Resolution No. 0109). The District's Water Shortage Contingency Plan (Water Conservation Policy, District's Policy No 6060) was adopted in April 13, 1993 and has been amended several times since then, most recently on April 11, 2016. A copy of the most recent amendment is provided in Attachment H. The purpose of the Water Shortage Contingency Plan is to provide a guide to deal with extended water shortages in a timely and systematic manner. It provides procedures, rules, and regulations for mandatory water conservation that gain results while minimizing the effect of a water shortage on the District's customers.

8-1. Stages of Action

The District has developed five stages of action to be taken in response to water supply shortages, up to 50%. The stages and their appropriate water supply condition are listed below:

- Stage 1 – Normal Water Supply: The District's water supply or distribution system is able to meet all the normal water demands of its customers in the immediate future.
- Stage 2 – Water Alert: There is a probability that the District's water supply or distribution system is not able to meet all the water demands of its customers.
- Stage 3 – Water Warning: The District's water supply or distribution system is not able to meet all the water demands of its customers.
- Stage 4 – Water Crisis: The District's water supply or distribution system is not able to meet all the water demands of its customers under Stage 3 requirements. Short term declaration is for water shortage conditions expected for duration of 45 days or less.
- Stage 5 – Water Emergency: The District is experiencing a major failure of water supply, storage, or distribution system facilities. Short term declaration is for water shortage conditions expected for a duration of 45 days or less.

Table 8- 1 summarizes the water supply shortage stages and conditions.

Table 8- 1. Stages of water shortage contingency plan.

Stage	Complete Both	
	Percent Supply Reduction[1] *Numerical value as a percent*	Water Supply Condition (*Narrative description)*
Add additional rows as needed		
1	0%	Normal water Supply
2	5-10%	Water Alert
3	11-25%	Water Warning
4-Short Term	26-50%	Water Crisis: Short Term
4-Long Term	26-50%	Water Crisis: Long Term
5-Short Term	>50%	Water Emergency: Short Term
5-Long Term	>50%	Water Emergency: Long Term

[1] One stage in the Water Shortage Contingency Plan must address a water shortage of 50%.

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8-2. Prohibitions on End Uses

Table 8- 2 summarizes the various prohibitions and the stages during which the prohibition becomes mandatory.

Table 8- 2. Restrictions and prohibitions on end uses.

Stage	Restrictions and Prohibitions on End Users ***Drop down list*** *These are the only categories that will be accepted by the WUEdata online submittal tool*	Additional Explanation or Reference *(optional)*	Penalty, Charge, or Other Enforcement? *Drop Down List*
Add additional rows as needed			
1	Landscape - Restrict or prohibit runoff from landscape irrigation	Excessive Runoff	Yes
1	Landscape - Prohibit certain types of landscape irrigation	Free-flowing hoses for all hoses	Yes
1	Other - Customers must repair leaks, breaks, and malfunctions in a timely manner	Uncorrected plumbing or irrigation leaks	Yes
1	Other - Prohibit use of potable water for washing hard surfaces	Washing of streets, driveways, sidewalks, building	Yes
2	Landscape - Prohibit certain types of landscape irrigation	Full flow of landscape and pasture irrigation	Yes
3	CII - Restaurants may only serve water upon request	Serving water at restaurants only when requested by customers	Yes
4	Landscape - Prohibit certain types of landscape irrigation	Irrigating of ornamental turf on public street medians is prohibited	Yes
4	CII - Restaurants may only serve water upon request		Yes
5	CII - Other CII restriction or prohibition	Flushing of sewers or fire hydrants	Yes
5	Other	New connection to the District's water distribution system	Yes

8-3. Penalties, Charges, Other Enforcement of Prohibitions

The District will enforce penalties and charges of prohibited water use as outlined in its *Water Conservation Policy*:

1. Upon observation by authorized District personnel of a water waste condition, the District shall issue a warning with the first two observations by personal service or by notice left on premises requesting compliance with the District's conservation rules.
2. Upon observation by authorized District personnel of a third water waste condition at the same property address, the customer shall be issued a violation by personal service or by notice left on premise and a copy mailed to customer at the premises. The customer shall be notified, in writing, that if an additional observation of water waste is documented, the District shall issue a 2nd violation notice, *require the installation of a water meter,* and begin termination actions of water service to the subject address. In lieu of service termination, the District may opt to impose a penalty charge for water waste. The District shall indicate in writing said penalty charge, if applicable*, and shall include the approved metered service and commodity rates* in the violation notice. If the customer is not the property owner, a copy of the writing shall be mailed to the owner of record.
3. Upon observation by authorized District personnel of a fourth, or subsequent water waste condition at the same property address, the customer shall be issued a violation notice by personal service or by notice left on premises and a copy mailed to the customer at the premises. The owner/customer shall then be notified, in writing by certified mail, that the water service to the subject address shall be terminated in fifteen (15) days. Reconnection to the District's system after said termination procedure shall be subject to a reconnect charge equal to the District's actual incurred costs to date, including penalty fees, or to a minimum charge as follows, whichever is greater:

   1st reconnect charge $100.00 per service connection
   2nd reconnect charge $200.00 per service connection
   3rd reconnect charge $300.00 per service connection
   4th reconnect charge $400.00 per service connection

   In addition, as a condition of water service, the District shall install a water meter and shall charge the approved metered service and commodity rate for water based on the actual volume of deliveries to the premises.
4. Subsequent violations shall be treated in the same manner as a 4th water waste or 2nd violation (subsequent reconnect charges applied).

5. Prior to the scheduled termination, the customer may choose to pay the District's costs associated with the subject action, and any penalty costs in lieu of terminating service. The customer may, in writing, request a meeting with the District's General Manager to discuss the proposed termination of service. Payment of the penalty charge and fees shall avoid said termination and shall be considered a "waiver of appeal".

Further discussion of the District's enforcement policies are discussed in its *Water Conservation Policy* (Attachment H).

8-4. Consumption Reduction Methods

Based on the requirements of the Act, Table 8- 3 summarizes the methods that can be used by the District in order to enforce a reduction in consumption, where necessary.

Table 8- 3. Stages of water shortage contingency plan - consumption reduction methods.

Stage	Consumption Reduction Methods by Water Supplier ***Drop down list*** *These are the only categories that will be accepted by the WUEdata online submittal tool*	Additional Explanation or Reference *(optional)*
Add additional rows as needed		
2, 3, 4, 5	Other	Mandatory reduction of indoor water use
2	Other	Reduce landscape and pasture irrigation. Customers with "smart" irrigation timers or controllers are asked to set the controllers to achieve 90 to 95% of the evapotranspiration (ET) rate.
3	Other	Reduce landscape and pasture irrigation. Customers with "smart" irrigation timers or controllers are asked to set the controllers to achieve 75 to 89% of the evapotranspiration (ET) rate.
4	Other	Reduce landscape and pasture irrigation. Customers with "smart" irrigation timers or controllers are asked to set the controllers to achieve 50 to 74% of the evapotranspiration (ET) rate.
5	Other	Landscape and pasture irrigation is prohibited

8-5. Determining Water Shortage Reductions

The Act asks for an analysis of mechanisms for determining actual reduction in water use when the Water Shortage Contingency Plan is in effect. Mechanisms for determining actual reductions are outlined below:

- District-wide water usage figures are recorded weekly and formally reported to the General Manager, whom will report any significant discrepancy in reduction goals to the Board of Directors so that appropriate corrective actions will take place.
- Usage reports will be formally presented to the Board of Directors on a monthly basis.
- Production from all sources and system pressure will be continually monitored around the clock and reported to the supervisor in charge. Causes of concern will be reported to the General Manager with implementation of corrective actions. Reports will be provided to the General Manager.

In addition to the specific actions that the District can undertake to verify level of conservation, the District can monitor long-term water use through regular bi-monthly meter readings, which give the District the ability to flag exceptionally high usage for verification of water loss or abuse.

8-6. Revenue and Expenditure Impacts

Section 10632(g) of the Act requires an analysis of the impacts of each of the actions taken for conservation and water restriction on the revenues and expenditures of the water supplier. The District has recently transitioned to a commodity-based billing approach. The current rate structure is provided in Attachment I. District completed a metering implementation program in 2011 and started charging all customers based on volumetric rates in 2012. The District relies significantly more on revenue associated with customer water use to ensure it remains revenue neutral. Therefore, reductions in water sales are a significant concern going forward, and the District has implemented protocols to prevent deficit conditions.

The District maintains a cash reserve account to offset a temporary reduction in water sales in the event of a short-term catastrophic event or limited drought. While reduced demands would result in decreased operations costs (such as water purchases and pumping), a long term event would likely require budgetary adjustments to fund the District at needed levels. In the event that it becomes necessary for the District to utilize its reserves, the District may have to increase rates and all rate increases will require completion of a Proposition 218 public approval process.

8-7. Resolution or Ordinance

As discussed in Section 8-1, a copy of the District's Water Shortage Contingency Plan is provided in Attachment H. The District's Water Shortage Contingency Plan (Water Conservation Policy, District's Policy No 6060) was adopted in April 13, 1993 and was most recently amended on April 11, 2016.

8-8. Catastrophic Supply interruption

A water shortage emergency could be the result of a sudden catastrophic event such as a failure of transmission facilities, regional power outage, earthquake, flooding, supply contamination from chemical spills, or other adverse conditions. In 1999, the District prepared a Vulnerability Assessment of the District's water system. The three major hazards to the system are drought, groundwater contamination, and fire. Other hazards such as surface water contamination, power outages, flood events, earthquakes, and distribution failures are considered secondary hazards because the probability of occurrence is low or the consequences resulting from the event are not serious.

The Vulnerability Assessment provides recommendations to mitigate for the likely consequences to the hazards most critical to the operations of the District. Recommendations to minimize the consequences of hazards include drilling new wells, enhancing inter-tie connections with other districts, installing additional fire hydrants in the woodland areas of the American Parkway, installing new valves on transmission mains to isolate damage, and purchasing additional portable generators. The Vulnerability Assessment lists the potential actions to be taken by the District in the event of a catastrophic emergency.

The following actions will be taken by the District in the event of a catastrophic drought:

- Replace groundwater wells with diminishing production capacity
- Drill new wells
- Implement groundwater protection program
- Implement efficiency water use program

The following actions will be taken by the District in the event of catastrophic groundwater contamination:

- Replace contaminated groundwater wells
- Construct wellhead treatment system
- Implement groundwater protection program
- Open emergency inter-ties with neighboring water suppliers

The following actions will be taken by the District in the event of a catastrophic fire:

- Open emergency inter-ties with neighboring water suppliers.
- Construct additional fire hydrants

8-9. Minimum Supply Next Three Years

The Act requires an estimate of the minimum water supply available during each of the next three water years based on the driest three-year historic sequence for the District's water supply.

Table 8- 4 summarizes the minimum volume of water available to the District during the next three-years based on a multiple-dry year scenario. The driest three-year historic sequence is provided in Table 7- 11.

In general, the wholesale supply from SJWD and local groundwater will meet projected water demands out to 2035 for all anticipated hydrologic conditions. This reliability is a result of: 1) highly reliable surface water supplies from the American River and 2) historically reliable groundwater supply from the Central Sacramento Basin.

Table 8- 4 summarizes the minimum volume of water available to the District during the next three years based on a multiple-dry water year scenario.

Table 8- 4. Minimum supply next three years.

	2016	2017	2018
Available Water Supply	21,138	21,138	21,138
NOTES: Volumes in AFY. Based on multiple-dry year scenario.			

9.0 DEMAND MANAGEMENT MEASURES

In 1998, the District became signatory to the *Memorandum of Understanding Regarding Urban Water Conservation in California* (MOU) and a member of the California Urban Water Conservation Council (CUWCC), establishing a firm commitment to the implementation of the Best Management Practices (BMPs) or Demand Management Measures (DMMs). The CUWCC is a consensus-based partnership of agencies and organizations concerned with water supply and conservation of natural resources in California. By becoming a signatory, the District committed to implementing a specific set of locally cost-effective conservation practices. The MOU was revised by the CUWCC on December 10, 2008.

CWC Section 10631(i) states:

> *"For the purposes of this part [of the UWMP], urban water suppliers that are members of the California Urban Water Conservation Council shall be deemed in compliance with the requirements of subdivision (f) by complying with all the provisions of the "Memorandum of Understanding Regarding Urban Water Conservation in California", dated December 10, 2008, as it may be amended, and by submitting the annual reports required by Section 6.2 of that memorandum."*

The District is in full compliance with the CUWCC's MOU and the 2013-2014 BMP annual coverage reports are provided in Attachment J. Brief descriptions of the District's implemented measures are also included in the following sections.

9-1. Water Waste Prevention Ordinances

This BMP is implemented through a Board approved conservation Policy, Number 6060, titled "Water Conservation." The policy has 5 different stages: (1) Normal water supply, (2) water alert, (3) water warning, (4) water crisis: short-term or long-term, and (5) water emergency: short term or long term. This policy sets forth water use enforcement policies, jurisdiction to declare a stage level and definitions for water use at each stage. Water conservation restrictions include:

- Use of potable water which results in flooding or runoff in gutters or streets.
- Use of free-flowing hoses.
- Use of water for washing streets, parking lots, driveways, sidewalks, or buildings except as necessary for health, aesthetic or sanitary purposes.
- Use of potable water for filling or refilling of swimming pools.
- Use of potable water for construction purposes.
- Use of potable water for more than minimal landscaping.

In addition to the list above, reduction of indoor water use may be required as well as more stringent measures described in the Policy. This Policy prohibits negligent or wasteful use of water, creates a process for mandatory conservation and rationing, and promotes the use of water saving devices.

9-2. Metering

The District has installed meters on all service connections as required by AB 2572. Service connections have been billed volumetrically since January 1, 2012.

9-3. Conservation Pricing

All retail customers in the District are currently billed volumetrically. A summary of the District's rate and fee structure is provided in Attachment I. *Consider including documentation on District rate structure in Appendix to reference in this section as well as Sections 8.3 and 9.2.3.*

9-4. Public Education and Outreach

The District administers public information programs for its customers and receives additional public outreach support through its partnership with RWA's Regional Water Efficiency Program (RWEP). The RWEP has a regional outreach program coordinated with support from a Public Outreach and School Education Committee comprised of RWEP member conservation coordinators and Public Information Officers.

The District also partners with RWA's RWEP to provide customers with a school education program. The RWEP program has focused mainly on K-8 programs. RWEP has continued to use the legacy Sacramento Bee Newspapers in Education (NIE), now called Media in Education (MIE) program that originated back in the mid-1990s as part of the Sacramento Area Water Works Association (SAWWA) program in order to meet the baseline requirements for school education outreach. The annual budgeted direct expenses for the regional school education program for 2015 were $25,000.

9-5. Programs to Assess and Manage Distribution System Real Loss

The District has implemented a number of measures to reduce unaccounted for water including:

- Conducting leak detection and repair programs - locating system leaks and repairing leaks immediately
- Identification and Replacement of steel piping that is in service within the District boundaries
- Updated master plan that identifies all steel piping and piping with a history of seepage

9-6. Water Conservation Program Coordination and Staffing Support

The District has one Conservation Coordinator who has several responsibilities including submitting annual reports to the CUWCC.

9-7. Other Demand Management Measures

The following is a list of current and typical program offerings are provided for information purposes only. The District plans to continue to partner with SJWD, RWA and SMUD to support incentive programs.

- *Residential Assistance Programs*

The District partners with RWA's Regional Water Efficiency Program to provide customers with conservation information. In addition to taking part in RWA's program, the District includes audits as an integral part of their metering program, distributes brochures at events, and provides welcome packets to all new owners in the District, encouraging customers to participate in their audit program.

- *Landscape Water Surveys*

The District's program "Free Water Assessment Program" also provides customers with free landscape water surveys in which an expert comes to the customer's residence and examines the existing irrigation system, before offering recommendations that should increase the efficiency and effectiveness of the system. The representative also provides suggested timelines for best irrigation and planting.

- *High-Efficiency Clothes Washers*

The District's customers are eligible to participate in the HECW provided in partnership with SMUD. The water efficiency of clothes washers is represented by the "water factor," which is a measure of the amount of water used to wash a standard load of laundry. Washers with a lower water factor save more water.

- *WaterSense Specification (WSS) Toilets*

The District's customers are eligible to participate in the 1.28 gallon per flush HET exchange program. The District offers a free HET to single family residential (Maximum of 2) and multifamily residential (Maximum of 10) customers in exchange for toilets that flush greater than 3.5 gallons per flush. The District has partnered with Regional Water Authority Regional Water Efficiency Programs and SRCSD.

- *Commercial, Industrial, and Institutional DMMs*

The District offers all of its conservation programs through the District newsletter when published, bill inserts, billing notices, website and events. Currently, the toilet replacement project offers HET rebates to CII customers.

- *Large Landscape*

The District offers irrigation audits to large landscape accounts through District newsletters, bills and community events. Information includes audit availability, controllers and services availability, over watering evaluations, specific drought watering instructions, drought resistant landscapes, irrigation strategies and other conservation methods.

9-8. Planned Implementation to Achieve Water Use Targets

Effective implementation of BMPs is critical to ensuring the long-term success of The District's conservation efforts. The District will utilize quantitative methods to assess the effectiveness of each BMP, to the extent practicable. The District will track the impact of new conservation pricing by using its upgraded billing system to carefully monitor consumption of residential customers.

The effectiveness of implementing Public Education BMPs will be measured by tracking the number of public outreach events and education programs where customers receive information on conservation. A successful public information program should encourage customers to take advantage of conservation incentives being offered by the District, RWA, SJWD, and SMUD as Programmatic DMMs. By encouraging conservation, these measures will continue to contribute to reducing the District's water use.

9-9. Consideration of Economic Impacts

Funding for all District conservation activities is subject to approval by the ratepayers and District Board of Directors before programs can be implemented, therefore the economic impacts of complying with SBX7-7 have not yet been fully determined. However, since it is expected that most of the water savings required to comply with SBX7-7 will be achieved through metering, this approach should provide an equitable cost-sharing mechanism across all water use sectors. The annual costs associated with implementing all traditional CUWCC programmatic BMPs cannot be determined because it represents the combined efforts of RWA and the District, where funding levels, incentives and particular measures change from year to year. To continue benefiting customers, District will continue to take advantage of available partnership programs that will make conservation programs more efficient and cost effective. Further discussion of revenue and expenditure impacts was discussed in Section 8-6.

10.0 Plan Adoption, Submittal, and Implementation

The Act requires the encouragement of public participation and a public hearing prior to the adoption of the 2015 UWMP. In order to reach the "diverse social, cultural, and economic elements of the population" within the District's service area, a public hearing was held on May 9, 2016 at the District Office in Fair Oaks, California and included a presentation to the public. This session was held for review and comment of the draft UWMP before adoption by the District.

The following notifications were sent to all cities and counties within which the District provides water:

- **60-Day Notification Letters:** Letters were sent at least 60-days prior to the public hearing to provide notification that the District was preparing its 2015 UWMP.
- **Notice of Public Hearing:** Letters were sent out at least 2 weeks prior to the public hearing to provide notice of the planned time and location of the public hearing. These letters were also to inform that a Public Draft of the District's 2015 UWMP was available for public review on the District's website and at the District office.

Both notification letters are included in Attachment K.

Table 10- 1. Notifications to Cities and Counties.

City Name	60 Day Notice	Notice of Public Hearing
Add additional rows as needed		
Citrus Heights	☑	☑
Folsom	☑	☑
Rancho Cordova	☑	☑
County Name *Drop Down List*	60 Day Notice	Notice of Public Hearing
Add additional rows as needed		
Sacramento County	☑	☑

In addition to letter notifications, the District published notices in the Sacramento Bee which included the time and place of the public hearing as well as the location where the draft Plan was available for public inspection (Attachment L). Two newspaper notices were published: the first was 2 weeks prior to the public hearing, and the second was 1 week prior to the public hearing.

The public hearing provided an opportunity for the District's customers, residents, and employees in the service area to learn about the District's water supply and the plans to continue providing reliable, safe, and high-quality water into the future. With no comments received from the public, the District Board adopted the 2015 UWMP at their June 13, 2016 meeting. The resolution adopting the UWMP by the Board of Directors is included as Attachment M.

Within 30 days of Board adoption, the UWMP was submitted and distributed as follows:

- Electronic submittal to DWR (prior to July 1, 2016 deadline)
- CD submittal to the California State Library
- CD submittal to all cities and counties within which the District provides water
- Posting on the District website for public access

Attachment A: UWMP Checklist Arranged by Subject

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UWMP Checklist Arranged by Subject

CWC Section	UWMP Requirement	Subject	Guidebook Location	FOWD UWMP Section
10620(b)	Every person that becomes an urban water supplier shall adopt an urban water management plan within one year after it has become an urban water supplier.	Plan Preparation	Section 2.1	**2-1**
10620(d)(2)	Coordinate the preparation of its plan with other appropriate agencies in the area, including other water suppliers that share a common source, water management agencies, and relevant public agencies, to the extent practicable.	Plan Preparation	Section 2.5.2	**2-3**
10642	Provide supporting documentation that the water supplier has encouraged active involvement of diverse social, cultural, and economic elements of the population within the service area prior to and during the preparation of the plan.	Plan Preparation	Section 2.5.2	2-3 & 10.0
10631(a)	Describe the water supplier service area.	System Description	Section 3.1	**3-1**
10631(a)	Describe the climate of the service area of the supplier.	System Description	Section 3.3	**3-3**
10631(a)	Provide population projections for 2020, 2025, 2030, and 2035.	System Description	Section 3.4	**3-5-2**
10631(a)	Describe other demographic factors affecting the supplier's water management planning.	System Description	Section 3.4	**3-4**
10631(a)	Indicate the current population of the service area.	System Description and Baselines and Targets	Sections 3.4 and 5.4	**3-5-1**
10631(e)(1)	Quantify past, current, and projected water use, identifying the uses among water use sectors.	System Water Use	Section 4.2	**4-1 through 4-3**
10631(e)(3)(A)	Report the distribution system water loss for the most recent 12-month period available.	System Water Use	Section 4.3	**4-4**
10631.1(a)	Include projected water use needed for lower income housing projected in the service area of the supplier.	System Water Use	Section 4.5	**4-6**
10608.20(b)	Retail suppliers shall adopt a 2020 water use target using one of four methods.	Baselines and Targets	Section 5.7 and App E	**5-2**

FAIR OAKS
WATER DISTRICT

10608.20(e)	Retail suppliers shall provide baseline daily per capita water use, urban water use target, interim urban water use target, and compliance daily per capita water use, along with the bases for determining those estimates, including references to supporting data.	Baselines and Targets	Chapter 5 and App E	**5-1**
10608.22	Retail suppliers' per capita daily water use reduction shall be no less than 5 percent of base daily per capita water use of the 5 year baseline. This does not apply is the suppliers base GPCD is at or below 100.	Baselines and Targets	Section 5.7.2	**5-2**
10608.24(a)	Retail suppliers shall meet their interim target by December 31, 2015.	Baselines and Targets	Section 5.8 and App E	**5-2**
1608.24(d)(2)	If the retail supplier adjusts its compliance GPCD using weather normalization, economic adjustment, or extraordinary events, it shall provide the basis for, and data supporting the adjustment.	Baselines and Targets	Section 5.8.2	**n/a**
10608.36	Wholesale suppliers shall include an assessment of present and proposed future measures, programs, and policies to help their retail water suppliers achieve targeted water use reductions.	Baselines and Targets	Section 5.1	**n/a**
10608.40	Retail suppliers shall report on their progress in meeting their water use targets. The data shall be reported using a standardized form.	Baselines and Targets	Section 5.8 and App E	**5-2**
10631(b)	Identify and quantify the existing and planned sources of water available for 2015, 2020, 2025, 2030, and 2035.	System Supplies	Chapter 6	**6-8**
10631(b)	Indicate whether groundwater is an existing or planned source of water available to the supplier.	System Supplies	Section 6.2	**6-2 & 6-8**
10631(b)(1)	Indicate whether a groundwater management plan has been adopted by the water supplier or if there is any other specific authorization for groundwater management. Include a copy of the plan or authorization.	System Supplies	Section 6.2.2	**6-2**
10631(b)(2)	Describe the groundwater basin.	System Supplies	Section 6.2.1	**6-2**
10631(b)(2)	Indicate if the basin has been adjudicated and include a copy of the court order or decree and a description of the amount of water the supplier has the legal right to pump.	System Supplies	Section 6.2.2	**6-2-1 (not adjudicated)**

10631(b)(2)	For unadjudicated basins, indicate whether or not the department has identified the basin as overdrafted, or projected to become overdrafted. Describe efforts by the supplier to eliminate the long-term overdraft condition.	System Supplies	Section 6.2.3	**6-2-1**
10631(b)(3)	Provide a detailed description and analysis of the location, amount, and sufficiency of groundwater pumped by the urban water supplier for the past five years	System Supplies	Section 6.2.4	**6-2-1 & 6-2-3**
10631(b)(4)	Provide a detailed description and analysis of the amount and location of groundwater that is projected to be pumped.	System Supplies	Sections 6.2 and 6.9	**6-8**
10631(d)	Describe the opportunities for exchanges or transfers of water on a short-term or long-term basis.	System Supplies	Section 6.7	**6-6**
10631(g)	Describe the expected future water supply projects and programs that may be undertaken by the water supplier to address water supply reliability in average, single-dry, and multiple-dry years.	System Supplies	Section 6.8	**6-7**
10631(i)	Describe desalinated water project opportunities for long-term supply.	System Supplies	Section 6.6	**6-5**
10631(j)	Retail suppliers will include documentation that they have provided their wholesale supplier(s) – if any - with water use projections from that source.	System Supplies	Section 2.5.1	**4-7**
10631(j)	Wholesale suppliers will include documentation that they have provided their urban water suppliers with identification and quantification of the existing and planned sources of water available from the wholesale to the urban supplier during various water year types.	System Supplies	Section 2.5.1	**n/a**
10633	For wastewater and recycled water, coordinate with local water, wastewater, groundwater, and planning agencies that operate within the supplier's service area.	System Supplies (Recycled Water)	Section 6.5.1	**6-4**
10633(a)	Describe the wastewater collection and treatment systems in the supplier's service area. Include quantification of the amount of wastewater collected and treated and the methods of wastewater disposal.	System Supplies (Recycled Water)	Section 6.5.2	**6-4**
10633(b)	Describe the quantity of treated wastewater that meets recycled water standards, is being discharged, and is otherwise available for use in a recycled water project.	System Supplies (Recycled Water)	Section 6.5.2.2	**6-4**

10633(c)	Describe the recycled water currently being used in the supplier's service area.	System Supplies (Recycled Water)	Section 6.5.3 and 6.5.4	**6-4**
10633(d)	Describe and quantify the potential uses of recycled water and provide a determination of the technical and economic feasibility of those uses.	System Supplies (Recycled Water)	Section 6.5.4	**6-4-1**
10633(e)	Describe the projected use of recycled water within the supplier's service area at the end of 5, 10, 15, and 20 years, and a description of the actual use of recycled water in comparison to uses previously projected.	System Supplies (Recycled Water)	Section 6.5.4	**6-4-1**
10633(f)	Describe the actions which may be taken to encourage the use of recycled water and the projected results of these actions in terms of acre-feet of recycled water used per year.	System Supplies (Recycled Water)	Section 6.5.5	**6-4-1**
10633(g)	Provide a plan for optimizing the use of recycled water in the supplier's service area.	System Supplies (Recycled Water)	Section 6.5.5	**6-4-1**
10620(f)	Describe water management tools and options to maximize resources and minimize the need to import water from other regions.	Water Supply Reliability Assessment	Section 7.4	**7-5**
10631(c)(1)	Describe the reliability of the water supply and vulnerability to seasonal or climatic shortage.	Water Supply Reliability Assessment	Section 7.1	**7.0**
10631(c)(1)	Provide data for an average water year, a single dry water year, and multiple dry water years	Water Supply Reliability Assessment	Section 7.2	**7-4**
10631(c)(2)	For any water source that may not be available at a consistent level of use, describe plans to supplement or replace that source.	Water Supply Reliability Assessment	Section 7.1	**7-4**
10634	Provide information on the quality of existing sources of water available to the supplier and the manner in which water quality affects water management strategies and supply reliability	Water Supply Reliability Assessment	Section 7.1	**7-3**
10635(a)	Assess the water supply reliability during normal, dry, and multiple dry water years by comparing the total water supply sources available to the water supplier with the total projected water use over the next 20 years.	Water Supply Reliability Assessment	Section 7.3	**7-4**
10632(a) and 10632(a)(1)	Provide an urban water shortage contingency analysis that specifies stages of action and an outline of specific water supply conditions at each stage.	Water Shortage Contingency Planning	Section 8.1	**8-1**

10632(a)(2)	Provide an estimate of the minimum water supply available during each of the next three water years based on the driest three-year historic sequence for the agency.	Water Shortage Contingency Planning	Section 8.9	**8-9**
10632(a)(3)	Identify actions to be undertaken by the urban water supplier in case of a catastrophic interruption of water supplies.	Water Shortage Contingency Planning	Section 8.8	**8-8**
10632(a)(4)	Identify mandatory prohibitions against specific water use practices during water shortages.	Water Shortage Contingency Planning	Section 8.2	**8-2**
10632(a)(5)	Specify consumption reduction methods in the most restrictive stages.	Water Shortage Contingency Planning	Section 8.4	**8-4**
10632(a)(6)	Indicated penalties or charges for excessive use, where applicable.	Water Shortage Contingency Planning	Section 8.3	**8-3**
10632(a)(7)	Provide an analysis of the impacts of each of the actions and conditions in the water shortage contingency analysis on the revenues and expenditures of the urban water supplier, and proposed measures to overcome those impacts.	Water Shortage Contingency Planning	Section 8.6	**8-6**
10632(a)(8)	Provide a draft water shortage contingency resolution or ordinance.	Water Shortage Contingency Planning	Section 8.7	**8-7**
10632(a)(9)	Indicate a mechanism for determining actual reductions in water use pursuant to the water shortage contingency analysis.	Water Shortage Contingency Planning	Section 8.5	**8-5**
10631(f)(1)	Retail suppliers shall provide a description of the nature and extent of each demand management measure implemented over the past five years. The description will address specific measures listed in code.	Demand Management Measures	Sections 9.2 and 9.3	**9.0**
10631(f)(2)	Wholesale suppliers shall describe specific demand management measures listed in code, their distribution system asset management program, and supplier assistance program.	Demand Management Measures	Sections 9.1 and 9.3	**n/a**
10631(j)	CUWCC members may submit their 2013-2014 CUWCC BMP annual reports in lieu of, or in addition to, describing the DMM implementation in their UWMPs. This option is only allowable if the supplier has been found to be in full compliance with the CUWCC MOU.	Demand Management Measures	Section 9.5	**9.0 & Attachment J**

10608.26(a)	Retail suppliers shall conduct a public hearing to discuss adoption, implementation, and economic impact of water use targets.	Plan Adoption, Submittal, and Implementation	Section 10.3	**10.0**
10621(b)	Notify, at least 60 days prior to the public hearing, any city or county within which the supplier provides water that the urban water supplier will be reviewing the plan and considering amendments or changes to the plan.	Plan Adoption, Submittal, and Implementation	Section 10.2.1	**10.0**
10621(d)	Each urban water supplier shall update and submit its 2015 plan to the department by July 1, 2016.	Plan Adoption, Submittal, and Implementation	Sections 10.3.1 and 10.4	**10.0**
10635(b)	Provide supporting documentation that Water Shortage Contingency Plan has been, or will be, provided to any city or county within which it provides water, no later than 60 days after the submission of the plan to DWR.	Plan Adoption, Submittal, and Implementation	Section 10.4.4	**10.0**
10642	Provide supporting documentation that the urban water supplier made the plan available for public inspection, published notice of the public hearing, and held a public hearing about the plan.	Plan Adoption, Submittal, and Implementation	Sections 10.2.2, 10.3, and 10.5	**10.0, Attachment K, & Attachment L**
10642	The water supplier is to provide the time and place of the hearing to any city or county within which the supplier provides water.	Plan Adoption, Submittal, and Implementation	Sections 10.2.1	**10.0**
10642	Provide supporting documentation that the plan has been adopted as prepared or modified.	Plan Adoption, Submittal, and Implementation	Section 10.3.1	**10.0 & Attachment M**
10644(a)	Provide supporting documentation that the urban water supplier has submitted this UWMP to the California State Library.	Plan Adoption, Submittal, and Implementation	Section 10.4.3	**10.0**
10644(a)(1)	Provide supporting documentation that the urban water supplier has submitted this UWMP to any city or county within which the supplier provides water no later than 30 days after adoption.	Plan Adoption, Submittal, and Implementation	Section 10.4.4	**10.0**
10644(a)(2)	The plan, or amendments to the plan, submitted to the department shall be submitted electronically.	Plan Adoption, Submittal, and Implementation	Sections 10.4.1 and 10.4.2	**10.0**
10645	Provide supporting documentation that, not later than 30 days after filing a copy of its plan with the department, the supplier has or will make the plan available for public review during normal business hours.	Plan Adoption, Submittal, and Implementation	Section 10.5	**10.0**

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Attachment B: DWR Population Tool Output

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WUEdata - Fair Oaks Water District

Home Sign Out

Please print this page to a PDF and include as part of your UWMP submittal.

Confirmation Information

Generated By	Water Supplier Name	Confirmation #	Generated On
Michael Rossiter	Fair Oaks Water District	3645612418	4/5/2016 9:28:45 AM

Boundary Information

Census Year	Boundary Filename	Internal Boundary ID
1990	FOWD_Pre2007.kml	801
2000	FOWD_Pre2007.kml	801
2010	FOWD_Current_Bndy.kml	800

Baseline Period Ranges

10 to 15-year baseline period

Number of years in baseline period:	10
Year beginning baseline period range:	1995
Year ending baseline period range[1]:	2004

5-year baseline period

Year beginning baseline period range:	2004
Year ending baseline period range[2]:	2008

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

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

Persons per Connection

Year	Census Block Level Total Population	Number of Connections *	Persons per Connection
1990	35,279	11891	2.97
1991	-	-	2.95
1992	-	-	2.92
1993	-	-	2.90
1994	-	-	2.87
1995	-	-	2.85
1996	-	-	2.83
1997	-	-	2.80
1998	-	-	2.78
1999	-	-	2.75
2000	35,869	13147	2.73
2001	-	-	2.72
2002	-	-	2.70
2003	-	-	2.69
2004	-	-	2.68
2005	-	-	2.67
2006	-	-	2.65
2007	-	-	2.64
2008	-	-	2.63
2009	-	-	2.61
2010	36,681	14129	2.60
2015	-	-	2.53 **

Population Using Persons-Per-Connection

Year		Number of Connections *	Persons per Connection	Total Population
10 to 15 Year Baseline Population Calculations				
Year 1	1995	12639	2.85	36,021
Year 2	1996	12788	2.83	36,139
Year 3	1997	12938	2.80	36,252
Year 4	1998	12952	2.78	35,981
Year 5	1999	13050	2.75	35,940
Year 6	2000	13147	2.73	35,869
Year 7	2001	13179	2.72	35,807
Year 8	2002	13248	2.70	35,823
Year 9	2003	13370	2.69	35,979
Year 10	2004	13471	2.68	36,075
5 Year Baseline Population Calculations				
Year 1	2004	13471	2.68	36,075
Year 2	2005	13544	2.67	36,095
Year 3	2006	13643	2.65	36,181
Year 4	2007	13700	2.64	36,154
Year 5	2008	13843	2.63	36,352
2015 Compliance Year Population Calculations				
2015		13894	2.53 **	35,114

Hide Print Confirmation

QUESTIONS / ISSUES? CONTACT THE WUEDATA HELP DESK

Attachment C: SACOG Population Forecast by Traffic Analysis Zone (TAZ)

FAIR OAKS
WATER DISTRICT

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Michael Rossiter

From: Tina Glover <TGlover@sacog.org>
Sent: Wednesday, March 23, 2016 10:11 AM
To: Michael Rossiter
Subject: SACOG 2016 MTP Forecast Data
Attachments: SACOG-POP_DU_EMP_by_all_geog_12_20_36.xlsx

Hi Mike,

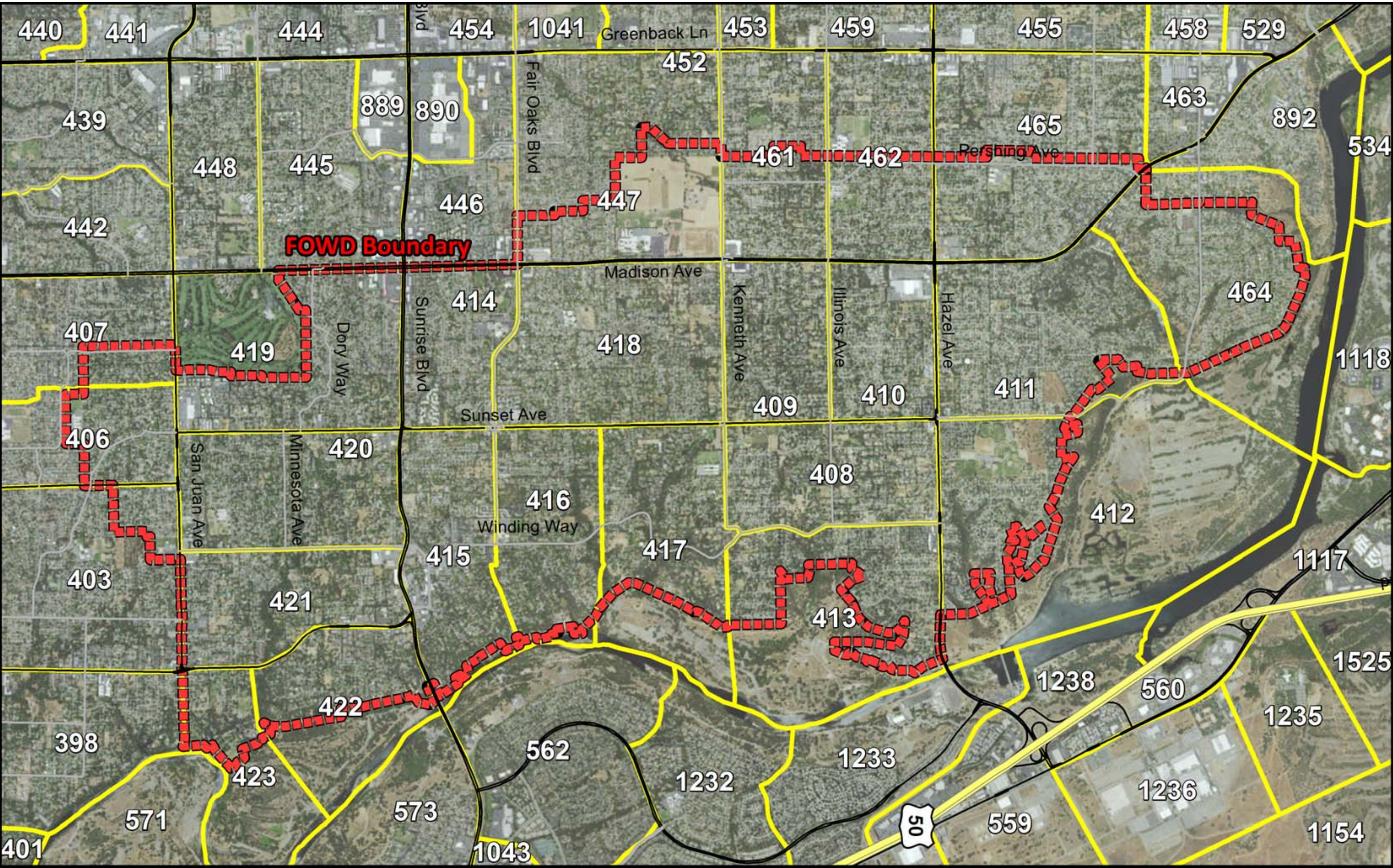
As we discussed over the phone, the 2016 MTP model data is still in the process of being rolled out. Details are below:

As of February 2016, this SACOG generated parcel level forecast that underlies the 2016 Metropolitan Transportation Plan/Sustainable Community Strategy (MTP/SCS) uses a 2012 base year with forecast figures for 2020 and 2036 and is available for select geographies. Variables are household population, housing units and total jobs at County, Traffic Analysis Zone (TAZ), Regional Analysis District (RAD), Jurisdiction and Sphere of Influence (SOI where appropriate), 2010 Census Designated Place (CDP), and ZIP Code Tabulation Area (ZCTA) levels. Due to different protocols among GIS models for tallying spatial data, housing unit and employee numbers in this summary may differ marginally from those reported in the MTP/SCS as well as the CDP summary.

The SACOG GIS Clearinghouse is here for geographies: http://www.sacog.org/regional-gis-clearninghouse
The SACOG Interactive Map Viewer is here: http://mapping.sacog.org/datacenter/
Again, the map viewer is currently loaded with the parcel level 2012 MTP which used a 2008 base year with projections to 2020 and 2035. We hope to have that parcel level data refreshed within the next week or so. Firefox is the best browser to use this tool, Chrome does not work well. Any shape delineated using the parcel tool must meet a minimum threshold of 1,000 residents and 100 jobs.

Please let me know if you have any questions, I'll also add your email to be notified when the new data is loaded.

Tina Glover
Sacramento Area Council of Governments (SACOG)
1415 L Street, Suite 300
Sacramento, CA 95814
Main: 916.321.9000
Direct: 916.340.6207
tglover@sacog.org



FAIR OAKS WATER DISTRICT

N

0 0.5 1 Miles

APRIL 2016

URBAN WATER MANAGEMENT PLAN

SACOG Traffic Analysis Zones

FIGURE

3-5

FOWD POPULATION PROJECTIONS

					SACOG Data[a] for Total TAZ									SACOG Data[a] for Portion of TAZ within FOWD								
					2012			2020			2036			2012			2020			2036		
TAZ #	Total TAZ Acres	TAZ Acres within FOWD	Percentage of TAZ within FOWD	City	Population	Dwelling Units	Employment	Population	Dwelling Units	Employment	Population	Dwelling Units	Employment	Population	Dwelling Units	Employment	Population	Dwelling Units	Employment	Population	Dwelling Units	Employment
403	603.1	56.6	9.4%	Carmichael	4,148	1,843	226	4,535	1,875	226	4,911	1,936	221	389	173	21	426	176	21	461	182	21
406	254.2	144.4	56.8%	Carmichael	1,820	758	218	2,029	784	224	2,050	806	219	1,034	431	124	1,153	445	127	1,165	458	124
407	305.2	53.0	17.3%	Carmichael	2,915	1,196	95	3,135	1,236	94	3,218	1,266	92	506	208	17	544	214	16	558	220	16
408	322.6	322.6	100.0%	Fair Oaks	1,272	513	114	1,501	535	112	1,563	592	110	1,272	513	114	1,501	535	112	1,563	592	110
409	246.6	246.6	100.0%	Fair Oaks	1,179	493	141	1,375	498	139	1,491	547	136	1,179	493	141	1,375	498	139	1,491	547	136
410	242.1	242.1	100.0%	Fair Oaks	1,854	795	557	2,059	826	550	2,125	852	538	1,854	795	557	2,059	826	550	2,125	852	538
411	496.6	470.6	94.8%	Fair Oaks	3,841	1,564	390	4,087	1,571	385	4,259	1,634	377	3,639	1,482	369	3,872	1,488	365	4,035	1,548	357
412	1029.1	283.9	27.6%	Fair Oaks	1,312	558	884	1,461	559	874	1,519	581	855	362	154	244	403	154	241	419	160	236
413	540.3	281.1	52.0%	Fair Oaks	1,747	760	180	2,138	775	178	2,075	824	175	909	396	94	1,112	403	93	1,079	429	91
414	238.2	238.2	100.0%	Fair Oaks	1,803	776	690	1,989	804	708	2,864	1,172	1,117	1,803	776	690	1,989	804	708	2,864	1,171	1,116
415	342.7	326.4	95.2%	Fair Oaks	2,281	1,096	935	2,467	1,119	1,142	2,643	1,189	1,325	2,173	1,044	890	2,350	1,066	1,088	2,517	1,133	1,262
416	315.2	302.0	95.8%	Fair Oaks	1,357	640	42	1,481	647	42	1,646	700	146	1,300	614	40	1,419	620	40	1,577	671	140
417	446.5	319.1	71.5%	Fair Oaks	688	354	45	793	355	49	915	380	48	492	253	32	567	253	35	654	272	34
418	510.4	510.4	100.0%	Fair Oaks	2,826	1,146	507	3,083	1,211	548	3,303	1,260	569	2,826	1,146	507	3,083	1,211	548	3,303	1,260	569
419	521.8	340.1	65.2%	Fair Oaks	3,249	1,540	796	3,650	1,589	786	3,677	1,611	770	2,118	1,004	519	2,379	1,035	513	2,397	1,050	502
420	378.0	378.0	100.0%	Fair Oaks	2,023	902	239	2,215	921	251	2,389	960	246	2,023	902	239	2,215	921	251	2,389	960	246
421	312.7	312.6	100.0%	Fair Oaks	1,264	532	375	1,321	543	370	1,583	651	439	1,264	532	375	1,321	543	370	1,582	651	439
422	331.5	189.0	57.0%	Fair Oaks	1,277	633	226	1,468	643	223	1,641	678	276	728	361	129	837	366	127	935	386	158
423	269.4	87.0	32.3%	Fair Oaks	242	133	187	308	141	189	341	161	185	78	43	60	99	46	61	110	52	60
447	618.9	254.5	41.1%	Fair Oaks	3,517	1,503	515	4,796	1,882	551	5,135	1,926	548	1,446	618	212	1,972	774	227	2,111	792	225
461	319.5	161.9	50.7%	Orangevale	1,997	829	428	2,300	880	432	2,359	913	469	1,012	420	217	1,166	446	219	1,195	462	237
462	321.4	160.5	49.9%	Orangevale	2,374	989	532	2,536	995	602	2,623	1,012	647	1,185	494	266	1,266	497	301	1,310	505	323
464	625.9	332.3	53.1%	Orangevale	2,926	1,100	391	3,064	1,105	392	3,204	1,151	383	1,553	584	208	1,627	586	208	1,701	611	203
465	576.0	256.6	44.5%	Orangevale	4,660	1,961	572	5,012	1,988	615	5,180	2,063	720	2,076	873	255	2,233	886	274	2,308	919	321
													Totals:	33,220	14,307	6,319	36,966	14,795	6,634	39,850	15,884	7,464
													Growth Rates:	--	--	--	11.28%	3.4%	5.0%	7.8%	7.4%	12.5%
													Annual Growth Rate:	--	--	--	1.41%	0.43%	0.62%	0.49%	0.46%	0.78%

Annual Growth Rates from 2012-2020

Annual Growth Rates from 2020-2036

FOWD PROJECTED POPULATION

Year	**2015**	2016	2017	2018	2019	**2020**	2021	2022	2023	2024	**2025**	2026	2027	2028	2029	**2030**	2031	2032	2033	2034	**2035**
Population	**35,114**	35,609	36,111	36,620	37,136	**37,659**	37,843	38,027	38,213	38,399	**38,587**	38,775	38,964	39,154	39,345	**39,537**	39,729	39,923	40,118	40,313	**40,510**

2015 Population from DWR Population Tool

Annual growth rate of 1.41% applied between 2015-2020

Annual growth rate of 0.49% applied between 2020-2035

[a] **Data Source:** SACOG. *Modeling Projections for 2012, 2020, and 2036.* Dated February 2016. Provided by SACOG via email correspondence on 3/23/16.

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Attachment D: Documentation of Data Exchanged with San Juan Water District

FAIR OAKS
WATER DISTRICT

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Michael Rossiter

From: Michael Rossiter
Sent: Monday, April 11, 2016 3:35 PM
To: 'Lisa Brown'
Cc: 'Michael Nisenboym'
Subject: RE: Water Supply Reliability Memo.doc
Attachments: FOWD 2015 UWMP Projections_04-07-16.docx

Lisa-
Attached is the information requested from FOWD's UWMP. Please let me know if you need anything else.
Thanks,

Mike Rossiter, PE, CFM
--
Peterson Brustad, Inc.
1180 Iron Point Rd., Suite 260
Folsom, CA 95630
Office: (916) 608-2212 ext. 127
Cell: (916) 416-6599
Fax: (916) 608-2232

From: Michael Rossiter
Sent: Friday, April 01, 2016 1:24 PM
To: 'Lisa Brown'
Cc: 'Michael Nisenboym'
Subject: RE: Water Supply Reliability Memo.doc

Lisa,

FYI- FOWD is in the process of reviewing the population projections and water use projections for the UWMP. We're aiming to get you our tables by next week.

Thanks,

Mike Rossiter, PE, CFM
--
Peterson Brustad, Inc.
1180 Iron Point Rd., Suite 260
Folsom, CA 95630
Office: (916) 608-2212 ext. 127
Cell: (916) 416-6599
Fax: (916) 608-2232

From: Lisa Brown [mailto:lbrown@sjwd.org]
Sent: Thursday, March 31, 2016 8:08 AM
To: Sharon Wilcox; 'rchurch@chwd.org'; 'Tom Gray'
Cc: Michael Rossiter; 'jim crowley'; 'Tony Firenzi'; Keith Durkin
Subject: Water Supply Reliability Memo.doc

Hello all,

FAIR OAKS WATER DISTRICT

2015 URBAN WATER MANAGEMENT PLAN

PROJECTED POPULATION AND WATER USE

Table 3-1 Retail: Population - Current and Projected						
Population Served	2015	2020	2025	2030	2035	2040*(opt)*
	35,114	37,659	38,587	39,537	40,510	--
NOTES: 2015 population based on DWR Population Tool. Projections beyond 2015 based on SACOG estimated growth rates within the District service area.						

Table 4-2 Retail: Demands for Potable and Raw Water - Projected						
Use Type *(Add additional rows as needed)*	Additional Description *(as needed)*	Projected Water Use *Report To the Extent that Records are Available*				
Use Drop down list *May select each use multiple times These are the only Use Types that will be recognized by the WUEdata online submittal tool*		2020	2025	2030	2035	2040-opt
Single Family		8,732	8,947	9,167	9,393	--
Multi-Family		807	827	847	868	--
Commercial		382	398	413	430	--
Institutional/Governmental		408	424	441	458	--
Landscape		474	493	513	533	--
Other	O&M	30	31	32	33	--
Other	Unaccounted	935	960	985	1,011	--
	TOTAL	11,768	12,080	12,398	12,726	0
NOTES: Units in acre-feet/year.						

FOWD Table 4-7. Surface Water Use Projections.

Type	Wholesaler	Contracted Volume	2020	2025	2030	2035
Surface Water	SJWD	Varies	10,591	10,872	11,158	11,453
NOTES: Units in acre-feet/year. Volumes listed only include projected surface water demands. Surface water demands represent 90% of the District's total demands.						

Michael Rossiter

From: Lisa Brown <lbrown@sjwd.org>
Sent: Thursday, March 31, 2016 8:08 AM
To: Sharon Wilcox; 'rchurch@chwd.org'; 'Tom Gray'
Cc: Michael Rossiter; 'jim crowley'; 'Tony Firenzi'; Keith Durkin
Subject: Water Supply Reliability Memo.doc
Attachments: Water Supply Reliability Memo.doc

Hello all,
I apologize for the delay but please find attached the water supply tables from our UWMP draft. This will help you complete your plans. In addition, would you please complete the population and demand projections for your agencies and return the information to me? I know we are all on a tight time frame so please respond as soon as you possibly can.

Tony,
This email, for you, is for information only.

Sincerely,
Lisa

Lisa Brown | Customer Service Manager
San Juan Water District | sjwd.org
Main: 916-791-0115 | Direct: 916-791-6948
Follow us on Facebook!

30 March 2016

Memorandum

From: Lisa Brown, Customer Service Manager
San Juan Water District

Subject: San Juan Water District 2015 Urban Water Management Plan
Supply Reliability and Projections

San Juan Water District (SJWD) is currently in the process of preparing its 2015 Urban Water Management Plan (UWMP) as required by State of California Law through the Urban Water Management Planning Act. SJWD obtains its water supply from surface water through Folsom Lake. The purpose of this memorandum is to provide SJWD's wholesale customer agencies with preliminary information for use in the development of their 2015 UWMPs and to request information SJWD needs to complete its UWMP as a wholesale provider.

This memo includes the following SJWD preliminary information:

- SJWD water supply sources
- SJWD water supply reliability

And requests the following information from wholesale customer agencies:

- Population projections
- Demand projections

The information provided in this memorandum is preliminary and may be different from what is presented in the adopted 2015 UWMP. If you have any questions or concerns please feel free to contact me at lbrown@sjwd.org or 791-6948.

Michael Rossiter

From: Lisa Brown <lbrown@sjwd.org>
Sent: Thursday, April 14, 2016 1:10 PM
To: 'jim crowley'; Michael Rossiter
Subject: Water Supply Reliability Memo_rev04132016.doc
Attachments: Water Supply Reliability Memo_rev04132016.doc

Hello!
I apologize for the original inaccuracy but we have revised the reliability tables to incorporate a reduction in PCWA water in dry years. The demand information will be completed when we receive the data from all wholesale agencies.

Thank you!
Lisa

April 14, 2016

SJWD Water Supply Sources

The following DWR tables represent SJWD's amended projected water supply information.

Table 6-7 Wholesale: Expected Future Water Supply Projects or Programs						
☑	No expected future water supply projects or programs that provide a quantifiable increase to the agency's water supply. Supplier will not complete the table below.					
☐	Some or all of the supplier's future water supply projects or programs are not compatible with this table and are described in a narrative format.					
	Provide page location of narrative in the UWMP					
Name of Future Projects or Programs	Joint Project with other agencies?		Description	Planned Implementation Year	Planned for Use in Year Type	Expected Increase in Water Supply to Agency
	Y/N	Agency Name?				
NOTES:						

Table 6-8 Wholesale: Water Supplies — Actual				
Water Supply	Additional Detail on Water Supply	2015		
		Actual Volume	Water Quality	Total Right or Safe Yield
Surface water	USBR CVP Folsom Lake	0	Raw Water	0
Surface water	Pre-1914 Right	31,234	Raw Water	33,000
Surface water	Placer County Water Agency	10,000	Raw Water	10000
	Total	41,234		43,000

NOTES:
(a) USBR CVP Folsom Lake contract water is subject to CVP M&I Water Shortage Policy and 2015 supplies were reduced to 50% of historical use of CVP supply as calculated by USBR. According to USBR, San Juan's historical use of CVP supply is 1,593 AF (USBR, 2/24/2015).
(b) In 2015, Folsom Reservoir inflow was projected to be below 400,000 AFY. Therefore the District's PCWA contract supply was reduced to 10,000 AF.
(c) Supply volume in units of AF.

Table 6-9 Wholesale: Water Supplies — Projected											
Water Supply	Additional Detail on Water Supply	**Projected Water Supply** *Report To the Extent Practicable*									
		2020		**2025**		**2030**		**2035**		**2040** *(opt)*	
		Reasonably Available Volume	Total Right or Safe Yield	Available Volume	Total Right	Available Volume	Total Right	Available Volume	Total Right	Available Volume	Total Right
Surface water	USBR CVP Folsom Lake	24,200	24,200	24,200	24,200	24,200	24,200	24,200	24,200	24,200	24,200
Surface water	Pre-1914 Right	33,000	33,000	33,000	33,000	33,000	33,000	33,000	33,000	33,000	33,000
Surface water	Placer County Water Agency	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000	25,000
	Total	82,200	82,200	82,200	82,200	82,200	82,200	82,200	82,200	82,200	82,200

NOTES:
1. Projected water supply is for a normal year based on Sacramento Water Forum definition of Folsom Reservoir inflow projected above 950,000 AF.
2. Units are in AFY

Water Supply Reliability

The following tables relate to reliability of SWJD water supplies.

Table 7-1 Wholesale: Basis of Water Year Data

Year Type	Base Year	Available Supplies if Year Type Repeats	
		Agency may provide volume only, percent only, or both	
		Volume Available	% of Average Supply
Average Year		82,200	100%
Single-Dry Year	1977	61,150	74%
Multiple-Dry Years 1st Year	1990	61,150	74%
Multiple-Dry Years 2nd Year	1991	55,100	67%
Multiple-Dry Years 3rd Year	1992	55,100	67%

Agency may use multiple versions of Table 7-1 if different water sources have different base years and the supplier chooses to report the base years for each water source separately.

NOTES:
1. Volume available is based on District water supply contracts only and does not include reductions due to Water Forum Agreement.
2. Average year assumes 100 percent availability of Water Right supply and contract supplies (based on Sacramento Water Forum definition of Folsom Reservoir inflow projected above 950,000 AF).
3. For the purposes of this analysis, it is assumed that historical USBR CVP Folsom Lake usage is equal to the full contract amount.
4. The single- and first multiple-dry years assume Folsom Reservoir inflow projected to be between 400,000 and 950,000 AFY: 100 percent availability of Water Right supply, 75 percent availability of full USBR CVP Folsom Lake contract supply, and 100 percent availability of PCWA contract supply.
5. The second and third multiple-dry years assume Folsom Reservoir inflow projected to be below 400,000 AFY: 100 percent availability of Water Right supply, 50 percent availability of full USBR CVP Folsom Lake contract supply, and 10,000 AF of PCWA contract supply.
6. Volume is in AFY.

Table 7-2 Wholesale: Normal Year Supply and Demand Comparison

	2020	2025	2030	2035	2040 *(Opt)*
Supply totals	82,200	82,200	82,200	82,200	82,200
Demand totals	29,848	65,239	70,750	76,475	82,200
Difference	52,352	16,961	11,450	5,725	0

NOTES: **Demand projections are preliminary estimates, and will be updated based on projected demands provided by wholesale customer agencies.**

(a) 1. Supply and demand volumes are in AFY.

(b) 2. Average year assumes 100 percent availability of Water Right supply and contract supplies (based on Sacramento Water Forum definition of Folsom Reservoir inflow projected above 950,000 AF).

(c) 3. Demands are the total retail and wholesale service area demands as projected in Chapter 4 Tables 4-2a and 4-3a and include future conjunctive use program.

The following assumptions are made for calculating supply and demand during single- and multiple-dry year scenarios. **Demand projections are preliminary estimates, and will be updated based on projected demand provided wholesale customer agency.**

1. Assume that Folsom Reservoir inflows are projected to be between 400,000 AFY and 950,000 AFY (non-Conference years). SJWD intends on complying with the Water Forum Agreement, which can reduce total surface water diversion in proportion to the water level in Folsom Lake to a minimum of 54,200 AFY. Therefore, it is assumed that available supply will be the minimum of 54,200 AFY. The decrease in diversion amounts will be met by a combination of reductions of PCWA and USBR CVP supply, both contractually and at the District's discretion.

2. Water supply will not be available for the City of Roseville or for conjunctive use during a single dry year.

3. Assume that District's retail service area water demands will meet SBX7-7 objectives through implementation of demand management measures described in Chapter 9.

4. The District retail water service area and wholesale customer agencies (including SJWD retail) will implement their respective Water Shortage Contingency Plans (WSCPs).

5. If the supply-demand balance shows a shortage, wholesale customers with groundwater supplies (FOWD and CHWD) will increase groundwater pumping to offset surface water supply.

SSWD groundwater will be provided to the SJWD through the Antelope Pump-Back Booster Station. This supply is only intended to be activated during dry years or when SJWD's surface water supplies are reduced. SSWD groundwater is estimated to provide an additional 5,300 AFY.

Table 7-A: Single Dry Year Supply and Demand Calculations					
	2020	**2025**	**2030**	**2035**	**2040**
Existing Supply Contracts					
Pre 1914 Rights	33,000	33,000	33,000	33,000	33,000
USBR CVP Folsom Lake Contract	24,200	24,200	24,200	24,200	24,200
PCWA Contract	25,000	25,000	25,000	25,000	25,000
Total Supply Contracts	**82,200**	**82,200**	**82,200**	**82,200**	**82,200**
Dry Year Supply Reductions					
Water Forum Agreement Maximum Reductions[(a)]	-28,000	-28,000	-28,000	-28,000	-28,000
Total Existing Supplies	**54,200**	**54,200**	**54,200**	**54,200**	**54,200**
Demand					
Wholesale Agency Demand w/o Conservation[(b)]	56,569	59,776	62,556	65,550	68,544
20x2020 Reduction in Retail Demand[(c)]	-1,596	-1,688	-1,767	-1,852	-1,938
Reduction from WSCP[(d)]	-8,246	-8,713	-9,118	-9,555	-9,991
Demand w/ Conservation	**46,726**	**49,375**	**51,671**	**54,143**	**56,616**
Supply-Demand Balance	**7,474**	**4,825**	**2,529**	**57**	**-2,416**
Supplemental Groundwater					
Additional Wholesale Groundwater Pumping[(e)]	0	0	0	0	2,416
Antelope Booster Pump-Back Station Groundwater (SSWD)[(f)]	0	0	0	0	0
Total Supplemental Groundwater	**0**	**0**	**0**	**0**	**2,416**

NOTES: **Demand projections are preliminary estimates, and will be updated based on projected demand provided wholesale customer agency.**

a. SJWD is a signatory to the Water Forum Agreement which can reduce total surface water diversion in proportion to the water level in Folsom Lake to as low as 54,200 AF.
b. Projected wholesale water demands from Chapter 4, Table 4-3a.
c. Reduction needed to meet retail SBX7-7 compliance calculated in Chapter 5.
d. 15 percent reductions from wholesale demand with SBX7-7 compliance by implementing WSCP Stage 3. See Chapter 8, Water Shortage Contingency Planning.
e. Groundwater supply from Wholesale Customer Agencies used to replace surface water supply reductions per the Water Forum Agreement and the WSCP in Chapter 8.
f. SSWD groundwater via the Antelope Booster Pump-Back Station is intended to be provided during the summer months in dry years or when SJWD's surface water supplies are reduced.

Table 7-3 and 7-4 summarize single-dry year and multiple-dry year supply and demand as described in Table 7-3 above.

Table 7-3 Wholesale: Single Dry Year Supply and Demand Comparison					
	2020	2025	2030	2035	2040 (Opt)
Supply totals	54,200	54,200	54,200	54,200	54,200
Demand totals	46,726	49,375	51,671	54,143	56,616
Difference	7,474	4,825	2,529	57	(2,416)

NOTES: **Demand projections are preliminary estimates, and will be updated based on projected demand provided wholesale customer agency.**

1. Supply and demand volumes are in AFY.
2. Dry year supply is based on the Water Forum Agreement, which reduces SJWD Folsom Lake diversions in proportion to lake levels to a minimum of 54,000 AF. Reduction will be met by a combination of reductions of PCWA and USBR CVP supply, both contractually and at the District's discretion.
3. Demands are the total retail and wholesale service area demands as projected in Chapter 4 Tables 4-2a and 4-3a and include retail water use reductions to meet SBX7-7, and implementation of WSCPs. Demand does not include conjunctive use.
4. Supply shortfall is expected to be met by supplemental groundwater pumping by SJWD Wholesale Customer Agencies with pumping capability and SSWD groundwater via the Antelope Pump-Back Booster Station.

Table 7-4 Wholesale: Multiple Dry Years Supply and Demand Comparison						
		2020	2025	2030	2035	2040 (Opt)
First year	Supply totals	54,200	54,200	54,200	54,200	54,200
	Demand totals	46,726	49,375	51,671	54,143	56,616
	Difference	7,474	4,825	2,529	57	(2,416)
Second year	Supply totals	54,200	54,200	54,200	54,200	54,200
	Demand totals	46,726	49,375	51,671	54,143	56,616
	Difference	7,474	4,825	2,529	57	(2,416)
Third year	Supply totals	54,200	54,200	54,200	54,200	54,200
	Demand totals	46,726	49,375	51,671	54,143	56,616
	Difference	7,474	4,825	2,529	57	(2,416)

NOTES: **Demand projections are preliminary estimates, and will be updated based on projected demand provided wholesale customer agency.**

1. Supply and demand volumes are in AFY.
2. Assumes Folsom Reservoir projected inflows to be between 400,000 AFY and 950,000 AFY (non-Conference years): the Water Forum Agreement reduces SJWD Folsom Lake diversions in proportion to lake levels to a minimum of 54,000 AF. Reduction will be met by a combination of reductions of PCWA and USBR CVP supply, both contractually and at the District's discretion.
3. Demands are the total retail and wholesale service area demands as projected in Chapter 4 Tables 4-2a and 4-3a and include retail water use reductions to meet SBX7-7, and implementation of WSCPs. Demand does not include conjunctive use.
4. Supply shortfall is expected to be met by supplemental groundwater pumping by SJWD Wholesale Customer Agencies with pumping capability and SSWD groundwater via the Antelope Pump-Back Booster Station.

Information Requested

SJWD requests the following information to accurately describe wholesale customer agency projections which affect supply and demand comparison and reliability analyses.

Table 3-1 Retail: Population - Current and Projected						
Population Served	2015	2020	2025	2030	2035	2040*(opt)*
NOTES:						

SJWD only requests the **total** projected water use per wholesale customer agency service area. DWR Table 4-2 is where wholesale customer agencies will report demand projections in their individual UWMPs.

Table 4-2 Retail: Demands for Potable and Raw Water - Projected						
Use Type	Additional Description	Projected Water Use				
		2020	2025	2030	2035	2040-opt
Single Family						
Multi-Family						
Commercial						
Institutional / Governmental						
Landscape						
Other						
Losses						
Agricultural irrigation						
TOTAL						
NOTES: Projected Water Use in units of AFY.						

Michael Rossiter

From: Lisa Brown <lbrown@sjwd.org>
Sent: Wednesday, May 25, 2016 2:26 PM
To: Michael Rossiter
Subject: RE: Water Supply Reliability Memo_rev04132016.doc
Attachments: SJWD UWMP_Final Draft_withAppendicesREDUCED FILED SIZE.PDF

Hi!
Attached is our final draft copy.
Thanks!
Lisa

From: Michael Rossiter [mailto:mrossiter@pbieng.com]
Sent: Wednesday, May 25, 2016 2:10 PM
To: Lisa Brown
Subject: RE: Water Supply Reliability Memo_rev04132016.doc

Hi Lisa- I wanted to check in to see if you have updated UWMP tables since the 4/14 version that you sent me last. We are finalizing our Plan for Board approval.
Thanks,

Mike Rossiter, PE, CFM
--
Peterson Brustad, Inc.
1180 Iron Point Rd., Suite 260
Folsom, CA 95630
Office: (916) 608-2212 ext. 127
Cell: (916) 416-6599
Fax: (916) 608-2232

From: Lisa Brown [mailto:lbrown@sjwd.org]
Sent: Thursday, April 14, 2016 1:10 PM
To: 'jim crowley'; Michael Rossiter
Subject: Water Supply Reliability Memo_rev04132016.doc

Hello!
I apologize for the original inaccuracy but we have revised the reliability tables to incorporate a reduction in PCWA water in dry years. The demand information will be completed when we receive the data from all wholesale agencies.

Thank you!
Lisa

Attachment E: Summary Report from AWWA Water Audit Software

FAIR OAKS
WATER DISTRICT

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AWWA Free Water Audit Software v5.0

This spreadsheet-based water audit tool is designed to help quantify and track water losses associated with water distribution systems and identify areas for improved efficiency and cost recovery. It provides a "top-down" summary water audit format, and is not meant to take the place of a full-scale, comprehensive water audit format.

Auditors are strongly encouraged to refer to the most current edition of AWWA M36 Manual for Water Audits for detailed guidance on the water auditing process and targetting loss reduction levels

The spreadsheet contains several separate worksheets. Sheets can be accessed using the tabs towards the bottom of the screen, or by clicking the buttons below.

Please begin by providing the following information

Name of Contact Person:	Ashley Martin
Email Address:	amartin@pbieng.com
Telephone (incl Ext.):	916-608-221 123
Name of City / Utility:	Fair Oaks Water District
City/Town/Municipality:	Fair Oaks
State / Province:	California (CA)
Country:	USA
Year:	2015 Calendar Year
Audit Preparation Date:	3/15/2016
Volume Reporting Units:	Acre-feet
PWSID / Other ID:	

The following guidance will help you complete the Audit

All audit data are entered on the ***Reporting Worksheet***

- Value can be entered by user
- Value calculated based on input data
- These cells contain recommended default values

Use of Option (Radio) Buttons: Pcnt: 0.25% Value:

Select the default percentage by choosing the option button on the left

To enter a value, choose this button and enter a value in the cell to the right

The following worksheets are available by clicking the buttons below or selecting the tabs along the bottom of the page

Instructions
The current sheet. Enter contact information and basic audit details (year, units etc)

Reporting Worksheet
Enter the required data on this worksheet to calculate the water balance and data grading

Comments
Enter comments to explain how values were calculated or to document data sources

Performance Indicators
Review the performance indicators to evaluate the results of the audit

Water Balance
The values entered in the Reporting Worksheet are used to populate the Water Balance

Dashboard
A graphical summary of the water balance and Non-Revenue Water components

Grading Matrix
Presents the possible grading options for each input component of the audit

Service Connection Diagram
Diagrams depicting possible customer service connection line configurations

Definitions
Use this sheet to understand the terms used in the audit process

Loss Control Planning
Use this sheet to interpret the results of the audit validity score and performance indicators

Example Audits
Reporting Worksheet and Performance Indicators examples are shown for two validated audits

Acknowledgements
Acknowledgements for the AWWA Free Water Audit Software v5.0

If you have questions or comments regarding the software please contact us via email at: wlc@awwa.org

AWWA Free Water Audit Software: Reporting Worksheet

? Click to access definition
\+ Click to add a comment

Water Audit Report for: Fair Oaks Water District
Reporting Year: 2015 | 1/2015 - 12/2015

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

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

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

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

Master Meter and Supply Error Adjustments

WATER SUPPLIED

Item	Grade	Value	Units	Adj. Grade	Pcnt	Value	Units
Volume from own sources:	8	873.000	acre-ft/yr	10			acre-ft/yr
Water imported:	8	7,257.000	acre-ft/yr	10			acre-ft/yr
Water exported:	10	0.000	acre-ft/yr				acre-ft/yr
WATER SUPPLIED:		**8,130.000**	acre-ft/yr				

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

AUTHORIZED CONSUMPTION

Click here: ? for help using option buttons below

Item	Grade	Value	Units	Pcnt	Value	Units
Billed metered:	9	7,568.000	acre-ft/yr			
Billed unmetered:	10	0.000	acre-ft/yr			
Unbilled metered:	10	13.000	acre-ft/yr			
Unbilled unmetered:		101.625	acre-ft/yr	1.25%		acre-ft/yr

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

AUTHORIZED CONSUMPTION:		**7,682.625**	acre-ft/yr

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

WATER LOSSES (Water Supplied - Authorized Consumption)

447.375 acre-ft/yr

Apparent Losses

Item	Grade	Value	Units	Pcnt	Value	Units
Unauthorized consumption:		20.325	acre-ft/yr	0.25%		acre-ft/yr

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

Item	Grade	Value	Units	Pcnt	Value	Units
Customer metering inaccuracies:	8	234.464	acre-ft/yr	3.00%		acre-ft/yr
Systematic data handling errors:	9	1.000	acre-ft/yr		1.000	acre-ft/yr
Apparent Losses:		**255.789**	acre-ft/yr			

Real Losses (Current Annual Real Losses or CARL)

Real Losses = Water Losses - Apparent Losses:	**191.586**	acre-ft/yr
WATER LOSSES:	**447.375**	acre-ft/yr

NON-REVENUE WATER

NON-REVENUE WATER: **562.000** acre-ft/yr

= Water Losses + Unbilled Metered + Unbilled Unmetered

SYSTEM DATA

Item	Grade	Value	Units
Length of mains:	8	182.0	miles
Number of active AND inactive service connections:	10	13,894	
Service connection density:		76	conn./mile main

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

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

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

Item	Grade	Value	Units
Average operating pressure:	8	80.0	psi

COST DATA

Item	Grade	Value	Units
Total annual cost of operating water system:	10	$5,538,900	$/Year
Customer retail unit cost (applied to Apparent Losses):	8	$1.92	$/100 cubic feet (ccf)
Variable production cost (applied to Real Losses):	10	$167.52	$/acre-ft

☑ Use Customer Retail Unit Cost to value real losses

WATER AUDIT DATA VALIDITY SCORE:

*** YOUR SCORE IS: 85 out of 100 ***

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

PRIORITY AREAS FOR ATTENTION:

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

1: Water imported

2: Unauthorized consumption

3: Customer metering inaccuracies

AWWA Free Water Audit Software: System Attributes and Performance Indicators

Water Audit Report for: Fair Oaks Water District
Reporting Year: 2015 | 1/2015 - 12/2015

*** YOUR WATER AUDIT DATA VALIDITY SCORE IS: 85 out of 100 ***

System Attributes:

Apparent Losses:	255.789	acre-ft/yr
+ Real Losses:	191.586	acre-ft/yr
= Water Losses:	447.375	acre-ft/yr
? Unavoidable Annual Real Losses (UARL):	274.99	acre-ft/yr
Annual cost of Apparent Losses:	$213,930	
Annual cost of Real Losses:	$160,233	Valued at Customer Retail Unit Cost

Return to Reporting Worksheet to change this assumpiton

Performance Indicators:

Financial:	Non-revenue water as percent by volume of Water Supplied:	6.9%	
	Non-revenue water as percent by cost of operating system:	8.5%	Real Losses valued at Customer Retail Unit Cost
Operational Efficiency:	Apparent Losses per service connection per day:	16.44	gallons/connection/day
	Real Losses per service connection per day:	12.31	gallons/connection/day
	Real Losses per length of main per day*:	N/A	
	Real Losses per service connection per day per psi pressure:	0.15	gallons/connection/day/psi
	From Above, Real Losses = Current Annual Real Losses (CARL):	191.59	acre-feet/year
	? Infrastructure Leakage Index (ILI) [CARL/UARL]:	0.70	

* This performance indicator applies for systems with a low service connection density of less than 32 service connections/mile of pipeline

AWWA Free Water Audit Software:
User Comments

WAS v5.0

Use this worksheet to add comments or notes to explain how an input value was calculated, or to document the sources of the information used.

General Comment:	

Audit Item	Comment
Volume from own sources:	
Vol. from own sources: Master meter error adjustment:	
Water imported:	
Water imported: master meter error adjustment:	
Water exported:	
Water exported: master meter error adjustment:	
Billed metered:	
Billed unmetered:	
Unbilled metered:	
Unbilled unmetered:	

Audit Item	Comment
Unauthorized consumption:	
Customer metering inaccuracies:	
Systematic data handling errors:	
Length of mains:	
Number of active AND inactive service connections:	
Average length of customer service line:	
Average operating pressure:	
Total annual cost of operating water system:	
Customer retail unit cost (applied to Apparent Losses):	
Variable production cost (applied to Real Losses):	

AWWA Free Water Audit Software: Water Balance

WAS v5.0

American Water Works Association.

Water Audit Report for:	Fair Oaks Water District
Reporting Year:	2015 — 1/2015 - 12/2015
Data Validity Score:	85

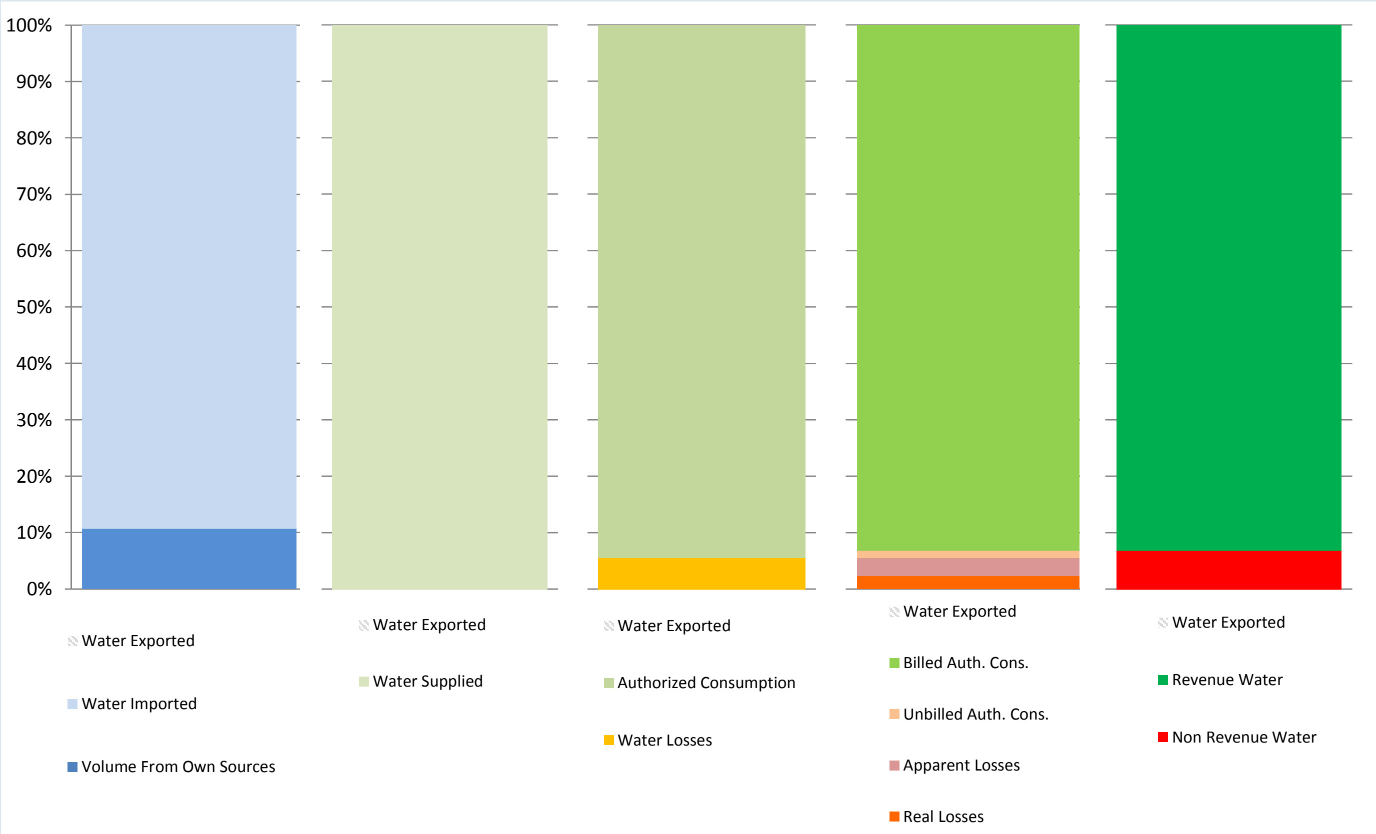
Own Sources (Adjusted for known errors) *873.000*	Water Exported *0.000*			Billed Water Exported	
	Water Supplied *8,130.000*	Authorized Consumption *7,682.625*	Billed Authorized Consumption *7,568.000*	Billed Metered Consumption (water exported is removed) *7,568.000*	Revenue Water 7,568.000
				Billed Unmetered Consumption *0.000*	
			Unbilled Authorized Consumption *114.625*	Unbilled Metered Consumption *13.000*	Non-Revenue Water (NRW) 562.000
				Unbilled Unmetered Consumption *101.625*	
		Water Losses *447.375*	Apparent Losses *255.789*	Unauthorized Consumption *20.325*	
				Customer Metering Inaccuracies *234.464*	
				Systematic Data Handling Errors *1.000*	
Water Imported *7,257.000*			Real Losses *191.586*	Leakage on Transmission and/or Distribution Mains *Not broken down*	
				Leakage and Overflows at Utility's Storage Tanks *Not broken down*	
				Leakage on Service Connections *Not broken down*	

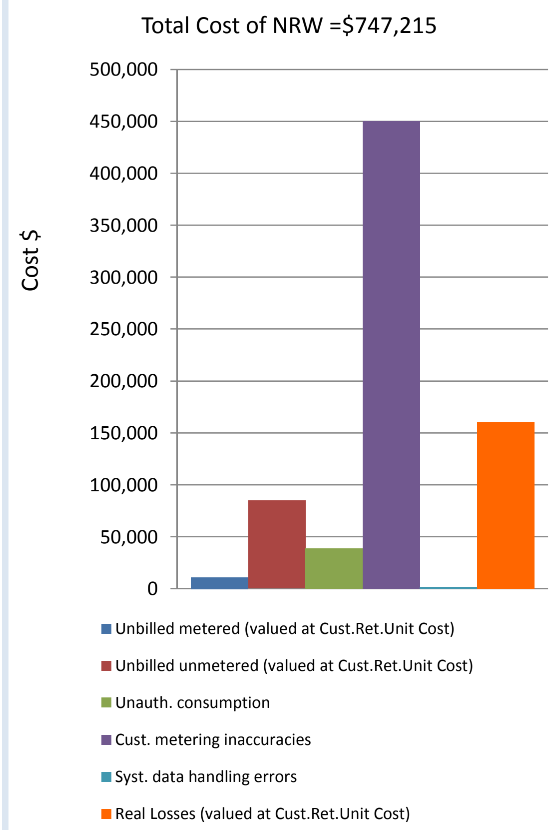
AWWA Free Water Audit Software: Dashboard

The graphic below is a visual representation of the Water Balance with bar heights propotional to the volume of the audit components

Water Audit Report for:	Fair Oaks Water District	
Reporting Year:	2015	1/2015 - 12/2015
Data Validity Score:	85	

○ Show me the VOLUME of Non-Revenue Water
◉ Show me the COST of Non-Revenue Water





AWWA Free Water Audit Software: Grading Matrix

WAS 5.0

The grading assigned to each audit component and the corresponding recommended improvements and actions are highlighted in yellow. Audit accuracy is likely to be improved by prioritizing those items shown in red

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
WATER SUPPLIED											
Volume from own sources:	Select this grading only if the water utility purchases/imports all of its water resources (i.e. has no sources of its own)	Less than 25% of water production sources are metered, remaining sources are estimated. No regular meter accuracy testing or electronic calibration conducted.	25% - 50% of treated water production sources are metered; other sources estimated. No regular meter accuracy testing or electronic calibration conducted.	Conditions between 2 and 4	50% - 75% of treated water production sources are metered, other sources estimated. Occasional meter accuracy testing or electronic calibration conducted.	Conditions between 4 and 6	At least 75% of treated water production sources are metered, or at least 90% of the source flow is derived from metered sources. Meter accuracy testing and/or electronic calibration of related instrumentation is conducted annually. Less than 25% of tested meters are found outside of +/- 6% accuracy.	Conditions between 6 and 8	100% of treated water production sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted annually, less than 10% of meters are found outside of +/- 6% accuracy	Conditions between 8 and 10	100% of treated water production sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted semi-annually, with less than 10% found outside of +/- 3% accuracy. Procedures are reviewed by a third party knowledgeable in the M36 methodology.
Improvements to attain higher data grading for "Volume from own Sources" component:		to qualify for 2: Organize and launch efforts to collect data for determining volume from own sources	to qualify for 4: Locate all water production sources on maps and in the field, launch meter accuracy testing for existing meters, begin to install meters on unmetered water production sources and replace any obsolete/defective meters.		to qualify for 6: Formalize annual meter accuracy testing for all source meters; specify the frequency of testing. Complete installation of meters on unmetered water production sources and complete replacement of all obsolete/defective meters.		to qualify for 8: Conduct annual meter accuracy testing and calibration of related instrumentation on all meter installations on a regular basis. Complete project to install new, or replace defective existing, meters so that entire production meter population is metered. Repair or replace meters outside of +/- 6% accuracy.		to qualify for 10: Maintain annual meter accuracy testing and calibration of related instrumentation for all meter installations. Repair or replace meters outside of +/- 3% accuracy. Investigate new meter technology; pilot one or more replacements with innovative meters in attempt to further improve meter accuracy.		to maintain 10: Standardize meter accuracy test frequency to semi-annual, or more frequent, for all meters. Repair or replace meters outside of +/- 3% accuracy. Continually investigate/pilot improving metering technology.
Volume from own sources master meter and supply error adjustment:	Select n/a only if the water utility fails to have meters on its sources of supply	Inventory information on meters and paper records of measured volumes exist but are incomplete and/or in a very crude condition; data error cannot be determined	No automatic datalogging of production volumes; daily readings are scribed on paper records without any accountability controls. Flows are not balanced across the water distribution system: tank/storage elevation changes are not employed in calculating the "Volume from own sources" component and archived flow data is adjusted only when grossly evident data error occurs.	Conditions between 2 and 4	Production meter data is logged automatically in electronic format and reviewed at least on a monthly basis with necessary corrections implemented. "Volume from own sources" tabulations include estimate of daily changes in tanks/storage facilities. Meter data is adjusted when gross data errors occur, or occasional meter testing deems this necessary.	Conditions between 4 and 6	Hourly production meter data logged automatically & reviewed on at least a weekly basis. Data is adjusted to correct gross error when meter/instrumentation equipment malfunction is detected; and/or error is confirmed by meter accuracy testing. Tank/storage facility elevation changes are automatically used in calculating a balanced "Volume from own sources" component, and data gaps in the archived data are corrected on at least a weekly basis.	Conditions between 6 and 8	Continuous production meter data is logged automatically & reviewed each business day. Data is adjusted to correct gross error from detected meter/instrumentation equipment malfunction and/or results of meter accuracy testing. Tank/storage facility elevation changes are automatically used in "Volume from own sources" tabulations and data gaps in the archived data are corrected on a daily basis.	Conditions between 8 and 10	Computerized system (SCADA or similar) automatically balances flows from all sources and storages; results are reviewed each business day. Tight accountability controls ensure that all data gaps that occur in the archived flow data are quickly detected and corrected. Regular calibrations between SCADA and sources meters ensures minimal data transfer error.
Improvements to attain higher data grading for "Master meter and supply error adjustment" component:		to qualify for 2: Develop a plan to restructure recordkeeping system to capture all flow data; set a procedure to review flow data on a daily basis to detect input errors. Obtain more reliable information about existing meters by conducting field inspections of meters and related instrumentation, and obtaining manufacturer literature.	to qualify for 4: Install automatic datalogging equipment on production meters. Complete installation of level instrumentation at all tanks/storage facilities and include tank level data in automatic calculation routine in a computerized system. Construct a computerized listing or spreadsheet to archive input volumes, tank/storage volume changes and import/export flows in order to determine the composite "Water Supplied" volume for the distribution system. Set a procedure to review this data on a monthly basis to detect gross anomalies and data gaps.		to qualify for 6: Refine computerized data collection and archive to include hourly production meter data that is reviewed at least on a weekly basis to detect specific data anomalies and gaps. Use daily net storage change to balance flows in calculating "Water Supplied" volume. Necessary corrections to data errors are implemented on a weekly basis.		to qualify for 8: Ensure that all flow data is collected and archived on at least an hourly basis. All data is reviewed and detected errors corrected each business day. Tank/storage levels variations are employed in calculating balanced "Water Supplied" component. Adjust production meter data for gross error and inaccuracy confirmed by testing.		to qualify for 10: Link all production and tank/storage facility elevation change data to a Supervisory Control & Data Acquisition (SCADA) System, or similar computerized monitoring/control system, and establish automatic flow balancing algorithm and regularly calibrate between SCADA and source meters. Data is reviewed and corrected each business day.		to maintain 10: Monitor meter innovations for development of more accurate and less expensive flowmeters. Continue to replace or repair meters as they perform outside of desired accuracy limits. Stay abreast of new and more accurate water level instruments to better record tank/storage levels and archive the variations in storage volume. Keep current with SCADA and data management systems to ensure that archived data is well-managed and error free.
Water Imported:	Select n/a if the water utility's supply is exclusively from its own water resources (no bulk purchased/ imported water)	Less than 25% of imported water sources are metered, remaining sources are estimated. No regular meter accuracy testing.	25% - 50% of imported water sources are metered; other sources estimated. No regular meter accuracy testing.	Conditions between 2 and 4	50% - 75% of imported water sources are metered, other sources estimated. Occasional meter accuracy testing conducted.	Conditions between 4 and 6	At least 75% of imported water sources are metered, meter accuracy testing and/or electronic calibration of related instrumentation is conducted annually for all meter installations. Less than 25% of tested meters are found outside of +/- 6% accuracy.	Conditions between 6 and 8	100% of imported water sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted annually, less than 10% of meters are found outside of +/- 6% accuracy	Conditions between 8 and 10	100% of imported water sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted semi-annually for all meter installations, with less than 10% of accuracy tests found outside of +/- 3% accuracy.
Improvements to attain higher data grading for "Water Imported Volume" component: (*Note: usually the water supplier selling the water - "the Exporter" - to the utility being audited is responsible to maintain the metering installation measuring the imported volume. The utility should coordinate carefully with the Exporter to ensure that adequate meter upkeep takes place and an accurate measure of the Water Imported volume is quantified.*)		to qualify for 2: Review bulk water purchase agreements with partner suppliers; confirm requirements for use and maintenance of accurate metering. Identify needs for new or replacement meters with goal to meter all imported water sources.	To qualify for 4: Locate all imported water sources on maps and in the field, launch meter accuracy testing for existing meters, begin to install meters on unmetered imported water interconnections and replace obsolete/defective meters.		to qualify for 6: Formalize annual meter accuracy testing for all imported water meters, planning for both regular meter accuracy testing and calibration of the related instrumentation. Continue installation of meters on unmetered imported water interconnections and replacement of obsolete/defective meters.		to qualify for 8: Complete project to install new, or replace defective, meters on all imported water interconnections. Maintain annual meter accuracy testing for all imported water meters and conduct calibration of related instrumentation at least annually. Repair or replace meters outside of +/- 6% accuracy.		to qualify for 10: Conduct meter accuracy testing for all meters on a semi-annual basis, along with calibration of all related instrumentation. Repair or replace meters outside of +/- 3% accuracy. Investigate new meter technology; pilot one or more replacements with innovative meters in attempt to improve meter accuracy.		to maintain 10: Standardize meter accuracy test frequency to semi-annual, or more frequent, for all meters. Continue to conduct calibration of related instrumentation on a semi-annual basis. Repair or replace meters outside of +/- 3% accuracy. Continually investigate/pilot improving metering technology.

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Water imported master meter and supply error adjustment:	Select n/a if the Imported water supply is unmetered, with Imported water quantities estimated on the billing invoices sent by the Exporter to the purchasing Utility.	Inventory information on imported meters and paper records of measured volumes exist but are incomplete and/or in a very crude condition; data error cannot be determined Written agreement(s) with water Exporter(s) are missing or written in vague language concerning meter management and testing.	No automatic datalogging of imported supply volumes; daily readings are scribed on paper records without any accountability controls to confirm data accuracy and the absence of errors and data gaps in recorded volumes. Written agreement requires meter accuracy testing but is vague on the details of how and who conducts the testing.	Conditions between 2 and 4	Imported supply metered flow data is logged automatically in electronic format and reviewed at least on a monthly basis by the Exporter with necessary corrections implemented. Meter data is adjusted by the Exporter when gross data errors are detected. A coherent data trail exists for this process to protect both the selling and the purchasing Utility. Written agreement exists and clearly states requirements and roles for meter accuracy testing and data management.	Conditions between 4 and 6	Hourly Imported supply metered data is logged automatically & reviewed on at least a weekly basis by the Exporter. Data is adjusted to correct gross error when meter/instrumentation equipment malfunction is detected; and to correct for error confirmed by meter accuracy testing. Any data gaps in the archived data are detected and corrected during the weekly review. A coherent data trail exists for this process to protect both the selling and the purchasing Utility.	Conditions between 6 and 8	Continuous Imported supply metered flow data is logged automatically & reviewed each business day by the Importer. Data is adjusted to correct gross error from detected meter/instrumentation equipment malfunction and/or results of meter accuracy testing. Any data errors/gaps are detected and corrected on a daily basis. A data trail exists for the process to protect both the selling and the purchasing Utility.	Conditions between 8 and 10	Computerized system (SCADA or similar) automatically records data which is reviewed each business day by the Exporter. Tight accountability controls ensure that all error/data gaps that occur in the archived flow data are quickly detected and corrected. A reliable data trail exists and contract provisions for meter testing and data management are reviewed by the selling and purchasing Utility at least once every five years.
Improvements to attain higher data grading for "Water imported master meter and supply error adjustment" component:		to qualify for 2: Develop a plan to restructure recordkeeping system to capture all flow data; set a procedure to review flow data on a daily basis to detect input errors. Obtain more reliable information about existing meters by conducting field inspections of meters and related instrumentation, and obtaining manufacturer literature. Review the written agreement between the selling and purchasing Utility.	to qualify for 4: Install automatic datalogging equipment on Imported supply meters. Set a procedure to review this data on a monthly basis to detect gross anomalies and data gaps. Launch discussions with the Exporters to jointly review terms of the written agreements regarding meter accuracy testing and data management; revise the terms as necessary.		to qualify for 6: Refine computerized data collection and archive to include hourly Imported supply metered flow data that is reviewed at least on a weekly basis to detect specific data anomalies and gaps. Make necessary corrections to errors/data errors on a weekly basis.		to qualify for 8: Ensure that all Imported supply metered flow data is collected and archived on at least an hourly basis. All data is reviewed and errors/data gaps are corrected each business day.		to qualify for 10: Conduct accountability checks to confirm that all Imported supply metered data is reviewed and corrected each business day by the Exporter. Results of all meter accuracy tests and data corrections should be available for sharing between the Exporter and the purchasing Utility. Establish a schedule for a regular review and updating of the contractual language in the written agreement between the selling and the purchasing Utility; at least every five years.		to maintain 10: Monitor meter innovations for development of more accurate and less expensive flowmeters; work with the Exporter to help identify meter replacement needs. Keep communication lines with Exporters open and maintain productive relations. Keep the written agreement current with clear and explicit language that meets the ongoing needs of all parties.
Water Exported:	Select n/a if the water utility sells no bulk water to neighboring water utilities (no exported water sales)	Less than 25% of exported water sources are metered, remaining sources are estimated. No regular meter accuracy testing.	25% - 50% of exported water sources are metered; other sources estimated. No regular meter accuracy testing.	Conditions between 2 and 4	50% - 75% of exported water sources are metered, other sources estimated. Occasional meter accuracy testing conducted.	Conditions between 4 and 6	At least 75% of exported water sources are metered, meter accuracy testing and/or electronic calibration conducted annually. Less than 25% of tested meters are found outside of +/- 6% accuracy.	Conditions between 6 and 8	100% of exported water sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted annually, less than 10% of meters are found outside of +/- 6% accuracy	Conditions between 8 and 10	100% of exported water sources are metered, meter accuracy testing and electronic calibration of related instrumentation is conducted semi-annually for all meter installations, with less than 10% of accuracy tests found outside of +/- 3% accuracy.
Improvements to attain higher data grading for "Water Exported Volume" component: (*Note: usually, if the water utility being audited sells (Exports) water to a neighboring purchasing Utility, it is the responsibility of the utility exporting the water to maintain the metering installation measuring the Exported volume. The utility exporting the water should ensure that adequate meter upkeep takes place and an accurate measure of the Water Exported volume is quantified.*)		to qualify for 2: Review bulk water sales agreements with purchasing utilities; confirm requirements for use & upkeep of accurate metering. Identify needs to install new, or replace defective meters as needed.	To qualify for 4: Locate all exported water sources on maps and in field, launch meter accuracy testing for existing meters, begin to install meters on unmetered exported water interconnections and replace obsolete/defective meters		to qualify for 6: Formalize annual meter accuracy testing for all exported water meters. Continue installation of meters on unmetered exported water interconnections and replacement of obsolete/defective meters.		to qualify for 8: Complete project to install new, or replace defective, meters on all exported water interconnections. Maintain annual meter accuracy testing for all exported water meters. Repair or replace meters outside of +/- 6% accuracy.		to qualify for 10: Maintain annual meter accuracy testing for all meters. Repair or replace meters outside of +/- 3% accuracy. Investigate new meter technology; pilot one or more replacements with innovative meters in attempt to improve meter accuracy.		to maintain 10: Standardize meter accuracy test frequency to semi-annual, or more frequent, for all meters. Repair or replace meters outside of +/- 3% accuracy. Continually investigate/pilot improving metering technology.
Water exported master meter and supply error adjustment:	Select n/a only if the water utility fails to have meters on its exported supply interconnections.	Inventory information on exported meters and paper records of measured volumes exist but are incomplete and/or in a very crude condition; data error cannot be determined Written agreement(s) with the utility purchasing the water are missing or written in vague language concerning meter management and testing.	No automatic datalogging of exported supply volumes; daily readings are scribed on paper records without any accountability controls to confirm data accuracy and the absence of errors and data gaps in recorded volumes. Written agreement requires meter accuracy testing but is vague on the details of how and who conducts the testing.	Conditions between 2 and 4	Exported metered flow data is logged automatically in electronic format and reviewed at least on a monthly basis, with necessary corrections implemented. Meter data is adjusted by the utility selling (exporting) the water when gross data errors are detected. A coherent data trail exists for this process to protect both the utility exporting the water and the purchasing Utility. Written agreement exists and clearly states requirements and roles for meter accuracy testing and data management.	Conditions between 4 and 6	Hourly exported supply metered data is logged automatically & reviewed on at least a weekly basis by the utility selling the water. Data is adjusted to correct gross error when meter/instrumentation equipment malfunction is detected; and to correct for error found by meter accuracy testing. Any data gaps in the archived data are detected and corrected during the weekly review. A coherent data trail exists for this process to protect both the selling (exporting) utility and the purchasing Utility.	Conditions between 6 and 8	Continuous exported supply metered flow data is logged automatically & reviewed each business day by the utility selling (exporting) the water. Data is adjusted to correct gross error from detected meter/instrumentation equipment malfunction and any error confirmed by meter accuracy testing. Any data errors/gaps are detected and corrected on a daily basis. A data trail exists for the process to protect both the selling (exporting) Utility and the purchasing Utility.	Conditions between 8 and 10	Computerized system (SCADA or similar) automatically records data which is reviewed each business day by the utility selling (exporting) the water. Tight accountability controls ensure that all error/data gaps that occur in the archived flow data are quickly detected and corrected. A reliable data trail exists and contract provisions for meter testing and data management are reviewed by the selling Utility and purchasing Utility at least once every five years.

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Improvements to attain higher data grading for "Water exported master meter and supply error adjustment" component:		to qualify for 2: Develop a plan to restructure recordkeeping system to capture all flow data; set a procedure to review flow data on a daily basis to detect input errors. Obtain more reliable information about existing meters by conducting field inspections of meters and related instrumentation, and obtaining manufacturer literature. Review the written agreement between the utility selling (exporting) the water and the purchasing Utility.	to qualify for 4: Install automatic datalogging equipment on exported supply meters. Set a procedure to review this data on a monthly basis to detect gross anomalies and data gaps. Launch discussions with the purchasing utilities to jointly review terms of the written agreements regarding meter accuracy testing and data management; revise the terms as necessary.		to qualify for 6: Refine computerized data collection and archive to include hourly exported supply metered flow data that is reviewed at least on a weekly basis to detect specific data anomalies and gaps. Make necessary corrections to errors/data errors on a weekly basis.		to qualify for 8: Ensure that all exported metered flow data is collected and archived on at least an hourly basis. All data is reviewed and errors/data gaps are corrected each business day.		to qualify for 10: Conduct accountability checks to confirm that all exported metered flow data is reviewed and corrected each business day by the utility selling the water. Results of all meter accuracy tests and data corrections should be available for sharing between the utility and the purchasing Utility. Establish a schedule for a regular review and updating of the contractual language in the written agreements with the purchasing utilities; at least every five years.		to maintain 10: Monitor meter innovations for development of more accurate and less expensive flowmeters; work with the purchasing utilities to help identify meter replacement needs. Keep communication lines with the purchasing utilities open and maintain productive relations. Keep the written agreement current with clear and explicit language that meets the ongoing needs of all parties.
AUTHORIZED CONSUMPTION											
Billed metered:	n/a (not applicable). Select n/a only if the entire customer population is not metered and is billed for water service on a flat or fixed rate basis. In such a case the volume entered must be zero.	Less than 50% of customers with volume-based billings from meter readings; flat or fixed rate billing exists for the majority of the customer population	At least 50% of customers with volume-based billing from meter reads; flat rate billing for others. Manual meter reading is conducted, with less than 50% meter read success rate, remaining accounts' consumption is estimated. Limited meter records, no regular meter testing or replacement. Billing data maintained on paper records, with no auditing.	Conditions between 2 and 4	At least 75% of customers with volume-based, billing from meter reads; flat or fixed rate billing for remaining accounts. Manual meter reading is conducted with at least 50% meter read success rate; consumption for accounts with failed reads is estimated. Purchase records verify age of customer meters; only very limited meter accuracy testing is conducted. Customer meters are replaced only upon complete failure. Computerized billing records exist, but only sporadic internal auditing conducted.	Conditions between 4 and 6	At least 90% of customers with volume-based billing from meter reads; consumption for remaining accounts is estimated. Manual customer meter reading gives at least 80% customer meter reading success rate; consumption for accounts with failed reads is estimated. Good customer meter records exist, but only limited meter accuracy testing is conducted. Regular replacement is conducted for the oldest meters. Computerized billing records exist with annual auditing of summary statistics conducted by utility personnel.	Conditions between 6 and 8	At least 97% of customers exist with volume-based billing from meter reads. At least 90% customer meter reading success rate; or at least 80% read success rate with planning and budgeting for trials of Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) in one or more pilot areas. Good customer meter records. Regular meter accuracy testing guides replacement of statistically significant number of meters each year. Routine auditing of computerized billing records for global and detailed statistics occurs annually by utility personnel, and is verified by third party at least once every five years.	Conditions between 8 and 10	At least 99% of customers exist with volume-based billing from meter reads. At least 95% customer meter reading success rate; or minimum 80% meter reading success rate, with Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) trials underway. Statistically significant customer meter testing and replacement program in place on a continuous basis. Computerized billing with routine, detailed auditing, including field investigation of representative sample of accounts undertaken annually by utility personnel. Audit is conducted by third party auditors at least once every three years.
Improvements to attain higher data grading for "Billed Metered Consumption" component:	If n/a is selected because the customer meter population is unmetered, consider establishing a new policy to meter the customer population and employ water rates based upon metered volumes.	to qualify for 2: Conduct investigations or trials of customer meters to select appropriate meter models. Budget funding for meter installations. Investigate volume based water rate structures.	to qualify for 4: Purchase and install meters on unmetered accounts. Implement policies to improve meter reading success. Catalog meter information during meter read visits to identify age/model of existing meters. Test a minimal number of meters for accuracy. Install computerized billing system.		to qualify for 6: Purchase and install meters on unmetered accounts. Eliminate flat fee billing and establish appropriate water rate structure based upon measured consumption. Continue to achieve verifiable success in removing manual meter reading barriers. Expand meter accuracy testing. Launch regular meter replacement program. Launch a program of annual auditing of global billing statistics by utility personnel.		to qualify for 8: Purchase and install meters on unmetered accounts. If customer meter reading success rate is less than 97%, assess cost-effectiveness of Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) system for portion or entire system; or otherwise achieve ongoing improvements in manual meter reading success rate to 97% or higher. Refine meter accuracy testing program. Set meter replacement goals based upon accuracy test results. Implement annual auditing of detailed billing records by utility personnel and implement third party auditing at least once every five years.		to qualify for 10: Purchase and install meters on unmetered accounts. Launch Automatic Meter Reading (AMR) or Advanced Metering Infrastructure (AMI) system trials if manual meter reading success rate of at least 99% is not achieved within a five-year program. Continue meter accuracy testing program. Conduct planning and budgeting for large scale meter replacement based upon meter life cycle analysis using cumulative flow target. Continue annual detailed billing data auditing by utility personnel and conduct third party auditing at least once every three years.		to maintain 10: Continue annual internal billing data auditing, and third party auditing at least every three years. Continue customer meter accuracy testing to ensure that accurate customer meter readings are obtained and entered as the basis for volume based billing. Stay abreast of improvements in Automatic Meter Reading (AMR) and Advanced Metering Infrastructure (AMI) and information management. Plan and budget for justified upgrades in metering, meter reading and billing data management to maintain very high accuracy in customer metering and billing.
Billed unmetered:	Select n/a if it is the policy of the water utility to meter all customer connections and it has been confirmed by detailed auditing that all customers do indeed have a water meter; i.e. no intentionally unmetered accounts exist	Water utility policy does not require customer metering; flat or fixed fee billing is employed. No data is collected on customer consumption. The only estimates of customer population consumption available are derived from data estimation methods using average fixture count multiplied by number of connections, or similar approach.	Water utility policy does not require customer metering; flat or fixed fee billing is employed. Some metered accounts exist in parts of the system (pilot areas or District Metered Areas) with consumption read periodically or recorded on portable dataloggers over one, three, or seven day periods. Data from these sample meters are used to infer consumption for the total customer population. Site specific estimation methods are used for unusual buildings/water uses.	Conditions between 2 and 4	Water utility policy does require metering and volume based billing in general. However, a liberal amount of exemptions and a lack of clearly written and communicated procedures result in up to 20% of billed accounts believed to be unmetered by exemption; or the water utility is in transition to becoming fully metered, and a large number of customers remain unmetered. A rough estimate of the annual consumption for all unmetered accounts is included in the annual water audit, with no inspection of individual unmetered accounts.	Conditions between 4 and 6	Water utility policy does require metering and volume based billing but established exemptions exist for a portion of accounts such as municipal buildings. As many as 15% of billed accounts are unmetered due to this exemption or meter installation difficulties. Only a group estimate of annual consumption for all unmetered accounts is included in the annual water audit, with no inspection of individual unmetered accounts.	Conditions between 6 and 8	Water utility policy does require metering and volume based billing for all customer accounts. However, less than 5% of billed accounts remain unmetered because meter installation is hindered by unusual circumstances. The goal is to minimize the number of unmetered accounts. Reliable estimates of consumption are obtained for these unmetered accounts via site specific estimation methods.	Conditions between 8 and 10	Water utility policy does require metering and volume based billing for all customer accounts. Less than 2% of billed accounts are unmetered and exist because meter installation is hindered by unusual circumstances. The goal exists to minimize the number of unmetered accounts to the extent that is economical. Reliable estimates of consumption are obtained at these accounts via site specific estimation methods.

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Improvements to attain higher data grading for "Billed Unmetered Consumption" component:		to qualify for 2: Conduct research and evaluate cost/benefit of a new water utility policy to require metering of the customer population; thereby greatly reducing or eliminating unmetered accounts. Conduct pilot metering project by installing water meters in small sample of customer accounts and periodically reading the meters or datalogging the water consumption over one, three, or seven day periods.	to qualify for 4: Implement a new water utility policy requiring customer metering. Launch or expand pilot metering study to include several different meter types, which will provide data for economic assessment of full scale metering options. Assess sites with access difficulties to devise means to obtain water consumption volumes. Begin customer meter installation.		to qualify for 6: Refine policy and procedures to improve customer metering participation for all but solidly exempt accounts. Assign staff resources to review billing records to identify errant unmetered properties. Specify metering needs and funding requirements to install sufficient meters to significant reduce the number of unmetered accounts		to qualify for 8: Push to install customer meters on a full scale basis. Refine metering policy and procedures to ensure that all accounts, including municipal properties, are designated for meters. Plan special efforts to address "hard-to-access" accounts. Implement procedures to obtain a reliable consumption estimate for the remaining few unmetered accounts awaiting meter installation.		to qualify for 10: Continue customer meter installation throughout the service area, with a goal to minimize unmetered accounts. Sustain the effort to investigate accounts with access difficulties, and devise means to install water meters or otherwise measure water consumption.		to maintain 10: Continue to refine estimation methods for unmetered consumption and explore means to establish metering, for as many billed remaining unmetered accounts as is economically feasible.
Unbilled metered:	select n/a if all billing-exempt consumption is unmetered.	Billing practices exempt certain accounts, such as municipal buildings, but written policies do not exist; and a reliable count of unbilled metered accounts is unavailable. Meter upkeep and meter reading on these accounts is rare and not considered a priority. Due to poor recordkeeping and lack of auditing, water consumption for all such accounts is purely guesstimated.	Billing practices exempt certain accounts, such as municipal buildings, but only scattered, dated written directives exist to justify this practice. A reliable count of unbilled metered accounts is unavailable. Sporadic meter replacement and meter reading occurs on an as-needed basis. The total annual water consumption for all unbilled, metered accounts is estimated based upon approximating the number of accounts and assigning consumption from actively billed accounts of same meter size.	Conditions between 2 and 4	Dated written procedures permit billing exemption for specific accounts, such as municipal properties, but are unclear regarding certain other types of accounts. Meter reading is given low priority and is sporadic. Consumption is quantified from meter readings where available. The total number of unbilled, unmetered accounts must be estimated along with consumption volumes.	Conditions between 4 and 6	Written policies regarding billing exemptions exist but adherence in practice is questionable. Metering and meter reading for municipal buildings is reliable but sporadic for other unbilled metered accounts. Periodic auditing of such accounts is conducted. Water consumption is quantified directly from meter readings where available, but the majority of the consumption is estimated.	Conditions between 6 and 8	Written policy identifies the types of accounts granted a billing exemption. Customer meter management and meter reading are considered secondary priorities, but meter reading is conducted at least annually to obtain consumption volumes for the annual water audit. High level auditing of billing records ensures that a reliable census of such accounts exists.	Conditions between 8 and 10	Clearly written policy identifies the types of accounts given a billing exemption, with emphasis on keeping such accounts to a minimum. Customer meter management and meter reading for these accounts is given proper priority and is reliably conducted. Regular auditing confirms this. Total water consumption for these accounts is taken from reliable readings from accurate meters.
Improvements to attain higher data grading for "Unbilled Metered Consumption" component:		to qualify for 2: Reassess the water utility's policy allowing certain accounts to be granted a billing exemption. Draft an outline of a new written policy for billing exemptions, with clear justification as to why any accounts should be exempt from billing, and with the intention to keep the number of such accounts to a minimum.	to qualify for 4: Review historic written directives and policy documents allowing certain accounts to be billing-exempt. Draft an outline of a written policy for billing exemptions, identify criteria that grants an exemption, with a goal of keeping this number of accounts to a minimum. Consider increasing the priority of reading meters on unbilled accounts at least annually.		to qualify for 6: Draft a new written policy regarding billing exemptions based upon consensus criteria allowing this occurrence. Assign resources to audit meter records and billing records to obtain census of unbilled metered accounts. Gradually include a greater number of these metered accounts to the routes for regular meter reading.		to qualify for 8: Communicate billing exemption policy throughout the organization and implement procedures that ensure proper account management. Conduct inspections of accounts confirmed in unbilled metered status and verify that accurate meters exist and are scheduled for routine meter readings. Gradually increase the number of unbilled metered accounts that are included in regular meter reading routes.		to qualify for 10: Ensure that meter management (meter accuracy testing, meter replacement) and meter reading activities for unbilled accounts are accorded the same priority as billed accounts. Establish ongoing annual auditing process to ensure that water consumption is reliably collected and provided to the annual water audit process.		to maintain 10: Reassess the utility's philosophy in allowing any water uses to go "unbilled". It is possible to meter and bill all accounts, even if the fee charged for water consumption is discounted or waived. Metering and billing all accounts ensures that water consumption is tracked and water waste from plumbing leaks is detected and minimized.
Unbilled unmetered:		Extent of unbilled, unmetered consumption is unknown due to unclear policies and poor recordkeeping. Total consumption is quantified based upon a purely subjective estimate.	Clear extent of unbilled, unmetered consumption is unknown, but a number of events are randomly documented each year, confirming existence of such consumption, but without sufficient documentation to quantify an accurate estimate of the annual volume consumed.	Conditions between 2 and 4	Extent of unbilled, unmetered consumption is partially known, and procedures exist to document certain events such as miscellaneous fire hydrant uses. Formulae is used to quantify the consumption from such events (time running multiplied by typical flowrate, multiplied by number of events).	Default value of 1.25% of system input volume is employed	Coherent policies exist for some forms of unbilled, unmetered consumption but others await closer evaluation. Reasonable recordkeeping for the managed uses exists and allows for annual volumes to be quantified by inference, but unsupervised uses are guesstimated.	Conditions between 6 and 8	Clear policies and good recordkeeping exist for some uses (ex: water used in periodic testing of unmetered fire connections), but other uses (ex: miscellaneous uses of fire hydrants) have limited oversight. Total consumption is a mix of well quantified use such as from formulae (time running multiplied by typical flow, multiplied by number of events) or temporary meters, and relatively subjective estimates of less regulated use.	Conditions between 8 and 10	Clear policies exist to identify permitted use of water in unbilled, unmetered fashion, with the intention of minimizing this type of consumption. Good records document each occurrence and consumption is quantified via formulae (time running multiplied by typical flow, multiplied by number of events) or use of temporary meters.
Improvements to attain higher data grading for "Unbilled Unmetered Consumption" component:		to qualify for 5: Utilize the accepted default value of 1.25% of the volume of water supplied as an expedient means to gain a reasonable quantification of this use. to qualify for 2: Establish a policy regarding what water uses should be allowed to remain as unbilled and unmetered. Consider tracking a small sample of one such use (ex: fire hydrant flushing).	to qualify for 5: Utilize accepted default value of 1.25% of the volume of water supplied as an expedient means to gain a reasonable quantification of this use. to qualify for 4: Evaluate the documentation of events that have been observed. Meet with user groups (ex: for fire hydrants - fire departments, contractors to ascertain their need and/or volume requirements for water from fire hydrants).		to qualify for 5: Utilize accepted default value of 1.25% of the volume of water supplied as an expedient means to gain a reasonable quantification of all such use. This is particularly appropriate for water utilities who are in the early stages of the water auditing process, and should focus on other components since the volume of unbilled, unmetered consumption is usually a relatively small quantity component, and other larger-quantity components should take priority.	to qualify for 6 or greater: Finalize policy and begin to conduct field checks to better establish and quantify such usage. Proceed if top-down audit exists and/or a great volume of such use is suspected.	to qualify for 8: Assess water utility policy and procedures for various unmetered usages. For example, ensure that a policy exists and permits are issued for use of fire hydrants by persons outside of the utility. Create written procedures for use and documentation of fire hydrants by water utility personnel. Use same approach for other types of unbilled, unmetered water usage.		to qualify for 10: Refine written procedures to ensure that all uses of unbilled, unmetered water are overseen by a structured permitting process managed by water utility personnel. Reassess policy to determine if some of these uses have value in being converted to billed and/or metered status.		to maintain 10: Continue to refine policy and procedures with intention of reducing the number of allowable uses of water in unbilled and unmetered fashion. Any uses that can feasibly become billed and metered should be converted eventually.
APPARENT LOSSES											

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Unauthorized consumption:		Extent of unauthorized consumption is unknown due to unclear policies and poor recordkeeping. Total unauthorized consumption is guesstimated.	Unauthorized consumption is a known occurrence, but its extent is a mystery. There are no requirements to document observed events, but periodic field reports capture some of these occurrences. Total unauthorized consumption is approximated from this limited data.	conditions between 2 and 4	Procedures exist to document some unauthorized consumption such as observed unauthorized fire hydrant openings. Use formulae to quantify this consumption (time running multiplied typical flowrate, multiplied by number of events).	Default value of 0.25% of volume of water supplied is employed	Coherent policies exist for some forms of unauthorized consumption (more than simply fire hydrant misuse) but others await closer evaluation. Reasonable surveillance and recordkeeping exist for occurrences that fall under the policy. Volumes quantified by inference from these records.	Conditions between 6 and 8	Clear policies and good auditable recordkeeping exist for certain events (ex: tampering with water meters, illegal bypasses of customer meters); but other occurrences have limited oversight. Total consumption is a combination of volumes from formulae (time x typical flow) and subjective estimates of unconfirmed consumption.	Conditions between 8 and 10	Clear policies exist to identify all known unauthorized uses of water. Staff and procedures exist to provide enforcement of policies and detect violations. Each occurrence is recorded and quantified via formulae (estimated time running multiplied by typical flow) or similar methods. All records and calculations should exist in a form that can be audited by a third party.
Improvements to attain higher data grading for "Unauthorized Consumption" component:		to qualify for 5: Use accepted default of 0.25% of volume of water supplied. to qualify for 2: Review utility policy regarding what water uses are considered unauthorized, and consider tracking a small sample of one such occurrence (ex: unauthorized fire hydrant openings)	to qualify for 5: Use accepted default of 0.25% of system input volume to qualify for 4: Review utility policy regarding what water uses are considered unauthorized, and consider tracking a small sample of one such occurrence (ex: unauthorized fire hydrant openings)		to qualify for 5: Utilize accepted default value of 0.25% of volume of water supplied as an expedient means to gain a reasonable quantification of all such use. This is particularly appropriate for water utilities who are in the early stages of the water auditing process.	to qualify for 6 or greater: Finalize policy updates to clearly identify the types of water consumption that are authorized from those usages that fall outside of this policy and are, therefore, unauthorized. Begin to conduct regular field checks. Proceed if the top-down audit already exists and/or a great volume of such use is suspected.	to qualify for 8: Assess water utility policies to ensure that all known occurrences of unauthorized consumption are outlawed, and that appropriate penalties are prescribed. Create written procedures for detection and documentation of various occurrences of unauthorized consumption as they are uncovered.		to qualify for 10: Refine written procedures and assign staff to seek out likely occurrences of unauthorized consumption. Explore new locking devices, monitors and other technologies designed to detect and thwart unauthorized consumption.		to maintain 10: Continue to refine policy and procedures to eliminate any loopholes that allow or tacitly encourage unauthorized consumption. Continue to be vigilant in detection, documentation and enforcement efforts.
Customer metering inaccuracies:	select n/a only if the entire customer population is unmetered. In such a case the volume entered must be zero.	Customer meters exist, but with unorganized paper records on meters; no meter accuracy testing or meter replacement program for any size of retail meter. Metering workflow is driven chaotically with no proactive management. Loss volume due to aggregate meter inaccuracy is guesstimated.	Poor recordkeeping and meter oversight is recognized by water utility management who has allotted staff and funding resources to organize improved recordkeeping and start meter accuracy testing. Existing paper records gathered and organized to provide cursory disposition of meter population. Customer meters are tested for accuracy only upon customer request.	Conditions between 2 and 4	Reliable recordkeeping exists; meter information is improving as meters are replaced. Meter accuracy testing is conducted annually for a small number of meters (more than just customer requests, but less than 1% of inventory). A limited number of the oldest meters are replaced each year. Inaccuracy volume is largely an estimate, but refined based upon limited testing data.	Conditions between 4 and 6	A reliable electronic recordkeeping system for meters exists. The meter population includes a mix of new high performing meters and dated meters with suspect accuracy. Routine, but limited, meter accuracy testing and meter replacement occur. Inaccuracy volume is quantified using a mix of reliable and less certain data.	Conditions between 6 and 8	Ongoing meter replacement and accuracy testing result in highly accurate customer meter population. Testing is conducted on samples of meters of varying age and accumulated volume of throughput to determine optimum replacement time for various types of meters.	Ongoing meter replacement and accuracy testing result in highly accurate customer meter population. Statistically significant number of meters are tested in audit year. This testing is conducted on samples of meters of varying age and accumulated volume of throughput to determine optimum replacement time for these meters.	Good records of all active customer meters exist and include as a minimum: meter number, account number/location, type, size and manufacturer. Ongoing meter replacement occurs according to a targeted and justified basis. Regular meter accuracy testing gives a reliable measure of composite inaccuracy volume for the customer meter population. New metering technology is embraced to keep overall accuracy improving. Procedures are reviewed by a third party knowledgeable in the M36 methodology.
Improvements to attain higher data grading for "Customer meter inaccuracy volume" component:	If n/a is selected because the customer meter population is unmetered, consider establishing a new policy to meter the customer population and employ water rates based upon metered volumes.	to qualify for 2: Gather available meter purchase records. Conduct testing on a small number of meters believed to be the most inaccurate. Review staffing needs of the metering group and budget for necessary resources to better organize meter management.	to qualify for 4: Implement a reliable record keeping system for customer meter histories, preferably using electronic methods typically linked to, or part of, the Customer Billing System or Customer Information System. Expand meter accuracy testing to a larger group of meters.		to qualify for 6: Standardize the procedures for meter recordkeeping within an electronic information system. Accelerate meter accuracy testing and meter replacements guided by testing results.		to qualify for 8: Expand annual meter accuracy testing to evaluate a statistically significant number of meter makes/models. Expand meter replacement program to replace statistically significant number of poor performing meters each year.		to qualify for 9: Continue efforts to manage meter population with reliable recordkeeping. Test a statistically significant number of meters each year and analyze test results in an ongoing manner to serve as a basis for a target meter replacement strategy based upon accumulated volume throughput.	to qualify for 10: Continue efforts to manage meter population with reliable recordkeeping, meter testing and replacement. Evaluate new meter types and install one or more types in 5-10 customer accounts each year in order to pilot improving metering technology.	to maintain 10: Increase the number of meters tested and replaced as justified by meter accuracy test data. Continually monitor development of new metering technology and Advanced Metering Infrastructure (AMI) to grasp opportunities for greater accuracy in metering of water flow and management of customer consumption data.

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Systematic Data Handling Errors:	Note: all water utilities incur some amount of this error. Even in water utilities with unmetered customer populations and fixed rate billing, errors occur in annual billing tabulations. Enter a positive value for the volume and select a grading.	Policies and procedures for activation of new customer water billing accounts are vague and lack accountability. Billing data is maintained on paper records which are not well organized. No auditing is conducted to confirm billing data handling efficiency. An unknown number of customers escape routine billing due to lack of billing process oversight.	Policy and procedures for activation of new customer accounts and oversight of billing records exist but need refinement. Billing data is maintained on paper records or insufficiently capable electronic database. Only periodic unstructured auditing work is conducted to confirm billing data handling efficiency. The volume of unbilled water due to billing lapses is a guess.	Conditions between 2 and 4	Policy and procedures for new account activation and oversight of billing operations exist but needs refinement. Computerized billing system exists, but is dated or lacks needed functionality. Periodic, limited internal audits conducted and confirm with approximate accuracy the consumption volumes lost to billing lapses.	Conditions between 4 and 6	Policy and procedures for new account activation and oversight of billing operations is adequate and reviewed periodically. Computerized billing system is in use with basic reporting available. Any effect of billing adjustments on measured consumption volumes is well understood. Internal checks of billing data error conducted annually. Reasonably accurate quantification of consumption volume lost to billing lapses is obtained.	Conditions between 6 and 8	New account activation and billing operations policy and procedures are reviewed at least biannually. Computerized billing system includes an array of reports to confirm billing data and system functionality. Checks are conducted routinely to flag and explain zero consumption accounts. Annual internal checks conducted with third party audit conducted at least once every five years. Accountability checks flag billing lapses. Consumption lost to billing lapses is well quantified and reducing year-by-year.	Conditions between 8 and 10	Sound written policy and procedures exist for new account activation and oversight of customer billing operations. Robust computerized billing system gives high functionality and reporting capabilities which are utilized, analyzed and the results reported each billing cycle. Assessment of policy and data handling errors are conducted internally and audited by third party at least once every three years, ensuring consumption lost to billing lapses is minimized and detected as it occurs.
Improvements to attain higher data grading for "Systematic Data Handling Error volume" component:		to qualify for 2: Draft written policy and procedures for activating new water billing accounts and oversight of billing operations. Investigate and budget for computerized customer billing system. Conduct initial audit of billing records by flow-charting the basic business processes of the customer account/billing function.	to qualify for 4: Finalize written policy and procedures for activation of new billing accounts and overall billing operations management. Implement a computerized customer billing system. Conduct initial audit of billing records as part of this process.		to qualify for 6: Refine new account activation and billing operations procedures and ensure consistency with the utility policy regarding billing, and minimize opportunity for missed billings. Upgrade or replace customer billing system for needed functionality - ensure that billing adjustments don't corrupt the value of consumption volumes. Procedurize internal annual audit process.		to qualify for 8: Formalize regular review of new account activation process and general billing practices. Enhance reporting capability of computerized billing system. Formalize regular auditing process to reveal scope of data handling error. Plan for periodic third party audit to occur at least once every five years.		to qualify for 10: Close policy/procedure loopholes that allow some customer accounts to go unbilled, or data handling errors to exist. Ensure that billing system reports are utilized, analyzed and reported every billing cycle. Ensure that internal and third party audits are conducted at least once every three years.		to maintain 10: Stay abreast of customer information management developments and innovations. Monitor developments of Advanced Metering Infrastructure (AMI) and integrate technology to ensure that customer endpoint information is well-monitored and errors/lapses are at an economic minimum.
SYSTEM DATA											
Length of mains:		Poorly assembled and maintained paper as-built records of existing water main installations makes accurate determination of system pipe length impossible. Length of mains is guesstimated.	Paper records in poor or uncertain condition (no annual tracking of installations & abandonments). Poor procedures to ensure that new water mains installed by developers are accurately documented.	Conditions between 2 and 4	Sound written policy and procedures exist for documenting new water main installations, but gaps in management result in a uncertain degree of error in tabulation of mains length.	Conditions between 4 and 6	Sound written policy and procedures exist for permitting and commissioning new water mains. Highly accurate paper records with regular field validation; or electronic records and asset management system in good condition. Includes system backup.	Conditions between 6 and 8	Sound written policy and procedures exist for permitting and commissioning new water mains. Electronic recordkeeping such as a Geographical Information System (GIS) and asset management system are used to store and manage data.	Conditions between 8 and 10	Sound written policy exists for managing water mains extensions and replacements. Geographic Information System (GIS) data and asset management database agree and random field validation proves truth of databases. Records of annual field validation should be available for review.
Improvements to attain higher data grading for "Length of Water Mains" component:		to qualify for 2: Assign personnel to inventory current as-built records and compare with customer billing system records and highway plans in order to verify poorly documented pipelines. Assemble policy documents regarding permitting and documentation of water main installations by the utility and building developers; identify gaps in procedures that result in poor documentation of new water main installations.	to qualify for 4: Complete inventory of paper records of water main installations for several years prior to audit year. Review policy and procedures for commissioning and documenting new water main installation.		to qualify for 6: Finalize updates/improvements to written policy and procedures for permitting/commissioning new main installations. Confirm inventory of records for five years prior to audit year; correct any errors or omissions.		to qualify for 8: Launch random field checks of limited number of locations. Convert to electronic database such as a Geographic Information System (GIS) with backup as justified. Develop written policy and procedures.		to qualify for 10: Link Geographic Information System (GIS) and asset management databases, conduct field verification of data. Record field verification information at least annually.		to maintain 10: Continue with standardization and random field validation to improve the completeness and accuracy of the system.
Number of active AND inactive service connections:		Vague permitting (of new service connections) policy and poor paper recordkeeping of customer connections/billings result in suspect determination of the number of service connections, which may be 10-15% in error from actual count.	General permitting policy exists but paper records, procedural gaps, and weak oversight result in questionable total for number of connections, which may vary 5-10% of actual count.	Conditions between 2 and 4	Written account activation policy and procedures exist, but with some gaps in performance and oversight. Computerized information management system is being brought online to replace dated paper recordkeeping system. Reasonably accurate tracking of service connection installations & abandonments; but count can be up to 5% in error from actual total.	Conditions between 4 and 6	Written new account activation and overall billing policies and procedures are adequate and reviewed periodically. Computerized information management system is in use with annual installations & abandonments totaled. Very limited field verifications and audits. Error in count of number of service connections is believed to be no more than 3%.	Conditions between 6 and 8	Policies and procedures for new account activation and overall billing operations are written, well-structured and reviewed at least biannually. Well-managed computerized information management system exists and routine, periodic field checks and internal system audits are conducted. Counts of connections are no more than 2% in error.	Conditions between 8 and 10	Sound written policy and well managed and audited procedures ensure reliable management of service connection population. Computerized information management system, Customer Billing System, and Geographic Information System (GIS) information agree; field validation proves truth of databases. Count of connections recorded as being in error is less than 1% of the entire population.
Improvements to attain higher data grading for "Number of Active and Inactive Service Connections" component:	**Note: The number of Service Connections does <u>not</u> include fire hydrant leads/lines connecting the hydrant to the water main**	to qualify for 2: Draft new policy and procedures for new account activation and overall billing operations. Research and collect paper records of installations & abandonments for several years prior to audit year.	to qualify for 4: Refine policy and procedures for new account activation and overall billing operations. Research computerized recordkeeping system (Customer Information System or Customer Billing System) to improve documentation format for service connections.		to qualify for 6: Refine procedures to ensure consistency with new account activation and overall billing policy to establish new service connections or decommission existing connections. Improve process to include all totals for at least five years prior to audit year.		to qualify for 8: Formalize regular review of new account activation and overall billing operations policies and procedures. Launch random field checks of limited number of locations. Develop reports and auditing mechanisms for computerized information management system.		to qualify for 10: Close any procedural loopholes that allow installations to go undocumented. Link computerized information management system with Geographic Information System (GIS) and formalize field inspection and information system auditing processes. Documentation of new or decommissioned service connections encounters several levels of checks and balances.		to maintain 10: Continue with standardization and random field validation to improve knowledge of system.
	Note: if customer water	Gradings 1-9 apply if customer properties are unmetered, if customer meters exist and are located inside the customer building premises, or if the water utility owns and is responsible for the entire service connection piping from the water main to the customer building. In any of these cases the average distance between the curb stop or boundary separating utility/customer responsibility for service connection piping, and the typical first point of use (ex: faucet) or the customer meter must be quantified. Gradings of 1-9 are used to grade the validity of the means to quantify this value. (See the "Service Connection Diagram" worksheet)									Either of two conditions can be met for a grading of 10:

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Average length of customer service line:	meters are located outside of the customer building next to the curb stop or boundary separating utility/customer responsibility, then the auditor should answer "Yes" to the question on the Reporting Worksheet asking about this. If the answer is Yes, the grading description listed under the Grading of 10(a) will be followed, with a value of zero automatically entered at a Grading of 10. See the Service Connection Diagram worksheet for a visual presentation of this distance.	Vague policy exists to define the delineation of water utility ownership and customer ownership of the service connection piping. Curb stops are perceived as the breakpoint but these have not been well-maintained or documented. Most are buried or obscured. Their location varies widely from site-to-site, and estimating this distance is arbitrary due to the unknown location of many curb stops.	Policy requires that the curb stop serves as the delineation point between water utility ownership and customer ownership of the service connection piping. The piping from the water main to the curb stop is the property of the water utility; and the piping from the curb stop to the customer building is owned by the customer. Curb stop locations are not well documented and the average distance is based upon a limited number of locations measured in the field.	Conditions between 2 and 4	Good policy requires that the curb stop serves as the delineation point between water utility ownership and customer ownership of the service connection piping. Curb stops are generally installed as needed and are reasonably documented. Their location varies widely from site-to-site, and an estimate of this distance is hindered by the availability of paper records of limited accuracy.	Conditions between 4 and 6	Clear written policy exists to define utility/customer responsibility for service connection piping. Accurate, well-maintained paper or basic electronic recordkeeping system exists. Periodic field checks confirm piping lengths for a sample of customer properties.	Conditions between 6 and 8	Clearly worded policy standardizes the location of curb stops and meters, which are inspected upon installation. Accurate and well maintained electronic records exist with periodic field checks to confirm locations of service lines, curb stops and customer meter pits. An accurate number of customer properties from the customer billing system allows for reliable averaging of this length.	Conditions between 8 and 10	a) Customer water meters exist outside of customer buildings next to the curb stop or boundary separating utility/customer responsibility for service connection piping. If so, answer "Yes" to the question on the Reporting Working asking about this condition. A value of zero and a Grading of 10 are automatically entered in the Reporting Worksheet . b). Meters exist inside customer buildings, or properties are unmetered. In either case, answer "No" to the Reporting Worksheet question on meter location, and enter a distance determined by the auditor. For a Grading of 10 this value must be a very reliable number from a Geographic Information System (GIS) and confirmed by a statistically valid number of field checks.
Improvements to attain higher data grading for "Average Length of Customer Service Line" component:		to qualify for 2: Research and collect paper records of service line installations. Inspect several sites in the field using pipe locators to locate curb stops. Obtain the length of this small sample of connections in this manner.	to qualify for 4: Formalize and communicate policy delineating utility/customer responsibilities for service connection piping. Assess accuracy of paper records by field inspection of a small sample of service connections using pipe locators as needed. Research the potential migration to a computerized information management system to store service connection data.		to qualify for 6: Establish coherent procedures to ensure that policy for curb stop, meter installation and documentation is followed. Gain consensus within the water utility for the establishment of a computerized information management system.		to qualify for 8: Implement an electronic means of recordkeeping, typically via a customer information system, customer billing system, or Geographic Information System (GIS). Standardize the process to conduct field checks of a limited number of locations.		to qualify for 10: Link customer information management system and Geographic Information System (GIS), standardize process for field verification of data.		to maintain 10: Continue with standardization and random field validation to improve knowledge of service connection configurations and customer meter locations.
Average operating pressure:		Available records are poorly assembled and maintained paper records of supply pump characteristics and water distribution system operating conditions. Average pressure is guesstimated based upon this information and ground elevations from crude topographical maps. Widely varying distribution system pressures due to undulating terrain, high system head loss and weak/erratic pressure controls further compromise the validity of the average pressure calculation.	Limited telemetry monitoring of scattered pumping station and water storage tank sites provides some static pressure data, which is recorded in handwritten logbooks. Pressure data is gathered at individual sites only when low pressure complaints arise. Average pressure is determined by averaging relatively crude data, and is affected by significant variation in ground elevations, system head loss and gaps in pressure controls in the distribution system.	Conditions between 2 and 4	Effective pressure controls separate different pressure zones; moderate pressure variation across the system, occasional open boundary valves are discovered that breech pressure zones. Basic telemetry monitoring of the distribution system logs pressure data electronically. Pressure data gathered by gauges or dataloggers at fire hydrants or buildings when low pressure complaints arise, and during fire flow tests and system flushing. Reliable topographical data exists. Average pressure is calculated using this mix of data.	Conditions between 4 and 6	Reliable pressure controls separate distinct pressure zones; only very occasional open boundary valves are encountered that breech pressure zones. Well-covered telemetry monitoring of the distribution system (not just pumping at source treatment plants or wells) logs extensive pressure data electronically. Pressure gathered by gauges/dataloggers at fire hydrants and buildings when low pressure complaints arise, and during fire flow tests and system flushing. Average pressure is determined by using this mix of reliable data.	Conditions between 6 and 8	Well-managed, discrete pressure zones exist with generally predictable pressure fluctuations. A current full-scale SCADA System or similar realtime monitoring system exists to monitor the water distribution system and collect data, including real time pressure readings at representative sites across the system. The average system pressure is determined from reliable monitoring system data.	Conditions between 8 and 10	Well-managed pressure districts/zones, SCADA System and hydraulic model exist to give very precise pressure data across the water distribution system. Average system pressure is reliably calculated from extensive, reliable, and cross-checked data. Calculations are reported on an annual basis as a minimum.
Improvements to attain higher data grading for "Average Operating Pressure" component:		to qualify for 2: Employ pressure gauging and/or datalogging equipment to obtain pressure measurements from fire hydrants. Locate accurate topographical maps of service area in order to confirm ground elevations. Research pump data sheets to find pump pressure/flow characteristics	to qualify for 4: Formalize a procedure to use pressure gauging/datalogging equipment to gather pressure data during various system events such as low pressure complaints, or operational testing. Gather pump pressure and flow data at different flow regimes. Identify faulty pressure controls (pressure reducing valves, altitude valves, partially open boundary valves) and plan to properly configure pressure zones. Make all pressure data from these efforts available to generate system-wide average pressure.		to qualify for 6: Expand the use of pressure gauging/datalogging equipment to gather scattered pressure data at a representative set of sites, based upon pressure zones or areas. Utilize pump pressure and flow data to determine supply head entering each pressure zone or district. Correct any faulty pressure controls (pressure reducing valves, altitude valves, partially open boundary valves) to ensure properly configured pressure zones. Use expanded pressure dataset from these activities to generate system-wide average pressure.		to qualify for 8: Install a Supervisory Control and Data Acquisition (SCADA) System, or similar realtime monitoring system, to monitor system parameters and control operations. Set regular calibration schedule for instrumentation to insure data accuracy. Obtain accurate topographical data and utilize pressure data gathered from field surveys to provide extensive, reliable data for pressure averaging.		to qualify for 10: Annually, obtain a system-wide average pressure value from the hydraulic model of the distribution system that has been calibrated via field measurements in the water distribution system and confirmed in comparisons with SCADA System data.		to maintain 10: Continue to refine the hydraulic model of the distribution system and consider linking it with SCADA System for real-time pressure data calibration, and averaging.

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
COST DATA											
Total annual cost of operating water system:		Incomplete paper records and lack of financial accounting documentation on many operating functions makes calculation of water system operating costs a pure guesstimate	Reasonably maintained, but incomplete, paper or electronic accounting provides data to estimate the major portion of water system operating costs.	Conditions between 2 and 4	Electronic, industry-standard cost accounting system in place. However, gaps in data are known to exist, periodic internal reviews are conducted but not a structured financial audit.	Conditions between 4 and 6	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited periodically by utility personnel, but not a Certified Public Accountant (CPA).	Conditions between 6 and 8	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited at least annually by utility personnel, and at least once every three years by third-party CPA.	Conditions between 8 and 10	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Data audited annually by utility personnel and annually also by third-party CPA.
Improvements to attain higher data grading for "Total Annual Cost of Operating the Water System" component:		to qualify for 2: Gather available records, institute new financial accounting procedures to regularly collect and audit basic cost data of most important operations functions.	to qualify for 4: Implement an electronic cost accounting system, structured according to accounting standards for water utilities		to qualify for 6: Establish process for periodic internal audit of water system operating costs; identify cost data gaps and institute procedures for tracking these outstanding costs.		to qualify for 8: Standardize the process to conduct routine financial audit on an annual basis. Arrange for CPA audit of financial records at least once every three years.		to qualify for 10: Standardize the process to conduct a third-party financial audit by a CPA on an annual basis.		to maintain 10: Maintain program, stay abreast of expenses subject to erratic cost changes and long-term cost trend, and budget/track costs proactively
Customer retail unit cost (applied to Apparent Losses):	Customer population unmetered, and/or only a fixed fee is charged for consumption.	Antiquated, cumbersome water rate structure is used, with periodic historic amendments that were poorly documented and implemented; resulting in classes of customers being billed inconsistent charges. The actual composite billing rate likely differs significantly from the published water rate structure, but a lack of auditing leaves the degree of error indeterminate.	Dated, cumbersome water rate structure, not always employed consistently in actual billing operations. The actual composite billing rate is known to differ from the published water rate structure, and a reasonably accurate estimate of the degree of error is determined, allowing a composite billing rate to be quantified.	Conditions between 2 and 4	Straight-forward water rate structure in use, but not updated in several years. Billing operations reliably employ the rate structure. The composite billing rate is derived from a single customer class such as residential customer accounts, neglecting the effect of different rates from varying customer classes.	Conditions between 4 and 6	Clearly written, up-to-date water rate structure is in force and is applied reliably in billing operations. Composite customer rate is determined using a weighted average residential rate using volumes of water in each rate block.	Conditions between 6 and 8	Effective water rate structure is in force and is applied reliably in billing operations. Composite customer rate is determined using a weighted average composite consumption rate, which includes residential, commercial, industrial, institutional (CII), and any other distinct customer classes within the water rate structure.	Conditions between 8 and 10	Current, effective water rate structure is in force and applied reliably in billing operations. The rate structure and calculations of composite rate - which includes residential, commercial, industrial, institutional (CII), and other distinct customer classes - are reviewed by a third party knowledgeable in the M36 methodology at least once every five years.
Improvements to attain higher data grading for "Customer Retail Unit Cost" component:		to qualify for 2: Formalize the process to implement water rates, including a secure documentation procedure. Create a current, formal water rate document and gain approval from all stakeholders.	to qualify for 4: Review the water rate structure and update/formalize as needed. Assess billing operations to ensure that actual billing operations incorporate the established water rate structure.		to qualify for 6: Evaluate volume of water used in each usage block by residential users. Multiply volumes by full rate structure.	Launch effort to fully meter the customer population and charge rates based upon water volumes	to qualify for 8: Evaluate volume of water used in each usage block by all classifications of users. Multiply volumes by full rate structure.		to qualify for 10: Conduct a periodic third-party audit of water used in each usage block by all classifications of users. Multiply volumes by full rate structure.		to maintain 10: Keep water rate structure current in addressing the water utility's revenue needs. Update the calculation of the customer unit rate as new rate components, customer classes, or other components are modified.
Variable production cost (applied to Real Losses):	Note: if the water utility purchases/imports its entire water supply, then enter the unit purchase cost of the bulk water supply in the Reporting Worksheet with a grading of 10	Incomplete paper records and lack of documentation on primary operating functions (electric power and treatment costs most importantly) makes calculation of variable production costs a pure guesstimate	Reasonably maintained, but incomplete, paper or electronic accounting provides data to roughly estimate the basic operations costs (pumping power costs and treatment costs) and calculate a unit variable production cost.	Conditions between 2 and 4	Electronic, industry-standard cost accounting system in place. Electric power and treatment costs are reliably tracked and allow accurate weighted calculation of unit variable production costs based on these two inputs and water imported purchase costs (if applicable). All costs are audited internally on a periodic basis.	Conditions between 4 and 6	Reliable electronic, industry-standard cost accounting system in place, with all pertinent water system operating costs tracked. Pertinent additional costs beyond power, treatment and water imported purchase costs (if applicable) such as liability, residuals management, wear and tear on equipment, impending expansion of supply, are included in the unit variable production cost, as applicable. The data is audited at least annually by utility personnel.	Conditions between 6 and 8	Reliable electronic, industry-standard cost accounting system in place, with all pertinent primary and secondary variable production and water imported purchase (if applicable) costs tracked. The data is audited at least annually by utility personnel, and at least once every three years by a third-party knowledgeable in the M36 methodology.	Conditions between 8 and 10	Either of two conditions can be met to obtain a grading of 10: 1) Third party CPA audit of all pertinent primary and secondary variable production and water imported purchase (if applicable) costs on an annual basis. or: 2) Water supply is entirely purchased as bulk imported water, and unit purchase cost serves as the variable production cost.
Improvements to attain higher data grading for "Variable Production Cost" component:		to qualify for 2: Gather available records, institute new procedures to regularly collect and audit basic cost data and most important operations functions.	to qualify for 4: Implement an electronic cost accounting system, structured according to accounting standards for water utilities		to qualify for 6: Formalize process for regular internal audits of production costs. Assess whether additional costs (liability, residuals management, equipment wear, impending infrastructure expansion) should be included to calculate a more representative variable production cost.		to qualify for 8: Formalize the accounting process to include direct cost components (power, treatment) as well as indirect cost components (liability, residuals management, etc.) Arrange to conduct audits by a knowledgeable third-party at least once every three years.		to qualify for 10: Standardize the process to conduct a third-party financial audit by a CPA on an annual basis.		to maintain 10: Maintain program, stay abreast of expenses subject to erratic cost changes and budget/track costs proactively

Average Length of Customer Service Line

The three figures shown on this worksheet display the assignment of the Average Length of Customer Service Line, Lp, for the three most common piping configurations.

Figure 1 shows the configuration of the water meter outside of the customer building next to the curb stop valve. In this configuration Lp = 0 since the distance between the curb stop and the customer metering point is essentially zero.

Figure 2 shows the configuration of the customer water meter located inside the customer building, where Lp is the distance from the curb stop to the water meter.

Figure 3 shows the configuration of an unmetered customer building , where Lp is the distance from the curb stop to the first point of customer water consumption, or, more simply, the building line.

In any water system the Lp will vary notably in a community of different structures, therefore the average Lp value is used and this should be approximated or calculated if a sample of service line measurements has been gathered.

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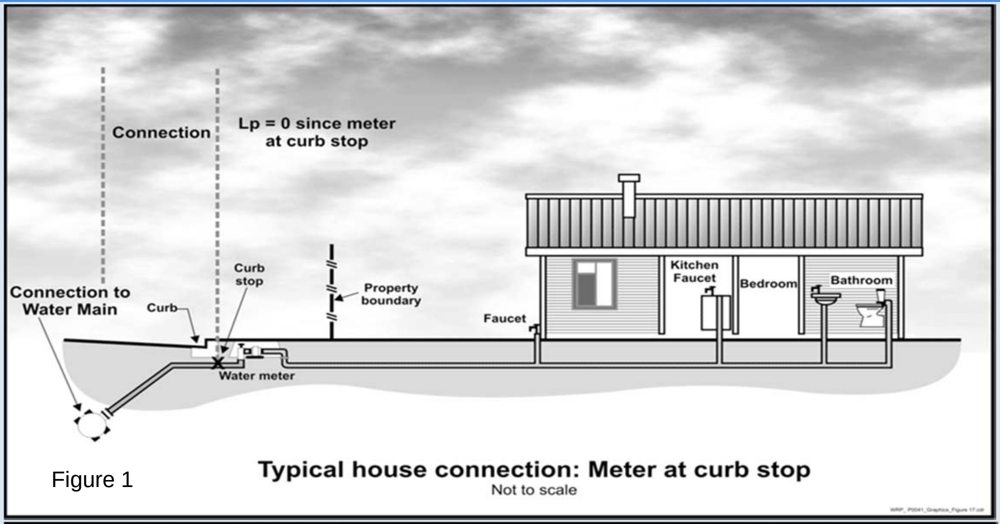


Figure 1 Typical house connection: Meter at curb stop
Not to scale

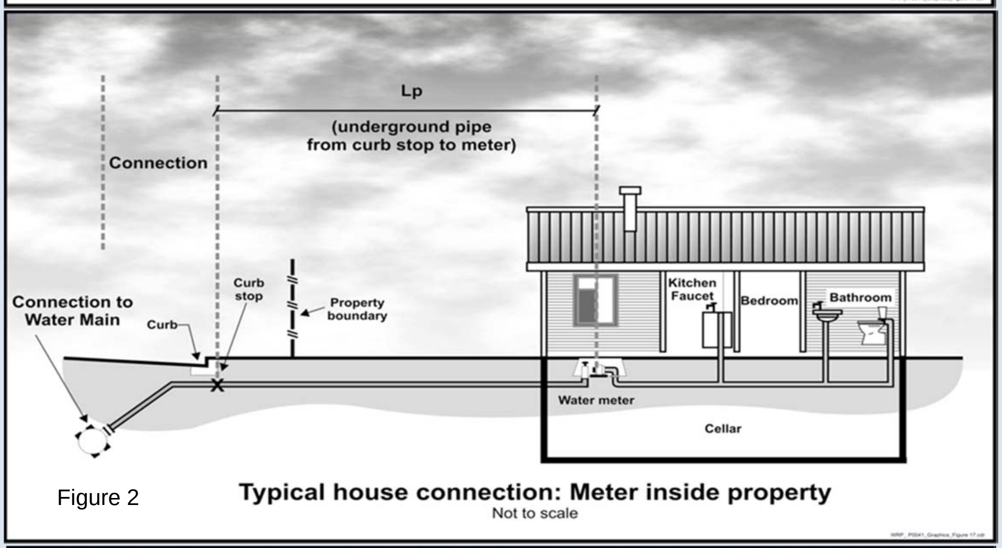


Figure 2 Typical house connection: Meter inside property
Not to scale

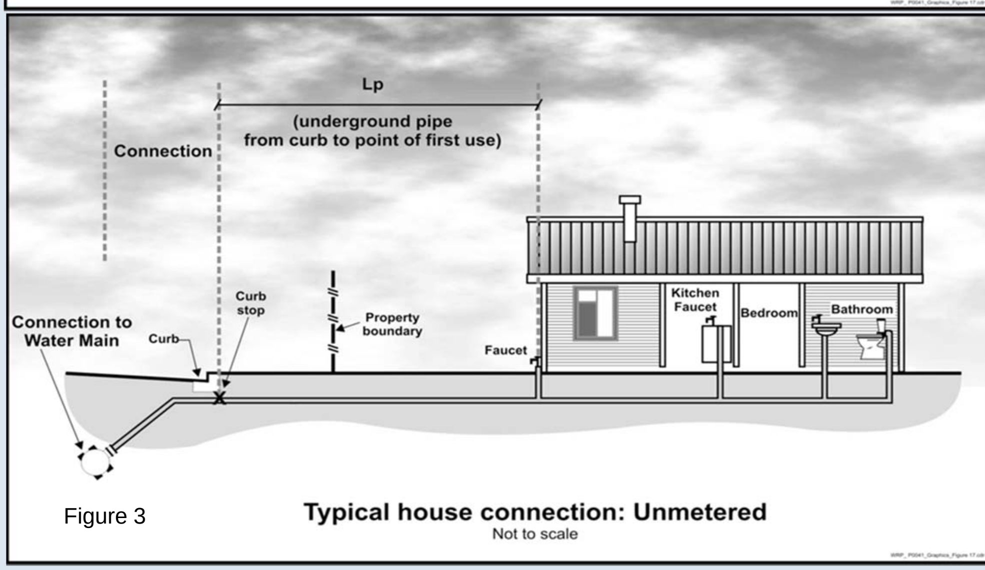
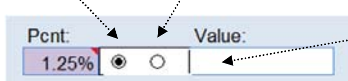


Figure 3 Typical house connection: Unmetered
Not to scale

Item Name	Description
Apparent Losses Find	= unauthorized consumption + customer metering inaccuracies + systematic data handling errors Apparent Losses include all types of inaccuracies associated with customer metering (worn meters as well as improperly sized meters or wrong type of meter for the water usage profile) as well as systematic data handling errors (meter reading, billing, archiving and reporting), plus unauthorized consumption (theft or illegal use). NOTE: Over-estimation of Apparent Losses results in under-estimation of Real Losses. Under-estimation of Apparent Losses results in over-estimation of Real Losses.
AUTHORIZED CONSUMPTION Find	= billed water exported + billed metered + billed unmetered + unbilled metered + unbilled unmetered consumption The volume of metered and/or unmetered water taken by registered customers, the water utility's own uses, and uses of others who are implicitly or explicitly authorized to do so by the water utility; for residential, commercial, industrial and public-minded purposes. Typical retail customers' consumption is tabulated usually from established customer accounts as billed metered consumption, or - for unmetered customers - billed unmetered consumption. These types of consumption, along with billed water exported, provide revenue potential for the water utility. **Be certain to tabulate the water exported volume as a separate component and do not "double-count" it by including in the billed metered consumption component as well as the water exported component.** Unbilled authorized consumption occurs typically in non-account uses, including water for fire fighting and training, flushing of water mains and sewers, street cleaning, watering of municipal gardens, public fountains, or similar public-minded uses. Occasionally these uses may be metered and billed (or charged a flat fee), but usually they are unmetered and unbilled. In the latter case, the water auditor may use a default value to estimate this quantity, or implement procedures for the reliable quantification of these uses. This starts with documenting usage events as they occur and estimating the amount of water used in each event. (See Unbilled unmetered consumption)
View Service Connection Diagram **Average length of customer service line** Find	This is the average length of customer service line, Lp, that is owned and maintained by the customer; from the point of ownership transfer to the customer water meter, or building line (if unmetered). The quantity is one of the data inputs for the calculation of Unavoidable Annual Real Losses (UARL), which serves as the denominator of the performance indicator: Infrastructure Leakage Index (ILI). The value of Lp is multiplied by the number of customer service connections to obtain a total length of customer owned piping in the system. The purpose of this parameter is to account for the unmetered service line infrastructure that is the responsibility of the customer for arranging repairs of leaks that occur on their lines. In many cases leak repairs arranged by customers take longer to be executed than leak repairs arranged by the water utility on utility-maintained piping. Leaks run longer - and lose more water - on customer-owned service piping, than utility owned piping. If the customer water meter exists near the ownership transfer point (usually the curb stop located between the water main and the customer premises) this distance is zero because the meter and transfer point are the same. This is the often encountered configuration of customer water meters located in an underground meter box or "pit" outside of the customer's building. The Free Water Audit Software asks a "Yes/No" question about the meter at this location. If the auditor selects "Yes" then this distance is set to zero and the data grading score for this component is set to 10. If water meters are typically located inside the customer premise/building, or properties are unmetered, it is up to the water auditor to estimate a system-wide average Lp length based upon the various customer land parcel sizes and building locations in the service area. Lp will be a shorter length in areas of high density housing, and a longer length in areas of low density housing and varied commercial and industrial buildings. General parcel demographics should be employed to obtain a composite average Lp length for the entire system. Refer to the "Service Connection Diagram" worksheet for a depiction of the service line/metering configurations that typically exist in water utilities. This worksheet gives guidance on the determination of the Average Length, Lp, for each configuration.
Average operating pressure Find	This is the average pressure in the distribution system that is the subject of the water audit. Many water utilities have a calibrated hydraulic model of their water distribution system. For these utilities, the hydraulic model can be utilized to obtain a very accurate quantity of average pressure. In the absence of a hydraulic model, the average pressure may be approximated by obtaining readings of static water pressure from a representative sample of fire hydrants or other system access points evenly located across the system. A weighted average of the pressure can be assembled; but be sure to take into account the elevation of the fire hydrants, which typically exist several feet higher than the level of buried water pipelines. If the water utility is compiling the water audit for the first time, the average pressure can be approximated, but with a low data grading. In subsequent years of auditing, effort should be made to improve the accuracy of the average pressure quantity. This will then qualify the value for a higher data grading.
Billed Authorized Consumption	All consumption that is billed and authorized by the utility. This may include both metered and unmetered consumption. See "Authorized Consumption" for more information.
Billed metered consumption Find	All metered consumption which is billed to retail customers, including all groups of customers such as domestic, commercial, industrial or institutional. **It does NOT include water supplied to neighboring utilities (water exported) which is metered and billed. Be sure to subtract any consumption for exported water sales that may be included in these billing roles. Water supplied as exports to neighboring water utilities should be included only in the Water Exported component.** The metered consumption data can be taken directly from billing records for the water audit period. The accuracy of yearly metered consumption data can be refined by including an adjustment to account for customer meter reading lag time since not all customer meters are read on the same day of the meter reading period. However additional analysis is necessary to determine the lag time adjustment value, which may or may not be significant.
Billed unmetered consumption Find	All billed consumption which is calculated based on estimates or norms from water usage sites that have been determined by utility policy to be left unmetered. This is typically a very small component in systems that maintain a policy to meter their customer population. However, this quantity can be the key consumption component in utilities that have not adopted a universal metering policy. **This component should NOT include any water that is supplied to neighboring utilities (water exported) which is unmetered but billed. Water supplied as exports to neighboring water utilities should be included only in the Water Exported component.**

Item Name	Description
Customer metering inaccuracies Find	Apparent water losses caused by the collective under-registration of customer water meters. Many customer water meters gradually wear as large cumulative volumes of water are passed through them over time. This causes the meters to under-register the flow of water. This occurrence is common with smaller residential meters of sizes 5/8-inch and 3/4 inch after they have registered very large cumulative volumes of water, which generally occurs only after periods of years. For meters sized 1-inch and larger - typical of multi-unit residential, commercial and industrial accounts - meter under-registration can occur from wear or from the improper application of the meter; i.e. installing the wrong type of meter or the wrong size of meter, for the flow pattern (profile) of the consumer. For instance, many larger meters have reduced accuracy at low flows. If an oversized meter is installed, most of the time the routine flow will occur in the low flow range of the meter, and a significant portion of it may not be registered. It is important to properly select and install all meters, but particularly large customer meters, size 1-inch and larger. The auditor has two options for entering data for this component of the audit. The auditor can enter a percentage under-registration (typically an estimated value), this will apply the selected percentage to the two categories of metered consumption to determine the volume of water not recorded due to customer meter inaccuracy. Note that this percentage is a composite average inaccuracy for <u>all</u> customer meters in the entire meter population. The percentage will be multiplied by the sum of the volumes in the Billed Metered and Unbilled Metered components. Alternatively, if the auditor has substantial data from meter testing activities, he or she can calculate their own loss volumes, and this volume may be entered directly. Note that a value of zero will be accepted but an alert will appear asking if the customer population is unmetered. Since all metered systems have some degree of inaccuracy, a positive value should be entered. A value of zero in this component is valid only if the water utility does not meter its customer population.
Customer retail unit cost Find	The Customer Retail Unit Cost represents the charge that customers pay for water service. This unit cost is applied routinely to the components of Apparent Loss, since these losses represent water reaching customers but not (fully) paid for. Since most water utilities have a rate structure that includes a variety of different costs based upon class of customer, a weighted average of individual costs and number of customer accounts in each class can be calculated to determine a single composite cost that should be entered into this cell. Finally, the weighted average cost should also include additional charges for sewer, storm water or biosolids processing, <u>but only if</u> these charges are based upon the volume of potable water consumed. For water utilities in regions with limited water resources and a questionable ability to meet the drinking water demands in the future, the Customer Retail Unit Cost might also be applied to value the Real Losses; instead of applying the Variable Production Cost to Real Losses. In this way, it is assumed that every unit volume of leakage reduced by leakage management activities will be sold to a customer. Note: the Free Water Audit Software allows the user to select the units that are charged to customers (either $/1,000 gallons, $/hundred cubic feet, or $/1,000 litres) and automatically converts these units to the units that appear in the "WATER SUPPLIED" box. The monetary units are United States dollars, $.
Infrastructure Leakage Index (ILI) Find	The ratio of the Current Annual Real Losses (Real Losses) to the Unavoidable Annual Real Losses (UARL). The ILI is a highly effective performance indicator for comparing (benchmarking) the performance of utilities in operational management of real losses.
Length of mains Find	Length of all pipelines (except service connections) in the system starting from the point of system input metering (for example at the outlet of the treatment plant). It is also recommended to include in this measure the total length of fire hydrant lead pipe. Hydrant lead pipe is the pipe branching from the water main to the fire hydrant. Fire hydrant leads are typically of a sufficiently large size that is more representative of a pipeline than a service connection. The average length of hydrant leads across the entire system can be assumed if not known, and multiplied by the number of fire hydrants in the system, which can also be assumed if not known. This value can then be added to the total pipeline length. Total length of mains can therefore be calculated as: Length of Mains, miles = (total pipeline length, miles) + [{(average fire hydrant lead length, ft) x (number of fire hydrants)} / 5,280 ft/mile] or Length of Mains, kilometres = (total pipeline length, kilometres) + [{(average fire hydrant lead length, metres) x (number of fire hydrants)} / 1,000 metres/kilometre]
NON-REVENUE WATER Find	= Apparent Losses + Real Losses + Unbilled Metered Consumption + Unbilled Unmetered Consumption. This is water which does not provide revenue potential to the utility.
Number of <u>active AND inactive</u> service connections Find	Number of customer service connections, extending from the water main to supply water to a customer. Please note that this includes the actual number of distinct piping connections, including fire connections, whether active or inactive. This may differ substantially from the number of customers (or number of accounts). **Note: this number does not include the pipeline leads to fire hydrants - the total length of piping supplying fire hydrants should be included in the "Length of mains" parameter.**
Real Losses Find	Physical water losses from the pressurized system (water mains and customer service connections) and the utility's storage tanks, up to the point of customer consumption. In metered systems this is the customer meter, in unmetered situations this is the first point of consumption (stop tap/tap) within the property. The annual volume lost through all types of leaks, breaks and overflows depends on frequencies, flow rates, and average duration of individual leaks, breaks and overflows.
Revenue Water	Those components of System Input Volume that are billed and have the potential to produce revenue.
Service Connection Density Find	=number of customer service connections / length of mains

Item Name	Description
Systematic data handling errors Find	Apparent losses caused by accounting omissions, errant computer programming, gaps in policy, procedure, and permitting/activation of new accounts; and any type of data lapse that results in under-stated customer water consumption in summary billing reports. Systematic Data Handling Errors result in a direct loss of revenue potential. Water utilities can find "lost" revenue by keying on this component. Utilities typically measure water consumption registered by water meters at customer premises. The meter should be read routinely (ex: monthly) and the data transferred to the Customer Billing System, which generates and sends a bill to the customer. Data Transfer Errors result in the consumption value being less than the actual consumption, creating an apparent loss. Such error might occur from illegible and mis-recorded hand-written readings compiled by meter readers, inputting an incorrect meter register unit conversion factor in the automatic meter reading equipment, or a variety of similar errors. Apparent losses also occur from Data Analysis Errors in the archival and data reporting processes of the Customer Billing System. Inaccurate estimates used for accounts that fail to produce a meter reading are a common source of error. Billing adjustments may award customers a rightful monetary credit, but do so by creating a negative value of consumption, thus under-stating the actual consumption. Account activation lapses may allow new buildings to use water for months without meter readings and billing. Poor permitting and construction inspection practices can result in a new building lacking a billing account, a water meter and meter reading; i.e., the customer is unknown to the utility's billing system. Close auditing of the permitting, metering, meter reading, billing and reporting processes of the water consumption data trail can uncover data management gaps that create volumes of systematic data handling error. Utilities should routinely analyze customer billing records to detect data anomalies and quantify these losses. For example, a billing account that registers zero consumption for two or more billing cycles should be checked to explain why usage has seemingly halted. Given the revenue loss impacts of these losses, water utilities are well-justified in providing continuous oversight and timely correction of data transfer errors & data handling errors. If the water auditor has not yet gathered detailed data or assessment of systematic data handling error, it is recommended that the auditor apply the default value of 0.25% of the Billed Authorized Consumption volume. However, if the auditor has investigated the billing system and its controls, and has well validated data that indicates the volume from systematic data handling error is substantially higher or lower than that generated by the default value, then the auditor should enter a quantity that was derived from the utility investigations and select an appropriate grading. Note: negative values are not allowed for this audit component. If the auditor enters zero for this component then a grading of 1 will be automatically assigned.
Total annual cost of operating the water system Find	These costs include those for operations, maintenance and any annually incurred costs for long-term upkeep of the drinking water supply and distribution system. It should include the costs of day-to-day upkeep and long-term financing such as repayment of capital bonds for infrastructure expansion or improvement. Typical costs include employee salaries and benefits, materials, equipment, insurance, fees, administrative costs and all other costs that exist to sustain the drinking water supply. Depending upon water utility accounting procedures or regulatory agency requirements, it may be appropriate to include depreciation in the total of this cost. This cost should not include any costs to operate wastewater, biosolids or other systems outside of drinking water.
Unauthorized consumption Find	Includes water illegally withdrawn from fire hydrants, illegal connections, bypasses to customer consumption meters, or tampering with metering or meter reading equipment; as well as any other ways to receive water while thwarting the water utility's ability to collect revenue for the water. Unauthorized consumption results in uncaptured revenue and creates an error that understates customer consumption. In most water utilities this volume is low and, if the water auditor has not yet gathered detailed data for these loss occurrences, it is recommended that the auditor apply a default value of 0.25% of the volume of water supplied. However, if the auditor has investigated unauthorized occurrences, and has well validated data that indicates the volume from unauthorized consumption is substantially higher or lower than that generated by the default value, then the auditor should enter a quantity that was derived from the utility investigations. Note that a value of zero will not be accepted since all water utilities have some volume of unauthorized consumption occurring in their system. Note: if the auditor selects the default value for unauthorized consumption, a data grading of 5 is automatically assigned, but not displayed on the Reporting Worksheet.
Unavoidable Annual Real Losses (UARL) Find	UARL (gallons/day)=(5.41Lm + 0.15Nc + 7.5Lc) xP, or UARL (litres/day)=(18.0Lm + 0.8Nc + 25.0Lc) xP where: Lm = length of mains (miles or kilometres) Nc = number of customer service connections Lp = the average distance of customer service connection piping (feet or metres) (see the Worksheet "Service Connection Diagram" for guidance on deterring the value of Lp) Lc = total length of customer service connection piping (miles or km) Lc = Nc X Lp (miles or kilometres) P = Pressure (psi or metres) The UARL is a theoretical reference value representing the technical low limit of leakage that could be achieved if all of today's best technology could be successfully applied. It is a key variable in the calculation of the Infrastructure Leakage Index (ILI). Striving to reduce system leakage to a level close to the UARL is usually not needed unless the water supply is unusually expensive, scarce or both. NOTE: The UARL calculation has not yet been proven as fully valid for very small, or low pressure water distribution systems. If, <u>in gallons per day:</u> (Lm x 32) + Nc < 3000 or P <35psi <u>in litres per day:</u> (Lm x 20) + Nc < 3000 or P < 25m then the calculated UARL value may not be valid. The software does not display a value of UARL or ILI if either of these conditions is true.

Item Name	Description
Unbilled Authorized Consumption	All consumption that is unbilled, but still authorized by the utility. This includes Unbilled Metered Consumption + Unbilled Unmetered Consumption. See "Authorized Consumption" for more information. For Unbilled Unmetered Consumption, the Free Water Audit Software provides the auditor the option to select a default value if they have not audited unmetered activities in detail. The default calculates a volume that is 1.25% of the Water Supplied volume. If the auditor has carefully audited the various unbilled, unmetered, authorized uses of water, and has established reliable estimates of this collective volume, then he or she may enter the volume directly for this component, and not use the default value.
Unbilled metered consumption Find	Metered consumption which is authorized by the water utility, but, for any reason, is <u>deemed by utility policy</u> to be unbilled. This might for example include metered water consumed by the utility itself in treatment or distribution operations, or metered water provided to civic institutions free of charge. **It does <u>not</u> include water supplied to neighboring utilities (water exported) which may be metered but not billed.**
Unbilled unmetered consumption Find	Any kind of Authorized Consumption which is neither billed or metered. This component typically includes water used in activities such as fire fighting, flushing of water mains and sewers, street cleaning, fire flow tests conducted by the water utility, etc. In most water utilities it is a small component which is very often substantially overestimated. **It does NOT include water supplied to neighboring utilities (water exported) which is unmetered and unbilled – an unlikely case.** This component has many sub-components of water use which are often tedious to identify and quantify. Because of this, and the fact that it is usually a small portion of the water supplied, it is recommended that the auditor apply the default value, which is 1.25% of the Water Supplied volume. Select the default percentage to enter this value. If the water utility <u>has</u> carefully audited the unbilled, unmetered activities occurring in the system, and has well validated data that gives a value substantially higher or lower than the default volume, then the auditor should enter their own volume. However the default approach is recommended for most water utilities. Note that a value of zero is not permitted, since all water utilities have some volume of water in this component occurring in their system.
Units and Conversions	The user may develop an audit based on one of three unit selections: 1) Million Gallons (US) 2) Megalitres (Thousand Cubic Metres) 3) Acre-feet Once this selection has been made in the instructions sheet, all calculations are made on the basis of the chosen units. Should the user wish to make additional conversions, a unit converter is provided below (use drop down menus to select units from the yellow unit boxes): Enter Units: **1** Convert From… **Million Gallons (US)** = **Converts to…..** **3.06888329** **Acre-feet** (conversion factor = 3.06888328973723)
Use of Option Buttons	To use the default percent value choose this button To enter a value choose this button and enter the value in the cell to the right  **NOTE:** For Unbilled Unmetered Consumption, Unauthorized Consumption and Systematic Data Handling Errors, a recommended default value can be applied by selecting the Percent option. The default values are based on fixed percentages of Water Supplied or Billed Authorized Consumption and are recommended for use in this audit unless the auditor has well validated data for their system. Default values are shown by purple cells, as shown in the example above. If a default value is selected, the user does not need to grade the item; a grading value of 5 is automatically applied (however, this grade will not be displayed).
Variable production cost (applied to Real Losses) Find	The cost to produce and supply the next unit of water (e.g., $/million gallons). This cost is determined by calculating the summed unit costs for ground and surface water treatment and all power used for pumping from the source to the customer. It may also include other miscellaneous unit costs that apply to the production of drinking water. It should also include the unit cost of bulk water purchased as an import if applicable. It is common to apply this unit cost to the volume of Real Losses. However, if water resources are strained and the ability to meet future drinking water demands is in question, then the water auditor can be justified in applying the Customer Retail Rate to the Real Loss volume, rather than applying the Variable Production Cost. The Free Water Audit Software applies the Variable Production costs to Real Losses by default. However, the auditor has the option on the Reporting Worksheet to select the Customer Retail Cost as the basis for the Real Loss cost evaluation if the auditor determines that this is warranted.
Volume from own sources Find	The volume of water withdrawn (abstracted) from water resources (rivers, lakes, streams, wells, etc) controlled by the water utility, and then treated for potable water distribution. Most water audits are compiled for utility retail water distribution systems, so this volume should reflect the amount of <u>treated</u> drinking water that entered the distribution system. Often the volume of water measured at the effluent of the treatment works is slightly less than the volume measured at the raw water source, since some of the water is used in the treatment process. Thus, it is useful if flows are metered at the effluent of the treatment works. If metering exists only at the raw water source, an adjustment for water used in the treatment process should be included to account for water consumed in treatment operations such as filter backwashing, basin flushing and cleaning, etc. If the audit is conducted for a wholesale water agency that sells untreated water, then this quantity reflects the measure of the raw water, typically metered at the source.

Item Name	Description
Volume from own sources: Master meter and supply error adjustment Find	An estimate or measure of the degree of inaccuracy that exists in the master (production) meters measuring the annual Volume from own Sources, and any error in the data trail that exists to collect, store and report the summary production data. This adjustment is a weighted average number that represents the collective error for all master meters for all days of the audit year and any errors identified in the data trail. Meter error can occur in different ways. A meter or meters may be inaccurate by under-registering flow (did not capture all the flow), or by over-registering flow (overstated the actual flow). Data error can occur due to data gaps caused by temporary outages of the meter or related instrumentation. All water utilities encounter some degree of inaccuracy in master meters and data errors in archival systems are common; thus a value of zero should <u>not</u> be entered. Enter a negative percentage or value for metered data under-registration; or, enter a positive percentage or value for metered data over-registration.
Water exported Find	The Water Exported volume is the bulk water conveyed and sold by the water utility to neighboring water systems that exists outside of their service area. Typically this water is metered at the custody transfer point of interconnection between the two water utilities. Usually the meter(s) are owned by the water utility that is selling the water: i.e. the exporter. If the water utility who is compiling the annual water audit sells bulk water in this manner, they are an exporter of water. Note: The Water Exported volume is sold to wholesale customers who are typically charged a wholesale rate that is different than retail rates charged to the retail customers existing within the service area. Many state regulatory agencies require that the Water Exported volume be reported to them as a quantity separate and distinct from the retail customer billed consumption. For these reasons - and others - the Water Exported volume is always quantified separately from Billed Authorized Consumption in the standard water audit. **Be certain not to "double-count" this quantity by including it in both the Water Exported box and the Billed Metered Consumption box of the water audit Reporting Worksheet. This volume should be included only in the Water Exported box.**
Water exported: Master meter and supply error adjustment Find	An estimate or measure of the volume in which the Water Exported volume is incorrect. This adjustment is a weighted average that represents the collective error for all of the metered and archived exported flow for all days of the audit year. Meter error can occur in different ways. A meter may be inaccurate by under-registering flow (did not capture all the flow), or by over-registering flow (overstated the actual flow). Error in the metered, archived data can also occur due to data gaps caused by temporary outages of the meter or related instrumentation. All water utilities encounter some degree of error in their metered data, particularly if meters are aged and infrequently tested. Occasional errors also occur in the archived data. Thus, a value of zero should <u>not</u> be entered. Enter a negative percentage or value for metered data under-registration; or enter a positive percentage or value for metered data over-registration. If regular meter accuracy testing is conducted on the meter(s) - which is usually conducted by the water utility selling the water - then the results of this testing can be used to help quantify the meter error adjustment. Corrections to data gaps or other errors found in the archived data should also be included as a portion of this meter error adjustment.
Water imported Find	The Water Imported volume is the bulk water purchased to become part of the Water Supplied volume. Typically this is water purchased from a neighboring water utility or regional water authority, and is metered at the custody transfer point of interconnection between the two water utilities. Usually the meter(s) are owned by the water supplier selling the water to the utility conducting the water audit. The water supplier selling the bulk water usually charges the receiving utility based upon a wholesale water rate.
Water imported: Master meter and supply error adjustment Find	An estimate or measure of the volume in which the Water Imported volume is incorrect. This adjustment is a weighted average that represents the collective error for all of the metered and archived imported flow for all days of the audit year. Meter error can occur in different ways. A meter may be inaccurate by under-registering flow (did not capture all the flow), or by over-registering flow (overstated the actual flow). Error in the metered, archived data can also occur due to data gaps caused by temporary outages of the meter or related instrumentation. All water utilities encounter some level of meter inaccuracy, particularly if meters are aged and infrequently tested. Occasional errors also occur in the archived metered data. Thus, a value of zero should <u>not</u> be entered. Enter a negative percentage or value for metered data under-registration; or, enter a positive percentage or value for metered data over-registration. If regular meter accuracy testing is conducted on the meter(s) - which is usually conducted by the water utility selling the water - then the results of this testing can be used to help quantify the meter error adjustment.
WATER LOSSES Find	= apparent losses + real losses Water Losses are the difference between Water Supplied and Authorized Consumption. Water losses can be considered as a total volume for the whole system, or for partial systems such as transmission systems, pressure zones or district metered areas (DMA); if one of these configurations are the basis of the water audit.

Water Audit Report for: Fair Oaks Water District
Reporting Year: 2015 | 1/2015 - 12/2015
Data Validity Score: **85**

Water Loss Control Planning Guide

	Water Audit Data Validity Level / Score				
Functional Focus Area	**Level I** (0-25)	**Level II** (26-50)	**Level III** (51-70)	**Level IV** (71-90)	**Level V** (91-100)
Audit Data Collection	Launch auditing and loss control team; address production metering deficiencies	Analyze business process for customer metering and billing functions and water supply operations. Identify data gaps.	Establish/revise policies and procedures for data collection	Refine data collection practices and establish as routine business process	Annual water audit is a reliable gauge of year-to-year water efficiency standing
Short-term loss control	Research information on leak detection programs. Begin flowcharting analysis of customer billing system	Conduct loss assessment investigations on a sample portion of the system: customer meter testing, leak survey, unauthorized consumption, etc.	Establish ongoing mechanisms for customer meter accuracy testing, active leakage control and infrastructure monitoring	Refine, enhance or expand ongoing programs based upon economic justification	Stay abreast of improvements in metering, meter reading, billing, leakage management and infrastructure rehabilitation
Long-term loss control		Begin to assess long-term needs requiring large expenditure: customer meter replacement, water main replacement program, new customer billing system or Automatic Meter Reading (AMR) system.	Begin to assemble economic business case for long-term needs based upon improved data becoming available through the water audit process.	Conduct detailed planning, budgeting and launch of comprehensive improvements for metering, billing or infrastructure management	Continue incremental improvements in short-term and long-term loss control interventions
Target-setting			Establish long-term apparent and real loss reduction goals (+10 year horizon)	Establish mid-range (5 year horizon) apparent and real loss reduction goals	Evaluate and refine loss control goals on a yearly basis
Benchmarking			Preliminary Comparisons - can begin to rely upon the Infrastructure Leakage Index (ILI) for performance comparisons for real losses (see below table)	Performance Benchmarking - ILI is meaningful in comparing real loss standing	Identify Best Practices/ Best in class - the ILI is very reliable as a real loss performance indicator for best in class service

For validity scores of 50 or below, the shaded blocks should not be focus areas until better data validity is achieved.

Once data have been entered into the Reporting Worksheet, the performance indicators are automatically calculated. How does a water utility operator know how well his or her system is performing? The AWWA Water Loss Control Committee provided the following table to assist water utilities is gauging an approximate Infrastructure Leakage Index (ILI) that is appropriate for their water system and local conditions. The lower the amount of leakage and real losses that exist in the system, then the lower the ILI value will be.

Note: this table offers an approximate guideline for leakage reduction target-setting. The best means of setting such targets include performing an economic assessment of various loss control methods. However, this table is useful if such an assessment is not possible.

General Guidelines for Setting a Target ILI
(without doing a full economic analysis of leakage control options)

Target ILI Range	Financial Considerations	Operational Considerations	Water Resources Considerations
1.0 - 3.0	Water resources are costly to develop or purchase; ability to increase revenues via water rates is greatly limited because of regulation or low ratepayer affordability.	Operating with system leakage above this level would require expansion of existing infrastructure and/or additional water resources to meet the demand.	Available resources are greatly limited and are very difficult and/or environmentally unsound to develop.
>3.0 -5.0	Water resources can be developed or purchased at reasonable expense; periodic water rate increases can be feasibly imposed and are tolerated by the customer population.	Existing water supply infrastructure capability is sufficient to meet long-term demand as long as reasonable leakage management controls are in place.	Water resources are believed to be sufficient to meet long-term needs, but demand management interventions (leakage management, water conservation) are included in the long-term planning.
>5.0 - 8.0	Cost to purchase or obtain/treat water is low, as are rates charged to customers.	Superior reliability, capacity and integrity of the water supply infrastructure make it relatively immune to supply shortages.	Water resources are plentiful, reliable, and easily extracted.
Greater than 8.0	Although operational and financial considerations may allow a long-term ILI greater than 8.0, such a level of leakage is not an effective utilization of water as a resource. Setting a target level greater than 8.0 - other than as an incremental goal to a smaller long-term target - is discouraged.		
Less than 1.0	If the calculated Infrastructure Leakage Index (ILI) value for your system is 1.0 or less, two possibilities exist. a) you are maintaining your leakage at low levels in a class with the top worldwide performers in leakage control. b) A portion of your data may be flawed, causing your losses to be greatly understated. This is likely if you calculate a low ILI value but do not employ extensive leakage control practices in your operations. In such cases it is beneficial to validate the data by performing field measurements to confirm the accuracy of production and customer meters, or to identify any other potential sources of error in the data.		

AWWA Water Audit Software Version 5.0 Developed by the Water Loss Control Committee of the American Water Works Association August, 2014

This software is intended to serve as a basic tool to compile a preliminary, or “top-down”, water audit. It is recommended that users also refer to the current edition of the AWWA M36 Publication, Water Audits and Loss Control Programs, for detailed guidance on compiling a comprehensive, or “bottom-up”, water audit using the same water audit methodology.

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- Kunkel, G. et al, 2003. Water Loss Control Committee Report: Applying Worldwide Best Management Practices in Water Loss Control. Journal AWWA, 95:8:65

- AWWA Water Audits and Loss Control Programs, M36 Publication, 3rd Edition, 2009
- Service Connection Diagrams courtesy of Ronnie McKenzie, WRP Pty Ltd.

VERSION HISTORY:

Version:	Release Date:	Number of Worksheets:	Key Features and Developments
v1	2005/ 2006	5	The AWWA Water Audit Software was piloted in 2005 (v1.0 beta). The early versions (1.x) of the software restricted data entry to units of Million Gallons per year. For each entry into the audit, users identified whether the input was measured or estimated.
v2	2006	5	The most significant enhancement in v2 of the software was to allow the user to choose the volumetric units to be used in the audit, Million Gallons or Thousand Cubic Metres (megalitres) per year. Two financial performance indicators were added to provide feedback to the user on the cost of Real and Apparent losses.
v3	2007	7	In v3, the option to report volumetric units in acre-feet was added. Another new feature in v3 was the inclusion of default values for two water audit components (unbilled unmetered and unauthorized consumption). v3 also included two examples of completed audits in units of million gallons and Megalitres. Several checks were added into v3 to provide instant feedback to the user on common data entry problems, in order to help the user complete an accurate water audit.
v4 - v4.2	2010	10	v4 (and versions 4.x) of the software included a new approach to data grading. The simple "estimated" or "measured" approach was replaced with a more granular scale (typically 1-10) that reflected descriptions of utility practices and served to describe the confidence and accuracy of the input data. Each input value had a corresponding scale fully described in the Grading Matrix tab. The Grading Matrix also showed the actions required to move to a higher grading score. Grading descriptions were available on the Reporting Worksheet via a pop-up box next to each water audit input. A water audit data validity score is generated (max = 100) and priority areas for attention (to improve audit accuracy) are identified, once a user completes the requied data grading. A service connection diagram was also added to help users understand the impact of customer service line configurations on water losses and how this information should be entered into the water audit software. An acknoweldgements section was also added. Minor bug fixes resulted in the release of versions 4.1 and 4.2. A French language version was also made available for v4.2.
v5	2014	12	In v5, changes were made to the way Water Supplied information is entered into software, with each major component having a corresponding Master Meter Error Adjustment entry (and data grading requirement). This required changes to the data validity score calculation; v5 of the software uses a weighting system that is, in part, proportional to the volume of input components. The Grading Matrix was updated to reflect the new audit inputs and also to include clarifications and additions to the scale descriptions. The appearance of the software was updated in v5 to make the software more user-friendly and several new features were added to provide more feedback to the user. Notably, a dashboard tab has been added to provide more visual feedback on the water audit results and associated costs of Non-Revenue Water. A comments sheet was added to allow the user to track notes, comments and to cite sources used.

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Attachment F: Sacramento Groundwater Authority 2014 Groundwater Management Plan for the Sacramento County – North Basin

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WATER DISTRICT

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Sacramento Groundwater Authority

Groundwater Management Plan

Sacramento County - North Basin




December 2014

SGA

Sacramento Groundwater Authority
Managing Groundwater Resources
in Northern Sacramento County

December 31, 2014

Sacramento Groundwater Authority
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Members:
California American Water
Carmichael Water District
Citrus Heights Water District
Del Paso Manor Water District
Fair Oaks Water District
Folsom, city of
Golden State Water Company
Natomas Central Mutual Water Company
Orange Vale Water Company
Rio Linda/Elverta Community Water District
Sacramento, city of
Sacramento, county of
Sacramento Suburban Water District
San Juan Water District
agricultural and self-supplied representatives

To Interested Parties and Individuals:

The Sacramento Groundwater Authority (SGA) is pleased to release this revised Groundwater Management Plan (GMP), adopted December 11, 2014 by the SGA Board of Directors. The plan represents a continuation of the SGA GMP initially adopted in 2003 to sustainably manage the groundwater basin in Sacramento County north of the American River. While the initial GMP was very effective in helping achieve this goal, SGA committed to comprehensive review and updates of its GMP to ensure that our objectives remain responsive to developing needs. SGA's increased understanding through time of best management practices for effective local groundwater management are reflected in this GMP update.

SGA and its members are committed to the regional objectives established by the historic Sacramento Water Forum Agreement of April 2000, and these objectives are incorporated into the plan. Since SGA's formation in 1998, SGA members have taken many steps to preserve the valuable groundwater resources underlying our region.

SGA is grateful for its successful partnership with the California Department of Water Resources that has allowed us to significantly advance our understanding and enhance our management decision-making in the basin. SGA also appreciates the efforts of member agencies and their respective Board representatives that ensure successful management in the basin. As California enters a new era in groundwater management, we look forward to continuing to be leaders in sustainable management of our groundwater.

Comments and suggestions to improve management in the basin are always welcome. To view our most recent Basin Management Report, which reviews GMP actions and results, please visit the SGA web site at www.sgah2o.org.

Sincerely,

John K. Woodling
Executive Director

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Table of Contents

SECTION 1 INTRODUCTION......1
1.1 Background......1
1.1.1 The Water Forum......1
1.1.2 Sacramento Groundwater Authority......4
1.1.3 Additional Collaboration......6
1.2 Authority to Prepare and Implement a GMP......10
1.3 Purpose of the SGA GMP......10
1.4 Mandatory and Suggested Components of a GMP and a Groundwater Sustainability Plan (GSP)......10

SECTION 2 WATER RESOURCES SETTING......15
2.1 Brief History of Water Development in the SGA Region......15
2.2 Groundwater Resources......17
2.2.1 Geology and Aquifer Characteristics......17
2.2.2 Groundwater Extraction......22
2.2.3 Groundwater Levels......24
2.2.4 Groundwater Recharge/Water Budget......28
2.2.5 Groundwater Quality......33
2.3 Surface Water Resources......39
2.3.1 Surface Water Supply......39
2.3.2 Surface Water-Groundwater Interaction......41
2.3.3 Gaining and Losing Streams......42
2.4 Water Supply and Demand......43
2.4.1 Recent Supply and Demand......43
2.4.2 Future Supply and Demand......45

SECTION 3 GROUNDWATER MANAGEMENT PLAN ELEMENTS......47
3.1 Groundwater Management Goal......47
3.2 Basin Management Objectives......47
3.3 Groundwater Management Process......48
3.3.1 Monitoring......50
3.3.2 Data Management......57
3.3.3 Data Analysis......58
3.3.4 Management Response Options......72

SECTION 4 PLAN IMPLEMENTATION......79
4.1 SGA Staffing......79
4.2 SGA Fees and Budget......79
4.2.1 Annual Fees......79
4.2.2 Annual Budget......80
4.3 GMP Implementation......81

SECTION 5 REFERENCES......85

Appendices

Appendix A – SGA Joint Powers Agreement

Appendix B – Public Process Documentation

Appendix C – Groundwater Model Background

Appendix D – Land Subsidence Monitoring Plan

List of Tables

Table 1. SGA Board Composition and Appointing Agencies 4
Table 2: Components of a GMP 11
Table 3: Components of a GSP 12
Table 4: Estimates of Groundwater Recharge to the North Basin 32
Table 5: Surface Water Rights and Entitlements for Agencies in the North Basin 40
Table 6: Reported M&I Surface Water and Groundwater Supplies by Agency 43
Table 7: Current and Projected M&I Water Demands by Agency 45
Table 8: SGA Water Level Monitoring Network Attributes 52
Table 9: SGA Agencies Subject to Annual Fees 80
Table 10: SGA FY 14/15 Revenues 81
Table 11: SGA FY 14/15 Expenses 81
Table 12: SGA GMP Implementation Actions 82

List of Figures

Figure 1: Water Forum Agreement Groundwater Management Sub-areas. 3
Figure 2: Water Supplier Service Areas within the North Basin. 5
Figure 3: Groundwater Management in Relation to the North American Subbasin. 8
Figure 4: Geology of the North Basin. 20
Figure 5: Apparent Change in Land Surface Elevation at a Bench mark and Groundwater Levels in Two Nearby Wells. 22
Figure 6: Reported M&I Annual Groundwater Extraction. 23
Figure 7: Spring 2014 Groundwater Elevation Contours. 26
Figure 8: Long-Term Hydrographs for the North Basin. 27
Figure 9: Distribution of Hydrologic Soil Types in the North Basin. 29
Figure 10: North Basin Land Use Map. 30
Figure 11: Streams Included in Calculation of Stream-Aquifer Interaction. 31
Figure 12: North Basin Recharge Map. 32
Figure 13: Principal Contaminant Plumes in the SGA Area. 38
Figure 14: Stage in the American River and Nearby Groundwater Levels. 41
Figure 15: Graphical Depiction of the SGA Groundwater Management Process. 49
Figure 16: SGA Groundwater Level Monitoring Network. 51

Figure 17: General Locations of Wells Subject to Monitoring and Reporting to SWRCB DDW. 53
Figure 18: SGA Land Subsidence Monitoring Network. 54
Figure 19: Stage, Precipitation, and Evaporation Monitoring Sites for the North Basin. 56
Figure 20: Locations of SGA Threshold Wells. 61
Figure 21: Threshold Values for MW-1. 63
Figure 22: Threshold Values for Lone Oak. 64
Figure 23: Threshold Values for Roseview Park. 64
Figure 24: Threshold Values for MW-AB4. 65
Figure 25: Threshold Values for Chuckwagon. 66
Figure 26: Threshold Values for MW-4. 67
Figure 27: Threshold Values for MW-6. 67
Figure 28: Threshold Values for MW-15. 68
Figure 29: Threshold Values in MW-N28. 69
Figure 30: Threshold Values in MW-10. 69

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Section 1 Introduction

This is the groundwater management plan (GMP) for the Sacramento Groundwater Authority (SGA), a public agency formed in 1998 for the purpose of managing the groundwater basin underlying Sacramento County north of the American River. This GMP is a comprehensive update of the 2008 SGA GMP, one in a continuing series of updated GMPs originally prepared and adopted in 2003. This GMP relates SGA's current understanding of the underlying basin based on years of ongoing groundwater management. It also describes past efforts that have resulted in the SGA area now being sustainably managed and a plan for SGA to continue to do so into the future.

1.1 Background

The Sacramento region is recognized for its collaborative and inclusive approach to sustainable water management. The region's Water Forum Agreement (WFA) of April 2000, with its co-equal objectives of providing reliable water supplies and preserving the environment of the Lower American River, was honored with several prestigious awards, including: Outstanding Environmental Achievement by the United States Environmental Protection Agency; the Clair A. Hill Water Agency Award for Excellence by the Association of California Water Agencies; and the Helen Putnam Water Award for Excellence in Land Use and Environmental Quality by the League of California Cities (Water Forum, 2001).

One of the key agencies formed to ensure the WFA was successfully implemented was the SGA. In 2001, SGA was honored by the Groundwater Resources Association of California with the Kevin J. Neese Award for outstanding contributions in the field of groundwater management for its part in partnering with other regional stakeholders to develop and implement cost-effective and efficient water resource management strategies. The SGA was recently recognized by one of the primary authors of the 2014 Sustainable Groundwater Management Act, when he indicated that a desired outcome of the Act was to ensure that every region had a system that performed the same function as the SGA (Sacramento Business Journal, 2014).

Collaboration and the resulting optimism regarding sustainable water management have not always characterized the SGA region. The 1970s and 1980s were a period of significant growth for the greater Sacramento region resulting in increasing water demands on the region's surface water and groundwater resources. Proposals to increase diversions from the already stressed habitat of the Lower American River faced potentially prolonged legal challenges (Water Education Foundation, 2002). Groundwater levels in much of the region were declining steadily, and as a result, Sacramento County was identified by the California Department of Water Resources as being in a state of groundwater overdraft (DWR, 1980). These conditions moved local leaders to conclude that a process was needed to ensure that water resources were managed sustainably as the region developed. That process became known as the Water Forum.

1.1.1 The Water Forum

Representatives of water suppliers, local governments, citizens groups, environmental organizations, and business began the Water Forum in 1993 with a goal of developing a plan to ensure reliable long-term water supplies while protecting the Lower American River. Following more than six years of analysis, professionally facilitated discussion, and negotiations, 40 diverse stakeholder groups signed the WFA[1] in April 2000 (Water Education Foundation, 2002). An Environmental Impact Report for the WFA was completed in October, 1999. The WFA included the following co-equal objectives:

- Provide a reliable and safe water supply for the region's economic health and planned development through the year 2030.
- Preserve the fishery, wildlife, recreational, and aesthetic values of the lower American River.

To achieve its objectives, WFA signatories approved an integrated package of seven elements:

1. Increased surface water diversions;
2. Actions to meet customer needs while reducing diversion impacts in drier years;
3. Support for improved pattern of fishery flow releases from Folsom Reservoir;
4. Lower American River habitat management;
5. Water conservation;
6. Groundwater management;
7. Water Forum Successor Effort.

The Water Forum effort continues today, with many successes and some ongoing challenges to meeting its objectives. Most importantly, a majority of the signatory stakeholder groups are still working to meet the WFA's objectives more than 14 years after its execution.

While each of the elements of the WFA is critical to meeting its co-equal objectives, the groundwater management element is most relevant to local groundwater management efforts and to this GMP. The groundwater management element provides a framework for protecting and using groundwater in a sustainable manner (Water Forum, 2001). In recognizing differences in development and use of groundwater in the region, the WFA divided Sacramento County into three groundwater management areas (Figure 1). They are referred to as the North Basin, Central Basin, and South Basin (also referred to as the North Area, Central Area, and South Area). Because of the level of municipal water supply development that had already occurred in the North Basin, the first groundwater management agency in the County formed there in 1998 in advance of executing the WFA. That agency, known as the SGA, has continually managed the North Basin since that time.

[1] The WFA is available online at http://www.waterforum.org.

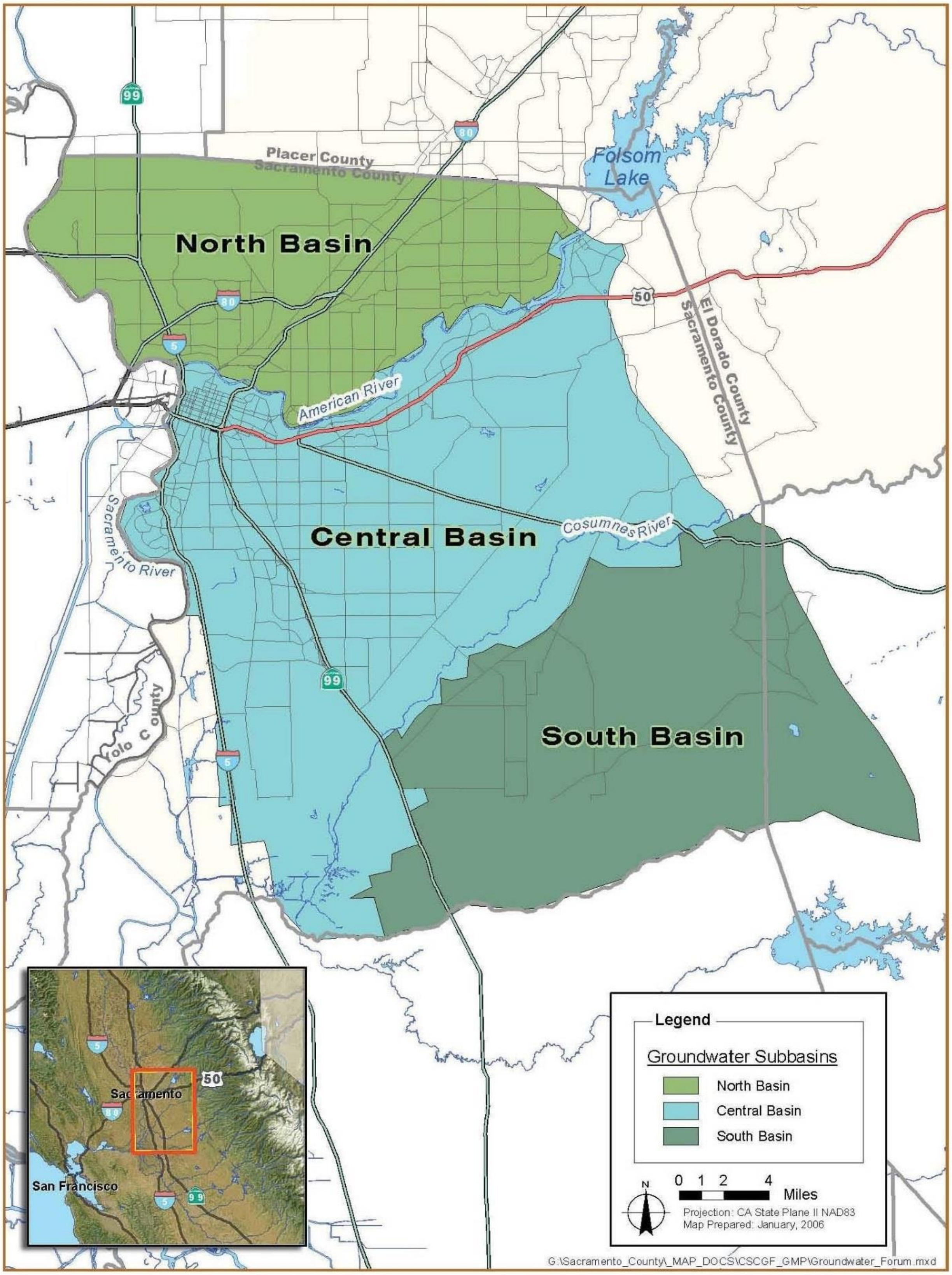

Figure 1: Water Forum Agreement Groundwater Management Sub-areas.

1.1.2 Sacramento Groundwater Authority

The SGA is a joint powers authority (JPA) created to manage the North Basin. It was originally formed in 1998 under the name Sacramento North Area Groundwater Management Authority. The SGA's boundary coincides with the North Basin, the area covered by this GMP, which consists of that portion of Sacramento County north of the American River.

In a joint powers agreement, included as Appendix A, the County of Sacramento and the cities of Citrus Heights, Folsom, and Sacramento authorized SGA to exercise their common police powers to manage the underlying groundwater basin. Additionally, they chose to manage the basin in a regionally cooperative fashion by allowing representatives of the 14 local water purveyors operating in the SGA area, along with representatives of agricultural and self-supplied pumpers, to serve as the SGA Board of Directors. In order to ensure that SGA is maintained as a local public agency, while allowing non-public entities to participate in Board activities, the JPA requires that Board representatives be appointed by one of the JPA signatories. Each position represented on the SGA Board and the appointing JPA agency is listed in Table 1 below. The term of office for each appointment is four years. The water supply agency service areas are shown in relation to the SGA boundary and the North Basin in Figure 2.

Table 1. SGA Board Composition and Appointing Agencies

SGA Board Position	Appointing JPA Signatory
California American Water	Sacramento City Council
Carmichael Water District	Sacramento County Board of Supervisors
Citrus Heights Water District	Citrus Heights City Council
City of Folsom	Folsom City Council
City of Sacramento	Sacramento City Council
Del Paso Manor Water District	Sacramento City Council
Fair Oaks Water District	Sacramento County Board of Supervisors
Golden State Water Company	Sacramento City Council
Natomas Central Mutual Water Company	Sacramento City Council
Orange Vale Water Company	Sacramento County Board of Supervisors
Rio Linda/Elverta Community Water District	Sacramento County Board of Supervisors
Sacramento County Water Agency	Sacramento County Board of Supervisors
Sacramento Suburban Water District	Sacramento City Council
San Juan Water District	Sacramento County Board of Supervisors
Agricultural Representative	Sacramento County Board of Supervisors
Self-Supplied Representative	Sacramento City Council

SGA's core management responsibilities are established in its JPA as follows:

1. To maintain the long-term sustainable yield of the North Basin, which was estimated to be 131,000 acre-feet in the WFA.
2. To manage the use of groundwater in the North Basin and facilitate implementation of an appropriate conjunctive use program by water purveyors.

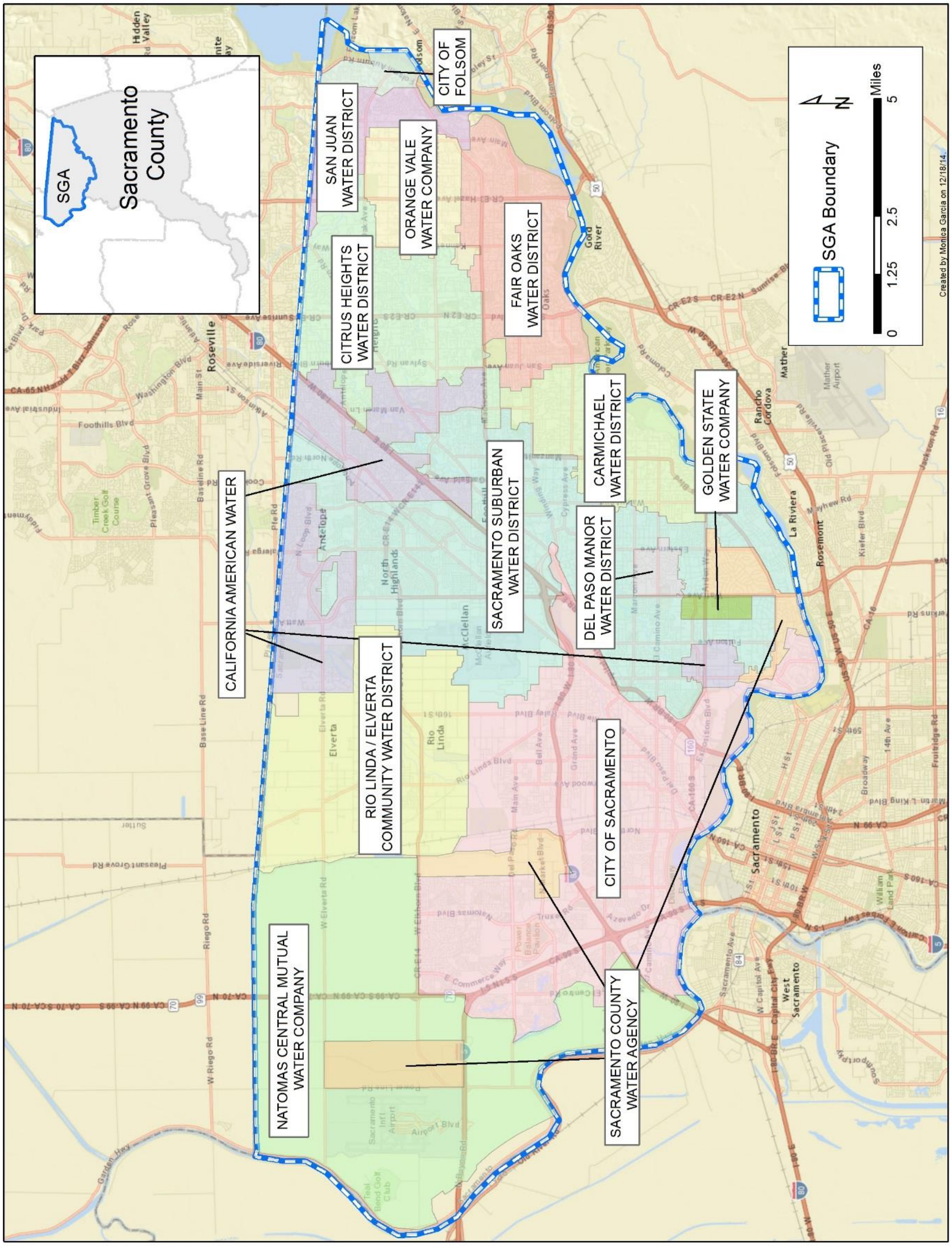

Figure 2: Water Supplier Service Areas within the North Basin.

3. To coordinate efforts among those entities represented on the governing body of the JPA to devise and implement strategies to safeguard groundwater quality.
4. To work collaboratively with other entities, including groundwater management agencies formed in other areas of Sacramento County and adjacent political jurisdictions, to promote coordination of policies and activities throughout the region.

SGA has been granted extensive powers and functions (see Section 16 of SGA JPA in Appendix A of this GMP) to accomplish its sustainable groundwater management mission. However, SGA has been able to manage in a cooperative fashion with the broad group of representative water users in the basin in such a way that many of its powers have never needed to be employed.

1.1.3 Additional Collaboration

SGA has long recognized that successful groundwater management requires extensive collaboration with many agencies within and adjacent to the North Basin. To address this, the SGA has pursued several means of achieving broader involvement in the management of the North Basin. These include: 1) involving other local agencies to better integrate water management; 2) involving other groundwater management groups within and adjacent to the SGA area; 3) developing relationships with state and federal agencies; and 4) coordinating with local land use planning efforts. Each of these is discussed further below.

<u>Involving Other Local Agencies to Integrate Water Management</u>

SGA staff also serves as staff of the Regional Water Authority (RWA). RWA is a JPA formed in 2001 in large part to assist local water suppliers in complying with various aspects of the WFA, including implementation of a regional water efficiency program to help meet the WFA water conservation element. Since 2001, the size and scope of RWA has grown significantly. Today, RWA has more than 20 water supplier member agencies in the greater Sacramento region; several of these agencies also manage wastewater and stormwater. Among RWA's associate members, agencies that do not serve water directly to customers, are the Sacramento Regional County Sanitation District, Sacramento Area Flood Control Agency, and the Sacramento Municipal Utilities District. This broad representation ensures a high level of integration of water-related planning in the region, including potable and recycled water supply, flood and stormwater management, and water and energy demand management.

RWA is the designated Regional Water Management Group authorized by DWR to prepare and implement the American River Basin (ARB) Integrated Regional Water Management Plan (IRWMP) (RWA, 2013). Because the same staff prepared both the IRWMP and the SGA GMP, they are fully aligned. SGA understands that effective groundwater management is key to meeting the vision, goals, and objectives of the ARB IRWMP. During IRWMP development, SGA ensured that specific strategies were identified to help meet the ARB IRWMP objectives. These strategies are consistent with the SGA GMP, and include:

- Increase groundwater production capacity to 550 million gallons per day by 2030.
- Reduce the extent of groundwater contamination, consistent with regulatory cleanup programs.
- Increase use of remediated groundwater for beneficial uses.

- Improve groundwater levels to support and improve habitat.
- Identify natural recharge areas and relay that information to relevant land-use planning agencies by 2015 (RWA, 2013).

SGA's successful groundwater management activities will contribute greatly to meeting the goals set forth in these ARB IRWMP strategies.

Involving Other Groundwater Management Agencies Within and Adjacent to the SGA Area

The SGA boundary covers approximately the southern one-third of the North American Subbasin as defined by DWR (DWR, 2003). The remainder of the subbasin includes portions of Sutter and Placer counties. The North American Subbasin and the agencies that manage groundwater within and adjacent to the subbasin are shown in Figure 3.

The SGA is closely connected to groundwater management activities in Placer County. In November 2007, the City of Roseville, the City of Lincoln, Placer County Water Agency, and California American Water (Cal Am) cooperatively developed the Western Placer County Groundwater Management Plan (WPCGMP). SGA participated in WPCGMP development meetings and has routinely coordinated with staff responsible for the WPCGMP on groundwater management activities. The City of Roseville, acting as the WPCGMP lead agency, routinely attends meetings of the SGA Board, and Cal Am is represented on the SGA Board for its north Sacramento County service areas.

In Sutter County, much of the subbasin is managed either by South Sutter Water District (South Sutter) or by Natomas Central Mutual Water Company (NCMWC). NCMWC is an SGA member, although the Sutter County portion of the district does not fall under the SGA GMP, because it is beyond the boundaries of the SGA's authority. NCMWC adopted a GMP in 2009. South Sutter adopted a GMP in 1995. South Sutter provided a copy of that GMP to the SGA, and the SGA has provided briefings to the South Sutter General Manager on its GMP implementation efforts. Sutter County adopted a GMP in 2012 and coordinated with SGA during its development.

In addition to involving other agencies within the North American Subbasin, the SGA also coordinates with the Yolo County Flood Control and Water Conservation District, representing the Yolo Subbasin to the west, which adopted a water management plan in 2000 that includes groundwater management components. Finally, SGA regularly attends meetings of the Sacramento Central Groundwater Authority (SCGA), representing the South American Subbasin, as defined by DWR, to the south. SCGA adopted a GMP in 2006. Several of the SCGA member agencies are also represented on the SGA Board because they also have service areas within the SCGA, resulting in extensive collaboration.

Relationships with State and Federal Agencies

Working relationships between SGA and local, state, and federal regulatory agencies are critical to developing and implementing the various groundwater management strategies and actions detailed in this GMP.

DWR has been a key SGA partner since 2002. DWR has provided several local groundwater assistance grants and has collaborated with SGA directly on several key elements of developing

SGA's groundwater management program. These included the development of SGA's original database of groundwater information, construction of dedicated monitoring wells, the update of the SGA groundwater modeling tool, and identification of threats to groundwater quality sustainability in the North Basin.

SGA partnered with DWR and the United States Bureau of Reclamation during 2002 in a water banking and exchange pilot study that resulted in the transfer of 7,143 acre-feet of water to the CALFED Bay-Delta Program Environmental Water Account. The transfer demonstrated the viability of a banking and exchange program within the region in which SGA was shown to be capable of successfully securing contractual and institutional arrangements for the transfer, while ensuring no net impacts to the underlying basin (SGA, 2003).

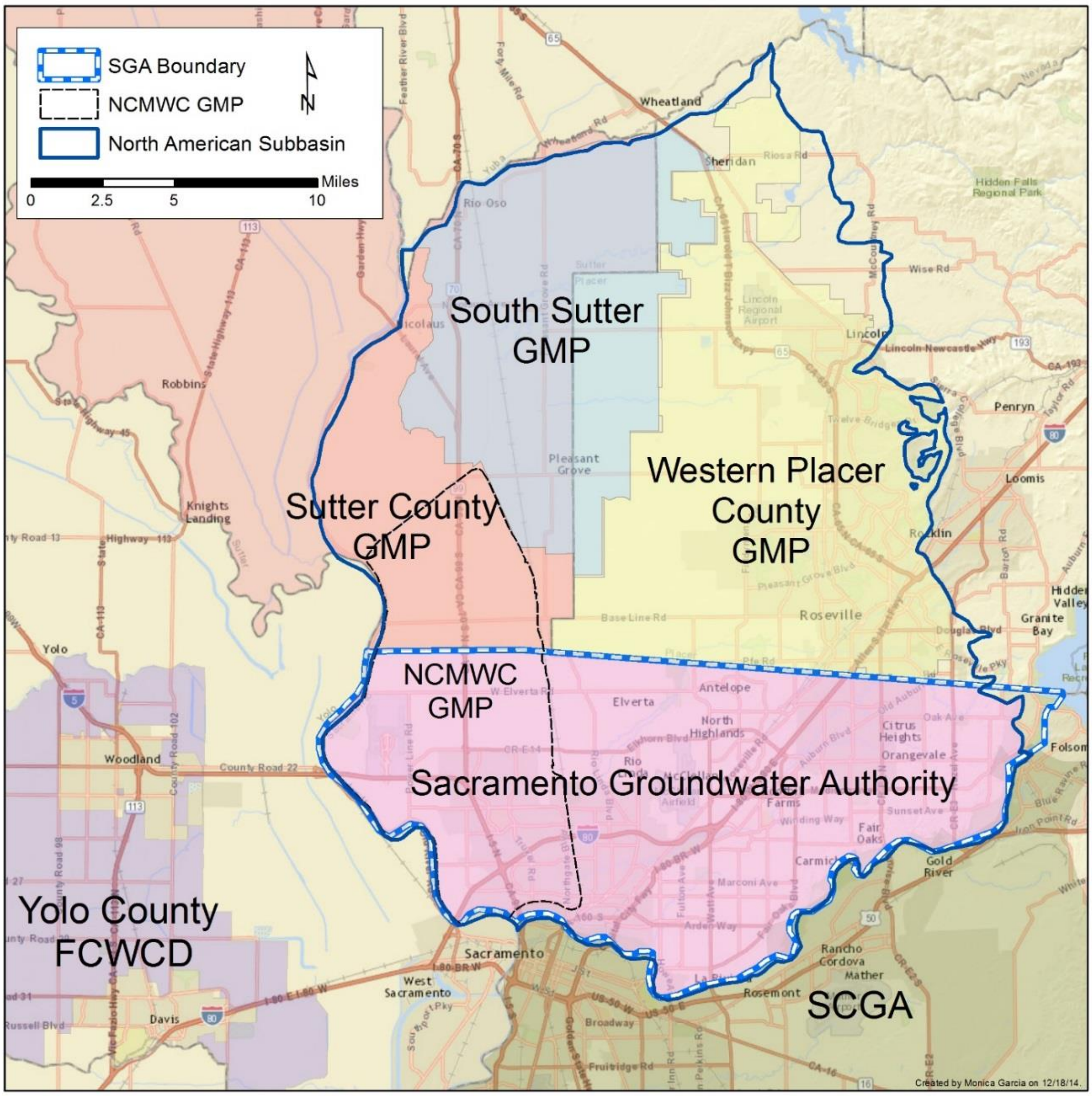

Figure 3: Groundwater Management in Relation to the North American Subbasin.

One issue of particular importance to SGA is the presence of groundwater contamination plumes associated with defense-related and other industrial activities. This contamination is known to limit local water purveyors' access to groundwater in a significant portion of the basin. If groundwater contamination is not managed properly, the region could potentially increase its reliance on surface water. This could in turn threaten the region's ability to implement the WFA. In February 2004, SGA learned that N-nitrosodimethylamine (NDMA) associated with a contaminant plume from the Aerojet facility near Rancho Cordova had been detected in a monitoring well within Carmichael Water District (CWD). In response, SGA joined forces with the Water Forum to establish what is now known as the Regional Contamination Issues Committee (RCIC) in June 2004. The RCIC is a forum for water purveyors, regulators and responsible parties to raise issues and discuss solutions for dealing with groundwater contamination issues that impact the region. The group has met continually since that time. Standing meetings are scheduled on a quarterly basis. State agencies represented include the Central Valley Regional Water Quality Control Board, the Department of Toxic Substances Control, and the Department of Public Health. The federal government has been represented by the United States Environmental Protection Agency.

The SGA has also been working with the Sacramento Area Flood Control Agency (SAFCA) and United States Army Corps of Engineers (USACE) in understanding the effects on groundwater of placing deep slurry walls to strengthen existing levees in Sacramento County along the Sacramento and American rivers. SGA will continue to review and comment on proposed plans for new slurry wall projects as they are released, particularly on the American River, which is a significant source of recharge to the groundwater basin.

Coordinating Other Planning Efforts

In addition to the WFA and the ARB IRWMP discussed above, there are two other forms of water resources-related plans that are relevant to SGA. These include county and city General Plans and public water supplier Urban Water Management Plans (UWMPs).

Within the SGA management area, four entities have responsibility for General Plans. These include the cities of Sacramento, Citrus Heights, and Folsom and the County of Sacramento. The SGA GMP and the adopted General Plans of these entities have a high level of consistency. Their planning horizons (out to 2030 or 2035) include the anticipated planned growth in the region consistent with the WFA. SGA's efforts to ensure sustainable groundwater resources will ensure that a reliable water supply is available to meet these future planned demands.

An opportunity for near-term coordination will be upon adoption of this GMP. SGA will provide the GMP to these entities, including the information on natural recharge areas. In addition, SGA will meet with representatives of each of the four entities responsible for preparing General Plans to discuss the requirements of the Sustainable Groundwater Management Act and identify opportunities for future coordination.

An example of ongoing coordination is with the Elverta Specific Plan (ESP) area in Sacramento County. The ESP area is subject to a County Policy (known as PF-8) that requires that future water supply be consistent with an SGA groundwater management program. A water supply for the area is still in the planning stages. When it is complete, the Sacramento County Planning Department intends to bring the proposed supply plan for a consistency check with SGA.

Preliminary meetings on the most recent supply plan for ESP were held in 2014 and are expected to continue into 2015.

Within the SGA management area, 12 member agencies are required to prepare UWMPs. There has been close coordination on these planning efforts. Member agencies typically rely on SGA to provide a description of the groundwater basin for use in UWMP updates. SGA is notified when draft UWMPs are available for public comment. SGA does not see any conflicts or impacts between its GMP and the UWMPs of these entities. Their planning horizons (currently to 2030) include the anticipated planned growth in the region consistent with the WFA. SGA's efforts to ensure sustainable groundwater resources will ensure that reliable water supply is available to meet these future planned demands. SGA will coordinate with these agencies in 2015 as their UWMP updates are being prepared to ensure ongoing consistency with the GMP.

1.2 Authority to Prepare and Implement a GMP

As a JPA formed by local public agencies that provide water service, SGA is authorized to prepare and implement this GMP by California Water Code (CWC) Section 10753(a). This GMP applies to the entirety of the SGA service area, which is defined in its JPA as all of Sacramento County north of the American River.

1.3 Purpose of the SGA GMP

This GMP serves multiple purposes. It serves as a framework for successful implementation of SGA's core management responsibilities by detailing the activities SGA has taken and will undertake to manage the North Basin to provide reliable and sustainable groundwater resources. This GMP update also serves as an opportunity to periodically evaluate groundwater management actions and to recommend new ones. Finally, the GMP enables SGA to align its management activities as closely as possible with the framework of sustainable groundwater management established in the CWC. This alignment is described further below.

1.4 Mandatory and Suggested Components of a GMP and a Groundwater Sustainability Plan (GSP)

California statute and good groundwater management practices require that a GMP include specific items. This section of the SGA GMP lists the required and voluntary components of a GMP and indicates where those components can be found in this plan. These components are relative to the sections of the CWC that existed at the time of commencing the GMP update in April, 2013. These components fall into two categories:

- The components that must be included in a GMP so that the agency administering the plan is eligible for the award of state funds for the construction of groundwater projects or groundwater quality projects (CWC Section 10753.7).
- The Water Code includes 12 technical issues that could be addressed in GMPs to manage the basin optimally and protect against adverse conditions (CWC Section 10753.8).

Table 2 lists the sections of this GMP where each component is addressed.

This GMP update was in progress as legislation was signed in September, 2014 requiring that GSPs be prepared for high and medium priority groundwater basins. The North Basin comprises a significant portion of the North American Subbasin, as defined by DWR, which is classified as a high priority basin. Therefore, this plan has incorporated, to the extent now possible, components required of GSPs as described in CWC Section 10727. The legislation, known as the Sustainable Groundwater Management Act, goes into effect on January 1, 2015. Table 3 identifies the components in the CWC and where each item is found in this GMP.

Table 2: Components of a GMP

Mandatory Components of a GMP from the CWC		
	CWC Section	**Where to find in SGA GMP**
Documentation of Public Involvement		Appendix B
Basin Management Objectives (BMOs)	10753.7 (a) (1)	3.2
Monitoring and management of groundwater elevations, groundwater quality, inelastic land surface subsidence, and changes in surface water flows and quality that directly affect groundwater levels or quality or are caused by pumping.	10753.7 (a) (1)	3.3.1
Description of how recharge areas contribute to groundwater replenishment	10753.7 (a) (1)	2.2.4
Plan to involve other agencies located within groundwater basin.	10753.7 (a) (2)	1.1.2, 1.1.3
Map of groundwater basin showing area of agency subject to GMP, other local agency boundaries, and groundwater basin boundary as defined in DWR Bulletin 118.	10753.7 (a) (3)	Figure 2 & 3
Map of recharge areas.	10753.7 (a) (4) (A)	Figure 12
Monitoring protocols for groundwater management	10753.7 (a) (5)	3.3.1
Voluntary Components of a GMP from the CWC		
1. Control of saline water intrusion.	10753.8 (a)	3.3.4
2. Identification and management of wellhead protection areas and recharge areas	10753.8 (b)	3.3.4
3. Regulation of the migration of contaminated groundwater	10753.8 (c)	3.3.4
4. Administration of well abandonment and well destruction program.	10753.8 (d)	3.3.4
5. Mitigation of conditions of overdraft	10753.8 (e)	3.3.4
6. Replenishment of groundwater extracted by water producers	10753.8 (f)	3.3.4
7. Monitoring of groundwater levels and storage	10753.8 (g)	3.3.1, 2.2.4
8. Facilitating conjunctive use operations	10753.8 (h)	3.3.4
9. Identification of well construction policies	10753.8 (i)	3.3.4
10. Construction and operation by local agency of groundwater contamination cleanup, recharge, storage, conservation, water recycling, and extraction projects	10753.8 (j)	3.3.4
11. Development of relationships with state and federal regulatory agencies	10753.8 (k)	1.1.3
12. Review of land use plans and coordination with land use planning agencies to assess activities that create reasonable risk of groundwater contamination.	10753.8 (l)	1.1.3

Table 3: Components of a GSP

Components of a GSP from the CWC, effective on January 1, 2015		
	Where to find in SGA GMP	**CWC Section**
A description of the physical setting and characteristics of the aquifer system underlying the basin. 1) Historical data 2) Groundwater levels, groundwater quality, subsidence, and groundwater-surface water interaction 3) A general discussion of historical and projected water demands and supplies 4) A map that details the area of the basin and the boundaries of the groundwater sustainability agencies that overlie the basin that have or are developing groundwater sustainability plans 5) A map identifying existing and potential recharge areas for the basin. The map or maps shall identify the existing recharge areas that substantially contribute to the replenishment of the groundwater basin. The map or maps shall be provided to the appropriate local planning agencies after adoption of the groundwater sustainability plan	2.2 2.2.1, 2.2.3 2.3.2, 2.3.3 2.2.2, 2.4 Figure 3 Figure 12	10727.2 (a) (1-5)
1) Measurable objectives, as well as interim milestones in increments of five years, to achieve the sustainability goal in the basin within 20 years of the implementation of the plan. 2) A description of how the plan helps meet each objective and how each objective is intended to achieve the sustainability goal for the basin for long-term beneficial uses of groundwater.	3.3, Objectives met. Compliance checked yearly. 3.3, 4.3, Table 12	10727.2 (b) (1-2)
A planning and implementation horizon	4.3, Table 12	10727.2 (c)
Components relating to the following, as applicable to the basin: 1) The monitoring and management of groundwater levels within the basin. 2) The monitoring and management of groundwater quality, groundwater quality degradation, inelastic land surface subsidence, and changes in surface flow and surface water quality that directly affect groundwater levels or quality or are caused by groundwater extraction in the basin. 3) Mitigation of overdraft. 4) How recharge areas identified in the plan substantially contribute to the replenishment of the basin. 5) A description of surface water supply used or available for use for groundwater recharge or in-lieu use.	3.3.1, 3.3.4, 4.3 3.3.1, 3.3.4, 4.3 2.2.2, 2.2.3, 3.3.4 2.2.4 2.3.1	10727.2 (d) (1-5)
A summary of the type of monitoring sites, type of measurements, and the frequency of monitoring for each location monitoring • groundwater levels, • groundwater quality,	3.3.1 3.3.1	10727.2 (e)

• subsidence, • streamflow, • precipitation, • evaporation, and • tidal influence. The plan shall include a summary of monitoring information such as well depth, screened intervals, and aquifer zones monitored, and a summary of the type of well relied on for the information, including public, irrigation, domestic, industrial, and monitoring wells.	3.3.1, App. D 3.3.1 3.3.1 3.3.1 Not applicable Table 8	
Monitoring protocols that are designed to detect changes in • groundwater levels, • groundwater quality, • inelastic surface subsidence for basins for which subsidence has been identified as a potential problem, and • flow and quality of surface water that directly affect groundwater levels or quality or are caused by groundwater extraction in the basin.	 3.3.1 3.3.1 3.3.1, App. D 3.3.1	10727.2 (f)
A description of the consideration given to the applicable county and city general plans and a description of the various adopted water resources-related plans and programs within the basin and an assessment of how the groundwater sustainability plan may affect those plans.	1.1.3	10727.2 (g)
… , a groundwater sustainability plan shall include, where appropriate and in collaboration with the appropriate local agencies, all of the following: a. Control of saline water intrusion. b. Wellhead protection areas and recharge areas. c. Migration of contaminated groundwater. d. A well abandonment and well destruction program. e. Activities implementing, opportunities for, and removing impediments to, conjunctive use or underground storage. f. Well construction policies. g. Measures addressing groundwater contamination cleanup, recharge, diversions to storage, conservation, water recycling, conveyance, and extraction projects. h. Efficient water management practices, as defined in Section 10902, for the delivery of water and water conservation methods to improve the efficiency of water use. i. Efforts to develop relationships with state and federal regulatory agencies. j. Processes to review land use plans and efforts to coordinate with land use planning agencies to assess activities that potentially create risks to groundwater quality or quantity. k. Impacts on groundwater dependent ecosystems.	 3.3.4 3.3.4 3.3.4 3.3.4 3.3.4 3.3.4 3.3.4 3.3.4 1.1.3 1.1.3 No known impacts	10727.4

Groundwater sustainability agencies intending to develop and implement multiple groundwater sustainability plans pursuant to paragraph (3) of subdivision (b) of Section 10727 shall coordinate with other agencies preparing a groundwater 10727.6 (a-g)sustainability plan within the basin to ensure that the plans utilize the same data and methodologies for the following assumptions in developing the plan: a. Groundwater elevation data. b. Groundwater extraction data. c. Surface water supply. d. Total water use. e. Change in groundwater storage. f. Water budget. g. Sustainable yield.	To be determined as guidelines and regulations are developed	
Public participation requirements for developing a GSP	Not applicable at this time	10727.8

Section 2 Water Resources Setting

This section of the SGA GMP describes the physical setting and underlying aquifer characteristics of the North Basin. It also includes a discussion of the SGA region's water supplies, a description of how those supplies evolved over time, and an estimate of the basin's water budget with emphasis on recharge areas, including those on the land surface.

Water users in the North Basin rely on a mix of surface water and groundwater to meet municipal, industrial, agricultural, and domestic demands. While some purveyors rely exclusively on either groundwater or surface water, others rely on a combination of surface water and groundwater. Since its inception in 1998, SGA has worked to optimize the use of groundwater and surface water to better match hydrologic conditions to help ensure sustainability of the region's water supply. The sources of the region's groundwater and surface water supplies and the hydrologic and physical characteristics that affect the sustainability of those supplies are discussed below.

2.1 Brief History of Water Development in the SGA Region

The North Basin can be divided into three areas from a water resources standpoint: eastern, central, and western. Groundwater conditions in these areas vary due to a number of reasons, the primary one being the extent to which surface water is available. In order to understand how and why conditions vary, it is helpful to consider the historical development of water resources in the basin.

As the eastern area of the SGA region was settled in the late 19th century, its development was sustained largely with surface water. Beginning in 1854, The North Fork Ditch Company diverted the American River "first, for mining and subsequently for irrigation of orchards, etc., in Fair Oaks Irrigation District, Citrus Heights Irrigation District, Orangevale, Cardwell Colony, Ashland Colony, Inwood Colony, San Juanita Colony, Rosedale Colony, and other lands." (DPW, 1955). This description encompasses much of the land now served by San Juan Water District (SJWD), Citrus Heights Water District (CHWD), Orangevale Water Company (OVWC) and Fair Oaks Water District (FOWD). Land along the American River adjacent to and west of these four purveyors was served with diversions from the American River by Carmichael Irrigation District, formed in 1916. The completion of Folsom Dam in 1955 made additional surface water supplies available to this entire area. Today, this eastern area of the SGA region continues to be served primarily with surface water.

At the turn of the 20th century, the western region of SGA which lies, for the most part, in the floodplain of the Sacramento River was covered by wetlands subject to annual flooding. By 1915, the Natomas Company of California had completed a river and drainage levee system for Reclamation District 1001 (RD 1001) and supplied the reclaimed lands with irrigation water diverted from the Sacramento River. In 1963, the four water companies which operated in RD 1001 merged to form Natomas Central Mutual Water Company (NCMWC) to more effectively negotiate with the Bureau of Reclamation (Reclamation) as it built the Central Valley Project (CVP). In 1964, NCMWC signed an agreement with Reclamation to purchase water from the CVP. Today, NCMWC continues to deliver CVP water to the area (NCMWC, 2014). Since the early 1980s, part of RD 1001 has been developed for urban uses. That urbanized area is served with water, some of which is groundwater, by the City of Sacramento.

The lands in the central area of SGA never experienced the relatively easy access to surface water enjoyed by those to the west and east. Early in the development of the central area, water users relied on hand-dug wells and windmills for their water supply (City of Citrus Heights, 2006). As population in the area grew through the 20th century, users constructed deeper wells with motorized pumps. The demand on groundwater in this area increased markedly in the middle of the 20th century as military and industrial facilities, such as McClellan Air Force Base and Aerojet, were established accompanied by rapid urban development. These military and industrial facilities also introduced the greatest threats to regional groundwater quality.

The water development timeline of Del Paso Manor Water District (DPMWD) generally represents the mid-20th century water development history of the central area of the North Basin as a whole. The district's water main infrastructure, along with the wells that supplied it, was built between 1948 and 1953 to serve groundwater to an area of about one square mile in the south central portion of the North Basin. By the mid-1960s, the land within the district was fully developed with housing and small businesses that depended on this water system (Sacramento Local Agency Formation Commission, 2005). Today DPMWD serves this area entirely with groundwater. Recently, the district has been evaluating the feasibility of acquiring surface water to develop conjunctive use projects to increase their supply reliability.

Land in the central area of SGA served by other purveyors, including California American Water, Golden State Water Company (GSWC), Rio Linda/Elverta Community Services District (RLECWD), Sacramento County Water Agency (SCWA) and Sacramento Suburban Water District (SSWD), followed a similar pattern of development also relying on groundwater. This widespread urban development and the lack of available surface water was largely the reason that by the 1960s a significant groundwater depression had developed in SGA's central area. Falling groundwater levels moved the Sacramento County Board of Supervisors to partner with DWR in 1968 to investigate the County's groundwater resources. The investigation was summarized in 1974 in Bulletin 118-3, "Evaluation of Ground Water Resources: Sacramento County" (DWR, 1974). Sacramento County was subsequently identified in Bulletin 118-80 (DWR, 1980) as one of 42 basins in California that showed evidence of overdraft.

In 1993, the Water Forum began a process to ensure a reliable water supply for the Sacramento region, including work to develop conjunctive use projects in the area. This resulted in the formation of SGA in 1998. SGA has focused the effort, started by earlier agencies, to manage groundwater in the North Basin. Since the 1990s, SGA and its member agencies have managed groundwater and implemented conjunctive use projects, thereby reversing the decline of groundwater levels in the basin.

2.2 Groundwater Resources

This section of the SGA GMP describes the following characteristics of the North Basin:

- Geology and Aquifer Characteristics
- Groundwater Extraction
- Groundwater Levels
- Groundwater Budget including Groundwater Recharge
- Groundwater Quality

The region's water development history described how the extensive aquifers underlying SGA have served municipal, industrial, and agricultural users for about a century. Over this time, the aquifers have proved reliable from both a water quality and quantity standpoint. With continued local groundwater management, they should continue to perform sustainably. The following summary of the basin's characteristics is based, to a large extent, on data and reports SGA has accumulated as it managed the basin.

2.2.1 Geology and Aquifer Characteristics

This section describes the North Basin's geology, especially as it pertains to the ability of geologic formations to store and transmit water, its physical boundaries, and the potential for land subsidence due to groundwater withdrawal. The nature of those basin boundaries, as will be shown, has required SGA to coordinate its activities closely with groundwater managers adjacent to its area of management responsibility. Understanding the physical nature of the basin is also essential to understanding the basin's potential for land surface subsidence resulting from groundwater pumping.

<u>Geology and its effect on Groundwater Supply</u>

The aquifers underlying SGA are composed of alluvium consisting of cobbles, gravel and sand which are interspersed with deposits of silt and clay, all deposited in stream channels, alluvial fans or floodplains by rivers draining the Sierra Nevada and the upper Sacramento Valley. DWR's Bulletin 118-3 describes the aquifers as "…a number of now-buried stream channel deposits. These deposits, which are composed of permeable sand and gravel, are enclosed by less permeable silt and clay. This has resulted in a network of meandering tabular aquifers." The most notable aquifers underlying the region follow the ancestral channels of the American River. A graphic interpretation of the location of those ancestral channels is depicted by DWR in Bulletin 118-3.

This complex system of intertwined and interbedded, fine and coarse-grained materials yields a great deal of groundwater to wells. The aquifers near the surface act as unconfined aquifers and the deeper aquifers act more as semi-confined aquifers or even confined aquifers at greater depths. In the North Basin, traveling uphill from its western to eastern boundaries, the alluvial deposits become thinner until the underlying granitic rocks, which hold and transmit little water, are exposed at the surface west of Folsom Reservoir. SJWD, OVWC and that portion of the City of Folsom within SGA overlie this eastern area where groundwater availability is limited by the geology. Along SGA's western boundary, alluvium has accumulated to a thickness of 2,000 feet under the Sacramento River (DWR, 2003). Alluvial deposits are sufficiently thick and permeable through much of SGA to provide a readily available groundwater supply.

Geologists have classified the alluvium comprising the local aquifers into geologic formations according to its physical characteristics. The aquifers underlying SGA are made up of sediments designated, from younger to older, as the following formations:

- Modesto Formation
- Riverbank Formation
- Turlock Lake Formation (Fair Oaks Formation in SGA Region, (Shlemon, 1972))
- Laguna Formation (Fair Oaks Formation in SGA Region)
- Mehrten Formation
- Valley Springs Formation

Although there may be sufficient differences between rocks and soils on the land surface to identify the formations to which they belong, there are often fewer distinguishing characteristics that can be used to readily identify the formation associated with sediments from the subsurface. A notable exception is the Mehrten Formation, which may contain distinctive dark volcanic sands. Many of the deepest and most productive wells in the region bottom out in this formation. However, even sediment samples that are collected from borings in the Mehrten Formation may be difficult to distinguish from other geologic formations. The geographic distribution of geologic formations in the North Basin is shown in Figure 4 along with a cross-section showing the general distribution of the geologic formations below the ground.

<u>Aquifer Boundaries</u>

The physical nature of groundwater basin boundaries determines how easily water flows into or is lost from the basin, whether that be flow from nearby streams, infiltration from rainfall or applied water, or flow to or from neighboring groundwater basins. Understanding the North Basin's boundaries' physical characteristics was vital in developing the computer model that calculated values for groundwater recharge and other components of the North Basin water budget discussed later in this GMP. The primary boundaries of the groundwater basin, including the land surface, lateral boundaries and the deep boundary, are described below.

Land Surface

The land surface and beds and banks of stream channels control the movement of most of the water that replenishes the aquifers in the SGA region. The degree to which the land surface allows groundwater recharge depends on soil type and underlying geology, land use, soil slope and depth to groundwater. Further discussion of this boundary and its effect on groundwater recharge is included in Section 2.2.4.

Lateral Aquifer Boundaries

The hydraulic characteristics of the geologic material in and surrounding the North Basin control the flow of water from one groundwater basin to another. The geologic materials in basins abutting the North Basin are generally permeable to the same extent that the geologic material within the North Basin is permeable. The aquifers yielding water to wells in the North Basin spread beyond its boundaries to the south, west, and north with only minor changes in their ability to hold and transmit water. The short eastern boundary of SGA, blocked with massive granitic rocks, labeled “Mesozoic Dioritic Plutonic Rocks” in Figure 4, is a notable barrier to lateral flow of groundwater into or out of the North Basin.

That aquifers underlying SGA continue relatively unchanged beyond the major streams of the area is demonstrated by the Aerojet contaminant plume, which originated south of the American River. This plume now extends north of the river and affects the operation of wells in several SGA member agencies. Water quality samples from SGA member wells indicate that by pumping wells north of the American River, Aerojet contaminants can be induced to flow from the Aerojet property, south of the American River, to those wells.

Deep Aquifer Boundary

Sediments that were originally deposited in marine environments lie beneath the geologic formations that make up SGA’s fresh water aquifers. In much of the North Basin, especially towards the west where these formations are found far beneath the land surface, these marine sediments hold highly mineralized water that is poorly suited for most local uses. The highly mineralized water is occasionally found in rocks as young as those in the lower zones of the Mehrten Formation (DWR, 1974), which indicates that, under certain pumping conditions, naturally-occurring poor quality groundwater could migrate into the overlying fresh water aquifer. Wells in the basin must be constructed and operated with this potential water quality concern in mind.

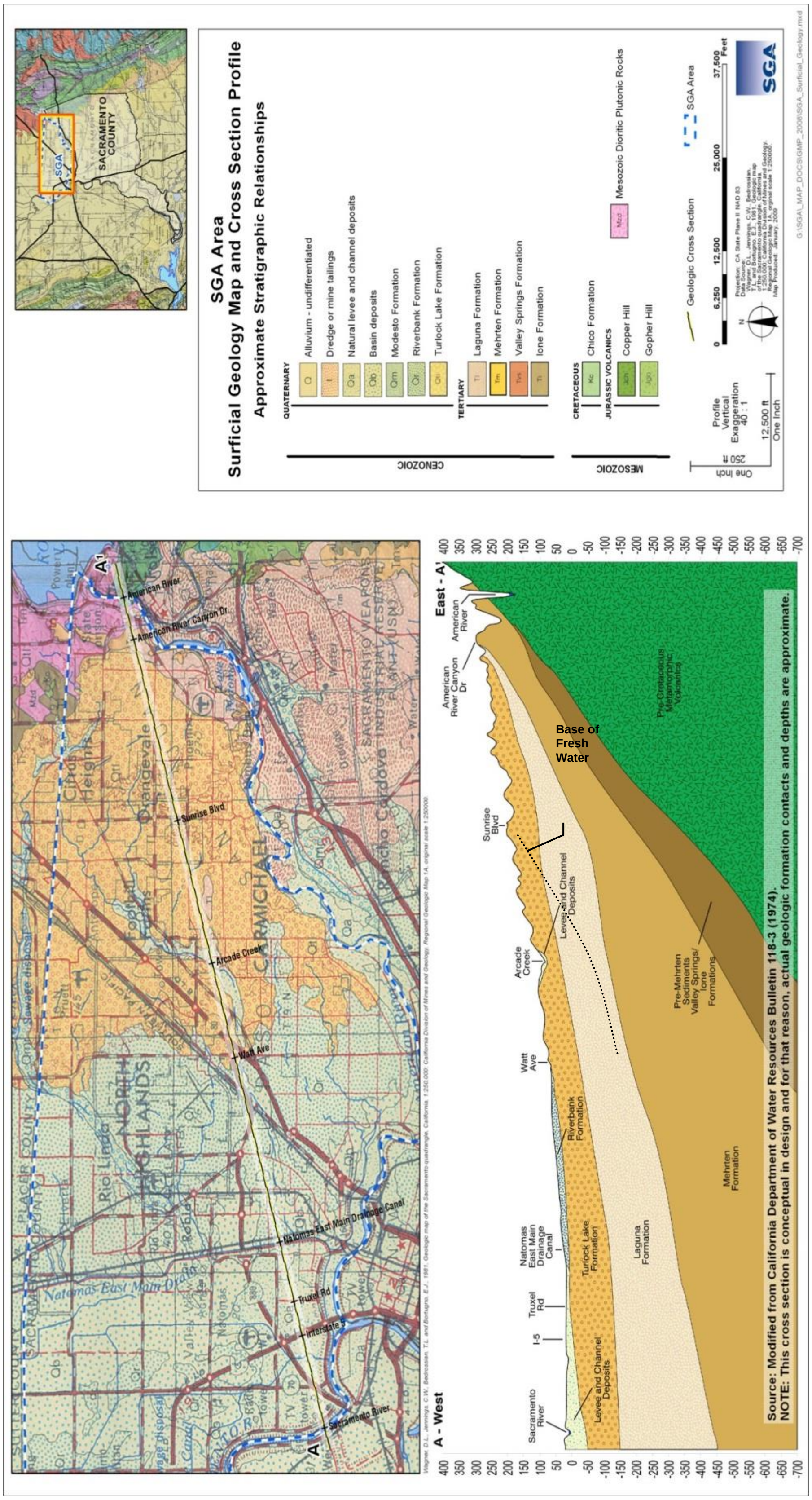

Figure 4: Geology of the North Basin.

Land Subsidence

Land subsidence results from lowering groundwater levels beyond their historically low levels in compressible geologic deposits. Its magnitude varies depending on the increase in effective stress (which results from lower groundwater levels), the compressibility and thickness of individual layers, the length of time the stress is applied, and whether an equal stress has been applied or exceeded in the past (Lofgren and Ireland, 1973). Alluvium in the North Basin may be subject to land subsidence, but not equally across the basin. "In general, if the deposits are coarse sand and gravel, the compaction will be small and chiefly elastic and reversible, whereas if they contain fine-grained clayey beds, the compaction will be much greater and chiefly inelastic and permanent" (Lofgren and Ireland, 1973). The North Basin deposits vary from generally coarse-grained alluvium in the east deposited in steeper, high-energy environments to finer-grained alluvium in the west deposited in low-gradient, low-energy environments such as floodplains. It is unknown to what extent subsidence may occur anywhere in the basin, but its potential is highly unlikely to match other areas of the Central Valley. In part, this is because "…, at a time when widespread lacustrine clays were being deposited in large lakes in the San Joaquin Valley, lacustrine clays of only local extent probably were being deposited in relatively small lakes in the Sacramento Valley." (Page, 1986). Those thick layers of lacustrine clay underlie the most subsidence-prone regions of the Central Valley.

Surveys in the Sacramento Valley to determine if the land surface has subsided have not been conducted with sufficient precision to confirm that land subsidence has or has not occurred in the North Basin. Indications from repeated measurements of one bench mark near and east of the former McClellan Air Force Base (AFB) suggested that the land surface in this area may have subsided by more than two feet. The apparent change in land surface elevation at one bench mark and the groundwater levels in two wells in the area are shown in Figure 5. Firm conclusions regarding the bench mark elevation data are elusive, however, because the surveys used GPS technology at a time when it was changing rapidly. Also, the integrity of the bench marks used in the surveys cannot be verified. However, because water levels in a nearby well declined up to one hundred feet over a 45-year period, SGA developed a monitoring plan to examine the possibility that the land surface subsided. Because groundwater levels have not fully recovered in this area, it is unknown whether subsidence that may have occurred can be reversed when groundwater levels rise. The proposed land subsidence monitoring plan could also answer that question. Fortunately, no adverse effects on facilities or drainage that might be associated with land subsidence in the North Basin have been identified.

Future efforts to monitor subsidence in the North Basin will take into account the difficulties associated with past efforts to assess land subsidence in the region. SGA's land subsidence monitoring network and plan are described in Section 3 and Appendix D of this GMP.

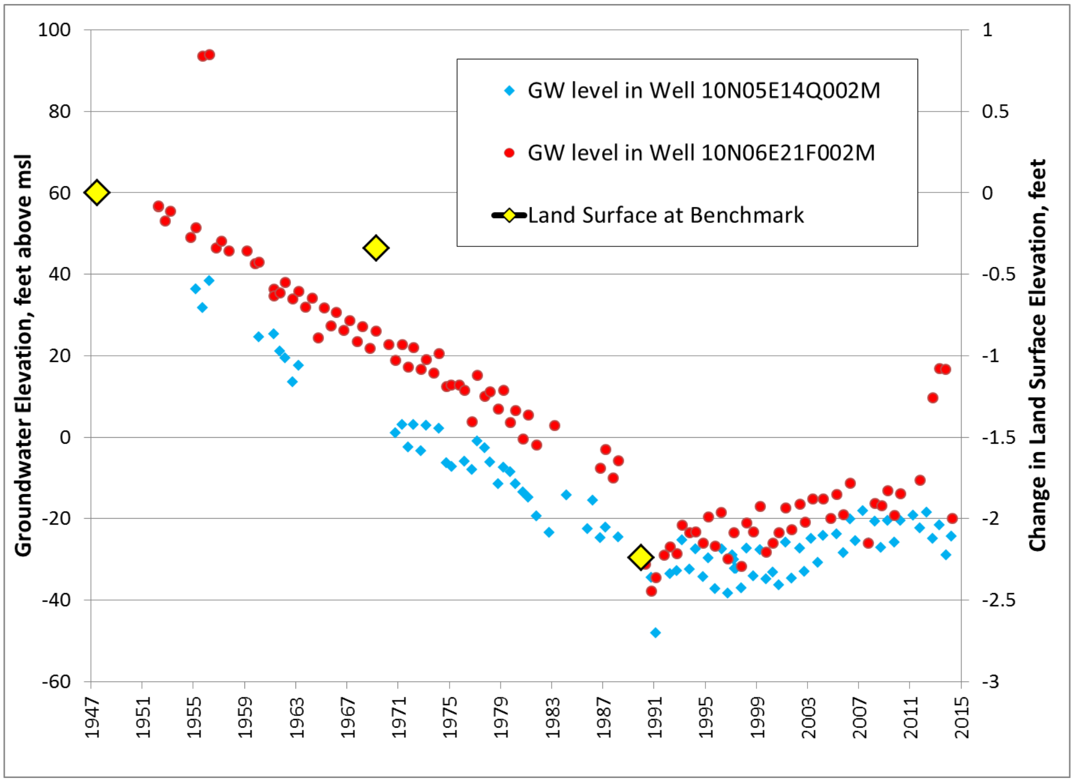

Figure 5: Apparent Change in Land Surface Elevation at a Bench mark and Groundwater Levels in Two Nearby Wells.

2.2.2 Groundwater Extraction

Groundwater is extracted from the North Basin to support municipal and industrial (M&I), agricultural, and domestic activities. Additionally, some groundwater is extracted as part of contamination cleanup activities. Each public supply well for M&I use is metered and that information is reported annually to SGA. Most of the self-supplied industrial users (those not permitted as public supply wells), agricultural, and domestic users do not measure their groundwater extractions. SGA does not request the extraction information from these users, because it does not appear to contribute to its ability to successfully manage the basin. Likewise, SGA has not requested annual reporting of groundwater extraction for groundwater cleanup purposes. Instead, SGA has used its groundwater model, Sacramento Area Integrated Water Resources Model (SacIWRM), to estimate the groundwater extractions by these other users. Based on a recent model update and re-calibration effort, groundwater extractions in 2004 consisted of about 85% M&I pumping, 8% independent agricultural pumping, 4% private domestic pumping, and 3% groundwater contaminant cleanup pumping (RMC, 2011).

The amount of groundwater extracted by SGA agencies in the period 1990 through 2013 is shown in Figure 6. The M&I purveyors in the region pumped about 95,000 acre-feet in 1990 in the middle of the 1987 to 1992 drought. Although their total extraction dropped to under 90,000 acre-feet in the following year, groundwater use increased steadily through the mid-1990s. M&I extraction peaked in 1997 at over 107,000 acre-feet. However, as will be discussed in more detail in the following section, a troublesome groundwater depression developed in SGA's central area years earlier. Although this depression took years to develop and showed up in the middle of the 20th century, it seemed to indicate that although the total amount of pumping for the SGA region might be sustainable, the manner in which the pumping was geographically distributed could be improved. Concerns regarding the pumping depression had, by this time, resulted in the Water Forum efforts to balance the use of the region's water resources and enhance its environmental resources, by, among other things, developing conjunctive use projects and increasing the amount of groundwater stored in the central part of the basin. The success of those continuing efforts is shown in Figure 6 as reductions in the amount of groundwater extracted on an annual basis. Especially notable is the groundwater pumping in 2009, a dry year. The SGA agencies pumped under 77,000 acre-feet that year, about 18,000 acre-feet less than in 2000, a pumping reduction of nearly 20%. Finally, note that groundwater use has increased in 2012 and 2013. This is consistent with conjunctive use operations, which increase reliance on groundwater during dry conditions such as those California has been experiencing from 2012 to present.

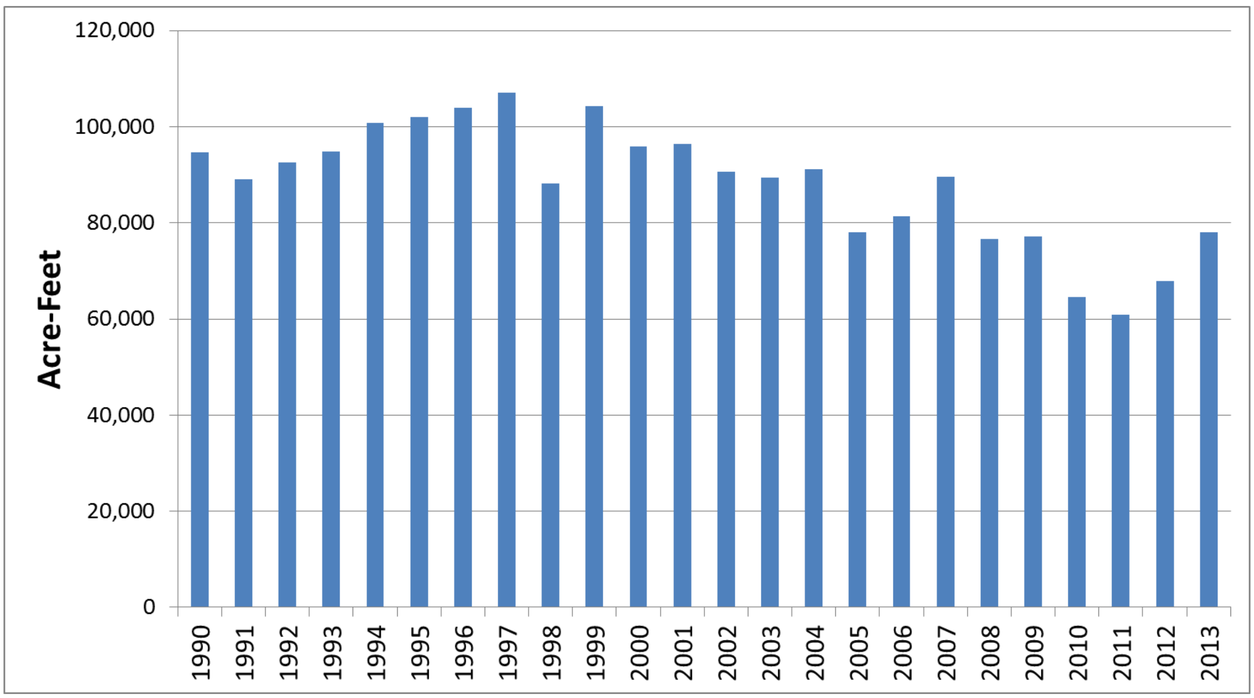

Figure 6: Reported M&I Annual Groundwater Extraction.

2.2.3 Groundwater Levels

Declining groundwater levels in the central area of the North Basin were a concern for local water resource managers for decades. Groundwater levels were dropping on a long-term average of more than a foot per year for several decades. A cone of depression formed in the center of the SGA that, although it is smaller than it once was, still remains as shown in Figure 7, a map of groundwater elevation contours for spring 2014. The current state of this depression is a substantial improvement over the situation in the mid-1990s when the depth to groundwater at the center of the depression was about twenty feet deeper than it is now. This improvement resulted largely from implementation of local groundwater management, especially conjunctive use operations. At this time, the groundwater depression is being managed to serve the groundwater cleanup effort associated with groundwater contamination at the former McClellan AFB.

In general, the remainder of the North Basin does not show distinctive regional groundwater elevation patterns other than to mimic the local topography. This results in groundwater generally flowing from east to west across the basin until it encounters the central groundwater depression.

DWR has monitored a series of domestic, irrigation and other observation wells in the North Basin for decades. The time-series groundwater level data displayed in hydrographs allow us to review the results of groundwater management actions on groundwater levels. Hydrographs depicting groundwater level trends in the North Basin’s long-term monitoring wells are shown in Figure 8. Recent data also support observations that groundwater elevations are now stable in the basin and even rising in some areas.

As discussed previously, the North Basin’s water resources were developed differently in the Western, Central and Eastern areas. Because of this, it is appropriate to discuss groundwater levels in each of these areas separately.

<u>Western Area</u>

The western portion of the SGA region is bounded by the Sacramento River on the west and extends east to approximately the boundary between NCMWC and RLECWD (Figure 8). This area is served almost exclusively by surface water. Hydrographs for wells 09N04E27F001M, 10N03E35A001M, and 10N04E23A001M show that groundwater elevations are fairly stable over the period of record and that recent groundwater elevations ranged from about MSL to over 15 feet above MSL.

<u>Central Area</u>

The central portion of the SGA region is bounded roughly on the west by the boundary between NCMWC and RLECWD and to the east by a line running approximately along San Juan Avenue (Figure 8). This area currently uses a combination of surface water and groundwater, but historically relied predominantly on groundwater. Hydrographs for 09N05E28K001M, 09N05E14B001M, 09N05E25J001M, 09N06E27D001M, and 10N05E14Q002M show that groundwater elevations currently range from about 10 feet above MSL in the southeastern corner of this area near the American River to about 30 feet below mean sea level (msl) near the center of the area.

Historically, significant drawdown, about 80 feet in 35 years beginning when groundwater levels were measured in 1955, was observed in well 10N05E14Q002M. Similar declining groundwater level trends were seen in other area wells. Groundwater levels in this area continued their steady decline until around the mid-1990s, when water levels stabilized due, in substantial part, to expanded conjunctive use operations. Water levels have continued to rise overall since that time, with slight declines during the 2007 through 2009 dry conditions experienced in the state.

Eastern Area

The eastern portion of the SGA region extends roughly east of San Juan Avenue to the American River, which is the eastern edge of the basin (Figure 8). Historically, this area has relied primarily on surface water. Hydrographs for wells 09N07E17K001M and 10N07E29G001M show groundwater levels are higher than 70 and 100 feet above msl, respectively. Groundwater elevations within the area can be highly varied, as seen by these two wells, because they tend to mimic ground elevations in this area of rolling topography. The two long-term hydrographs indicate that groundwater elevations have not varied greatly over time. This is expected given the limited use of groundwater in the area. Groundwater elevations measured in well 10N07E29G001M have varied no more than two feet from October 1998 through 2012.

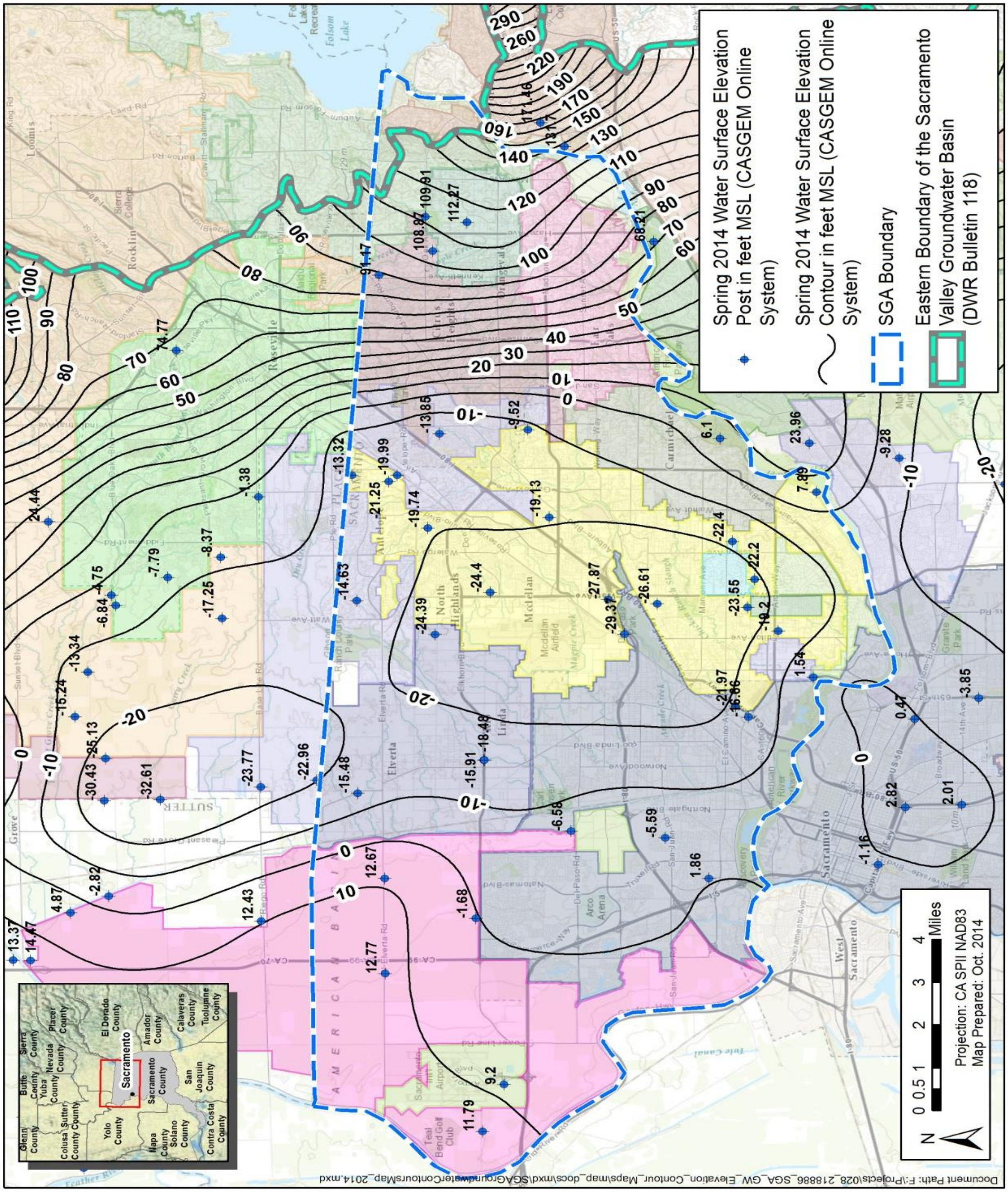

Figure 7: Spring 2014 Groundwater Elevation Contours.

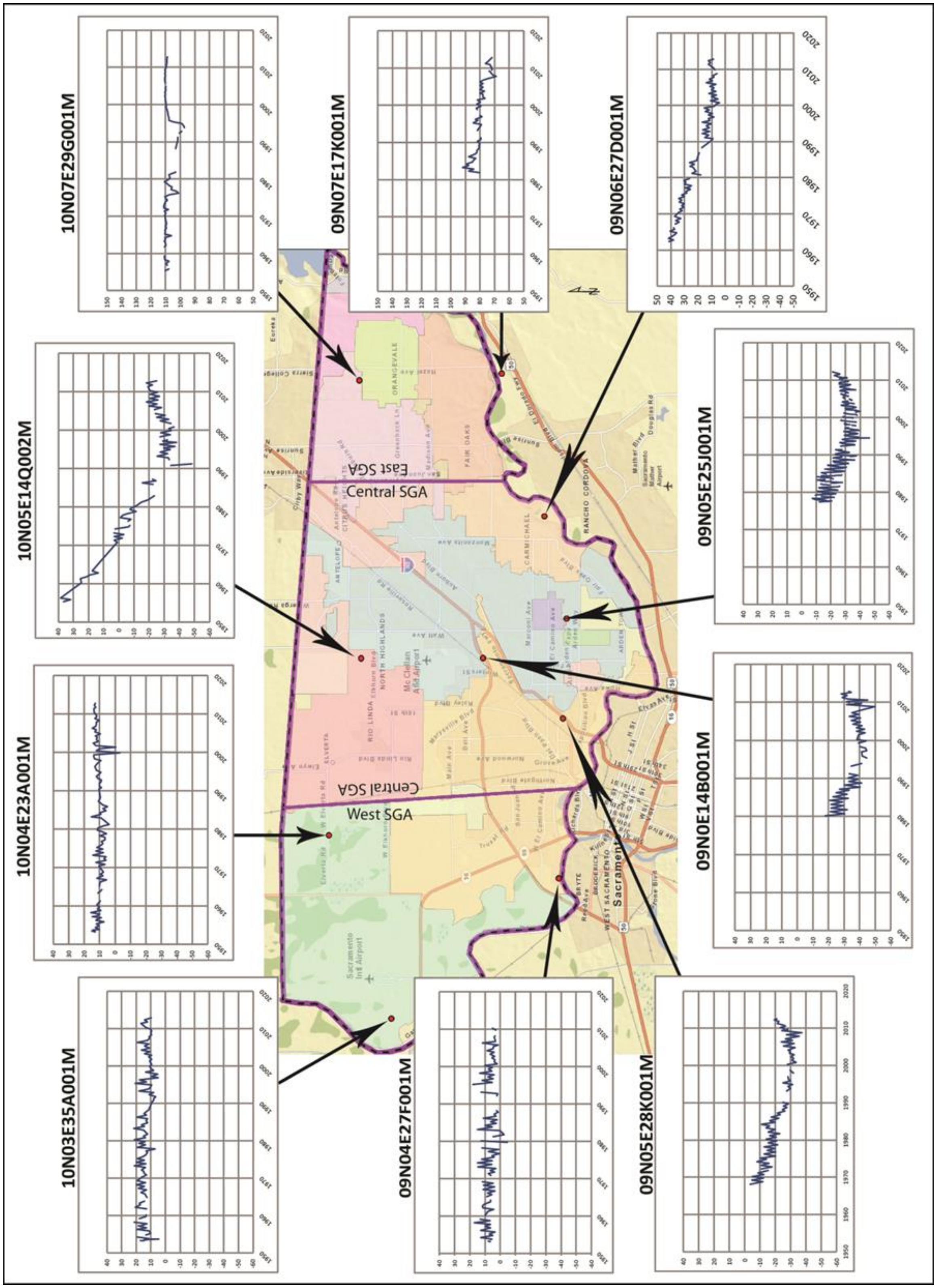

Figure 8: Long-Term Hydrographs for the North Basin.

2.2.4 Groundwater Recharge/Water Budget

The North Basin water budget, including estimates of recharge from the land surface, recharge from streams and recharge from subsurface flow from adjacent basins, was estimated using the existing conditions baseline scenario developed with the Sacramento Area Integrated Water Resources Model (SacIWRM). The water budget presented in this section was derived with the model configured, for the most part, as described in "SacIWRM, Model Development and Baseline Scenarios" (RMC, 2011). Results from the Yolo County Integrated Groundwater Surface Water Model were also used in the analysis to estimate the influence of regions adjoining the North Basin.

SacIWRM is a water resources management model for the Sacramento region, from the Feather River in the north to the Mokelumne River in the south, including groundwater basins in Sacramento County and portions of Placer, Sutter, and San Joaquin counties. It integrates the surface water hydrologic system, the groundwater aquifer system, and the land surface processes, including evapotranspiration and infiltration of precipitation and irrigation applied water, into a single model. This integration allows water managers to evaluate the effect of changes to water demands, land use, water use, groundwater pumping, surface water diversions, imported water, and reservoir operations on groundwater and surface water systems, including stream-aquifer interactions.

SacIWRM is an analytical tool that has undergone continual development for more than 20 years and is maintained through collaboration among many local, state and federal entities and funding from local, state and federal sources. Completed studies and the agencies involved to develop and maintain this model are listed in Appendix C.

The primary components of groundwater recharge in the North Basin include: deep percolation from rainfall and applied water; recharge from streams; and recharge subsurface flows between adjacent basins. Each of these are discussed below followed by a discussion of the entire groundwater budget.

<u>Groundwater Recharge from Rainfall and Applied Water</u>

SacIWRM estimated that approximately 41,000 acre-feet or 36% of the water recharging the North Basin in an average year is deep percolation of rainfall and applied water. Soil characteristics, land use, crop type and rainfall data are incorporated with the other data supporting SacIWRM to derive this estimate.

Recharge of precipitation and applied water is affected to a great extent by hydrologic soil type. Hydrologic soil types for use in SacIWRM were determined using soil survey data obtained from the National Resources Conservation Service. Each soil series was placed in one of four hydrologic categories based on its runoff potential and infiltration characteristics. The resulting distribution of the four hydrologic soil types is shown in Figure 9. The soils with the lowest runoff potential and highest permeability occupy low-lying terraces along the American River and a portion of the North Basin along the Sacramento River and are represented by dark brown areas in the figure.

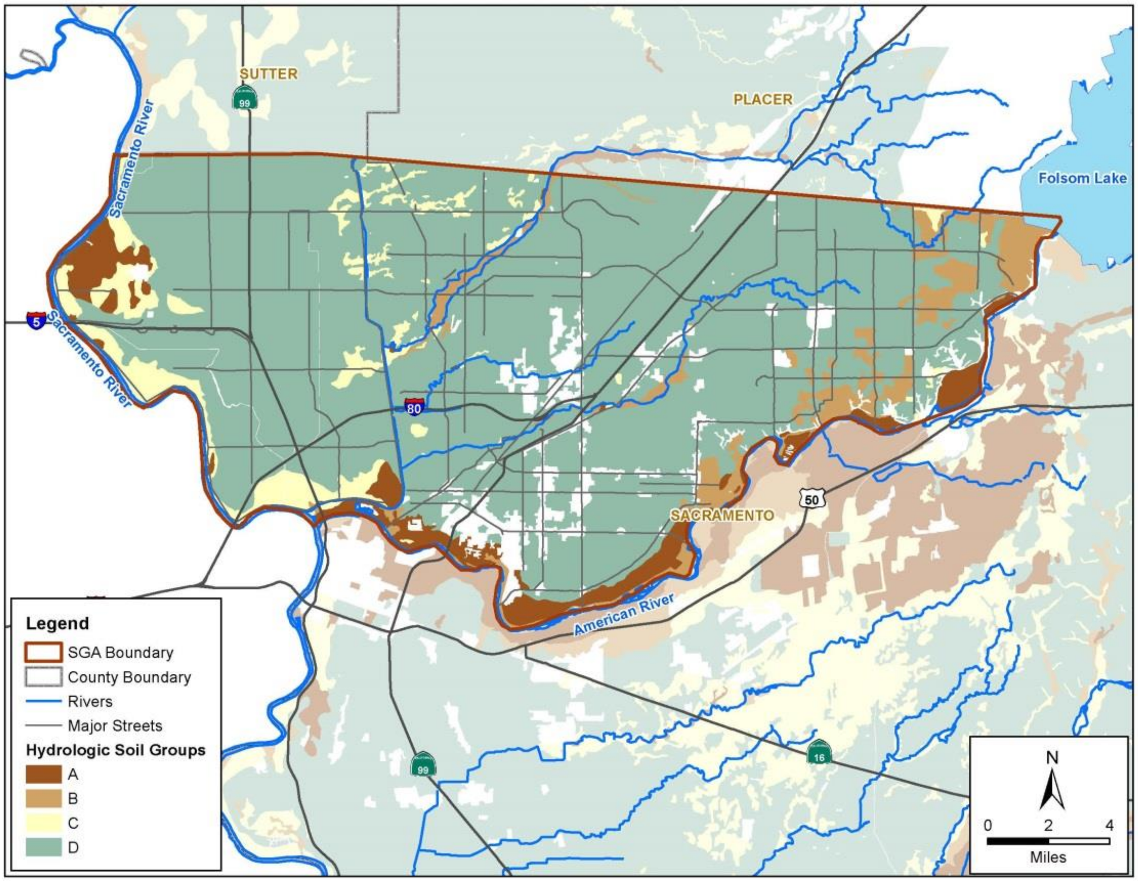

Figure 9: Distribution of Hydrologic Soil Types in the North Basin.

Land use in the North Basin is predominantly urban, except for the western portion which is dominated by agriculture. The distribution of land uses overlying the basin is shown in Figure 10.

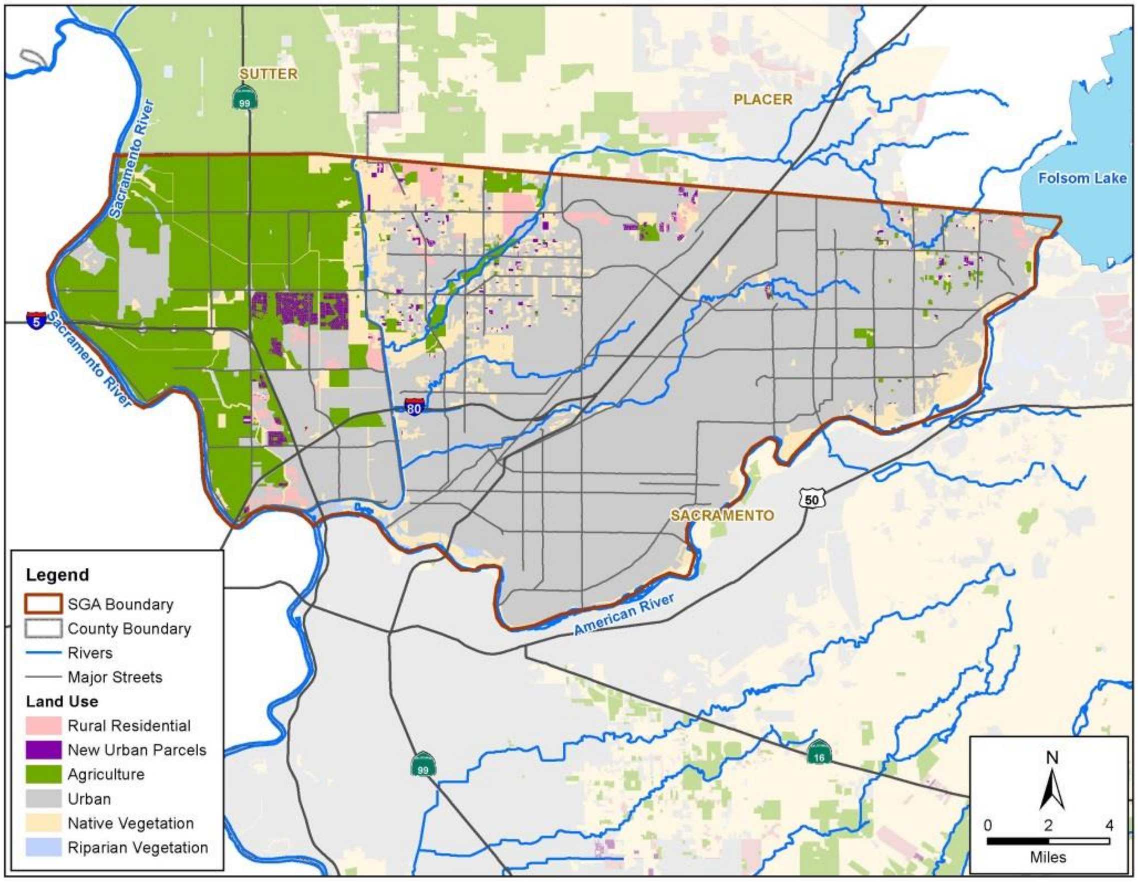

Figure 10: North Basin Land Use Map.

<u>Groundwater Recharge from Streams</u>

SacIWRM estimated that in an average year North Basin aquifers gain approximately 33,000 acre-feet more water than is lost to streams and rivers, or about 28% of all of the water replenishing the basin. The model calculated the amount of flow between North Basin aquifers and the following water courses within and adjacent to the basin.

- Sacramento River
- American River
- Dry Creek
- Natomas East Drain (Steelhead Creek)
- Arcade Creek
- Magpie Creek

Figure 11 shows where these streams run across and around the basin. The numbered stream nodes on the figure identify the stream reaches where SacIWRM calculates stream-aquifer interaction.

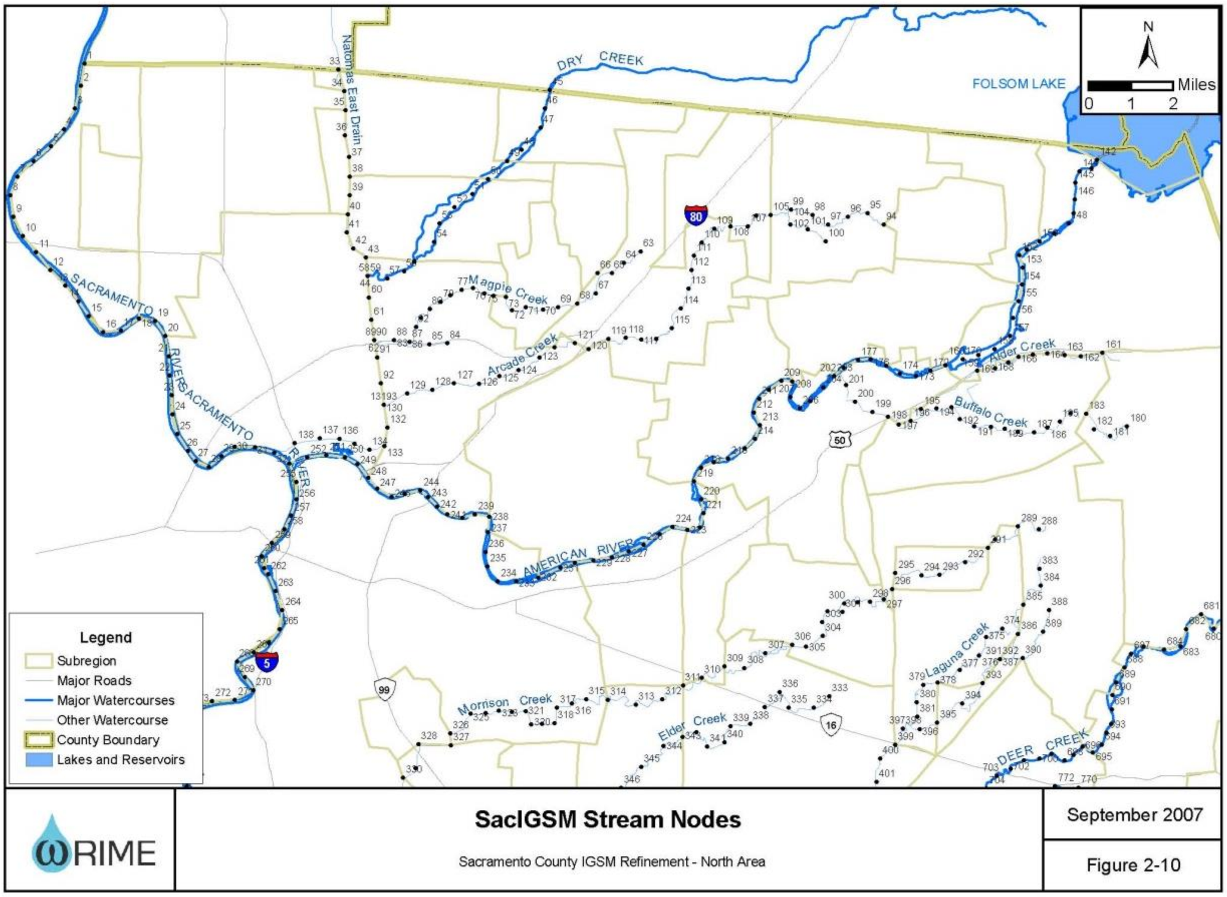

Figure 11: Streams Included in Calculation of Stream-Aquifer Interaction.

<u>Groundwater Recharge from Subsurface Flow</u>

SacIRWM estimated that in an average year, about 41,000 acre-feet of water flows from adjacent groundwater basins into the North Basin. This is about the same amount of water that recharges the basin through deep percolation. Most of the subsurface flow, 30,000 acre-feet, is estimated to originate south of the American River in the Central Basin (WFA designation) or South American Basin (DWR designation). Other areas of the North American Subbasin are estimated to contribute 7,300 acre-feet of inflow and 3,700 acre-feet is estimated to flow from aquifer west of the Sacramento River.

<u>Groundwater Recharge Summary</u>

The extent to which each of the processes discussed above recharge the North Basin is summarized in the water budget pie graphic depicted in the following map of recharge areas (Figure 12). Each of the recharge processes, deep percolation of water from the land surface, stream-aquifer interaction and subsurface flow from adjacent regions is represented on the map. The map is color-coded to indicate how deep percolation varies across the land surface. Blue arrows on the map, which indicate recharge from streams, are accompanied by a value of recharge in acre-feet. Likewise, dark arrows indicate subsurface flow from adjacent regions. All values are annual average values estimated by SacIWRM. Table 4 below summarizes the estimated recharge components, which result in an estimated average annual recharge to the North Basin of 114,400 acre-feet.

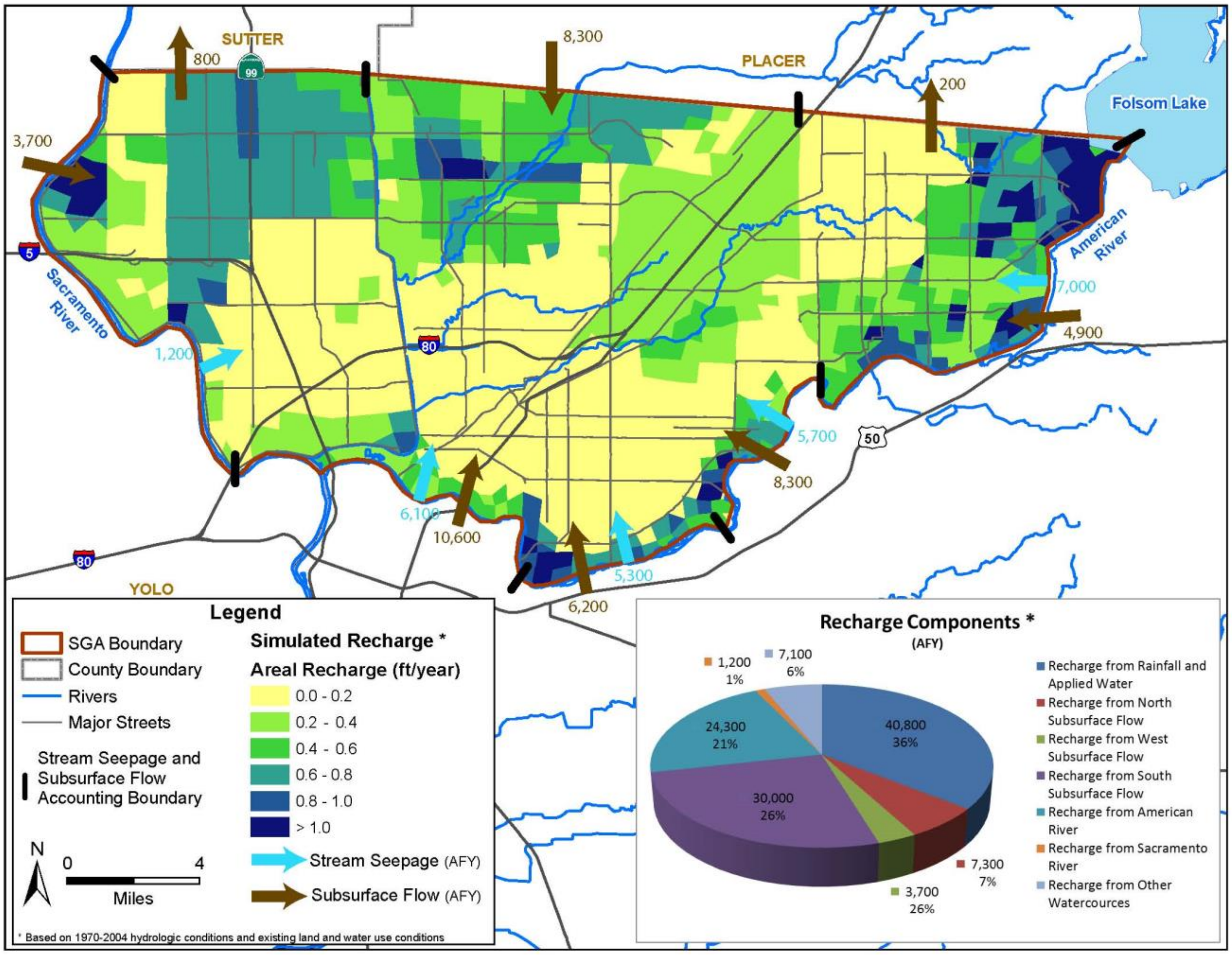

Figure 12: North Basin Recharge Map.

Table 4: Estimates of Groundwater Recharge to the North Basin

Groundwater Recharge Components	Acre-feet	Percent
Recharge from Rainfall and Applied Water	40,800	36%
Recharge from Subsurface Flow from the North	7,300	6%
Recharge from Subsurface Flow from the West	3,700	3%
Recharge from Subsurface Flow from the South	30,000	26%
Recharge from American River	24,300	21%
Recharge from Sacramento River	1,200	1%
Recharge from other Watercourses	7,100	6%

Groundwater Budget Summary

The groundwater budget for the North Basin includes the following components:

- Groundwater pumping
- Recharge from precipitation and applied water (deep percolation)
- Recharge from streams (groundwater-surface water interaction)
- Subsurface flow from adjacent regions
- Change in storage

SacIWRM calculated the budget using the existing conditions baseline modeling scenario. This scenario estimated average annual groundwater pumping in the North Basin as 118,000 acre-feet per year, with approximately 100,000 acre-feet per year pumped by SGA purveyors. These pumping conditions were incorporated into the scenario in 2003 and were considered an accurate representation of long-term groundwater use at that time. However, pumping by SGA purveyors peaked at about 105,000 acre-feet in 1997 and has declined since that time (see Section 2.2.2). The average annual groundwater pumping by SGA purveyors from 2000 to 2013 was approximately 82,000 acre-feet per year. The reduced pumping reflects increased conservation and increased surface water use by the purveyors.

The existing conditions baseline modeling scenario was not updated with the update of this GMP, and the scenario results must be interpreted with the understanding that actual groundwater pumping averages approximately 18,000 acre-feet per year less than values used in the scenario. It is expected that the lower groundwater pumping would result in higher groundwater storage volumes than indicated by scenario results. The resulting higher groundwater levels would also reduce subsurface flows and recharge from streams into the North Basin. The existing conditions baseline scenario estimated an average annual change in groundwater storage of -3,600 acre-feet per year, however, the reduced pumping of approximately 18,000 acre-feet per year experienced in the basin would result in a positive adjustment of average annual change in storage, consistent with the generally upward recent trends in groundwater elevations in the North Basin indicated by the hydrographs in Figure 8.

2.2.5 Groundwater Quality

Generally, the quality of groundwater in the basin is suitable for nearly all uses, with the exception of documented areas of contamination and localized quality issues discussed later in this section. The concentration of constituents varies widely over the SGA region and also with depth at any given location. The California State Water Resources Control Board (SWRCB) Division of Drinking Water (DDW) maintains a database of public water systems' water quality analyses (referred to hereafter as the "DDW database") that has been very useful in identifying potential problems in the region. SGA has used data from the DDW database, along with other sources of data, to identify known and potential threats to groundwater quality in the North Basin. In particular, SGA completed a Groundwater Quality Vulnerability Assessment in 2011 that was partially funded through a Local Groundwater Assistance Grant from DWR. With noted exceptions, much of the summary below resulted from that study. Groundwater quality issues are discussed below from three perspectives: 1) specific water quality parameters; 2) known contaminant plumes; and 3) potential point sources of contamination.

Groundwater Quality Conditions

One way to evaluate water quality is to look at specific water quality parameters of interest to a particular region. Parameters of interest can vary based on local geologic conditions, land use practices, or a specific user of water. For example, agricultural areas are often interested in dissolved boron concentrations in groundwater. The water quality parameters described below are those that have been of greatest interest to SGA over the past several years.

Total Dissolved Solids

Total dissolved solids (TDS) is a measure of all dissolved constituents in water, resulting primarily from rocks and sediments with which the water comes in contact. In the North Basin, as in the rest of the Sacramento Valley, the TDS concentration in groundwater generally increases with depth below the land surface. At depths greater than about 1,200 feet in the center of the SGA region, TDS is generally found in groundwater at concentrations exceeding 1,000 milligrams per liter (mg/L) (Berkstresser, 1973). While water of this quality does not represent specific health concerns, it is undesirable because it typically tastes bad.

In general, TDS is seen as a good initial indicator of overall water quality. If groundwater pumping patterns in an area alter groundwater gradients so that deep groundwater flows towards the surface, high-TDS water present at greater depths could degrade water quality. Also, subsurface activities, such as natural gas exploration, which potentially provides a conduit for water to flow from deep sediments, must be managed to prevent the upward migration of poor quality groundwater. TDS concentrations in groundwater may also increase due to human activities, such as agriculture or other land uses and waste disposal practices. Because of these various activities that could lead to water quality degradation, TDS concentration trends are often used as a long-term indicator of basin health.

TDS has a recommended secondary maximum contaminant level (MCL) drinking water standard (associated with the aesthetics of the water) of 500 milligrams per liter (mg/L). There were 255 distinct samples from wells analyzed for the 2011 Groundwater Quality Vulnerability Assessment. With respect to TDS, the quality of water in the basin is very good, with an average TDS of 268 mg/L and only six wells exceeding the secondary MCL.

In order to evaluate the general water quality trends in the North Basin, SGA analyzed long-term results in wells that had TDS results of 450 mg/L (approaching the MCL) or more as part of its 2013 update of its Basin Management Report. The data included sample results from the DDW database between 1985 and September 2013. A total of 17 wells in the region had a sample result during that period that contained TDS greater than 450 mg/L. In general, the TDS concentrations in those 17 wells were consistent over time and 71% of the samples from the 17 wells had TDS concentrations of less than 450 mg/L. As a whole, TDS concentrations in the 17 wells were neither rising nor falling over time. SGA plans to update its review of TDS trends in groundwater in its future Basin Management Report updates.

Nitrate

Nitrate is a naturally-occurring constituent, but elevated concentrations in groundwater are often associated with human activities such as wastewater discharge, fertilizer application and land application of animal wastes. Due to the Central Valley-wide focus on nitrate in groundwater resulting from the Central Valley Salts Program, SGA has conducted additional evaluation to determine the potential for nitrate to contaminate its groundwater resource. The primary MCL for nitrate in drinking water is 45 mg/L.

Tests have shown that nitrate levels in public supply wells are generally not of concern in the SGA area. Of 252 samples from public supply wells tested during the period, the average concentration was 11.5 mg/L with a maximum observed concentration of 51 mg/L.

To evaluate whether there are any long-term trends with respect to nitrate concentrations, SGA obtained and reviewed available nitrate data for wells from the DDW database as part of its 2013 Basin Management Report update. For wells that had nitrate concentrations of 10 mg/L or greater, a condition found in 34 wells in the database, the data were examined to determine if concentrations were rising. In 19 of the 34 wells nitrate concentrations were rising somewhat over the period of record (earliest records in the database are generally from the mid-1980s or later). In ten of the 34 wells, nitrate concentrations were decreasing and in three wells there was no discernible trend. SGA plans to update its review of nitrate trends in wells in its Basin Management Report updates.

One observation in discussing nitrate concentrations with local water purveyors is that the nitrate concentrations can vary widely, depending on how frequently the well has been used prior to sampling. For example, purveyors indicated that in some instances elevated nitrates were observed in wells that were only recently turned on for sampling purposes. Longer-term pumping resulted in concentrations decreasing. Based on the available data and limitations, SGA did not attempt to determine conclusively if there is an overall trend. However, there are no indications that nitrates present a public health concern within the SGA area.

Arsenic

Arsenic is a commonly naturally-occurring element in the earth's crust. The USGS recently found that a number of wells in the center of the Sacramento Valley near the Feather and Sacramento Rivers yielded groundwater with relatively high concentrations of arsenic (Bennett and others, 2011). Conditions in the North Basin tend to confirm this finding. SGA member wells with elevated levels of arsenic are generally found in the western portion of the basin in the vicinity of Rio Linda/Elverta (SGA, 2011). The use of two water supply wells in the SGA area was discontinued after the drinking water standard for arsenic was lowered to 10 ug/L in January 2006. Outside of this area, groundwater in the North Basin typically has arsenic at concentrations below 5 ug/L (SGA, 2011).

Hexavalent Chromium

Hexavalent chromium (CrVI) is an oxidized form of the metal that is commonly found in low concentrations in drinking water. It can occur naturally, but has also been sourced historically from industrial activities. A California MCL of 10 ug/L became effective on July 1, 2014. As a result of the recent MCL, SGA obtained CrVI results from the DDW database from 2001 into 2014. Of the 215 wells for which data are available, the average concentration is approximately 5.2 ug/L. Of the 215 wells, 19 have concentrations exceeding the MCL and another 25 are close to the MCL (>7.5 ug/L). The areas of biggest concern appear to the north of Interstate 80 near the communities of Rio Linda, Antelope, and North Highlands.

Iron

Iron is a naturally occurring element in the earth's crust and is found in groundwater as a metallic ion. Iron has a secondary MCL of 300 ug/L because at elevated concentrations, it tends to have a bad taste and can precipitate as a red-brown solid on plumbing fixtures. In general, dissolved iron is not considered a significant problem in SGA-area public supply wells, but it is fairly routinely encountered. Of 196 distinct wells with available sample results, six wells were below the detection level of 10 ug/L. Of the wells with detections, 56 wells had concentrations exceeding the secondary MCL (SGA, 2011). Note that these represent the maximum detections observed in a given well, so the well may not routinely sample above these concentrations.

Manganese

Manganese is a naturally occurring element in the earth's crust and is found in groundwater as a metallic ion. Manganese has a secondary MCL of 50 ug/L because at elevated concentrations, it can have a bad taste and can precipitate as a black solid on plumbing fixtures. With a distribution similar to the occurrence of iron, but to a lesser extent, wells in the SGA region produce water with elevated manganese concentrations (SGA, 2011). Of the 183 distinct wells sampled during the period, 55 wells were below the detection level of 10 ug/L. Of the remaining wells, 35 wells had concentrations exceeding the secondary MCL.

Tetrachloroethene

Tetrachloroethene (PCE) is a volatile organic compound (VOC) used as a component of solvents, hydraulic fluids, paint thinners, and dry cleaning agents. PCE has an MCL of 5 ug/L. Of 142 wells with sample results that were evaluated, 118 wells were below the detection level of 0.5 ug/L (SGA, 2011). Of the remaining wells with detections, six had concentrations exceeding the MCL. Notably, most of the wells that exceed or are near the MCL are in the northern part of Sacramento County adjacent to Interstate 80 and west of Auburn Boulevard. The number of detections is increasing through time downgradient from this area, which is a source of concern to SGA. Beginning in late 2013, SGA began a study to evaluate the potential extent of the contamination and to assess the potential regional impacts of the contamination. The study is funded primarily from a Local Groundwater Assistance Grant from DWR awarded in July 2013. SGA is also coordinating the local water suppliers and the Central Valley Regional Water Quality Control Board.

<u>Known Contaminant Plumes</u>

Principal groundwater contaminant plumes within or near the SGA area are known to exist from the following source areas:

- former McClellan Air Force Base (McClellan)
- Aerojet, a Gencorp Inc. company (Aerojet)

- former Mather Air Force Base (Mather)
- Downtown Sacramento Union Pacific Railyards
- Boeing/Aerojet Inactive Rancho Cordova Test Site (IRCTS)

The geographic extent of these plumes is shown in Figure 13. Although other localized plumes exist within the SGA area, these contaminant plumes are the largest and best-documented in the North Basin. SGA continues to coordinate with state and federal regulatory agencies, local water suppliers, and known responsible parties, to ensure that effective remedies are in place to contain and remediate these contaminant plumes.

The following contaminants of concern (CoCs) are found in groundwater at McClellan: trichloroethene (TCE); tetrachloroethene (PCE); cis-1,2-ichloroethene (DCE); 1,2-dichloroethane (DCA); 1,4-dioxane; total and hexavalent chromium; and perchlorate.

TCE, PCE, and carbon tetrachloride are the primary CoCs are found in the former Mather AFB plume. For the Aerojet plume, the primary CoCs are TCE and perchlorate (SGA, 2011).

Potential Point Sources of Contamination

The State Water Resources Control Board geotracker web site (http://geotracker.waterboards.ca.gov/) identifies numerous sites in the SGA region, which may present threats to local groundwater quality. These sites may have leaking underground storage tanks, improperly stored pesticides, leaking dry cleaning solvents or other point sources of contamination. Based on a query of geotracker on November 14, 2014, there 103 cleanup sites classified as "open" within the SGA area. While the threat from many of these sites can be mitigated, the aggregate impact from undetected point source contamination on groundwater quality in the basin cannot be determined.

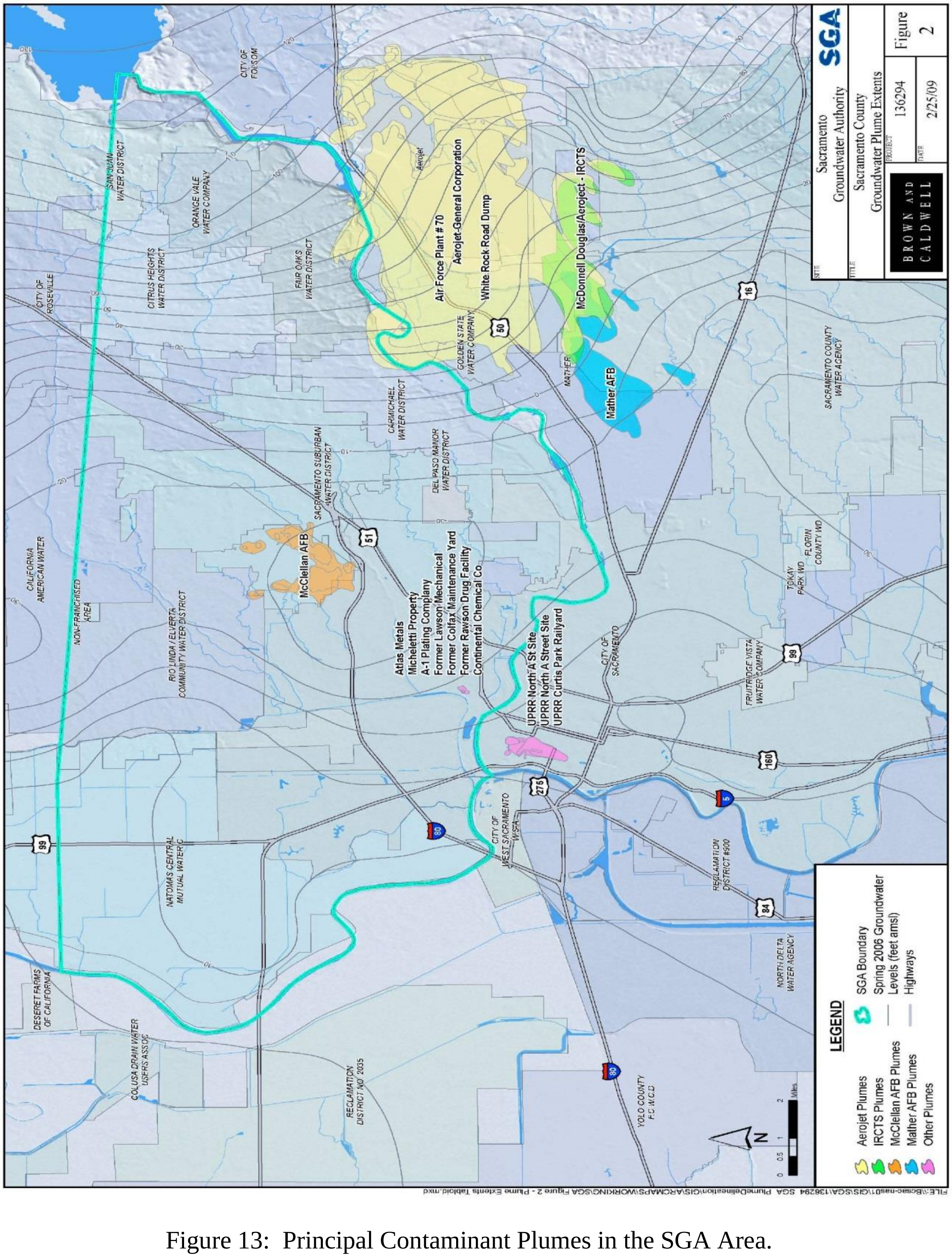

Figure 13: Principal Contaminant Plumes in the SGA Area.

2.3 Surface Water Resources

This section will discuss the relationship between surface water and groundwater in the North Basin with an emphasis on surface water. It includes discussion of surface water-groundwater interaction, gaining and losing streams, and surface water flows.

Groundwater management in the North Basin, as explained in Section 1 of this GMP, is one element of a regional effort to provide reliable water supplies and preserve the environment of the Lower American River. From its inception, the North Basin groundwater management effort was inextricably linked to management of the region's environment and its surface water resources. Flows in the American River, the Sacramento River, and other streams within the SGA area are vital to the regional water supply and provide habitat for a variety of fish and wildlife species. The WFA commitments to increase diversions from the American River in wet years and improve the pattern of fishery flow releases from Folsom Reservoir will also impact the manner in which SGA and its partners will manage the North Basin.

2.3.1 Surface Water Supply

Surface water availability is key to the sustainability of SGA's groundwater basin. To the extent that surface water sources can be developed to serve users dependent on groundwater, more water can be stored in the groundwater basin. Currently, SGA member agencies as a whole meet water demands with a mixture of a little more than half surface water and a little less than half groundwater. To the extent practical, the agencies maximize the use of surface water in wet years to maximize the amount of groundwater stored in the basin.

The American and Sacramento rivers are the source of most of the surface water delivered to the SGA region. The eastern two-thirds of the SGA region lies within the lower American watershed and surface water served to that area typically came from the American River. The western one-third of the SGA region, that part of the basin lying west of the Natomas East Drain, also known as Steelhead Creek, is drained to the Sacramento River. Table 5 lists the surface water rights and agreements for water that can be diverted and delivered to the SGA region.

Although the American and Sacramento rivers provide the SGA region with a fairly reliable water supply, it can be interrupted during dry conditions. The conditions that may interrupt surface water supplies include the following:

- Reclamation imposes the shortage policy for CVP water, from both the American and Sacramento Rivers, in times of drought, unavoidable interruptions and other operational restrictions.
- When Hodge Flows in the American River are not met, the City of Sacramento must restrict the amount of American River water it diverts at its Fairbairn Treatment Plant. This also affects the amount of water that SSWD may purchase from Sacramento.
- When the projected unimpaired flow to Folsom Reservoir is less than 1,600,000 acre-feet, SSWD is unable to exercise its agreement with Placer County Water Agency to use American River water.

Table 5: Surface Water Rights and Entitlements for Agencies in the North Basin

WATER AGENCY	American River		Sacramento River	
	Description of Right or Entitlement	**Maximum Use (AFY)**	**Description of Right or Entitlement**	**Maximum Use (AFY**
California American Water	Wholesale Agreement with SSWD	2,000		
Carmichael Water District	Appropriative	10,859		
	Appropriative	3,669		
	Appropriative	18,099		
Citrus Heights Water District	Wholesale contract with SJWD	Unspecified quantity from SJWD[1]		
Del Paso Manor Water District	Potential contract with Sacramento	2,460		
Fair Oaks Water District	Wholesale contract with SJWD	Unspecified quantity from SJWD[1]		
Folsom, City of	Pre-1914 and CVP Supply through wholesale contract with SJWD for Ashland area (includes only portion of Folsom within SGA)	1,540		
Natomas Central Mutual Water Company			Appropriative right conditioned by Settlement Agreement with Reclamation	120,200
Orange Vale Water Company	Wholesale contract with SJWD	Unspecified quantity from SJWD[1]		
Sacramento, City of	Appropriative (conditioned by Settlement Agreement with Reclamation)	245,000	Pre-1914 and appropriative (conditioned by Settlement Agreement with Reclamation)	81,800
Sacramento Suburban Water District	Agreement w/City of Sacramento	26,404		
	Agreement w/Placer County Water Agency	29,000		
San Juan Water District	Pre-1914	33,000		
	CVP contract	11,200		
	"Fazio Water" (Public Law 101-514)	13,000		
	Agreement w/Placer County Water Agency	25,000		

1. The "unspecified quantity" in the above table refers to contracts between San Juan Water District and four other entities; Citrus Heights Water District, Fair Oaks Water District, Orange Vale Water Company and City of Folsom for their Ashland area. The contracts are not for a specified amount of water. They indicate that SJWD will deliver water to meet the demand of each of these agencies.

2.3.2 Surface Water-Groundwater Interaction

Rivers and streams replenish much of the groundwater that is pumped from the North Basin. Groundwater – surface water interaction in the basin has been documented through observation and data analysis and suggests the extent to which the impacts of managing either surface water or groundwater as an isolated resource could be detrimental to the other.

The extent to which surface water and groundwater flow through the stream/aquifer interface was estimated by SacIWRM and summarized previously. Each of the water courses shown in Figure 11 was included in the evaluation. The model estimated that roughly 1/3 of the water that replenishes the groundwater basin on an average annual basis comes from water courses abutting and overlying the basin. The model manages a large amount of site-specific data used in such an analysis. If a situation was identified where it was useful to know how groundwater pumping impacted stream flow at some point in the basin, SGA has the analytical tool supported by ongoing monitoring to make that determination.

The link between shallow groundwater and surface water can be demonstrated with data from monitoring sites along the American River. SGA monitoring wells MW-4 and MW-6 sit just north of the river. A stream gage, American River at Fair Oaks (AFO), operates upstream of these wells. Figure 14 below shows the groundwater levels in MW-4 and MW-6 and the stage at AFO. Note that the trend in groundwater elevations mimics the stage in the American River. The highest water level elevation occurs furthest upstream at the stream gage while the lowest water level elevation occurs at the furthest downstream monitoring well, MW-4.

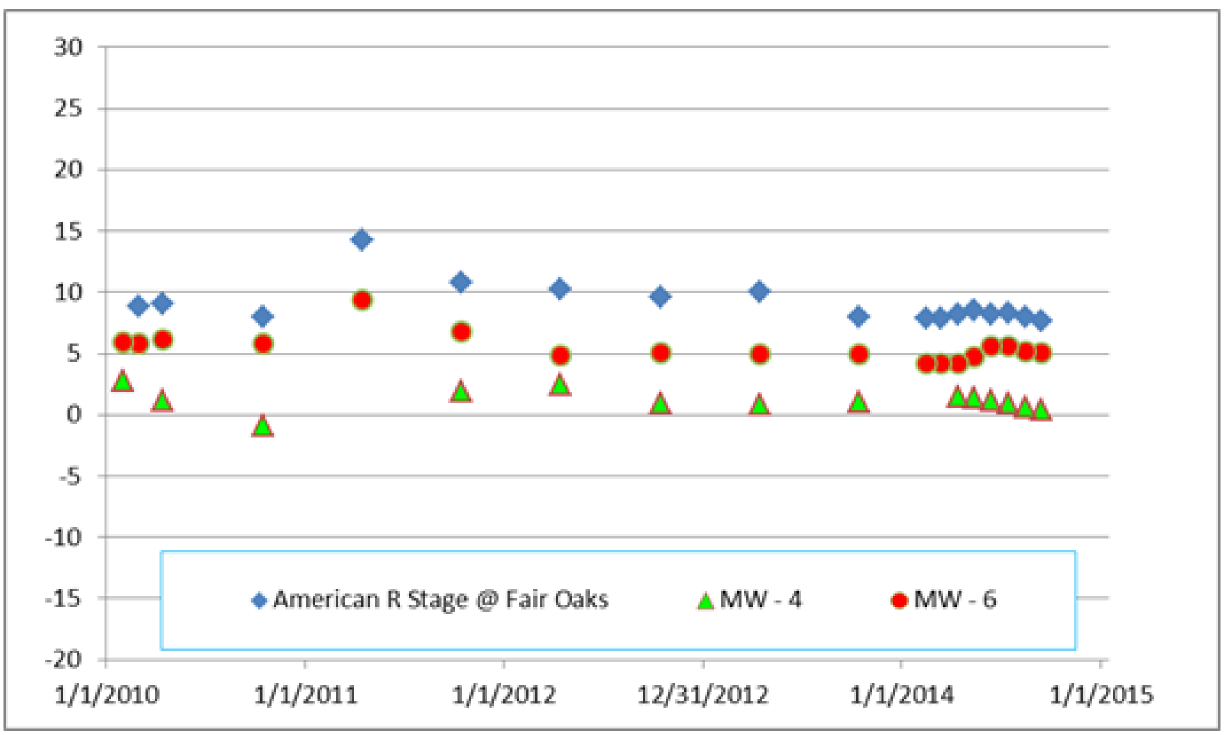

Figure 14: Stage in the American River and Nearby Groundwater Levels.

2.3.3 Gaining and Losing Streams

The estimate of recharge from streams in the North Basin indicates that over an average year more surface water is lost from streams than they gain from groundwater. However, whether or not any particular stream reach is gaining or losing varies throughout the basin and over time as groundwater levels and stream stages vary. No wells have been identified in the North Basin that significantly impact stream flow on a short-term basis.

Gaining and losing conditions were determined for the American River along the south boundary of the North Basin to support hearings in 2002 before the SWRCB. A draft decision by the SWRCB concluded that from Nimbus Dam to about 6,000 feet below the dam, groundwater level and river stage data supported the conclusion that groundwater is tributary to the American River. The decision also found that in the reach of the American River further than 6,000 feet downstream of Nimbus Dam water flows from the river to the adjoining aquifer (SWRCB, 2003).

Although the management of groundwater in the North Basin influences the flow of streams, the streams bounding the North Basin are influenced to a much greater extent by the operations of the Central Valley Project and the State Water Project which, together, control the flow of millions of acre-feet per year through the American and Sacramento rivers. The flow of surface water, as well as groundwater levels, are influenced to a great extent by the ability of agencies within the SGA area to operate surface water and groundwater conjunctively, which is, in turn, governed by local purveyors' access to surface water.

2.4 Water Supply and Demand

This section provides an overview of historic supply and demand for M&I uses for 2009 through 2013 and projected M&I demands through 2030.

2.4.1 Recent Supply and Demand

Table 6 is a summary of groundwater and surface water deliveries for SGA agencies for the past five years. The table shows that about six of the thirteen M&I purveyors have access to both surface water and groundwater. Four M&I purveyors have access to groundwater nearly exclusively and three purveyors have access to surface water nearly exclusively. Note that SJWD and City of Folsom show no groundwater use. These agencies overlie the far eastern portion of the North Basin where the aquifer thins and, as a result, groundwater resources are limited. Despite these limitations, the region as a whole is able to implement conjunctive use operations. Note in Table 6 the decrease in surface water use and the increase in groundwater use in 2012 as the region experienced drier than normal conditions.

Table 6: Reported M&I Surface Water and Groundwater Supplies by Agency

Water Purveyor	Year	Surface Water	Ground Water	Total Water Deliveries
California American Water	2013	0	14,110	14,110
	2012	591	13,595	14,186
	2011	2,099	11,605	13,704
	2010	1,576	13,324	14,900
	2009	620	19,248	19,868
Carmichael Water District	2013	8,369	2,031	10,400
	2012	8,315	1,580	9,895
	2011	7,850	1,469	9,319
	2010	8,214	1,518	9,732
	2009	8,965	1,609	10,574
Citrus Heights Water District	2013	14,193	465	14,658
	2012	13,355	583	13,938
	2011	12,095	962	13,057
	2010	11,945	1,560	13,505
	2009	12,007	2,120	14,127
Del Paso Manor Water District	2013	0	1,571	1,571
	2012	0	1,499	1,499
	2011	0	1,428	1,428
	2010	0	1,409	1,409
	2009	0	1,504	1,504
Fair Oaks Water District	2013	10,939	1,320	12,259
	2012	9,987	1,563	11,550
	2011	9,597	1,516	11,113
	2010	10,606	1,194	11,800
	2009	11,072	1,109	12,181
Folsom, City of	2013	1,462	0	1,462
	2012	1,279	0	1,279
	2011	1,279	0	1,279
	2010	1,331	0	1,331
	2009	1,647	0	1,647

Water Purveyor	**Year**	**Surface Water**	**Ground Water**	**Total Water Deliveries**
Golden State Water Company	2013	0	1,184	1,184
	2012	0	1,119	1,119
	2011	0	1,041	1,041
	2010	0	1,029	1,029
	2009	0	1,127	1,127
Orange Vale Water Company	2013	5,139	0	5,139
	2012	4,658	0	4,658
	2011	4,108	0	4,108
	2010	4,324	0	4,324
	2009	4,409	0	4,409
Rio Linda/Elverta CWD	2013	0	3,053	3,053
	2012	25	2,857	2,882
	2011	0	2,544	2,544
	2010	3	2,719	2,722
	2009	11	2,914	2,925
Sacramento, City of	2013	27,336	11,732	39,068
	2012	24,530	13,554	38,084
	2011	18,656	17,607	36,263
	2010	18,324	17,768	36,092
	2009	21,609	18,867	40,476
Sacramento County Water Agency	2013	0	5,316	5,316
	2012	0	5,211	5,211
	2011	0	4,663	4,663
	2010	0	4,950	4,950
	2009	0	5,202	5,202
Sacramento Suburban WD	2013	409	38,482	38,891
	2012	10,559	27,530	38,089
	2011	16,709	19,119	35,828
	2010	17,807	20,178	37,985
	2009	12,084	23,021	35,105
San Juan Water District	2013	3,643	0	3,643
	2012	3,421	0	3,421
	2011	3,046	0	3,046
	2010	3,011	0	3,011
	2009	3,249	0	3,249
Total for SGA Area	2013	71,490	79,264	150,754
	2012	76,720	69,091	145,811
	2011	75,439	61,954	137,393
	2010	77,141	65,649	142,790
	2009	75,673	76,721	152,394

Notes: As noted previously, groundwater extraction for agriculture, including Natomas Central Mutual Water Company, and self-supplied users is generally not measured. Therefore, it is not included in this table. The table also does not include surface water supplies for portions of the San Juan Water District and the City of Folsom that are not within the SGA boundary.

2.4.2 Future Supply and Demand

The North Basin is largely developed, so projected demands for water supply for M&I uses are expected to increase by less than 30 percent over current use. Some agencies are projecting to less use by 2030 than their current use as they comply with the 20 percent per capita water use reduction goal resulting from California Senate Bill X7-7 from 2009. Table 7 below lists the 2013 demand and the 2030 projected demand for the public water suppliers in the SGA area. Except where noted, projections are from 2010 Urban Water Management Plans (UWMP).

Table 7: Current and Projected M&I Water Demands by Agency

Agency	2013 Total Demand	2030 Projected Demand	Notes
California American Water	14,110	17,286	Includes Antelope, Arden, and Lincoln Oaks service areas.
Carmichael WD	10,400	9,571	
Citrus Heights WD	14,658	18,765	
Del Paso Manor WD	1,571	1,570	Not required to prepare UWMP. Estimate from Water Forum Agreement.
Fair Oaks WD	12,259	11,118	
Folsom, City of	1,462	1,540	Includes Ashland service area only.
Golden State Water Company	1,184	1,346	Not required to prepare UWMP for Arden Town service area. Estimate from GSWC staff.
Orange Vale Water Company	5,139	5,009	
Rio Linda/Elverta Community WD	3,053	17,500	Projection from 2014 Water Master Plan.
Sacramento, City of	39,068	55,875	Estimate provided by City Water Utility staff.
Sacramento County Water Agency	5,316	9,758	Includes Arden Park Vista and Northgate service areas. Also assumes future new supply to Metro Air Park.
Sacramento Suburban WD	38,891	40,390	
San Juan WD	3,643	4,154	Assumed Sacramento County portion of projected demand at 25 percent of total retail demand.
Total for SGA Area	**150,754**	**193,882**	

Future groundwater use is not expected to change significantly from the current supply as much of the project increases in demand are planned with surface water. Demands will continue to be met by slightly more than half surface water and slightly less than half groundwater. The ratio of the use of the two sources of supply is expected to vary more than it currently does as agencies continue to develop conjunctive use programs. Groundwater will be used preferentially in drier years, while surface water will be used preferentially in wetter years. For example, in 2011 (a wet year), M&I demand was met with 55 percent surface water and 45 percent groundwater. In 2013 (a dry year), M&I demand was met with 47 percent surface water and 53 percent groundwater.

Section 3 Groundwater Management Plan Elements

Since the initial adoption of a GMP in 2003, SGA has continuously refined its goals and objectives as a result of experience gained through management of the North Basin. This section describes the current goals and objectives of the SGA GMP and the indicators that SGA will use to evaluate whether it is meeting its objectives. Also in this section, a process is described that has helped SGA create a structure around the many aspects of groundwater management.

3.1 Groundwater Management Goal

The goal of the SGA GMP is to manage the North Basin to:

Provide reliable and sustainable groundwater resources for the existing and future needs of the region.

Through the past and ongoing efforts of SGA and the local area water suppliers, SGA believes that this goal is currently being met. The intent of the GMP is to identify the Basin Management Objectives and define a Groundwater Management Process that will ensure the goal continues to be met.

3.2 Basin Management Objectives

Basin management objectives serve as a framework for achieving the goal of the GMP. To meet its groundwater management goal, SGA has adopted the following basin management objectives (BMOs).

1. **Maintain groundwater elevations in the SGA area that provide for sustainable use of the groundwater basin.** The lowering of groundwater elevations can have adverse impacts ranging from increased energy costs to the need to deepen existing wells or even construct new ones. Lower groundwater elevations can also create groundwater quality problems by accelerating the migration of poor quality groundwater or contaminant plumes. Past patterns of groundwater pumping resulted in a persistent cone of depression within the central portion of the North Basin. The SGA members have and will continue to implement conjunctive use programs that reduce further declines in the regional cone-of-depression. The SGA members intend that overall groundwater elevations remain stable over time relative to current conditions in the basin, and that the groundwater basin be managed such that the impacts during drier years will be minimized when surface water supplies may be reduced and temporarily replaced by increased relative use of groundwater supplies.
2. **Maintain or improve groundwater quality in the SGA area to ensure sustainable use of the groundwater basin.** The groundwater resource in the basin is generally suitable for all identified beneficial uses. However, occurrences of large-scale groundwater contamination are documented in the basin. It is the intent of the SGA that use of groundwater by member agencies in the basin is not hindered by contamination, and that demand on groundwater

does not compromise its quality. Where contamination is documented, or occurs in the future, the SGA will coordinate with appropriate local, state and federal regulatory agencies to identify and pursue actions that result in the containment and eventual remediation of the contaminant. SGA will also monitor for long-term trends to ensure that salinity of the groundwater basin does not increase as a result of groundwater use. If increases are observed, SGA would work with local water suppliers to identify and pursue actions to mitigate against such trends.

3. **Maintain groundwater levels to prevent inelastic land surface subsidence that would damage infrastructure or exacerbate flooding.** Historic land surface subsidence within the SGA area has been minimal, with no known impacts to existing infrastructure. Given the historical trends, the potential for land surface subsidence from groundwater extractions that would damage existing infrastructure or water-related operations (water supply, wastewater collection, flood control) in the SGA portion of the groundwater basin is remote. However, the SGA intends to monitor for potential land surface subsidence. If inelastic subsidence is documented in conjunction with declining groundwater elevations, the SGA will investigate appropriate actions to avoid adverse impacts.

4. **Protect against adverse impacts to surface water or groundwater resulting from interaction between groundwater in the basin and surface water in the American River, the Sacramento River, and other surface water bodies within the SGA area.** The current relationship between the surface water and groundwater system in the SGA area took several decades to establish. The Water Forum Agreement (WFA) establishes a framework to ensure that this balance is not upset. This included establishing a sustainable yield for the North Basin, establishing procedures to reduce diversions during drier years; and establishing an improved flow release pattern from Folsom Reservoir to support habitat. Implementation of the WFA, combined with SGA's other groundwater management actions will protect against adverse impacts to these systems. SGA intends to continue monitoring conditions near the surface water/groundwater interface. If significant negative changes are observed, SGA will investigate appropriate actions to mitigate against adverse impacts.

3.3 Groundwater Management Process

Local agencies can use many different approaches to successfully manage their groundwater resources. After more than a decade of comprehensive management in the North Basin, SGA has defined a process through which it has organized and considered the components that could be employed in a GMP. Figure 15 is a graphical depiction of the groundwater management process that has developed through time at SGA. The process starts with an effective monitoring program that is followed by management and analysis of the data collected to see if BMOs are being met. If BMOs are not being met, a series of potential response actions could be identified and implemented. This would be followed by monitoring, which continues the groundwater management process.

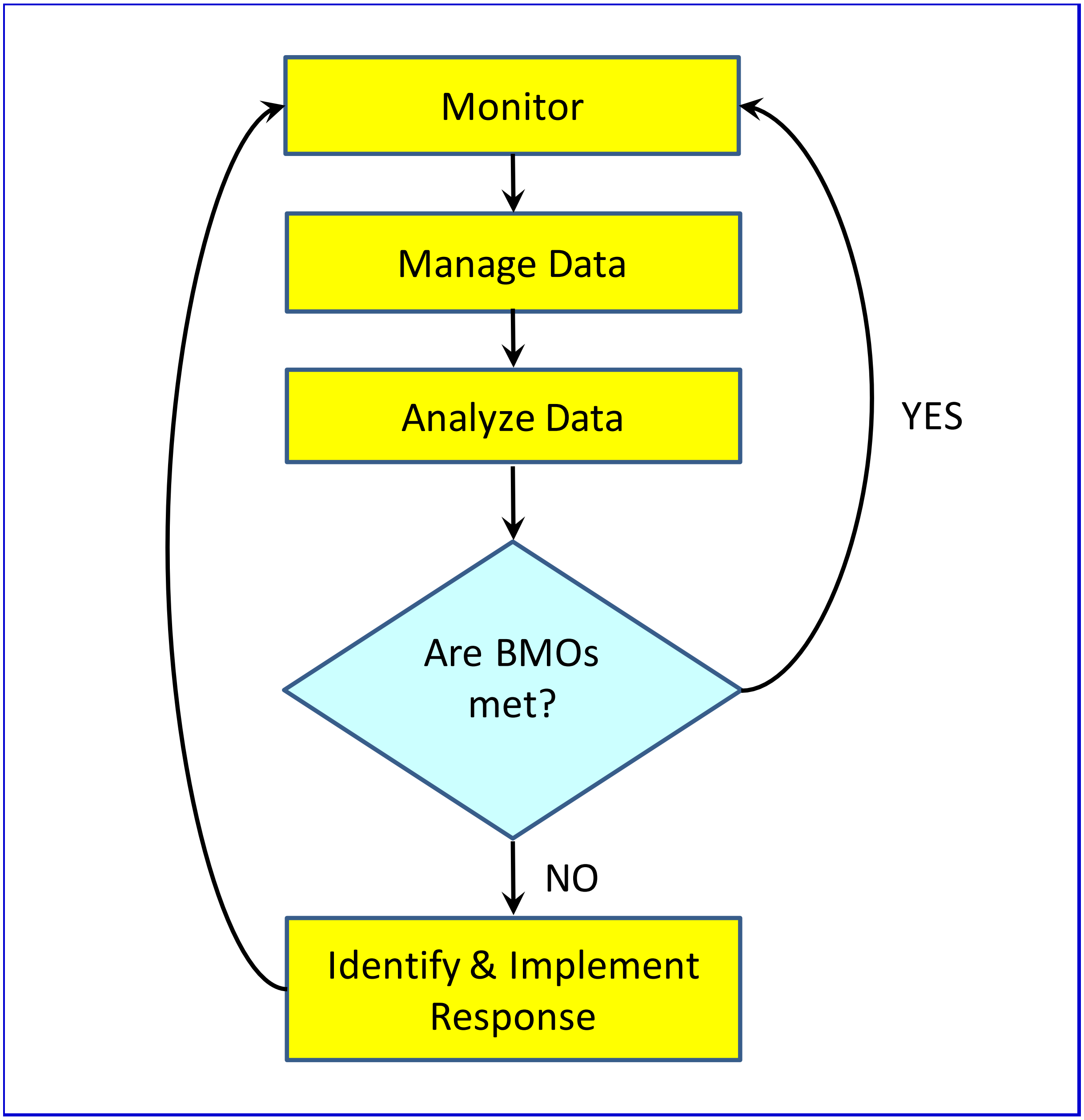

Figure 15: Graphical Depiction of the SGA Groundwater Management Process.

The groundwater management process can be defined as a series of components (usually actions or strategies) that could be employed to meet the BMOs of the GMP. The California Water Code identifies many components that could be used for successful groundwater management, while local agencies may identify many others during the groundwater management process to account for local conditions, policies, or ordinances. These components can be grouped into four broad categories: 1) monitoring; 2) data management; 3) data analysis; and 4) management response options. Each of these is described further below.

3.3.1 Monitoring

At the heart of this GMP is a monitoring program capable of assessing the status of the basin and responses in the basin to future management actions. The program includes the monitoring of groundwater elevations, monitoring of groundwater quality, monitoring the potential for inelastic land surface subsidence, and other monitoring to support our understanding of the relationship between surface water and groundwater and other important climate-related parameters. Also important is the continued use of monitoring protocols to ensure the accuracy and consistency of data collected.

Groundwater Elevation Monitoring

The SGA has compiled historic water level data measurements extending from prior to 1950 through 2008. Sources of historic water level data for the SGA area include: DWR, SGA and its member agencies, and the United States Geological Survey.

Based on the extensive knowledge of the underlying groundwater basin and the requirements resulting from Senate Bill X7 6 (Steinberg 2009), SGA developed a representative California Statewide Groundwater Elevation Monitoring (CASGEM) Program network for the North Basin. SGA's network of groundwater level monitoring wells provides data that is the foundation for many groundwater management decisions. SGA's State-approved CASGEM network consists of 41 wells[2] in the basin. The well locations are shown in Figure 16. Attributes of the well network are provided in Table 8 below.

Based on the analysis of groundwater level monitoring data from the basin dating back several decades, SGA has determined that semi-annual groundwater level measurements are sufficient to identify groundwater level trends that may threaten the sustainability of the basin's groundwater resources.

Groundwater levels are collected in the spring when they are typically higher than any other time of the year and groundwater pumping stresses are usually minimal. Therefore, measurements at individual wells may be more representative of regional conditions than at times when nearby wells are producing more water. Likewise, fall measurements are taken after the heaviest pumping has occurred for the dry season and before substantial recharge has occurred from precipitation. The fall measurement can be considered the regional minimum groundwater level for a given year.

The specific timing of the monitoring was determined by SGA and its cooperators in 2004. They mutually agreed that groundwater level measurements would be collected on April 15 and October 15. The work has been completed during a two-week window on either side of these target dates to accommodate inclement weather and scheduling conflicts.

[2] The DWR-approved CASGEM network included an abandoned public supply well operated by SSWD (Well 54). That well has since been destroyed. The Roseview Park well shown at the end of Table 8 and in Figure 16 is not currently part of the CASGEM network. SGA will work with DWR to add this well to the CASGEM network in 2015.

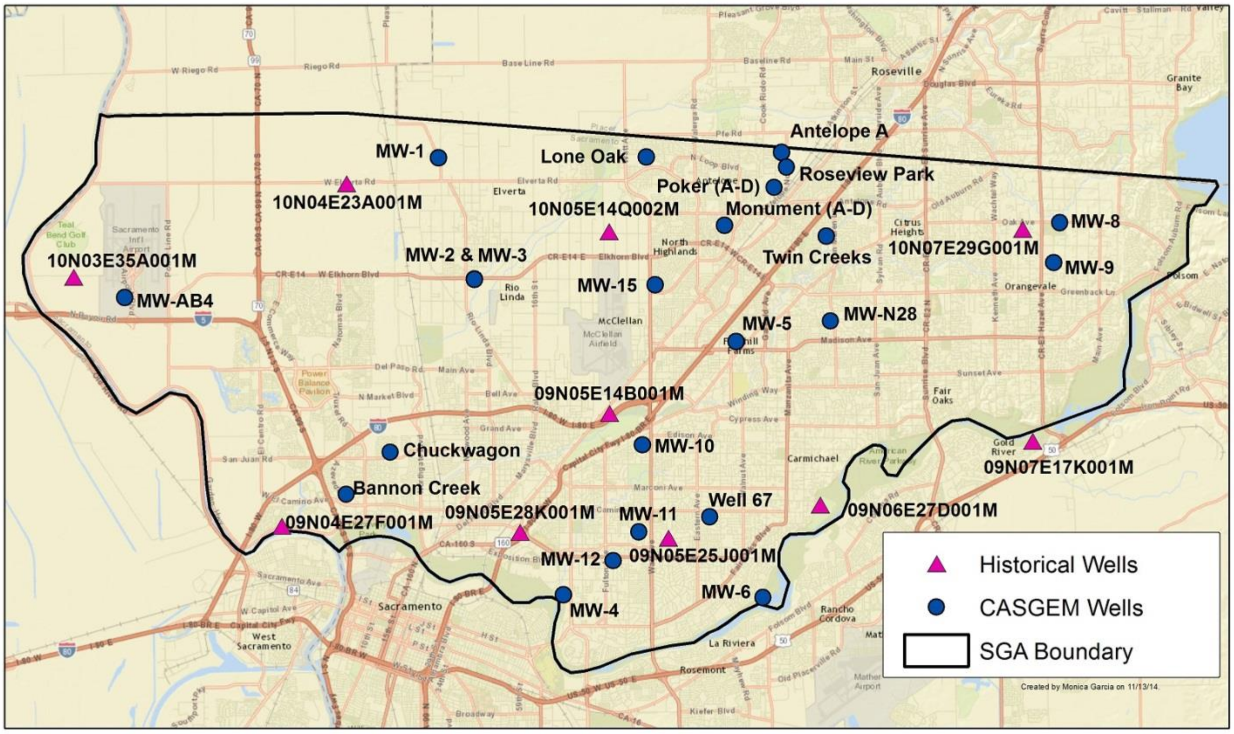

Figure 16: SGA Groundwater Level Monitoring Network.

Under some conditions, groundwater level measurements may be collected more frequently. For example, when Sacramento Suburban Water District and the City of Sacramento were pumping groundwater to participate in the 2009 Drought Water Bank, groundwater level measurements were collected on a monthly basis from the beginning of the water transfer pumping until groundwater levels recovered to their seasonal highs the following spring. Similarly, groundwater levels were monitored monthly in 2014 to evaluate the effects of reduced surface water supplies on the basin.

Table 8: SGA Water Level Monitoring Network Attributes

Well Name	Top of Screen	Bottom of Screen	Total Depth	Aquifer Zone	Cooperator
AB-3 shallow	190	210	220	shallow	DWR
AB-3 middle	470	490	500	production	DWR
AB-3 deep	745	985	995	deep	DWR
MW-AB4	170	190	200	shallow	DWR
AB-4 mid-shallow	380	400	410	production	DWR
AB-4 mid-deep	795	815	815	deep	DWR
AB-4 deep	1060	1070	1080	deep	DWR
MW-1	100	110	110	shallow	SGA
MW-2	100	110	110	shallow	SGA
MW-3	285	305	305	production	SGA
MW-4	55	65	65	shallow	SGA
MW-5	205	215	220	shallow	SGA
MW-6	62	72	72	shallow	SGA
MW-8	130	140	145	shallow	SGA
MW-9	150	160	165	shallow	SGA
MW-10	210	262	265	shallow	SSWD
MW-11A	167	177	187	shallow	SSWD
MW-11B	258	268	278	shallow	SSWD
MW-11C	332	365	375	production	SSWD
MW-12A	200	280	285	shallow	SSWD
MW-12B	360	380	385	production	SSWD
MW-12C	590	610	615	production	SSWD
MW-12D	810	840	845	deep	SSWD
MW-12E	960	1000	1005	deep	SSWD
MW-15	205	481	486	production	SSWD
Well 67	480	570	577	production	SSWD
MW-N28	170	452	454	production	SSWD
Monument (A)	226	274	274	shallow	SSWD
Monument (B)	324	334	334	production	SSWD
Monument (C)	380	450	450	production	SSWD
Monument (D)	498	544	544	production	SSWD
Poker (A)	104	124	134	shallow	SSWD
Poker (B)	156	166	176	shallow	SSWD
Poker (C)	274	310	320	production	SSWD
Poker (D)	370	460	470	production	SSWD
Antelope A	258	278	283	shallow	SSWD
Antelope B	328	468	473	production	SSWD

Well Name	Top of Screen	Bottom of Screen	Total Depth	Aquifer Zone	Cooperator
Chuckwagon	27	37	52	shallow	USGS
Bannon Creek	33	43	48	shallow	USGS
Twin Creeks	183	193	198	shallow	USGS
Lone Oak	151	161	166	shallow	USGS
Roseview Park	295	305	315	production	SGA

Groundwater Quality Monitoring

Each of the wells operated by SGA members to produce drinking water is required to be monitored for water quality by the SWRCB DDW. Due to that requirement, SGA has an established network of over 200 wells available to monitor water quality in the aquifers of greatest concern, zones tapped to produce the water that serves the municipal and industrial needs of the region. An extensive record of water quality data from these wells, dating from about 1985 to the present, is available. General locations of these wells are provided in Figure 17.

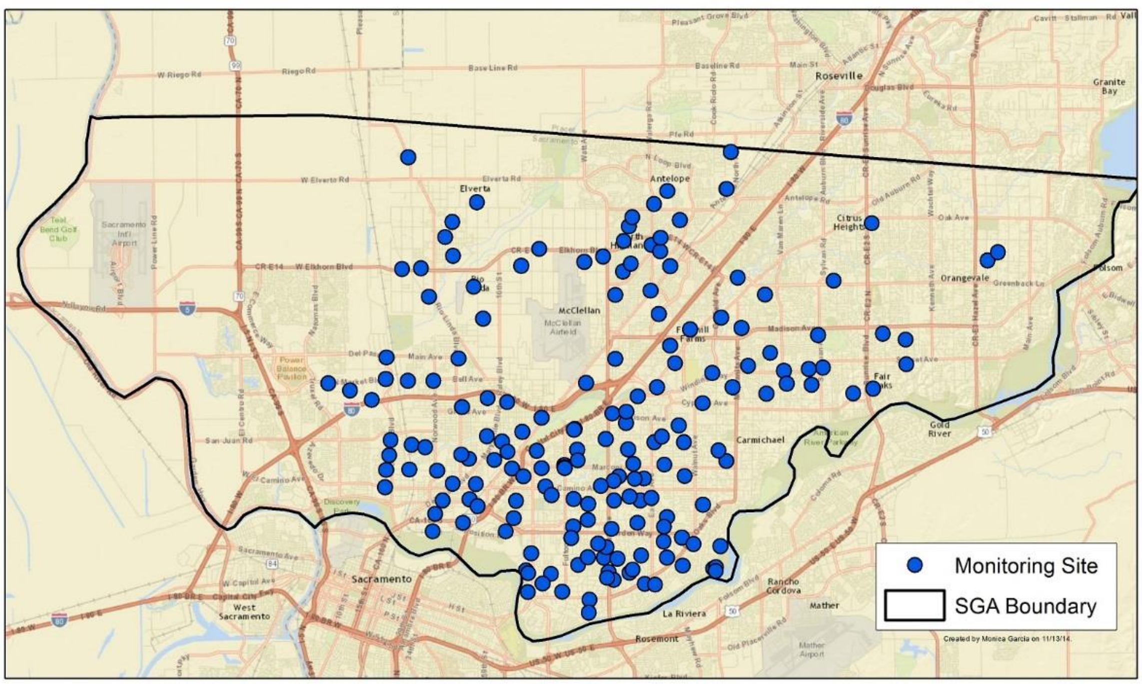

Figure 17: General Locations of Wells Subject to Monitoring and Reporting to SWRCB DDW.

Additional wells have been built for specific water quality investigations, both local and regional in scope. SGA maintains a dedicated monitoring network of wells that were constructed specifically to monitor groundwater quality and levels. Two additional multi-level monitoring wells are maintained in the western portion of the basin by DWR, one near Sacramento Metropolitan Airport and the other near the headquarters of NCMWC. In the center of the North

Basin, many dedicated monitoring wells are maintained by the Air Force Real Property Agency (AFRPA) in and around the former McClellan AFB. Wells north of the American River were constructed specifically to track the extent of water quality impacts, which originated south of the river at Aerojet. The USGS maintains monitoring wells in the basin that were used in the NAWQA program. Access to, or data from, these wells are available to SGA to be used in their efforts to assess the sustainability of the North Basin.

<u>Land Surface Elevation Monitoring</u>

Based on the observation from previous data (see Section 2.2.1) that land subsidence due to groundwater extraction may have occurred to a limited degree in the North Basin, SGA has developed a land subsidence monitoring plan, which is described in Appendix D. The plan includes the following broad steps:

1. Establish bench marks in the North Basin
2. Conduct an initial (baseline) GPS survey of bench marks to determine starting elevations
3. Conduct subsequent GPS surveys of bench marks to detect elevation changes
4. Evaluate survey results in the context of other elevation data to determine the extent to which processes other than fluctuating groundwater levels change land surface elevation

Fortunately, ten bench marks established within a Sacramento Valley-wide land subsidence monitoring network are in the North Basin. They comprise the foundation of the SGA monitoring plan. That monitoring network is shown below in Figure 18. The initial survey of those bench marks is complete. Subsequent surveys of the network will be conducted if groundwater level conditions indicate subsidence may be occurring.

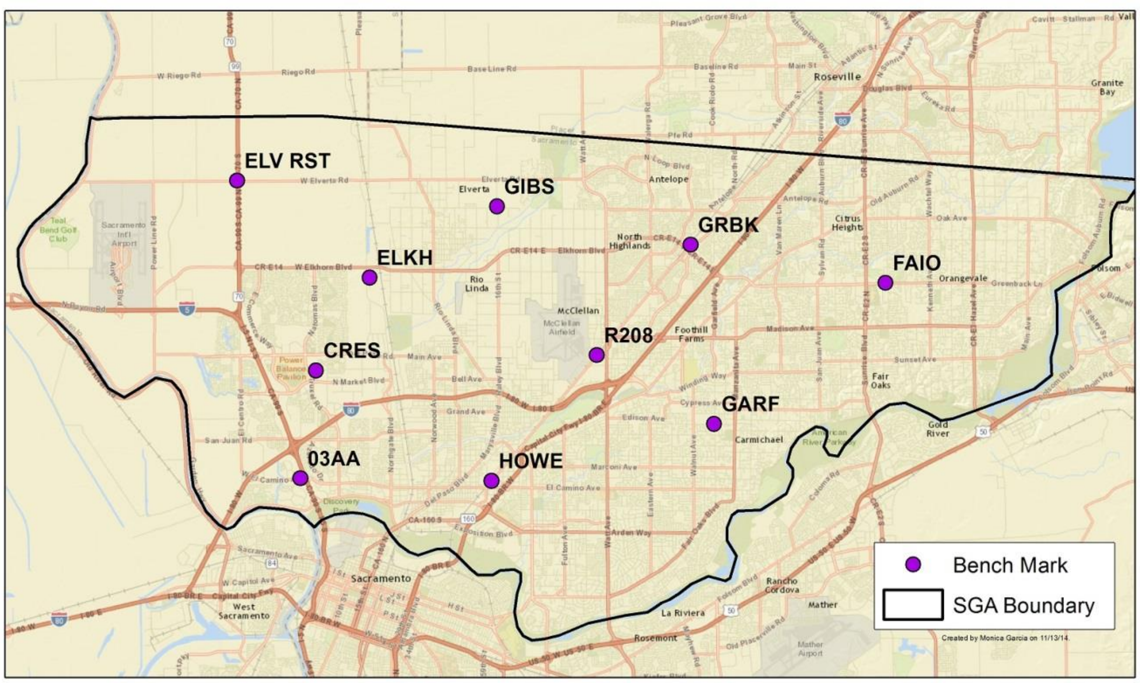

Figure 18: SGA Land Subsidence Monitoring Network.

<u>Other Monitoring</u>

The North Basin has well-placed and appropriate monitoring facilities that provide data needed to estimate the extent to which surface water and groundwater interact. The groundwater monitoring facilities were discussed previously in this GMP. Stream stage, precipitation and evaporation are monitored with the stations represented in Figure 19 and discussed below.

Stream stage is monitored at three primary stations shown on Figure 19. Each station is designated by a three-letter code which identifies them in the California Data Exchange Center (CDEC) database, where the data is managed. The operating agency, type and frequency of measurements are listed below for each station:

- AFO – American River at Fair Oaks. Stage and flow measured each 15 minutes. USGS, operator.
- HST – American River at H Street. Stage measured each minute. DWR, operator
- IST – Sacramento River at I Street. Stage and flow measured each hour. DWR, operator.

Precipitation is monitored at the following stations in and near the North Basin.

- RSV – Roseville Fire Station operated by City of Roseville
- RLN – Rio Linda W.C. operated by Sacramento County
- SMF – Sacramento Metro Airport operated by Sacramento County
- FLD – Folsom Dam at Folsom Point operated by National Weather Service
- CHG – Chicago (near Orangevale) operated by Sacramento County
- ARW – Arden Way operated by Sacramento County

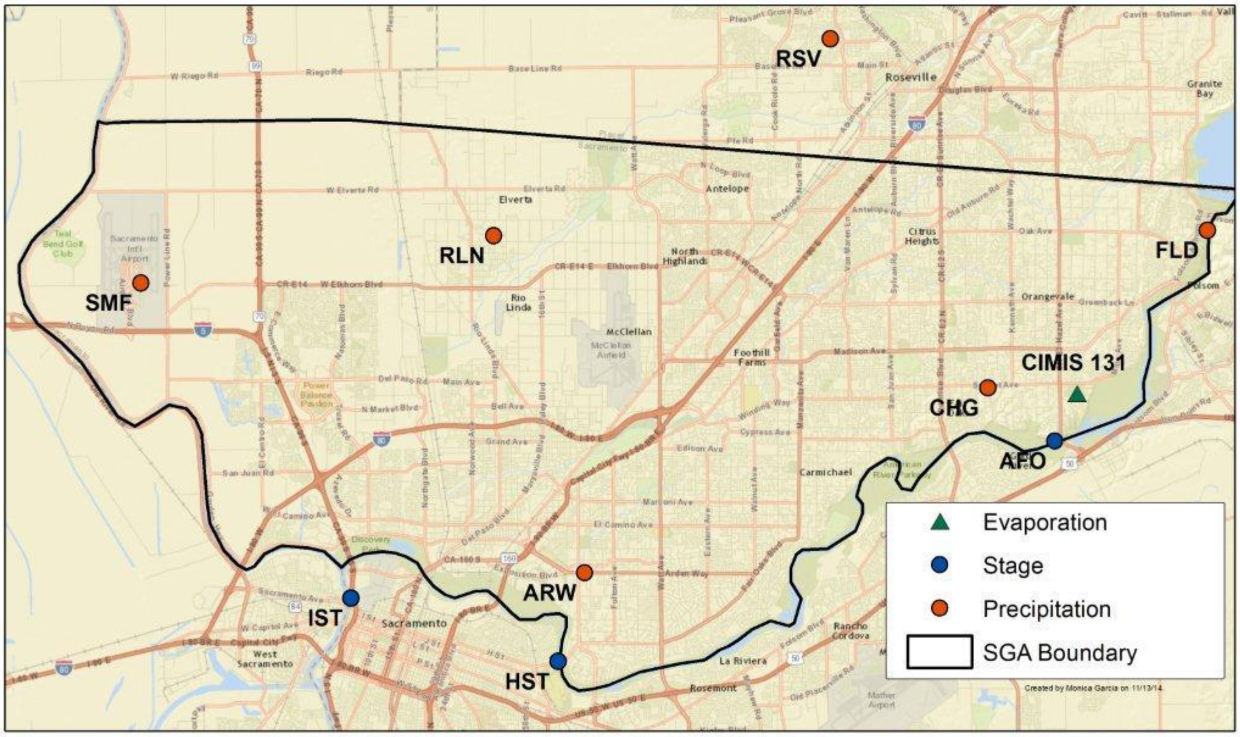

Figure 19: Stage, Precipitation, and Evaporation Monitoring Sites for the North Basin.

DWR operates a California Irrigation Management Information System (CIMIS) station in Fair Oaks in the North Basin. CIMIS stations throughout California collect data that assists irrigators in managing their water resources. The station at Fair Oaks collects environmental data on an hourly basis, which is used to calculate reference evapotranspiration (ETo) values. The data is available through DWR, which stores it in a database available to the public.

<u>Protocols for the Collection of Groundwater Data</u>

Groundwater level measurements must be collected with consistency and with sufficient additional data that those who use the data understand its usefulness and limitations. Field notes which document the data collection are therefore required. The following data is collected on standard forms in the field to establish a dependable groundwater level measurement:

- Name of person collecting data and agency association
- Well name/identification
- Date and time of measurement
- Type of equipment used to measure
- Reference point (RP) used at each well
- Nearby conditions which confirm (or not) that measurement is static water level
- Measurement from the RP to the water surface (RPWS)
- Weather and other conditions that may affect the ability to obtain a good measurement

Additional steps are taken in the field to

- ensure the safety of staff collecting the data
- ensure the integrity of the data collection process
- maintain hygienic conditions in the wells and
- maintain good relations with property owners

By following the field guidelines DWR's Groundwater Elevation Monitoring Guidelines published in December 2010 (DWR, 2010), SGA ensures that its groundwater level measurements are appropriate for use in conjunction with other groundwater level data from other groundwater management entities.

The State of California requires that public water systems maintain a level of water quality monitoring that ensures the public is provided with a safe, reliable drinking water supply. Specifically, system operators, which include SGA's member agencies, must collect and analyze samples from their producing wells to determine the concentration of a broad range of constituents on a scheduled basis as detailed in Title 22 of the California Code of Regulations. The sampling events are carried out under detailed sampling plans which comply with State requirements.

In addition to SGA members' production wells, SGA's dedicated monitoring network wells are sampled as needed for distinct studies, but no less than once every five years, following sampling plans developed by consultants experienced in complying with the requirements of groundwater investigations. The AFRPA and Aerojet wells are sampled frequently under strict protocols established by federal or state regulatory agencies. NAWQA wells are sampled infrequently by USGS using sampling procedures followed by USGS staff.

3.3.2 Data Management

SGA relies on a variety of means to manage available data from the monitoring activities described above. In 2003, SGA completed a multi-year effort to develop a comprehensive Microsoft Access database of groundwater extraction, groundwater elevation, groundwater quality, and construction information for each of the more than 200 public supply wells in the basin. Most of the time-related data dated back to 1990. Through 2007, SGA continued to comprehensively update this database. However, through time, more cost-effective and time-efficient sources of groundwater-related data emerged. SGA will continue to update its database for groundwater extraction and public supply well construction information, but will use the DWR CASGEM on-line database to manage water elevation data and the SWRCB DDW chemical database for management of water quality data in public supply wells.

With the establishment of an official DWR CASGEM network in the North Basin, SGA believes that the DWR on-line database and interface is the most effective means of managing long-term water elevation data and sharing that data with the public. The CASGEM database holds data obtained by SGA, SCWA and DWR for the SGA monitoring network.

SGA relies on the SWRCB DDW chemical database as its primary source of groundwater quality data. As certified laboratories analyze samples submitted by water systems complying with SWRCB DDW monitoring requirements, they transmit the analytical results electronically, which maintains that data in databases that are accessible through the internet. This results in several advantages for SGA. Most significantly, data generated by multiple agencies in the basin has shared data protocols making the data relatively easy to compare. Also, as data is generated it is stored with historical data from the same monitoring site in an easily accessible format. The data generated by the regular sampling of public supply wells is available not only to SGA, but also to the public and other stakeholders in the region, which improves efforts to coordinate and collaborate with others to meet the water quality BMO.

Data generated from the sampling and analysis of other monitoring wells in SGA is managed in several ways. Water quality data from SGA's dedicated monitoring network is managed with an MS Access database that resides within the agency. Water quality data from wells monitoring the former McClellan AFB is presented in quarterly reports made available to SGA on compact disks. DWR and USGS manage data from their sampling efforts.

SGA does not currently manage subsidence-related data, as it has not been a historical problem in the North Basin. If SGA collects future subsidence-related data, it will coordinate with DWR on a means of maintaining and making the data available to the public. For nearly all other data related to SGA's management and assessment activities in the North Basin (surface water, precipitation, evapotranspiration, etc.), SGA has and will continue to rely on the CDEC website to assemble and analyze the data as needed.

3.3.3 Data Analysis

SGA has multiple means of conducting data analysis. Three of these are described more fully below. The first analysis consists of reviewing a series of BMO indicators that were established during the development of this GMP. These quantifiable thresholds are set for volumes of groundwater extracted, groundwater levels, and groundwater quality that SGA can use to evaluate whether it is continuing to meet its BMOs. The second analysis consists of the preparation of a recurring Basin Management Report for the North Basin, which SGA has been conducting regularly since 2004. The final means of data analysis is the SGA integrated groundwater and surface water model, which has been used continuously in the region for more than 20 years.

<u>Basin Management Objective Indicators</u>

To assist in determining if SGA is meeting its BMOs, SGA is using a series of indicators with quantifiable targets. This update of the SGA GMP incorporates quantitative thresholds for groundwater levels and groundwater quality. These indicators represent one way of evaluating, in terms of groundwater extractions, groundwater levels, and groundwater quality, whether the region's groundwater basin is sustainable. The defined indicators in this plan will help ensure that irreversible impacts to North Basin groundwater resources are avoided. Note that due to a lack of any significant documented subsidence or any damage caused by subsidence, SGA has not established thresholds relative to subsidence. A land subsidence monitoring plan is described in Appendix D of this GMP.

BMO Indicator 1. Groundwater Extraction

There are two primary groundwater extraction indicators by which SGA can determine whether the North Basin is being managed sustainably. The first indicator is operating the basin within its estimated annual average sustainable yield of 131,000 acre-feet. The second indicator is whether the SGA Central Area is meeting its water purveyor basin sustainability pumping balance of an average annual volume of 90,000 acre-feet. Each of these is discussed further below.

North Basin Sustainable Yield

During development of the Water Forum Agreement (described in Section 1.1.1 of the GMP), modeling was conducted to evaluate the proposed 2030 estimated average annual groundwater extraction in the North Basin. That modeling concluded that the basin could sustain an average annual extraction of 131,000 acre-feet, which then became the assumed sustainable yield for the North Basin. The modeling results did indicate that some portions of the basin could have groundwater levels that would continue to decline by approximately 20 feet before stabilizing in about the year 2020. An Environmental Impact Report (EIR) completed for the Water Forum Agreement in 1999 concluded that the impacts of these declines would be less than significant and would not require any mitigation measures (City-County Office of Metropolitan Water Planning, 1999).

SGA has tracked the North Basin groundwater extraction relative to this sustainable yield since 2000. As further discussed in Section 2.2.5 of this GMP, SGA estimates that the average annual extractions in the North Basin from 2000 through 2013 have been 99,500. This is based on metered reporting from municipal water supplies of 81,500 acre-feet and a model-estimated groundwater extraction for agriculture, domestic, remediation, and other self-supplied users of 18,000 acre-feet. The trend for groundwater use has actually declined during the monitored period, largely due to implementation of conjunctive use operations by municipal water purveyors with some reductions due to water use efficiency efforts in the region.

The North Basin is well within its sustainable yield indicator. Because the North Basin is largely developed, SGA does not expect new water demands that would cause the basin to approach its average annual sustainable yield. SGA will continue to monitor and report on overall North Basin extractions on an annual basis. If any long-term trends emerge that would cause any concern relative to the sustainable yield, SGA would work with local water suppliers to:

- identify if there are impacted groundwater users and identify mitigation measures for those impacts;
- identify and implement actions to operate within the targets.

Central Area Basin Sustainability Extraction Balance

In June 2010, SGA adopted a policy known as the Water Accounting Framework (WAF)[3]. The WAF resulted following a multi-year and multi-phase study to develop a set of policies and procedures within the North Basin to ensure the long-term sustainability of the underlying groundwater resource. While there are many other aspects to the WAF, one result was an indicator for sustainable average annual groundwater extraction by municipal water purveyors in the SGA Central Area of 90,000 acre-feet. The Central Area is shown on Figure 8 of Section 2.2.3 of this GMP.

This number does not conflict with the Water Forum sustainable yield of 131,000 acre-feet. Rather, it is complementary. It became necessary to further evaluate the Central Area because it surrounds the largest contaminant plume in the North Basin at the former McClellan Air Force Base. Additionally, this is the area that has been historically dependent on groundwater and has seen the most significant groundwater level declines. During development of the WAF, SGA determined that it would be most desirable to maintain fairly stable groundwater levels. This is because McClellan operates treatment systems both above and below the groundwater table. Maintaining stable groundwater level elevations helps optimize the McClellan remediation, which is expected to be largely completed within about 30 years.

Based on a technical analysis of the relationship of groundwater extractions and groundwater elevation changes, extraction of 90,000 acre-feet was determined to be the value that would result in stable groundwater levels. Each of the eight purveyors in the SGA Central Area agreed to a goal of reducing their cumulative groundwater extractions from a baseline of 101,784 acre-feet per year down to 90,000 acre-feet. While there was no defined penalty for not meeting this level of groundwater extraction, it does result in some agencies not being able to participate in incentive-based programs, such as a state or federal water bank program, that could result in additional revenues for the purveyor.

The North Basin is currently well within its Central Area Basin Sustainability Extraction Balance indicator. Official tracking for the Central Area began in 2012. For the two years through 2013, average groundwater extraction by the eight purveyors has been 72,212 acre-feet per year. The WAF has a provision to revisit its recommendations every five years and to evaluate whether changes are needed to ensure basin sustainability. The initial evaluation will occur in 2017 after five full years of tracking data are available.

BMO Indicator 2. Groundwater Levels

As discussed in Section 2.2.3 of this GMP, long-term groundwater elevations in the North Basin indicate that management actions over the past two decades have not only arrested a several decade groundwater level decline, but have caused levels to increase in many wells. Additionally, as described above in Section 3.3.1, a goal of relatively stable groundwater elevations can potentially result in improved contamination cleanup efforts. Despite the demonstrated positive results of recent management actions in the basin and the expectation that these conditions will continue to exist into the foreseeable future, SGA believes it is necessary

[3] More information on the WAF can be found at http://www.sgah2o.org.

and prudent to establish some lower bounds for acceptable levels in a subset of wells in the SGA area. These groundwater levels serve as an indicator, or a threshold value, that if exceeded could threaten the sustainability of a portion or all of the North Basin. Additionally, exceeding thresholds would serve as an indication that significant impacts could occur in groundwater management areas adjacent to SGA.

SGA has identified a set of ten representative wells, known as Threshold Wells, from an extensive network of monitoring wells (described in Section 3.3.1 of this GMP). The Threshold Wells are shown in Figure 20. The levels at each Threshold Well have been set in consideration of the historical range of groundwater levels at or near the well and other conditions; such as depth of nearby wells, surrounding groundwater level gradients, land subsidence potential and extent of interaction with nearby surface water bodies. Additionally, data from wells in the North Basin that DWR has historically monitored, and continues to monitor, contribute to SGA's proposed groundwater level thresholds. The data record from those wells is especially useful because it goes back fifty years or more in some cases and shows the historical lows experienced in various parts of the basin, which was typically in the early to mid-1990s. Those wells are shown on Figure 8 in Section 2.2.3.

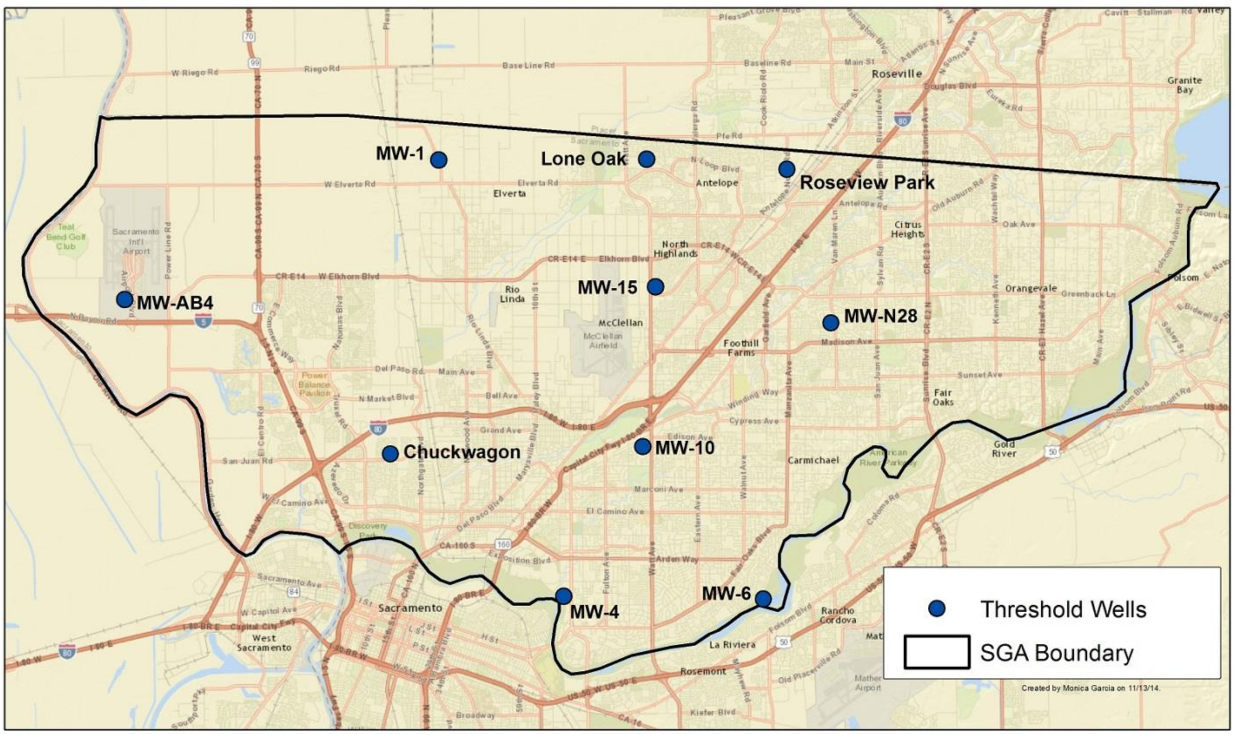

Figure 20: Locations of SGA Threshold Wells.

SGA foresees that establishing these levels is a multi-step process requiring collection and consideration of additional groundwater level data and long-term groundwater level trends. As an initial step, two provisional groundwater levels are identified in each of the ten Threshold Wells.

The Threshold Wells are grouped in the following discussion according to which part of the basin they are primarily intended to monitor. SGA has established groups of wells for its northern, western, and southern boundaries. Additionally an internal area to the SGA is monitored, because this is where the past historical lows in groundwater elevations were previously observed. No Threshold Wells were established for the SGA eastern boundary, because there is very limited past or future expected pumping due to geologic conditions. Additionally, there are no public supply wells to the east, because it is outside of the groundwater basin.

For each Threshold Well discussed below, a graph has been prepared to depict recent groundwater elevations and the upper and lower threshold levels. Groundwater elevations in the wells are noted by the red circles and blue diamonds. The red circles are particularly important to note. They represent annual measurements taken during the spring season, and they typically note the high mark for groundwater elevations for the year. SGA will use only the spring seasonal groundwater elevations for the threshold analysis because seasonal drawdowns in wells are highly variable and may result from localized phenomena. The upper threshold is indicated on each hydrograph by a yellow dashed line with arrows. The lower threshold is shown as a red dashed line.

If groundwater levels recede to the upper threshold level, actions may include:

- increase monitoring to determine potential causes of the observed drawdown and if there are other impacted users of groundwater;
- notify the SGA Board and potentially impacted users;
- identify range of actions that can be implemented to respond to verified problems associated with the drawdown of groundwater levels in the area.

If groundwater levels reach the lower threshold level in a well, the SGA Board will consider additional actions to implement to arrest or reverse declining groundwater levels. These actions may include:

- implement actions that were identified from the upper threshold exceedance;
- mitigate impacts to other users of groundwater.

Northern Boundary Groundwater Level Indicators

The northernmost Threshold Wells in the North Basin are, from west to east, MW-1, Lone Oak and Antelope A. These wells sit south of the Placer County line in areas where groundwater may be, or is already being pumped to provide a significant portion of the local supply. The wells also provide essential data for coordinating groundwater management efforts with entities north of the North Basin in Sutter and Placer counties.

MW-1 is 0.8 miles south of the Placer County line in the northwest quadrant of the Rio Linda/Elverta Community Water District. It is screened over a ten-foot interval from 100 to 110 feet below ground surface. To this point in time, groundwater level trends in MW-1 follow seasonal hydrologic trends with little variation from spring to fall. This regional trend is confirmed by water levels observed since the 1950s by DWR in a nearby well, 10N03E23A001M. The initial upper threshold level is set about 10 feet below the current low spring groundwater level (see Figure 21). Due to its location just south of the North Basin boundary and near the border with Sutter and Placer counties, MW-1 will provide data needed to coordinate groundwater management efforts with both counties to the north.

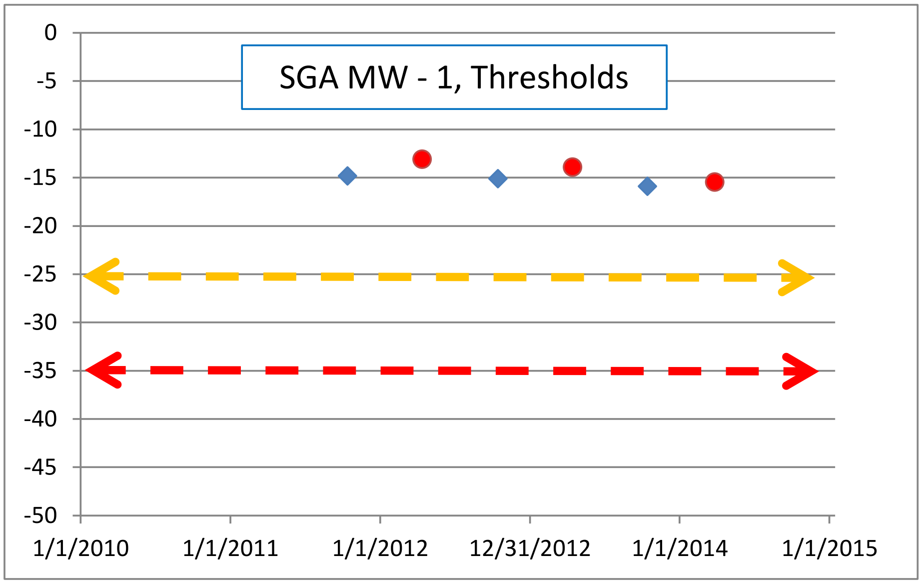

Figure 21: Threshold Values for MW-1.

Lone Oak is 0.4 miles south of the Placer County line in an area of Antelope covered with housing developments served with groundwater from California American Water wells. This monitoring well is screened over a ten-foot interval from 151 to 161 feet below ground surface. Seasonal variations in Lone Oak result in about a five-foot groundwater level change from spring to fall. Groundwater level measurements in this well show that groundwater levels over the long-term have been rising here on the north flank of the basin's cone of depression. This is due in large part to implementing conjunctive use operations in the basin. Groundwater level monitoring frequency in Lone Oak increased to once a month during the summer of 2014 to identify potential drought impacts. The upper threshold in Lone Oak is tentatively set at ten feet below the historical low groundwater level measured in 1998, which is the lowest known spring seasonal measurement in the well (see Figure 22). Due to its location just south of the North Basin boundary, Lone Oak will provide data needed to coordinate groundwater management efforts with entities in Placer County to the north.

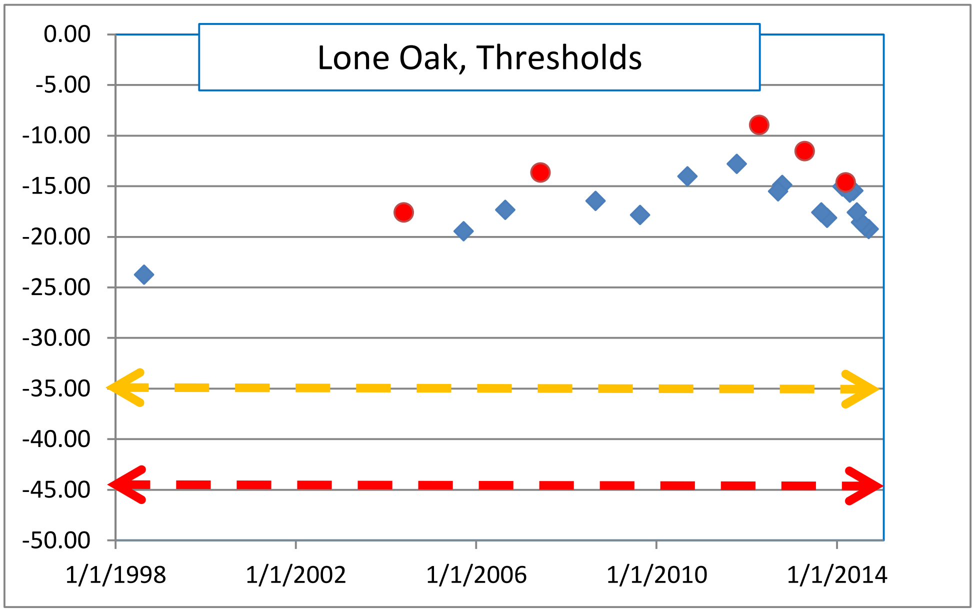

Figure 22: Threshold Values for Lone Oak.

Roseview Park is about 0.3 miles south of the City of Roseville border at the northern extent of SSWD. This monitoring well is screened over a ten-foot interval from 295 to 305 feet below ground surface. Despite only having a few months of data, this is an excellent location for a dedicated monitoring well in the basin. It is near pumping wells, but not so close that it will be overly-influenced by local pumping. Based on historical lows in other wells in the vicinity, an upper threshold for groundwater elevations has been set at -25 feet elevation, and a lower threshold has been set at -35 feet elevation (see Figure 23). This well will provide data needed to coordinate groundwater management efforts with entities in Placer County to the north.

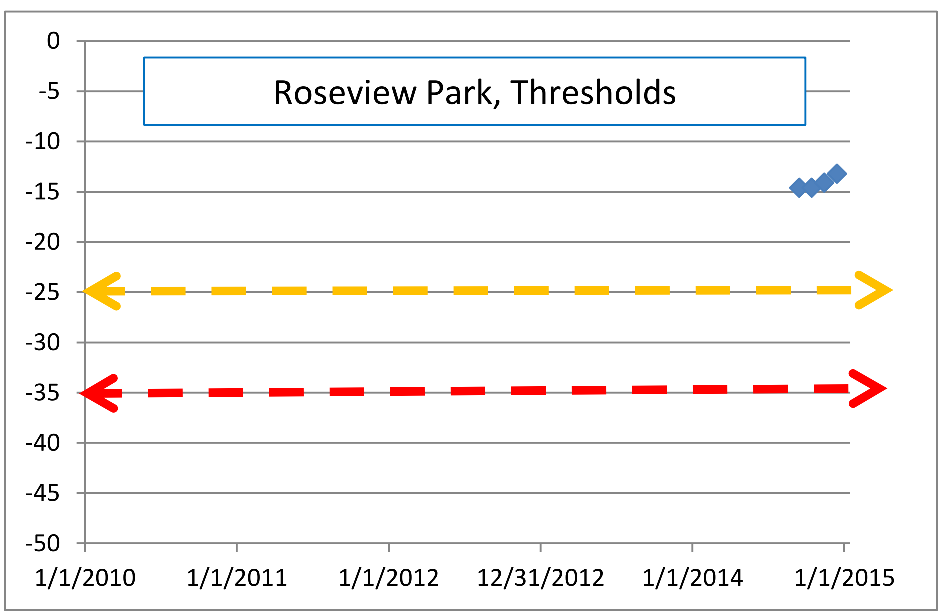

Figure 23: Threshold Values for Roseview Park.

Western Boundary Groundwater Level Indicators

Threshold Wells MW-AB4 and Chuckwagon monitor the SGA western area where groundwater pumping has been minimal. MW-AB4 has the additional advantage of being sited so that it can be used to coordinate groundwater management with entities in Yolo County to the west.

MW-AB4 is on the southwest side of the Sacramento International Airport property. It is screened in the shallowest coarse-grained interval, 170 to 190 feet below ground surface, of four monitoring wells at this location. DWR has measured groundwater levels in MW-AB4 every month or more frequently since 1997. The groundwater levels in this well have been shown to vary up to ten feet on a seasonal basis with the lowest levels often occurring in July. Currently, groundwater pumping in the area is minimal. The provisional upper threshold level is set about ten feet below the most recent spring seasonal groundwater level observed in this well (see Figure 24).

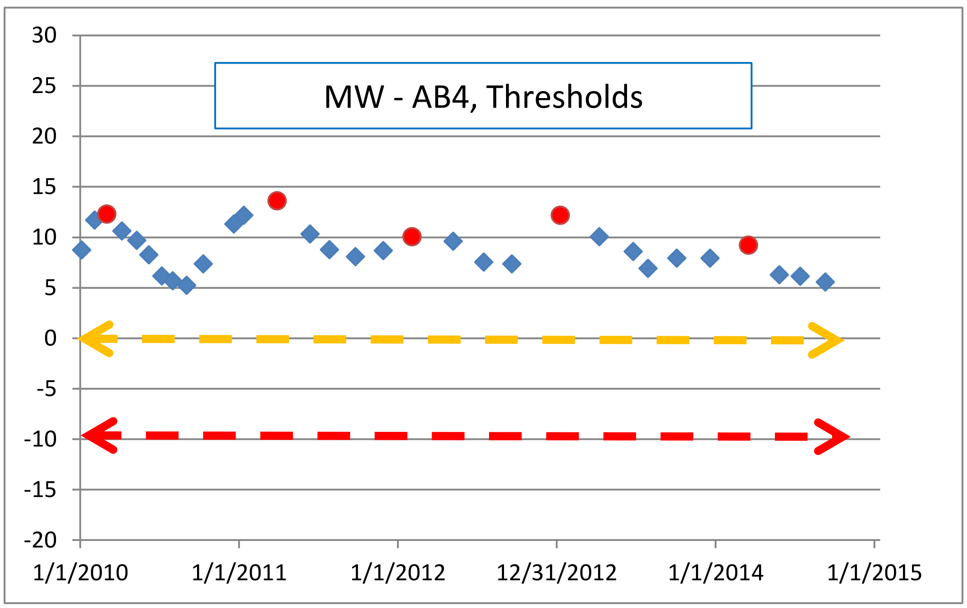

Figure 24: Threshold Values for MW-AB4.

Chuckwagon is a shallow well, screened from 27 to 37 feet below the ground surface, at the northern edge of a South Natomas subdivision and south of Interstate 80 in the City of Sacramento. Groundwater levels in this well have ranged over a span of nine feet during its 16-year period of record in response to seasonal conditions, precipitation patterns and pumping by, for the most part, the City of Sacramento. The tentative upper threshold is set about 15 feet below the most recent spring seasonal groundwater level measured in this well (see Figure 25).

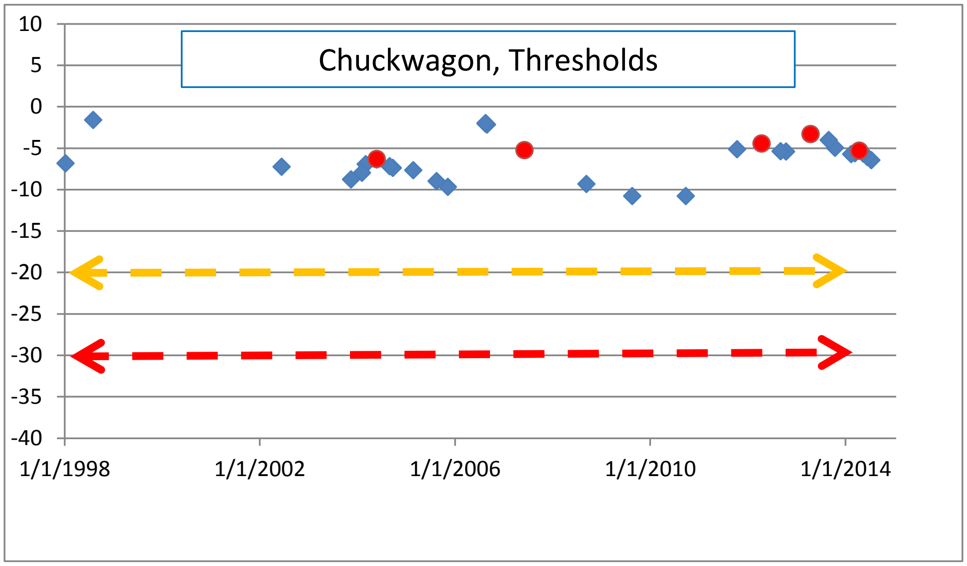

Figure 25: Threshold Values for Chuckwagon.

Southern Boundary Groundwater Level Indicators

MW-4 and MW-6 lie along the American River where they monitor the interaction of groundwater and surface water at the boundary of the North Basin with the Central Basin (WFA designation) or South American Subbasin (DWR designation). Relative to many of the other Threshold Wells, the water level drawdowns are set closer to historical lows experienced in this area. This will help limit impacts associated with groundwater and surface water interaction in the basin.

MW-4 is screened from 55 to 65 feet below ground surface and sits over 800 feet from the right bank of the American River on the land side of the flood protection levee. The water levels in this well closely follow the stage of the American River. The provisional upper threshold in this well is set about ten feet below the water levels found in the well to date (see Figure 26).

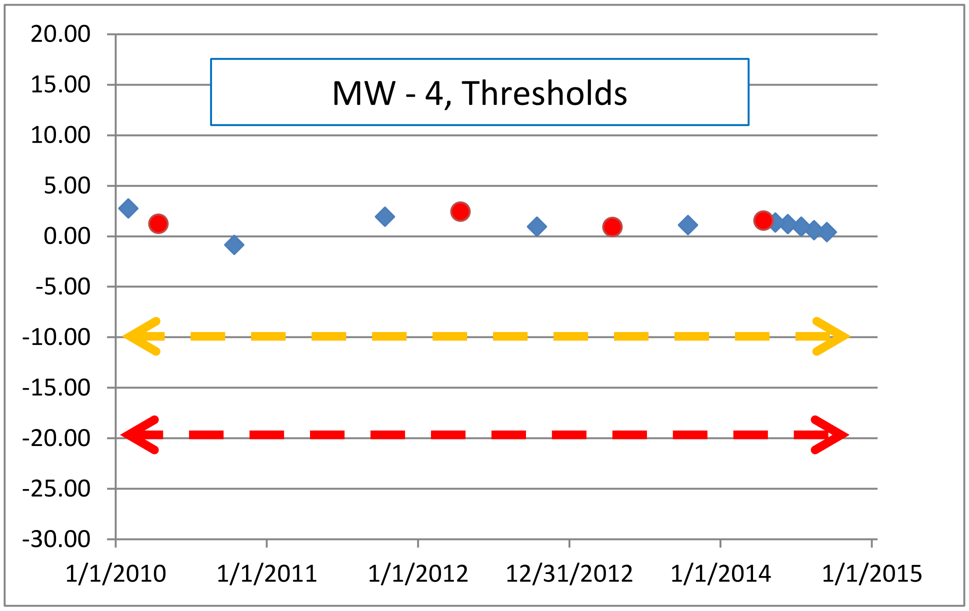

Figure 26: Threshold Values for MW-4.

MW-6 is screened at 62 to 72 feet below ground surface in the floodplain of the American River. It lies further from the American River than MW-4, about 1,100 feet north of the bank on the land side of the flood protection levee, but a low-lying flooded area which might affect water levels in the well is about 500 feet to the east. The water levels in MW-6 also mimic the stage in the American River. The upper threshold in this well is set at less than ten feet below the most recent spring seasonal water levels found in the well (see Figure 27).

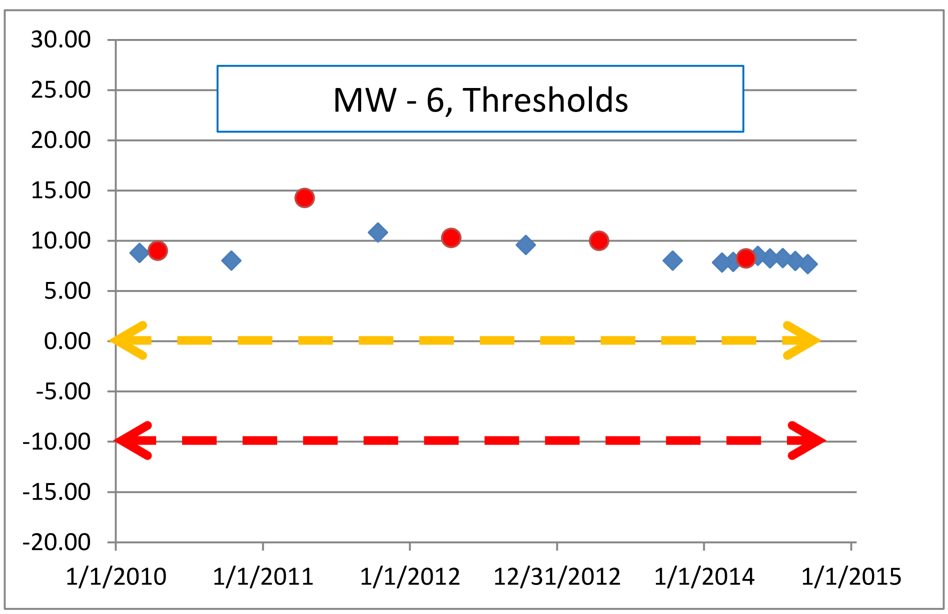

Figure 27: Threshold Values for MW-6.

SGA Internal Area Groundwater Level Indicators

Threshold levels are provisionally set in three Threshold Wells in the central region of the North Basin, MW-15, MW-N28, and MW-10, where much of the North Basin's groundwater pumping depression was established. The primary benefit of establishing thresholds at these wells is to ensure that contaminants in the central part of the basin are not mobilized. Additionally, by keeping water elevations above their past historical lows, we have some assurances that the potential for any significant subsidence in the North Basin remains remote.

MW-15 is screened through several coarse-grained layers from 205 to 481 feet below ground surface. It is east of the former McClellan AFB on the east flank of a major cone of depression that has existed in the central SGA region for decades. One nearby well monitored by DWR, 10N05E14Q002M, showed water levels declined about 65 feet from Spring 1956 to Spring 1997. From Spring 1997 to Spring 2012 water levels in that well recovered over ten feet. The provisional upper threshold was set about eleven feet below the all-time historical low water level in the nearby well, which is about twenty feet below the lowest water levels found in MW-15 (see Figure 28).

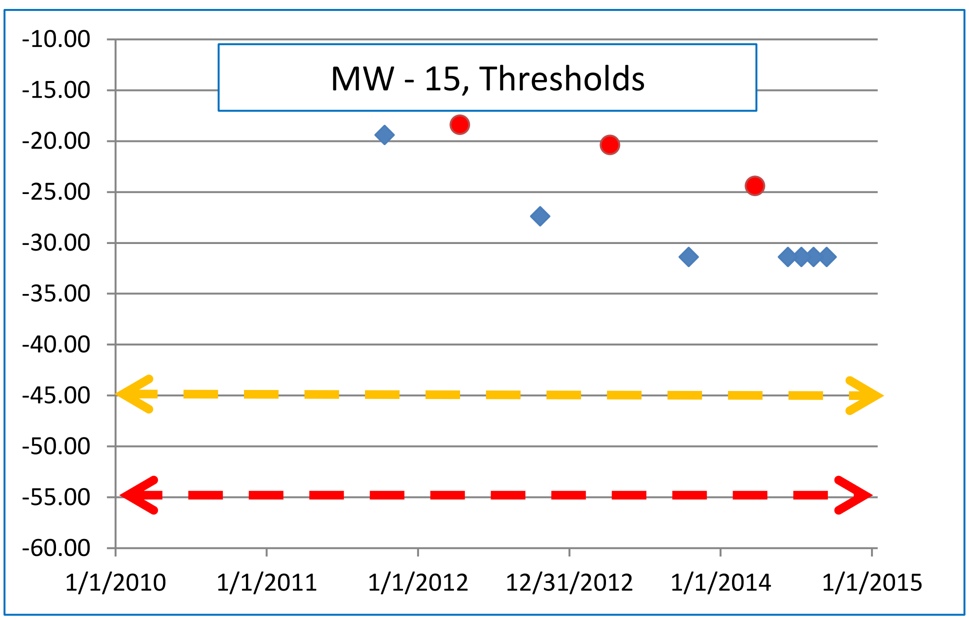

Figure 28: Threshold Values for MW-15.

MW-N28 lies along the eastern edge of SSWD where it abuts California American Water's service area. It is a former production well screened in several coarse-grained layers from 170 to 452 feet below ground surface. Water levels vary seasonally and have also declined from year to year over the short time this well has been monitored. The upper threshold has tentatively been set about twenty feet below the lowest spring seasonal water levels observed in this well (see Figure 29).

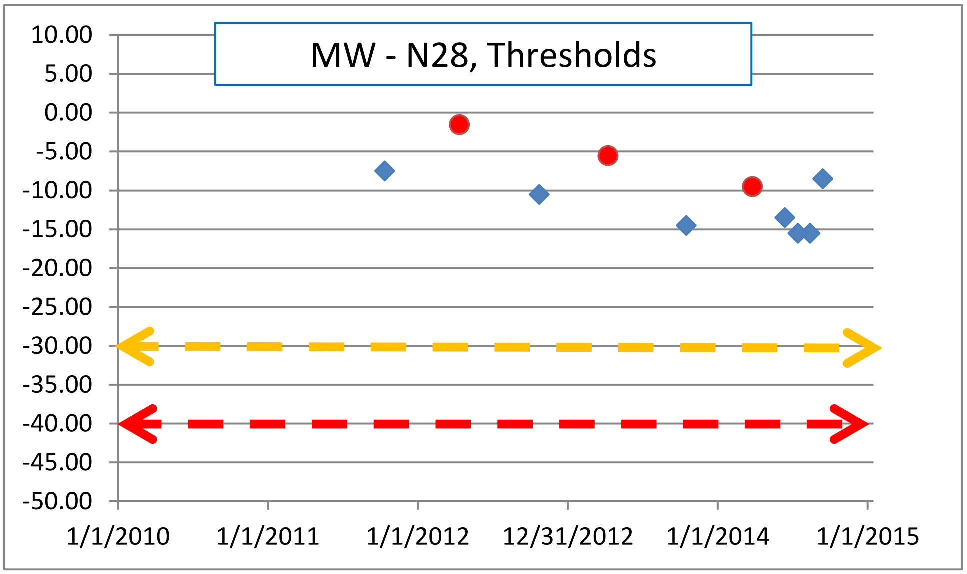

Figure 29: Threshold Values in MW-N28.

MW-10 lies near the geographic center of the North Basin within SSWD. It is a former production well screened within the regional production zone from 210 to 262 feet below ground surface. Water levels over its short monitoring period have varied seasonally, about five feet from spring to fall. The upper threshold has tentatively been set at about twenty feet below the lowest spring seasonal water levels measured in the well (see Figure 30). The upper threshold is consistent with lowest groundwater surface elevation measurements in the North Basin, which we were in the vicinity of this well in the mid-1990s.

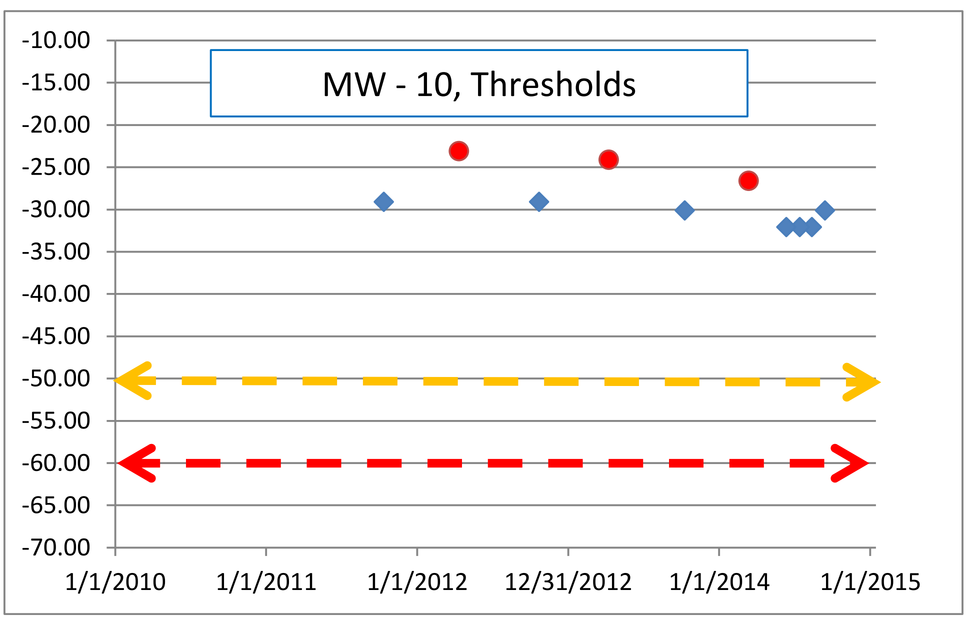

Figure 30: Threshold Values in MW-10.

BMO Indicator 3. Groundwater Quality

There are two primary groundwater quality indicators that SGA relies on to determine if the North Basin is being managed sustainably. The first indicator is the maximum contaminant level (MCL) for any constituent in public water systems as regulated by the SWRCB DDW. The second indicator is long-term trends in total dissolved solids (TDS) concentrations. Each of these is discussed further below.

MCL Exceedances

As discussed in Section 2.2.5 of this GMP, water quality as measured in public supply wells for municipal uses is of very high quality. However, there are localized occurrences of groundwater contamination in the basin in the form of contaminant plumes associated with past industrial and military activities. Additionally, there are many distinct point sources of contamination in the North Basin. Finally, there are naturally occurring contaminant sources in the basin. Despite these threats, SGA member agencies have met water quality criteria for public health standards for decades and will continue to do so.

As noted in Section 2.2.2 of this GMP, municipal supply accounts for about 85% of groundwater use in the North Basin. This supply is closely monitored by SGA member agencies and is regulated under the SWRCB DDW. There are currently more than 200 wells being monitored in the basin to ensure public health criteria are being met (Figure 17). Because of this extensive monitoring, the use of MCL exceedances for any constituent monitored under this program serves as a useful groundwater quality indicator. New exceedances could indicate that an existing known contaminant plume has moved within the basin or that a contaminant from a point source has reached a well.

Historically, SGA has relied on querying the SWRCB DDW database as part of preparing Basin Management Reports to evaluate the status of water quality in the North Basin. This resulted in identifying water quality concerns up to two years after they were first noted by the water purveyor. Beginning in 2015, SGA will request that each member agency report any MCL exceedances for the previous year on an annual basis. SGA will compile this information and report it to the region through the SGA Board. If the detection appears to be isolated to a particular well, procedures are well-established for required responses by the SWRCB DDW. If the problem appears in multiple wells, or is near a known existing contaminant plume, SGA would coordinate additional actions. Actions could include, but are not limited to, the following:

- requesting additional monitoring by the water purveyor within the well or in nearby wells;
- conducting additional monitoring in any nearby dedicated monitoring wells;
- bringing the issue to the Regional Contamination Issues Committee for discussion and suggestions for additional action.

TDS Trends

Trends in TDS concentrations through time can serve as an indicator of groundwater quality sustainability. Increases in TDS could indicate either the movement of poorer quality water into an area resulting from pumping patterns or they could indicate concentration of salts due to overlying land use practices. Either case could threaten groundwater quality sustainability. As discussed in Section 2.2.5 of this GMP, SGA analyzed trends in 17 wells in the North Basin with TDS concentrations above 450 mg/L. While that analysis concluded that TDS showed no discernible increase or decrease through time, it is useful to continue to monitor TDS trends going forward.

The concentration of 450 mg/L was chosen as a threshold for water quality because it is well below that secondary standard of 500 mg/L, but it is significantly higher than the average TDS in wells in the North Basin of 268 mg/L. Beginning in 2015, SGA will request that each member agency report any result in a well exceeding TDS of 450 mg/L for the previous year. SGA will compile this information and report it to the region through the SGA Board. If there is a trend through time of increasing TDS in a well or if there is a regional occurrence of a series of wells exceeding 450 mg/L TDS, SGA would coordinate additional actions. Actions could include, but are not limited to, the following:

- requesting additional monitoring data by the water purveyor within the well or in nearby wells;
- bringing the issue to the SGA Board for additional discussion and suggestions for additional action to characterize and mitigate against any concerns.

<u>Recurring Basin Management Report</u>

In order to realize the benefits of collecting and managing large amounts of data, there must be a systematic approach in place to assess the data and transform it into useful information for groundwater basin managers. Since completion of its initial GMP in 2003, SGA has prepared four comprehensive Basin Management Reports (BMR) for the periods 2004-2005, 2006-2007, 2008-2010, and 2011-2012. A BMR for 2013-2014 will be prepared in mid-2015. The BMRs are available for download on the SGA website (http://www.sgah2o.org). Each BMR represents an opportunity to assess and convey to the public information relative to groundwater basin sustainability over the previous period. The BMR summarizes the following information:

- Basin conditions, including climate, hydrology, water use, groundwater elevations, and groundwater quality.
- Basin management actions, including those that were identified in the adopted GMP and other actions that arose outside of the adopted GMP.
- Conclusions and recommendations, particularly with respect to meeting the objectives of the adopted GMP.

SGA Groundwater Model

A groundwater model can be used as a means of organizing and analyzing a large amount of groundwater, surface water, climate, and land use data. As described in Section 2.2.4 of this GMP, the region developed an integrated groundwater and surface water model application in the early 1990s. That model, referred to today as the Sacramento Integrated Water Resources Model (SacIWRM) has been used on many occasions to analyze projects and programs, including determining the regional groundwater sustainable yield during the Water Forum process.

In September 2007, an update of the application for the North Basin was completed. Half of the update was funded through a $250,000 grant from the Department of Water Resources' Local Groundwater Assistance Program (AB 303) to SGA. The remaining half of the update was funded through a partnership between RWA, the U.S. Army Corps of Engineers, and a Proposition 50 planning grant from DWR.

The model improvements included: 1) updating the hydrology for the calibration period (1970 through 2004) from monthly to daily; 2) refining the model grid to improve the model simulation, particularly along stream nodes where recharge to the aquifer system may be occurring; 3) identifying additional monitoring wells to increase the number of groundwater elevation measurements used in calibrating aquifer hydrogeologic parameters; and 4) developing baseline models of existing and future conditions to evaluate potential impacts of various conjunctive use scenarios.

The updated SacIWRM has been used in establishing a Water Accounting Framework in the SGA Central Area to ensure basin sustainability, evaluating the potential for mobilizing known contaminant plumes under a variety of conjunctive use operating scenarios, and determining the regional groundwater budget described in this GMP. SGA is committed to maintaining a modeling tool as an effective means of analyzing available data to estimate the results of a variety of proposed projects in the North Basin and proposed groundwater management actions.

3.3.4 Management Response Options

Should the monitoring and analysis result in any concerns related to the sustainability of the North Basin, there are many options that have been or could be considered. Options for consideration when managing a basin can be loosely grouped into those that are primarily operational in nature (e.g., groundwater recharge) or protective in nature (e.g., pollution prevention). These options and their current level of implementation or applicability are described below.

Management Response Operational Actions

Operational options for management responses for achieving sustainability include groundwater recharge, reduction of demand by water users, and identifying alternatives sources of supplies. Each of these is discussed as they apply to the North Basin below.

Groundwater Recharge

Opportunities for direct recharge from overlying land in the basin are limited, because much of the land is developed or is overlain by flood basin deposits or has already been developed for urban uses. Most of the recharge occurring through current conjunctive use is from in-lieu recharge (i.e., replacing groundwater extraction with surface water supply).

In 2010, SGA completed a Water Accounting Framework (WAF) to ensure a safe and sustainable water supply for the greater Sacramento region by encouraging water purveyors to "bank" water in the basin, when available, for use during dry periods. This includes the establishment of a WAF that supports groundwater banking programs by setting forth rules for operating a model groundwater bank, and monitoring the basin to ensure its sustainability as the program is implemented.

The initial basin sustainability goal of 11,784 acre-feet for the Central Area of the SGA represents an average annual goal for reducing groundwater extractions from this portion of the basin, which will contribute to stabilizing groundwater levels. Each SGA agency in the Central Area is assigned a basin sustainability goal (expressed as a pumping target). This goal may be revised based on future observations of groundwater conditions or changing future demands. As a result of the WAF, the minimum amount of recharge to the North Basin will be 11,784 acre-feet on an average annual basis. Since tracking of the WAF began in 2012, water purveyors in the Central Area have exceeded that target, using an average of 17,788 acre-feet per year less than the 90,000 acre-foot goal.

Expanded Conjunctive Use

As discussed in Section 2.2.2 of this GMP water purveyors in the North Basin have access to either groundwater exclusively, surface water exclusively, or a combination of the two sources. Expanding conjunctive use would involve the water purveyors that have only one source of water supply to acquire the alternative source (either groundwater or surface water). For those agencies that already have access to both sources, the goal would be to maximize one source dependent on hydrologic conditions. Due to the nature of existing surface water rights and existing infrastructure, expanding conjunctive use is a long-term endeavor.

For agencies with both supply sources, some may not fully utilize their surface water supplies in wet years due to distribution systems constraints. Improvements to distribution systems could increase the amount of in-lieu recharge that could be achieved in wet years making more groundwater resources available in drier years, while maintaining the overall health of the groundwater basin.

Agencies reliant exclusively on groundwater could enter into agreements with agencies with available surface water in wetter years that would allow for in-lieu recharge through decreased groundwater extractions. In addition to contractual issues, additional distribution system improvements (e.g., agency interties) may be needed to allow the groundwater-dependent agency to take surface water.

Agencies fully reliant on surface water in the North Basin either overlie part of the basin where well yields are not high enough for a public water supply source or water quality concerns have been encountered. Distribution system improvements could be made to better interconnect these agencies with agencies that do overlie high yield parts of the groundwater basin. This would allow for the use of groundwater by these surface water-dependent agencies during extreme dry conditions. An example of this is currently underway in response to the 2014 dry conditions. SSWD is constructing a booster pump station that will allow it to move groundwater produced in its service area to be transported to the east into San Juan Water District, which relies exclusively on surface water. Such a project is feasible because of the past actions by SSWD to bank groundwater in the basin via in-lieu recharge.

Potable Supply Demand Reduction

Demand reduction is both a viable short-term management response and a long-term management response in the North Basin. Short-term demand reductions typically come in the form of calls for conservation from customers in response to extreme dry conditions. The Governor's drought declaration in 2014 calling for reductions in residential water use by 20% is an example of a conservation action. The Sacramento region has been a demonstrated leader during 2014 by leading the state in reduced water production compared to 2013. When dry conditions are no longer being experienced, customer water use will usually return to similar volumes used prior to the dry conditions.

Long-term demand reductions come in the form of permanently reducing customer per capita usage through water use efficiency measures. For example, conversion to high efficiency flush toilets permanently reduces customers' indoor demands. Because the North Basin's supply is primarily municipal and industrial, demand reductions have been targeted at urban per capita water use. The RWA has developed and is actively implementing a regional Water Efficiency Program (WEP). The WEP assists members in meeting their water conservation agreements with the Water Forum, the California Urban Water Conservation Council, and for some members the Central Valley Project Improvement Act (CVPIA). Since execution of the Water Forum Agreement in 2000, urban water suppliers in the region have made significant reductions in per capita water use (Water Forum, 2012). Passage of SBX-7 in 2009 establishes a target reduction in per capita water use of 20 percent. Continued progress toward meeting these water use efficiency targets will be an effective management response action for the region.

Alternative Supply Supplementation Options

Recycled Water. Opportunities for the use of recycled water in the North Basin are extremely limited. Wastewater in Sacramento County is transported to a central location south of the City of Sacramento, where it is treated by the Sacramento Regional County Sanitation District (SRCSD). The distance from the SRCSD Wastewater Treatment Plant is greater than 7 miles to the nearest point in the North Basin, so it is not currently feasible to deliver recycled water to the North Basin. Additionally, once in the North Basin, much of the region was developed prior to the 1990s, so recycled water distribution infrastructure is not available.

Remediated Groundwater. The use of remediated groundwater in the region is expanding. Much of the remediated groundwater is being used in areas south of the North Basin where supply has been directly impacted by Aerojet contamination. In 2010, Aerojet and Carmichael Water District completed a cooperative effort to construct a groundwater extraction and treatment facility at Ancil Hoffman Golf Course in the North Basin. This project treats contaminated groundwater and supplies nearly 400 acre-feet per year to irrigate the golf course. This in turn offsets the same volume of potable treated drinking water that was previously being used on the golf course. The former McClellan AFB discharges its remediated groundwater into Magpie Creek to the west of the former base. While the volumes of remediated water are relatively small in comparison to the overall regional water supply, the use of remediated water remains a viable opportunity for supply supplementation in the region.

Management Response Protective Actions

SGA considers groundwater protection to be one of the most critical components of ensuring a sustainable groundwater resource. In this GMP, resource protection includes both prevention of contamination from entering the groundwater basin and remediation of existing contamination. Prevention measures include proper well construction and destruction practices, development of wellhead protection measures, and protection of recharge areas.

Well Construction Policies

The Sacramento County Environmental Management Department (EMD) administers the well permitting program for Sacramento County. The standards for construction are identified in Sacramento County Code, Chapter 6.28 (Sacramento County Ordinance No. 1246) as amended on April 13, 2010. In addition to general well construction standards, Sacramento County receives and scans all well completion reports for wells constructed in Sacramento County. EMD also manages an active inspection program to insure that all new wells, well modifications, and well repairs are performed properly.

The Sacramento County EMD maintains a prohibition zone for water wells around the former McClellan AFB to ensure protection of public health. The Sacramento County EMD is a participant on the RCIC, so there is close coordination on ensuring effective well construction policies are in place in the North Basin.

Well Abandonment and Well Destruction Policies

The Sacramento EMD also administers the well abandonment and destruction program for Sacramento County. All public water suppliers in the SGA area have EMD procedures for abandonment or destruction. EMD has recently increased it effort to identify inactive private domestic and irrigation wells in the County and ensure that they are properly abandoned or destroyed. SGA intends to coordinate with EMD to get a better understanding of these programmatic changes and identify areas for further coordination.

Wellhead Protection Measures

Identification of wellhead protection areas is a component of the Drinking Water Source Assessment and Protection (DWSAP) Program currently administered by the SWRCB DDW.

All public water supply agencies in the SGA complete their required assessments by performing the three major components required by DWSAP for protection:

- Delineation of capture zones around sources (wells).
- Inventory of Potential Contaminating Activities (PCAs) within protection areas.
- Vulnerability analysis to identify the PCAs to which the source is most vulnerable.

Delineation of capture zones includes using groundwater gradient and hydraulic conductivity data to calculate the surface area overlying the portion of the aquifer that contributes water to a well within specified time-of-travel periods. Typically, areas are delineated representing 2-, 5-, and 10-year time-of-travel periods. These protection areas need to be managed to protect the drinking water supply from viral, microbial, and direct chemical contamination.

Inventories of PCAs include identifying potential origins of contamination to the drinking water source and protection areas. PCAs may consist of commercial, industrial, agricultural, and residential sites, or infrastructure sources such as utilities and roads. Depending on the type of source, each PCA is assigned a risk ranking, ranging from “very high” for such sources as gas stations, dry cleaners, and landfills, to “low” for such sources as schools, lakes, and non-irrigated cropland.

Protection of Recharge Areas

SGA recognizes the link between activities occurring on the land surface and the potential impact of these activities on the quality and quantity of groundwater recharge. The Water Code recognizes this link and requires that GMPs include a map identifying the recharge areas for the groundwater basin. That map is included in this plan. The Water Code also requires that after the GMP is adopted, the agency shall provide the map to the appropriate local planning agencies. Within the SGA region, Sacramento County, City of Sacramento, City of Citrus Heights and City of Folsom are able to exercise zoning ordinances to protect groundwater recharge areas. SGA’s role in protecting recharge areas does not stop with passing a map to these agencies. SGA is committed to educating land use planning agencies, the authorities that oversee those agencies and the public about the importance of protecting recharge areas by paying attention to land use practices that either impede recharge or pollute water as it flows from the surface to an aquifer.

Control of the Migration and Remediation of Contaminated Groundwater

As noted in Section 2.2.5 and illustrated in Figure 4**,** the North Basin has significant groundwater contaminant plumes. SGA has worked closely with regulators and responsible parties at McClellan and Aerojet through the RCIC to ensure remedial activities at these sites were adequate to control the migration of contaminants. Additionally, in 2011, SGA completed a long-term Groundwater Quality Vulnerability Assessment, which was partially funded by a Local Groundwater Assistance Grant from DWR. The assessment included a modeling exercise using SacIWRM to evaluate the effectiveness of the capture by the remediation systems in place at McClellan and Aerojet. The model was set up to simulate future conditions with a net increase in groundwater pumping to see if the contaminant plumes escaped the capture zones of existing and planned remedial systems. The model showed that these remedial systems were largely capable of retaining the existing contaminant plumes under increased municipal pumping in the North Basin (SGA, 2011). While monitoring for potential escape of these plumes will continue, they currently appear to be well under control.

Despite the presence of large contaminant plumes in and around the SGA area, the region is fortunate that active remediation is in place at these sites. At McClellan, active groundwater remediation systems and soil vapor extractions systems are removing contaminants at an aggressive pace. The AFRPA estimates cleanup of most contamination within 30 years. While the cleanup associated with Aerojet will take significantly longer, there is an extensive remediation system in place. Part of the remediation is occurring at the leading edge of plumes within the North Basin in the communities of Carmichael and Fair Oaks. Those activities are closely coordinated with the overlying water suppliers.

Control of Saline Water Intrusion

Saline water intrusion from the Sacramento/San Joaquin River Delta (Delta) is not a problem in the North Basin, and it is not expected to become a problem in the future. Higher groundwater elevations associated with recharge in the American and Sacramento rivers have maintained a historical positive gradient preventing significant migration of any saline water bodies associated with the Delta from migrating east into the region. These groundwater gradients will continue to serve to prevent any localized pumping depressions in the basin from inducing flow from the Delta into the North Basin.

A more local source of saline water is beneath the base of fresh water in the North Basin. Berkstresser (1973) mapped the base of fresh water (the point below which the specific conductivity of the water is greater than 3,000 micromhos per centimeter) for the Sacramento Valley. As noted in Section 2.2.1 and illustrated in Figure 4**,** the North Basin has a minimum depth of fresh water at an elevation of about 800 feet below mean sea level near the eastern basin margin and increases to a depth of approximately 2,000 feet below mean sea level on the western margin of the basin. The SGA member agencies generally extract groundwater from depths of less than 500 feet, so their extractions are substantially above the base of fresh water. Therefore, current pumping practices would not be expected to create a situation where deeper saline water is being drawn into the fresh water aquifer. As described in the BMO Indicators section above, SGA will continue to assess TDS trends to ensure that the North Basin is not threatened by the potential of saline water intrusion.

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Section 4 Plan Implementation

This section provides a description of how the SGA GMP will be implemented. Successful implementation requires staffing, sufficient and sustained funding, and specific actions to be taken with appropriate timeframes.

4.1 SGA Staffing

SGA has maintained staffing continuously since its inception in 1998. Staffing is provided through a staffing agreement with the RWA. This allows for sharing of common administrative expenses to maintain fiscal efficiency. The staffing agreement results in SGA maintaining four half-time (50%) positions and one one-fifth time (20%) position, which is the equivalent of 2.2 full time positions dedicated to groundwater management. Since 2003, SGA has employed a certified hydrogeologist with groundwater management expertise as its Groundwater Program Manager. This demonstrates SGA's commitment to effective groundwater management of the North Basin. For completion of several special projects over the years, SGA has utilized outside consulting services. This has allowed SGA to expand and contract depending on workload requirements, while maintaining a efficiently-sized organization.

4.2 SGA Fees and Budget

SGA has maintained itself since 1998 by collecting fees from the 13 public water supply agencies and one agricultural water supplier. The current method for collecting fees and a summary of the Fiscal Year 2014-2015 (FY 14/15) budget are provided and described further below.

4.2.1 Annual Fees

As described in Section 1 of this GMP, groundwater management is a critical element of successful implementation of the region's WFA. As such, all of the agencies participating in SGA recognize the benefit of sustaining the North Basin regardless of their status as a groundwater user. For example, four agencies do not currently use groundwater, while another two agencies only rely on groundwater for about 10 percent of their supply. However, each agency has agreed to fund SGA through the payment of annual fees.

To ensure sustainable and equitable funding, SGA has developed a two-tiered system for collecting fees. The first part is a base fee collected from all 14 water supply agencies within SGA. For FY 14/15, the base fee is set at a minimum of $7,150 per agency plus $0.92 per connection for each connection over 6,000. There is no cap on the connections for the base fee, so the largest agencies pay higher fees than the smallest agencies.

The second part of the SGA fee is for groundwater extraction. For FY 14/15, the groundwater extraction fee is $4.10 per acre-foot of groundwater extracted. To account for variability in groundwater pumping by some agencies from year-to-year, the basis for the volume of groundwater extracted is an average of groundwater extracted over the five previous years. This results in steadier revenue planning for SGA and steadier expense planning for the agencies paying the fees. For example, in 2011 SSWD extracted 19,119 acre-feet of groundwater. In 2013, SSWD extracted 38,482 acre-feet of groundwater. If the single previous year's extraction was used, this would result in a large impact on revenue for SGA and a large impact on fees paid for SSWD. Using the five year average allows for better budget planning for both agencies.

While the method of collecting the two fees is fixed, the amount of the fee for connections and groundwater extraction can be adjusted each year to generate the revenue needed to fund the activities of SGA. Table 9 below indicates the SGA agencies and whether they pay only a base fee or both the base fee and groundwater extraction fee.

Table 9: SGA Agencies Subject to Annual Fees

Agency	Primary Supplier Type	Base Fee	Groundwater Extraction Fee
California American Water	Municipal/Industrial	X	X
Carmichael Water District	Municipal/Industrial	X	X
Citrus Heights Water District	Municipal/Industrial	X	X
Del Paso Manor Water District	Municipal/Industrial	X	X
Fair Oaks Water District	Municipal/Industrial	X	X
Folsom, City of	Municipal/Industrial	X	
Golden State Water Company	Municipal/Industrial	X	X
Natomas Central Mutual Water Company	Agricultural	X	
Orange Vale Water Company	Municipal/Industrial	X	
Rio Linda/Elverta Community Water District	Municipal/Industrial	X	X
Sacramento, City of	Municipal/Industrial	X	X
Sacramento County Water Agency	Municipal/Industrial	X	X
Sacramento Suburban Water District	Municipal/Industrial	X	X
San Juan Water District	Municipal/Industrial	X	

Per the WFA, users extracting groundwater for single-unit residences or for irrigation of less than 2.5 acres are exempt from SGA fees. Additionally, SGA is given discretion in the WFA to decide whether exemptions for other users are allowed. To date, SGA has determined that the costs associated with identifying and collecting water use information and fees from users other than the water supply agencies listed above outweigh the benefits of doing so. This determination is evaluated and subject to confirmation during the adoption of each annual SGA budget.

4.2.2 Annual Budget

Fees and other sources of revenue are used to fund the planned activities of SGA on an annual basis. Table 10 shows the sources of revenue for FY 14/15. These include the base and groundwater extraction fees, a DWR AB 303 Grant for a special study of contamination in the SGA area, interest income, and planned use of available cash in excess of required reserve balances.

Table 10: SGA FY 14/15 Revenues

Revenue Type	**FY 14/15 Budget**
Base Fee	$ 289,200
Groundwater Extraction Fee	$ 232,300
Special Project Grant Income (DWR AB 303 Grant)	$ 125,000
Interest Income	$ 2,700
Planned Use of Available Cash Reserve	$ 134,000
Total	**$ 783,200**

Table 11 shows the planned expenses for the FY 14/15 revenues. SGA is able to maintain efficient staffing and office expenses by sharing these costs with RWA. SGA also maintains separate consulting budgets for administrative (e.g., audits, legal, etc.) and groundwater management activities (e.g., water quality sampling).

Table 11: SGA FY 14/15 Expenses

Expense Type	**FY 14/15 Budget**
Staffing	$ 476,550
Office	$ 53,750
Administrative Consultant Support	$ 77,900
Groundwater Management Consultant Support	$ 50,000
Special Project Grant Income (DWR AB 303 Grant)	$ 125,000
Total	**$ 783,200**

4.3 GMP Implementation

SGA has a well-documented history of implementing GMP elements since its initial GMP adoption in December 2003. Implementation is documented in past SGA GMPs and through SGA BMRs, which are available on-line (www.sgah2o.org). SGA's near-term priorities for groundwater management include the following:

- Participate in stakeholder processes as DWR develops regulations and best management practices as required by the Sustainable Groundwater Management Act of 2014.
- Meet with Sacramento County EMD by March 31, 2015 to discuss potential roles, responsibilities, and opportunities for collaboration resulting from enactment of the Sustainable Groundwater Management Act.
- Meet with representatives of local entities responsible for preparing General Plans to discuss the requirements of the Sustainable Groundwater Management Act and identify opportunities for future coordination by May 31, 2015.
- Characterize the occurrence of hexavalent chromium and evaluate water supply impacts and responses to the 2014 adopted maximum contaminant level standard by June 30, 2015.

- Complete a DWR grant-funded study to characterize and manage a regionally-extensive area of tetrachlorethene (PCE) contamination in the SGA area by June 30, 2016.

While there are many additional actions taken by SGA related to groundwater management on a regular basis, this GMP identifies those actions specific to the SGA groundwater management process presented in Section 3.3 of this GMP. Table 12 below summarizes the revised actions of the updated GMP with a planned implementation schedule. Updates on progress towards implementing these actions will be documented in future SGA BMRs.

Table 12: SGA GMP Implementation Actions

Monitoring
Groundwater Elevation Monitoring
1. Continue ongoing semi-annual monitoring of SGA CASGEM network. 2. Conduct more frequent monitoring as conditions warrant (e.g., monthly monitoring in a subset of wells during 2014 drought conditions.
Groundwater Quality Monitoring
1. Request results from public supply well water quality monitoring for any MCL exceedance or well with TDS of 450 mg/L or greater from the previous year by March 31 of each year.
Land Surface Elevation Monitoring
1. No current action required unless water level thresholds are exceeded or potential damage to infrastructure from possible subsidence is reported.
Other Monitoring
1. Collect additional monitoring data from CDEC on an as-needed basis (e.g., during preparation of BMR).
Protocols for the Collection of Groundwater Data
1. Meet with SSWD staff (an SGA cooperator on the CASGEM monitoring) by March 31, 2015 to ensure they are continuing to follow proper monitoring protocols for groundwater elevation monitoring.
Data Management
1. Upload groundwater elevation data on an ongoing basis to CASGEM by the end of each month in which monitoring occurs. 2. Develop spreadsheet of water quality data submitted by water suppliers for MCL exceedances and TDS of 450 mg/L or greater and update data by May 31 of each year. 3. Update SGA database with monthly groundwater production data and any data on newly constructed wells by May 31 of each year.

Data Analysis
Basin Management Objective Indicators
1. Review total reported extractions from SGA agencies by April 30 of each year. Compare extractions to the total North Basin sustainable yield and the SGA Central Area sustainable groundwater basin extraction balance. 2. Collect water levels from Threshold Wells by April 30 of each year. 3. Analyze results from public supply well water quality data of any MCL exceedance or well with TDS of 450 mg/L or greater from the previous year by April 30 of each year.
Recurring Basin Management Report
1. Continue to complete recurring BMR on a biennial basis by June 30 of the year following the period being reported (Note: the next BMR will cover 2013-2014 and will be completed by June 30, 2015).
SGA Groundwater Model
1. No current action is required. SGA will evaluate its modeling needs after guidance and regulations related to the Sustainable Groundwater Management Act are developed.
Management Response Options
Management Response Operational Actions
1. Track and report on implementation of the SGA WAF to the SGA Board by April 15 of each year. 2. Evaluate the in-lieu conjunctive use potential of the North Basin by December 31, 2016. 3. Review the effectiveness if the WAF toward meeting basin sustainability goals and make any recommended modifications to WAF through the SGA Board by December 31, 2017. 4. Coordinate annually with the RWA WEP to evaluate region's progress toward compliance with meeting 20 percent per capita water demand reductions by 2020. 5. Coordinate through the SGA RCIC to identify and report on potential uses of remediated groundwater within the North Basin.
Management Response Protective Actions
1. Work with local water agencies to update status of public supply wells as active, standby, abandoned, or destroyed by May 31 of each year. 2. Provide copies of groundwater recharge area information to appropriate local planning agencies by January 31, 2015. 3. Continue facilitating ongoing recurring quarterly meetings of the SGA RCIC.

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Section 5 References

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Sacramento Groundwater Authority

Groundwater Management Plan – 2014

Appendix A

Joint Powers Agreement

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NOTE: THIS AGREEMENT SUPERCEDES AG2000-074.

JOINT POWERS AGREEMENT BETWEEN THE CITY OF CITRUS HEIGHTS, THE CITY OF FOLSOM, THE CITY OF SACRAMENTO AND THE COUNTY OF SACRAMENTO CREATING THE SACRAMENTO-GROUNDWATER AUTHORITY

This Agreement is made and entered into this 7th day of May, 2002, by and between the City of Citrus Heights, a municipal corporation, the City of Folsom, a municipal corporation, the City of Sacramento, a municipal corporation, and the County of Sacramento, a political subdivision of the State of California ("County").

RECITALS

WHEREAS, each of the parties to this Agreement is a local government entity functioning within the County of Sacramento; and

WHEREAS, pursuant to the Joint Exercise of Powers Act (Chapter 5 of Division 7 of Title 1 of the California Government Code), two or more public agencies may by agreement jointly exercise any power held in common by the agencies entering into such an agreement; and

WHEREAS, each of the parties hereto has under its police power the authority to regulate groundwater; and

WHEREAS, the parties hereto have each been either directly or indirectly involved in the process commonly referred to as the Sacramento Area Water Forum ("Water Forum"); and

WHEREAS, the Water Forum process has resulted in the development of a Groundwater Management Element, dated August, 1998 ("Groundwater Management Element"), which provides for the formation of a groundwater management authority for the north area of the County of Sacramento pursuant to a joint powers agreement between the City of Citrus Heights, the City of Folsom, the City of Sacramento and the County; and

WHEREAS, a true and correct copy of the Groundwater Management Element is attached hereto and incorporated herein as Exhibit "A"; and

CITY AGREEMENT NO. 2000-074-A

CITY AGREEMENT NO. 2000-074-A

WHEREAS, the completion of the Water Forum process and the approval of the final Water Plan by the Water Forum stakeholders has been delayed for reasons unrelated to groundwater management issues; and

WHEREAS, the parties hereto and the Water Forum stakeholders who have been involved in the development of the Groundwater Management Element believe that it is in the public interest to move forward with the development of the institutional framework necessary to implement the Groundwater Management Element within the North Area Basin, rather than suspending those efforts until such time as the Water Forum process is finalized; and

WHEREAS, the formation of the joint powers authority contemplated by this Agreement is not legally dependent upon the finalization of the Water Forum process, but is independently authorized by state law; and

WHEREAS, the parties hereto find that it is to their mutual advantage and benefit to establish such a groundwater management authority pursuant to this Agreement in order to implement the groundwater management policies embodied in the Groundwater Management Element; and

WHEREAS, the parties hereto find and declare that the conservation of groundwater resources within the North Area Basin for agricultural and municipal and industrial uses is in the public interest and for the common benefit of all water users within the County of Sacramento; and

WHEREAS, the overriding purpose of the joint powers authority established pursuant to this Agreement is to maintain the sustainable yield of the North Area Basin as set forth in the Groundwater Management Element; and

WHEREAS, it is the desire of the parties hereto to use the groundwater management powers which they have in common that are necessary and appropriate to further the purposes for which the joint powers authority is being established; and

WHEREAS, the parties hereto are receptive to amending this Agreement in the future to include public agencies outside the County of Sacramento who have a specific and relevant interest in the North Area Basin.

NOW, THEREFORE, in consideration of the promises, terms, conditions, and covenants contained herein, the City of Citrus Heights, the City of Folsom, the City of Sacramento and the County hereby agree as follows:

1. **Incorporation of Recitals.** The foregoing recitals are hereby incorporated by reference.

2. **Definitions.** As used in this Agreement, the following words and phrases shall have the meanings set forth below unless the context clearly indicates otherwise.

(a) "Conjunctive use" shall mean the planned management and use of both groundwater and surface water in order to maintain the sustainable yield of the North Area Basin.

(b) "North Area Basin" shall mean the groundwater basin underlying the area within the boundaries of the Authority.

(c) "Sustainable yield" shall mean the amount of groundwater which can be safely extracted from the North Area Basin on an estimated average annual basis while maintaining groundwater elevations and groundwater quality at acceptable levels as set forth in the Groundwater Management Element. Sustainable yield requires a balance between extraction and basin recharge and is expressed as the number of acre feet of groundwater per year which can be extracted from the North Area Basin on an average annual basis as set forth in the Groundwater Management Element.

(d) "Water Production," for purposes of determining assessments, fees or charges to support Water Costs of the Authority, means the total amount of groundwater produced within the boundaries of the Authority by each retail provider, by Agricultural Interests, and by Commercial/Industrial Self-Supplied Water Users for use within the boundaries of the Authority or other areas approved by the Board.

3. Purpose. This Agreement is being entered into in order to establish a joint powers authority for the following purposes:

(a) to maintain the long-term sustainable yield of the North Area Basin;

(b) to manage the use of groundwater in the North Area Basin and facilitate implementation of an appropriate conjunctive use program by water purveyors;

(c) to coordinate efforts among those entities represented on the governing body of the joint powers authority to devise and implement strategies to safeguard groundwater quality; and

(d) to work collaboratively with other entities, including groundwater management authorities that may be formed in other areas of the County of Sacramento and adjacent political jurisdictions, to promote coordination of policies and activities throughout the region.

4. Establishment Of The Authority. There is hereby established pursuant to the Joint Exercise of Powers Act a joint powers authority which shall be a public entity separate from the parties to this Agreement. The name of such entity shall be the Sacramento Groundwater Authority ("Authority"). The boundaries of the Authority shall be as follows: north of the American River to the Sacramento County line; bounded on the south by the

American River; on the west by the Sacramento River; on the north and east by the Sacramento County line; and including the City of Folsom. A map depicting the boundaries of the Authority is attached hereto and incorporated herein as Exhibit "B".

5. **Membership Of The Governing Board.** The governing body of the Authority shall be a Board of Directors of sixteen (16) members consisting of the following representatives who shall be appointed in the manner set forth in Section 7 of this Agreement:

(a) An elected member of the governing board or designated employee of each of the following public agencies: the City of Folsom, the City of Sacramento and the Sacramento County Water Agency.

(b) An elected member of the governing board of each of the following public agencies: the Carmichael Water District, the Citrus Heights Water District, the Del Paso Manor Water District, the Fair Oaks Water District, the Rio Linda/Elverta Community Water District, the Sacramento Suburban Water District, and the San Juan Water District.

(c) A member of the board of directors, or designee thereof, of each of the following private water purveyors or investor owned utilities: the Arden Cordova Water Company, California-American Water Company, the Natomas Central Mutual Water Company and the Orange Vale Water Company.

(d) One representative of Agricultural Interests within the boundaries of the Authority.

(e) One representative of Commercial/Industrial Self-Supplied Water Users within the boundaries of the Authority.

6. **Adjustment To Composition Of Governing Board.** Should circumstances change in the future, any person or entity may petition the parties hereto to amend this Agreement so as to add or delete representatives to the governing board to accurately reflect groundwater production within the boundaries of the Authority.

7. **Appointment Of Members Of Governing Board.**

(a) The members of the governing board of the Authority shall be appointed as follows:

(i) The City of Folsom representative shall be appointed by the Folsom City Council.

(ii) The Agricultural Interests representative shall be appointed by the County Board of Supervisors.

(iii) The representative of Commercial/Industrial Self-Supplied Water Users shall be appointed by the Sacramento City Council.

(iv) The Citrus Heights City Council shall appoint the representative of the Citrus Heights Water District.

(v) The Sacramento City Council shall appoint the representatives of the following entities: Arden Cordova Water Company, California-American Water Company, the City of Sacramento, Del Paso Manor Water District, the Natomas Central Mutual Water Company, and Sacramento Suburban Water District.

(vi) The County Board of Supervisors shall appoint the representatives of the following entities: Carmichael Water District, Fair Oaks Water District, Orange Vale Water Company, Rio Linda/Elverta Community Water District, San Juan Water District and the Sacramento County Water Agency.

(b) Prior to the appointment of the representatives of the entities described in subsections (a)(v) and (vi) above, those entities shall submit a recommended appointment for their respective representatives to the appointing authority. The appointing authority shall give consideration to such recommendations, but shall retain the absolute discretion to appoint any person satisfying the criteria for appointment set forth in Section 5 hereof.

8. <u>Governing Board Voting Requirements</u>.

(a) Each member of the governing board of the Authority shall have one vote. With the exception of fiscal items as set forth in subsections (b) and (c) below, a majority vote of all members of the governing board is required to approve any item.

(b) Fiscal items related to the **Administrative Costs** of the Authority shall require approval by a double majority consisting of the following: a majority vote of all members of the governing board and a majority vote weighted according to the financial contribution of each Retail Provider, of Agricultural Interests, or of Commercial/Industrial Self-Supplied Water Users to the total administrative budget for the last complete fiscal year. The weighted vote of each member of the governing board shall be established and fixed annually at the time the Financing Plan for the administrative budget is adopted, and shall remain in effect throughout the succeeding fiscal year and shall apply to all votes on fiscal items related to the Administrative Costs of the Authority.

(c) Fiscal items related to **Water Costs** shall require approval by a double majority consisting of the following: a majority of all members of the governing board and a majority vote weighted on the basis of Water Production as defined in Section 2(d) hereof.

(d) For purposes of subsection (c) hereof, the weighted vote of the representative of Agricultural Interests and the Commercial/Industrial Self-Supplied Water Users representative shall be weighted on the basis of groundwater production by all such interests and users within the boundaries of the Authority, adjusted to reflect any differential rate which may be paid by a particular classification of water users; e.g., if each acre-foot of water pumped equals one vote and Agricultural Interests pump 100,000 acre feet, but pay only 20% of the per acre-foot assessment, fee or charge levied on other types of pumpers, the vote of the Agricultural Interests representative would be calculated at 20,000 votes.

(e) Water Production, as defined in Section 2(d) hereof, shall be based on an annual determination by the governing body of the Authority during the previous calendar year. Until such time as the governing board of the Authority makes its annual determination of Water Production, the last complete yearly calculation shall be controlling for purposes of the double majority requirement set forth in subsection (c) above.

9. **Quorum.** A majority of the members of the governing board shall constitute a quorum for purposes of transacting business, except less than a quorum may vote to adjourn a meeting.

10. **Terms Of Office.** With the exception of the initial term of the representatives appointed by the City of Folsom and the City of Sacramento, the term of office of each member of the governing board the Authority shall be for a period of four (4) years. For the purpose of providing staggered terms of office, the term of the initial representatives appointed by the City of Folsom and the City of Sacramento shall be for a period of two (2) years. Thereafter, the term of office of each representative appointed by the City of Folsom and the City of Sacramento shall be for a period of four (4) years. Each member of the governing board shall serve at the pleasure of the appointing body and may be removed as a member of the governing board by the appointing body at any time. If at any time a vacancy occurs on the governing board, a replacement shall be appointed to fill the unexpired term of the previous representative pursuant to the provisions of Section 7 hereof within ninety (90) days of the date that such position becomes vacant.

11. **Alternates.** The City of Citrus Heights, the City of Folsom, the City of Sacramento and the County, in addition to their regular appointments, shall appoint one or more persons with the required qualifications to serve as alternate members of the governing board of the Authority. Any such alternates shall be empowered to cast votes in the absence of the regular members or, in the event of a conflict of interest preventing the regular member from voting, to vote because of such a conflict of interest.

12. **Organization Of The Authority.** The governing board of the Authority shall elect a chair, a vice chair and such other officers as the governing board shall find appropriate. Such officers shall serve for a term of one (1) year unless sooner terminated at the pleasure of the governing board.

13. **Treasurer, Controller, Clerk and Legal Counsel.** The governing board of the Authority shall appoint a treasurer, controller, clerk and legal counsel as it deems appropriate. The controller of the Authority shall cause an independent annual audit of the Authority's finances to be made by a certified public accountant in compliance with Government Code Section 6505. The treasurer of the Authority shall be the depositor and shall have custody of all money of the Authority from whatever source. The controller of the Authority shall draw warrants to pay demands against the Authority when the demands have been approved by the Authority or by its authorized representative pursuant to any delegation of authority adopted by the Authority. The treasurer and controller shall comply strictly with the provisions of statutes relating to their duties found in Chapter 5 (commencing with Section 6500) of Division 7 of Title 1 of the Government Code.

14. **Executive Director.** The governing board of the Authority shall appoint an Executive Director-who shall be responsible to the governing board for the proper and efficient administration of the Authority as directed by the governing board pursuant to the provisions of this Agreement or of any ordinance, resolution or order of the governing board. In addition to any other duties which may be assigned, the Executive Director shall have the following authority:

(a) under the policy direction of the governing board, to plan, organize and direct all Authority activities;

(b) to authorize expenditures within the designations and limitations of the budget approved by the governing board;

(c) to make recommendations to and requests of the governing board concerning any matter which is to be performed, done or carried out by the governing board;

(d) to have the authority to appoint, discipline, assign and otherwise supervise and control the activities of any employees or contractors which may be hired or retained by the Authority; and

(e) to have charge of, handle and have access to any property of the Authority.

15. **<u>Meetings</u>.** The Authority shall provide for regular and special meetings in accordance with the Ralph M. Brown Act (Chapter 9 (commencing with Section 54950) of Part 1 of Division 2 of Title 5 of the Government Code) or with any successor provision.

16. **<u>Powers and Functions</u>.**

(a) The Authority shall have no power to regulate land use or to engage in the retail sale of water and shall be prohibited from restricting or otherwise limiting the extraction of groundwater within the boundaries of the Authority except by means of economic incentives and disincentives. The Authority shall further be prohibited from funding any capital construction projects. In addition, prior to October 13, 2003, the Authority shall be prohibited from levying annual fees or assessments to fund Water Cost payments that exceed an annual average charge during such five (5) year period of $5.00 for each acre foot (minimum $0.00-maximum $10.00) of groundwater pumped from the North Area Basin during such five (5) year period. Further, during any individual year of such five (5) year period, the Authority shall be prohibited from levying annual fees or assessments to fund Water Cost payments that exceed a charge of $10.00 for each acre foot of groundwater pumped from the North Area Basin during any such year. For purposes of this section, Water Costs shall include the cost of water, pumping and treatment costs, and other costs related to any Conjunctive Use program administered by the Authority.

(b) Subject to the limitations set forth in subsection (a), the Authority shall have any and all powers commonly held by the parties hereto necessary or appropriate to regulate groundwater within the boundaries of the Authority including, but not limited to, the following powers:

(i) Collect and monitor data on the extraction of groundwater from, and the quality of groundwater in, the North Area Basin;

(ii) Establish and administer a Conjunctive Use program for the purpose of maintaining Sustainable yields in the North Area Basin consistent with the Groundwater Management Element;

(iii) Buy and sell water on other than a retail basis;

(iv) Exchange water;

(v) Distribute water in exchange for ceasing or reducing groundwater extractions;

(vi) Spread, sink and inject water into the North Area Basin;

(vii) Store, transport, recapture, recycle, purify, treat or otherwise manage and control water for the beneficial use of persons and property within the Authority;

(viii) To implement any Conjunctive Use program which the Authority deems necessary to maintain Sustainable yields in the North Area Basin consistent with the Groundwater Management Element; and

(ix) Study and plan ways and means to implement any or all of the foregoing powers.

(c) For purposes of exercising the authority set forth in subsection (b), and subject to the limitations set forth in subsection (a), the Authority shall have the following corporate and political powers:

(i) To sue and be sued in all actions and proceedings in all courts and tribunals.

(ii) To adopt a seal and alter it at its discretion.

(iii) To take by grant, purchase, gift, devise or lease, to hold, use and enjoy, and to lease, convey or dispose of, real and personal property of every kind, within or without the boundaries of the Authority, necessary or convenient to the full exercise of its power.

(iv) For the common benefit of the Authority, to store water in underground water basins or reservoirs within and outside the Authority, to appropriate water and acquire water rights within or outside the Authority, to import water into the Authority, and to conserve, or cause the conservation of, water within or outside the Authority.

(v) To exercise the right of eminent domain to take any property necessary to supply the Authority or any portion of it with replenishment water; provided that the right of eminent domain may not be exercised with respect to water and water rights, and may not be exercised with respect to any property owned or occupied by any of the parties hereto or the entities represented on the governing board of the Authority.

(vi) To act jointly, or cooperate, with the United States or any agency thereof, the state, or any county or agency thereof, or any political subdivision or district therein, including flood control districts, private and public corporations, and any person, so that the powers of the Authority may be fully and economically exercised.

(vii) To cause taxes, assessments, fees or charges to be levied in accordance with applicable State law, and in a manner consistent with the Groundwater Management Element, to accomplish the purposes of the Authority.

(viii) To require the permitting of groundwater extraction facilities within the boundaries of the Authority, to maintain a record of extraction with respect to any such facilities, and to require the installation of meters on groundwater extraction facilities for the purpose of determining the amount of groundwater being extracted from the North Area Basin.

(ix) To make contracts, employ labor and to do all acts necessary for the full exercise of the Authority's powers.

(x) To carry on technical and other investigations of all kinds necessary to further the purposes of the Authority.

(xi) To fix rates at which water acquired by the Authority shall be sold for replenishment purposes, and to establish different rates for different classes of service or conditions of service, provided that the rates shall be uniform for like classes and conditions of service.

(xii) To participate in any contract under which producers may voluntarily agree to use surface water in lieu of groundwater, and to that end the Authority may become a party to the contract and pay from Authority funds that portion of the cost of the surface water as will encourage the purchase and use of that water in lieu of pumping so long as persons or property within the boundaries of the Authority are directly or indirectly benefitted by the resulting replenishment of the North Area Basin.

(xiii) To apply for, accept and receive state, federal or local licenses, permits, grants, loans or other aid from any agency of the United States, the State of California, or other public or private entity necessary or appropriate for the Authority's full exercise of its powers.

17. **Budgets.** Within ninety days after the first meeting of the governing board of the Authority, and thereafter prior to the commencement of each fiscal year (defined as July 1 through June 30), the governing board shall adopt a budget for the Authority for the ensuing fiscal year.

18. **Termination.** This Agreement shall remain in effect until terminated by one of the parties hereto pursuant to this section. This Agreement may be terminated by any of the parties hereto at any time and for any reason by providing ninety (90) days written notice of termination to the other parties. Except as provided in Section 19(b) hereof, the Authority shall automatically terminate upon the effective date of the termination of this Agreement.

19. **Disposition Of Authority Assets Upon Termination.**

(a) In the event of the termination of the Authority where there will be a successor public entity which will carry on the functions of the Authority and assume its assets, the assets of the Authority shall be transferred to the successor public entity.

(b) If there is no successor public entity which will carry on the functions of the Authority and assume its assets, the assets shall be returned to the parties hereto in proportion to the contribution of each party during the term of this Agreement.

(c) If there is a successor public entity which will carry on some of the functions of the Authority and assume some of its assets, the assets of the Authority shall be allocated by the governing board of the Authority between the successor public entity and the parties hereto.

20. **Liabilities.** The debts, liabilities and obligations of the Authority shall be the debts, liabilities and obligations of the Authority alone, and not of the parties to this Agreement.

21. **Rules.** The governing board of the Authority may adopt from time to time such rules and regulations for the conduct of its affairs as it deems necessary and appropriate.

22. **Minutes.** The clerk appointed by the governing board of the Authority shall cause to be kept minutes of all meetings of the governing board, and shall cause a copy of the minutes to be forwarded to each member of the governing board and to each of the parties hereto.

23. **Effective Date.** The Authority was created on October 13, 1998. This Agreement, which replaces and supercedes all prior Agreements and Amendments to the Joint Powers Agreement creating the Authority, shall become effective when the governing bodies of all the parties shall have authorized its execution.

24. **Amendments.** This Agreement may only be amended by the affirmative vote of the governing bodies of all of the parties hereto.

IN WITNESS WHEREOF, the parties hereto execute this Agreement on the date first written above.

CITY OF CITRUS HEIGHTS

Dated: 6/26/02

By Roberta MacGlashan
Mayor

Attest:

City Clerk

Approved As To Form:

City Attorney

CITY OF FOLSOM

Dated: 8.18.02

By
Mayor

Attest:

Lisa Robinson
City Clerk

Approved As To Form:

City Attorney
8/16/02

CITY OF SACRAMENTO

Dated: 6-18-02

By Heather Fargo
Mayor

Attest:

Valerie A. Burrowes
City Clerk

Approved As To Form:

Joe Robinson
City Attorney

COUNTY OF SACRAMENTO

MAY 07 2002
Dated:
Chairperson, Board of Supervisors

By Don Nottoli

Attest:

Cyndy H. Turner
Clerk of the Board

Approved As To Form:

John F. Whisenhunt
County Counsel

CITY AGREEMENT NO. 2000-074-A

05-07-2002 SGA Revised JPA

CITY
AGREEMENT NO. 2000-074-A

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Sacramento Groundwater Authority

Groundwater Management Plan – 2014

Appendix B

Public Process Documentation

Copies of the following are included in this appendix:

1. Notice of a hearing on intent to draft a GMP
2. Resolution of intent to adopt a GMP
3. Notice of hearing to adopt GMP

The GMP was adopted in SGA's December 11, 2014 Board Meeting. The minutes of that meeting are published on-line at www.sgah2o.org.

MAR 27 2013

The Sacramento Bee

P.O. Box 15779 • 2100 Q Street • Sacramento, CA 95852

SACRAMENTO GROUND WATER AUTHORITY
NANCY MERRIER
5620 BIRDCAGE ST #180
CITRUS HEIGHTS, CA 95610

DECLARATION OF PUBLICATION
(C.C.P. 2015.5)

COUNTY OF SACRAMENTO
STATE OF CALIFORNIA

I am a citizen of the United States and a resident of the County aforesaid; I am over the age of eighteen years, and not a party to or interest ed in the above entitled matter. I am the printer and principal clerk of the publisher of The Sacramento Bee, printed and published in the City of Sacramento, County of Sacramento, State of California, daily, for which said newspaper has been adjudged a newspaper of general circulation by the Superior Court of the County of Sacramento, State of California, under the date of September 26, 1994, Action No. 379071; that the notice of which the annexed is a printed copy, has been published in each issue thereof and not in any supplement thereof on the following dates, to wit:

March 19, 26, 2013

I certify (or declare) under penalty of perjury that the foregoing is true and correct and that this declaration was executed at Sacramento, California, on **March 26, 2013**

Kim Sm

(Signature)

NO 354 PUBLIC NOTICE

NOTICE OF INTENT TO UPDATE A GROUNDWATER MANAGEMENT PLAN

The Sacramento Groundwater Authority (SGA) is a joint powers authority formed to manage the groundwater basin underlying Sacramento County north of the American River. To maintain a sustainable groundwater resource for the more than half-million citizens that rely on the basin for their daily water needs, SGA intends to begin an update of its groundwater management plan adopted in December 2008. SGA encourages any individual interested in the update to attend the April 11, 2013 meeting of the SGA board of directors. The meeting, which is open to the public, will begin at 9 am at 5620 Birdcage Street, Suite 110 in Citrus Heights, CA. For more information on the groundwater management plan, contact Rob Swartz of SGA at (916) 967-7692.

RESOLUTION NO. 2013-02

A RESOLUTION OF THE SACRAMENTO GROUNDWATER AUTHORITY DECLARING ITS INTENT TO PREPARE AN UPDATE TO ITS GROUNDWATER MANAGEMENT PLAN AND ADOPTING A STATEMENT OF PUBLIC PARTICIPATION

The Board of the Sacramento Groundwater Authority (SGA) does hereby find that:

WHEREAS, the SGA was formed under the Joint Exercise of Powers Act (Chapter 5 of Division 7 of Title 1 of the California Government Code), pursuant to a Joint Powers Agreement by and among the City of Citrus Heights, the City of Folsom, the City of Sacramento, and the County of Sacramento dated August 11, 1998; and

WHEREAS, the SGA was created for the purposes of protecting, preserving, and enhancing, for current and future beneficial uses, the groundwater resources in the North Area Groundwater Basin, in Sacramento County, north of the American River; and

WHEREAS, one of the SGA's primary functions is to develop, adopt and implement a plan for the management of groundwater resources in the North Area Groundwater Basin.

NOW, THEREFORE, be it resolved that:

1. The SGA intends to develop, adopt and implement an update to its groundwater management plan for the North Area Groundwater Basin, in Sacramento County, north of the American River as originally adopted on December 11, 2003 and revised on December 11, 2008.

2. The SGA further intends to provide and allow broad opportunity for public involvement in the development of the groundwater management plan for the North Area Groundwater Basin. Individuals interested in participating in the update can find more information at www.sgah2o.org/sga/programs/groundwater.

PASSED AND ADOPTED by the Board of Directors of the Sacramento Groundwater Authority, on April 11, 2013.

By: ______________________
Chairperson, Sacramento Groundwater Authority

Attest: ______________________
Nancy Marrier, Secretary, Board of Directors

COPY

The Sacramento Bee

P.O. Box 15779 • 2100 Q Street • Sacramento, CA 95852

SACRAMENTO REGIONAL GROUND WATER AUTHORITY
5620 BIRDCAGE ST #180
CITRUS HEIGHTS, CA 95610

DECLARATION OF PUBLICATION
(C.C.P. 2015.5)

COUNTY OF SACRAMENTO
STATE OF CALIFORNIA

I am a citizen of the United States and a resident of the County aforesaid; I am over the age of eighteen years, and not a party to or interested in the above entitled matter. I am the printer and principal clerk of the publisher of The Sacramento Bee, printed and published in the City of Sacramento, County of Sacramento, State of California, daily, for which said newspaper has been adjudged a newspaper of general circulation by the Superior Court of the County of Sacramento, State of California, under the date of September 26, 1994, Action No. 379071; that the notice of which the annexed is a printed copy, has been published in each issue thereof and not in any supplement thereof on the following dates, to wit:

DECEMBER 2, 2014
DECEMBER 9, 2014

I certify (or declare) under penalty of perjury that the foregoing is true and correct and that this declaration was executed at Sacramento, California, on **DECEMBER 9, 2014.**

(Signature)

NO 776 NOTICE OF INTENT TO ADOPT AN UPDATE OF A GROUNDWATER MANAGEMENT PLAN

The Sacramento Groundwater Authority (SGA) is a joint powers authority charged with managing the groundwater basin underlying Sacramento County north of the American River. To maintain a sustainable groundwater resource for the citizens that rely upon the basin for their daily water needs, SGA intends to adopt an update of its 2008 Groundwater Management Plan (GMP). SGA encourages any individual interested in the GMP to attend the December 11, 2014 meeting of the SGA board of directors. The meeting, which is open to the public, will begin at 9 am at 5620 Birdcage Street, Suite 110 in Citrus Heights, CA. For more information on SGA Board meetings or to find out more about groundwater management efforts, contact Rob Swartz of SGA at (916) 967-7692.

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Sacramento Groundwater Authority

Groundwater Management Plan – 2014

Appendix C

Groundwater Model Background

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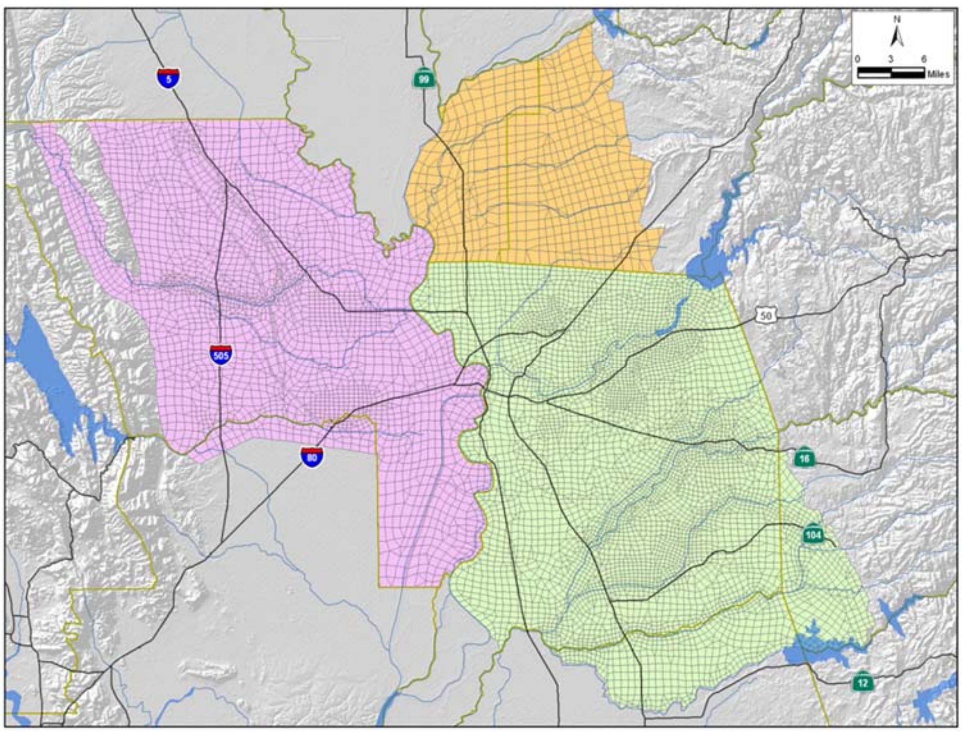
SacIWRM is a water resources management model for the Sacramento region, from the Feather River in the north to the Mokelumne River in the south, including groundwater basins in Sacramento County and portions of Placer, Sutter, and San Joaquin counties. It integrates the surface water hydrologic system, the groundwater aquifer system, and the land surface processes, including evapotranspiration and infiltration of precipitation and irrigation applied water, into a single model. This integration allows water managers to evaluate the effect of changes to water demands, land use, water use, groundwater pumping, surface water diversions, imported water, and reservoir operations on groundwater and surface water systems, including stream-aquifer interactions.

SacIWRM was used to estimate values of the North Basin groundwater budget including the primary components of groundwater recharge; deep percolation, recharge from streams and subsurface inflows from adjacent basins which are discussed in the body of this groundwater management plan.

The area represented in SacIWRM is shown in orange and green in the following figure. In order to account for subsurface flow to and from adjacent basins, results from YoloIGSM were incorporated into the water balance estimates. The area represented in the Yolo model is highlighted in purple.



SacIWRM has undergone continual development for about 20 years. Completed studies and the agencies that have collaborated to develop and maintain the model are listed below.

Project	Year	Agencies Involved
Development of City-wide integrated groundwater and surface water model	1992	City of Sacramento
Development of County-wide integrated groundwater and surface water model	1993	Sacramento County Water Agency
American River Water Resources Investigation	1996	U.S. Bureau of Reclamation
Northridge Conjunctive Use Study	1996	Sacramento County Water Agency
Rio Linda Water Supply Analysis	1996	Sacramento County Water Agency
Model Hydrology Update	1996	Sacramento County Water Agency
Water Forum Basin Yield Analysis	1996	Water Forum
Sunrise Douglas Water Supply Analysis	1999	Sacramento County Water Agency
Zone 40 – North Vineyard Well field	1999	Sacramento County Water Agency
American River Basin Cooperating Agencies Studies	2002	Water Forum
Analysis of Impact of GET Operations at Aerojet/Boeing on Basin Yield	2004	Regional Water Quality Control Board
Zone 40 Water Supply Master Plan	2005	Sacramento County Water Agency
Natomas Central Mutual Water Company Impacts Assessment	2005	Sacramento County Water Agency
Rio del Oro Development Water Supply Impacts Study	2007	Sacramento County Water Agency
Sutter Measure M Impact Study	2007	Sacramento County Water Agency
Comprehensive SacIWRM Model Update	2008	Sacramento Groundwater Authority, Sacramento Central Groundwater Authority, South Sacramento County Agricultural Water Authority
RWA Water Transfer Study	2010	Regional Water Authority
Regional Contamination Analysis	2011	Sacramento Groundwater Authority, Sacramento Central Groundwater Authority
Groundwater Management Plan	2011	South Sacramento County Agricultural Water Authority
SunCreek Development Water Supply Impact Study	2012	City of Rancho Cordova
South County Agricultural Recycled Water Feasibility Study	2014	Sacramento County Regional Sanitation District
Basin Management Objective Analysis	2014	Sacramento Central Groundwater Authority
GW Recharge Mapping	2014	Sacramento Groundwater Authority

(Table provided by RMC Consultants.)

Appendix D

Land Subsidence Monitoring Plan

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The following monitoring plan is designed to determine if land subsidence occurs in the North Basin and to what extent. The plan is based on land surveying and SGA's understanding of its groundwater resources.

In preparation of this plan several land elevation surveying methods were evaluated. A method that employs Global Positioning System (GPS) elevation surveys was chosen as the most effective means of evaluating land subsidence in the North Basin. Other survey methods or even extensometers, which measure compaction of a specific subsurface layer, could be added to the plan in the future to complement the GPS surveys. Since the early 2000s, GPS elevation surveys have been successfully executed in nearby regions of the Sacramento Valley to determine the extent of land subsidence (Frame & D'Onofrio, 2006). The survey method proposed to be used in the North Basin includes the following broad steps:

1. Establish bench marks in the North Basin
2. Conduct an initial (baseline) GPS survey of bench marks
3. Conduct subsequent GPS surveys of bench marks
4. Evaluate survey results

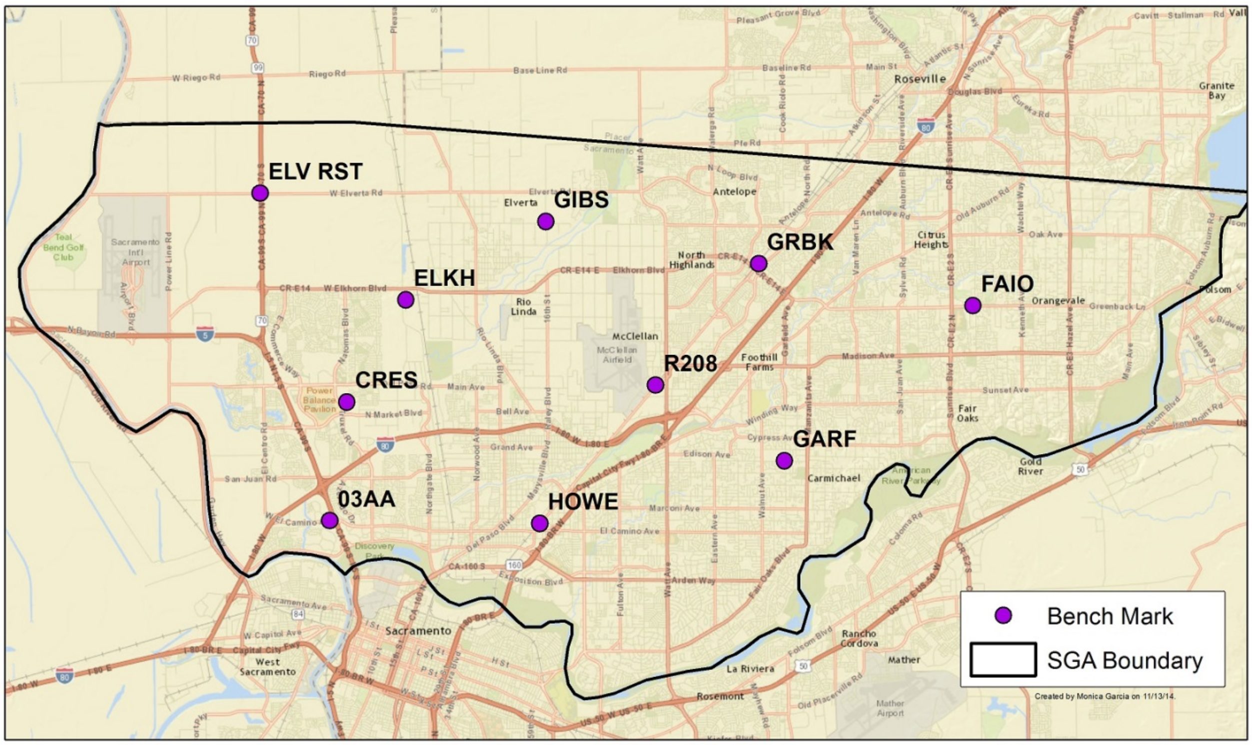
Although these survey principles seem basic, they are difficult and expensive to execute and interpret properly. SGA's land subsidence monitoring plan is designed with the purpose of detecting land subsidence due to groundwater extractions. Details of the plan are described below.

1. Establish Bench Marks

A bench mark is a vertical reference point, often a metal disk which is attached to concrete, rock or a metal rod driven into the ground so that it maintains its position relative to the earth's surface. A well-distributed network of bench marks suitable for GPS surveys has already been established in the North Basin. The bench marks were established in 2008 by DWR and Reclamation in cooperation with many local agencies for the purpose of establishing a land subsidence monitoring network for the entire Sacramento Valley. That project established and surveyed bench marks from Sacramento and Yolo Counties in the south through Shasta County to the north. (DWR & USBR, September, 2008). Nine of the ten bench marks in the North Basin were included in that project and now make up the bulk of the SGA land subsidence monitoring network. The tenth bench mark in the SGA network was established in 2013 to replace one of those in the original network that had subsequently been destroyed. The bench marks proposed for use in the SGA land subsidence monitoring plan are listed in the following table:

STATION NAME	OTHER ID	PID
Gibson	GIBS	DL9168
Greenback	GRBK	DH6485
Elkhorn	ELKH	DH6491
Fair	FAIO	DK2883
Control Monument LR 208	R208	AC9237
Capitol Reservoir	CRES	DE9128
Garfield	GARF	DL9167
HPGN D CA 03 AA	03AA	AC9226
Howe	HOWE	DH6484
Elverta Reset 2013	ELV RST	na

The locations of these bench marks are shown in the following figure.



2. Conduct Baseline Survey

After the bench marks are established, an elevation survey must be conducted to determine their elevations. Elevation values were established with GPS survey methods at each of the bench marks shown above in DWR and Reclamation's 2008 land subsidence monitoring effort. Therefore, the requirements of conducting a baseline survey have been completed for SGA's land subsidence monitoring network. Future surveys will determine the change in land surface elevation relative to the land surface that existed during the baseline survey conducted in 2008, except for "Elverta Reset 2013", which had been destroyed and was re-established and re-surveyed in 2013.

The 2008 survey was designed and completed under the direction of licensed professional land surveyors with assistance from a former employee of the National Geodetic Survey (NGS) (DWR & Reclamation, 2008). They completed the survey and processed the data following rigorous procedures required by the NGS for data to be published in the NGS database, a process referred to as “blue-booking” in reference to the manual detailing the data publication guidelines. The survey results are available on the NGS web site. The survey data for “Elverta Reset 2013” which was re-established by Sacramento County in 2013 was submitted to the NGS Online Positioning User Service (OPUS) for processing. The survey results for this bench mark are available on NGS’ OPUS web site.

3. Conduct subsequent surveys

In order to determine if land subsidence has occurred since 2008, or in the case of Elverta Reset 2013, since 2013, another GPS survey of the bench marks must be conducted. Subsequent surveys must use methods that produce data that is appropriate to compare to the data produced in the initial surveys. Fortunately, all bench marks have been maintained or re-established so that the spacing parameters required for another high-precision survey remain. Also, as with the initial survey, SGA will employ professionals with prior experience conducting surveys that use GPS methods to determine changes in land surface elevation over time. The survey operations will be managed by them for the specific purpose of detecting land subsidence.

SGA would conduct a subsequent survey of the monitoring network if concerns arise that land may have subsided due to groundwater withdrawal. Land subsidence due to groundwater withdrawal occurs when groundwater levels decline beyond their historically low levels in compressible geologic deposits (Lofgren and Ireland, 1973). A survey could also be initiated if a threat of damage to infrastructure due to land subsidence is identified.

In order to determine if land subsidence due to groundwater withdrawal may be affecting infrastructure, SGA will encourage stakeholders to submit records that document changes to infrastructure that may be linked to land subsidence and maintain a file of those records. The records will aid future survey planning by indicating whether additional work should be considered.

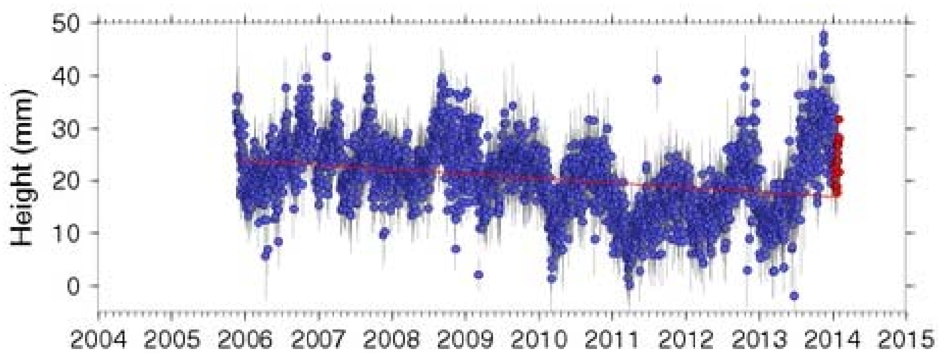
Some of things that would be considered in subsequent surveys include:

- Subsequent surveys would be conducted at the same time of year as initial survey to reduce variations due to different seasonal groundwater levels, moisture content and vegetative cover
- Additional bench marks in areas where subsidence has the potential to occur at a greater rate than covered by current network
- Add bench mark(s) in area where land surface elevation is unlikely to be affected by subsidence due to groundwater level declines to identify other processes that affect changes in land elevation.

4. Evaluate Survey Results

Survey data must be analyzed and properly interpreted to determine whether declining groundwater levels have caused land subsidence. The initial step in this process is to compare bench mark elevations from successive surveys to determine if land surface elevations have changed between surveys. If this plan is implemented, elevation values determined for the SGA monitoring network bench marks from a future land subsidence monitoring survey would be compared to bench mark elevations from the 2008 and 2013 surveys of the bench mark network.

The land surface in the North Basin may rise or fall due to multiple causes, not simply groundwater level declines. Interpretations of land elevation survey data must consider, for example, plate tectonics and the manner in which the weight of water in Folsom Reservoir might deform the region's land surface. The Plate Boundary Observatory (PBO), which evaluates earth deformation resulting from the movement of the Pacific and North American tectonic plates in the western United States, maintains a station near Folsom where land surface elevation is determined at regular intervals. The station is sited on Jurassic-age metamorphic rocks that yield little water through fractures. Data from this station, shown in the following figure, illustrate that even at a site near the North Basin where geologic conditions do not favor land subsidence due to groundwater level declines, the land surface is rising and falling up to two inches per year on an annual pattern and the average land surface elevation is declining over the eight-year period of record, likely due to other causes. This example emphasizes that survey data must be evaluated in the context of all pertinent data and an understanding of other earth processes which affect land surface elevation.



Patterns of land surface elevation change identified at the PBO station can be used along with similar data from Continuously Operating Reference Stations (CORS) to identify phenomenon, other than groundwater level changes, that affect land surface elevation changes. A CORS station, which collects time series elevation and horizontal position data, lies in the center of the North Basin. Data from this station should also be considered when interpreting survey results.

If it is difficult to determine which processes are causing land surface elevation changes, it may be necessary to expand the monitoring network. For instance, it might be helpful to include benchmarks that are established on geologic materials less susceptible to compaction due to groundwater withdrawal. It might also be useful to conduct elevation surveys using spirit leveling techniques referenced to land subsidence monitoring benchmarks to determine if the extent of land surface elevation change between benchmarks is greater or less than changes at the benchmarks.

Attachment G: Fair Oaks Water District 2014 Consumer Confidence Report

FAIR OAKS
WATER DISTRICT

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2014 Consumer Confidence Report
Published by the
San Juan Wholesale Customer Agencies
P.O. Box 2157
Granite Bay, CA 95746

Este informe contiene información muy importante sobre su agua potable. Tradúzcalo o hable con alguien que lo entienda bien.

Your drinking water continues to meet all state and federal drinking water standards.

Contact Us

If you have any questions about this report or your water supply, please contact your local water provider. Each of the member agencies holds monthly board meetings that are open to the public as indicated below.

San Juan Water District

Contact Person:
Greg Turner
(916) 791-1715
gturner@sjwd.org
www.sjwd.org

Board Meetings:
2nd and 4th Wednesday each month
7:00 p.m.
9935 Auburn-Folsom Road
Granite Bay

Citrus Heights Water District

Contact Person:
Brian Hensley
(916) 725-6873
bhensley@chwd.org
www.chwd.org

Board Meetings:
2nd Tuesday each month
6:30 p.m.
6230 Sylvan Road
Citrus Heights

Fair Oaks Water District

Contact Person:
Michael Nisenboym, P.E.
(916) 844-3513
mnisenboym@fowd.com
www.fowd.com

Board Meetings:
2nd Monday every month
6:30 p.m.
10326 Fair Oaks Boulevard
Fair Oaks

Orange Vale Water Company

Contact Person:
Mark DuBose
(916) 988-1693
mdubose@orangevalewater.com
www.orangevalewater.com

Board Meetings:
1st Tuesday each month
5:00 p.m.
9031 Central Avenue
Orangevale

Learn more about your water at www.sjwd.org

2014 Consumer Confidence Report

Published by the San Juan Wholesale Customer Agencies

San Juan Water District • Citrus Heights Water District • Fair Oaks Water District • Orange Vale Water Company

San Juan Water District provides reliable, high-quality water supplies to our customers. We serve nearly 160,000 customers in our retail and wholesale service areas throughout Sacramento and Placer counties. We test our surface water, which comes from the American River watershed, and our local groundwater for microbiological and chemical quality.

The U.S. Environmental Protection Agency and the State Water Resources Control Board maintain strict water quality standards designed to protect customers from waterborne disease organisms and harmful chemicals. As a public water agency, we are required by the USEPA to provide you with an annual Consumer Confidence Report.

This report provides you with information about drinking water quality and how we comply with drinking water quality standards. As your water provider, we are proud to report that this year's CCR concludes that, once again, your drinking water meets all federal and state drinking water standards.

What's In Your Water?

The sources of drinking water (both tap water and bottled water) include rivers, lakes, streams, ponds, reservoirs, springs, and wells. As water travels over the surface of the land or through the ground, it dissolves naturally-occurring minerals and, in some cases, radioactive material, and can pick up substances resulting from the presence of animals or from human activity.

Contaminants that may be present in the source water include:

- Microbial contaminants, such as viruses and bacteria, that may come from sewage treatment plants, septic systems, agricultural livestock operations, and wildlife.
- Inorganic contaminants, such as salts and metals, that can be naturally-occurring or result from urban stormwater runoff, industrial or domestic wastewater discharges, oil and gas production, mining, or farming.
- Pesticides and herbicides, that may come from a variety of sources such as agriculture, urban stormwater runoff, and residential uses.
- Organic chemical contaminants, including synthetic and volatile organic chemicals, that are by-products of industrial processes and petroleum production, and can also come from gas stations, urban stormwater runoff, agricultural application, and septic systems.
- Radioactive contaminants, that can be naturally-occurring or be the result of oil and gas production and mining activities.

In order to ensure that tap water is safe to drink, the U.S. Environmental Protection Agency (USEPA) and the State Water Resources Control Board (State Board) prescribe regulations that limit the amount of certain contaminants in water provided by public water systems. State Board regulations also establish limits for contaminants in bottled water that provide the same protection for public health.

Drinking water, including bottled water, may reasonably be expected to contain at least small amounts of some contaminants. The presence of contaminants does not necessarily indicate that water poses a health risk. More information about contaminants and potential health effects can be obtained by calling the USEPA's Safe Drinking Water Hotline (1-800-426-4791).

Where Does Your Water Come From?

Water from the agencies comes from two sources: treated surface water and groundwater. San Juan Water District diverts and treats surface water from Folsom Lake. This treated water is then distributed to the agencies. Orange Vale Water Company and San Juan Water District receive 100 percent of their supply from treated surface water. If you are a consumer of Citrus Heights or Fair Oaks Water Districts, your water is a mixture of treated surface water from San Juan Water District and groundwater from local wells.

San Juan Water District – 100% surface water
Orange Vale Water Company – 100% surface water
Citrus Heights Water District – 84% surface water, 16% groundwater
Fair Oaks Water District – 75.7% surface water, 24.3% groundwater

Source water assessments have been conducted for all the water sources to enable the Agencies to understand the activities that have the greatest potential for contaminating the drinking water supplies. The groundwater sources were assessed in 2002 and the surface water source was evaluated in 2001. New wells for Citrus Heights Water District were assessed in 2008 and 2009. These assessments were conducted in accordance with State Board guidelines and copies of the complete assessments are available for review at the respective agency offices.

San Juan Water District conducted the evaluation of the Folsom Lake source. It was found to be most vulnerable to potential contamination from the Folsom Lake State Recreation Area facilities, high-density housing and associated activities such as sewer and septic systems and fertilizer, pesticide and herbicide application, as well as illegal activities and dumping. The source water is typically treated using conventional filtration and disinfection that is designed to remove many contaminants. Again this year, your water meets all federal and state drinking water standards.

Citrus Heights and Fair Oaks water districts conducted assessments of their local groundwater wells. It was found that all the wells are vulnerable to commercial urban activities, such as active and historic gas stations, dry cleaners, leaking underground storage tanks, known contaminant plumes, automobile repair shops, and sewer collection systems, none of which are associated with any detected contaminants.

Although Orange Vale Water Company does not currently utilize available local groundwater, assessments found that wells within their service area would be most vulnerable to rural grazing activities.

A Note For Sensitive Populations

Some people may be more vulnerable to contaminants in drinking water than the general population. Immuno-compromised persons such as persons with cancer undergoing chemotherapy, persons who have undergone organ transplants, people with HIV/AIDS or other immune system disorders, some elderly, and infants can be particularly at risk from infections. These people should seek advice about drinking water from their health care providers. USEPA/Centers for Disease Control (CDC) guidelines on appropriate means to lessen the risk of infection by *Cryptosporidium* and other microbial contaminants are available from the Safe Drinking Water Hotline (1-800-426-4791).

Important Information About Radon

Radon is a radioactive gas that you cannot see, taste or smell. It is found throughout the United States. Radon can move up through the ground and into a home through cracks and holes in the foundation. Radon can build up to high levels in all types of homes. Radon can also get into indoor air when released from tap water from showering, washing dishes, and other household activities. Compared to radon entering the home through soil, radon entering the home through tap water will, in most cases, be a small source of radon in indoor air. Radon is a known human carcinogen. Breathing air containing radon can lead to lung cancer. Drinking water containing radon may cause increased risk of stomach cancer. If you are concerned about radon in your home, test the air in your home. Testing is inexpensive and easy. You should pursue radon removal for your home if the level of radon in your air is 4 picocuries per liter of air (pCi/L) or higher. There are simple ways to fix a radon problem that are not too costly. For additional information, call the California Radon Program (1-800-745-7236), the USEPA Safe Drinking Water Act Hotline (1-800-426-4791), or call the National Safety Council Radon Hotline at (1-800-767-7236).

General Information on Lead

If present, elevated levels of lead can cause serious health problems, especially for pregnant women and young children. Lead in drinking water is primarily from materials and components associated with service lines and home plumbing. The San Juan Family Agencies are responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. If you are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline or at http://www.epa.gov/safewater/lead.

The San Juan Family Agencies test distribution system samples every three years for lead and over ninety-five percent of samples are non-detectable and therefore not reported in the data table.

Unregulated Contaminant Monitoring Rule (UCMR3) Results

USEPA requires public water systems to collect data for unregulated constituents in drinking water supplies under the Unregulated Contaminant Monitoring Rule 3. Currently, these constituents have no drinking water standards but may be regulated in the future. More information on this USEPA program can be found at http://water.epa.gov/lawsregs/rulesregs/sdwa/ucmr/ucmr3/index.cfm. Citrus Heights Water District, Orange Vale Water Company, and Fair Oaks Water District all conducted a sampling program for their supplies and distribution system during 2014. Several constituents were detected, none at any level of human health concern.

Key to Abbreviations

PPB	parts per billion or micrograms per liter (µg/L)
PPM	parts per million or milligrams per liter (mg/L)
NTU	nephelometric turbidity units
µS/CM	microsiemens per centimeter
pCi/L	picocuries per liter
ND	not detected
NR	not required
N/A	not applicable
TON	threshold odor number

Water Quality Definitions

Maximum Contaminant Level (MCL) — The highest level of a contaminant that is allowed in drinking water. Primary MCLs are set as close to the PHGs (or MCLGs) as is economically and technologically feasible. Secondary MCLs are set to protect the odor, taste, and appearance of drinking water.

Public Health Goal (PHG) — The level of a contaminant in drinking water below which there is no known or expected risk to health. PHGs are set by the California Environmental Protection Agency.

Maximum Contaminant Level Goal (MCLG) — The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs are set by the U.S. Environmental Protection Agency.

Maximum Residual Disinfectant Level (MRDL) — The highest level of a disinfectant allowed in drinking water. There is convincing evidence that addition of a disinfectant is necessary for control of microbial contaminants.

Maximum Residual Disinfectant Level Goal (MRDLG) — The level of a drinking water disinfectant below which there is no known or expected risk to health. MRDLGs do not reflect the benefits of the use of disinfectants to control microbial contaminants.

Primary Drinking Water Standard (PDWS) — MCLs and MRDLs for contaminants that affect health along with their monitoring and reporting requirements, and water treatment requirements.

Treatment Technique (TT) — A required process intended to reduce the level of a contaminant in drinking water.

Regulatory Action Level (AL) — The concentration of a contaminant which, if exceeded, triggers treatment or other requirements that a water system must follow.

Notification Level (NL) — Health-based advisory level set by the State Board for constituents with no MCL. This is not an enforceable standard, although requirements and recommendations may apply if detected above this level.

CONSTITUENT	Range (ug/L)	Average (ug/L)	Human Health Advisory	Potential Sources
HCFC-22 (chlorodifluoromethane)	ND-0.11 [1]	ND [1]	None	Refrigerant and propellant
Vanadium	ND-11 [1] ND-8.1 [2]	7.2 [1] 4.4 [2]	State Board Notification Level – 50 ug/L	Naturally-occurring metal
Molybdenum	ND-1 [1] ND-1.7 [2]	ND [1,2]	USEPA Lifetime Health Advisory – 40 ug/L	Naturally-occurring metal
Strontium	46-460 [1] 46-220 [2] 46 [3]	245 [1] 148 [2] 46 [3]	USEPA Lifetime Health Advisory – 4,000 ug/L	Naturally-occurring metal
Chlorate	ND-40 [1] ND-58 [2]	ND [1] 25 [2]	State Board Notification Level – 800 ug/L	Oxidant used in pyrotechnics and possible by-product of water treatment
Testosterone	ND-0.00013 [1]	ND [1]	None	Mammalian hormone

1 – Citrus Heights Water District (wells, treated surface water from SJWD and distribution system)
2 – Fair Oaks Water District (wells, treated surface water from SJWD and distribution system)
3 – Orange Vale Water Company (treated surface water from SJWD and distribution system)

San Juan Wholesale Customer Agencies – 2014 Table of Detected Constituents

DETECTED PRIMARY DRINKING WATER CONSTITUENTS regulated to protect your health													
CONSTITUENT	UNITS	PHG or (MCLG) or [MRDLG]	MCL or [MRDL]	San Juan Surface Water Including Orange Vale Water Company(a)			Citrus Heights Groundwater			Fair Oaks Groundwater			MAJOR SOURCES
				RANGE	AVERAGE	YEAR SAMPLED	RANGE	AVERAGE	YEAR SAMPLED	RANGE	AVERAGE	YEAR SAMPLED	
Arsenic	PPB	0.004	10	ND	ND	2013	ND–3.7	ND	2013	ND - 2.2	2.2	2006, 2012	Erosion of natural deposits; runoff from orchards; glass and electronics production waste
Barium	PPM	2	1	ND	ND	2013	ND–0.1	ND	2013	ND	ND	2006, 2012	Erosion of natural deposits and wastes from metal refineries
Fluoride	PPM	1	2.0	ND	ND	2013	ND–0.18	0.12	2013	0.1 - 0.11	0.11	2006, 2012	Erosion of natural deposits; discharge from fertilizer and aluminum factories
Hexavalent Chromium	PPB	0.02	10	ND	ND	2014	ND–2.3	1.4	2014	ND–2.5	ND	2014	Erosion from natural deposits or discharge from electroplating factories, leather tanneries, wood preservation, chemical synthesis, refractory production, and textile manufacturing facilities
Nitrate (as nitrate)	PPM	45	45	ND	ND	2014	5.2- 13	8.2	2014	2.2–22	7.3	2007, 2014	Runoff and leaching from fertilizer use; leaching from septic tanks and sewage; erosion of natural deposits
Nitrate/Nitrite (as N)	PPM	10	10	ND	ND	2014	NR	NR	N/A	0.41–0.59	0.51	2006, 2012	Runoff and leaching from fertilizer use; leaching from septic tanks and sewage; erosion of natural deposits
Chlorine Residual (distribution system)	PPM	[4]	[4]	0.1–0.84 (0.19–0.89)	0.53 (0.5)	2014	0.22–1.08	0.5	2014	0.2–1.25	0.46	2014	Drinking water disinfectant added for treatment
Total Trihalomethanes (distribution system)	PPB	N/A	80	23–60 (26–69)	44.3 (52)	2014	ND–50	40	2014	ND–59	37.8	2014	By-product of drinking water disinfection
Haloacetic Acids (distribution system)	PPB	N/A	60	16–32 (18–41)	23 (28)	2014	ND–40	20	2014	ND–36	20.3	2014	By-product of drinking water disinfection
Control of Disinfection By-Product Precursors (TOC) (raw water) (b)	PPM	N/A	TT = 2	1.0–1.9	1.3	2014	NR	N/A	N/A	NR	N/A	N/A	Various natural and manmade sources
CONSTITUENT	UNITS	PHG or (MCLG)	MCL	LEVEL FOUND		YEAR SAMPLED	LEVEL FOUND		YEAR SAMPLED	LEVEL FOUND		YEAR SAMPLED	MAJOR SOURCES
Turbidity (b)	NTU	N/A	TT = 1 NTU	0.21		2014	NR		N/A	NR		N/A	Soil runoff
	% Samples	N/A	TT = ≤0.3 NTU	100		2014	NR		N/A	NR		N/A	
	UNITS	PHG or (MCLG)	AL	90th PERCENTILE	# SAMPLED/ # EXCEED AL	YEAR SAMPLED	90th PERCENTILE	# SAMPLED/ # EXCEED AL	YEAR SAMPLED	90th PERCENTILE	# SAMPLED/ # EXCEED AL	YEAR SAMPLED	MAJOR SOURCES
Copper	PPM	0.3	1.3	0.06 (0.12)	30/0 (30/0)	2012 (2012)	0.09	30/0	2012	0.054	30/0	2013	Internal corrosion of household plumbing systems; erosion of natural deposits; leaching from wood preservatives
	UNITS	PHG or (MCLG)	MCL	HIGHEST MONTHY RESULT	# MONTHS/ POSITIVE SAMPLE	YEAR SAMPLED	HIGHEST MONTHY RESULT	# MONTHS/ POSITIVE SAMPLE	YEAR SAMPLED	HIGHEST MONTHY RESULT	# MONTHS/ POSITIVE SAMPLE	YEAR SAMPLED	MAJOR SOURCES
Total Coliform Bacteria	# Samples	(0)	>1 monthly sample positive	N/A (1)	N/A (2)	2014	N/A	N/A	N/A	N/A	N/A	N/A	Naturally present in the environment
Total Coliform Bacteria	% Samples	(0)	>5% monthly samples positive	2.33 (N/A)	2 (N/A)	2014	0	0	2014	1.4	1	2014	Naturally present in the environment
DETECTED SECONDARY DRINKING WATER CONSTITUENTS regulated for aesthetic qualities													
CONSTITUENT	UNITS	PHG or (MCLG)	MCL	San Juan Surface Water including Orange Vale Water Company			Citrus Heights Groundwater			Fair Oaks Groundwater			MAJOR SOURCES
				RANGE	AVERAGE	YEAR SAMPLED	RANGE	AVERAGE	YEAR SAMPLED	RANGE	AVERAGE	YEAR SAMPLED	
Total Dissolved Solids	PPM	N/A	1,000	41	41	2013	190-260	228	2013	100–400	181	2006, 2012	Runoff/leaching from natural deposits
Specific Conductance	µS/CM	N/A	1,600	58-84	72	2013	260–350	294	2013	140–550	228	2006, 2012	Substances that form ions when in water
Sulfate	PPM	N/A	500	4.8	4.8	2013	7.8-12	9.7	2013	3.6–28	10.8	2006, 2012	Runoff/leaching from natural deposits
Chloride	PPM	N/A	500	2.8	2.8	2013	10–18	15	2013	3.1–23	6.9	2006, 2012	Runoff/leaching from natural deposits
Turbidity	NTU	N/A	5	0.018–0.21	0.026	2014	ND–0.1	ND	2013	0.12–0.6	0.35	2006, 2012	Soil runoff
Odor	TON	N/A	3	2	2	2013	ND	ND	2013	ND	ND	2006, 2012	Naturally-occurring organic materials
DETECTED UNREGULATED DRINKING WATER CONSTITUENTS (c)													
CONSTITUENT	UNITS	PHG or (MCLG)	NL	San Juan Surface Water Including Orange Vale Water Company			Citrus Heights Groundwater			Fair Oaks Groundwater			MAJOR SOURCES
				RANGE	AVERAGE	YEAR SAMPLED	RANGE	AVERAGE	YEAR SAMPLED	RANGE	AVERAGE	YEAR SAMPLED	
Hardness	PPM	N/A	NONE	20	20	2013	95-150	121	2013	47–210	86.8	2006, 2012	Hardness is the sum of polyvalent cations present in the water, generally naturally occurring magnesium and calcium.
Sodium	PPM	N/A	NONE	2.5	2.5	2013	11–23	18.8	2013	4.9–32	11.6	2006, 2012	Naturally occurring salt in the water
Calcium	PPM	N/A	NONE	5.2	5.2	2013	23-33	27	2013	12–43	19.6	2006, 2012	Erosion of natural deposits
Magnesium	PPM	N/A	NONE	1.7	1.7	2013	9.4-16	12.7	2013	4.2–25	9.2	2006, 2012	Erosion of natural deposits
Radon 222	pCi/L	N/A	NONE	ND	ND	2006	165–304	234.5	2008,2009	114–333	215	2005	Erosion of natural deposits

(a)– Data for OVWC Distribution System is shown in parenthesis.
(b)– Only surface water sources must comply with PDWS for Control of Disinfection By-Product Precursors and turbidity.
(c)– Unregulated contaminant monitoring helps determine where certain contaminants occur and whether they need to be regulated.
The State allows us to monitor for some contaminants less than once per year because the concentrations of these contaminants do not change frequently.
Some of our data, though representative, are more than one year old.

Attachment H: Fair Oaks Water District Water Conservation Policy No. 6060

FAIR OAKS
WATER DISTRICT

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FAIR OAKS
WATER DISTRICT

Policy Number:	**6060**
Policy Title:	**Water Conservation**

MANDATORY REQUIREMENTS: STAGES 1 - 5

WATER CONSERVATION STAGE DECLARATION:

Upon declaration or amendment by the Board of Directors of a specific Stage in effect, the following mandatory water conservation requirements shall be in effect.

The declaration of short-term stage 4 or stage 5 water conservation requirements may be declared by the agency's General Manager or his/her designee and subject to ratification by the agency's Board of Directors in a regular or special session. A short-term declaration is for water shortage conditions expected for a duration of 45 days or less.

STAGE 1 – NORMAL WATER SUPPLY

1. Water shall be used for beneficial purposes only; all unnecessary and wasteful uses of water are prohibited.

2. Water shall be confined to the customer's property and shall not be allowed to run-off to adjoining properties or to the roadside ditch or gutter. Care shall be taken not to water past the point of saturation.

3. Free-flowing hoses for all uses are prohibited. Automatic shut-off devices shall be attached on any hose or filling apparatus in use.

4. Leaking customer pipes or faulty sprinklers shall be repaired within five (5) working days or less if warranted by the severity of the problem.

5. All pools, spas, and ornamental fountains/ponds shall be equipped with a recirculation pump and shall be constructed to be leak-proof. Pool draining and refilling shall be allowed only for health, maintenance, or structural considerations.

6. Washing streets, parking lots, driveways, sidewalks, or buildings, except as necessary for health, esthetic or sanitary purposes, is prohibited.

7. Customers are encouraged to take advantage of the water agency's conservation programs and rebates.

STAGE 2 – WATER ALERT

1. Water shall be used for beneficial purposes only; all unnecessary and wasteful uses of water are prohibited.

2. Water shall be confined to the customer's property and shall not be allowed to run-off to adjoining properties or to the roadside ditch or gutter. Care shall be taken not to water past the point of saturation.

3. Free-flowing hoses for all uses are prohibited. Automatic shut-off devices shall be attached on any hose or filling apparatus in use.

4. Leaking customer pipes or faulty sprinklers shall be repaired within five (5) working days or less if warranted by the severity of the problem.

5. All pools, spas, and ornamental fountains/ponds shall be equipped with a recirculation pump and shall be constructed to be leak-proof. Pool draining and refilling shall be allowed only for health, maintenance, or structural considerations.

6. Washing streets, parking lots, driveways, sidewalks, or buildings, except as necessary for health, esthetic or sanitary purposes, is prohibited.

7. Customers are encouraged to take advantage of the water agency's conservation programs and rebates.

8. Reduce landscape and pasture irrigation by 5 – 10%. Customers with 'smart" irrigation timers or controllers are asked to set their controllers to achieve 90 to 95% of the evapotranspiration (ET) rate. Drip irrigation systems are excluded from this requirement.

9. Reduce indoor water use by 5 – 10%. Contact your water provider for tips and techniques to reduce indoor water use.

10. Users of construction meters and fire hydrant meters will be monitored for efficient water use.

STAGE 3 – WATER WARNING

1. Water shall be used for beneficial purposes only; all unnecessary and wasteful uses of water are prohibited.

2. Water shall be confined to the customer's property and shall not be allowed to run-off to adjoining properties or to the roadside ditch or gutter. Care shall be taken not to water past the point of saturation.

3. Free-flowing hoses for all uses are prohibited. Automatic shut-off devices shall be attached on any hose or filling apparatus in use.

4. Leaking customer pipes or faulty sprinklers shall be repaired within two (2) working days or less if warranted by the severity of the problem.

5. All pools, spas, and ornamental fountains/ponds shall be equipped with a recirculation pump and shall be constructed to be leak-proof. Pool draining and refilling shall be allowed only for health, maintenance, or structural considerations.

6. Washing streets, parking lots, driveways, sidewalks, or buildings, except as necessary for health, esthetic or sanitary purposes, is prohibited.

7. Customers are encouraged to take advantage of the water agency's conservation programs and rebates.

8. Reduce landscape and pasture irrigation by 11 – 25%. Customers with 'smart" irrigation timers or controllers are asked to set their controllers to achieve 75 to 89% of the evapotranspiration (ET) rate. Drip irrigation systems are excluded from this requirement.

9. Reduce indoor water use by 11 – 25%. Contact your water provider for tips and techniques to reduce indoor water use.

10. Restaurants shall serve water only upon request.

11. Users of construction meters and fire hydrant meters will be monitored for efficient water use.

STAGE 4 – WATER CRISIS: SHORT-TERM

The declaration of Short-Term Stage 4 water conservation requirements may be declared by the agency's General Manager or his/her designee and subject to ratification by the agency's Board of Directors in a regular or special session. A short-term declaration is for water shortage conditions expected for a duration of 45 days or less.

1. Water shall be used for beneficial purposes only; all unnecessary and wasteful uses of water are prohibited.

2. Water shall be confined to the customer's property and shall not be allowed to run-off to adjoining properties or to the roadside ditch or gutter. Care shall be taken not to water past the point of saturation.

3. Irrigating of ornamental landscapes or turf shall be limited to a maximum of THREE DAYS PER WEEK based on an ODD-EVEN schedule. Customers with street addresses that end with an ODD number may irrigate only on TUESDAYS, THURSDAYS, and SATURDAYS. Customers with street addresses that end with an EVEN number may irrigate only on WEDNESDAYS, FRIDAYS, and SUNDAYS. NO irrigating is permitted on MONDAYS.

4. The application of potable water to outdoor landscapes during and within 48 hours after measurable rainfall is prohibited.

5. Irrigating of ornamental turf on public street medians is prohibited.

6. Free-flowing hoses for all uses are prohibited. Automatic shut-off devices shall be attached on any hose or filling apparatus in use.

7. Leaking customer pipes or faulty sprinklers shall be repaired within 24 hours or less if warranted by the severity of the problem.

8. All pools, spas, and ornamental fountains/ponds shall be equipped with a recirculation pump and shall be constructed to be leak-proof. Pool draining and refilling shall be allowed only for health, maintenance, or structural considerations.

9. Washing streets, parking lots, driveways, sidewalks, or buildings, except as necessary for safety purposes, is prohibited.

10. Customers are encouraged to take advantage of the water agency's conservation programs and rebates.

11. Reduce landscape and pasture irrigation by 26 – 50%. Customers with 'smart" irrigation timers or controllers are asked to set their controllers to achieve 50 to 74% of the evapotranspiration (ET) rate. Drip irrigation systems are NOT excluded from this requirement.

12. Reduce indoor water use by 26 – 50%. Contact your water provider for tips and techniques to reduce indoor water use.

13. Restaurants shall serve water only upon request.

14. Flushing of sewers or fire hydrants is prohibited except in case of emergency and for essential operations.

15. Irrigating outside of newly constructed homes and buildings that is not delivered by drip or micro spray systems is prohibited.

STAGE 4 – WATER CRISIS: LONG-TERM

The declaration of Long-Term Stage 4 water conservation requirements will be declared by the agency's Board of Directors in a regular or special session. A Long-term declaration is for water shortage conditions expected for a duration of more than 45 days.

1. Water shall be used for beneficial purposes only; all unnecessary and wasteful uses of water are prohibited.

2. Water shall be confined to the customer's property and shall not be allowed to run-off to adjoining properties or to the roadside ditch or gutter. Care shall be taken not to water past the point of saturation.

3. Irrigating of ornamental landscapes or turf shall be limited to a maximum of THREE DAYS PER WEEK based on an ODD-EVEN schedule. Customers with street addresses that end with an ODD number may irrigate only on TUESDAYS, THURSDAYS, and SATURDAYS. Customers with street addresses that end with an EVEN number may irrigate only on WEDNESDAYS, FRIDAYS, and SUNDAYS. NO irrigating is permitted on MONDAYS.

4. The application of potable water to outdoor landscapes during and within 48 hours after measurable rainfall is prohibited.

5. Irrigating of ornamental turf on public street medians is prohibited.

6. Free-flowing hoses for all uses are prohibited. Automatic shut-off devices shall be attached on any hose or filling apparatus in use.

7. Leaking customer pipes or faulty sprinklers shall be repaired within 24 hours or less if warranted by the severity of the problem.

8. All pools, spas, and ornamental fountains/ponds shall be equipped with a recirculation pump and shall be constructed to be leak-proof. Pool draining and refilling shall be allowed only for health, maintenance, or structural considerations.

9. Washing streets, parking lots, driveways, sidewalks, or buildings, except as necessary for safety purposes, is prohibited.

10. Customers are encouraged to take advantage of the water agency's conservation programs and rebates.

11. Reduce landscape and pasture irrigation by 26 – 50%. Customers with 'smart" irrigation timers or controllers are asked to set their controllers to achieve 50 to 74% of the evapotranspiration (ET) rate. Drip irrigation systems are NOT excluded from this requirement.

12. Reduce indoor water use by 26 – 50%. Contact your water provider for tips and techniques to reduce indoor water use.

13. Restaurants shall serve water only upon request.

14. Flushing of sewers or fire hydrants is prohibited except in case of emergency and for essential operations.

15. Irrigating outside of newly constructed homes and buildings that is not delivered by drip or micro spray systems is prohibited.

STAGE 5 – WATER EMERGENCY: SHORT-TERM

The declaration of Short-Term Stage 5 water conservation requirements may be declared by the agency's General Manager or his/her designee and subject to ratification by the agency's Board of Directors in a regular or special session. A short-term declaration is for water shortage conditions expected for a duration of 45 days or less.

1. Water shall be used for beneficial purposes only; all unnecessary and wasteful uses of water are prohibited.

2. Landscape and pasture irrigation is prohibited.

3. Free-flowing hoses for all uses are prohibited. Automatic shut-off devices shall be attached on any hose or filling apparatus in use.

4. Leaking customer pipes or faulty sprinklers shall be repaired immediately. Water service will be suspended until repairs are made.

5. All pools, spas, and ornamental fountains/ponds shall be equipped with a recirculation pump and shall be constructed to be leak-proof. No potable water from the District's system shall be used to fill or refill swimming pools, artificial lakes, ponds or streams. Water use for ornamental ponds and fountains is prohibited.

6. Washing streets, parking lots, driveways, sidewalks, or buildings, except as necessary for safety purposes, is prohibited.

7. Customers are encouraged to take advantage of the water agency's conservation programs and rebates.

8. Reduce indoor water use by more than 50%. Contact your water provider for tips and techniques to reduce indoor water use.

9. Restaurants shall serve water only upon request.

10. Water flow for testing and construction purposes from water agency fire hydrants and blow-offs is prohibited. No potable water from the District's system shall be used for construction purposes including but not limited to dust control, compaction, or trench jetting. Use of reclaimed water for construction purposes is encouraged.

11. Flushing of sewers or fire hydrants is prohibited except in case of emergency and for essential operations.

12. Installation of new turf or landscaping is prohibited.

13. Automobiles or equipment shall be washed only at commercial establishments that use recycled or reclaimed water.

STAGE 5 – WATER EMERGENCY: LONG-TERM

The declaration of Long-Term Stage 5 water conservation requirements will be declared by the agency's Board of Directors in a regular or special session. A Long-term declaration is for water shortage conditions expected for a duration of more than 45 days.

1. Water shall be used for beneficial purposes only; all unnecessary and wasteful uses of water are prohibited.

2. Landscape and pasture irrigation is prohibited.

3. Free-flowing hoses for all uses are prohibited. Automatic shut-off devices shall be attached on any hose or filling apparatus in use.

4. Leaking customer pipes shall be repaired immediately. Water service will be suspended until repairs are made.

5. All pools, spas, and ornamental fountains/ponds shall be equipped with a recirculation pump and shall be constructed to be leak-proof. No potable water from the District's system shall be used to fill or refill swimming pools, artificial lakes, ponds or streams. Water use for commercial and multi-family residential ornamental ponds and fountains is prohibited.

6. Washing streets, parking lots, driveways, sidewalks, or buildings, except as necessary for safety purposes, is prohibited.

7. Customers are encouraged to take advantage of the water agency's conservation programs and rebates.

8. Reduce indoor water use by more than 50%.

9. Restaurants shall serve water only upon request.

10. Water flow for testing and construction purposes from water agency fire hydrants and blow-offs is prohibited. No potable water from the District's system shall be used for construction purposes including but not limited to dust control, compaction, or trench jetting. Use of reclaimed water for construction purposes is encouraged.

11. Flushing of sewers or fire hydrants is prohibited except in case of emergency and for essential operations.

12. Installation of new turf or landscaping is prohibited.

13. Automobiles or equipment shall be washed only at commercial establishments that use recycled or reclaimed water.

14. New connections to the District water distribution system will not be allowed.

15. Water Crisis/Emergency tiered pricing will be implemented.

16. No commitments will be made to provide service for new water service connections.

ENFORCEMENT

The District shall terminate water service to the property of a customer who receives two violations for noncompliance with conditions set forth herein. ***In addition, as a condition of water service, the District shall require the installation of a water meter, and shall charge the approved metered service and commodity rate for water based on the actual volume of deliveries, as measured by a water meter.***

1. Upon observation by authorized District personnel of a water waste condition, the District shall issue a warning with the first two observations by personal service or by notice left on premises requesting compliance with the District's conservation rules.

2. Upon observation by authorized District personnel of a third water waste condition at the same property address, the customer shall be issued a violation by personal service or by notice left on premise and a copy mailed to customer at the premises. The customer shall be notified, in writing, that if an additional observation of water waste is documented, the District shall issue a 2^{nd} violation notice, ***require the installation of a water meter,*** and begin termination actions of water service to the subject address. In lieu of service termination, the District may opt to impose a penalty charge for water waste. The District shall indicate in writing said penalty charge, if applicable***, and shall include the approved metered service and commodity rates*** in the violation notice. If the customer is not the property owner, a copy of the writing shall be mailed to the owner of record.

3. Upon observation by authorized District personnel of a fourth, or subsequent water waste condition at the same property address, the customer shall be issued a violation notice by personal service or by notice left on premises and a copy mailed to the customer at the premises. The owner/customer shall then be notified, in writing by certified mail, that the water service to the subject address shall be terminated in fifteen (15) days. Reconnection to the District's system after said termination procedure shall be subject to a reconnect charge equal to the District's actual incurred costs to date, including penalty fees, or to a minimum charge as follows, whichever is greater:

1st reconnect charge	$100.00 per service connection
2nd reconnect charge	$200.00 per service connection
3rd reconnect charge	$300.00 per service connection
4th reconnect charge	$400.00 per service connection

   In addition, as a condition of water service, the District shall install a water meter and shall charge the approved metered service and commodity rate for water based on the actual volume of deliveries to the premises.

4. Subsequent violations shall be treated in the same manner as a 4^{th} water waste or 2^{nd} violation (subsequent reconnect charges applied).

5. Prior to the scheduled termination, the customer may choose to pay the District's costs associated with the subject action, and any penalty costs in lieu of terminating service. The customer may, in writing, request a meeting with the District's General Manager to discuss the proposed termination of service. Payment of the penalty charge and fees shall avoid said termination and shall be considered a "waiver of appeal".

6. If the customer requests a meeting with the General Manager, and said meeting does not resolve the proposed termination of service to the customer's satisfaction, the customer may request a hearing before the Board of Directors. Such request shall be made in writing and delivered to the District office within five (5) days from the date of the meeting between the customer and the District's General Manager.

7. If such request is made for a hearing before the Board, the matter shall be scheduled at the earliest possible date. A written notice of such hearing shall be mailed to customer at the premises at least ten (10) days prior to the date of such hearing.

8. Reconnection to the District's system after said termination procedure shall be subject to a reconnect charges equal to the District's actual incurred costs to date, including penalty fees, and other related charges. The District must receive payment for said charges before the water service is restored.

9. The State Water Resources Control Board shall be notified upon termination and reinstatement of service.

If the customer is not issued a warning or violation for a period of one year from the date of the last observed conservation rules violation, enforcement actions shall revert to paragraph (1) of this section

Attachment I: Fair Oaks Water District Rate and Fee Schedule

FAIR OAKS
WATER DISTRICT

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Rates & Fees

The District Board of Directors adopted the current schedule of fees and charges on December 14, 2015, through approval of 2016 District Budget. Rates are applicable for all residential, commercial, institutional, and irrigation services within District boundaries.

Bimonthly Fixed Service Charges

Meter Size (inch)	2014	2015	2016
1	$65.10	$65.10	$65.10
1.5	$119.31	$119.31	$119.31
2	$184.28	$184.28	$184.28
3	$357.56	$357.56	$357.56
4	$552.61	$552.61	$552.61
6	$1,093.84	$1,093.84	$1,093.84
8	$1,744.82	$1,744.82	$1,744.82
10	$2,718.87	$2,718.87	$2,718.87

Back to top

Commodity Rate

	2014	2015	2016
Commodity Rate per CCF (1)	$0.45	$0.45	$0.45

(1) One CCF is equal to 100 cubic feet. 100 cubic feet is equal to 748 gallons. The commodity

rate is invoiced based upon CCFs used.

Back to top

Shared Metered Services

User Category	2014	2015	2016
Shared meter service(s) – multiple parcel community residential domestic(3)	$65.10 per parcel + consumption(4)	$65.10 per parcel + consumption(4)	$65.10 per parcel + consumption(4)
Shared meter service(s) – multiple parcel offices commercial domestic	Meter service rate(5)	Meter service rate(5)	Meter service rate(5)

(1) Customers outside the District's service area will pay an additional 50% of the above water rates or as otherwise determined by Fair Oaks Water District.

(2) One CCF is equal to 100 cubic feet. 100 cubic feet is equal to 748 gallons. The commodity rate is invoiced based upon CCFs used.

(3) Requires separation of common area and irrigation water systems with each irrigation water service billed based on meter size plus consumption.

(4) Consumption measured by a master meter with one responsible party in billing for the master meter.

(5) Each connection will be billed a fixed service charge based on meter size plus consumption with one responsible party in billing for the account.

Back to top

New Business Fees

Connection Fees	2016
1″ service	$4,643
1.5″ service	$10,447
2″ service	$18,572

3″ service	$33,430
4″ service	$59,430
6″ service	$133,718
8″ service	$237,722
10″ service	$371,440
Tapping and Service Installation: 1″ service	time and materials
Tapping and Service Installation: 1.5″ service	time and materials
Tapping and Service Installation: 2″ service	time and materials
Hydrant Flow Testing: Fire flow test	$200
Hydrant Flow Testing: Fire flow letter	$75
Backflow Device Testing: Test and tag	$125
Inspection per hour (1-hour minimum)	$90
Development Fees: Application for water service fee	$50
Development Fees: Plan checking (minimum)	$300
Development Fees: Plan checking – additional (per hour)	$100
Construction fee	time and materials
Construction meter deposit (with certified backflow device)	$1,500
Construction meter daily charge	$5.00
Cost of construction water (per CCF)	$1.66
Bacteriological sampling (including lab cost)	$150
Additional testing (same location and time)	$50

Back to top

Other Fees

	2016
Return check fee	$25
Meter Service : Meter re-read fee	$25
Meter Service : Meter test fee	$50
Meter Service : Reduce service size (1.5-inch to 1-inch)	$250

Meter Service : Reduce service size (2-inch to 1-inch)	$250
Meter Service : Reduce service size (2-inch to 1.5-inch)	$300
Late penalty fee – assessed after the payment due date	10%
Lien processing fee	$25
Disconnect Service : Final notice service fee	$19
Disconnect service fee	$61
Deposit	$125

Back to top

Dedicated Fire Service Rates

The dedicated fire service is a connection to water system that is specifically designed for the suppression of fire on the premises. Water used for any other purposes other than fire suppression is not authorized. Installation of an approved backflow device is required in accordance with District Resolution #97-09.

Bimonthly Service Charges

Service Size	2016
2-inch	$15.00
3-inch	$30.00
4-inch	$45.00
6-inch	$90.00
8-inch	$145.00
10-inch	$225.00

Attachment J: Fair Oaks Water District's CUWCC BMP Annual Reports for 2013-2014

FAIR OAKS
WATER DISTRICT

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EMAIL CORRESPONDENCE CONFIRMING COMPLIANCE WITH THE CUWCC MOU

From: BMP
Sent: Thursday, January 28, 2016 4:19 PM
To: shuckaby@fowd.com
Cc: Luke Sires
Subject: BMP Annual coverage report

Dear Fair Oaks Water District,

Thank you for submitting your BMP reports to the Council. Please find attached the BMP Coverage reports for each year submitted as part of the 2013-2014 reporting period.[1] After reviewing the coverage reports, please reply to this email or contact us at bmp@cuwcc.org to let us know at least one of the following:

- any questions you may have about the coverage report,
- you would like to request that we open individual BMP forms so that you can update the reported data, or
- the attached draft coverage reports are approved.

If the coverage status in the reports does not match that the coverage indicated in the online reporting database, that is because the online reporting database coverage calculation is provisional. The coverage listed in the draft reports attached has been reviewed by staff and we believe it is accurate. If you think an error has been made in determining the coverage for any of the BMPs, please let us know and we will review coverage together.
If you would like us to open up the BMP forms to be edited, please let us know which year and which BMP form you would like to edit.

Click here to view an outline of the BMP Reporting and Coverage Report Workflow. Approved coverage reports will be uploaded to our website at: http://cuwcc.org/Resources/Reporting-Database - this is also our primary BMP Reporting Resources page.

Below is a summary of the draft BMP coverage reports with notes.

Fair Oaks Water District - USBR	2014	2014
BMP	Coverage Status	Notes
1.1	On Track	
1.2	On Track	
1.3	On Track	
1.4	On Track	
2.1	On Track	
2.2	On Track	
GPCD	On Track	

Thank you,
Cindy

Cindy Starr
California Urban Water Conservation Council
716 10th Street, Suite 200
Sacramento, CA 95814-4406

CUWCC BMP Retail Coverage Report 2014

Foundational Best Managemant Practices for Urban Water Efficiency

BMP 1.1 Operation Practices

ON TRACK

120 Fair Oaks Water District

1. Conservation Coordinator provided with necessary resources to implement BMPs?

Name: Shawn Huckaby

Title: Customer Service Manager

Email: shuckaby@fowd.com

2. Water Waste Prevention Documents

WW Document Name	WWP File Name	WW Prevention URL	WW Prevention Ordinance Terms Description
Option A Describe the ordinances or terms of service adopted by your agency to meet the water waste prevention requirements of this BMP.	Copy of Fair Oaks Water District_Fair Oaks Water District_120_ Operations Practices_BMP1.1_ Water Waste Prevention.pdf		Fair Oaks Water District has a Board approved conservation policy for water waste prevention that has mandatory requirements Stages 1-5 with enforcement.
Option B Describe any water waste prevention ordinances or requirements adopted by your local jurisdiction or regulatory agencies within your service area.			
Option C Describe any documentation of support for legislation or regulations that prohibit water waste.			
Option D Describe your agency efforts to cooperate with other entities in the adoption or enforcement of local requirements consistent with this BMP.			
Option E Describe your agency support positions with respect to adoption of legislation or regulations that are consistent with this BMP.			
Option F Describe your agency efforts to support local ordinances that establish permits requirements for water efficient design in new development.			

At Least As effective As No

Exemption No

Comments:

CUWCC BMP Retail Coverage Report 2014

Foundational Best Managemant Practices for Urban Water Efficiency

BMP 1.1 Operation Practices **ON TRACK**

CUWCC BMP Coverage Report 2014

Foundational Best Management Practices For Urban Water Efficiency

BMP 1.2 Water Loss Control **ON TRACK**

120 Fair Oaks Water District

Completed Standard Water Audit Using AWWA Software?	Yes
AWWA File provided to CUWCC?	Yes
Copy of Copy of Fair Oaks Water District Water Loss BMP1.2 AWWA Water Audit.xls	
AWWA Water Audit Validity Score?	83
Complete Training in AWWA Audit Method	Yes
Complete Training in Component Analysis Process?	Yes
Component Analysis?	Yes
Repaired all leaks and breaks to the extent cost effective?	Yes
Locate and Repar unreported leaks to the extent cost effective?	Yes
Maintain a record keeping system for the repair of reported leaks, including time of report, leak location, type of leaking pipe segment or fitting, and leak running time from report to repair.	Yes

Provided 7 Types of Water Loss Control Info

Leaks Repairs	Value Real Losses	Value Apparent Losses	Miles Surveyed	Press Reduction	Cost Of Interventions	Water Saved (AF)
52	38.744	510.293	0	True	2140000	

At Least As effective As No

NA

Exemption No

Comments:

CUWCC BMP Coverage Report 2014

Foundational Best Management Practices For Urban Water Efficiency

BMP 1.3 Metering With Commodity

ON TRACK

120 Fair Oaks Water District

Numbered Unmetered Accounts	No
Metered Accounts billed by volume of use	Yes
Number of CII Accounts with Mixed Use Meters	300
Conducted a feasibility study to assess merits of a program to provide incentives to switch mixed-use accounts to dedicated landscape meters?	Yes
Feasibility Study provided to CUWCC?	Yes

Date: 8/12/2013

Uploaded file name: Fair Oaks Water District_Fair Oaks Water District_120_BMP1_3_Feasibility.pdf

Completed a written plan, policy or program to test, repair and replace meters	Yes

At Least As effective As No

NA

Exemption No

Comments:

NA

CUWCC BMP Coverage Report 2014

Foundational Best Management Practices For Urban Water Efficiency

BMP 1.4 Retail Conservation Pricing

On Track

120 Fair Oaks Water District

Implementation (Water Rate Structure)

Customer Class	Water Rate Type	Conserving Rate?	(V) Total Revenue Comodity Charges	(M) Total Revenue Fixed Carges
Single-Family	Uniform	Yes	1396171.61	5122930.99
Multi-Family	Uniform	Yes	135571.95	383635.01
Dedicated Irrigation	Uniform	Yes	79775.27	163198.19
Institutional	Uniform	Yes	63051.02	133757.32
Commercial	Uniform	Yes	60875.1	223021.83
			1735444.95	**6026543.34**

Calculate: V / (V + M) **22 %**

Implementation Option: Use Annual Revenue As Reported

☐ Use 3 years average instead of most recent year

Canadian Water and Wastewater Association

Upload file:

Agency Provide Sewer Service: No

At Least As effective As No

NA

Exemption No

Comments:

CUWCC BMP Coverage Report 2014

Foundational Best Management Practices For Urban Water Efficiency

BMP 2.1 Public Outreach

ON TRACK

120 **Fair Oaks Water District** **Retail**

Does your agency perform Public Outreach programs? Yes

The list of wholesale agencies performing public outreach which can be counted to help the agency comply with the BMP

NA

The name of agency, contact name and email address if not CUWCC Group 1 members

Did at least one contact take place during each quater of the reporting year? No

Public Outreach Program List	Number
General water conservation information	13
Email Messages	6
General water conservation information	14
Flyers and/or brochures (total copies), bill stuffers, messages printed on bill, information packets	1
Total	**34**

Did at least one contact take place during each quater of the reporting year? Yes

Number Media Contacts	Number
Written editorials	1
Radio contacts	24
Newspaper contacts	41
News releases	13
Articles or stories resulting from outreach	114
Total	**193**

Did at least one website update take place during each quater of the reporting year? Yes

Public Information Program Annual Budget

Annual Budget Category	Annual Budget Amount
	113000
Total Amount:	**113000**

Description of all other Public Outreach programs

Comments:

At Least As effective As No

CUWCC BMP Coverage Report 2014

Foundational Best Management Practices For Urban Water Efficiency

BMP 2.1 Public Outreach ON TRACK

Exemption	No	0

CUWCC BMP Coverage Report 2014

Foundational Best Management Practices For Urban Water Efficiency

BMP 2.2 School Education Programs

ON TRACK

120 Fair Oaks Water District **Retail**

Does your agency implement School Education programs? No

The list of wholesale agencies performing public outreach which can be counted to help the agency comply with the BMP

N/A

Materials meet state education framework requirements? Yes

A student newspaper supplement called be "Water Smart News' with teachers guide and regional focused lessons. An updated be Water Smart News teacher's guide provides regional focus and lessons based on the California Standards.

Materials distributed to K-6? Yes

A student newspaper supplement, a CA waterways map provided by DWR, and K-4 Mr. Leaky conservation book. Project WET informational handout.

Materials distributed to 7-12 students? Yes (Info Only)

A student newspaper supplement, a CA waterways map provided by DWR, and K-4 Mr. Leaky conservation book. Project WET informational handout.

Annual budget for school education program: 31000.00

Description of all other water supplier education programs

FOWD participated in RWA program (information listed above).
FOWD water conservation poster contest for grades 4-6. Six schools in the District service area participated.
FOWD presented a water conservation lesson to three participating schools.

Comments:

At Least As effective As No

Exemption No 0

CUWCC BMP Coverage Report 2014

120 Fair Oaks Water District

Baseline GPCD: 329.84

GPCD in 2014 235.88

GPCD Target for 2018: 270.50

Biennial GPCD Compliance Table **ON TRACK**

		Target		Highest Acceptable Bound	
Year	Report	% Base	GPCD	% Base	GPCD
2010	1	96.4%	**318.00**	100%	**329.80**
2012	2	92.8%	**306.10**	96.4%	**318.00**
2014	3	89.2%	**294.20**	92.8%	**306.10**
2016	4	85.6%	**282.30**	89.2%	**294.20**
2018	5	82.0%	**270.50**	82.0%	**270.50**

CUWCC BMP Coverage Report 2013

120 Fair Oaks WD

Baseline GPCD (1997-2006) 294

GPCD in 2013 301.5

GPCD Target for 2018: 270.50

Biennial GPCD Compliance Table

ON TRACK

Year	Report	Target % Base	Target GPCD	Highest Acceptable Bound % Base	Highest Acceptable Bound GPCD
2010	1	96.4%	**318.00**	100%	**329.80**
2012	2	92.8%	**306.10**	96.4%	**318.00**
2014	3	89.2%	**294.20**	92.8%	**306.10**
2016	4	85.6%	**282.30**	89.2%	**294.20**
2018	5	82.0%	**270.50**	82.0%	**270.50**

CUWCC BMP Retail Coverage Report 2013

Foundational Best Managemant Practices for Urban Water Efficiency

BMP 1.1 Operation Practices

ON TRACK

120 Fair Oaks Water District

1. Conservation Coordinator provided with necessary resources to implement BMPs?

Name: Shawn Huckaby

Title: Operations Superintendent

Email: shuckaby@fowd.com

2. Water Waste Prevention Documents

WW Document Name	WWP File Name	WW Prevention URL	WW Prevention Ordinance Terms Description
Option A Describe the ordinances or terms of service adopted by your agency to meet the water waste prevention requirements of this BMP.	Copy1 of Fair Oaks Water District_Fair Oaks Water District_120_ Operations Practices_BMP1.1_ Water Waste Prevention.pdf		Fair Oaks Water District has a Board approved conservation policy for water waste prevention that has mandatory requirements Stages 1-5 with enforcement.
Option B Describe any water waste prevention ordinances or requirements adopted by your local jurisdiction or regulatory agencies within your service area.			N/A
Option C Describe any documentation of support for legislation or regulations that prohibit water waste.			N/A
Option D Describe your agency efforts to cooperate with other entities in the adoption or enforcement of local requirements consistent with this BMP.			N/A
Option E Describe your agency support positions with respect to adoption of legislation or regulations that are consistent with this BMP.			N/A
Option F Describe your agency efforts to support local ordinances that establish permits requirements for water efficient design in new development.			N/A

At Least As effective As No

N/A

Exemption No

CUWCC BMP Retail Coverage Report 2013

Foundational Best Managemant Practices for Urban Water Efficiency

BMP 1.1 Operation Practices **ON TRACK**

Comments:

N/A

CUWCC BMP Coverage Report 2013

Foundational Best Management Practices For Urban Water Efficiency

BMP 1.2 Water Loss Control

ON TRACK

120 Fair Oaks Water District

Completed Standard Water Audit Using AWWA Software? Yes

AWWA File provided to CUWCC? Yes

Fair Oaks Water District _Fair Oaks Water District_120_Water Loss Control_BMP1.2 2013_AWWA Water Audit.xls

AWWA Water Audit Validity Score? 82

Complete Training in AWWA Audit Method Yes

Complete Training in Component Analysis Process? Yes

Component Analysis? Yes

Repaired all leaks and breaks to the extent cost effective? Yes

Locate and Repar unreported leaks to the extent cost effective? Yes

Maintain a record keeping system for the repair of reported leaks, including time of report, leak location, type of leaking pipe segment or fitting, and leak running time from report to repair. Yes

Provided 7 Types of Water Loss Control Info

Leaks Repairs	Value Real Losses	Value Apparent Losses	Miles Surveyed	Press Reduction	Cost Of Interventions	Water Saved (AF)
69	2787	694497	0	True	702995	

At Least As effective As No

N/A

Exemption No

Comments:

N/A

CUWCC BMP Coverage Report 2013

Foundational Best Management Practices For Urban Water Efficiency

BMP 1.3 Metering With Commodity

ON TRACK

120 Fair Oaks Water District

Numbered Unmetered Accounts	No
Metered Accounts billed by volume of use	Yes
Number of CII Accounts with Mixed Use Meters	300
Conducted a feasibility study to assess merits of a program to provide incentives to switch mixed-use accounts to dedicated landscape meters?	Yes
Feasibility Study provided to CUWCC?	Yes

Date: 8/12/2013

Uploaded file name: Copy of Fair Oaks Water District_Fair Oaks Water District_120_BMP1_3_Feasibility.pdf

Completed a written plan, policy or program to test, repair and replace meters	Yes

At Least As effective As No

N/A

Exemption No

Comments:

N/A

CUWCC BMP Coverage Report 2013

Foundational Best Management Practices For Urban Water Efficiency

BMP 1.4 Retail Consrvation Pricing

On Track

120 Fair Oaks Water District

Implementation (Water Rate Structure)

Customer Class	Water Rate Type	Conserving Rate?	(V) Total Revenue Comodity Charges	(M) Total Revenue Fixed Carges
Single-Family	Uniform	Yes	1811883.07	5115537.47
Multi-Family	Uniform	Yes	156192.75	385258.2
Commercial	Uniform	Yes	72958.23	229520.54
Institutional	Uniform	Yes	93742.62	150576.3
Dedicated Irrigation	Uniform	Yes	83141.93	137085.89
			2217918.6	**6017978.4**

Calculate: V / (V + M) **27 %**

Implementation Option: Use Annual Revenue As Reported

☐ Use 3 years average instead of most recent year

Canadian Water and Wastewater Association

Upload file:

Agency Provide Sewer Service: No

At Least As effective As No

N/A

Exemption No

Comments:

N/A

CUWCC BMP Coverage Report 2013

Foundational Best Management Practices For Urban Water Efficiency

BMP 2.1 Public Outreach

ON TRACK

120 **Fair Oaks Water District** **Retail**

Does your agency perform Public Outreach programs? Yes

The list of wholesale agencies performing public outreach which can be counted to help the agency comply with the BMP

N/A

The name of agency, contact name and email address if not CUWCC Group 1 members

Did at least one contact take place during each quater of the reporting year? No

Public Outreach Program List	Number
Newsletter articles on conservation	5
General water conservation information	16
Flyers and/or brochures (total copies), bill stuffers, messages printed on bill, information packets	1
Website	2
Total	**24**

Did at least one contact take place during each quater of the reporting year? Yes

Number Media Contacts	Number
Articles or stories resulting from outreach	9
News releases	12
Radio contacts	6
Television contacts	5
Newspaper contacts	2
Total	**34**

Did at least one website update take place during each quater of the reporting year? Yes

Public Information Program Annual Budget

Annual Budget Category	Annual Budget Amount
	188500
Total Amount:	**188500**

Description of all other Public Outreach programs

Comments:

N/A

At Least As effective As No

CUWCC BMP Coverage Report 2013

Foundational Best Management Practices For Urban Water Efficiency

BMP 2.1 Public Outreach **ON TRACK**

Exemption	No	0

CUWCC BMP Coverage Report 2013

Foundational Best Management Practices For Urban Water Efficiency

BMP 2.2 School Education Programs

ON TRACK

120 Fair Oaks Water District **Retail**

Does your agency implement School Education programs? No

The list of wholesale agencies performing public outreach which can be counted to help the agency comply with the BMP

N/A

Materials meet state education framework requirements? Yes

A student newspaper supplement called be "Water Smart News' with teachers guide and regional focused lessons. An updated be Water Smart News teacher's guide provides regional focus and lessons based on the California Standards.

Materials distributed to K-6? Yes

A student newspaper supplement, a CA waterways map provided by DWR, and K-4 Mr. Leaky conservation book. Project WET informational handout.

Materials distributed to 7-12 students? Yes (Info Only)

A student newspaper supplement, a CA waterways map provided by DWR, and K-4 Mr. Leaky conservation book. Project WET informational handout.

Annual budget for school education program: 31000.00

Description of all other water supplier education programs

FOWD participated in RWA program (information listed above).
FOWD water conservation poster contest for grades 4-6. Six schools in the District service area participated.
FOWD presented a water conservation lesson to three participating schools.

Comments:

At Least As effective As No

Exemption No 0

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Attachment K: Notification Letters Regarding UWMP Preparation and UWMP Public Hearing

FAIR OAKS
WATER DISTRICT

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FAIR OAKS
WATER DISTRICT

March 3, 2016

Ms. Colleen McDuffee
Planning Manager
City of Citrus Heights
7927 Auburn Boulevard
Citrus Heights, CA 95610

Subject: Preparation of 2015 Urban Water Management Plan (UWMP) - 60-day Notification

Dear Ms. McDuffee:

In accordance with the California Water Code (CWC), Fair Oaks Water District (District) is notifying all cities and counties in the area that we provide water supplies that we are in the process of reviewing and considering amendments to our Urban Water Management Plan (UWMP), as required by the CWC at least every 5 years.

The District plans to prepare its 2015 UWMP and adopt it at one of our regularly scheduled Board Meetings. Prior to adopting the UWMP, the document will be made available for public inspection and a Public Hearing will be scheduled. Pursuant to CWC, you are receiving this notice at least 60-days prior to the Public Hearing.

The District expects to have a public draft of the 2015 UWMP available for review at least 2 weeks prior to the Public Hearing which is tentatively set for May 9, 2016. An additional notification letter will be sent to you once the public draft becomes available and once the date and time of the Public Hearing is confirmed.

Should you have any questions or concerns, please feel free to contact me at (916) 967-5723 or mnisenboym@fowd.com.

Sincerely,

Michael Nisenboym
Operations Manager
Fair Oaks Water District

Cc: Michael Rossiter, Peterson Brustad, Inc.

0326 Fair Oaks Boulevard
Fair Oaks, CA 95628
Tel: (916) 967-5723
Fax: (916) 967-0153
www.fowd.com

FAIR OAKS
WATER DISTRICT

March 3, 2016

Mr. Marcus Yasutake
Environmental & Water Resources Director
City of Folsom
50 Natoma Street
Folsom, CA 95630

Subject: Preparation of 2015 Urban Water Management Plan (UWMP) - 60-day Notification

Dear Mr. Yasutake:

In accordance with the California Water Code (CWC), Fair Oaks Water District (District) is notifying all cities and counties in the area that we provide water supplies that we are in the process of reviewing and considering amendments to our Urban Water Management Plan (UWMP), as required by the CWC at least every 5 years.

The District plans to prepare its 2015 UWMP and adopt it at one of our regularly scheduled Board Meetings. Prior to adopting the UWMP, the document will be made available for public inspection and a Public Hearing will be scheduled. Pursuant to CWC, you are receiving this notice at least 60-days prior to the Public Hearing.

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Should you have any questions or concerns, please feel free to contact me at (916) 967-5723 or mnisenboym@fowd.com.

Sincerely,

Michael Nisenboym
Operations Manager
Fair Oaks Water District

Cc: Michael Rossiter, Peterson Brustad, Inc.

.0326 Fair Oaks Boulevard
Fair Oaks, CA 95628
Tel: (916) 967-5723
Fax: (916) 967-0153
www.fowd.com

FAIR OAKS
WATER DISTRICT

March 3, 2016

Mr. Aaron Busch
Community Development Director
City of Ranch Cordova
2729 Prospect Park Drive
Rancho Cordova, CA 95670

Subject: Preparation of 2015 Urban Water Management Plan (UWMP) - 60-day Notification

Dear Mr. Busch:

In accordance with the California Water Code (CWC), Fair Oaks Water District (District) is notifying all cities and counties in the area that we provide water supplies that we are in the process of reviewing and considering amendments to our Urban Water Management Plan (UWMP), as required by the CWC at least every 5 years.

The District plans to prepare its 2015 UWMP and adopt it at one of our regularly scheduled Board Meetings. Prior to adopting the UWMP, the document will be made available for public inspection and a Public Hearing will be scheduled. Pursuant to CWC, you are receiving this notice at least 60-days prior to the Public Hearing.

The District expects to have a public draft of the 2015 UWMP available for review at least 2 weeks prior to the Public Hearing which is tentatively set for May 9, 2016. An additional notification letter will be sent to you once the public draft becomes available and once the date and time of the Public Hearing is confirmed.

Should you have any questions or concerns, please feel free to contact me at (916) 967-5723 or mnisenboym@fowd.com.

Sincerely,

Michael Nisenboym
Operations Manager
Fair Oaks Water District

Cc: Michael Rossiter, Peterson Brustad, Inc.

10326 Fair Oaks Boulevard
Fair Oaks, CA 95628
Tel: (916) 967-5723
Fax: (916) 967-0153
www.fowd.com

FAIR OAKS
WATER DISTRICT

March 3, 2016

Mr. Michael Grinstead
Senior Civil Engineer, Water Resources
County of Sacramento
827 7th Street, Suite 301
Sacramento, CA 95814

Subject: Preparation of 2015 Urban Water Management Plan (UWMP) - 60-day Notification

Dear Mr. Grinstead:

In accordance with the California Water Code (CWC), Fair Oaks Water District (District) is notifying all cities and counties in the area that we provide water supplies that we are in the process of reviewing and considering amendments to our Urban Water Management Plan (UWMP), as required by the CWC at least every 5 years.

The District plans to prepare its 2015 UWMP and adopt it at one of our regularly scheduled Board Meetings. Prior to adopting the UWMP, the document will be made available for public inspection and a Public Hearing will be scheduled. Pursuant to CWC, you are receiving this notice at least 60-days prior to the Public Hearing.

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Sincerely,

Michael Nisenboym
Operations Manager
Fair Oaks Water District

Cc: Michael Rossiter, Peterson Brustad, Inc.

0326 Fair Oaks Boulevard
Fair Oaks, CA 95628
Tel: (916) 967-5723
Fax: (916) 967-0153
www.fowd.com

FAIR OAKS
WATER DISTRICT

April 12, 2016

Ms. Colleen McDuffee
Planning Manager
City of Citrus Heights
7927 Auburn Boulevard
Citrus Heights, CA 95610

Subject: Fair Oaks Water District 2015 Urban Water Management Plan (UWMP) – Notice of Public Hearing

Dear Ms. McDuffee:

In accordance with the California Urban Water Management Planning Act, Fair Oaks Water District (District) is hosting a public hearing on Monday, May 9, 2016, beginning at 6:30pm, during our regularly scheduled Board Meeting at the District's office (address below). The purpose of the hearing is to allow community input and to adopt the District's 2015 Urban Water Management Plan (UWMP).

A public draft of the UWMP will be available by April 25, 2016 on the District's website (www.fowd.com) or at the District's office during normal business hours Monday through Friday, 8:00am to 4:30pm:

Fair Oaks Water District Office
10326 Fair Oaks Blvd.
Fair Oaks, CA 95628

Should you have any questions or concerns, please feel free to contact me at (916) 967-5723 or mnisenboym@fowd.com.

Sincerely,

Michael Nisenboym
Operations Manager
Fair Oaks Water District

Cc: Michael Rossiter, Peterson Brustad, Inc.

FAIR OAKS
WATER DISTRICT

April 12, 2016

Mr. Marcus Yasutake
Environmental & Water Resources Director
City of Folsom
50 Natoma Street
Folsom, CA 95630

Subject: Fair Oaks Water District 2015 Urban Water Management Plan (UWMP) – Notice of Public Hearing

Dear Mr. Yasutake:

In accordance with the California Urban Water Management Planning Act, Fair Oaks Water District (District) is hosting a public hearing on Monday, May 9, 2016, beginning at 6:30pm, during our regularly scheduled Board Meeting at the District's office (address below). The purpose of the hearing is to allow community input and to adopt the District's 2015 Urban Water Management Plan (UWMP).

A public draft of the UWMP will be available by April 25, 2016 on the District's website (www.fowd.com) or at the District's office during normal business hours Monday through Friday, 8:00am to 4:30pm:

Fair Oaks Water District Office
10326 Fair Oaks Blvd.
Fair Oaks, CA 95628

Should you have any questions or concerns, please feel free to contact me at (916) 967-5723 or mnisenboym@fowd.com.

Sincerely,

Michael Nisenboym
Operations Manager
Fair Oaks Water District

Cc: Michael Rossiter, Peterson Brustad, Inc.

FAIR OAKS
WATER DISTRICT

April 12, 2016

Mr. Michael Grinstead
Senior Civil Engineer, Water Resources
County of Sacramento
827 7th Street, Suite 301
Sacramento, CA 95814

Subject: Fair Oaks Water District 2015 Urban Water Management Plan (UWMP) – Notice of Public Hearing

Dear Mr. Grinstead:

In accordance with the California Urban Water Management Planning Act, Fair Oaks Water District (District) is hosting a public hearing on Monday, May 9, 2016, beginning at 6:30pm, during our regularly scheduled Board Meeting at the District's office (address below). The purpose of the hearing is to allow community input and to adopt the District's 2015 Urban Water Management Plan (UWMP).

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Fair Oaks, CA 95628

Should you have any questions or concerns, please feel free to contact me at (916) 967-5723 or mnisenboym@fowd.com.

Sincerely,

Michael Nisenboym
Operations Manager
Fair Oaks Water District

Cc: Michael Rossiter, Peterson Brustad, Inc.

.0326 Fair Oaks Boulevard
Fair Oaks, CA 95628
Tel: (916) 967-5723
Fax: (916) 967-0153
www.fowd.com

FAIR OAKS
WATER DISTRICT

April 12, 2016

Mr. Aaron Busch
Community Development Director
City of Ranch Cordova
2729 Prospect Park Drive
Rancho Cordova, CA 95670

Subject: Fair Oaks Water District 2015 Urban Water Management Plan (UWMP) – Notice of Public Hearing

Dear Mr. Busch:

In accordance with the California Urban Water Management Planning Act, Fair Oaks Water District (District) is hosting a public hearing on Monday, May 9, 2016, beginning at 6:30pm, during our regularly scheduled Board Meeting at the District's office (address below). The purpose of the hearing is to allow community input and to adopt the District's 2015 Urban Water Management Plan (UWMP).

A public draft of the UWMP will be available by April 25, 2016 on the District's website (www.fowd.com) or at the District's office during normal business hours Monday through Friday, 8:00am to 4:30pm:

Fair Oaks Water District Office
10326 Fair Oaks Blvd.
Fair Oaks, CA 95628

Should you have any questions or concerns, please feel free to contact me at (916) 967-5723 or mnisenboym@fowd.com.

Sincerely,

Michael Nisenboym
Operations Manager
Fair Oaks Water District

Cc: Michael Rossiter, Peterson Brustad, Inc.

Attachment L: Published Notices in the Sacramento Bee

FAIR OAKS
WATER DISTRICT

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The Sacramento Bee

P.O. Box 15779 • 2100 Q Street • Sacramento, CA 95852

FAIR OAKS WATER DISTRICT
10326 FAIR OAKS BLVD.
FAIR OAKS, CA 95628

DECLARATION OF PUBLICATION
(C.C.P. 2015.5)

COUNTY OF SACRAMENTO
STATE OF CALIFORNIA

I am a citizen of the United States and a resident of the County aforesaid; I am over the age of eighteen years, and not a party to or interest ed in the above entitled matter. I am the printer and principal clerk of the publisher of The Sacramento Bee, printed and published in the City of Sacramento, County of Sacramento, State of California, daily, for which said newspaper has been adjudged a newspaper of general circulation by the Superior Court of the County of Sacramento, State of California, under the date of September 26, 1994, Action No. 379071; that the notice of which the annexed is a printed copy, has been published in each issue thereof and not in any supplement thereof on the following dates, to wit:

APRIL 25, 2016
MAY 2, 2016

I certify (or declare) under penalty of perjury that the foregoing is true and correct and that this declaration was executed at Sacramento, California, on **MAY 2, 2016**

(Signature)

NO 322 PUBLIC NOTICE

NOTICE OF PUBLIC HEARING

In accordance with the California Urban Water Management Planning Act, Fair Oaks Water District (District) is hosting a public hearing on Monday, May 9, 2016, beginning at 6:30 PM, during our regularly scheduled Board Meeting at the District'soffice (address below). The purpose of the hearing is to allow community input and to adopt the District's 2015 Urban Water Management Plan (UWMP). A public draft of the UWMP will be available by April 25, 2016 on the District's website (www.fowd.com) or at the District's office during normal business hours Monday through Friday, 8:00 AM to 4:30 PM: Fair Oaks Water District Office, 10326 Fair Oaks Blvd., Fair Oaks, CA 95628.

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Attachment M: Board Resolution Adopting the 2015 Urban Water Management Plan

FAIR OAKS
WATER DISTRICT

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RESOLUTION NO. 16-06

A RESOLUTION OF THE BOARD OF DIRECTORS OF THE FAIR OAKS WATER DISTRICT

A RESOLUTION ADOPTING THE 2015 URBAN WATER MANAGEMENT PLAN

WHEREAS, the Fair Oaks Water District Urban Water Management Plan is prepared and submitted to fulfill the requirements of the California Urban Water Management Planning Act of 1983, Assembly Bill No. 797, Water Code Section 10610 et seq.; and

WHEREAS, the District has prepared and made available for public review a draft Urban Water Management Plan, and a properly noticed public hearing regarding said Plan was conducted by the Board of Directors on May 9, 2016; and

WHEREAS, the Board of Directors intends that the Plan shall serve as a guideline to assist the District in its efforts to encourage conservation and efficient use of water.

NOW, THEREFORE, BE IT RESOLVED by the Board of Directors of Fair Oaks Water District as follows:

1. That the 2015 Urban Water Management Plan is hereby adopted; and the District Secretary is hereby authorized and directed to file the plan with the California Department of Water Resources; and

2. The District General Manager is hereby directed to implement the program as set forth in the 2015 Urban Water Management Plan, subject to review and express authorization of the Board of Directors for actions requiring approval of the Board of Directors.

I certify that the foregoing Resolution was adopted by the Board of Directors of the Fair Oaks Water District at a Regular meeting held on the 13th day of June 2016, by the following vote:

AYES: Directors Marx, McRae, Sarkovich and Underwood

NOES:

ABSTAIN:

ABSENT:

Dave Underwood, President
Board of Directors

ATTEST:

Tom R. Gray, General Manager / Secretary

FAIR OAKS WATER DISTRICT
FAIR OAKS
SACRAMENTO
COUNTY
CALIFORNIA
ORGANIZED MARCH 26, 1917

Attachment N: DWR Standardized UWMP Tables for Retail Urban Water Suppliers

FAIR OAKS
WATER DISTRICT

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DWR STANDARDIZED UWMP TABLES FOR RETAIL URBAN WATER SUPPLIERS

Table 2-1 Retail Only: Public Water Systems			
Public Water System Number	Public Water System Name	Number of Municipal Connections 2015	Volume of Water Supplied 2015
3410009	Fair Oaks Water District	13,894	8,130
TOTAL		13894	8,130
NOTES: Volume in acre-feet per year.			

Table 2-2: Plan Identification (Select One)		
☑	Individual UWMP	
☐	Regional UWMP (RUWMP) *(checking this triggers the next line to appear)*	
	Select One:	
	☐	RUWMP includes a Regional Alliance
	☐	RUWMP does not include a Regional Alliance
NOTES:		

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

Table 2-4 Retail: Water Supplier Information Exchange
The retail supplier has informed the following wholesale supplier(s) of projected water use in accordance with CWC 10631.
Wholesale Water Supplier Name *(Add additional rows as needed)*
San Juan Water District (SJWD)
NOTES:

DWR STANDARDIZED UWMP TABLES FOR RETAIL URBAN WATER SUPPLIERS

Table 3-1 Retail: Population - Current and Projected						
Population Served	2015	2020	2025	2030	2035	2040*(opt)*
	35,114	37,659	38,587	39,537	40,510	--
NOTES: 2015 population based on DWR Population Tool. Projections beyond 2015 based on SACOG estimated growth rates within the District service area.						

Table 4-1 Retail: Demands for Potable and Raw Water - Actual			
Use Type *(Add additional rows as needed)*	2015 Actual		
Use Drop down list *May select each use multiple times These are the only Use Types that will be recognized by the WUEdata online submittal tool*	Additional Description *(as needed)*	Level of Treatment When Delivered *Drop down list*	Volume
Single Family		Drinking Water	6,034
Multi-Family		Drinking Water	626
Commercial		Drinking Water	281
Institutional/Governmental		Drinking Water	266
Landscape		Drinking Water	361
Other	O&M	Drinking Water	13
Other	Unaccounted	Drinking Water	549
TOTAL			8,130
NOTES: Units in acre-feet.			

DWR STANDARDIZED UWMP TABLES FOR RETAIL URBAN WATER SUPPLIERS

Table 4-2 Retail: Demands for Potable and Raw Water - Projected						
Use Type *(Add additional rows as needed)*	Additional Description *(as needed)*	Projected Water Use *Report To the Extent that Records are Available*				
Use Drop down list *May select each use multiple times* *These are the only Use Types that will be recognized by the WUEdata online submittal tool*		2020	2025	2030	2035	2040-opt
Single Family		8,732	8,947	9,167	9,393	--
Multi-Family		807	827	847	868	--
Commercial		382	398	413	430	--
Institutional/Governmental		408	424	441	458	--
Landscape		474	493	513	533	--
Other	O&M	30	31	32	33	--
Other	Unaccounted	935	960	985	1,011	--
TOTAL		11768	12080	12398	12726	0
NOTES: Units in acre-feet per year.						

Table 4-3 Retail: Total Water Demands						
	2015	2020	2025	2030	2035	2040 *(opt)*
Potable and Raw Water *From Tables 4-1 and 4-2*	8,130	11,768	12,080	12,398	12,726	0
Recycled Water Demand *From Table 6-4*	0	0	0	0	0	0
TOTAL WATER DEMAND	8,130	11,768	12,080	12,398	12,726	0
NOTES: Units in acre-feet/year.						

Table 4-4 Retail: 12 Month Water Loss Audit Reporting	
Reporting Period Start Date (mm/yyyy)	Volume of Water Loss
01/2015	447
NOTES: Units in acre-feet.	

Table 4-5 Retail Only: Inclusion in Water Use Projections	
Are Future Water Savings Included in Projections? (Refer to Appendix K of UWMP Guidebook) *Drop down list (y/n)*	No
If "Yes" to above, state the section or page number, in the cell to the right, where citations of the codes, ordinances, etc... utilized in demand projections are found.	n/a
Are Lower Income Residential Demands Included In Projections? *Drop down list (y/n)*	Yes
NOTES:	

Table 5-1 Baselines and Targets Summary *Retail Agency or Regional Alliance Only*					
Baseline Period	Start Year	End Year	Average Baseline GPCD*	2015 Interim Target *	Confirmed 2020 Target*
10-15 year	*1995*	*2004*	*348*	*314*	*279*
5 Year	*2004*	*2008*	*315*		
*All values are in Gallons per Capita per Day (GPCD)					
NOTES:					

Table 5-2: 2015 Compliance *Retail Agency or Regional Alliance Only**								
Actual 2015 GPCD	2015 Interim Target GPCD	**Optional Adjustments to 2015 GPCD** Enter "0" for adjustments not used *From Methodology 8*					2015 GPCD *(Adjusted if applicable)*	Did Supplier Achieve Targeted Reduction for 2015? Y/N
		Extraordinary Events	Economic Adjustment	Weather Normalization	TOTAL Adjustments	Adjusted 2015 GPCD		
207	314				0	207	207	Yes
**All values are in Gallons per Capita per Day (GPCD)*								
NOTES:								

DWR STANDARDIZED UWMP TABLES FOR RETAIL URBAN WATER SUPPLIERS

Table 6-1 Retail: Groundwater Volume Pumped						
☐	Supplier does not pump groundwater. The supplier will not complete the table below.					
Groundwater Type ***Drop Down List*** *May use each category multiple times*	Location or Basin Name	2011	2012	2013	2014	2015
Add additional rows as needed						
Alluvial Basin	Sacramento North Area Groundwater Basin	1516	1562	1319	2329	872
TOTAL		1,516	1,562	1,319	2,329	872
NOTES: Volumes in acre-feet per year.						

Table 6-2 Retail: Wastewater Collected Within Service Area in 2015						
☐	There is no wastewater collection system. The supplier will not complete the table below.					
100%	Percentage of 2015 service area covered by wastewater collection system *(optional)*					
100%	Percentage of 2015 service area population covered by wastewater collection system *(optional)*					
Wastewater Collection			**Recipient of Collected Wastewater**			
Name of Wastewater Collection Agency	Wastewater Volume Metered or Estimated? *Drop Down List*	Volume of Wastewater Collected in 2015	Name of Wastewater Treatment Agency Receiving Collected Wastewater	Treatment Plant Name	Is WWTP Located Within UWMP Area? *Drop Down List*	Is WWTP Operation Contracted to a Third Party? *(optional)* *Drop Down List*
Add additional rows as needed						
Sacramento Area Sewer District	Estimated	99,739	Sacramento Regional County Sanitation District	Sacramento Regional WWTP	No	No
Total Wastewater Collected from Service Area in 2015:		99,739				
NOTES: SASD volumes were not available for 2015. Volume of WW represents SASD's 2014 estimate for their entire service area. FOWD makes up approximately 3.5% of SASD's service area.						

Table 6-3 Retail: Wastewater Treatment and Discharge Within Service Area in 2015										
☑	No wastewater is treated or disposed of within the UWMP service area. The supplier will not complete the table below.									
							2015 volumes			
Wastewater Treatment Plant Name	Discharge Location Name or Identifier	Discharge Location Description	Wastewater Discharge ID Number *(optional)*	Method of Disposal *Drop down list*	Does This Plant Treat Wastewater Generated Outside the Service Area?	Treatment Level *Drop down list*	Wastewater Treated	Discharged Treated Wastewater	Recycled Within Service Area	Recycled Outside of Service Area
Add additional rows as needed										
						Total	0	0	0	0
NOTES:										

Table 6-4 Retail: Current and Projected Recycled Water Direct Beneficial Uses Within Service Area								
☑	Recycled water is not used and is not planned for use within the service area of the supplier. The supplier will not complete the table below.							
Name of Agency Producing (Treating) the Recycled Water:								
Name of Agency Operating the Recycled Water Distribution System:								
Supplemental Water Added in 2015								
Source of 2015 Supplemental Water								
Beneficial Use Type *These are the only Use Types that will be recognized by the DWR online submittal tool*	General Description of 2015 Uses	Level of Treatment *Drop down list*	2015	2020	2025	2030	2035	2040 (opt)
Agricultural irrigation								
Landscape irrigation (excludes golf courses)								
Golf course irrigation								
Commercial use								
Industrial use								
Geothermal and other energy production								
Seawater intrusion barrier								
Recreational impoundment								
Wetlands or wildlife habitat								
Groundwater recharge (IPR)								
Surface water augmentation (IPR)								
Direct potable reuse								
Other — Type of Use								
		Total:	0	0	0	0	0	0
IPR - Indirect Potable Reuse								
NOTES:								

Table 6-5 Retail: 2010 UWMP Recycled Water Use Projection Compared to 2015 Actual			
☑	Recycled water was not used in 2010 nor projected for use in 2015. The supplier will not complete the table below.		
Use Type *These are the only Use Types that will be recognized by the WUEdata online submittal tool*		2010 Projection for 2015	2015 actual use
Agricultural irrigation			
Landscape irrigation (excludes golf courses)			
Golf course irrigation			
Commercial use			
Industrial use			
Geothermal and other energy production			
Seawater intrusion barrier			
Recreational impoundment			
Wetlands or wildlife habitat			
Groundwater recharge (IPR)			
Surface water augmentation (IPR)			
Direct potable reuse			
Other	Required for this use		
	Total	0	0
NOTES:			

Table 6-6 Retail: Methods to Expand Future Recycled Water Use			
☑	Supplier does not plan to expand recycled water use in the future. Supplier will not complete the table below but will provide narrative explanation.		
	Provide page location of narrative in UWMP		
Name of Action	Description	Planned Implementation Year	Expected Increase in Recycled Water Use
Add additional rows as needed			
		Total	0
NOTES:			

Table 6-7 Retail: Expected Future Water Supply Projects or Programs						
☐	No expected future water supply projects or programs that provide a quantifiable increase to the agency's water supply. Supplier will not complete the table below.					
☐	Some or all of the supplier's future water supply projects or programs are not compatible with this table and are described in a narrative format.					
Section 6-7	Provide page location of narrative in the UWMP					
Name of Future Projects or Programs	Joint Project with other agencies?		Description (if needed)	Planned Implementation Year	Planned for Use in Year Type *Drop Down List* *User may select more than one.*	Expected Increase in Water Supply to Agency *This may be a range*
	Drop Down List (y/n)	*If Yes, Agency Name*				
Add additional rows as needed						
Madison Well	No			2016	Average year	1,774 AF/year
Skyway Drive Well	No			Long Term	Average year	807 AF/year
NOTES:						

Table 6-8 Retail: Water Supplies — Actual				
Water Supply	Additional Detail on Water Supply	2015		
Drop down list *May use each category multiple times. These are the only water supply categories that will be recognized by the WUEdata online submittal tool*		Actual Volume	Water Quality *Drop Down List*	Total Right or Safe Yield *(optional)*
Add additional rows as needed				
Groundwater	See section 6-2	873	Drinking Water	8,338
Purchased or Imported Water	See section 6-1	7,257	Drinking Water	15,000
	Total	8,130		23,338
NOTES: Volumes in acre-feet per year.				

Table 6-9 Retail: Water Supplies — Projected											
Water Supply	Additional Detail on Water Supply	Projected Water Supply *Report To the Extent Practicable*									
Drop down list *May use each category multiple times. These are the only water supply categories that will be recognized by the WUEdata online submittal tool*		2020		2025		2030		2035		2040 *(opt)*	
		Reasonably Available Volume	Total Right or Safe Yield *(optional)*	Reasonably Available Volume	Total Right or Safe Yield *(optional)*	Reasonably Available Volume	Total Right or Safe Yield *(optional)*	Reasonably Available Volume	Total Right or Safe Yield *(optional)*	Reasonably Available Volume	Total Right or Safe Yield *(optional)*
Add additional rows as needed											
Groundwater	Sec. 6-2	8,338	8,338	8,338	8,338	8,338	8,338	8,338	8,338	--	--
Purchased or imported water	Sec. 6-1	15,000	15,000	15,000	15,000	15,000	15,000	15,000	15,000	--	--
	Total	23,338	23,338	23,338	23,338	23,338	23,338	23,338	23,338	0	0
NOTES: Volumes in acre-feet per year. Groundwater is extracted from the North American subbasin as described in DWR Bulletin 118.											

Table 7-1 Retail: Basis of Water Year Data			
Year Type	Base Year	Available Supplies if Year Type Repeats	
		Agency may provide volume only, percent only, or both	
		Volume Available	% of Average Supply
Average Year	2001	15,000	100%
Single-Dry Year	1977	12,750	85%
Multiple-Dry Years 1st Year	1990	12,750	85%
Multiple-Dry Years 2nd Year	1991	12,750	85%
Multiple-Dry Years 3rd Year	1992	12,750	85%
Multiple-Dry Years 4th Year *Optional*			
Multiple-Dry Years 5th Year *Optional*			
Multiple-Dry Years 6th Year *Optional*			
Agency may use multiple versions of Table 7-1 if different water sources have different base years and the supplier chooses to report the base years for each water source separately. If an agency uses multiple versions of Table 7-1, in the "Note" section of each table, state that multiple versions of Table 7-1 are being used and identify the particular water source that is being reported in each table.			
NOTES: Surface Water (ie- Purchased SJWD Water). Volumes in acre-feet per year.			

Table 7-1 Retail: Basis of Water Year Data			
Year Type	Base Year	Available Supplies if Year Type Repeats	
		Agency may provide volume only, percent only, or both	
		Volume Available	% of Average Supply
Average Year	2001	8,388	100%
Single-Dry Year	1977	8,388	100%
Multiple-Dry Years 1st Year	1990	8,388	100%
Multiple-Dry Years 2nd Year	1991	8,388	100%
Multiple-Dry Years 3rd Year	1992	8,388	100%
Multiple-Dry Years 4th Year *Optional*			
Multiple-Dry Years 5th Year *Optional*			
Multiple-Dry Years 6th Year *Optional*			
Agency may use multiple versions of Table 7-1 if different water sources have different base years and the supplier chooses to report the base years for each water source separately. If an agency uses multiple versions of Table 7-1, in the "Note" section of each table, state that multiple versions of Table 7-1 are being used and identify the particular water source that is being reported in each table.			
NOTES: Groundwater Supply (District wells). Volumes in acre-feet per year.			

Table 7-2 Retail: Normal Year Supply and Demand Comparison					
	2020	2025	2030	2035	2040 *(Opt)*
Supply totals *(autofill from Table 6-9)*	23,338	23,338	23,338	23,338	0
Demand totals *(autofill from Table 4-3)*	11,768	12,080	12,398	12,726	0
Difference	11,570	11,258	10,940	10,612	0
NOTES: Volumes in acre-feet per year.					

Table 7-3 Retail: Single Dry Year Supply and Demand Comparison					
	2020	2025	2030	2035	2040 (Opt)
Supply totals	21,138	21,138	21,138	21,138	
Demand totals	11,768	12,080	12,398	12,726	
Difference	9,370	9,058	8,740	8,412	0
NOTES: Volumes in acre-feet per year.					

Table 7-4 Retail: Multiple Dry Years Supply and Demand Comparison						
		2020	2025	2030	2035	2040 (Opt)
First year	Supply totals	21,138	21,138	21,138	21,138	
	Demand totals	11,768	12,080	12,398	12,726	
	Difference	9,370	9,058	8,740	8,412	0
Second year	Supply totals	21,138	21,138	21,138	21,138	
	Demand totals	11,768	12,080	12,398	12,726	
	Difference	9,370	9,058	8,740	8,412	0
Third year	Supply totals	21,138	21,138	21,138	21,138	
	Demand totals	11,768	12,080	12,398	12,726	
	Difference	9,370	9,058	8,740	8,412	0
Fourth year *(optional)*	Supply totals					
	Demand totals					
	Difference	0	0	0	0	0
Fifth year *(optional)*	Supply totals					
	Demand totals					
	Difference	0	0	0	0	0
Sixth year *(optional)*	Supply totals					
	Demand totals					
	Difference	0	0	0	0	0
NOTES: Volumes in acre-feet per year.						

Table 8-1 Retail Stages of Water Shortage Contingency Plan		
Stage	Complete Both	
	Percent Supply Reduction[1] *Numerical value as a percent*	Water Supply Condition (*Narrative description)*
Add additional rows as needed		
1	0%	Normal water Supply
2	5-10%	Water Alert
3	11-25%	Water Warning
4-Short Term	26-50%	Water Crisis: Short Term
4-Long Term	26-50%	Water Crisis: Long Term
5-Short Term	>50%	Water Emergency: Short Term
5-Long Term	>50%	Water Emergency: Long Term
[1] One stage in the Water Shortage Contingency Plan must address a water shortage of 50%.		
NOTES:		

Table 8-2 Retail Only: Restrictions and Prohibitions on End Uses			
Stage	Restrictions and Prohibitions on End Users ***Drop down list*** *These are the only categories that will be accepted by the WUEdata online submittal tool*	Additional Explanation or Reference *(optional)*	Penalty, Charge, or Other Enforcement? *Drop Down List*
Add additional rows as needed			
1	Landscape - Restrict or prohibit runoff from landscape irrigation	Excessive Runoff	Yes
1	Landscape - Prohibit certain types of landscape irrigation	Free-flowing hoses for all hoses	Yes
1	Other - Customers must repair leaks, breaks, and malfunctions in a timely manner	Uncorrected plumbing or irrigation leaks	Yes
1	Other - Prohibit use of potable water for washing hard surfaces	Washing of streets, driveways, sidewalks, building	Yes
2	Landscape - Prohibit certain types of landscape irrigation	Full flow of landscape and pasture irrigation	Yes
3	CII - Restaurants may only serve water upon request	Serving water at restaurants only when requested by customers	Yes
4	Landscape - Prohibit certain types of landscape irrigation	Irrigating of ornamental turf on public street medians is prohibited	Yes
4	CII - Restaurants may only serve water upon request		Yes
5	CII - Other CII restriction or prohibition	Flushing of sewers or fire hydrants	Yes
5	Other	New connection to the District's water distribution system	Yes
NOTES:			

Table 8-3 Retail Only: Stages of Water Shortage Contingency Plan - Consumption Reduction Methods		
Stage	Consumption Reduction Methods by Water Supplier ***Drop down list*** *These are the only categories that will be accepted by the WUEdata online submittal tool*	Additional Explanation or Reference *(optional)*
Add additional rows as needed		
2, 3, 4, 5	Other	Mandatory reduction of indoor water use
2	Other	Reduce landscape and pasture irrigation. Customers with "smart" irrigation timers or controllers are asked to set the controllers to achieve 90 to 95% of the evapotranspiration (ET) rate.
3	Other	Reduce landscape and pasture irrigation. Customers with "smart" irrigation timers or controllers are asked to set the controllers to achieve 75 to 89% of the evapotranspiration (ET) rate.
4	Other	Reduce landscape and pasture irrigation. Customers with "smart" irrigation timers or controllers are asked to set the controllers to achieve 50 to 74% of the evapotranspiration (ET) rate.
5	Other	Landscape and pasture irrigation is prohibited
NOTES:		

Table 8-4 Retail: Minimum Supply Next Three Years			
	2016	2017	2018
Available Water Supply	21,138	21,138	21,138
NOTES: Volumes in AFY. Based on multiple-dry year			

DWR STANDARDIZED UWMP TABLES FOR RETAIL URBAN WATER SUPPLIERS

Table 10-1 Retail: Notification to Cities and Counties		
City Name	60 Day Notice	Notice of Public Hearing
Add additional rows as needed		
Citrus Heights	☑	☑
Folsom	☑	☑
Rancho Cordova	☑	☑
County Name *Drop Down List*	60 Day Notice	Notice of Public Hearing
Add additional rows as needed		
Sacramento County	☑	☑
	☐	☐
	☐	☐
NOTES:		

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Attachment O: SB X7-7 Verification Form

FAIR OAKS
WATER DISTRICT

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SB X7-7 VERIFICATION FORMS

SB X7-7 Table 0: Units of Measure Used in UWMP* *(select one from the drop down list)*
Acre Feet
**The unit of measure must be consistent with Table 2-3*
NOTES:

SB X7-7 Table-1: Baseline Period Ranges			
Baseline	**Parameter**	**Value**	**Units**
10- to 15-year baseline period	2008 total water deliveries	12,759	Acre Feet
	2008 total volume of delivered recycled water	0	Acre Feet
	2008 recycled water as a percent of total deliveries	0.00%	Percent
	Number of years in baseline period[1]	10	Years
	Year beginning baseline period range	1995	
	Year ending baseline period range[2]	2004	
5-year baseline period	Number of years in baseline period	5	Years
	Year beginning baseline period range	2004	
	Year ending baseline period range[3]	2008	

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

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

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

NOTES:

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

SB X7-7 VERIFICATION FORMS

SB X7-7 Table 3: Service Area Population		
Year		Population
10 to 15 Year Baseline Population		
Year 1	1995	36,021
Year 2	1996	36,139
Year 3	1997	36,252
Year 4	1998	35,981
Year 5	1999	35,940
Year 6	2000	35,869
Year 7	2001	35,807
Year 8	2002	35,823
Year 9	2003	35,979
Year 10	2004	36,075
Year 11		
Year 12		
Year 13		
Year 14		
Year 15		
5 Year Baseline Population		
Year 1	2004	36,075
Year 2	2005	36,095
Year 3	2006	36,181
Year 4	2007	36,154
Year 5	2008	36,352
2015 Compliance Year Population		
2015		35,114
NOTES:		

SB X7-7 VERIFICATION FORMS

SB X7-7 Table 4: Annual Gross Water Use *								
Baseline Year *Fm SB X7-7 Table 3*		Volume Into Distribution System *This column will remain blank until SB X7-7 Table 4-A is completed.*	Deductions					Annual Gross Water Use
			Exported Water	Change in Dist. System Storage (+/-)	Indirect Recycled Water *This column will remain blank until SB X7-7 Table 4-B is completed.*	Water Delivered for Agricultural Use	Process Water *This column will remain blank until SB X7-7 Table 4-D is completed.*	
10 to 15 Year Baseline - Gross Water Use								
Year 1	1995	14,890	-	-	-	-	-	14,890
Year 2	1996	14,076	-	-	-	-	-	14,076
Year 3	1997	14,253	-	-	-	-	-	14,253
Year 4	1998	12,515	-	-	-	-	-	12,515
Year 5	1999	14,424	-	-	-	-	-	14,424
Year 6	2000	14,377	-	-	-	-	-	14,377
Year 7	2001	15,148	-	-	-	-	-	15,148
Year 8	2002	14,067	-	-	-	-	-	14,067
Year 9	2003	12,573	-	-	-	-	-	12,573
Year 10	2004	14,153	-	-	-	-	-	14,153
10 - 15 year baseline average gross water use								**14,047**
5 Year Baseline - Gross Water Use								
Year 1	2004	14,153	-	-	-	-	-	14,153
Year 2	2005	12,454	-	-	-	-	-	12,454
Year 3	2006	12,023	-	-	-	-	-	12,023
Year 4	2007	12,432	-	-	-	-	-	12,432
Year 5	2008	12,759	-	-	-	-	-	12,759
5 year baseline average gross water use								**12,764**
2015 Compliance Year - Gross Water Use								
2015		8,130	-	-	-	-	-	**8,130**
* NOTE that the units of measure must remain consistent throughout the UWMP, as reported in Table 2-3								
NOTES: Units in acre-feet per year.								

SB X7-7 Table 4-A: Volume Entering the Distribution System(s) Complete one table for each source.				
Name of Source		San Juan Water District		
This water source is:				
☐	The supplier's own water source			
☑	A purchased or imported source			
Baseline Year *Fm SB X7-7 Table 3*		Volume Entering Distribution System	Meter Error Adjustment * *Optional* *(+/-)*	Corrected Volume Entering Distribution System
10 to 15 Year Baseline - Water into Distribution System				
Year 1	1995	14795	0	14,795
Year 2	1996	13766	0	13,766
Year 3	1997	13771	0	13,771
Year 4	1998	11924	0	11,924
Year 5	1999	14235	0	14,235
Year 6	2000	14018	0	14,018
Year 7	2001	15040	0	15,040
Year 8	2002	11456	0	11,456
Year 9	2003	12333	0	12,333
Year 10	2004	13841	0	13,841
Year 11	0			0
Year 12	0			0
Year 13	0			0
Year 14	0			0
Year 15	0			0
5 Year Baseline - Water into Distribution System				
Year 1	2004	13841	0	13,841
Year 2	2005	12282	0	12,282
Year 3	2006	11178	0	11,178
Year 4	2007	11533	0	11,533
Year 5	2008	10534	0	10,534
2015 Compliance Year - Water into Distribution System				
2015		7257	0	7,257
* *Meter Error Adjustment - See guidance in Methodology 1, Step 3 of Methodologies Document*				
NOTES: Volumes in acre-feet/year.				

SB X7-7 VERIFICATION FORMS

SB X7-7 Table 5: Gallons Per Capita Per Day (GPCD)				
Baseline Year *Fm SB X7-7 Table 3*		Service Area Population *Fm SB X7-7 Table 3*	Annual Gross Water Use *Fm SB X7-7 Table 4*	Daily Per Capita Water Use (GPCD)
10 to 15 Year Baseline GPCD				
Year 1	1995	36,021	14,890	369
Year 2	1996	36,139	14,076	348
Year 3	1997	36,252	14,253	351
Year 4	1998	35,981	12,515	311
Year 5	1999	35,940	14,424	358
Year 6	2000	35,869	14,377	358
Year 7	2001	35,807	15,148	378
Year 8	2002	35,823	14,067	351
Year 9	2003	35,979	12,573	312
Year 10	2004	36,075	14,153	350
Year 11	0	0	0	
Year 12	0	0	0	
Year 13	0	0	0	
Year 14	0	0	0	
Year 15	0	0	0	
10-15 Year Average Baseline GPCD				**348**
5 Year Baseline GPCD				
Baseline Year *Fm SB X7-7 Table 3*		Service Area Population *Fm SB X7-7 Table 3*	Gross Water Use *Fm SB X7-7 Table 4*	Daily Per Capita Water Use
Year 1	2004	36,075	14,153	350
Year 2	2005	36,095	12,454	308
Year 3	2006	36,181	12,023	297
Year 4	2007	36,154	12,432	307
Year 5	2008	36,352	12,759	313
5 Year Average Baseline GPCD				**315**
2015 Compliance Year GPCD				
2015		35,114	8,130	207
NOTES: Annual gross water use in acre-feet/year.				

SB X7-7 VERIFICATION FORMS

SB X7-7 Table 6: Gallons per Capita per Day *Summary From Table SB X7-7 Table 5*	
10-15 Year Baseline GPCD	348
5 Year Baseline GPCD	315
2015 Compliance Year GPCD	207
NOTES:	

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

SB X7-7 Table 7-A: Target Method 1 20% Reduction	
10-15 Year Baseline GPCD	2020 Target GPCD
348	279
NOTES:	

SB X7-7 Table 7-F: Confirm Minimum Reduction for 2020 Target			
5 Year Baseline GPCD *From SB X7-7 Table 5*	Maximum 2020 Target*	Calculated 2020 Target *Fm Appropriate Target Table*	Confirmed 2020 Target
315	299	279	279
** Maximum 2020 Target is 95% of the 5 Year Baseline GPCD*			
NOTES:			

SB X7-7 VERIFICATION FORMS

SB X7-7 Table 8: 2015 Interim Target GPCD		
Confirmed 2020 Target *Fm SB X7-7 Table 7-F*	10-15 year Baseline GPCD *Fm SB X7-7 Table 5*	2015 Interim Target GPCD
279	348	314
NOTES:		

SB X7-7 Table 9: 2015 Compliance								
Actual 2015 GPCD	2015 Interim Target GPCD	Optional Adjustments *(in GPCD)*					2015 GPCD *(Adjusted if applicable)*	**Did Supplier Achieve Targeted Reduction for 2015?**
		Enter "0" if Adjustment Not Used			TOTAL Adjustments	Adjusted 2015 GPCD		
		Extraordinary Events	Weather Normalization	Economic Adjustment				
207	314	*From Methodology 8 (Optional)*	*From Methodology 8 (Optional)*	*From Methodology 8 (Optional)*	-	207	207	**YES**
NOTES:								