Brown AND Caldwell

Prepared for
City of Stockton

CITY OF STOCKTON

2015 Urban Water Management Plan

July 2016

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July 12, 2016

Regina Rubier
Water Resources Program Manager
City of Stockton
Municipal Utilities Department
11373 North Lower Road
Lodi, CA 95242

1017-148592

Subject: 2015 Urban Water Management Plan

Dear Ms. Rubier,

We are pleased to submit to you this final 2015 Urban Water Management Plan (UWMP). We have updated your 2010 UWMP to incorporate more recent data and information as well as address the new requirements in the law and from the California Department of Water Resources (DWR) based on the DWR Guidebook for Urban Water Supplies finalized in March 2016.

Please let me know if you have any questions.

Very truly yours,

Brown and Caldwell,
a California Corporation

Melanie Holton, P.E.
Project Engineer

MH:ds

Enclosure (1):

1. 2015 Urban Water Management Plan for the City of Stockton

2015 Urban Water Management Plan

Prepared for
City of Stockton
Stockton, CA
July 2016

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List of Abbreviations

°F	degrees Fahrenheit
ac-ft	acre-feet
ac-ft/yr	acre-feet per year
Act	Urban Water Management Act
AWWA	American Water Works Association
B/C	benefit/cost
BMPs	Best Management Practices
Cal Water	California Water Service Company
CCF	hundred cubic feet
City	City of Stockton
CII	commercial, industrial, and institutional
CIMIS	California Irrigation Management Information System
CMMS	Computerized Maintenance Management System
COSMA	City of Stockton Metropolitan Area
COSMUD	City of Stockton Municipal Utilities Department
CPUC	California Public Utility Commission
CSJWCD	Central San Joaquin Water Conservation District
CUWCC	California Urban Water Conservation Council
CWC	California Water Code
DAC	Disadvantaged Community
DMM	Demand Management Measure
DOF	Department of Finance
DWR	California Department of Water Resources
DWSP	Delta Water Supply Project
ETo	evapotranspiration
ft	feet/foot
GBA	Eastern San Joaquin County Groundwater Basin Authority
GIS	Geographic Information System
GPCD	gallons per capita per day
gpd	gallons per day
gpm	gallons per minute
GSA	Groundwater Sustainability Agency
GSP	Groundwater Sustainability Plan
HET	high efficiency toilet
ICC	Incident Command Center
ICE	Irrigation Consultation and Evaluation
ICU	Integrated Conjunctive Use
IRWMP	Integrated Regional Water Management Plan
kW	kilowatt
MCLs	Maximum Contaminant Levels
MG	million gallons
mgd	million gallons per day
MOMR	monthly operations and maintenance report
MOU	Memorandum of Understanding
MUD	Municipal Utility District
MWELO	Model Water Efficient Landscape Ordinance
PG&E	Pacific Gas and Electric Company
Plan	Urban Water Management Plan
psi	pounds per square inch
REACON	Recycling, Energy, and Conservation
RWCF	Regional Wastewater Control Facility
RWQCB	Regional Water Quality Control Board
SAWS	Stockton Area Water Suppliers
SB	Senate Bill
SB X7-7	Water Conservation Act of 2009
SEWD	Stockton East Water District
SGMA	Sustainable Groundwater Management Act
SJCOG	San Joaquin Council of Governments
SSJID	South San Joaquin Irrigation District
SWRCB	State Water Resources Control Board
TAF	thousand acre feet
UAW	unaccounted-for water
ULFTs	ultra low flush toilets
USBR	United States Bureau of Reclamation
USEPA	United Stated Environmental Protection Agency
WID	Woodbridge Irrigation District
WRCC	Western Regional Climate Center
WSCP	Water Shortage Contingency Plan
WTP	water treatment plant
WWTP	wastewater treatment plant

Section 1

Introduction

This Urban Water Management Plan (UWMP) was prepared for the City of Stockton (City). This UWMP includes a description of the water supply sources, projected water use, and a comparison of water supply water demands during normal, single-dry, and multiple-dry years. Also described is the City's water conservation program.

The remainder of this section provides an overview of the Urban Water Management Planning Act (Act), public participation, agency coordination, plan implementation, and UWMP organization.

1.1 Urban Water Management Planning Act

The City's UWMP has been prepared in accordance with the Act, as amended, California Water Code, Division 6, Part 2.6, Sections 10610 through 10656. The Act became part of the California Water Code with the passage of Assembly Bill 797 during the 1983–1984 regular session of the California legislature. The Act was amended in November 2009 with the adoption of the Water Conservation Act or SBX 7-7 and was most recently amended in 2014. The Water Conservation Act is described in Division 6, Part 2.55, Section 10608.

The Act requires every urban water supplier providing water for municipal purposes to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually to adopt and submit an UWMP every five years to the California Department of Water Resources (DWR). The Act describes the required contents of the UWMP as well as how urban water suppliers should adopt the UWMP.

1.2 Basis for Preparing the Plan

The City of Stockton Municipal Utilities Department (COSMUD) is a retail water agency that supplies treated water within the City. Table 1-1 presents the Public Water System name and number as well as the number of connections and amount of water supplied in 2015.

Table 1-1. (DWR Table 2-1)
Retail: Public Water Systems

Public water system number	Public water system name	Number of municipal connections 2015	Volume of water supplied 2015, ac-ft
CA3910006	Stockton	49,387[a]	24,843[b]

[a] *Active and inactive connections*

[b] *Only includes water supplied to retail water system.*

The City has selected individual reporting for this UWMP, as identified in Table 1-2. This UWMP is reporting on a calendar year basis using acre-feet (ac-ft) as the unit of measure as noted in Table 1-3.

Table 1-2. (DWR Table 2-2). Plan Identification	
✓	Individual UWMP
	Regional UWMP *(checking this triggers the next line to appear)*
No	Does this Regional UWMP include a Regional Alliance?

Table 1-3. (DWR 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	
--	--
Units of Measure Used in UWMP	
Unit	Acre-feet, ac-ft

1.3 Coordination and Outreach

The Act requires the City to coordinate the preparation of its UWMP 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. The City has informed their wholesale water supplier, Stockton East Water District (SEWD), of the City's projected water use, as shown in Table 1-4. The City has also coordinated this UWMP with other agencies and the community as summarized in Table 1-5.

Table 1-4. (DWR Table 2-4) Retail: Water Supplier Information Exchange
The retail supplier has informed the following wholesale supplier(s) of projected water use in accordance with CWC 10631.
Wholesaler water supplier name:
Stockton East Water District

Table 1-5. Coordination with Appropriate Agencies				
Coordinating agencies	Noticed of UWMP update at least 60 days prior to public hearing (Cities and Counties)	Was sent a copy of the draft UWMP	Participated in UWMP preparation	Was sent a final copy
Stockton East Water District	X	X	X	X
California Water Service Company	X	X		X
Woodbridge Irrigation District	X	X		X
South San Joaquin Irrigation District		X		X
San Joaquin County	X	X		X
City of Stockton Wastewater Agency	X			
General public		On website, City Clerks Office		On website
Water Advisory Group				X
Public Library		X		
California Department of Water Resources				X
California State Library				X

The City is an active member agency of Stockton Area Water Suppliers (SAWS). SAWS was formed in 1980 as an association of Stockton urban area retail water suppliers dedicated to communication and mutual assistance regarding issues affecting water supply, distribution, and conservation in the City of Stockton Metropolitan Area (COSMA). Members of SAWS include COSMUD, California Water Service Company (Cal Water), SEWD, and San Joaquin County.

The City is also a member of the Northeastern San Joaquin County Groundwater Basin Authority, the American Water Works Association, and the Central Valley Salinity Alternatives for Long-Term Sustainability (Lower San Joaquin River Committee).

1.4 Public Participation and Plan Adoption

The Act requires the encouragement of public participation and a public hearing as part of the UWMP development and approval process. As required by the Act, prior to adopting this UWMP, the City made the UWMP available for public inspection and held a public hearing. The City notified cities and counties within the service area 60 days before the public hearing as shown in Table 1-6. Appendix A provides documentation that the city and counties within which the City provides water supplies was notified at least 60 days prior to the UWMP public hearing. This hearing provided an opportunity for the City's customers including social, cultural, and economic community groups to learn about the water supply situation and the plans for providing a reliable, safe, high-quality water

supply for the future. The hearing was an opportunity for people to ask questions regarding the current situation and the viability of future plans.

Table 1-6. (DWR Table 10-1) Retail: Notification to Cities and Counties		
City name	60 day notice	Notice of public hearing
City of Stockton	✓	✓
Up to 10 entries allowed		
County name	60 day notice	Notice of public hearing
San Joaquin County	✓	✓

Per the requirements of Government Code Section 6066 a Notice of Public Hearing was published twice in the Stockton Record newspaper to notify all customers and local governments of the public hearing and copies of the draft UWMP were made available for public inspection at the City's offices, at local public libraries, and on the City website, http://www.stocktongov.com/. A copy of the published Notice of Public Hearing is included in Appendix B. This UWMP was adopted by the City Council on July 12, 2016. A copy of the adopted resolution is provided in Appendix C. The adopted UWMP will be provided to DWR, the California State Library, and the appropriate cities and counties within 30 days of adoption. The adopted UWMP will also be available for public review during normal business hours at the City's Clerks office.

1.5 Plan Organization

This section provides a summary of the sections in this UWMP.

- Section 2 provides a description of the service area, climate, and historical and projected population.
- Section 3 presents historical and projected water demands.
- Section 4 describes the SBx7-7 gallons per capita per day (GPCD) analysis.
- Section 5 describes the water supplies.
- Section 6 describes water supply reliability.
- Section 7 describes the water shortage contingency plan (WSCP).
- Section 8 summarizes demand management measures.
- Section 9 provides a list of references.
- Appendices provide relevant supporting documents.

DWR has provided a checklist of the items that must be addressed in each UWMP based upon the Act. This checklist makes it simple to identify exactly where in the UWMP each item has been addressed. The checklist is completed for this Plan and provided in Appendix D. It references the sections in this UWMP where specific items can be found.

Section 2

System Description

This section contains a description of the service area and its climate, and historical and projected population.

2.1 Description of Service Area

The City is located in north central California, approximately 70 miles east of San Francisco Bay Area and 50 miles south of Sacramento. The City is roughly bordered by Interstate 5 on the west side and State Highway 99 on the east side.

The City was founded in the late 1840's and grew as a supply center during the California gold rush. The City was incorporated in 1850 and now occupies approximately 56.5 square miles. The deep water port and channel to San Francisco Bay help support a large industrial and agricultural base.

The City has provided water service to North Stockton since 1954 and South Stockton since 1984. The City created the COSMUD in the late 1970's for purposes of constructing, operating, and maintaining water, wastewater, and drainage facilities within the City's service areas. An organizational chart for the COSMUD is provided on Figure 2-1. The City of Stockton is organized as a charter government.

Areas within the City that are served by other water agencies are excluded from this UWMP. The central Stockton water service area is owned and operated by Cal Water, which is an investor-owned public utility company regulated by the California Public Utilities Commission (CPUC). In addition, there are smaller developed areas served by San Joaquin County with two small maintenance districts located within the City's boundaries. COSMUD delivers water from SEWD to the two San Joaquin County water systems under water service agreements. The boundaries of the City's service area and service areas of surrounding water agencies are shown on Figure 2-2.

2.2 Service Area Climate

The City is located in the heart of the fertile Central Valley of California. The climate ranges from summer temperatures routinely exceeding 100 degrees Fahrenheit (°F) with low humidity, and winter temperatures dropping into the low 30's°F. Average annual rainfall is normally approximately 14 inches. Based on the historical data obtained from the California Irrigation Management Information System (CIMIS) and the Western Regional Climate Center (WRCC), the City's service area average monthly temperatures are as low as 37°F and as high as 95°F. Table 2-1 summarizes the City's climate conditions in representative areas based on the CIMIS and WRCC databases based on monthly averages of historic information.

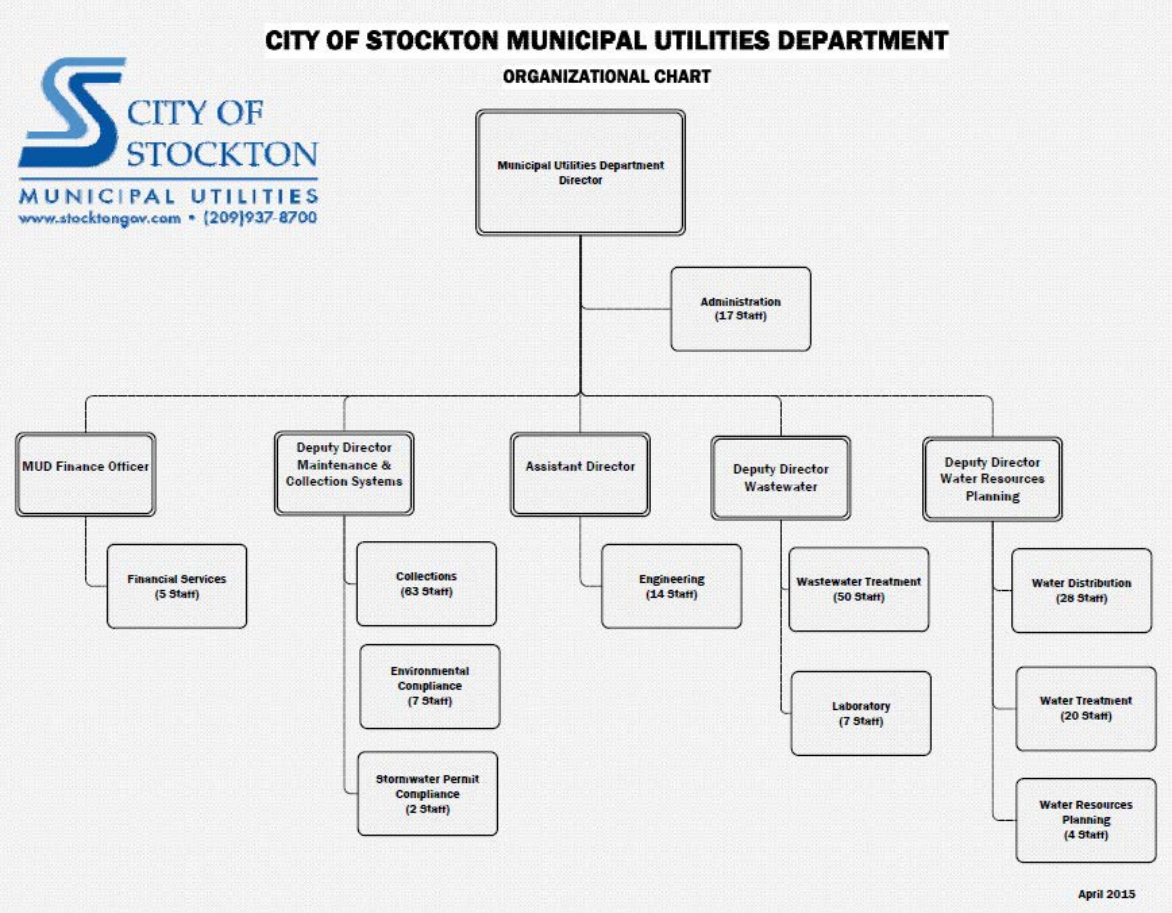
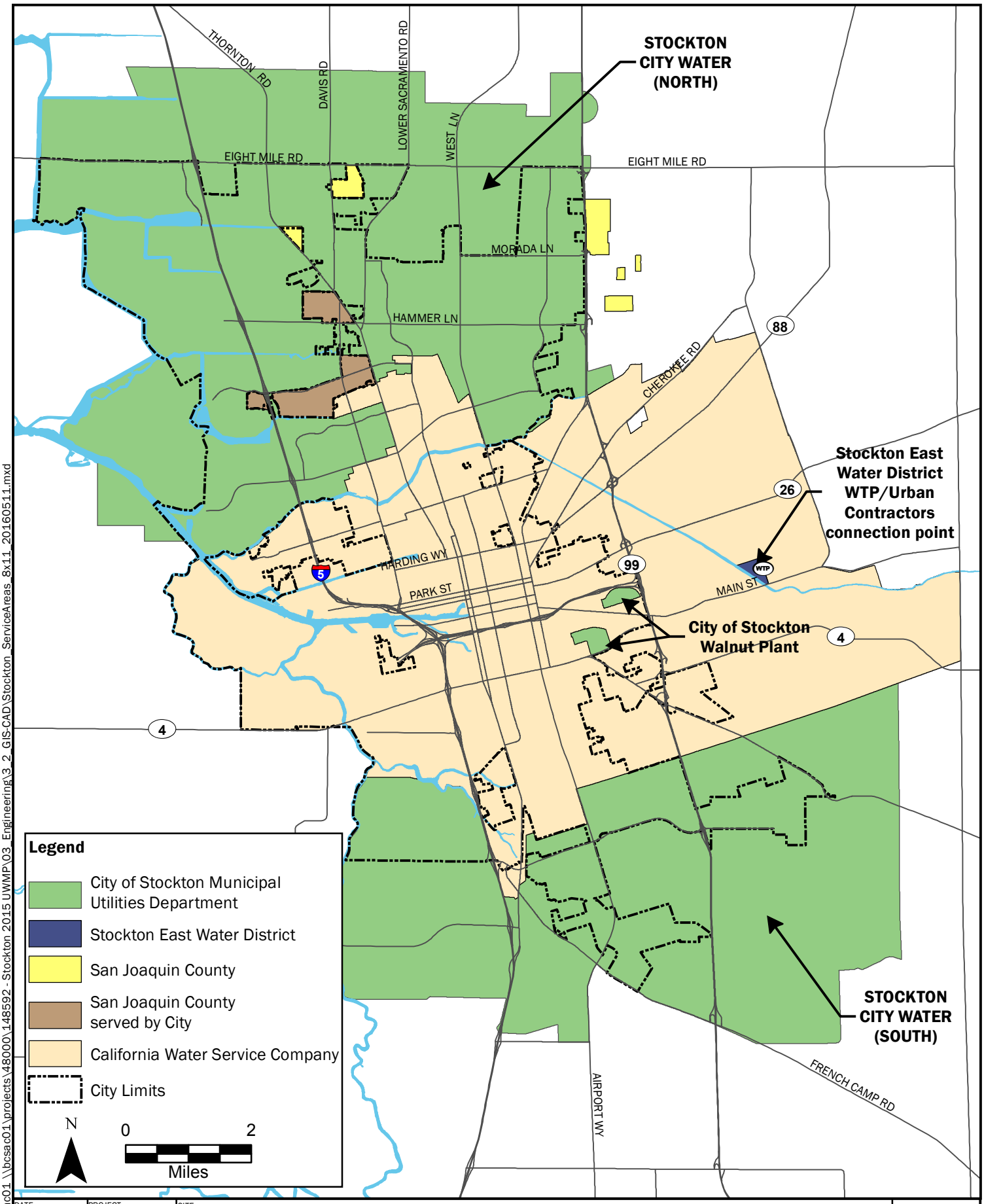


Figure 2-1. Organizational Chart for the City of Stockton Municipal Utilities Department (Accessed April 2015)



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Water Service Area

Figure 2-2

Table 2-1. (DWR Table 3-1) Monthly Average Climate Data Summary													
Location	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Manteca (CIMIS Station No. 70, WRCC Station No. 045303) [a]													Elevation: 40 ft
Standard average ETo, in	1.11	1.92	3.53	5.05	6.78	7.71	7.96	7.03	5.15	3.37	1.67	1.01	52.3
Maximum temperature, °F	53.7	61.1	66.3	72.4	80.9	88.6	93.2	91.5	87.7	77.7	61.1	53.8	--
Minimum temperature, °F	36.3	39.3	42.1	45.2	50.5	55.9	59.2	58.5	55.9	49.2	40.4	35.4	--
Rainfall, in	1.65	1.35	1.52	0.95	0.21	0.09	0.12	0.23	0.24	0.97	1.58	1.51	10.4
Stockton Metro Airport (WRCC Station No. 048558) [b]													Elevation: 20 ft
Maximum temperature, °F	53.7	60.6	65.9	72.8	81.0	88.5	94.2	92.7	88.3	78.3	64.4	54.0	--
Minimum temperature, °F	37.6	40.4	42.6	46.1	51.6	56.9	60.4	59.7	57.0	50.2	42.2	37.5	--
Rainfall, in	2.80	2.24	2.03	1.14	0.41	0.10	0.03	0.04	0.25	0.73	1.71	2.30	13.8
Snowfall, in	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

[a] *Period of record is 1971 to 2000*

[b] *Period of record is 10/1/1948 to 1/20/2015*

2.3 Service Area Population and Demographics

The historical COSMUD water service area population is estimated using the DWR population tool. Using the a map of the COSMUD water service area and the number of COSMUD service connections, the tool calculates the population for non-census years based on the census population in 1990, 2000, and 2010 correlated to the single family and multi-family connections in those census years. The population estimated in this UWMP for year 2000 census year (135,716 people) is 11 percent higher than the population estimated in the 2010 UWMP for the year 2000 (121,969 people). The population estimated in this UWMP for the year 2010 census year (178,307 people) is 5 percent higher than the population estimated in the 2010 UWMP for the year 2010 (169,963 people). Table 2-2 lists the historical residential connections, estimated people per residential connection, and estimated population from 1995 through 2015.

Table 2-2. Estimate of Historical Population

Year	Residential connections		People per connection		Population
	Single family connections	Multi-family connections	People per single family connection	People per multi-family connection	
1995	23,137	4,066	3.71	7.71	117,303
1996	24,246	4,044	3.7	7.78	121,253
1997	24,393	4,040	3.69	7.84	121,765
1998	25,366	4,123	3.68	7.91	126,002
1999	26,546	4,148	3.67	7.97	130,527
2000	27,903	4,184	3.66	8.04	135,716
2001	29,576	4,189	3.65	7.96	141,191
2002	30,345	4,997	3.63	7.89	149,619
2003	32,961	4,984	3.62	7.81	158,173
2004	36,024	4,901	3.6	7.73	167,725
2005	38,511	5,078	3.59	7.65	177,127
2006	40,525	3,692	3.58	7.58	172,895
2007	40,271	3,666	3.56	7.5	170,944
2008	43,011	3,636	3.55	7.42	170,017
2009	40,709	3,578	3.53	7.35	170,153
2010	41,634	4,379	3.52	7.27	178,387
2011	41,711	3,713	3.51	7.19	172,941
2012	41,791	3,713	3.49	7.11	172,347
2013	41,890	3,713	3.48	7.04	171,816
2014	41,960	3,713	3.46	6.96	171,183
2015	42,033	3,713	3.45	6.88	170,417

Estimated 2015 and projected populations for the COSMUD retail water service area are presented in Table 2-3. The 2015 population estimated using the DWR population tool is 4 percent less than the COSMUD population estimate for 2015 of 177,808 people, which is based on the 2010 census. The projected population is based on San Joaquin County growth rates developed by the San Joaquin Council of Governments (SJCOG) recent draft 2015 forecast in which the City is projected to grow at an annual average growth rate of 1.3 percent per year (Telephone communication with SJCOG, Kim Anderson, Senior Regional Planner, February 2016).

Table 2-3. (DWR Table 3-1) Retail: Population- Current and Projected

	2015	2020	2025	2030	2035	2040
Population served	170,417	181,862	194,076	207,110	221,019	235,862

Note: Annual average growth rate based on recent SJCOG draft 2015 forecast for City of Stockton.

Other demographic factors that affect water management planning include the uncertainty in estimating future population growth and per capita water use. The actual population growth that has occurred since the preparation of the 2005 and 2010 UWMPs has been generally less than anticipated. The recession that started in 2008 and the accompanying slow down in the construction of dwelling units resulted in population not growing as much as previously estimated. The adoption of per capita demand targets in 2010 along with the mandated demand reductions announced by the Governor in 2015 due to the drought have resulted in a significant decline in per capita water use. It is not known to what extent per capita water use will rebound to pre-drought levels once the drought ends. The uncertainties with both future population and per capita water use are considered in the City's water management planning.

Section 3

System Water Use

This section presents the current and projected retail water demands by sector, distribution system water losses, future passive water savings, and low income household water use.

3.1 Water Uses by Sector

The City's water uses include residential, single family, and multi-family accounts as well as commercial, industrial, institutional (CII), and landscape accounts. Based on the total number of accounts, residential users make up about 95 percent of the total customer base. Non-residential customers make up approximately 5 percent of the total number of connections. Table 3-1 shows the historical number of connections by customer sector. Water use by customer sector for 2015 is based on the City's metered water sales records and is shown in Table 3-2.

Table 3-1. Historical Connections by Customer Sector

Customer type	2010	2011	2012	2013	2014	2015
Single Family	41,634	41,711	41,791	41,890	41,960	42,033
Multi-Family	4,379	3,713	3,713	3,713	3,713	3,713
Commercial	2,387	2,531	2,539	2,554	2,567	2,567
Industrial	5	10	19	19	19	21
Institutional/Governmental	160	167	172	175	176	177
Landscape	872	880	878	882	880	876
Total	49,437	49,012	49,111	49,233	49,315	49,387

Table 3-2. (DWR Table 4-1) Retail: Demands for Potable and Raw Water - Actual			
Use type	2015 Actual		
	Additional description	Level of treatment when delivered	Volume, ac-ft/yr
Single Family		Drinking water	13,764
Multi-Family		Drinking water	2,854
Commercial		Drinking water	2,553
Industrial		Drinking water	723
Institutional/Governmental		Drinking water	1,099
Landscape		Drinking water	2,152
Sales/Transfers/Exchanges to other agencies	SEWD water delivered to two San Joaquin County water systems	Drinking water	1,476
Losses	Within water distribution system	Drinking water	1,699
Total			26,319

Note: The sum of the COSMUD 2015 retail water demands is 24,843 ac-ft. This is the 2015 volume served to the City's retail water system and does not include the 1,476 ac-ft delivered from SEWD to two San Joaquin County water systems.

A description of the assumptions and methodology used to develop the water demand projections is provided below.

- The total number of connections by customer category is projected through 2040 based on SJCOG population growth rate projections (See Section 2.3). The projected breakdown of connections by customer category is proportional to the 2015 breakdown.
- Normal year water demands through 2040 are projected based on assuming per connection demands will increase back to approximately 90 percent of 2012 water demands. This is based on the assumption that 2012 was a normal water demand year and that some conservation measures implemented by the City and its customers during the drought are permanent and will result in some level of continued reduced water demands into the future.
- Unit water demand factors by customer sector are estimated based on 90 percent of water use per connection in 2012 and reduced to incorporate expected passive water savings. It is assumed the City' water conservation program will continue to be implemented to enable the City to meet its GPCD target (See Section 4).
  - Year 2012 is assumed to be a normal water use year. It is estimated that unit water demands could decline in the future due to the passive savings that result from low flow plumbing fixtures achieving a higher level of saturation in the City. The assumptions used to estimate passive water savings is described in Section 3.3. It is assumed that the City will realize up to 1,900 ac-ft/yr in passive water savings by 2040. This equates to 7 GPCD in passive water savings in 2040.
  - Based on the assumptions described above, the City's active water conservation program will need to save a minimum of approximately 1,300 ac-ft/yr in 2020. This reduction could occur from an additional 5 percent reduction in single family use, multi-family use, and

commercial use from 90 percent of 2012 levels or from other conservation program activities. As passive savings increase through 2040, the City's minimum water savings from the conservation program can be decreased.

The projected unit water demand factors are multiplied by the projected number of connections by customer category to estimate projected water demands by customer sector as shown in Table 3-3. The SEWD water wheeled to the two San Joaquin County systems within the City are expected to remain at 2015 levels through 2040. The City does not anticipate using water for groundwater recharge, saline water intrusion barriers, agricultural irrigation, wetlands, or wildlife habitat. It is assumed that projected water system losses are equal to 6.8 percent of production for the retail water system.

The resulting water demand projections come close to meeting the City's 2020 water use target of 165 GPCD (See Section 4). It is expected that the City will meet its GPCD target through the occurrence of "passive water savings" and from implementation of the City's water conservation program (See Section 8).

Table 3-3. (DWR Table 4-2) Retail: Demands for Potable and Raw Water - Projected

Use Type	Additional description	Projected water use, ac-ft/yr				
		2020	2025	2030	2035	2040-opt
Single Family		16,818	17,948	19,162	20,468	21,871
Multi-Family		1,614	1,716	1,826	1,944	2,071
Commercial		2,869	3,043	3,230	3,430	3,645
Industrial		683	729	777	830	885
Institutional/Governmental		5,328	5,686	6,067	6,475	6,910
Landscape		3,611	3,853	4,112	4,388	4,683
Sales/Transfers/Exchanges to other agencies	Water delivered from SEWD to two San Joaquin County water systems	1,476	1,476	1,476	1,476	1,476
Losses	Assumed at 6.8% of production for retail system	2,256	2,406	2,566	2,739	2,923
Total		33,178	35,380	39,217	41,749	44,465

Projected water demands for the City's retail water service area through the year 2040 meet the City's SBx7-7 GPCD target. As shown in Table 3-4 and on Figure 3-1, the projected expected passive water savings and conservation program water savings will enable the City to meet its GPCD target of 165 GPCD. The City's GPCD target evaluation is discussed in detail in Section 4. Water use declined in 2014 and 2015 as a result of the Governor's drought declaration. It is assumed that the current decline in water use due to the drought is temporary and will increase back to near 2012 levels.

Table 3-4. Retail Water System Historical and Projected Water Demand									
Description	2012	2013	2014	2015	2020	2025	2030	2035	2040
Demand excluding expected passive and active water conservation savings	34,961	34,394	29,627	24,843	34,948	37,295	39,800	42,473	45,325
Minimum water savings from conservation program	-- [a]	-- [a]	-- [a]	-- [a]	1,241	1,076	889	677	438
Expected passive water savings	-- [a]	-- [a]	-- [a]	-- [a]	529	838	1,169	1,522	1,898
Total[c]	34,961	34,394	29,627	24,843	33,178[b]	35,380[b]	37,743[b]	40,274[b]	42,989[b]

Notes:

[a] *Passive water savings and water savings from conservation program are not estimated for historical years.*

[b] *Projected demand at SBX7-7 per capita demand target (165 GPCD).*

[c] *Total demand is actual demand through 2015. Projected total demand 2020 through 2040 is projected demand including estimated passive savings and minimum water conservation program savings. Total demand is for retail water savings and does not include SEWD water wheeled to San Joaquin County water systems.*

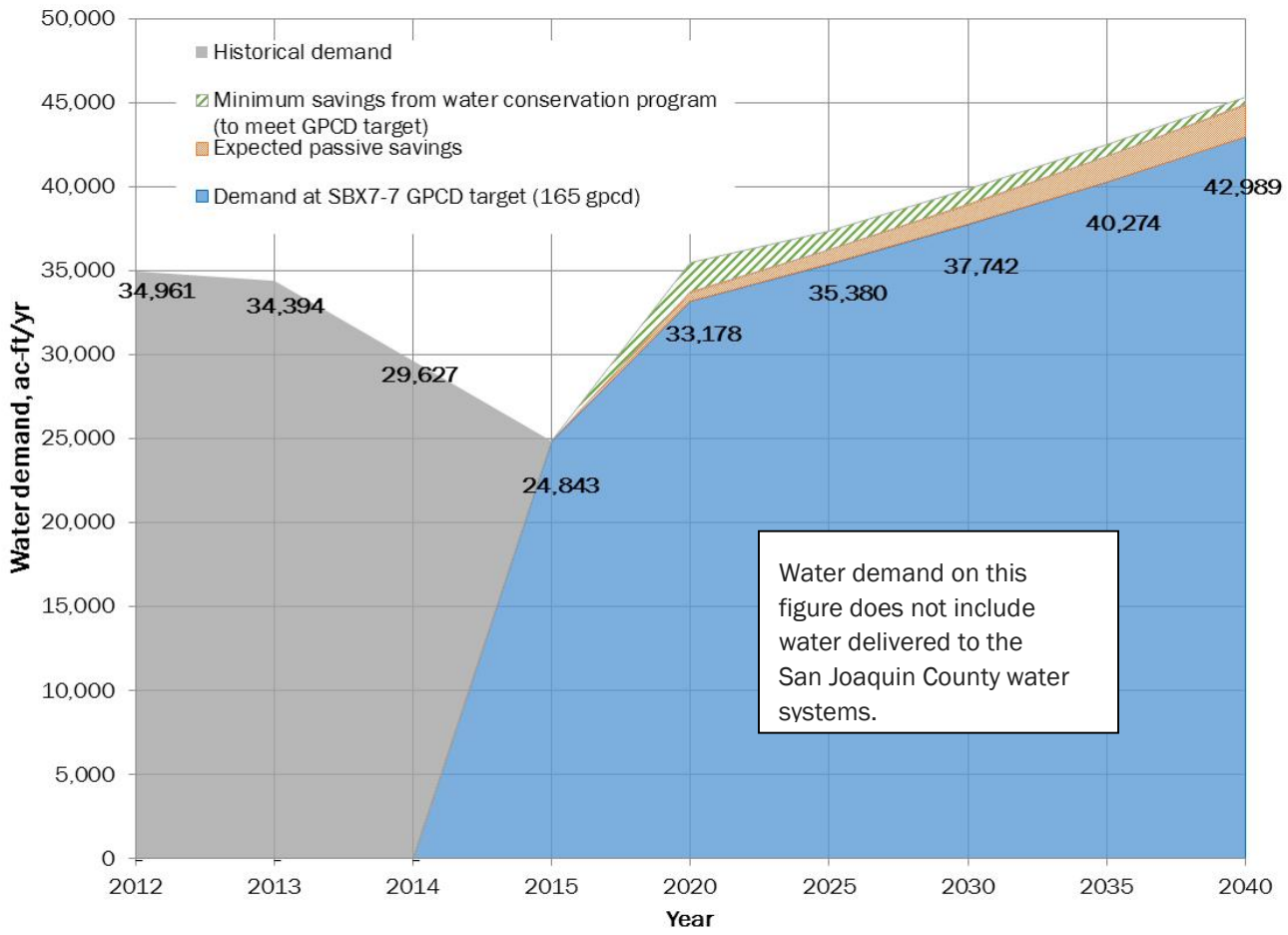

Figure 3-1. City of Stockton Retail Water System Historical and Projected Water Demand

Table 3-5 summarizes the current and projected demands for potable, recycled, and raw water usage by the City. The City does not currently or project to use recycled water as described in Section 5.

Table 3-5. (DWR Table 4-3) Retail: Total Water Demands, ac-ft/yr						
	2015	2020	2025	2030	2035	2040
Potable and Raw Water (From DWR Tables 4-1 and 4-2)	26,319	34,654	36,856	39,217	41,749	44,465
Recycled Water Demand (From DWR Table 6-4)	0	0	0	0	0	0
Total water demand	26,319	34,654	36,856	39,217	41,749	44,465

3.2 Distribution System Water Losses

Water losses in the City's water system for 2015 are presented in Table 3-6. The City's water distribution system consists of 590 miles of distribution pipelines and transmission mains. A detailed analysis following the DWR Water Audit Manual (AWWA, 2016) is provided in Appendix E. The water audit is an accounting exercise that tracks all sources and uses of water within a water system over a specified period.

Table 3-6. (DWR Table 4-4) Retail: Water Loss Audit Reporting	
Reporting Period Start Date (Month/Year)	Loss
January 2015	1,703 ac-ft/yr [(a)]

[(a)] *From the field "Water Losses" (a combination of apparent losses and real losses) from the AWWA worksheet provided in Appendix E.*

3.3 Estimating Future Water Savings

Estimated future water savings within the COSMUD are made up of active water conservation program savings plus passive savings. Expected passive savings are described below. The City's active water conservation program is described in Section 8.

Passive savings is described as water savings from codes, standards, ordinances, or transportation and land use plans. These various factors generally decrease the per capita water use for existing and future customers, compared to historical customers. Below is a summary of the applicable state codes and ordinances that could reduce the City's per capita water demand in the future based on information provided in the DWR 2015 UWMP Guidebook (DWR, 2016b).

Model Water Efficient Landscape Ordinance – Effective on December 1, 2015, this new ordinance is projected to reduce the typical residential outdoor landscape demands for new construction by up to 20 percent from the estimated demand using the prior ordinance provisions. Commercial landscape for new construction may reduce outdoor water demand by up to 35 percent over the prior ordinance.

California Energy Commission Title 20 appliance standards for toilets, urinals, faucets, and showerheads – This standard will impact both new construction and replacement fixtures in existing

homes. This is included in the CALGreen assumption for new construction described below. Assume up to 5 percent reduction in indoor water use of existing homes.

CALGreen Building Code – Requires residential and non-residential water efficiency and conservation measures for new buildings and structures. It is assumed that this code will reduce residential and non-residential indoor water on new construction by up to 20 percent of new construction indoor water demands.

A summary of the estimated future passive water savings for the COSMUD service area is provided in Table 3-7.

Table 3-7. Estimated Future Passive Water Savings from Projected Water Demands

	2020	2025	2030	2035	2040
Model Water Efficient Landscape Ordinance					
Reduction in projected single family outdoor water use, new construction, ac-ft/yr	137	283	440	606	784
Reduction in projected commercial outdoor water use, new construction, ac-ft/yr	34	70	109	150	194
California Energy Commission Title 20		-	-	-	-
Reduction in projected single family indoor water use, existing homes, ac-ft/yr	238	238	238	238	238
CAL Green Building code		-	-	-	-
Reduction in projected single family and multi-family indoor water use, new construction, ac-ft/yr	100	207	321	442	572
Reduction in projected commercial indoor water use, new construction, ac-ft/yr	19	40	62	86	111
Total reduction in projected water use, ac-ft/yr	529	838	1,169	1,522	1,898
Total reduction in projected water use, GPCD	2.6	3.9	5.0	6.1	7.2

Based on these assumed reductions in water use by customer sector, it is estimated that the City could realize approximately 1,900 ac-ft/yr passive water savings by 2040. In terms of GPCD, this is approximately 7 GPCD in passive water savings by 2040 from these codes and ordinances. The water use projections in Table 3-4 do account for these passive water savings that may be realized from these codes and ordinances, as stated in Table 3-8.

Table 3-8. (DWR Table 4-5). Retail Only: Inclusion in Water Use Projections

Future Water Savings Included Y/N	Yes
If "Yes" to above, state the section or page number where citations of the codes, ordinances, etc... utilized in demand projections are found.	Location in UWMP Section 3.3
Are lower Income Residential Demands Included in Projections?	Yes

3.4 Water Use for Lower Income Households

Projected water use for lower income households within the COSMUD service area are included in the demand projections in this UWMP. Using the Disadvantaged Community (DAC) Mapping Tool provided by DWR, census blocks where the median income is less than 80 percent of the state median income are shown on the screen capture provided on Figure 3-2. According to the City's Housing Element, 43 percent of the City and 37 percent of the San Joaquin County are low income (City of Stockton, 2016). Table 3-8 verifies that the expected water use for low income housing is included in the projected water demands in this UWMP. The estimate of the projected low-income single family and multi-family water demand in 2040 is 10,300 ac-ft/yr. This low income water demand is estimated by applying the 43 percent (to represent the low income residential dwelling units) times the projected 2040 residential water demand within the City's retail water service area. These projected low income water demand projections are included in Tables 3-3 and 3-4.

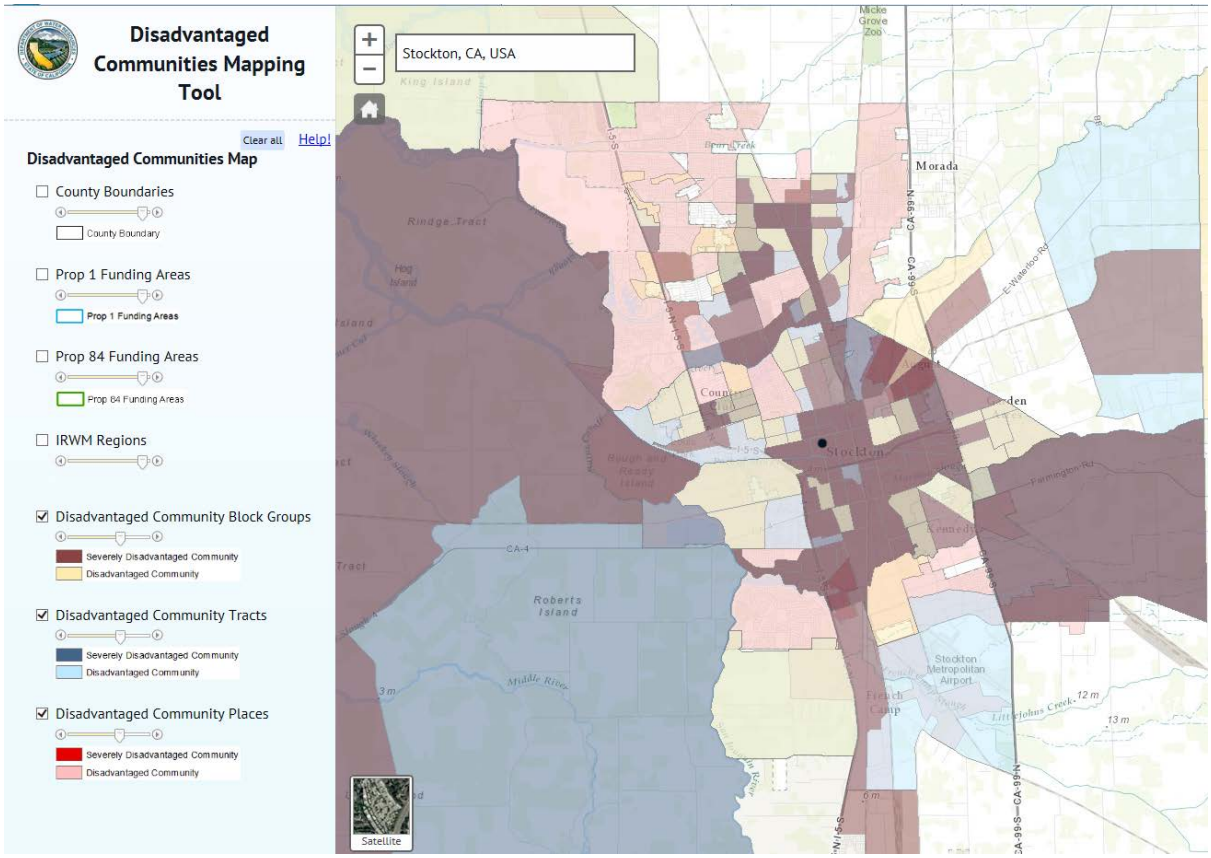

Figure 3-2. Disadvantaged Communities Map for City Area

Section 4

SB X7-7 Baseline and Targets

This section describes the City's SBX7-7 GPCD baseline and targets as updated from the analysis conducted as part of the 2010 UWMP. Compliance with the 2015 interim target is also discussed.

4.1 Updated Calculations from 2010 UWMP

The City's 2010 UWMP provided calculations and a resulting 2015 and 2020 GPCD target based on the DWR methodology (DWR, 2016d). Since the adoption of the 2010 UWMP, the 2010 census data is now available. Also, since the adoption of the 2010 UWMP, DWR has developed SB X7-7 verification tables that the City is required to complete with the updated census data to determine the updated SB X7-7 baseline and target GPCD. The City's completed verification tables are provided in Appendix F of this UWMP.

4.2 Baseline Periods

In this 2015 UWMP, the City has updated the years selected for their baseline periods from those selected in the 2010 UWMP. Two baseline periods must be selected.

4.2.1 10-15 Year Baseline Period (Baseline GPCD)

The City must define a 10- to 15-year baseline period ending between December 31, 2004 and December 31, 2010 for water use and calculate the average water use, in GPCD, over that length of time. Whether the City uses a 10-year baseline period or 15-year baseline period is dependent upon the amount of recycled water use in 2008. Only water suppliers that have recycled water use greater than 10 percent of their total demand are allowed to select a 15 year baseline period. Because the City did not use recycled water in 2008, the City must use a 10-year baseline period. The City's selected 10-year baseline period is 1998 to 2007, as shown in SB X7-7 Table 1, located in Appendix F. This 10-year baseline period is adjusted from the period (1999 to 2008) that was selected in the 2010 UWMP analysis due to revisions in the historical population estimates.

4.2.2 5-Year Baseline Period (Target Confirmation)

The City must also calculate water use, in GPCD, for a 5-year baseline period. This is used to confirm that the selected 2020 target meets the minimum water use reduction requirements. This is a continuous 5-year period that ends no earlier than December 31, 2007 and no later than December 31, 2010. The City's 5-year baseline period is 2005 to 2009, as shown in SB X7-7 Table 1, located in Appendix F. This is updated from the 2010 UWMP 5-year baseline period of 2003 to 2007.

4.3 Service Area Population

In order to calculate the annual baseline GPCD, the City must determine the population that they served for each baseline year in both the baseline periods and for the 2015 compliance year. The City conducted this baseline population analysis as part of the 2010 UWMP based on the year 2000 census. The year 2010 census data was not available until after the 2010 UWMP submittal deadline. For this 2015 UWMP, the City is required to re-calculate its baseline population using 2010 census data. As a result of this analysis update, described in Section 2.3, using the 2010

census, the historical population served by the City is modified as shown in Table SB X7-7 Table 3, located in Appendix F.

4.4 Gross Water Use

Gross water use is the measure of water that enters the City's distribution system over a 12-month period with certain allowable exclusions. These allowable exclusions are recycled water delivered within the service area, indirect recycled water, water placed into long term storage, water conveyed to another urban supplier, water delivered for agricultural use, and process water. The City's gross water use is shown in Table SB X7-7 Table 4 located in Appendix F.

4.5 Per Capita Water Use

The City's baseline and target per capita water use are described in this section.

4.5.1 Baseline Daily Per Capita Water Use

The City's historical gross water and population are used to calculate the baseline daily per capita use in GPCD in Table SB X7-7 Table 5, located in Appendix F. The resulting 5-year and 10-year baseline GPCDs are shown in Table SB X7-7 Table 6, located in Appendix F. The updated 10-year baseline period GPCD is 178 GPCD. The updated 10-year baseline period per capita water use is less than the 2010 UWMP analysis which developed a baseline per capita water use of 195 GPCD. The updated 5-year base period per capita water use is 179 GPCD which is less than the 2010 5-year baseline per capita water use of 193 GPCD. The historical GPCD for the City has decreased since the 2010 UWMP analysis because the baseline population has somewhat increased.

4.5.2 2015 and 2020 GPCD Targets

Per the law as adopted in SBx7-7, the City must establish per capita water use targets using one of four methods, described as follows:

1. **Method 1** - Eighty percent of the urban retail supplier's baseline per capita daily water use.
2. **Method 2** - The per capita daily water use that is estimated using the sum of several defined performance standards.
   a) 55 gallons per day (gpd) for indoor residential water use.
   b) Water efficiency equivalent to the standards of the Model Water Efficient Landscape Ordinance for landscape irrigated through dedicated or residential meters or connections.
   c) A 10 percent reduction in commercial, industrial, and institutional (CII) uses from the baseline CII water use by 2020.
3. **Method 3** - Ninety-five percent of the applicable state hydrologic region target, as outline in the State's draft 20x2020 Water Conservation Plan.
4. **Method 4** - Calculated water savings based on indoor residential water savings, metering savings, CII savings, and landscape and water loss savings, as outline in DWR's Provisional Method 4 for Calculating Urban Water Use Targets, released February 2011.

Regardless of which of the four methods is adopted by the City, if the five-year baseline water use is more than 100 GPCD, the City must compare two target GPCD values:

1. 95 percent of the five-year baseline daily per capita water use and
2. The target determined by the target method the City selects from the four methods allowed.

The 2020 GPCD target is the lower of the two values.

The City has selected Method 3. A summary of the City's baseline and targets is provided in Table 4-1. The City's interim urban water use target is the value halfway between the 10-year baseline GPCD (from Table SBX7-7 Table 5, located in Appendix F) and the confirmed 2020 GPCD target (from Table SBX7-7 Table 7, located in Appendix F).

Table 4-1. (DWR Table 5-1) Baselines and Targets Summary
Retail Agency or Regional Alliance Only

Baseline period	Start years	End years	Average GPCD	2015 Interim Target	Confirmed 2020 Target
10-15 year	1998	2007	178	172	165
5 Year	2005	2009	179		

4.5.3 Adjustments to 2015 Gross Water Use and 2015 Compliance

There are allowable adjustments that can be made to the City's 2015 gross water use for extraordinary events, economic adjustments, or weather normalization. The City did not adjust their 2015 gross water use, as shown in Table 4-2. Also shown in Table 4-2, the City achieved the targeted GPCD value for 2015. It is expected that the City's actual GPCD will increase from the 2015 actual values in the future assuming drought conditions do not continue. The City is on-track to meet its 2020 target.

Table 4-2. (DWR Table 5-2) 2015 Compliance
Retail Agency or Regional Alliance Only [a]

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		
130	172	--	--	--	--	--	130	Yes

[a] *All values are in gallons per capita per day (GPCD)*

Section 5

System Supplies

This section describes the City's existing and projected water supplies. The City's current water supplies consist of purchased water, surface water, and groundwater.

5.1 Purchased Water

The City purchases water from SEWD and Woodbridge Irrigation District (WID) as described in this section.

5.1.1 Stockton East Water District

The City currently receives treated water from SEWD. As described in detail in SEWD's 2015 UWMP, this supply is made up of surface water from New Melones Reservoir and New Hogan Reservoir as well as groundwater. Per the terms of the Second Amended Contract with SEWD, the City's supply allocation from SEWD is based on the amount of water delivered in the previous year. Approximately three months prior to the beginning of the water year, the City reviews their current year SEWD treated water deliveries and determines whether they desire to change the agreement for the upcoming year, compared to what they received in the current water year.

With the commencement of the operation of the Delta Water Supply Project (DWSP) in 2012, the City's planned delivery and allocation of SEWD treated water was 17,500 ac-ft/yr, which was 37.6 percent of SEWD's total supplies. For 2015, due to the drought and a reduction in the SEWD's supplies, the City's planned SEWD delivery and allocation was amended to 6,380 ac-ft/yr, which was 31.9 percent of total SEWD supplies. The City used 5,634 ac-ft of the SEWD supply in 2015. The City has entered into another allocation agreement with all of the parties resulting in 6,000 ac-ft for 2016 for the City, or 30 percent of SEWD supplies during 2016. Moving forward the City will use approximately 6,000 ac-ft/yr from SEWD.

If SEWD is not able to supply the City the total amount requested, the City will be allocated a proportional reduction in the amount of SEWD treated water requested for the subsequent water year.

5.1.2 Woodbridge Irrigation District

In 2008, the COSMUD executed a 40 year purchase agreement with WID for 6,500 ac-ft/yr of water from the Mokelumne River for municipal and industrial water use within the City. This supply will augment the DWSP supply if the San Joaquin River water is not available due to environmental issues. The water is conveyed to the DWSP water treatment plant (WTP) for treatment and pumping to the water distribution system. Under this contract an additional 6,500 ac-ft/yr of WID supply will become available to the City as WID-served agricultural lands in the northern part of the City are annexed to the City for municipal and industrial use at a rate of 3.0 ac-ft/ac/yr. For this analysis, it is assumed the WID supply will increase from 6,500 ac-ft/yr to 13,000 ac-ft/yr by 2025. It is assumed that the WID supply is cut back by approximately 30 percent in single dry years and the third year of a dry year period, similar to what occurred in 2015, as discussed in Section 6.

5.2 Groundwater

The City currently has groundwater wells located in the City's North and South systems. Groundwater is used conjunctively with the City's other supply sources. With the DWSP WTP now online, the City uses less groundwater in wet and average years and increases groundwater use in dry years to make up for reductions in surface water deliveries. Groundwater is managed for long-term sustainability and supply through conjunctive use with surface water supplies. The City has determined that the sustainable groundwater yield is 0.75 ac-ft/acre/yr, equivalent to a groundwater yield of approximately 50,000 ac-ft/yr (MWH, 2003). To establish the projected groundwater supply that is reasonably available, COSMUD assumes that the reasonably available groundwater for the current water service area (38,524 acres) is pumped at 0.6 ac-ft/acre/yr, equivalent to an annual groundwater supply of 23,100 ac-ft/yr.

5.2.1 Basin Description

The groundwater basin underlying the City is the San Joaquin Valley Basin, Eastern San Joaquin Subbasin (5-22.01), as shown on Figure 5-1. The Eastern San Joaquin Subbasin is defined by the areal extent of unconsolidated to semi consolidated sedimentary deposits that are bounded by the Mokelumne River on the north and northwest; San Joaquin River on the west; Stanislaus River on the south; and consolidated bedrock on the east. The Eastern San Joaquin Subbasin is drained by the San Joaquin River and several of its major tributaries namely, the Stanislaus, Calaveras, and Mokelumne Rivers. The San Joaquin River flows northward into the Sacramento and San Joaquin Delta and discharges into the San Francisco Bay. Water bearing formations of significance in the Eastern San Joaquin Subbasin consist of the Alluvium and Modesto/Riverbank Formations, Flood Basin Deposits, Laguna Formation, and Mehrten Formation. The Mehrten Formation is considered to be the oldest fresh water-bearing formation on the east side of the basin, even though the underlying Valley Springs Formation produces minor quantities (DWR, 2006).

Other known groundwater users in the Subbasin include the following agencies:

- City of Lathrop
- City of Lodi
- City of Manteca
- California Water Service Company
- Central Delta Water Agency
- Central San Joaquin Water Conservation District
- Lockeford Community Services District
- North Delta Water Agency
- North San Joaquin Water Conservation District
- Oakdale Irrigation District
- Rock Creek Water District
- South Delta Water Agency
- South San Joaquin Irrigation District
- Stockton East Water District
- City of Ripon
- Woodbridge Irrigation District

Source: Department of Water Resources, CWP 2013

Figure 5-1. Alluvial Groundwater Basins and Subbasins within the San Joaquin River Hydrologic Region

As presented in the Spring 2015 Groundwater Report, one-hundred twenty-eight wells are monitored in the San Joaquin County Flood Control and Water Conservation District in San Joaquin County. Of the sixty-nine wells that were able to be compared, fifty-six wells decreased in groundwater levels since Spring 2014. Nine wells show increases in groundwater levels and four wells had no change in

groundwater elevations (San Joaquin County Flood Control and Water Conservation District, 2015). The Spring 2015 Groundwater Report illustrates the changed groundwater levels in wells along the Highway 99 alignment from 1986, 1992, and Spring 2015. Well locations are shown on Figure 5-2 and groundwater levels are shown on Figure 5-3. Spring 2015 groundwater levels are lower than in the Spring of 1986, but higher than in the Fall of 1992.

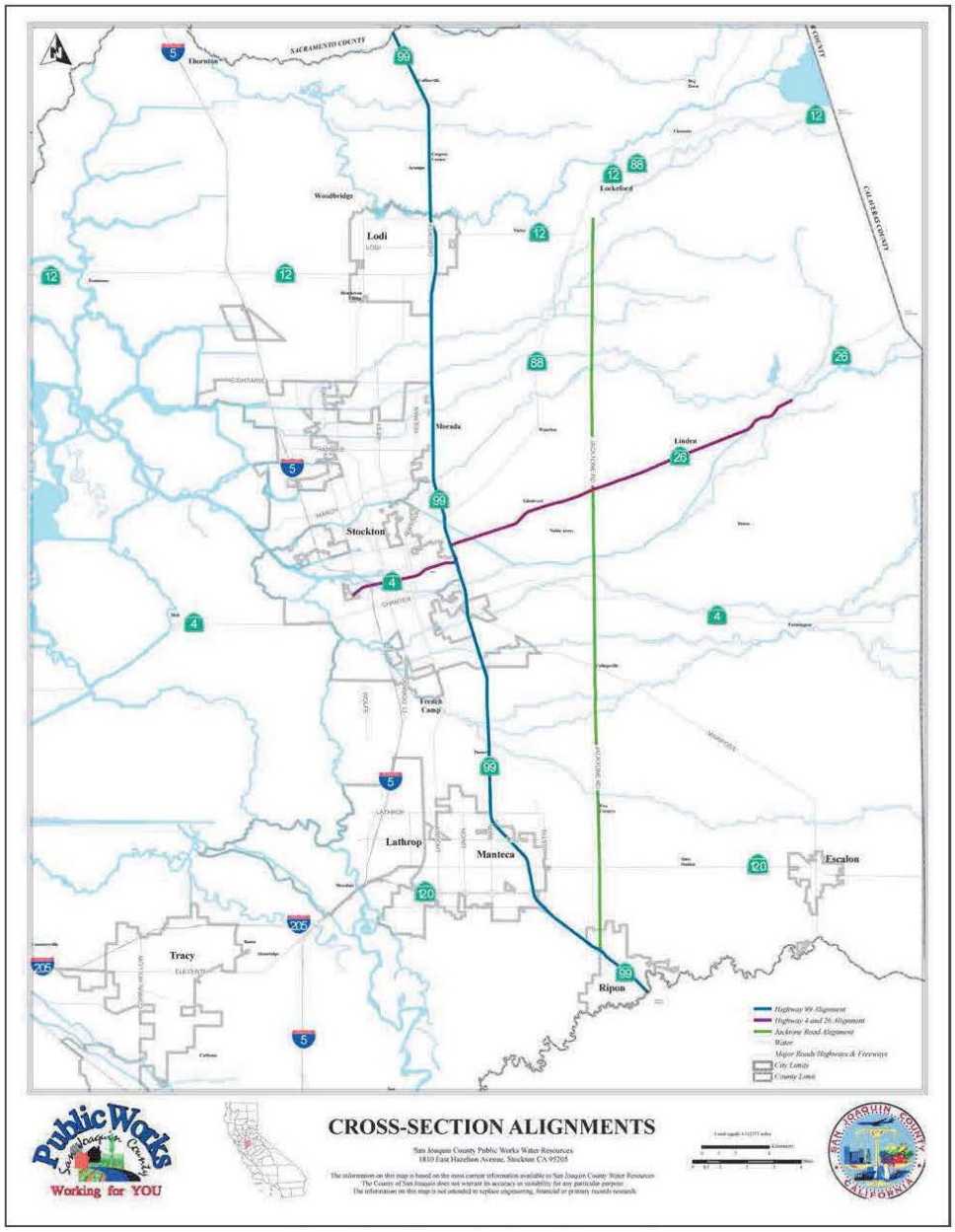

Figure 5-2. Groundwater Well Cross-Section Alignments

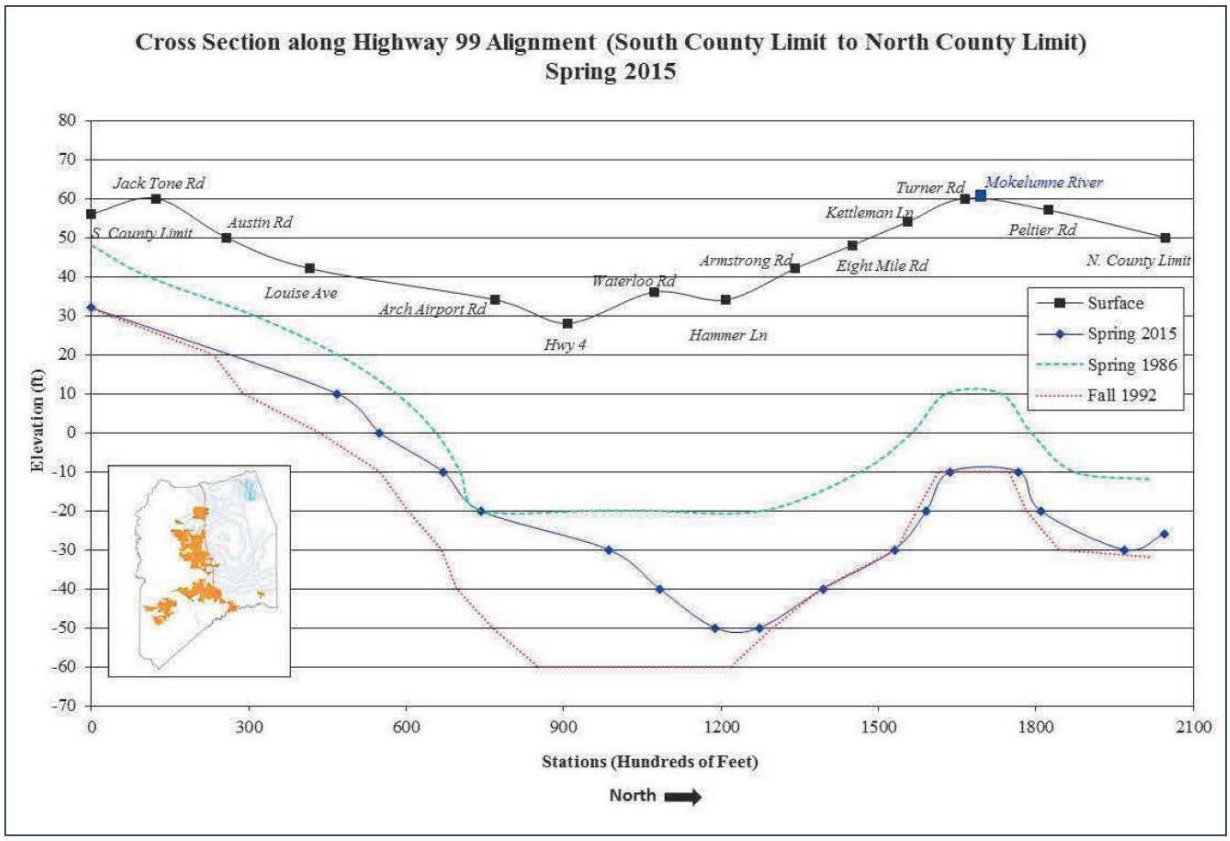

Figure 5-3. Highway 99 Cross Section Groundwater Levels

5.2.2 Groundwater Quality

Extensive groundwater pumping has caused movement of the saline waters eastward from under the Delta. A principal objective of the DWSP is to reduce groundwater overdraft and protect the groundwater basin from further saltwater intrusion and water quality degradation.

5.2.3 Groundwater Management

The City has been proactive to protect groundwater supplies. This section describes the City's groundwater management plan, groundwater recharge efforts, activities pertaining to the California Statewide Groundwater Elevation Monitoring (CASGEM), and Sustainable Groundwater Management Act (SGMA) activities.

5.2.3.1 Groundwater Management Plan

The City is a member of the Eastern San Joaquin County Groundwater Basin Authority (GBA). The GBA was established in 2001 as a joint powers authority to collectively develop locally supported projects to strengthen water supply reliability in Eastern San Joaquin County. In 2005, the City adopted the Eastern San Joaquin Groundwater Basin Groundwater Management Plan (San Joaquin County Department of Public Works, 2004) prepared by the Northeastern San Joaquin County Groundwater Banking Authority, replacing the 1995 Groundwater Management Plan. The comprehensive plan developed by those agencies which overlay the local groundwater basin, is to review, enhance, assess, and coordinate existing groundwater management policies and programs in Eastern San Joaquin County and develop new policies and programs to ensure the long-term

sustainability of groundwater resources in this area. The Eastern San Joaquin Groundwater Basin Management Plan is located on the internet at the following weblink:

http://www.gbawater.org/Portals/0/assets/docs/IRWMP-2014/Groundwater-Management-Plan-Final.pdf

5.2.3.2 Sustainable Groundwater Management Act

The SGMA that was enacted by the legislature in 2014 requires groundwater management in priority groundwater basins, which includes the formation of Groundwater Sustainability Agencies (GSAs) and the development of Groundwater Sustainability Plans (GSPs) for groundwater basins or subbasins that are designated by DWR as medium or high priority. One of the first steps required as part of the groundwater sustainability plan is for a GSA to be formed. This agency will have enforcement authority over their designated portion of the basin and must be formally established by June 30, 2017. As of December 2015, DWR recognized the City's intent in coordination with Cal Water to be the GSA for their portion of the Eastern San Joaquin Groundwater Basin. There are overlaps with SEWD's and WID's proposed GSAs. The City and Cal Water are coordinating with SEWD and WID to refine the boundaries of the GSAs.

SGMA directs DWR to identify groundwater basins and subbasins in conditions of critical overdraft. DWR has identified the Eastern San Joaquin Subbasin as a critically overdrafted basin. Conditions of critical overdraft result from undesirable impacts which can include seawater intrusion, land subsidence, groundwater depletion, and/or chronic lowering of groundwater levels. As required in the SGMA, all Bulletin 118 basins designated as high or medium priority and critically overdrafted shall be managed under a groundwater sustainability plan or coordinated groundwater sustainability plans by January 31, 2020. All other high and medium priority basins must be managed under a groundwater sustainability plan by January 31, 2022.

DWR implemented the CASGEM Program in response to legislation enacted in California's 2009 Comprehensive Water package. As part of the CASGEM Program and pursuant to the California Water Code (CWC §10933), DWR is required to prioritize California groundwater basins, so as to help identify, evaluate, and determine the need for additional groundwater level monitoring.

The CASGEM Groundwater Basin Prioritization is a statewide ranking of groundwater basin importance that incorporates groundwater reliance and focuses on basins producing greater than 90 percent of California's annual groundwater. CASGEM ranked the Eastern San Joaquin Subbasin as a high priority basin (DWR, January 2016c).

5.2.4 Overdraft Conditions

DWR previously identified critically over drafted basins in Bulletin-118, 1980 and the 2003 update. The Eastern San Joaquin Subbasin is identified as a critically overdrafted groundwater basin in Bulletin 118. As defined in the SGMA, "A basin is subject to critical overdraft when continuation of present water management practices would probably result in significant adverse overdraft-related environmental, social, or economic impacts." Municipal and agricultural uses of groundwater within San Joaquin contribute to an overall average use of groundwater estimated to be 761,828 ac-ft/yr for agricultural uses and 47,493 ac-ft/yr for municipal and industrial uses (DWR 2006). Historically, groundwater elevations have declined from about 40 to 60 feet averaging approximately 1.7 feet per year. As a result, a regional cone of depression has formed in Eastern San Joaquin County creating a gradient that allows saline water underlying the Delta region to migrate northeast within the southern portions of the City.

5.2.5 Historical Groundwater Pumping

Groundwater is used if surface water supplies are insufficient to meet water demands. As shown in Table 5-1, in 2014 and 2015, the City pumped an increased amount of groundwater due to reductions in the availability of surface water.

Table 5-1. (DWR Table 6-1) Retail: Groundwater Volume Pumped, ac-ft/yr						
☐	Supplier does not pump groundwater. The supplier will not complete the table below.					
Groundwater type	Location or basin name	2011	2012	2013	2014	2015
Alluvial Basin	San Joaquin Valley Basin, Eastern San Joaquin Subbasin (5-22.01),	6,009	3,393	3,825	7,227	6,628
Total		6,009	3,393	3,825	7,227	6,628

5.3 Surface Water

The City has developed a new surface water supply, Delta water at the DWSP intake facility, from the San Joaquin River. The objective of this supply is to achieve a long-term reliable water supply from the Delta for existing and future customers. The City has rights to Delta water because portions of the COSMA fall within the legally defined Delta and the area of origin. The City's water rights application addressed a long-term planning horizon through the year 2050, requesting an ultimate diversion of 160 million gallons per day (mgd) (125,900 ac-ft/yr). The State Water Resources Control Board (SWRCB) divided the water rights application into two separate applications, Application 30531A and 30531B. Application 30531A covers the initial phase of the DWSP up to 30 mgd (33,600 ac-ft/yr) and the place of use is confined to the current 1990 General Plan boundary. The initial phase was granted a water right under California Water Code Section 1485. The City has a permit from the SWRCB issued on March 8, 2006 for a 33,600 ac-ft/yr supply from the Sacramento/San Joaquin Delta.

The DWSP intake and water treatment plant was operational in 2012 with an initial capacity of 30 mgd (33,600 ac-ft/yr). The projected capacity of the DWSP by 2035 is 90 mgd with an annual production of approximately 50,000 ac-ft/yr. The DWSP will expand as needed up to 120 mgd provided water rights are granted.

The City's supply from the San Joaquin River is curtailed annually from February through June of each year due to U.S. Department of Fish and Wildlife Service and Department of Fish and Game restrictions.

California Water Code (CWC) Section 1485 Water Rights allows the City to take out of the Delta as much water as the City's wastewater treatment plant discharges into the Delta. This quantity, which fully covers the 33,600 ac-ft/yr, is not restricted as long as the same amount of wastewater is discharged into the Delta. Section 1485 water may be subject to pumping restriction in some months due to fish protection.

5.4 Stormwater

There are no plans to divert stormwater runoff as a water source.

5.5 Wastewater and Recycled Water

This section describes the wastewater collection, treatment, and disposal and recycled water coordination within the City's water service area.

5.5.1 Recycled Water Coordination

The City owned Stockton Regional Wastewater Control Facility (RWCF) collects, treats, and discharges municipal wastewater that is generated and treated within the City's wastewater service area.

5.5.2 Wastewater Collection, Treatment, and Disposal

This section describes how the City collects and treats, as well as discharges the wastewater from the RWCF.

5.5.2.1 Wastewater Collected Within Service Area

The wastewater collection system in the City is a network of pipes, and lift stations that transport wastewater from its source to the treatment plant. A summary of the wastewater generated in the City's wastewater service area is provided in Table 5-2.

Table 5-2. (DWR Table 6-2) Wastewater Collected Within Service Area in 2015

☐	There is no wastewater collection system. The supplier will not complete the table below.
100%	Percentage of 2015 service area covered by wastewater collection system (optional)
100%	Percentage of 2015 service area population covered by wastewater collection system (optional)

Wastewater collection			Recipient of collected wastewater			
Name of wastewater collection agency	Wastewater volume metered or estimated?	Volume of wastewater collected in 2015	Name of wastewater treatment agency receiving collected wastewater	Treatment plant name	Is WWTP located within UWMP area? Drop down list	Is WWTP operation contracted to a third party? (optional) Drop down list
City of Stockton	Metered	27,534 ac-ft/yr [(a)]	City of Stockton	Stockton Regional Wastewater Control Facility	Yes	No
Total Wastewater Collected from Service Area:		27,534 ac-ft/yr				

[(a)] *2015 RWCF wastewater influent.*

5.5.2.2 Wastewater Treatment and Discharge within Service Area

The Stockton RWCF is located in the southwest area of the City. The facility is a 55 mgd tertiary treatment facility. The facility serves the City of Stockton and outlying County areas and processes an average of 33 mgd. It includes primary, secondary, and advanced tertiary treatment of wastewater. The treated wastewater is discharged into the San Joaquin River.

Table 5-3. (DWR Table 6-3) Retail: Wastewater Treatment and Discharge Within Service Area in 2015										
☐	No wastewater is treated or disposed of within the UWMP service area. The Supplier will not complete the table below.									
Wastewater treatment plant name	Discharge location name or identifier	Discharge location description	Wastewater discharge ID number (optional)	Method of disposal	Does this plant treat wastewater generated outside the service area?	Treatment level	2015 volumes (ac-ft)			
							Wastewater treated	Discharged treated wastewater	Recycled within service area	Recycled outside of service area
Stockton Regional Wastewater Control Facility	Delta	San Joaquin River		River or creek outfall	Yes	Tertiary	23,349 [(a)]	23,349	0	0
						Total	23,349	23,349	0	0

[(a)] *2015 RWCF wastewater effluent.*

5.5.3 Recycled Water System

Municipal recycled water is municipal wastewater that has been treated to a specified quantity to enable it to be used again for a beneficial purpose. For the purpose of this UWMP, recycled water means only municipal recycled water, that is, water that has been treated and discharged from a municipal wastewater facility. Up until the City began to exercise their CWC Section 1485 water right, which is based on the amount of treated wastewater effluent discharged from the RWCF plant into the Delta, the RWCF had been supplying recycled water to a privately owned 14-acre farm for over 20 years. The farm used the recycled water to irrigate crops of alfalfa and safflower. The farm was supplied approximately 107 ac-ft/yr of recycled water. The City does not currently operate a recycled water system. Because of the City's 1485 water right, it is not likely the City will market recycled water into the future.

5.5.4 Actions to Encourage and Optimize Future Recycled Water Use

Three potential options for recycled water use in the Stockton Area were identified in a study conducted in 1996 (Corollo, 1996) that consisted of community based customers, market to Central San Joaquin Water Conservation District (CSJWCD), and groundwater recharge in the Linden area. The City has held focus group meetings for the three alternatives. The meetings included individuals with knowledge on water issues in the Stockton area, individuals with expertise in recycled water, farmers, community members, and customers from the Linden area.

Distribution pipelines would be required throughout the City to convey the recycled water to any customer. A storage requirement of approximately 43 ac-ft would also be required. The estimated cost for implementing community based recycled water use is about $135 million. Recycled water would not be able to be used throughout each year within the community. Storage or diverting of the unused recycled water would be required.

Marketing to CSJWCD would require a pipeline to Woodward Reservoir and would require 33,200 ac-ft of storage space. The estimated cost for providing recycled water to CSJWCD is about $60 million. Currently there is minimal interest by farmers in the area in paying for recycled water, because farmers in the San Joaquin area currently have a reliable supply of water at a fairly low cost.

Groundwater recharge in the Linden area would require a pipeline to Linden. No storage would be necessary. The estimated cost for groundwater recharge is approximately $86 million to $117 million. The range in cost is based on the rate of percolation, which has been found to vary from about 1 to 11 feet per day in previous studies.

Customers in the Stockton area have expressed concerns over the potential use of recycled water. Concerns include the long-term impacts recycled water would have on groundwater and surface water, negative impacts on crops and soils, and a decrease in marketability of crops irrigated by recycled water. Any recycled water use will reduce the availability of Section 1485 water that will be diverted and treated by the DWSP. This provides no incentive for increasing recycled water production beyond current flows.

As stated in Table 5-4, the City at this time is not pursuing the alternatives listed above. High costs, lack of public interest, concerns of the customers, and the reduction in potable water rights make the alternatives prohibitive to implement at the present time. The information from the Recycled Water Market Evaluation Study (Carollo, 1996) will be used in future master planning of the Wastewater Treatment Plant.

Table 5-4. (DWR Table 6-6) Retail: Methods to Expand Future Recycled Water Use			
✓	Supplier does not plan to expand recycled water use in the future. Supplier will not complete the table below but will provide narrative explanation.		
Section 5.5.4	Provide page location of narrative in UWMP		
Name of action	Description	Planned implementation year	Expected Increase in recycled water use
--	--	--	--

5.6 Desalinated Water Opportunities

The City has no sources of ocean water, brackish water, or groundwater that provide viable opportunities for development of desalinated water as a long term supply. There are no opportunities for the development of desalinated water within the City's service area as a future supply source.

5.7 Exchanges or Transfers

The City is not pursuing any additional water resource exchanges or transfers.

5.8 Future Water Projects

The City plans to expand the DWSP capacity by 2035, as shown in Table 5-5.

Table 5-5. (DWR Table 6-7) Retail: Expected Future Water Supply Projects or Programs					
☐	No expected future water supply projects or programs that provide a quantifiable increase to the agency's water supply. Supplier will not complete the table below.				
☐	Some or all of the supplier's future water supply projects or programs are not compatible with this table and are described in narrative format. LOCATION OF THE NARRATIVE_____				
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
DWSP Capacity Expansion	--	Expand DWSP capacity from 30 mgd to 90 mgd	2035	2035	16,400 ac-ft/yr (33,600 ac-ft/yr to 50,000 ac-ft/yr)

5.9 Summary of Existing and Planned Sources of Water

A summary of actual supply sources and quantities in 2015 are provided in Table 5-6. The water supplies projected from 2020 through 2040 are provided in Table 5-7. The supply projected to be available from each source in normal years is shown. It should be noted that in normal years the City's objective is to minimize the use of groundwater and maximize the use of surface water as part of their conjunctive use program.

Table 5-6. (DWR Table 6-8) Water Supplies – Actual, ac-ft/yr				
Water supply	Additional detail on water supply	2015		
		Actual volume	Water quality	Total right or safe yield
Purchased water	SEWD	4,159[(a)]	Drinking water	6,380
Purchased water	WID (DWSP intake facility)	4,628	Raw water	6,500
Supply from storage				
Groundwater	Eastern San Joaquin Subbasin 5-22.01	6,628	Raw water	50,000
Surface water	Delta (DWSP intake facility)	9,428	Raw water	33,600
Recycled water		0		0
Desalinated water		0		0
Stormwater use		0		0
Transfers		0		0
Exchanges		0		0
Total		24,843		96,480

Note: A normal year is assumed.

[(a)] The 1,486 ac-ft/yr water wheeled from SEWD to San Joaquin County water systems is not included.

Table 5-7. (DWR Table 6-9)
Water Supplies – Projected, ac-ft/yr

Water supply	Additional detail on water supply	2020		2025		2030		2035		2040	
		Reasonably available volume	Total right or safe yield	Reasonably available volume	Total right or safe yield	Reasonably available volume	Total right or safe yield	Reasonably available volume	Total right or safe yield	Reasonably available volume	Total right or safe yield
Purchased water	SEWD	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000	6,000
Purchased water	WID (DWSP intake facility)	6,500	6,500	13,000	13,000	13,000	13,000	13,000	13,000	13,000	13,000
Supply from storage		0	0	0	0	0	0	0	0	0	0
Groundwater	Eastern San Joaquin Subbasin 5-22.01	23,100	50,000	23,100	50,000	23,100	50,000	23,100	50,000	23,100	50,000
Surface water	Delta (DWSP intake facility)	33,600	33,600	33,600	33,600	33,600	33,600	50,000	50,000	50,000	50,000
Recycled water		0	0	0	0	0	0	0	0	0	0
Desalinated water		0	0	0	0	0	0	0	0	0	0
Stormwater use		0	0	0	0	0	0	0	0	0	0
Transfers		0	0	0	0	0	0	0	0	0	0
Exchanges		0	0	0	0	0	0	0	0	0	0
Total		69,200	96,100	75,700	102,600	75,700	102,600	92,100	119,000	92,100	119,000

Note: *A normal year is assumed.*

Section 6

Water Supply Reliability Assessment

This section describes factors impacting long term reliability of water supplies and provides a comparison of projected water supplies and demand projections in normal, single dry, and multiple dry years.

6.1 Constraints on Water Sources

Water supply reliability is an important component of the water management planning process. Factors contributing to inconsistency in the City's water supplies include legal limitations due to water rights and contracts limiting the quality of water available to the City, environmental constraints, and reductions in availability due to climatic factors. The factors and constraints specific to each of the City's individual water supplies are described in Section 5.

6.2 Reliability by Type of Year

The basis of the water year data is provided in Table 6-1 for SEWD supply, Table 6-2 for the Delta supply, and Table 6-3 for the WID supply. The definitions of the three water year types as described by DWR (DWR, 2016b) are provided below.

1. Average year is a year, or an averaged range of years in the historical sequence that most closely represents median water supply availability to the agency. Normal and average are used interchangeably within the DWR guidebook.
2. Single dry year is the year with the lowest water supply availability to the agency.
3. Multiple-dry year period is the lowest average water supply availability to the agency for a consecutive multiple year period (three years or more) for a watershed since 1903.

Table 6-1. (DWR Table 7-1)
Retail Basis of Water Year Data – SEWD

Year type	Base year	Volume available[(a)], ac-ft/yr	Percentage of average supply
Average year	2012	24,144	100%
Single dry year	2015	5,634	23%
Multiple-dry years 1st year	2013	17,209	71%
Multiple-dry years 2nd year	2014	14,788	61%
Multiple-dry years 3rd year	2015	5,634	23%

Note: SEWD is able to treat groundwater and supplement its surface water sources with groundwater in dry years.

(a) Volume shown as "volume available" is the actual amount of SEWD water used by the City and the San Joaquin County water systems in each year type. In future years it is assumed the City use of SEWD water will not exceed 6,000 ac-ft/yr in normal years, and the 1st and 2nd year of multiple dry years. It is assumed the City's use of SEWD water will not exceed 4,000 ac-ft/yr in single dry years and the 3rd year of multiple dry years. This does not include the SEWD supply wheeled to the San Joaquin County water systems.

Table 6-2. (DWR Table 7-1) Retail Basis of Water Year Data – Delta			
Year type	Base year	Volume available, ac-ft/yr	Percentage of average supply
Average year	2012	33,600	100%
Single dry year	2015	33,600	100%
Multiple-dry years 1st year	2013	33,600	100%
Multiple-dry years 2nd year	2014	33,600	100%
Multiple-dry years 3rd year	2015	33,600	100%

Table 6-3. (DWR Table 7-1) Retail Basis of Water Year Data – WID			
Year type	Base year	Volume available, ac-ft/yr	Percentage of average supply
Average year	2012	6,500	100%
Single dry year	2015	4,500	69%
Multiple-dry years 1st year	2013	6,500	100%
Multiple-dry years 2nd year	2014	6,500	100%
Multiple-dry years 3rd year	2015	4,500	69%

Note: In future years when the WID supply is increased, it is assumed that the single dry year and multiple dry year 3rd year will be reduced at the same percentage.

It is assumed that the City's groundwater supply will be used conjunctively with the surface water and purchased water supplies. In years when surface water and purchased water is available, they will be used to the fullest extent. This will allow the City to minimize the use of groundwater.

6.3 Supply and Demand Assessment

This section provides a comparison of normal, single dry, and multiple dry water year supplies and demands for the City. Water demands are addressed in Section 3 and water supplies are addressed in Section 5. The normal water year current and projected water supplies are compared to the current and projected demands for the City in Table 6-4.

Table 6-4. (DWR Table 7-2) Retail: Normal Year Supply and Demand Comparison, ac-ft/yr					
	2020	2025	2030	2035	2040
Supply [a]					
SEWD	6,000	6,000	6,000	6,000	6,000
WID	6,500	13,000	13,000	13,000	13,000
Delta	33,600	33,600	33,600	50,000	50,000
Groundwater	23,100	23,100	23,100	23,100	23,100
Recycled water	0	0	0	0	0
Supply total	69,200	75,700	75,700	92,100	92,100
Demand total[b]	34,654	36,856	39,217	41,749	44,465
Difference (supply minus demand)	34,546	38,844	36,483	50,351	47,635

[a] *Supply from Table 5-7*

[b] *Demand from Table 3-4*

The current and projected water supplies are compared to the demands for a single dry year for the City in Table 6-5.

Table 6-5. (DWR Table 7-3) Single Dry Year Water Supply and Demand Comparison, ac-ft/yr					
	2020	2025	2030	2035	2040
Supply					
SEWD	4,000	4,000	4,000	4,000	4,000
WID	4,500	9,000	9,000	9,000	9,000
Delta	33,600	33,600	33,600	50,000	50,000
Groundwater	23,100	23,100	23,100	23,100	23,100
Recycled water	0	0	0	0	0
Supply total	65,200	69,700	69,700	86,100	86,100
Demand total	34,654	36,856	39,217	41,749	44,465
Difference (supply minus demand)	30,546	32,844	30,483	44,351	41,635

The projected water supplies are compared to the demands for multiple dry years for the City in Table 6-6.

Table 6-6. (DWR Table 7-4) Retail: Multiple-Dry Years Supply and Demand Comparison, ac-ft/yr						
		2020	2025	2030	2035	2040
First year	Supply					
	SEWD	6,000	6,000	6,000	6,000	6,000
	WID	6,500	13,000	13,000	13,000	13,000
	Delta	33,600	33,600	33,600	50,000	50,000
	Groundwater	23,100	23,100	23,100	23,100	23,100
	Recycled water	0	0	0	0	0
	Supply total	69,200	75,700	75,700	92,100	92,100
	Demand total	34,654	36,856	39,217	41,749	44,465
	Difference	34,546	38,844	36,483	50,351	47,635
Second year	Supply					
	SEWD	6,000	6,000	6,000	6,000	6,000
	WID	6,500	13,000	13,000	13,000	13,000
	Delta	33,600	33,600	33,600	50,000	50,000
	Groundwater	23,100	23,100	23,100	23,100	23,100
	Recycled water	0	0	0	0	0
	Supply total	69,200	75,700	75,700	92,100	92,100
	Demand totals	34,654	36,856	39,217	41,749	44,465
	Difference	34,546	38,844	36,483	50,351	47,635
Third year	Supply					
	SEWD	4,000	4,000	4,000	4,000	4,000
	WID	4,500	9,000	9,000	9,000	9,000
	Delta	33,600	33,600	33,600	50,000	50,000
	Groundwater	23,100	23,100	23,100	23,100	23,100
	Recycled water	0	0	0	0	0
	Supply total	65,200	69,700	69,700	86,100	86,100
	Demand total	34,654	36,856	39,217	41,749	44,465
	Difference	30,546	32,844	30,483	44,351	41,635

6.4 Regional Supply Reliability

The City is a member of the Eastern San Joaquin County Groundwater Basin Authority and was a key participant in the GBA 2014 Integrated Regional Water Management Plan (IRWMP) Update (GBA, 2014). The purpose of the 2014 IRWMP is to define and integrate key water management strategies to establish the protocols and course of action for implementation of the Eastern San Joaquin Integrated Conjunctive Use Program (ICU Program). The ICU Program will implement a comprehensive, prioritized set of projects and actions that when implemented will meet adopted Basin Management Objectives and provide regional benefits to area stakeholders.

The ICU Program is a broad-based program to integrate and coordinate water resource management over a large region encompassing all or parts of the watersheds of the Mokelumne, Calaveras, and Stanislaus rivers, Littlejohns Creek, and Bear Creek. The IRWMP is designed to be expandable to integrate with entire watersheds and adjacent areas such as the American River and upper Mokelumne River in the future. As such, a set of measurable, performance-based evaluation criteria have been developed that will be applicable to potential future planning and management in a broader region. The purpose of establishing these criteria is to support implementation of projects and programs that best meet the region's objectives rather than a small constituency, and identify opportunities for regional collaboration and leadership.

Section 7

Water Shortage Contingency Planning

This section describes the City's water shortage contingency planning process and how the City responds to water shortages. The City's water shortage contingency plan consists of the City's adopted Water Conservation Ordinance (1988) and Water Shortage Emergency Ordinance (1991) in the City Municipal Code Section 13.28, provided in Appendix G.

7.1 Stages of Action

The City will implement an appropriate water shortage contingency stage based on the City's water supply conditions, as listed for the five stages defined in Table 7-1. Approximately three months prior to the beginning of the water year the City will know its expected purchased water and surface water supplies. Based on the total normal year availability of those supplies combined with the City's groundwater supply the City will determine what water supply stage will apply during the year. Other conditions such as statewide water supply conditions, Governor's executive orders, and actions by surrounding agencies could also have an impact on the stage determined by the City.

Table 7-1. (DWR Table 8-1) Retail: Stages of Drought Contingency Plan			
Stage	Target conservation (water savings)	Percent supply reduction (numerical value as a percentage) [(a)]	Water supply condition
Stage 1 Mandatory Water Conservation	10%	45 to 50%	• WID, Delta, and/or North wells capacity reduction • DWSP issues • Intake structure issues • SEWD and /or South wells capacity reduction
Stage 2 Water Shortage Emergency	20%	50 to 55%	• WID, Delta, and/or North wells capacity reduction • DWSP issues • Intake structure issues • SEWD and /or South wells capacity reduction
Stage 3 Water Shortage Emergency	30%	55 to 60%	• WID, Delta, and/or North wells capacity reduction • DWSP issues • Intake structure issues • SEWD and /or South wells capacity reduction
Stage 4 Water Shortage Emergency	40%	60 to 65%	• WID, Delta, and/or North wells capacity reduction • DWSP issues • Intake structure issues • SEWD and /or South wells capacity reduction
Stage 5 Water Shortage Emergency	50%	65 to 70%	• WID, Delta, and/or North wells capacity reduction • DWSP issues • Intake structure issues • SEWD and /or South wells capacity reduction

[(a)] *Percent supply reduction is based on the current normal year supplies and target conservation of 2020 demands.*

7.2 Prohibitions on End Uses

The City's water shortage contingency plan includes mandatory prohibitions on water uses. DWR categorizes the types of restrictions and prohibitions as landscape irrigation, commercial/ institutional/ industrial (CII), water features and swimming pools, and other. A summary of the City's restrictions and prohibitions are provided in Table 7-2.

Table 7-2. (DWR Table 8-2)
Restrictions and Prohibitions on End Uses

Stage	Restrictions and prohibitions to end users (from drop down list)	Additional explanation	Penalty, charge, or other enforcement?
All stages	Landscape - Restrict or prohibit runoff from landscape irrigation		Warning, surcharge, disconnection (See Section7.3)
2,3,4,5	Landscape - Limit landscape irrigation to specific times and days	Prohibit/ restrict landscape irrigation except by drip or mist systems From May 1 through November 1 irrigation is prohibited during specific hours and days	Warning, surcharge, disconnection (See Section7.3)
2,3,4,5	Landscape - Other landscape restriction or prohibition	Prohibit irrigation runoff or waste at all times	Warning, surcharge, disconnection (See Section7.3)
All stages	CII - Restaurants may only serve water upon request	CII water use prohibitions are requested in State 1 and enforced in Stage 2 and later. In all stages from May 1 to November 1 restaurant owners are not to serve water unless requested by the customer.	Warning, surcharge, disconnection (See Section7.3)
All stages	Water Features - Restrict water use for decorative water features, such as fountains	Use of water in ornamental fountains in public and commercial establishments shall be prohibited unless the water is recirculated.	Warning, surcharge, disconnection (See Section7.3)
All stages	Pools - Allow filling of swimming pools only when an appropriate cover is in place	It is prohibited in all stages to drain or refill existing swimming pools, except for protection of public health and safety.	Warning, surcharge, disconnection (See Section7.3)
All stages	Other - Customers must repair leaks, breaks, and malfunctions within 48 hours		Warning, surcharge, disconnection (See Section7.3)
All stages (May 1 to Nov 1)	Other - Require automatic shut off hoses	In all stages customers must use automatic shutoff hose nozzles and repair leaks, breaks, and malfunctions in a timely manner.	Warning, surcharge, disconnection (See Section7.3)
2, 3, 4, 5	Other - Prohibit use of potable water for construction and dust control	In stages 2, 3, 4, and 5, water use for dust control is prohibited.	Warning, surcharge, disconnection (See Section7.3)
2, 3, 4, 5	Other	Use of potable water from any fire hydrant for use other than suppression purposes or with permit	Warning, surcharge, disconnection (See Section7.3)

7.3 Penalties, Charges, Other Enforcement

Whenever the City becomes aware of a person violating, causing, or permitting a violation of the prohibitions presented in Table 7-2, a notice shall be provided that describes the nature of the violation and order that said violation be corrected within a stated period. Upon occurrence of a second violation or failure to correct the initial violation, a second notice shall be served ordering immediate correction and imposing a surcharge of $100 per day for each day the violation continues. The Director may issue an order to cease and desist until appropriate remedial actions are taken. A violation shall constitute an offense in addition to surcharges and disconnection procedure.

7.4 Consumption Reduction Methods

Consumption reduction methods are actions taken by the City to reduce water demand within the service area, whereas prohibitions, addressed in Section 7.2 limit specific uses of water. All connections in the City service area are metered. Actual reductions in water use can be monitored as necessary to achieve the goals of the demand reduction program implemented during water shortages. During Stage 1 the City increases its public outreach and drought awareness in order to communicate voluntary (Stage 1) and mandatory (Stages 2, 3, and 4) reduction targets to retail customers.

Table 7-3 summarizes the City's consumption reduction methods to reduce water demand in the service area.

Table 7-3. (DWR 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 WUE data online submittal tool*	Additional explanation or reference *(optional)*
1	Expand public information campaign	
1	Offer water use surveys	
2	Decrease line flushing	
1	Reduce water system loss	
2	Implement or modify drought rate structure or surcharge	In process

7.5 Determining Water Shortage Reductions

Since the COSMUD service area is fully metered, reductions in water use can be quantified and compared with previous years' water use.

7.6 Revenue and Expenditure Impacts

The City maintains an adequate operational reserve to protect against a temporary water shortage. The City is in the process of developing a drought rate structure. The City's proposed updated rate structure includes a schedule of drought rates. The goal of drought rates is to recover the temporary

loss of revenue due to reduction of water sales during a period of drought. The City Council adopted a resolution approving a Proposition 218 Public Notice and Protest Hearing to occur in June 2016.

7.7 Resolution or Ordinance

The City's water shortage contingency plan consists of the City's adopted Water Conservation Ordinance (1988) and Water Shortage Emergency Ordinance (1991) in the City Municipal Code Section 13.28, provided in Appendix G.

7.8 Catastrophic Supply Interruption Plan

Water shortage emergency response is coordinated with the County's Advisory Water Commission. Actions to be taken in the event of loss of water facilities are incorporated into the City's Emergency Plan. The City's response planning includes the use of standby generators, water purification supplies and equipment, emergency drinking water storage, and water trucks. Water storage, treatment, and pumping facilities have been constructed to meet earthquake safety standards and are inspected regularly. The City has entered into a Memorandum of Understanding (MOU) with Cal WARN for mutual aid and assistance during times of emergency.

7.9 Three-Year Minimum Water Supply

An estimate of the minimum water supply for 2016, 2017, and 2018 is based on the combined availability of all water sources available during the City's historical multiple-dry year sequence, 2013, 2014, and 2015.

Table 7-4. (DWR Table 8-4) Retail: Three-Year Minimum Water Supply, ac-ft/yr

	2016	2017	2018
Available water supply	69,200	69,200	65,200

Section 8

Demand Management Measures

The City conducts an ongoing water conservation program. The City is committed to implementing water conservation measures for all customer sectors. This section provides narrative descriptions addressing the nature and extent of each demand management measure (DMM) implemented over the past five years, from 2010 through 2015, as well as the City's planned implementation of each conservation measure. The City is a signatory to the California Urban Water Conservation Council (CUWCC) Memorandum of Understanding.

8.1 Water Waste Prohibition

The City's Municipal Code, Chapter 13.28 (Appendix G) is dedicated for water conservation and restricts certain uses of water, as described in Section 7. The restrictions are enforceable per the Municipal Code 13.28.090 and are enforced by the COSMUD.

Planned Implementation: The implementation of this DMM is ongoing. The City will continue to enforce this regulation. The City routinely reviews and updates its water conservation ordinance.

Method to Estimate Expected Water Savings: Water savings from this program cannot be directly quantified. Water waste complaints and violations are received and investigated by COSMUD staff and addressed via door hangers and/or direct contact in person or via telephone with tenants and property owners. Complaints and violations are opened, tracked, and closed in the COSMUD Monthly Operations and Maintenance Report.

8.2 Metering

The entire City water service area is fully metered and all connections are billed based on the volume of water used. The City became fully metered in 1954. In addition, customers are classified by meter type including single-family residential, multi-family residential, commercial, institutional, industrial, and landscape irrigation accounts.

Planned Implementation: This DMM is fully implemented and the City will continue to install and read meters on all new services.

Methods to Estimate Expected Water Savings: Meters allow the City to track customer water use and compare current use to historic data. Since the City is fully metered no additional water savings will be realized.

8.3 Conservation Pricing

The City has a uniform rate structure. The City's Water Fee Schedule is provided in Appendix H. The City's water conservation ordinance allows the City to raise water prices during declared water emergencies. The City is in the process of developing a drought rate structure.

Planned Implementation: The implementation of this DMM is ongoing. The City plans to continue implementing its uniform rate structure. The Water Fee Schedule is in place and effective beginning July 1, 2015 and is adjusted annually July 1 in accordance with the approved rate increases and/or cost of living adjustments.

Methods to Estimate Expected Water Savings: Effectiveness of this DMM is evaluated by comparison of the City's water use prior to and following the implementation of conservation pricing.

8.4 Public Education and Outreach

The City provides water conservation information as part of COSMUD's outreach program. The current 2015/2016 budget for the City's public information programs is $519,080, which includes labor, program, and advertising. The public information program includes print and web-based publications, monthly bill inserts, and public outreach events.

The City includes water conservation tips and information in the City's monthly utility bill newsletter, Stockton Water News, which is mailed to all COSMUD water customers. Water conservation is featured in the May issue of Stockton Water News as part of Water Awareness Month. City staff also provides an update on the City's water supply to the City's Water Advisory Group, Council Water Committee, and City Council. This report provides information regarding anticipated water supplies and provides an overview of the COSMUD water use and conservation programs.

The City is a United States Environmental Protection Agency (USEPA) WATERSense Partner and is able to utilize available promotion materials and actively promotes USEPA's Fix a Leak Week every year.

The City provides water conservation education as part of the community and school outreach program through their participation in SAWS. SAWS water conservation materials are included with teacher packets for classroom presentations and are discussed during classroom programs. The City participates with SAWS to develop and implement a water education program for public and private schools within its service area. The SAWS group believes that providing water education in elementary and secondary schools is highly effective in reaching the public at large because young children are apt to share the lessons they learn in class with their parents, siblings, and extended families.

Educational materials, pamphlets, and guidance to classroom activities are available to schools and the public to highlight the value of water and ways to conserve. SAWS's Water Conservation Program reaches approximately 28,000 K-6 grade students annually and has an outreach budget of $217,000. The program provides outreach in various formats including: a large assembly program, in-class presentations, after-school programs, booths at festivals and community events, and various workshops. Examples of materials used in public education programs are included in Appendix I.

Water conservation outreach literature is also distributed at community events such as Family Day in the Park, Black Family Day, Cinco de Mayo, State of the City, and the annual Earth Day Festival. Water conservation literature is also distributed throughout City departments and to various community centers and libraries. The public can access water conservation information on the COSMUD section of the City's web page at:

http://www.stocktongov.com/government/departments/municipalUtilities/utilWaterCon.html

The City's website offers water wise landscaping resources, tips, and virtual tours and photo galleries of local low-water use gardens. This information can be found at http://www.stockton.watersavingplants.com/.

Planned Implementation: The City's public information and school education program is an ongoing, annual program. The City will continue to provide water conservation materials as part of its community and school outreach programs, as well as continue to work cooperatively with SAWS to develop and distribute water conservation information to K-6 grade students in public and private schools. The City will continue to coordinate and schedule community events and develop hands-on activities for events. The City will continue to promote the water conservation program at events

including Family Day, Black Family Day, Cinco de Mayo, Earth Day, Recycling Exposition (REXPO), Senior Day, National Night Out, Stockton Ports Educational Days, and State of the City. The following is a list of additional new or ongoing activities planned for implementation.

- Track and record event attendance and "impressions"
- Maintain current program information on website
- Assist with development and implementation of annual Water Awareness Month Media Campaign
- Coordinate annual activities associated with Fix a Leak Week
- Development of promotional materials
- Create messaging for twelve utility bill insert
- Create public service announcements
- Maintain Water Conservation Hotline
- Maintain current information on "phone tree"
- Retrieve and reply to messages/requests for information
- Participate in market research to refine conservation message
- Maintain four water conservation related updates to website
- Maintain City's Waterwise Landscaping website

The City plans to maintain and create new promotional partner opportunities. They will provide annual reporting for the USEPA WaterSense program.

Methods to Estimate Expected Water Savings: The City provides residents with an 866-STOKWTR number where they can call and report water wasters as well as request information. The City works cooperatively with SAWS to develop teacher and student surveys to measure the effectiveness of the outreach campaign. All comments are tracked and programmatic adjustments are made base on the information received. The City has no method to quantify water conservation savings directly as a result of this DMM.

8.5 Programs to Assess and Manage COSMUD Distribution System Real Loss

The COSMUD has a continuous distribution system water audit program in place. Ongoing analysis of water loss is one of the most effective means to achieve conservation by reducing leaks from the system. COSMUD currently documents unmetered consumption in its Monthly Operations and Maintenance Report.

All water meter leaks, service line, main break and manifold leaks are reported to the City by customers calling in or by a system generated work order. All leaks/breaks are documented in the City's Computerized Maintenance Management System (CMMS). Information documented includes: date and time of reported leak, name of person responding to the call, type of leak, work done, customer side or city leak, and time to complete. Also documented is any communication with the customer. All meter leaks and emergency breaks are repaired the same day they are reported. Non-emergency service line and main breaks are usually held until a 48 hour Underground Service Alert is completed. Numbers from main and service line breaks are obtained by taking the line size, duration of the leak, and volume of water leaking to estimate total water loss. Meter leak water loss values are estimated based on the volume of water found and duration of the leak.

Once a year, the City flushes the system through fire hydrants. The time spent flushing is documented in the CMMS. Hard copies of each hydrant flushed and how long it was flushed are kept

as records. Water loss numbers are calculated by volume of water being flushed and time flushed multiplied by the number of hydrants flushed. City fire flow tests, commercial and residential construction usage, and equipment testing are sources of water loss that are estimated based on the number of tests performed and number of new construction sites. Street sweeping water usage is documented on hard copies and calculated by size of tank, number of street sweepers, and load counts.

Planned Implementation: This DMM is currently being implemented and will continue to be implemented as part of COSMUD's ongoing operations and maintenance program.

Methods to Estimate Expected Water Savings: The total amount of water conserved over the five-year period by implementing this DMM is directly related to the percentage of unaccounted for water loss leaving the system. The City is committed to maintaining an average of 8 percent or less unaccounted for water during the reporting period.

8.6 Water Conservation Program Coordination and Staffing Support

The City's Water Resources Program Manager currently serves part-time as the City's Water Conservation Coordinator. The Conservation Coordinator establishes an annual program budget based on available funding and resources. Program accomplishments are highlighted and corresponding goals are established for the upcoming year.

Planned Implementation: The implementation of this DMM is ongoing. The City plans on hiring a full time conservation coordinator in the future. The City's water conservation staff updates the monthly operations and maintenance report (MOMR) on a monthly basis, and reports to the CUWCC and USEPA annually.

Methods to Estimate Expected Water Savings: Water savings from this DMM cannot be directly quantified. Effectiveness of this DMM will be evaluated by the success of the City's water conservation program.

8.7 Other Demand Management Measures

The City implements other residential and non-residential demand management measures as described in this section.

8.7.1 Water Survey Programs for Single Family Residential and Multi-Family Residential Customers

Until May 2010, the City offered complimentary water use surveys for single and multi-family residential customers. Surveys were conducted by City staff certified as AWWA Water Use Efficiency Practitioners, covering indoor and outdoor water uses. Due to limited staff resources, the City has developed and implemented a self-performed water use survey modeled after the City of Santa Rosa.

Surveys consist of water use evaluation for appliances, such as dishwashers, washing machines, toilets, and faucets. Landscape and irrigation systems are evaluated as a part of the outdoor water use survey and the customer's water meter is observed to ensure no leaks are occurring. Following completion of the survey, customers are provided a low-flow water use efficiency kit.

The City first implemented water surveys for single and multi-family residential customers in May 2009. This program is still being implemented and will continue to be implemented. The City will continue to serve as a liaison with Water Field Office staff performing in-home surveys. They will track and record water savings from self-certification surveys, coordinate with public on distribution

and receipt of self-certification surveys, and track and record the estimated water savings from surveys.

8.7.2 Residential Plumbing Retrofit

The City offers and promotes low-flow water use efficiency kits through distribution at community events, after completion of water surveys, via the City website, through 866-STOKWTR, as well as advertising through utility bill inserts. The low-flow water use efficiency kit includes the following items: (2) 1.5 gallons per minute (gpm) low-flow shower head(s), a 1.5 gpm kitchen aerator, (2) 1.0 gpm bathroom aerators, toilet flapper(s), a metal garden hose nozzle, shower timer, landscape moisture meter, and a 2.5 gallon water bucket.

The City has been distributing low-flow water use efficiency kits, in various forms, for a number of years back to 1990. However, distribution and tracking of the kits described above commenced in 2009 and continues. The City will continue to offer low-flow water use efficiency kits during the reporting period and the City will continue to track number of kits offered and compare the total water usage for customers before and after kits are received.

The City will continue to manage and maintain the device inventory. The City will coordinate with the program manager on purchasing new and replacement items to fit the program needs. The City will continue to track and record the distribution and associated water savings estimated for this program. The City will continue to coordinate with customers and contractors on products and installation, distribute customer satisfaction surveys, and track and record associated estimate water savings. Implementation of this measure is supported by the City's Climate Action Plan (ICF International, 2014), which calls to promote water efficiency for existing development.

8.7.3 Conservation Programs for Commercial, Industrial, and Institutional Accounts

The City promotes water conservation to its CII users by charging users by volume of wastewater discharged from their facility in addition to charging CII users per a uniform water rate structure. Beginning in 2010, the City started offering a high efficiency toilet (HET) Direct Install Program for CII customers. The program covers the cost of the installation and hardware. CII customers may select a pre-approved plumbing contractor for the installation. The approved budget for the HET Direct Install Program is $150,000. To date, 411 HETs have been installed for approximately 64 CII customers.

In addition, the City, as part of SAWS, participates as part of the Greater Stockton Chamber of Commerce's REACON (Recycling, Energy and Conservation) Program and makes periodic visits to CII customers to conduct water use evaluations as a way to assist businesses with reducing their costs of doing business and at the same time, promote environmental stewardship via water conservation practices. The City will continue to attend REACON visits to Stockton service area businesses and conduct water use evaluations. The City will also continue to work with Chamber of Commerce and certified Water Field Office staff to complete water use surveys for Green Business Certifications.

The City will continue to coordinate the completion of permission and release forms with customers, coordinate installs with plumbing contractors, update the approved plumbing contractor list per Directive (advertising, meetings, contracts), distribute customer satisfaction surveys, and track and record associated water savings.

8.7.4 Landscape Conservation Programs and Incentives

The City's landscape conservation program consists of implementing a model water efficient landscape program and a large landscape water use management program.

8.7.4.1 Model Water Efficient Landscape Program

The City will implement a City Water Efficient Landscape Ordinance. This is supported by the City's Climate Action Plan (ICF International, 2014), which lists promotion of the use of water efficient landscaping as a supporting action. City staff will work with other City Departments (Community Development Department and Utility Billing) to obtain and track information received during the permitting process to develop and track water budgets. The City will transmit model water efficient landscape ordinance (MWELO) information obtained during the permit process to Cal Water. The City will also develop a mechanism to establish water budgets for landscape customers before installation of MWELO landscapes.

8.7.4.2 Water Conservation Program for Large Landscape Users

The City will develop and implement a pilot program for Home Owners Associations and other large water users whereby they can track and manage their monthly water use on-line via Landscape Water Use Reports.

8.8 Planned Implementation to Achieve Water Use Targets

The City's active water conservation program should be tailored to enable the City to meet demands at a desired level in conjunction with what is expected to be realized from passive savings. For this UWMP analysis, it is assumed that the City's conservation program is designed at a minimum to enable the City to meet its SB X7-7 per capita target of 165 GPCD (Section 4). Because it is projected that the City will realize an increasing reduction in single family, multi-family and commercial water use from passive saving described in Section 3.3.1, the City's active water conservation program, at a minimum would make up the difference between the City's water demand based on meeting the GPCD target minus what is expected from the projected increasing passive savings. This City's minimum required conservation program savings to meet the GPCD target ranges from approximately 1,300 ac-ft/yr in 2020 down to zero minimum water conservation program savings by 2040. In addition to the DMMs the City plans to implement, described earlier in this section, there are a variety of conservation activities the City can implement to meet this minimum savings goal, described as follows.

- Improve COSMUD operations – Reducing water loss through operational activities is an area where water agencies can conserve water without relying on customer participation. In 2015 the City's water losses (water sales minus water production) were approximately 6.5 percent of total production. This is due in part to the City delaying operational activities such as system flushing and fire flow testing. This is also due in part to a higher response rate to system leak reports. It is not expected that the City would maintain water losses at this low level into the future. Water projections in this UWMP are based on 8 percent water loss in normal years. However, the City may be able to reduce the normal year water loss percentage into the future by further examining the activities implemented during 2015 compared to normal year activities to identify actions that might continue the water losses at a lower level than 8 percent in normal years. Continuing or increasing the City's water distribution leak detection and repair program can help reduce water losses. Some cities like the City of Davis and City of Santa Barbara are currently implementing or considering implementing use of a flushing truck, such as NO-DES, to recapture water main flushing water through the use of a NO-DES truck that utilizes a filtering system, large pump, and hoses. The unit accesses the City's water system through a fire hydrant, circulates water through the filters, and sends the clean water back into the system via a second hydrant. No water is flushed to waste in the street.
- Target large water users – Rather than a blanket conservation program aimed at all customers, the City could target COSMUD's large water users within each customer category. Because the

City is fully metered, high water use customers within each customer category could be targeted. The City could also evaluate customer water usage by customer category compared to water use in the same customer category as for other water agencies. By utilizing available water use information, the City can focus efforts on high water users that will result in higher water savings. Monthly or seasonal (winter/summer) water use for large water users should be reviewed to determine if changes in water use should be due to higher outdoor (summer) or higher indoor(winter) than the average seasonal usage. Pre-drought and drought water usage could be evaluated to determine which customers resulted in a large decrease in water use. These customers should be evaluated to determine the cause of their reduced water usage.

- Target outdoor water use – In normal years outdoor water use is a large percentage of overall water use. Outdoor residential water conservation programs that have proved successful in terms of continuing decreased water use for other water agencies such as City of Roseville include residential irrigation efficiency rebates and residential Smart Timers programs. Higher water savings are likely to result from programs that support implementation of permanent solutions (i.e. turf removal or modification) and depend less on participant behavior. As discussed above, targeting the larger water users for this type of program will result in more water savings. In conjunction with targeting the higher water users, customers could also be potentially targeted based on landscape size.

Section 9

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Appendix A: Documentation of City/County Notification

CITY OF STOCKTON

DEPARTMENT OF MUNICIPAL UTILITIES

2500 Navy Drive • Stockton, CA 95206-1191 • 209/937-8750 • Fax 209/937-8708

www.stocktongov.com

April 8, 2016

Mr. Scot Moody
General Manager
Stockton East Water District
PO Box 5157
Stockton, CA 95205

CITY OF STOCKTON URBAN WATER MANAGEMENT PLAN

The City of Stockton (City) is updating its Urban Water Management Plan (UWMP), which will be submitted to the State of California Department of Water Resources (DWR) in July 2016.

The City is required by the California Water Code to update and adopt a UWMP and submit a completed UWMP to DWR every five years. The UWMP provides an overview of the City's water supply sources and water demand, in addition to water conservation programs. The UWMP is part of the City's long-range planning to ensure water supply reliability for City customers.

In compliance with the California Water Code, the City is providing this notice to encourage participation in the update of the UWMP. The City's draft 2015 UWMP is expected to be released in May 2016. A public review period, public comment meeting and public hearing will be held to provide opportunity to comment on the Draft 2015 UWMP. A public hearing to be followed by the City Council's consideration for adoption of the UWMP is scheduled for June 7, 2016 at 5:30pm at City Hall, 425 N. El Dorado Street, Stockton, CA 95202.

Should you have any questions or would like additional information, please contact Regina Rubier via email at Regina.Rubier@stocktonca.gov or by telephone at (209) 937-8782.

ROBERT L. GRANBERG, P.E.
ACTING DIRECTOR OF MUNICIPAL UTILITIES

Anton S. Jacob

for REGINA RUBIER
WATER RESOURCES PROGRAM MANAGER III

RLG:AST:RR:jad

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CITY OF STOCKTON

DEPARTMENT OF MUNICIPAL UTILITIES

2500 Navy Drive • Stockton, CA 95206-1191 • 209/937-8750 • Fax 209/937-8708

www.stocktongov.com

April 8, 2016

Mr. John Freeman, Jr.
District Manager
California Water Service Company
1505 E Sonora St
Stockton, CA 95205

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ROBERT L. GRANBERG, P.E.
ACTING DIRECTOR OF MUNICIPAL UTILITIES

Anita S. Tank.

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WATER RESOURCES PROGRAM MANAGER III

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CITY OF STOCKTON

DEPARTMENT OF MUNICIPAL UTILITIES

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April 8, 2016

Mr. Fritz Buchman
Deputy Director – Development Services
San Joaquin County Public Works
1810 E Hazelton Ave
Stockton, CA 95205

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Antonio S. Tack

for REGINA RUBIER
WATER RESOURCES PROGRAM MANAGER III

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April 8, 2016

Mr. Anders Christensen
District Manager
Woodbridge Irrigation District
PO Box 580
Woodbridge, CA 95258

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Anton S. Jaunk

for REGINA RUBIER
WATER RESOURCES PROGRAM MANAGER III

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1999

Appendix B: Notice of Public Hearing

PUBLIC HEARING
STOCKTON CITY COUNCIL

On Tuesday, July 12, 2016, at 5:30 pm, in the Council Chambers, 425 N El Dorado St, a rescheduled a public hearing will be held to consider a resolution adopting the City of Stockton 2015 Urban Water Management Plan. The 2015 Urban Water Management Plan may be viewed prior to the public hearing at the City of Stockton Office of the City Clerk, at the Cesar Chavez Library, or at www.stocktongov.com/mud. All City Council proceedings are in English. If an interpreter is needed, it shall be the responsibility of the person needing one.

Anyone wishing to be heard on this matter may appear at the public hearing and/or file a written opinion with the City Clerk, City Hall, Stockton, prior to the hearing.

If you challenge the proposed action in court, you may be limited to raising only those issues you or someone else raised at the public hearing, or in written correspondence delivered to the City Council at, or prior to, the public hearing.

Should you have any questions or would like additional information, please contact Regina Rubier via email at Regina.Rubier@stocktonca.gov or by telephone at (209) 937-8782.

BONNIE PAIGE, CMC
STOCKTON CITY CLERK

#1072655 6/28, 7/5, 2016

Appendix C: Adoption Resolution

Resolution No. 2016-07-12-1601

STOCKTON CITY COUNCIL

RESOLUTION APPROVING AND ADOPTING THE 2015 URBAN WATER MANAGEMENT PLAN

On October 13, 2015, the City of Stockton (City) entered into an agreement for Professional Services with Brown and Caldwell Engineering to prepare the 2015 Urban Water Management Plan (2015 Plan); and

The Urban Water Management Planning Act at Wat. Code, Div. 6, Pt. 2.6, §§ 10610 through 10656 requires urban water suppliers providing over 3,000 acre-feet of water annually or serving 3,000 or more connections to prepare and submit an Urban Water Management Plan to the California Department of Water Resources every five years; and

Urban Water Management Plans are intended to provide a guide to manage urban water demands efficiently and to provide long-term water resource planning to ensure adequate and reliable water supplies over a 20-year planning horizon considering normal, dry, and multiple dry years; and

An Urban Water Management Plan is necessary for water agencies to be eligible for State water management grants and loans; and

As part of the Urban Water Management Plan, the Water Conservation Act of 2009 (Senate Bill X7-7) calls for a statewide per capita water use reduction of 20 percent by 2020 and requires water agencies to determine their baseline water use, an interim water use target, and a compliance water use target using one of four methodologies identified by the California Department of Water Resources; and

Using the methodology provided by the California Department of Water Resources, an 2015 interim water use target of 172 gallons per capita per day and a 2020 compliance water use target of 165 gallons per capita per day must be achieved; and

The City's actual 2015 gallons per capita per day of 130 achieved the 2015 interim target and is also projected to meet the 2020 target; and

The City is committed to implementing and adjusting the Demand Management Measures, water conservation measures, identified in the 2015 Plan to help achieve both the interim and compliance water use targets based on available resources; the financial impact and commitment for which will be evaluated as part of the annual budget process; and

In accordance with the California Water Code and other applicable laws, a 60-day notice was provided to all applicable agencies on April 8, 2016, the 2015 Plan was made available for public inspection prior to consideration for adoption, and notice of the time and place of the public hearing was provided in the Stockton Record on May 23, 2016; and

The Urban Water Management Plan complies with the requirements of the Urban Water Management Planning Act; now, therefore,

BE IT RESOLVED BY THE COUNCIL OF THE CITY OF STOCKTON, AS FOLLOWS:

1. The City Council approves and adopts the 2015 Urban Water Management Plan in accordance with the California Water Code and authorizes its transmittal to the California Department of Water Resources, a copy of which is attached as Exhibit 1 and incorporated by this reference.

2. As part of the 2015 Plan, the City Council identifies 179 gallons per capita per day (gpcd) as the City's 5-year baseline water use, 178 gpcd as the 10-year baseline water use, and adopts Method 3 methodology, as provided by the California Department of Water Resources for determining both the 2015 interim and 2020 compliance water use targets of 172 and 165 gpcd, respectively as identified in the 2015 Plan.

3. Adoption of the 2015 Plan is exempt from the California Environmental Quality Act pursuant to the California Water Code.

4. The City Manager is hereby authorized and directed to take all necessary actions to carry out the purpose and intent of this resolution and to incorporate any necessary amendments as stipulated by the State Department of Water Resources.

PASSED, APPROVED, and ADOPTED July 12, 2016.

ANTHONY SILVA
Mayor of the City of Stockton

ATTEST:

BONNIE PAIGE
City Clerk of the City of Stockton

Appendix D: DWR UWMP Checklist

Checklist Arranged by Subject

CWC Section	UWMP Requirement	Subject	Guidebook Location	UWMP Location *(Optional Column for Agency Use)*
10620(b)	Every person that becomes an urban water supplier shall adopt an urban water management plan within one year after it has become an urban water supplier.	Plan Preparation	Section 2.1	Section 1.1
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	Section 1.3
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	Section 1.3
10631(a)	Describe the water supplier service area.	System Description	Section 3.1	Section 2.1
10631(a)	Describe the climate of the service area of the supplier.	System Description	Section 3.3	Section 2.2
10631(a)	Provide population projections for 2020, 2025, 2030, and 2035.	System Description	Section 3.4	Section 2.3
10631(a)	Describe other demographic factors affecting the supplier's water management planning.	System Description	Section 3.4	Section 2.3
10631(a)	Indicate the current population of the service area.	System Description and Baselines and Targets	Sections 3.4 and 5.4	Section 2.3
10631(e)(1)	Quantify past, current, and projected water use, identifying the uses among water use sectors.	System Water Use	Section 4.2	Section 3.1
10631(e)(3)(A)	Report the distribution system water loss for the most recent 12-month period available.	System Water Use	Section 4.3	Section 3.2
10631.1(a)	Include projected water use needed for lower income housing projected in the service area of the supplier.	System Water Use	Section 4.5	Section 3.4
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	Section 4
10608.20(e)	Retail suppliers shall provide baseline daily per capita water use, urban water use target, interim urban water use target, and	Baselines and Targets	Chapter 5 and App E	Section 4/Appendix F

	compliance daily per capita water use, along with the bases for determining those estimates, including references to supporting data.			
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	Section 4.5.2 Appendix F
10608.24(a)	Retail suppliers shall meet their interim target by December 31, 2015.	Baselines and Targets	Section 5.8 and App E	4.5.3 Appendix F
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 4.5.3 Appendix F
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	4.5.3 Appendix F
10631(b)	Identify and quantify the existing and planned sources of water available for 2015, 2020, 2025, 2030, and 2035.	System Supplies	Chapter 6	Section 5
10631(b)	Indicate whether groundwater is an existing or planned source of water available to the supplier.	System Supplies	Section 6.2	Section 5.2
10631(b)(1)	Indicate whether a groundwater management plan has been adopted by the water supplier or if there is any other specific authorization for groundwater management. Include a copy of the plan or authorization.	System Supplies	Section 6.2.2	Section 5.2
10631(b)(2)	Describe the groundwater basin.	System Supplies	Section 6.2.1	Section 5.2
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	N/A
10631(b)(2)	For unadjudicated basins, indicate whether or not the department has identified the basin as overdrafted, or projected to become overdrafted. Describe efforts by the supplier to eliminate the long-term overdraft condition.	System Supplies	Section 6.2.3	Section 5.2
10631(b)(3)	Provide a detailed description and analysis of the location, amount, and sufficiency of groundwater pumped by the urban water	System Supplies	Section 6.2.4	Section 5.2

	supplier for the past five years			
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	Section 5.2
10631(d)	Describe the opportunities for exchanges or transfers of water on a short-term or long-term basis.	System Supplies	Section 6.7	Section 5.7
10631(g)	Describe the expected future water supply projects and programs that may be undertaken by the water supplier to address water supply reliability in average, single-dry, and multiple-dry years.	System Supplies	Section 6.8	Section 5.8
10631(i)	Describe desalinated water project opportunities for long-term supply.	System Supplies	Section 6.6	N/A, Section 5.6
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	Table 1.5
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	Section 5.5.1
10633(a)	Describe the wastewater collection and treatment systems in the supplier's service area. Include quantification of the amount of wastewater collected and treated and the methods of wastewater disposal.	System Supplies (Recycled Water)	Section 6.5.2	Section 5.5.2
10633(b)	Describe the quantity of treated wastewater that meets recycled water standards, is being discharged, and is otherwise available for use in a recycled water project.	System Supplies (Recycled Water)	Section 6.5.2.2	Section 5.5.2
10633(c)	Describe the recycled water currently being used in the supplier's service area.	System Supplies (Recycled Water)	Section 6.5.3 and 6.5.4	Section 5.5.2
10633(d)	Describe and quantify the potential uses of recycled water and provide a determination of the technical and economic feasibility of those uses.	System Supplies (Recycled Water)	Section 6.5.4	Section 5.5.4, Table 5-6
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	N/A

10633(f)	Describe the actions which may be taken to encourage the use of recycled water and the projected results of these actions in terms of acre-feet of recycled water used per year.	System Supplies (Recycled Water)	Section 6.5.5	Section 5.5.5
10633(g)	Provide a plan for optimizing the use of recycled water in the supplier's service area.	System Supplies (Recycled Water)	Section 6.5.5	Section 5.5.5
10620(f)	Describe water management tools and options to maximize resources and minimize the need to import water from other regions.	Water Supply Reliability Assessment	Section 7.4	Section 6.4
10631(c)(1)	Describe the reliability of the water supply and vulnerability to seasonal or climatic shortage.	Water Supply Reliability Assessment	Section 7.1	Section 5 and Section 6
10631(c)(1)	Provide data for an average water year, a single dry water year, and multiple dry water years	Water Supply Reliability Assessment	Section 7.2	Section 6.2
10631(c)(2)	For any water source that may not be available at a consistent level of use, describe plans to supplement or replace that source.	Water Supply Reliability Assessment	Section 7.1	Section 5 and Section 6
10634	Provide information on the quality of existing sources of water available to the supplier and the manner in which water quality affects water management strategies and supply reliability	Water Supply Reliability Assessment	Section 7.1	Section 5.5.2
10635(a)	Assess the water supply reliability during normal, dry, and multiple dry water years by comparing the total water supply sources available to the water supplier with the total projected water use over the next 20 years.	Water Supply Reliability Assessment	Section 7.3	Section 6.3
10632(a) and 10632(a)(1)	Provide an urban water shortage contingency analysis that specifies stages of action and an outline of specific water supply conditions at each stage.	Water Shortage Contingency Planning	Section 8.1	Section 7.1
10632(a)(2)	Provide an estimate of the minimum water supply available during each of the next three water years based on the driest three-year historic sequence for the agency.	Water Shortage Contingency Planning	Section 8.9	Section 7.9
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	Section 7.8
10632(a)(4)	Identify mandatory prohibitions against specific water use practices during water shortages.	Water Shortage Contingency Planning	Section 8.2	Section 7.2
10632(a)(5)	Specify consumption reduction methods in the most restrictive stages.	Water Shortage Contingency Planning	Section 8.4	Section 7.4
10632(a)(6)	Indicated penalties or charges for excessive use, where applicable.	Water Shortage Contingency	Section 8.3	Section 7.3

		Planning		
10632(a)(7)	Provide an analysis of the impacts of each of the actions and conditions in the water shortage contingency analysis on the revenues and expenditures of the urban water supplier, and proposed measures to overcome those impacts.	Water Shortage Contingency Planning	Section 8.6	Section 7.6
10632(a)(8)	Provide a draft water shortage contingency resolution or ordinance.	Water Shortage Contingency Planning	Section 8.7	Appendix G
10632(a)(9)	Indicate a mechanism for determining actual reductions in water use pursuant to the water shortage contingency analysis.	Water Shortage Contingency Planning	Section 8.5	Section 7.5
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	Section 8
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	Appendix H
10608.26(a)	Retail suppliers shall conduct a public hearing to discuss adoption, implementation, and economic impact of water use targets.	Plan Adoption, Submittal, and Implementation	Section 10.3	Section 1.4
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	Section 1.4 Appendix A
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	Section 1.4
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	Section 1.4
10642	Provide supporting documentation that the urban water supplier made the plan available for public inspection, published notice of the	Plan Adoption, Submittal, and	Sections 10.2.2, 10.3,	Appendix B

	public hearing, and held a public hearing about the plan.	Implementation	and 10.5	
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	Section 1.4 Appendix A
10642	Provide supporting documentation that the plan has been adopted as prepared or modified.	Plan Adoption, Submittal, and Implementation	Section 10.3.1	Section 1.4 Appendix C
10644(a)	Provide supporting documentation that the urban water supplier has submitted this UWMP to the California State Library.	Plan Adoption, Submittal, and Implementation	Section 10.4.3	Section 1.4
10644(a)(1)	Provide supporting documentation that the urban water supplier has submitted this UWMP to any city or county within which the supplier provides water no later than 30 days after adoption.	Plan Adoption, Submittal, and Implementation	Section 10.4.4	Section 1.4
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	Section 1.4
10645	Provide supporting documentation that, not later than 30 days after filing a copy of its plan with the department, the supplier has or will make the plan available for public review during normal business hours.	Plan Adoption, Submittal, and Implementation	Section 10.5	Section 1.4

Appendix E: Distribution System Water Loss Audit

AWWA Free Water Audit Software:
Reporting Worksheet

WAS v5.0

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? Click to access definition
+ Click to add a comment

Water Audit Report for: City of Stockton (CA3910006)
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

	Grade	Value		Pcnt	Value	
Volume from own sources:	6	20,684.000	acre-ft/yr	0.00%		acre-ft/yr
Water imported:	9	5,634.000	acre-ft/yr	0.00%		acre-ft/yr
Water exported:	8	1,476.000	acre-ft/yr	1.00%		acre-ft/yr

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

WATER SUPPLIED: 24,856.614 acre-ft/yr

AUTHORIZED CONSUMPTION

Click here: ? for help using option buttons below

	Grade	Value		Pcnt	Value	
Billed metered:	8	23,144.000	acre-ft/yr			
Billed unmetered:			acre-ft/yr			
Unbilled metered:			acre-ft/yr			
Unbilled unmetered:	6	9.000	acre-ft/yr		9.000	acre-ft/yr

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

AUTHORIZED CONSUMPTION: 23,153.000 acre-ft/yr

WATER LOSSES (Water Supplied - Authorized Consumption)

1,703.614 acre-ft/yr

Apparent Losses

	Grade	Value		Pcnt	Value	
Unauthorized consumption:		62.142	acre-ft/yr	0.25%		acre-ft/yr

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

	Grade	Value		Pcnt	Value	
Customer metering inaccuracies:	5	2.315	acre-ft/yr	0.01%		acre-ft/yr
Systematic data handling errors:		57.860	acre-ft/yr	0.25%		acre-ft/yr

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

Apparent Losses: 122.316 acre-ft/yr

Real Losses (Current Annual Real Losses or CARL)

Real Losses = Water Losses - Apparent Losses: 1,581.298 acre-ft/yr

WATER LOSSES: 1,703.614 acre-ft/yr

NON-REVENUE WATER

NON-REVENUE WATER: 1,712.614 acre-ft/yr

= Water Losses + Unbilled Metered + Unbilled Unmetered

SYSTEM DATA

	Grade	Value	
Length of mains:	9	590.0	miles
Number of active AND inactive service connections:	9	48,823	
Service connection density:		83	conn./mile main
Are customer meters typically located at the curbstop or property line?		Select...	
Average length of customer service line:	9	40.0	ft
Average operating pressure:	9	50.0	psi

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

COST DATA

	Grade	Value	
Total annual cost of operating water system:	9	$40,000,000	$/Year
Customer retail unit cost (applied to Apparent Losses):	9	$1.67	$/100 cubic feet (ccf)
Variable production cost (applied to Real Losses):	6		$/acre-ft

☑ Use Customer Retail Unit Cost to value real losses

WATER AUDIT DATA VALIDITY SCORE:

*** YOUR SCORE IS: 70 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: Volume from own sources
2: Customer metering inaccuracies
3: Variable production cost (applied to Real Losses)

AWWA Free Water Audit Software:
System Attributes and Performance Indicators

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Water Audit Report for: City of Stockton (CA3910006)
Reporting Year: 2015 | 1/2015 - 12/2015

*** YOUR WATER AUDIT DATA VALIDITY SCORE IS: 70 out of 100 ***

System Attributes:

Apparent Losses:	122.316	acre-ft/yr
+ Real Losses:	1,581.298	acre-ft/yr
= Water Losses:	1,703.614	acre-ft/yr
? Unavoidable Annual Real Losses (UARL):	744.30	acre-ft/yr
Annual cost of Apparent Losses:	$88,979	
Annual cost of Real Losses:		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:	3.1%	Real Losses valued at Customer Retail Unit Cost
Operational Efficiency:	Apparent Losses per service connection per day:	2.24	gallons/connection/day
	Real Losses per service connection per day:	28.91	gallons/connection/day
	Real Losses per length of main per day*:	N/A	
	Real Losses per service connection per day per psi pressure:	0.58	gallons/connection/day/psi

From Above, Real Losses = Current Annual Real Losses (CARL):	1,581.30	acre-feet/year
? Infrastructure Leakage Index (ILI) [CARL/UARL]:	2.12	

* 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

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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:	Total treated water production.
Vol. from own sources: Master meter error adjustment:	Mag meter
Water imported:	From Filber/MLK interconnect and SEWD
Water imported: master meter error adjustment:	Mag meter
Water exported:	Wheeled water to two County systems
Water exported: master meter error adjustment:	
Billed metered:	Retail consumption
Billed unmetered:	
Unbilled metered:	

Audit Item	Comment
Unbilled unmetered:	2.94 MG
Unauthorized consumption:	Minute
Customer metering inaccuracies:	Minute
Systematic data handling errors:	
Length of mains:	
Number of active AND inactive service connections:	52,498 From no. of actual connections by customer category. MOMR states 48,823. Difference is dwelling units vs connections in some multi family connections.
Average length of customer service line:	Assumed for now.
Average operating pressure:	Assumed for now.
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

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Water Audit Report for:	City of Stockton (CA3910006)
Reporting Year:	2015 — 1/2015 - 12/2015
Data Validity Score:	70

Own Sources (Adjusted for known errors) 20,684.000	System Input 26,318.000	Water Exported 1,461.386	Billed Water Exported			Revenue Water 1,461.386
		Water Supplied 24,856.614	Authorized Consumption 23,153.000	Billed Authorized Consumption 23,144.000	Billed Metered Consumption (water exported is removed) 23,144.000	Revenue Water 23,144.000
					Billed Unmetered Consumption 0.000	
				Unbilled Authorized Consumption 9.000	Unbilled Metered Consumption 0.000	Non-Revenue Water (NRW) 1,712.614
					Unbilled Unmetered Consumption 9.000	
			Water Losses 1,703.614	Apparent Losses 122.316	Unauthorized Consumption 62.142	
					Customer Metering Inaccuracies 2.315	
					Systematic Data Handling Errors 57.860	
Water Imported 5,634.000				Real Losses 1,581.298	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

WAS v5.0

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

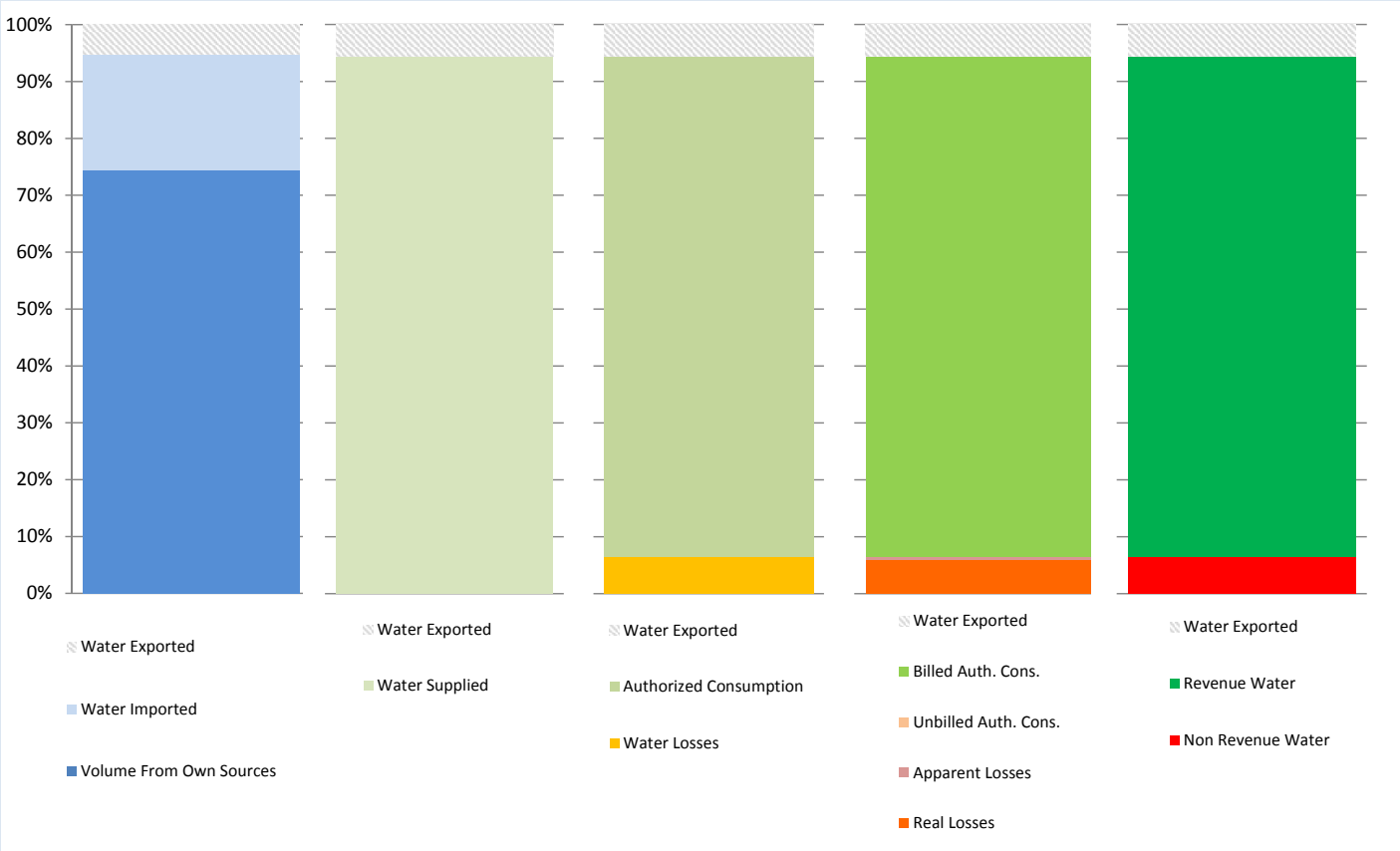
Water Audit Report for: **City of Stockton (CA3910006)**

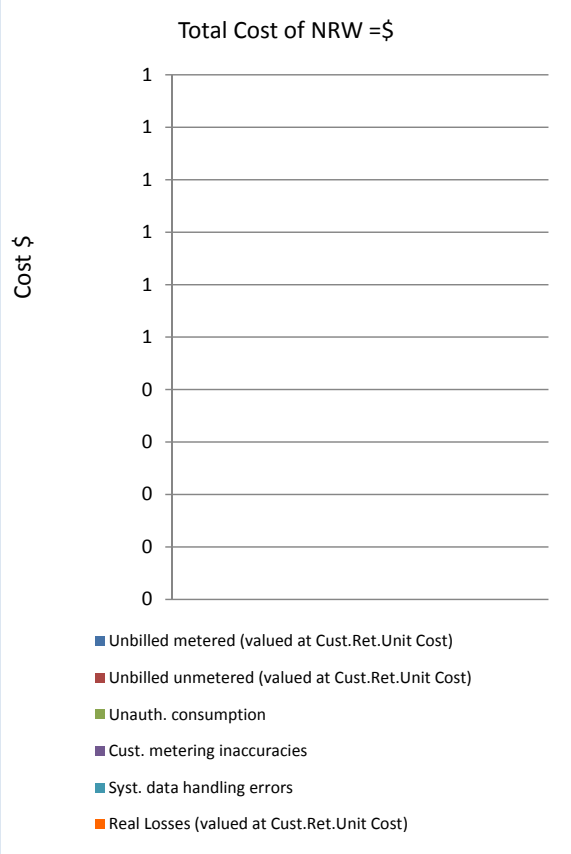
Reporting Year: **2015** **1/2015 - 12/2015**

Data Validity Score: **70**

○ 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

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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 Exporter. 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 eixst, 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 conducting 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 flushings).	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, umetered consumption is usually a relatively small quatity 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.

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
APPARENT LOSSES											
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 quality 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 acocunts 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 not 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.

Grading >>>	n/a	1	2	3	4	5	6	7	8	9	10
Average length of customer service line:	Note: if customer water 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.	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: 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.
		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	
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 water imported, and the unit purchase cost - including all applicable marginal supply costs - serves as the variable production cost. If all applicable marginal supply costs are not included in this figure, a grade of 10 should not be selected.
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 knowledgable 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

AWWA Free Water Audit Software: Customer Service Line Diagrams

WAS v5.0

American Water Works Association.
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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.

Click for more information

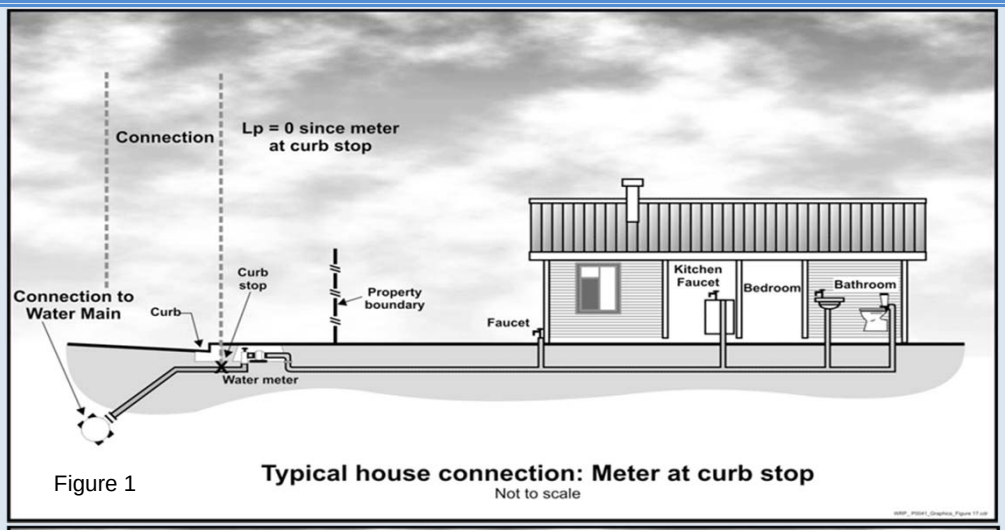

Figure 1

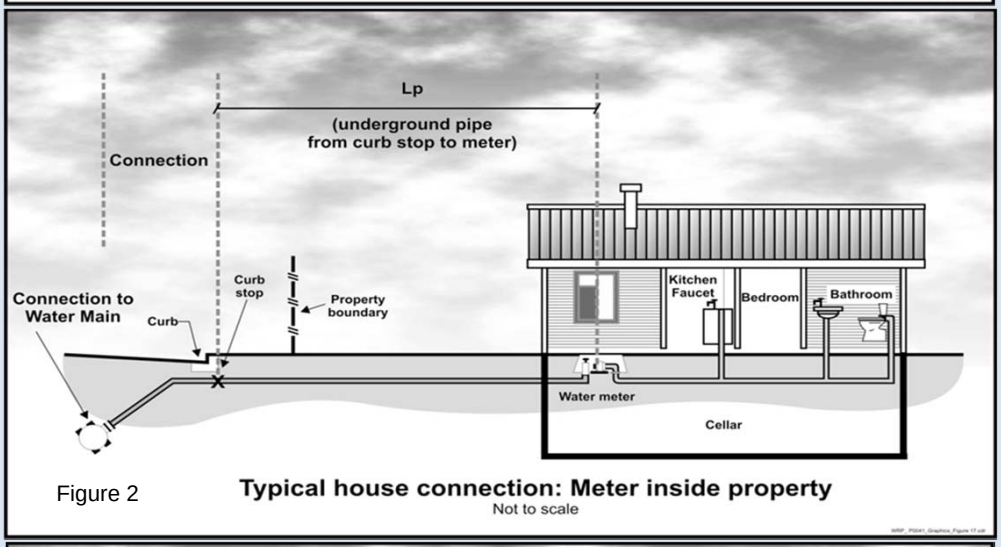

Figure 2

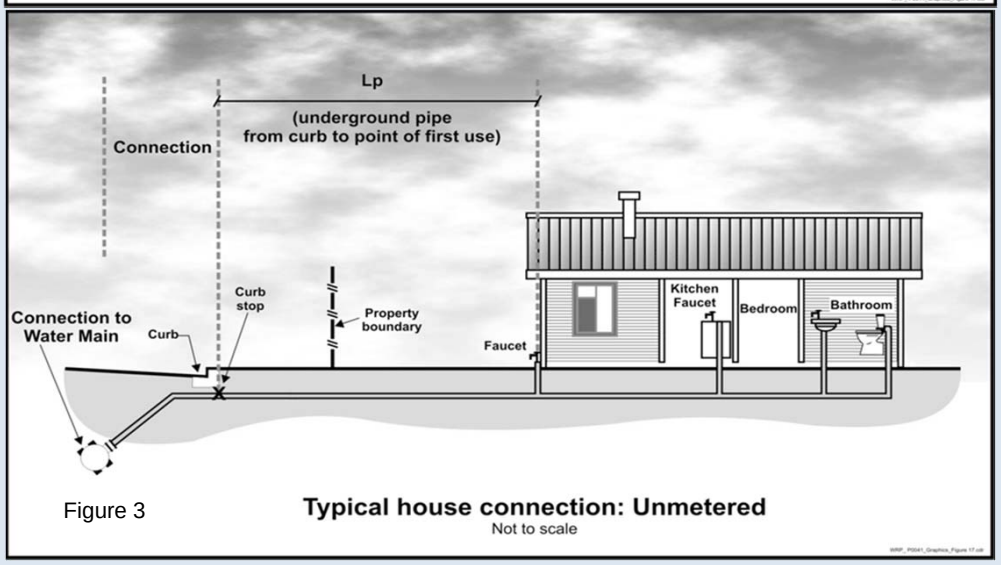

Figure 3

AWWA Free Water Audit Software: Definitions

WAS v5.0

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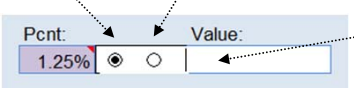
Item Name	Description
Apparent Losses Find	= unauthorized consumption + customer metering inaccuracies + systematic data handling errors Apparent Losses include all types of inaccuracies associated with customer metering (worn meters as well as improperly sized meters or wrong type of meter for the water 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 all 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, but only if 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 active AND inactive 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 hyrants 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 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)=(5.41Lm + 0.15Nc + 7.5Lc) xP, or UARL (litres)=(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, in gallons: (Lm x 32) + Nc < 3000 or P <35psi in litres: (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 deemed by utility policy 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 not 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 has 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 treated 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 not 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 not 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 not 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.

AWWA Free Water Audit Software:
Determining Water Loss Standing

WAS v5.0

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Water Audit Report for: City of Stockton (CA3910006)
Reporting Year: 2015 | 1/2015 - 12/2015
Data Validity Score: **70**

Water Loss Control Planning Guide

Functional Focus Area	Water Audit Data Validity Level / Score				
	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 Free Water Audit Software:
Examples of Completed and Validated Audits

WAS v5.0

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Example 1a: Million Gallons: | **Example 1b**: Million Gallons: Performance Indicators | **Example 2a**: Megalitres: Reporting Worksheet | **Example 2b**: Megalitres: Reporting Worksheet

Example Audit 1a:

AWWA Free Water Audit Software: Reporting Worksheet

WAS v5.0

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? Click to access definition
+ Click to add a comment

Water Audit Report for: City of Asheville (01-11-010)
Reporting Year: 2013 7/2012 - 6/2013

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: MILLION GALLONS (US) 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 Error Adjustments

WATER SUPPLIED

	Grade	Volume		Grade	Pcnt	Value	
Volume from own sources:	7	7,352.880	MG/Yr	3		285.450	MG/Yr
Water imported:	n/a	0.000	MG/Yr				MG/Yr
Water exported:	n/a	0.000	MG/Yr				MG/Yr
WATER SUPPLIED:		7,067.430	MG/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

	Grade	Volume		Pcnt	Value	
Billed metered:	8	4,782.250	MG/Yr			
Billed unmetered:	n/a	0.000	MG/Yr			
Unbilled metered:	7	27.757	MG/Yr			
Unbilled unmetered:	8	157.790	MG/Yr		157.790	MG/Yr
AUTHORIZED CONSUMPTION:		4,967.797	MG/Yr			

Unbilled Unmetered volume entered is greater than the recommended default value

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

WATER LOSSES (Water Supplied - Authorized Consumption) 2,099.633 MG/Yr

Apparent Losses

	Grade	Volume		Pcnt	Value	
Unauthorized consumption:		17.669	MG/Yr	0.25%		MG/Yr
Customer metering inaccuracies:	7	111.220	MG/Yr	2.26%		MG/Yr
Systematic data handling errors:	5	11.956	MG/Yr	0.25%		MG/Yr
Apparent Losses:		140.844	MG/Yr			

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

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

Real Losses (Current Annual Real Losses or CARL)

Real Losses = Water Losses - Apparent Losses: 1,958.789 MG/Yr

WATER LOSSES: 2,099.633 MG/Yr

NON-REVENUE WATER

NON-REVENUE WATER: 2,285.180 MG/Yr

= Water Losses + Unbilled Metered + Unbilled Unmetered

SYSTEM DATA

	Grade	Volume	
Length of mains:	4	1,236.5	miles
Number of active AND inactive service connections:	7	55,256	
Service connection density:		45	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

	Grade	Volume	
Average operating pressure:	4	145.3	psi

COST DATA

	Grade	Volume	
Total annual cost of operating water system:	10	$33,630,676	$/Year
Customer retail unit cost (applied to Apparent Losses):	10	$3.22	$/100 cubic feet (ccf)
Variable production cost (applied to Real Losses):	6	$335.94	$/Million gallons

☐ Use Customer Retail Unit Cost to value real losses

WATER AUDIT DATA VALIDITY SCORE:

***** YOUR SCORE IS: 72 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: Volume from own sources
2: Variable production cost (applied to Real Losses)
3: Unauthorized consumption

Example Audit 1b:

AWWA Free Water Audit Software:
System Attributes and Performance Indicators

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Water Audit Report for: City of Asheville (01-11-010)
Reporting Year: 2013 | 7/2012 - 6/2013

*** YOUR WATER AUDIT DATA VALIDITY SCORE IS: 72 out of 100 ***

System Attributes:

	Apparent Losses:	140.844	MG/Yr
+	Real Losses:	1,958.789	MG/Yr
=	**Water Losses:**	**2,099.633**	MG/Yr
?	Unavoidable Annual Real Losses (UARL):	794.34	MG/Yr
	Annual cost of Apparent Losses:	$606,265	
	Annual cost of Real Losses:	$658,036	Valued at **Variable Production Cost**

Return to Reporting Worksheet to change this assumpiton

Performance Indicators:

Financial:	Non-revenue water as percent by volume of Water Supplied:	32.3%	
	Non-revenue water as percent by cost of operating system:	3.9%	Real Losses valued at Variable Production Cost
Operational Efficiency:	Apparent Losses per service connection per day:	6.98	gallons/connection/day
	Real Losses per service connection per day:	97.12	gallons/connection/day
	Real Losses per length of main per day*:	N/A	
	Real Losses per service connection per day per psi pressure:	0.67	gallons/connection/day/psi
	From Above, Real Losses = Current Annual Real Losses (CARL):	1,958.79	million gallons/year
?	Infrastructure Leakage Index (ILI) [CARL/UARL]:	2.47	

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

Example Audit 2a:

AWWA Free Water Audit Software: Reporting Worksheet

WAS v5.0

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Click to add a comment

Water Audit Report for: The City of Calgary
Reporting Year: 2013 | 1/2013 - 12/2013

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: MEGALITRES (THOUSAND CUBIC METRES) PER YEAR

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

Master Meter Error Adjustments

WATER SUPPLIED

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

					Pcnt	Value:	
Volume from own sources:	7	174,324.000	ML/Yr	7	1.00%		ML/Yr
Water imported:	n/a	0.000	ML/Yr				ML/Yr
Water exported:	7	8,190.131	ML/Yr	7	1.00%		ML/Yr

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

WATER SUPPLIED: 164,488.979 ML/Yr

AUTHORIZED CONSUMPTION

Click here: ? for help using option buttons below

				Pcnt	Value:	
Billed metered:	6	125,111.268	ML/Yr			
Billed unmetered:	8	3,503.386	ML/Yr			
Unbilled metered:	7	166.157	ML/Yr			
Unbilled unmetered:	6	1,444.000	ML/Yr		1,444.000	ML/Yr

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

AUTHORIZED CONSUMPTION: 130,224.811 ML/Yr

WATER LOSSES (Water Supplied - Authorized Consumption) 34,264.168 ML/Yr

Apparent Losses

				Pcnt	Value:	
Unauthorized consumption:		411.222	ML/Yr	0.25%		ML/Yr
Default option selected for unauthorized consumption - a grading of 5 is applied but not displayed						
Customer metering inaccuracies:	6	1,265.429	ML/Yr	1.00%		ML/Yr
Systematic data handling errors:		312.778	ML/Yr	0.25%		ML/Yr
Default option selected for Systematic data handling errors - a grading of 5 is applied but not displayed						
Apparent Losses:		1,989.429	ML/Yr			

Real Losses (Current Annual Real Losses or CARL)

Real Losses = Water Losses - Apparent Losses: 32,274.739 ML/Yr

WATER LOSSES: 34,264.168 ML/Yr

NON-REVENUE WATER

NON-REVENUE WATER: 35,874.325 ML/Yr

= Water Losses + Unbilled Metered + Unbilled Unmetered

SYSTEM DATA

Length of mains:	8	4,945.0	kilometers
Number of active AND inactive service connections:	8	312,075	
Service connection density:		63	conn./km main
Are customer meters typically located at the curbstop or property line?		No	
Average length of customer service line:	8	12.0	metres (length of service line, beyond the property boundary, that is the responsibility of the utility)
Average operating pressure:	8	50.8	metres (head)

COST DATA

Total annual cost of operating water system:	9	$169,973,759	$/Year
Customer retail unit cost (applied to Apparent Losses):	9	$2.35	$/1000 litres
Variable production cost (applied to Real Losses):	9	$73.54	$/Megalitre

☑ Use Customer Retail Unit Cost to value real losses

WATER AUDIT DATA VALIDITY SCORE:

***** YOUR SCORE IS: 72 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: Volume from own sources
2: Billed metered
3: Customer metering inaccuracies

Example Audit 2b:

AWWA Free Water Audit Software:
System Attributes and Performance Indicators

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Water Audit Report for: The City of Calgary
Reporting Year: 2013 | 1/2013 - 12/2013

*** YOUR WATER AUDIT DATA VALIDITY SCORE IS: 72 out of 100 ***

System Attributes:

	Apparent Losses:	1,989.429	ML/Yr
+	Real Losses:	32,274.739	ML/Yr
=	**Water Losses:**	**34,264.168**	ML/Yr
?	Unavoidable Annual Real Losses (UARL):	8,015.57	ML/Yr
	Annual cost of Apparent Losses:	$4,675,159	
	Annual cost of Real Losses:	$75,845,637	Valued at **Customer Retail Unit Cost**

Return to Reporting Worksheet to change this assumption

Performance Indicators:

Financial:	Non-revenue water as percent by volume of Water Supplied:	21.8%	
	Non-revenue water as percent by cost of operating system:	49.6%	Real Losses valued at Customer Retail Unit Cost
Operational Efficiency:	Apparent Losses per service connection per day:	17.47	litres/connection/day
	Real Losses per service connection per day:	283.34	litres/connection/day
	Real Losses per length of main per day*:	N/A	
	Real Losses per service connection per day per meter (head) pressure:	5.58	litres/connection/day/m
	From Above, Real Losses = Current Annual Real Losses (CARL):	32,274.74	ML/year
?	Infrastructure Leakage Index (ILI) [CARL/UARL]:	4.03	

* This performance indicator applies for systems with a low service connection density of less than 20 service connections/kilometre of pipeline

AWWA Free Water Audit Software: Acknowledgements

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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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- 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.

Appendix F: SBX7-7 GPCD 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	37,394	Acre Feet
	2008 total volume of delivered recycled water	-	Acre Feet
	2008 recycled water as a percent of total deliveries	0.00%	Percent
	Number of years in baseline period[1, 2]	10	Years
	Year beginning baseline period range	1998	
	Year ending baseline period range[3]	2007	
5-year baseline period	Number of years in baseline period	5	Years
	Year beginning baseline period range	2005	
	Year ending baseline period range[4]	2009	

[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 Water Code requires that the baseline period is between 10 and 15 years. However, DWR recognizes that some water suppliers may not have the minimum 10 years of baseline data.

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

[4] 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 Table 3: Service Area Population		
Year		**Population**
10 to 15 Year Baseline Population		
Year 1	1998	126,002
Year 2	1999	130,527
Year 3	2000	135,716
Year 4	2001	141,191
Year 5	2002	149,619
Year 6	2003	158,173
Year 7	2004	167,725
Year 8	2005	177,127
Year 9	2006	172,895
Year 10	2007	170,944
Year 11		
Year 12		
Year 13		
Year 14		
Year 15		
5 Year Baseline Population		
Year 1	2005	177,127
Year 2	2006	172,895
Year 3	2007	170,944
Year 4	2008	170,017
Year 5	2009	170,153
2015 Compliance Year Population		
2015		170,417
NOTES:		

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	1998	23,124	436		-		-	22,688
Year 2	1999	25,797	516		-		-	25,281
Year 3	2000	27,061	546		-		-	26,515
Year 4	2001	29,296	586		-		-	28,709
Year 5	2002	30,606	586		-		-	30,020
Year 6	2003	32,865	534		-		-	32,331
Year 7	2004	36,523	1,967		-		-	34,556
Year 8	2005	34,678	531		-		-	34,147
Year 9	2006	34,804	767		-		-	34,037
Year 10	2007	40,073	1,936		-		-	38,137
Year 11	0	-			-		-	-
Year 12	0	-			-		-	-
Year 13	0	-			-		-	-
Year 14	0	-			-		-	-
Year 15	0	-			-		-	-
10 - 15 year baseline average gross water use								**30,642**
5 Year Baseline - Gross Water Use								
Year 1	2005	34,147	531		-		-	33,617
Year 2	2006	34,037	767		-		-	33,270
Year 3	2007	38,137	1,936		-		-	36,201
Year 4	2008	37,394	746		-		-	36,649
Year 5	2009	34,642	2,001		-		-	32,641
5 year baseline average gross water use								**34,475**
2015 Compliance Year - Gross Water Use								
2015		26,319	1,476		-		-	**24,843**

* NOTE that the units of measure must remain consistent throughout the UWMP, as reported in Table 2-3

NOTES:

SB X7-7 Table 4-A: Volume Entering the Distribution System(s)

Complete one table for each source.

Name of Source	Total deliveries
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	1998	23,124		23,124
Year 2	1999	25,797		25,797
Year 3	2000	27,061		27,061
Year 4	2001	29,296		29,296
Year 5	2002	30,606		30,606
Year 6	2003	32,865		32,865
Year 7	2004	36,523		36,523
Year 8	2005	34,678		34,678
Year 9	2006	34,804		34,804
Year 10	2007	40,073		40,073
Year 11	0			-
Year 12	0			-
Year 13	0			-
Year 14	0			-
Year 15	0			-
5 Year Baseline - Water into Distribution System				
Year 1	2005	34,147		34,147
Year 2	2006	34,037		34,037
Year 3	2007	38,137		38,137
Year 4	2008	37,394		37,394
Year 5	2009	34,642		34,642
2015 Compliance Year - Water into Distribution System				
2015		26,319		26,319

** Meter Error Adjustment - See guidance in Methodology 1, Step 3 of Methodologies Document*

NOTES:

SB X7-7 Table 5: Gallons Per Capita Per Day (GPCD)				
Baseline Year *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	1998	126,002	22,688	161
Year 2	1999	130,527	25,281	173
Year 3	2000	135,716	26,515	174
Year 4	2001	141,191	28,709	182
Year 5	2002	149,619	30,020	179
Year 6	2003	158,173	32,331	182
Year 7	2004	167,725	34,556	184
Year 8	2005	177,127	34,147	172
Year 9	2006	172,895	34,037	176
Year 10	2007	170,944	38,137	199
Year 11	0	-	-	
Year 12	0	-	-	
Year 13	0	-	-	
Year 14	0	-	-	
Year 15	0	-	-	
10-15 Year Average Baseline GPCD				**178**
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	2005	177,127	33,617	169
Year 2	2006	172,895	33,270	172
Year 3	2007	170,944	36,201	189
Year 4	2008	170,017	36,649	192
Year 5	2009	170,153	32,641	171
5 Year Average Baseline GPCD				**179**
2015 Compliance Year GPCD				
2015		170,417	24,843	**130**
NOTES:				

SB X7-7 Table 6: Gallons per Capita per Day *Summary From Table SB X7-7 Table 5*	
10-15 Year Baseline GPCD	178
5 Year Baseline GPCD	179
2015 Compliance Year GPCD	130
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**
178	**143**
NOTES:	

SB X7-7 Table 7-E: Target Method 3				
Agency May Select More Than One as Applicable	Percentage of Service Area in This Hydrological Region	Hydrologic Region	"2020 Plan" Regional Targets	Method 3 Regional Targets (95%)
☐		North Coast	137	130
☐		North Lahontan	173	164
☐		Sacramento River	176	167
☐		San Francisco Bay	131	124
☑		San Joaquin River	174	165
☐		Central Coast	123	117
☐		Tulare Lake	188	179
☐		South Lahontan	170	162
☐		South Coast	149	142
☐		Colorado River	211	200
Target *(If more than one region is selected, this value is calculated.)*				**0**

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[1]	Calculated 2020 Target[2]	**Confirmed 2020 Target**
179	170	165	**165**

[1] Maximum 2020 Target is 95% of the 5 Year Baseline GPCD [2] 2020 Target is calculated based on the selected Target Method, see SB X7-7 Table 7 and corresponding tables for agency's calculated target.

NOTES:

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**
165	178	**172**
NOTES:		

SB X7-7 Table 9: 2015 Compliance								
Actual 2015 GPCD	2015 Interim Target GPCD	Optional Adjustments *(in GPCD)* Enter "0" if Adjustment Not Used			TOTAL Adjustments	Adjusted 2015 GPCD	2015 GPCD *(Adjusted if applicable)*	**Did Supplier Achieve Targeted Reduction for 2015?**
		Extraordinary Events	Weather Normalization	Economic Adjustment				
130	172	*From Methodology 8 (Optional)*	*From Methodology 8 (Optional)*	*From Methodology 8 (Optional)*	-	130	130	**YES**
NOTES:								

WUEdata - Stockton City Of

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
May Huang	Stockton City Of	4034803092	4/12/2016 9:59:10 AM

Boundary Information

Census Year	Boundary Filename	Internal Boundary ID
1990	UrbanServiceBoundary1990_polygon_city_only.kml	443
2000	UrbanServiceBoundary2000_polygon_city_only.kml	444
2010	WaterServiceFeeZone_polygon.kml	465

Baseline Period Ranges

10 to 15-year baseline period

Number of years in baseline period: 10

Year beginning baseline period range: 1998

Year ending baseline period range[1]: 2007

5-year baseline period

Year beginning baseline period range: 2005

Year ending baseline period range[2]: 2009

[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-SF Connection and Persons-Per-MF/GQ Connection

	Census Block Group Level	Census Block Level						
Year	% Population in SF Housing	Service Area Population	Population in SF Housing (calculated)	Population in MF/GQ Housing (calculated)	# SF Connections	# MF/GQ Connections	Persons per SF Connection	Persons per MF/GQ Connection
1990	70.48%	106,385	74,984	31,401	19872	4255	3.77	7.38
1991	-	-	-	-	-	-	3.76	7.45
1992	-	-	-	-	-	-	3.75	7.51
1993	-	-	-	-	-	-	3.74	7.58
1994	-	-	-	-	-	-	3.73	7.64
1995	-	-	-	-	-	-	3.71	7.71
1996	-	-	-	-	-	-	3.70	7.78
1997	-	-	-	-	-	-	3.69	7.84
1998	-	-	-	-	-	-	3.68	7.91
1999	-	-	-	-	-	-	3.67	7.97
2000	75.21%	135,716	102,069	33,647	27903	4184	3.66	8.04
2001	-	-	-	-	-	-	3.65	7.96
2002	-	-	-	-	-	-	3.63	7.89
2003	-	-	-	-	-	-	3.62	7.81
2004	-	-	-	-	-	-	3.60	7.73
2005	-	-	-	-	-	-	3.59	7.65
2006	-	-	-	-	-	-	3.58	7.58
2007	-	-	-	-	-	-	3.56	7.50
2008	-	-	-	-	-	-	3.55	7.42
2009	-	-	-	-	-	-	3.53	7.35
2010	82.15%	178,307	146,474	31,833	41634	4379	3.52	7.27
2015	-	-	-	-	-	-	3.45 *	6.88 *

Population Using Persons-Per-SF Connection and Persons-Per-MF/GQ Connection

Year		# SF Connections	# MF/GQ Connections	Persons per SF Connection	Persons per MF/GQ Connection	SF Population	MF/GQ Population	Total Population
10 to 15 Year Baseline Population Calculations								
Year 1	1998	25366	4123	3.68	7.91	93,398	32,605	126,002
Year 2	1999	26546	4148	3.67	7.97	97,450	33,076	130,527
Year 3	2000	27903	4184	3.66	8.04	102,069	33,647	135,716
Year 4	2001	29576	4189	3.65	7.96	107,834	33,357	141,191
Year 5	2002	30345	4997	3.63	7.89	110,213	39,406	149,619
Year 6	2003	32961	4984	3.62	7.81	119,253	38,920	158,173
Year 7	2004	36024	4901	3.60	7.73	129,830	37,895	167,725
Year 8	2005	38511	5078	3.59	7.65	138,254	38,872	177,127
Year 9	2006	40525	3692	3.58	7.58	144,917	27,978	172,895
Year 10	2007	40271	3666	3.56	7.50	143,445	27,499	170,944
5 Year Baseline Population Calculations								
Year 1	2005	38511	5078	3.59	7.65	138,254	38,872	177,127
Year 2	2006	40525	3692	3.58	7.58	144,917	27,978	172,895
Year 3	2007	40271	3666	3.56	7.50	143,445	27,499	170,944
Year 4	2008	40311	3636	3.55	7.42	143,023	26,994	170,017
Year 5	2009	40709	3578	3.53	7.35	143,866	26,288	170,153
2015 Compliance Year Population Calculations								
2015		42033	3713	3.45 *	6.88 *	144,857	25,560	170,417

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QUESTIONS / ISSUES? CONTACT THE WUEDATA HELP DESK

Appendix G: City of Stockton Municipal Code Section 13.28.

CITY OF STOCKTON
MUNICIPAL UTILITIES

California is in the fourth year of a record-setting drought. Stockton's Water Conservation Ordinance (SMC 13.28) has been updated to include state-mandated water regulations. Additional restrictions may apply in the future.

For water-saving tips, visit stocktongov.com/savewater.

Watering – Exterior Irrigation

No watering – between11:00 a.m. and 6:00 p.m. or within 48 hours of measurable rainfall
Even numbered addresses (ending in 0, 2, 4, 6, 8) – Tuesdays and Fridays only
Odd numbered addresses (ending in 1, 3, 5, 7, 9) – Mondays and Thursdays only
Locations without addresses – Mondays and Thursdays only
Water leaks – must be corrected within 24 hours of discovery/notification
Wasteful running of water/washing with water – unlawful, without reasonable purpose

Other – Exterior Uses

Buildings and mobile home exterior (with water) – only with bucket and sponge
Cars and Vehicles – using positive shut-off nozzle only on assigned watering days & times
Fountains (public/commercial locations) – operated only with recirculated water
Outside surfaces – driveways, sidewalks, patios, parking lots, & other surfaces; only with pressurized sidewalk cleaning equipment for sanitation, public health/safety, & fire protection
Repairing/Repainting – pressurized washing device with quick acting, positive shut-off
Pool draining/refilling – must obtain permit; only for protection of public health/safety

Additional Business (Commercial and Industrial) and Fire Hydrants

Car washes (commercial) – must use reclaimed soap and water (no day restrictions)
Hotels and motels – must provide option to refuse daily towel & linen laundering
Restaurants – water served only upon customer request
Dust control – use of potable water not allowed, except for public health/safety
Fire hydrant – use of potable water not allowed (unless no alternate/recycled water sources are available) except by Fire protection agencies for fire suppression or as allowed by responsible water agencies

Reporting Water Waste

⇨ Online – www.stocktongov.com/savewater

⇨ Call – 1-866-STOKWTR (866-786-5987)

Penalties

The State allows water suppliers to fine violators up to $500 each day a violation occurs.

Water suppliers can be fined of up to $10,000 per day, per violation, for violating the State Emergency Regulations.

Effective May 19, 2015

Chapter 13.28 WATER CONSERVATION

13.28.010 Definitions.

Unless the context requires otherwise, the following definitions shall be used in the interpretation and construction of this chapter. Words used in the present tense include the future; the singular number includes the plural and the plural the singular.

"Alternate water source" means water from sloughs, canals, streams, rivers or nonpotable wells which is acquired with permission from the responsible owner or agency with jurisdiction.

"Director" means the Director of Municipal Utilities of the City.

"Person" means any individual, firm, organization, partnership, association, trust, company, business, corporation, public entity, political entity, or any agent thereof.

"Reclaimed" and "reclaimed water" refer to the process of reusing the soap/water solution and to that portion of the soap/water solution which is recaptured, processed, and reused at a non-self service commercial car wash facility.

"Recycled water" means water from the City of Stockton Regional Wastewater Control Facility supplied from designated hydrants under permit from the State Regional Water Quality Control Board.

"Waste" means any inefficient or unreasonable use of or unreasonable method of use of water.

"Water" means any water used in the City. (Prior code § 9-710)

13.28.020 Application of regulations.

The provisions of this chapter shall apply to all persons using water in the City regardless of whether any person using water shall have a contract for water service with the City. Notwithstanding other provisions of this code inconsistent with the chapter, the provisions of this chapter shall supersede and prevail until termination of this chapter, except during a declared water shortage emergency, Stage 2, 3, 4 or 5, in which event the provisions of Chapter 13.32 shall prevail. (Prior code § 9-711)

13.28.030 Regulations.

It is unlawful during the period May 1st to November 1st of each year for any person to use, permit or allow the use of water in any of the following manners:

A. Any use of potable water from any fire hydrant is prohibited except by regularly constituted fire protection agencies for fire suppression purposes or by the responsible water agency, when alternate water sources or reclaimed water sources are available. In the absence of alternate water sources or recycled water sources, potable water from any fire hydrant may be used provided a permit for such use is approved by the Fire Department and the responsible water agency.

B. For exterior irrigation except as follows:

1. These provisions shall apply to all exterior irrigation including but not limited to public, private and commercial locations.

2. Irrigation shall be prohibited between the hours of 11:00 a.m. to 6:00 p.m.

3. To conduct exterior irrigation in such a manner or extent that allows water to run off or escape from the premises or to be wasted.

4. Exceptions to the above regulations:

a. Drip and/or mist irrigation systems.

b. During the initial 21-day period of establishment for new plantings the above regulations shall not apply.

c. Other uses which cannot reasonably comply with the above regulations due to the large size, normal hours of use or type of use of the area to be irrigated may be excepted upon approval by the Director of a water conservation plan which meets the goals of reduction and conservation.

C. To allow the escape of water through leaks, breaks, or malfunction within the water user's plumbing or distribution system for any period of time within which such break or leak should reasonably have been discovered and corrected. It shall be presumed that a period of 24 hours after the water user discovers such break, leak, or malfunction, or receives notice from the City, any water provider or enforcement authority of such condition, whichever occurs first, is a reasonable time within which to correct such condition or to make arrangements for correction.

D. The use of water for washing cars or boats is permitted only with the use of a quick-acting positive shut-off nozzle on the hose.

E. The operation of any non-self service commercial car wash unless the soap/water solution for such use is reclaimed. If a reclaimed water system cannot be installed, the car wash operator shall submit a plan satisfactory to the Director to modify operation of the facility to reduce its usage of water by at least 20 percent of its usage during the same month of the prior year for comparable business volume. If there is no history of prior use, the operator shall provide to the Director data comparable to such history to establish its base monthly usage.

F. Restaurants shall serve water to customers only upon request.

G. Use of water for cleaning building or mobile home exteriors shall be prohibited except as follows:

1. With the use of a bucket and sponge; or

2. For the preparation of such exterior surfaces for the purpose of repair or repainting with the use of a pressurized washing device equipped with a quick acting positive shut off.

H. Use of water in publicly displayed ornamental fountains in public and commercial establishments shall be prohibited unless the water is recirculated.

I. Use of water to wash driveways, sidewalks, patios, parking lots, aprons and other similar exterior surfaces is prohibited except with the use of pressurized sidewalk cleaning equipment or for sanitation, public health and safety and fire protection purposes.

J. The draining and/or refilling of all existing swimming pools, whether public, private or commercial, shall be prohibited between June 1st and October 1st except for protection of public health and safety.

K. Use of potable water for dust control purposes except for public health or safety purposes. Reclaimed, recycled or other nonpotable water may be used for such purposes so long as such water is not wasted.

L. The indiscriminate running of water or washing with water not otherwise prohibited above which is wasteful and without reasonable purpose.

M. Exception. The above regulations shall not apply to users or uses when the source of water is other than:

1. A public water system as defined in California Code of Regulations, Section 64555(a) (23); or
2. A groundwater aquifer used by a public water system. (Prior code § 9-712)

13.28.040 Regulations.

During the period of November 1st through April 30th, it is unlawful for any person to use, permit to allow the use of water as set out in Section 13.28.030 except that no restriction as to the hours of irrigation shall be imposed. (Prior code § 9-712.1)

13.28.050 Water rates and surcharges.

A. Whenever the City becomes aware of a person violating, causing or permitting a violation of the provisions of this chapter, a written notice stating the nature of the violation shall be delivered to the person at the premises by personal service or by first class mail and by posting in a conspicuous location at said premises. A copy of the notice shall be mailed to the person who is regularly billed for use of water at said premises.

B. All notices provided for by this section may be served as an addendum to the regular water service bill. All such notices may be given to any other person known to the City who is responsible for the violation or the correction thereof.

C. The notice shall describe the nature of the violation and order that said violation be corrected, cured or abated immediately or within such specified period as the City believes is reasonable under the circumstances.

D. Upon occurrence of a second violation or failure to immediately correct, cure or abate a violation, a second notice shall be served, as provided above, ordering the immediate correction, cure or abatement of the violation and imposing a surcharge of $100.00 per day for each day the violation continues. The surcharge may be added to the next regular billing for water service. (Prior code § 9-713)

13.28.060 Discontinuance of service.

Upon a determination by the Director that a person has consumed water in violation of any of the provisions of this chapter, the Director may issue an order to cease and desist from such violation, and further order such person to comply forthwith with such provisions or otherwise to take appropriate remedial or preventive action. If, after the issuance of a cease and desist order, such person continues to consume or use, or again consumes or uses water in violation of any such provisions, the Director may, subject to the provisions for notification and hearing hereafter set forth, discontinue water service to the premises of such person. (Prior code § 9-714)

13.28.070 Procedure for discontinuance of service.

Prior to the discontinuance of water service to any premises, the Director shall give written notice of intention to discontinue such service, and of hearing to be held by the Director upon the question of termination, not less than 10 days prior to such hearing. A person determined to be in violation of the provisions of this chapter, the owner of the premises (if not such person), and such other persons as the Director may deem appropriate, shall be heard at the hearing on the question of termination. If, upon completion of the hearing, the Director finds that no violation has occurred, the Director shall order that the service shall not be terminated. If, upon completion of the hearing, the Director determines that such violation has occurred, or is occurring, the Director may order the water service to be terminated, or may order that service be terminated within a specified period of time unless such violation or the conditions or activities causing such violations cease forthwith or

within a specified period of time, or the Director may make such other order as deemed appropriate under the circumstances and in furtherance of the purposes and intent of this chapter. (Prior code § 9-714.1)

13.28.080 Appeal.

Any person aggrieved by a determination, order, or directive of the Director made pursuant to the provisions of Sections 13.28.060 and 13.28.070 may appeal such determination, order, or directive to the City Manager. Written notification of such appeal shall be filed with the City Clerk within 10 days after notification of the determination, order, or directive of the Director, and shall set forth in detail the facts and reasons supporting the appeal. Hearing on the appeal shall be held by the City Manager or the designee within 10 days from the date of filing the notice of appeal. The appellant, the Director, and such other persons as the City Manager or the City Manager's designee may deem appropriate, shall be heard at the hearing on appeal. Upon conclusion of hearing the appeal, the City Manager or the designee may affirm, reverse or modify the determination, order or directive of the Director as deemed just and equitable, and in furtherance of the provisions, purposes, and intent of this chapter. During the pendency of any such appeal, the determination, order or directive of the Director shall remain in full force and effect. The City Manager's or the designee's action on the appeal shall be final. (Prior code § 9-715)

13.28.090 Violation an infraction.

Any person violating any of the provisions of this chapter shall be deemed guilty of an infraction. Each day such violation is committed or permitted to continue shall constitute a separate offense and shall be punishable as such. Said violation shall be in addition to the surcharges and disconnection procedure established hereinabove. (Prior code § 9-716)

13.28.100 Powers and duties of the Director.

The Director of Municipal Utilities is hereby authorized to and may enforce all the provisions of this chapter. For such purposes, the Director shall have the powers and discretion of a law enforcement officer. The Director, and duly delegated representatives, pursuant to the provisions of Section 836.5 of the Penal Code of the State of California, are hereby authorized to arrest a person without a warrant whenever there exists reasonable cause to believe the person has in his or her presence violated any provision of this chapter which is an infraction. Upon making such arrest, the Director or the delegated representative shall prepare a citation and release the person arrested pursuant to Section 853.6 of the Penal Code of the State of California. The provisions of Sections 836.5 and 853.6 of the Penal Code are hereby adopted by reference as part of this section. (Prior code § 9-717)

13.28.110 Remedies cumulative.

The remedies and penalties provided for in this chapter shall be cumulative and shall be in addition to any or all other remedies available to the City. (Prior code § 9-719)

Chapter 13.32 WATER SHORTAGE EMERGENCIES

13.32.010 Purpose and scope.

This chapter adopts regulations to deal with water shortage emergency conditions which exist within the City and the City's water service areas, as declared by resolution of this City Council. These regulations shall become effective with the effective date of the ordinance codified in this chapter. A water shortage emergency declaration shall be in effect upon proper findings made by the City Council after a public hearing and shall remain in effect until the City Council finds and declares by resolution that the water shortage emergency condition has abated, has changed in degree or no longer exists. (Prior code § 9-730)

13.32.020 Findings.

The City Council finds, determines, and declares that the following shall occur prior to enforcement of the provisions of this chapter:

A. The City Council shall conduct duly noticed public hearings for the purpose of determining whether a water shortage emergency condition exists and, if so, the degree of the emergency and what regulations and restrictions should be enforced in response to the shortage.

B. The City Council shall adopt a resolution which declares that a water shortage emergency condition exists, the facts and conclusions which support such a declaration and that the ordinary water demands and requirements of water consumers within the City cannot be satisfied.

C. The regulations set forth herein are necessary and proper to protect and conserve the water supply for human consumption, sanitation, and fire protection during the duration of the water shortage emergency condition.

D. The regulations set forth herein shall remain enforceable to the extent declared by the City Council and until such time as the City Council finds that the water shortage emergency no longer exists.

E. During the existence of a declared water shortage emergency, the provisions of this chapter shall take precedence over the provisions of the City's Water Conservation Ordinance, Stockton Municipal Code Chapter 13.28, as now enacted or hereafter amended. The provisions of the Water Conservation Ordinance shall continue in effect except where provisions of this chapter are different. Within areas of the City where water service is provided by any other water provider, the provisions of this chapter as to prohibited uses and waste shall be applicable. The Water Conservation Ordinance shall remain in effect except where more stringent requirements are set out herein. (Prior code § 9-731)

13.32.030 Definitions.

The following terms are defined for the purposes of this chapter:

"Allocation" means the calculated percentage of the amount of water delivered to each customer's property during the corresponding monthly billing period of the base year for which no penalty or surplus use charge shall be imposed.

"Applicant" means a person, firm, partnership, business, corporation, district or governmental agency that requests or receives water service from the City.

"Base year" means the calendar year of 1987 or any other period established by resolution of the City Council.

"Customer" means any person, firm, partnership, business, corporation, district, or governmental agency that receives water from the City ("City") Water Utility.

"Director" means the Director of the Municipal Utilities Department of the City.

"Process water" means water used to manufacture, alter, convert, clean, grow, heat or cool a product, including water used in laundries and car wash facilities.

"Water" means water used in or supplied by the City. (Prior code § 9-732)

13.32.040 Additional limits on water use available to all water users.

During Stage 2, 3, 4 and 5 emergencies, the following wasteful uses shall be prohibited in addition to the prohibitions and limitations stated in the Water Conservation Ordinance, Stockton Municipal Code Chapter 13.28. During said stages Section 13.28.040 and Sections 13.28.030(A) and (B)(3) and (4) shall not be applicable. In the event the provisions of the section are inconsistent with the Water Conservation Ordinance, this section shall prevail.

A. Any use of potable water from any fire hydrant is prohibited, except by regularly constituted fire protection agencies for fire suppression purposes or by the responsible water agency, when alternate water sources or recycled water sources are available. In the absence of alternate water sources or reclaimed water sources, use of potable water from a hydrant may be used provided a permit for such use is approved by the Fire Department and the responsible water agency.

B. Use of potable water for dust control purposes except for public health or safety purposes. Reclaimed, recycled or other nonpotable water may be used for such purposes so long as such water is not wasted.

C. Irrigation of exterior landscaping, turf areas, open ground, crops, trees, grass, lawn, groundcover, shrubbery, or decorative plantings between the hours of 11:00 a.m. and 6:00 p.m. except irrigation by drip or mist irrigation systems shall not be restricted as to hours.

D. Irrigation of exterior landscaping, turf areas, open ground, crops, trees, grass, lawn, groundcover, shrubbery, or decorative plantings in such a manner or extent that allows water to run off or escape from the premises or to be wasted.

E. Violation of the above stated provisions shall be unlawful and an infraction. (Prior code § 9-733)

13.32.050 Water allocations—City water utility.

A. The following classes of water use are established:

1. "Residential" which shall consist of water service to land improved with structures designed to serve as a residence for human habitation.

2. "Multiple-family residential" which shall consist of water service to land improved with structures designed to serve as a residence for more than a single family, including apartments, condominiums, townhouses, mobilehome parks, and the like where more than one unit is served by a single meter.

3. "Nonresidential" which shall consist of water service to land improved with structures designed to serve for uses other than residential uses and land without structures but used for agricultural purposes. The following kinds of water use are, without limitation, designated as nonresidential: commercial, industrial, agricultural, municipal, schools, and churches.

4. "Process water users" which shall consist of nonresidential users which utilize water primarily to manufacture, alter, convert, clean, grow, heat, or cool a product, including laundries and vehicle wash facilities.

B. No customer shall use City water for permitted uses in excess of the respective allocation for each class of service within each stage of water shortage emergency. (Prior code § 9-734)

13.32.060 Stages of water shortage emergency.

The following stages of water shortage emergency are established. Upon declaration of the City Council that an emergency condition exists, as provided in Sections 13.32.010 and 13.32.020, the City Council shall declare the degree of emergency and identify the applicable stage and the regulations which shall be enforceable for each respective stage. During Stages 2, 3, 4 and 5 additional restrictions on water use shall be enforceable as stated in Section 13.32.040.

A. Stage 1—Mandatory Water Conservation. Upon a finding made by the City Council that a Stage 1 water shortage emergency exists, the regulations set out in the Water Conservation Ordinance, Stockton Municipal Code Chapter 13.28, as presently enacted or amended shall be enforceable as to all water users.

B. Stage 2—Water Shortage Emergency. Upon declaration of the City Council that a Stage 2 water shortage emergency exists, the following regulations shall be applicable to all customers of the City's water system:

1. Residential Accounts. Residential accounts shall use no more than 90 percent of the quantity of water delivered to the customer's property as recorded by meter during the corresponding billing period of the base year. Notwithstanding this provision, no residential account shall receive an allocation of less than 600 cubic feet (6 CCF) of water per billing period.

2. Multiple-Family Residential Accounts. Multiple family residences which are served by a single meter shall use no more than 90 percent of the total quantity of water delivered to the customer's property as recorded by meter during the corresponding billing period during the base year. Notwithstanding this provision, no multiple-family residential account shall receive a monthly allocation of less than 400 cubic feet (4 CCF) of water per unit served on a single meter.

3. Nonresidential Accounts. Nonresidential accounts shall use no more than 90 percent of the quantity of water delivered to the customer's property as recorded by meter during the corresponding billing period of the base year.

4. Process-Water User Accounts. Process-water users shall use no more than 100 percent of the quantity of water as recorded by meter during the corresponding billing period during the base year.

C. Stage 3—Water Shortage Emergency. The following regulations shall be applicable to all customers of the City's water system:

1. Residential Accounts. Residential accounts shall use no more than 80 percent of the quantity of water delivered to the customer's property as recorded by meter during the corresponding billing period of the base year. Notwithstanding this provision, no residential account shall receive an allocation of less than 600 cubic feet (6 CCF) of water per billing period.

2. Multiple-Family Residential Accounts. Multiple family residences which are served by a single meter shall use no more than 80 percent of the total quantity of water delivered to the customer's property as recorded by the meter during the corresponding billing period during the base year. Notwithstanding this provision, no multiple-family residential account shall receive a monthly allocation of less than 400 cubic feet (4 CCF) of water per unit served on a single meter.

3. Nonresidential Accounts. Nonresidential accounts shall use no more than 80 percent of the quantity of water delivered to the customer's property as recorded by meter during the corresponding billing period of the

base year.

4. Process-Water User Accounts. Process-water users shall use no more than 90 percent of the quantity of water as recorded by meter during the corresponding billing period during the base year.

D. Stage 4—Water Shortage Emergency. The following regulations shall be applicable to all customers of the City's water system.

1. Residential Accounts. Residential accounts shall use no more than 70 percent of the quantity of water delivered to the customer's property as recorded by meter during the corresponding billing period of the base year. Notwithstanding this provision, no residential account shall receive an allocation of less than 600 cubic feet (6 CCF) of water per billing period.

2. Multiple-Family Residential Accounts. Multiple-family residences which are served by a single meter shall use no more than 70 percent of the total quantity of water delivered to the customer's property as recorded by meter during the corresponding billing period during the base year. Notwithstanding this provision, no multiple-family residential account shall receive a monthly allocation of less than 400 cubic feet (4 CCF) of water per unit served on a single meter.

3. Nonresidential Accounts. Nonresidential accounts shall use no more than 70 percent of the quantity of water delivered to the customer's property as recorded by meter during the corresponding billing period of the base year.

4. Process-Water User Accounts. Process-water users shall use no more than 90 percent of the quantity of water as recorded by meter during the corresponding billing period during the base year.

E. Stage 5—Water Shortage Emergency. The following regulations shall be applicable to all customers of the City's water system.

1. Residential Accounts. Residential accounts shall use no more than 60 percent of the quantity of water delivered to the customer's property as recorded by meter during the corresponding billing period of the base year. Notwithstanding this provision, no residential account shall receive an allocation of less than 600 cubic feet (6 CCF) of water per billing period.

2. Multiple-Family Residential Accounts. Multiple family residences which are served by a single meter shall use no more than 60 percent of the total quantity of water delivered to the customer's property as recorded by meter during the corresponding billing period during the base year. Notwithstanding this provision, no multiple-family residential account shall receive a monthly allocation of less than 400 cubic feet (4 CCF) of water per unit served on a single meter.

3. Nonresidential Accounts. Nonresidential accounts shall use no more than 60 percent of the quantity of water delivered to the customer's property as recorded by meter during the corresponding billing period of the base year.

4. Process-Water User Accounts. Process-water users shall use no more than 80 percent of the quantity of water as recorded by meter during the corresponding billing period during the base year. (Prior code § 9-735)

13.32.070 Establishment of customer allocation.

A. The Director shall classify each customer and calculate each customer's allocation. Each customer shall be notified of the Director's determination by mail deposited in the United States Postal Service.

B. Establishment of Allocations With No Customer Use History.

1. Residential. All residential customers with no water use history at the current property address shall be assigned an allocation for single- or multiple-family residential accounts, as determined by the Director, on

the basis of usage by similarly situated customers or on such other basis as may be fair and equitable under all the circumstances.

2. Other Use Classifications. In order to determine water use allocations for a new nonresidential use customer, for a change in property use, or for a customer with no water use history at the current property address, an application by the customer shall be submitted to the Director designating the intended use of the property, the square footage, and number of employees. An allocation will be determined by the Director after reviewing the above factors as well as comparing water use for similar types of construction and property uses, averaging the water use and applying the appropriate percentage reduction to this amount. (Prior code § 9-736)

13.32.080 Request for increase in allocation.

A. All applicants for an increase in allocation must submit an application in writing to the City Department of Municipal Utilities on an application form provided by the City.

B. Requests for increased allocations will be reviewed by the Water Conservation Officer for recommendation to the Director for approval, modified approval, or denial. Requests for increased allocations in excess of the historical use may be recommended for approval for reasons outlined in subsection D of this section.

C. All residential applicants for an additional allocation based on additional persons residing at a residence shall show proof of residency for all residents at that property.

D. Water allocations may be adjusted by the Director upon written application where the requested adjustment is found to be reasonably necessary. Factors for consideration shall include without limitation:

1. Additional people residing full time at that residence.

2. Unusual medical needs.

3. Change of property use.

4. Where a City audit of nonresidential customer's water-using appliances and usage shows that all reasonable conservation measures are being employed and the applicant provides a conservation plan demonstrating the measures employed and compliance with the plan.

5. Where a nonresidential customer has demonstrated growth in business volume over the base year in providing a water-related service to the public, the allocation may be based upon 1990 annual water use.

6. Hospitals, health care facilities, nursing care facilities, health clinics, and similar users may be excepted from the percentage reductions providing that a water conservation plan demonstrating reductions in consumption to the maximum extent feasible without jeopardizing patient care is prepared and approved by the Director.

E. A decision in writing shall be mailed to the applicant within 15 days of receipt of the application. (Prior code § 9-737)

13.32.090 Appeals.

A. Procedure. Any customer may appeal for reconsideration of the Director's classification of use, allocation or determination of a request for an increase in allocation on the basis of hardship or incorrect calculation. Appeals for reconsideration shall be processed as set forth below.

1. Any customer appealing for reconsideration of the classification or allocation shall do so in writing to the Director by either using forms provided by the City or by letter setting forth in detail the reasons for the appeal.

2. The appeal for reconsideration shall be reviewed by the City Department of Municipal Utilities and a site visit scheduled if required.

3. If an appeal for reconsideration is sustained, a condition of approval may include a requirement for the installation of water efficient plumbing fixtures and/or irrigation systems.

4. A staff committee or designee of the Director and the Director shall review all appeals for reconsideration and make decisions on the appeal.

5. If an applicant disagrees with the Director's decision, the decision may be appealed in the same procedural manner as specified in subsection A of this section to the City Manager or a designee, whose decision shall be final. If an appeal to the City Manager is requested, the customer shall be notified of a hearing date by mail. Such hearing shall be scheduled within 10 days of filing the appeal. A decision shall be forwarded to the applicant within 15 days of the date of the hearing.

B. Each appeal to the City Manager shall be accompanied by an appeal fee in an amount to be set by resolution of the City Council from time to time to defray the additional costs to the City. (Prior code § 9-738)

13.32.100 Enforcement and penalties.

A. The first billing period after the effective date of the Council's declaration of a water shortage emergency or the effective date stated in said resolution shall be considered an adjustment period during which no penalties will be imposed for water usage in excess of the allocation.

B. Beginning with the second billing period after the effective date and except as provided in subsection C of this section, any customer who exceeds the established allocation in any monthly billing cycle shall pay an excess use charge in addition to all other charges. The excess use charge shall be based on a rate schedule as specified from time to time by resolution of the City Council.

C. No excess use charge shall be imposed in the following circumstances:

1. Multiple-family residential customers whose consumption is 400 cubic feet (4 CCF) per unit or less during any billing period;

2. All other customers whose consumption is 600 cubic feet (6 CCF) or less during any billing period.

D. Installation of Flow Restrictor.

1. After the issuance of one (1) written warning for violation of the provisions of this chapter, or for any use of water which is prohibited, the City may install a flow restricting device on the customer's water service which shall remain in place for a period of not less than 48 hours and until the customer has paid the removal charges set forth below. The device shall not be removed except by the City.

2. If the customer, after removal of a flow restricting device by the City, shall again violate the provisions of this ordinance or the Water Conservation Ordinance, the City may install a flow restricting device which shall remain for a period of at least two (2) weeks and until payment for removal by the City.

3. Further violations, removal of or by-passing the flow restricting device may result in termination of water service. Upon a determination by the Director that service shall be terminated, written notice of intent to disconnect shall be mailed to the customer. Said notice shall be mailed to the resident and any other person or entity known to the City who is responsible for the violation or correction of the violation, including the property owner in the case of rentals. A request for hearing on the discontinuance of service shall be requested within five (5) days of mailing the notice. A hearing before the Director shall be held within three (3) days of expiration of the period for requesting a hearing. The Director's final decision shall be mailed to the responsible parties within three (3) days of the hearing. If the final decision is to discontinue service, the discontinuance shall not occur less than three (3) days after mailing of the Director's final decision.

4. Removal Charges. The charge for removal of a flow restricting device shall be based on a rate schedule as established from time to time by resolution of the City Council. In the case of rentals, the person or entity occupying the premises and the owner shall be jointly and severally responsible for payment of said costs. (Prior code § 9-739)

Appendix H: Water Fee Schedule

CITY OF STOCKTON

FY 2015-2016

FEE SCHEDULE

FY 2015-16 Adopted Fees
Introduction

Following is the Fiscal Year 2015-16 adopted fee document which includes new and changed fees.

New fees are presented for Economic Development, Facility & Property Rentals and Recreation & Leisure. Fee changes include revisions to Economic Development programs of Stockton marina and boat launching facility, Municipal Utilities for Stormwater, Wastewater and Water previously approved multi-year resolutions, and parking rental to simplify and adjust for market conditions. Some of these changes are increases and some are decreases.

In addition, most other fees have been adjusted for a 1.5% CPI-Annual 2014 with the exception of Public Facilities Fees (PFF) and Community Development fees which are waiting the results of a fee study that is in process. A reduction of certain residential and non-residential PFF that began in 2010 continues through December 31, 2015 per Council direction (resolution # 2014-11-18-1501).

Subsequent to City Council adoption of Stockton's FY 2015-16 fees, San Joaquin County established fee changes to the County Facilities Fee (CFF) and Regional Transportation Impact Fee (RTIF) effective July 1, 2015 which have been updated in the following details. These fees are considered "pass-through" as they are collected by the City on behalf of the County.

Further fee information can be obtained from the City of Stockton website at http://www.stocktongov.com/government/departments/adminservices/feeonline.html

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Municipal Utilities Department

Water

(209) 937-8706

FY 2015-16 Adopted Fee Schedule

Account #	Effective Date	Description	Amount
Single Family Residential Monthly Service Charge			
421-0000-343.31-00	7/1/2015	Consumption per CCF (1 unit = 1CCF)	$1.67
421-0000-343.31-00	7/1/2015	5/8 inch meter	$18.94
421-0000-343.31-00	7/1/2015	3/4 inch meter	$22.25
421-0000-343.31-00	7/1/2015	1 inch meter	$29.24
421-0000-343.31-00	7/1/2015	1 1/2 inch meter	$42.17
421-0000-343.31-00	7/1/2015	2 inch meter	$54.49
421-0000-343.31-00	7/1/2015	3 inch meter	$96.36
421-0000-343.31-00	7/1/2015	4 inch meter	$138.53
421-0000-343.31-00	7/1/2015	6 inch meter	$228.20
421-0000-343.31-00	7/1/2015	8 inch meter	$330.87
421-0000-343.31-00	7/1/2015	10 inch meter	$412.91
421-0000-343.31-00	7/1/2015	12 inch meter	$581.32
Multi-Family Residential Monthly Service Charge			
421-0000-343.32-00	7/1/2015	Consumption per CCF (1 unit = 1 CCF)	$1.67
421-0000-343.32-00	7/1/2015	5/8 inch meter	$18.94
421-0000-343.32-00	7/1/2015	3/4 inch meter	$22.25
421-0000-343.32-00	7/1/2015	1 inch meter	$29.24
421-0000-343.32-00	7/1/2015	1 1/2 inch meter	$42.17
421-0000-343.32-00	7/1/2015	2 inch meter	$54.49
421-0000-343.32-00	7/1/2015	3 inch meter	$96.36
421-0000-343.32-00	7/1/2015	4 inch meter	$138.53
421-0000-343.32-00	7/1/2015	6 inch meter	$228.20
421-0000-343.32-00	7/1/2015	8 inch meter	$330.87
421-0000-343.32-00	7/1/2015	10 inch meter	$412.91
421-0000-343.32-00	7/1/2015	12 inch meter	$581.32
Commercial Monthly Service Charge			
421-0000-343.33-00	7/1/2015	Consumption per CCF (1 unit = 1 CCF)	$1.67
421-0000-343.33-00	7/1/2015	5/8 inch meter	$18.94
421-0000-343.33-00	7/1/2015	3/4 inch meter	$22.25
421-0000-343.33-00	7/1/2015	1 inch meter	$29.24
421-0000-343.33-00	7/1/2015	1 1/2 inch meter	$42.17

Municipal Utilities Department

Water

(209) 937-8706

FY 2015-16 Adopted Fee Schedule

Account #	Effective Date	Description	Amount
421-0000-343.33-00	7/1/2015	2 inch meter	$54.49
421-0000-343.33-00	7/1/2015	3 inch meter	$96.36
421-0000-343.33-00	7/1/2015	4 inch meter	$138.53
421-0000-343.33-00	7/1/2015	6 inch meter	$228.20
421-0000-343.33-00	7/1/2015	8 inch meter	$330.87
421-0000-343.33-00	7/1/2015	10 inch meter	$412.91
421-0000-343.33-00	7/1/2015	12 inch meter	$581.32
Industrial Monthly Service Charge			
421-0000-343.35.00	7/1/2015	5/8 inch meter	$18.94
421-0000-343.35.00	7/1/2015	3/4 inch meter	$22.25
421-0000-343.35.00	7/1/2015	1 inch meter	$29.24
421-0000-343.35.00	7/1/2015	1 1/2 inch meter	$42.17
421-0000-343.35.00	7/1/2015	2 inch meter	$54.49
421-0000-343.35.00	7/1/2015	3 inch meter	$96.36
421-0000-343.35.00	7/1/2015	4 inch meter	$138.53
421-0000-343.35.00	7/1/2015	6 inch meter	$228.20
421-0000-343.35.00	7/1/2015	8 inch meter	$330.87
421-0000-343.35.00	7/1/2015	10 inch meter	$412.91
421-0000-343.35.00	7/1/2015	12 inch meter	$581.32
421-0000-343.35.00	7/1/2015	Consumption per CCF (1 unit = 1 CCF)	$1.67
Institutional Monthly Service Charge			
421-0000-343.36-00	7/1/2015	5/8 inch meter	$18.94
421-0000-343.36-00	7/1/2015	3/4 inch meter	$22.25
421-0000-343.36-00	7/1/2015	1 inch meter	$29.24
421-0000-343.36-00	7/1/2015	1 1/2 inch meter	$42.17
421-0000-343.36-00	7/1/2015	2 inch meter	$54.49
421-0000-343.36-00	7/1/2015	3 inch meter	$96.36
421-0000-343.36-00	7/1/2015	4 inch meter	$138.53
421-0000-343.36-00	7/1/2015	6 inch meter	$228.20
421-0000-343.36-00	7/1/2015	8 inch meter	$330.87
421-0000-343.36-00	7/1/2015	10 inch meter	$412.91
421-0000-343.36-00	7/1/2015	12 inch meter	$581.32

Municipal Utilities Department

Water

(209) 937-8706

FY 2015-16 Adopted Fee Schedule

Account #	Effective Date	Description	Amount
421-0000-343.36-00	7/1/2015	Consumption per CCF (1 unit = 1CCF)	$1.67
Landscape Irrigation Monthly Service Charge			
421-0000-343.33-00	7/1/2015	5/8 inch meter	$18.94
421-0000-343.33-00	7/1/2015	3/4 inch meter	$22.25
421-0000-343.33-00	7/1/2015	1 inch meter	$29.24
421-0000-343.33-00	7/1/2015	1 1/2 inch meter	$42.17
421-0000-343.33-00	7/1/2015	2 inch meter	$54.49
421-0000-343.33-00	7/1/2015	3 inch meter	$96.36
421-0000-343.33-00	7/1/2015	4 inch meter	$138.53
421-0000-343.33-00	7/1/2015	6 inch meter	$228.20
421-0000-343.33-00	7/1/2015	8 inch meter	$330.87
421-0000-343.33-00	7/1/2015	10 inch meter	$412.91
421-0000-343.33-00	7/1/2015	12 inch meter	$581.32
421-0000-343.33-00	7/1/2015	Consumption per CCF (1 unit = 1 CCF)	$1.67
Hydrant Meter Rental			
421-0000-379.99-00	7/1/2015	Installation - Field Charge	$53.00
421-0000-379.99-00	7/1/2015	Consumption Charge	$3.33
421-0000-379.99-00	7/1/2015	Monthly Rental	$96.36
Temporary Service			
Varies by user	7/1/2015	Charges for water furnished through a temporary service connection shall be at double the established rates for like permanent customers. For unmetered temporary service of three days or less duration	$18.00
Backflow Device Testing Charges			
Varies by user	7/1/2015	Double Check Valves (plus parts)	$71.25
Varies by user	7/1/2015	Double check valves 2" and larger and reduce pressure devices (RPD) (plus parts)	$71.25
Private Fire Hydrant Service			
Varies by user	7/1/2015	Hydrant	$6.00
Charges for Private Fire Protection Service			
Varies by user	7/1/2015	1 1/2 connection	$8.38
Varies by user	7/1/2015	2 inch connection	$11.18
Varies by user	7/1/2015	3 inch connection	$16.76
Varies by user	7/1/2015	4 inch connection	$22.10

Municipal Utilities Department

Water

(209) 937-8706

FY 2015-16 Adopted Fee Schedule

Account #	Effective Date	Description	Amount
Varies by user	7/1/2015	6 inch connection	$33.27
Varies by user	7/1/2015	8 inch connection	$42.16
Varies by user	7/1/2015	10 inch connection	$55.12
Varies by user	7/1/2015	12 inch connection	$66.04
Residential Connections			
424-0000-344.20-00	7/1/2015	Single Family	$2,170.01
424-0000-344.20-00	7/1/2015	Multi-Family - First meter	$2,170.01
424-0000-344.20-00	7/1/2015	Each Additional Unit(s) - Multi-Family	$1,750.84
Non-Residential Connections			
424-0000-344.20-00	7/1/2015	5/8 & 3/4 inch meter	$2,170.01
424-0000-344.20-00	7/1/2015	1 inch meter	$4,087.84
424-0000-344.20-00	7/1/2015	1 1/2 inch meter	$9,241.74
424-0000-344.20-00	7/1/2015	2 inch meter	$13,065.02
424-0000-344.20-00	7/1/2015	3 inch meter	$27,747.57
424-0000-344.20-00	7/1/2015	4 inch meter	$46,202.64
424-0000-344.20-00	7/1/2015	6 inch meter	$100,448.93
424-0000-344.20-00	7/1/2015	10 inch meter (1)	See Formula
424-0000-344.20-00	7/1/2015	12 inch meter (2)	See Formula
Delta Water Supply Project Surface Water Supply Fee			
425-0000-344.20-00	7/1/2015	3/4 inch meter	$4,946.00
425-0000-344.20-00	7/1/2015	1 inch meter	$8,259.82
425-0000-344.20-00	7/1/2015	1 1/2 inch meter	$19,784.00
425-0000-344.20-00	7/1/2015	2 inch meter	$26,362.18
425-0000-344.20-00	7/1/2015	3 inch meter	$52,773.82
425-0000-344.20-00	7/1/2015	4 inch meter	$82,449.82
425-0000-344.20-00	7/1/2015	6 inch meter	$164,850.18
425-0000-344.20-00	7/1/2015	8 inch meter	$263,770.18
425-0000-344.20-00	7/1/2015	10 inch meter (5)	See Formula
425-0000-344.20-00	7/1/2015	12 inch meter (6)	See Formula

Municipal Utilities Department

Water

(209) 937-8706

FY 2015-16 Adopted Fee Schedule

Account #	*Effective Date*	*Description*	*Amount*
Engineering Studies required under Senate Bill 221 and 610			
Varies by user	7/1/2015	Deposit	$12,500.00

Division General Comments (Applicable to all Fees)

An Administrative Fee of 3.5% will be added to the Sewer and Water Connection fee Amount
WATER CONNECTION FEES ONLY: For new single-family residential connections that require a 1" meter to meet the residential fire sprinkler building code requirements, the 1" meter connection fee(s) will be reduced to an amount equal to a 3/4" meter connection fee(s). This reduction does not apply to those new connections that would have required a 1" or greater size meter regardless of the residential fire sprinkler building code requirement nor does the reduction apply to the monthly meter charge which will be charged based on the actual meter size installed.

(1) Formula for 10 inch connection = [(Flow rate/30gpm x $2,135.84) + 61,907.00]

(2) Formula for 12 inch connection = [(Flow rate/30gpm x $2,135.84) + 86,049.00]

(5) DWSP Surface Water Fee Formula for 10 inch connection = [(Flow rate/30gpm x $4,838)+61,907.00]

(6) DWSP Surface Water Fee Formula for 12 inch connection = [(Flow rate/30gpm x $4,838)+86,049.00]

Municipal Utilities Department

Water Fees & Regulations

(209) 937-7031

FY 2015-16 Adopted Fee Schedule

Account #	*Effective Date*	*Description*	*Amount*
421-0000-239.10	7/1/2015	Deposit: An amount equal to 2.5 times the estimated average monthly bill, but not less than $125	$125.00
421-0000-343.41	7/1/2015	Field Charge (Regular Dispatch)	$53.00
	7/1/2015	Field Charge (Special Dispatch)	$80.00
421-0000-343.41	7/1/2015	Damaged Lock or Device (each)	$25.00
421-0000-343.41	7/1/2015	Damage to City Property - Full cost of repairs, but not less than $50	$50.00
421-0000-343.41	7/1/2015	Meter Removal	$100.00
421-0000-343.41	7/1/2015	Removal of Unauthorized Connection	$80.00
421-0000-343.41	7/1/2015	Extension/Cancellation of closing	$30.00
421-0000-343.41	7/1/2015	Same Day Service Fee	$53.00
421-0000-343.44-00	7/1/2015	Hydrant Water Flow Testing per hour/per person (no less than $169)	$169.00

Municipal Utilities Department

Water Fees & Regulations

FY 2015-16 Adopted Fee Schedule

A. DEFINITIONS

APPLICANT A person applying for water service

CITY The City of Stockton, California, a municipal corporation

CITY COUNCIL The City Council of the City of Stockton, California

CROSS CONNECTION Any unprotected connection between any part of a water system used or intended to supply potable water and any source or system containing non-potable water or other substances not safe for human consumption

CUSTOMER A person receiving water or other utility service(s) from the City of Stockton

CUSTOMER LINE The pipe, valves and fittings leading from the meter outlet into the property served, which is installed, maintained and owned by the customer

FIRE SERVICE A connection used solely for the extinguishing of fires except as may be specifically authorized for public or other purposes by the water division

METER The water meter and its enclosure, valves and related appurtenances, which are and shall remain the exclusive property of the City of Stockton

PERSON Any natural person, firm, partnership, association or corporation acting either for themselves or as the clerk, employee or agent of another

SERVICE LINE OR SERVICE CONNECTION Pipe, valves and fittings laid from the main up to and including the water meter

TEMPORARY SERVICE Service of non-permanent nature or of limited duration

UNIFIED BILL A utility bill which contains charges for various utility services, such as water, storm water, solid waste and wastewater, provided to a specific service address

WATER DIVISION The Water Division of the Municipal Utilities Department of the City of Stockton

WATER MAIN The pipe owned and maintained by the City, usually four (4) inches in diameter or larger, laid in a street, road, right-of-way or easement capable of serving two or more customers

WATER MAIN EXTENSION A water main connected to an existing water main

WATER SUPERINTENDENT The superintendent of the Water Division of the Municipal Utilities Department of the City of Stockton

B. APPLICATION FOR SERVICE

APPLICATION AND DEPOSIT Each person desiring a water supply from the City Water System must make application on a form provided by the City or its authorized agent and provide such information or documents as may be required by the City to approve the application. A deposit, as established in the City's annual fee schedule, may be required of an applicant for water service based on the creditworthiness of the applicant. Water service is provided on the next regular business day.

CUSTOMER AGREES TO BE BOUND Every customer shall be deemed to have expressed consent to be bound to the terms and provisions of the regulations then in effect and as may be amended at a later date. Whenever any regulation is violated, the City reserves the right to terminate the water service without notice. The customer whose water is thus terminated shall forfeit all payments made and the water shall not be restored until all unpaid delinquent charges billed on the unified bill and any fees, charges and/or deposits associated with the violation and service termination are paid in full and all other requirements of these regulations are met.

UNPAID BILL Water service shall not be granted to an applicant or customer if that person has unpaid delinquent bills (or charges) for City utility services.

FAILURE TO APPLY OR TO COMPLETE APPLICATION PROCESS Water service shall not be granted to any person who fails to apply for service or who does not complete the application process. The City reserves the right to terminate the water service without notice when it is determined that an application for service has not been approved for the customer(s) at that service address.

FRAUD - REFUSAL OF SERVICE The City shall have the right to refuse water service to any person(s) or premises at any time or to discontinue service without notice if found necessary to do so in order to protect itself against fraud or abuse.

SERVICE TERMINATION FOR NON-PAYMENT, DAMAGE TO CITY PROPERTY OR UNAUTHORIZED WATER SERVICE If water service is terminated because of unpaid delinquent charges billed on a unified bill, dishonored payments, acquisition (or provision) of unauthorized water service or damage to City property, water service shall not be restored to the service address or to the customer(s) at another address until all unpaid delinquent charges billed on the unified bill and any fees, charges and/or deposits associated with the violation and service termination are paid in full and all other requirements of these regulations are met. Water restoral will be made on the next business day following receipt of payment in full and confirmation that all other requirements have been met.

FIELD CHARGE A fee, as established in the annual fee schedule, shall be charged when City personnel are dispatched to terminate water service because of non-payment of delinquent utility charges billed on a unified bill or when City personnel are dispatched to the service location due to dishonored payments, acquisition (or provision) of unauthorized water service or damage to City equipment or property. This fee will be added to the water service customer's account. Failure to pay this fee shall be considered the same as failure to pay for water or water service. In addition to the field charge, the City may require a customer to pay a deposit, as established in the annual fee schedule, before service is restored.

Municipal Utilities Department

Water Fees & Regulations

FY 2015-16 Adopted Fee Schedule

C. METER READING, BILLING AND COLLECTION

COMBINING OF METER READINGS Each meter on a customer's premise will be considered and billed separately. The readings of two or more meters will not be combined.

METER READING FREQUENCY Meters will normally be read at monthly intervals for the preparation of regular bills, and as may be required for the preparation of opening bills, closing bills and special bills.

NON-REGISTERING AND UNREADABLE METERS Bills for service will be based on an estimate if a meter fails to register the volume of water consumed or cannot be read. In estimating consumption due consideration will be given to fluctuations in usage caused by seasonal changes or known service interruptions.

FAILURE TO RECEIVE BILL It shall be the water service customer's responsibility to provide the City or its authorized agent the correct address to which bills are to be mailed. Failure to receive a bill shall not relieve the water service customer of responsibility for on-time payment.

DEPOSIT ON ACTIVE ACCOUNTS A deposit as established in the annual fee schedule may be required if all charges billed on a unified bill are not paid by the due date. This deposit will be added to the water service customer's account. Failure to pay the deposit shall be considered the same as failure to pay for water or water service.

DAMAGE TO CITY PROPERTY A fee, as established in the annual fee schedule, shall be charged to the water service customer's account for each lock or device attached to the City's water meter that is removed or broken by anyone other than authorized City personnel. Other damages to the City water meter or associated equipment will result in additional charges being levied to recover the full cost of repairs with a minimum charge for damages as established in the annual fee schedule. These fees are in addition to field charges and deposits and will be added to the water service customer's account. Failure to pay this fee shall be considered the same as failure to pay for water or water service.

METER REMOVAL A fee, as established in the annual fee schedule, shall be charged if a water meter is removed because of: (1) non-payment of delinquent utility charges billed on a unified bill, (2) damage to or tampering with the City water meter or associated equipment, or (3) acquisition or provision of unauthorized water service. This fee will be added to the water service customer's account. Failure to pay this fee shall be considered the same as failure to pay for water or water service.

EXTENSION OF ACCOUNT CLOSING DATE/SAME-DAY SERVICE FEE A fee, as established in the annual fee schedule, shall be charged if a customer does not cancel their request to close an account (terminate service) at least one business day prior to the scheduled account closing date or if the customer does not meet all requirements for approval of their application for service at least one business day before water service is requested. Same day service fee shall be charged when service is provided sooner than the next business day after approval of customer's application. This fee will be added to the water service customer's account. Failure to pay this fee shall be considered the same as failure to pay for water or water service.

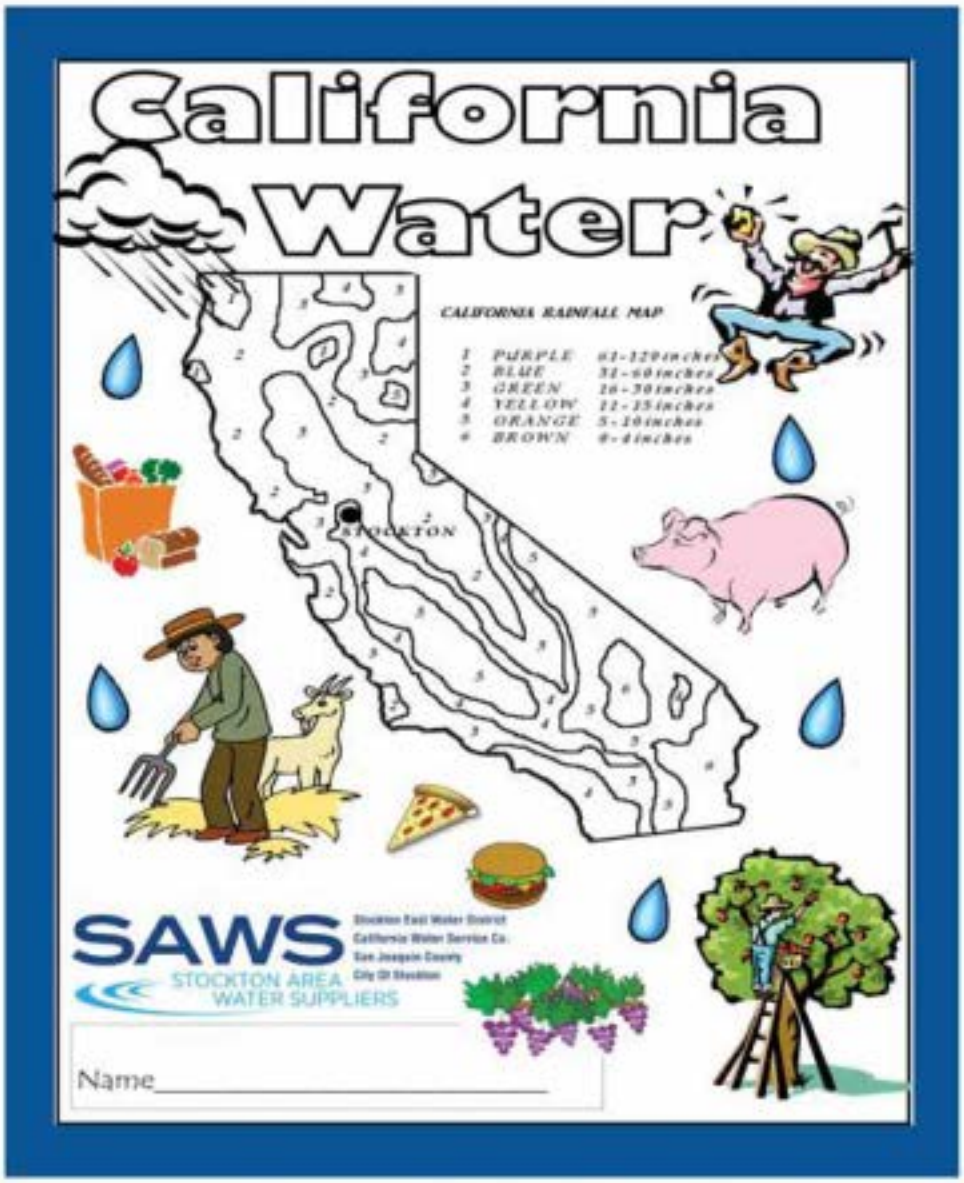
Refer to Resolution No. 02-0331 Sections E, F, G, H, and I for guidelines to water rates and regulations.
Fees adjusted annually in accordance with Resolution No. 03-0362

Appendix I: Sample Water Conservation Public Information and Outreach Materials

SAWS Water Education Program

ANNUAL REPORT

2014/2015 School Year



SAWS
STOCKTON AREA WATER SUPPLIERS

Stockton East Water District
California Water Service Co.
San Joaquin County
City Of Stockton

SAWS Water Education Program Annual Report

School Year: 2014/2015

July 1, 2014 through June 30, 2015

REPORT SUMMARY

This report presents an update on activities related to implementation of the Stockton Area Water Suppliers (SAWS) Water Education Program in the 2014/2015 school year. The report includes a summary, a full report, charts of data and statistics, participant feedback, and the Zun Zun "Water Beat" assembly program final report.

In light of statewide concerns about the current drought situation in California, every classroom presentation in the 2014/2015 school year placed special emphasis on drought awareness and water conservation measures. Students were asked to share and implement what they learned about water conservation with family and friends and make changes in their water use habits.

In the 2014/2015 school year, the SAWS Water Education Program continued to serve Stockton's elementary and middle school classrooms and after school programs. As part of a comprehensive outreach effort, the SAWS Water Education Program also participated in numerous special events in San Joaquin County, including three AgVenture events, school farm days, Stockton's Earth Day Festival and a variety of local youth-oriented events and gatherings. Our standard program offers seven grade-level specific in-class presentations, an after-school program and water-themed, school-wide assemblies performed by the Zun Zun environmental education troupe. In the 2014/2015 school year, the SAWS Water Education Program reached a total of 28,268 students and participants; 23,538 through in-class, event and after school programs and 4,730 through the Zun Zun assembly program.

Measuring Success in an Extraordinary Year

How can the SAWS Water Education Program measure success?

It is well known that the quantitative results of water conservation/education programs are difficult to measure. How much did the target audience learn? How many will actually embrace the message and act on it? Who will share the information with family and friends? Will they make water conservation a life-long habit? It's impossible to answer these questions, and under normal circumstances we can only hope our efforts are making a difference.

But recent events may provide rare, tangible evidence of success. According to recent news reports, Stockton is meeting and exceeding state and local mandated drought water use cutback goals, and it's likely that the SAWS Water Education Program is playing a role in that accomplishment. Our message of water conservation has been consistently delivered to Stockton area schools and to children at youth-oriented events for over ten years now. We know from our feedback that those we have reached have embraced our message; some understood the message and became conservation-minded, some shared the message with family and friends, and some have even become well-informed, conservation minded Stockton rate-payers. Overall, it is likely that those we reached have a deeper understanding of the importance of our precious water resources and the need to conserve, not just in times of drought, but in their everyday lives. **Is Stockton's impressive success in meeting and exceeding water conservation goals a result of the SAWS agencies effort to inform the public and change water use habits? It's certainly possible! And it seems like a logical way to measure success.**

A summary of 2013/2014 Program highlights:

- The SAWS Water Education Program visited 74 Stockton area schools/venues, presenting in 382 classrooms and after school venues for 14,465 students.
- SAWS sponsored 14 Zun Zun "Water Beat" assembly performances for 4,730 students in ten Stockton elementary schools.
- The Stockton East Water District hosted 2 facility tours of the Dr. Joe Waidhofer Drinking Water Treatment Plant for 85 attendees.
- SAWS sponsored 1 career/water awareness workshop for 30 students.
- The SAWS Water Education Program participated in a variety of local, youth-oriented special events and promotional programs, reaching 9,340 attendees. These events included:

- Three San Joaquin County AgVenture Events (South County, Stockton & Lodi)
- SJCOE Science Fair judging
- Don Riggio Elementary's "Delta Experience"
- Manteca Unified School District's "Planet Party Day"
- Manteca Unified School District's Farm Days
- Lincoln USD and Lodi USD Spring/Family Fun Days & School Carnivals
- Stockton's Earth Day Festival at Victory Park
- Tyler Elementary's Earth Day Festival
- Children/Youth Day at Pixie Woods

- Special Drought and Water Conservation and Career Path Development presentations were made for a variety of organizations and groups, including:
  - Garden Acres Community Center: Drought and Water Conservation Presentation
  - Lincoln HOA Unit 3: Drought and Water Conservation Booth
  - Girl Scout Troop #64: Drought and Water Conservation Presentation
  - Green Team San Joaquin: Drought and Water Conservation Presentation
  - San Joaquin County, Solid Waste Division: Drought and Water Conservation Presentation
  - Lincoln High School's "Window on Your Future" Event: Career Path Development

Please see the full report that follows for further details.

2014/2015 SAWS WATER EDUCATION PROGRAM HIGHLIGHTS & UPDATES

The SAWS In-Class Presentation Program:

The SAWS in-class presentations continue to be in high demand in Stockton area schools. Invitations to book presentations for the 2014/2015 school year were sent to teachers and administrators via email in early May 2014. The presentation calendar was full by the end of summer, and a waiting list was established in September.

In response to statewide concerns about the current drought situation in California, every classroom presentation we offer emphasized drought awareness and a discussion about water conservation at home. Presenters set aside time during each presentation to define the word drought and related terminology, engaged the class in a discussion about water conservation at home and asked students to relate what they learned to family and friends. Interestingly, most students, even Kinders, know about California's drought, and most understand the meaning and cause. We found that students were eager to learn more about the drought and share their knowledge with others.

The SAWS Water Education Program has developed a devoted following among Stockton teachers; those familiar with the program often design their lesson plans with the SAWS Water Education Program in mind; the colorful visuals and hand-on activities featured in our presentations can bring lessons to life for students. Often, one teacher takes the lead to schedule for an entire grade level so each child can experience a "Water Lady" visit. Some schools even plan field trips that coordinate with our programs; St. Luke, Tully Knoles Elementary, and several other Lincoln and Lodi USD schools coordinate our "California Water" presentation with fourth grade field trips to Columbia State Park. Don Riggio Elementary coordinates our water cycle presentation with their Delta Experience event, and teachers often book a water treatment plant tour/field trip in conjunction with our Grade 5 "Water Cycle: The Incredible Journey" presentation. Others coordinate our grade-specific presentations with established curriculum and common core standards: Kinder/first grade teachers can use our popular "Water Cycle Story" presentation to reinforce lessons about weather and states of matter, while the second grade "H20 to Go!" presentation addresses standards related to gravity, motion and machines through a

variety of fun and exciting hands-on pumping activities. The “Water Matters” and “Incredible Journey” programs target science content standards for grades 3, 4 and 5. These presentations are similar, but adapted for content/common core standards specific to grade level. Both programs focus on the water cycle, addressing a variety of science standards through fascinating facts and figures and a demonstration of the ratio of fresh to salt water on earth. During the “Water Matters” program, students perform a hands-on “scientific experiment” that demonstrates the properties of surface tension and cohesion, as well as concepts related to food chains and webs and environmental issues in our communities. The “Incredible Journey” program addresses similar science standards for grade 5; after a refresher on the water cycle, students participate in an active, social game from Project WET, embarking on the “Incredible Journey” of a water molecule in the water cycle, evaporating, condensing and precipitating around the room as they make a beaded bracelet, with each bead representing a component and process of the water cycle. These programs also include a comprehensive “Source to Tap” diagram, learning how water travels from the water cycle to their faucets at home. A scale model sand and gravel water filter demonstration gives students a glimpse of the processes involved in water treatment and distribution and provides information about local water sources and the agencies that sponsor the SAWS Water Education Program. Drought, conservation and water awareness is also discussed.

The “California Water” presentation, which covers the history, use and distribution of water in our state, is responsive to both fourth and sixth grade content standards and features a variety of hands-on activities, including map interpretation and a role-playing game designed to introduce students to the concepts of water rights and legislation relating to our natural resources.

The middle school program, entitled “Our Watershed: We All Live Downstream,” features hands-on activities using two “Enviroscape” models. Every student participates in setting the stage for a demonstration that explains storm water runoff, point and non-point source water pollution and how our actions can affect water quality in our communities.

Every student in every classroom we visit receives a sharpened water-saver pencil and an age-appropriate workbook with information and activities pertaining to water conservation and awareness. As a thank you for inviting us to present, participating teachers receive a variety of gifts, including tote bags, magnetic clips, seed packets, water activity guides, sponges, pocket hand sanitizers, white board markers, crayon packs and other items. **The SAWS Water**

Education Program only distributes promotional items that are practical and useful in the classroom.

There is evidence that as Stockton's educational resources have diminished, our water education presentations have steadily gained favor. Teachers find value in our ability to connect content/common core standards to water resources, the environment, conservation and, recently, current events such as the drought and water legislation in California. The combination of education and entertainment we provide makes learning exciting and fun for students. Teachers know that our presentations can address multiple content/common core standards in 60-90 minutes with little or no teacher prep; we provide an excellent introduction or follow up to standard curriculum involving water for every grade level. We like to remind teachers that, in spite of budget cuts, students can still experience the benefit of community learning because SAWS sponsors in-class programs that "bring the field trip to the classroom."

Water Treatment Plant Tours

When the SAWS Water Education Program visits middle/ high school and college classrooms (Grade 5 and up), we encourage teachers to schedule a visit to the Dr. Joe Waidhofer Drinking Water Treatment Plant for a facility tour. When elementary and middle-school classes visit, we ask that the groups include at least one parent/adult chaperon for every five students. While the main purpose for this request is crowd control, we have found that parents touring the plant often learn more than their children do, and invariably leave with a greater appreciation for their community's water resources. College classes and community groups are fascinated by and impressed with our facilities and the treatment process; most citizens never take the time to consider the source and systems that provide them with drinking water. While school districts often lack funding for field trip transportation, some public and private schools are able to visit by using adult/parent chauffeurs and chaperons. Facility tours are valuable in raising public awareness and can provide an enlightening experience for students and community members, as well as those looking for career path possibilities.

After School Programs, AgVenture & Special Events:

The H2Olympics After School and Special Event Program:

The “H20lympics” program is offered to any school with a Stockton address and can serve as an after school program, a booth at school festivals and events, or as a hands-on activity presentation to serve an entire grade level. In the 2014/2015 school year, our presenters brought the H20lympics program to 1285 students in 12 schools. The program features a series of fun, hands-on water activities or “experiments” that demonstrate scientific properties of water, including cohesion, adhesion and surface tension: How many water drops can you fit on the head of a penny? Can you make a paperclip float? Can you keep a water drop intact while guiding it through a laminated maze? The format of the H20lympics program allows students to have fun while learning in a relaxed, non-classroom atmosphere. As with other SAWS Water Education Programs, we have incorporated a drought/conservation discussion into the “H20lympics” program format, and, depending on the venue, sometimes include a prize wheel or “water saver” button-making activity.

Benefits of the SAWS H20lympics Programs Include:

- Hands-on activities educate and entertain
- Format holds students’ attention because it provides an alternative to classroom learning structure
- Students are likely to take message home
- Parents often show up at after school programs and may even participate
- Broad outreach to multiple grade levels (K-8): maximum contacts in minimum amount of time
- Use of upper elementary and middle school helpers allows older students to work with/teach younger students: excellent learning environment for all.
- Provides teachers, facilitators and activities coordinators with free, appropriate educational activities.

San Joaquin County’s AgVenture Events:

Every third grader in San Joaquin County is eligible to participate in this dynamic program sponsored by San Joaquin Farm Bureau and Select San Joaquin Foundation. AgVenture participants enjoy a day of fun while learning about the vast diversity of agriculture in San Joaquin County. This event exposes students to important concepts during their “day on the farm,” including nutritional values, agronomics, marketing, farm and crop production, the value

of locally grown products and the role that producers, vendors and the purveyors of our natural resources play in bringing these commodities to the community. AgVenture's unique format offers a meaningful and memorable experience for students and a special opportunity for the agricultural community to reach out to some of our most impressionable citizens. SAWS participation in these events allows us to promote our in-class, after school and assembly programs while sharing our message of water awareness and conservation with thousands of third graders and their teachers. Each of the three San Joaquin County AgVenture events hosts between 3,500 and 4,000 third graders, and the SAWS booth reaches 1,500-2,000 students during each event.

Since 2010, the Stockton Area Water Suppliers alliance has donated $1,000 annually to AgVenture to help sustain this valuable program.

Zun Zun "Water Beat" Assemblies

Stephen Snyder and Gwynne Snyder Cropsey are "Zun Zun," a performing arts group that celebrates the environment through water-themed, interactive musical assemblies. In the 2014/2015 school year, SAWS sponsored 14 Zun Zun assemblies for 4,730 students in ten Stockton area schools.

ZunZun's "Water Beat" show highlights the connection of the community to its watershed, focusing on water conservation and resource protection. In this 45 minute program, Zun Zun performs a number of skits using musical instruments, song and dance, audience participation and humor for a truly memorable show. Topics covered include drought, water conservation, watershed protection, water reclamation, and water pollution. Students and teachers are encouraged to participate, playing unique "water instruments" from around the world, joining in the Sprinkler, Swimmer, and Washing Machine dances and singing the "Save Some Water" song. Audience members are invited on stage to participate in hilarious activities like the "Toilet Game Show," where students learn that fixing a leaking toilet may be the single greatest way to save water at home. Students do the Drought Limbo and participate in a crazy race that explains the purpose of storm drains and the potential threat of storm water pollution. Participants leave the assembly singing, dancing and chatting about the many facets of water covered in the performance. In the 2014/2015 school year, SAWS sponsored a "Zun Zun Tunes" music CD for

every class that attended a Zun Zun performance. ***See the Assembly Program Report section of this report for Zun Zun's Annual Report.***

The SAWS "Conservation Cottage" Exhibit at the Children's Museum of Stockton

The Children's Museum of Stockton is currently operating under the management of its Board of Directors. The facility has expanded operating hours and added new features and exhibits, attracting more visitors than ever. The Coordinator works with museum personnel on a continuing basis to maintain and improve the exhibit. In 2012, SAWS sponsored a water source mural on the drinking fountain wall, and in 2014 SAWS sponsored placement of a "Water Burger" (a giant plastic hamburger designed by DWR specifically for water education) in the exhibit, which has been very popular with the 3-7 year old set that frequents the museum. Recently, the water system that supports the low-flow shower and toilet demo in the exhibit has experienced problems that may indicate the end of its useful life. The Coordinator is currently working with museum personnel to determine a suitable replacement for this component.

SAWS Water Education Program and the Community

The SAWS Water Education Program participates in and supplies hand-outs and materials for numerous community gatherings and other special activities and events in Stockton. The following is a list of some of the community events the SAWS Water Education Program staff participated in during the 2014/2015 school year:

- **San Joaquin County AgVentures:** The SAWS Water Education Program staffed a booth at each of the three AgVenture events in the 2014/2015 school year: November 6, 2014 (South San Joaquin County), January 21, 2015 (Stockton), and March 3, 2015 (Lodi). SAWS participation in AgVenture allows our staff to promote SAWS sponsored in-class, after school and assembly programs while sharing our message of water awareness and conservation with thousands of third grade students and their teachers. The Stockton East Water District Board of Directors was also a funding contributor to this year's events. Each AgVenture event hosts between 2,500 and 4,000 third graders; the SAWS activity booths hosted over 4,500 students at the three events.
- **Lincoln USD "Window on Your Future" February 25, 2015:** The SAWS Coordinator participated in mock job interviews designed to prepare Lincoln High School students for entry into the job market. This event presents an opportunity for

SAWS to share career path outreach with potential job seekers. The Coordinator reached approximately 30 Lincoln High School juniors and seniors at this event.

- **Rotary Read In:** The SAWS Coordinator participated in the Stockton Rotary Read-In on February 26, 2015, visiting a second grade class at Mabel Barron Elementary School in Stockton.
- **San Joaquin County Science Fair Judging, March 2015:** The SAWS Coordinator participated in exhibit judging at the annual San Joaquin County Science Fair, judging approximately 70 K-8 entries at this event.
- **Don Riggio Elementary School's "Delta Experience" March 27, 2015:** The SAWS Water Education Program participated in this lower-elementary school event that focuses on the Sacramento/San Joaquin Delta. The SAWS activities at this event reached approximately 100 students and their teachers.
- **MUSD "Planet Party Day," April 30, 2015:** The SAWS Water Education Program staff hosted a hands-on water activity booth for this all-day event that focuses on science and math. Outreach at this event reached approximately 400 MUSD middle school students.
- **Manteca Unified School District's Farm Days:** In Spring 2015, SAWS sponsored an activity booth (H20lympics) at Great Valley Elementary School's annual Farm Day event. The SAWS activity booth hosted 120 students at this event.
- **Stockton's Earth Day Festival, Sunday April 26, 2015:** SAWS was a principle sponsor of this popular annual festival at Victory Park in Stockton. Drought awareness reusable tote bags were distributed to all participants, and the SAWS Water Education Program sponsored a booth featuring color-your-own water saver buttons for children. The SAWS activities at this event reached approximately 2500 community members, and promotional tote bags were distributed to over 5000 attendees.
- **Great Valley Elementary Farm Day, Thursday May 7, 2015:** The SAWS Water Education Program sponsored an activity booth (H20lympics) at this annual event, reaching approximately 120 upper elementary school students.
- **Children and Youth Day at Pixie Woods, Saturday May 16, 2015:** The SAWS Water Education Program hosted an activity booth at this event, which is sponsored by the Stockton Family Resource and Referral Center. Children and their families enjoy free admission to Pixie Woods and are able to engage in a variety of crafts and activities throughout the day. Those visiting the SAWS activity booth made color-your-own water conservation themed buttons. The SAWS activities at this event reached approximately 2,500 people.
- **Tyler Elementary Earth Day Celebration, Thursday May 14, 2015:** The SAWS Water Education Program sponsored an activity booth (drought awareness and water distribution presentation) for approximately 400 upper elementary school students.

- **Children's Museum Benefit Bocce Challenge, Sunday June 14, 2015:** Each year, SAWS donates to and participates in the Children's Museum Annual Bocce Challenge, an event that raises thousands of dollars for the Children's Museum of Stockton.
- **Drought Awareness Presentations:** The SAWS Water Education Program made drought awareness presentations for several homeowners' associations, the Green Team San Joaquin group and San Joaquin County's Solid Waste Division.
- **Water Treatment Plant Tours:** The SAWS Water Education Program and SEWD staff hosted two water treatment plant tours in the 2014/2015 school year for 85 attendees. Tours for classrooms (grade 5 and above) required one adult chaperon for every five students attending. A public tour of the Dr. Joe Waidhofer Drinking Water Treatment Plant, arranged by the Friends of the Lower Calaveras River advocacy group, was conducted in September 2014.
- **Community Based Programs:** SAWS visited and supplied water conservation materials for Special Day classrooms at Grant High School, Head Start and regional pre-school programs, SUSD's "Project Live" programs for developmentally disabled adults, and other community programs requesting materials and resources.
- **DWR Water Education Committee:** The SAWS Coordinator attended a meeting of the DWR Water Education Committee in Temecula, CA on June 2 and 3, 2015, joining water educators from all over California to share resources and ideas for water conservation education and outreach.

Measuring Success in an Extraordinary Year

How can the SAWS Water Education Program measure success?

It is well known that the quantitative results of water conservation/education programs are difficult to measure. How much did the target audience learn? How many will actually embrace the message and act on it? Who will share the information with family and friends? Will they make water conservation a life-long habit? It's impossible to answer these questions, and under normal circumstances we can only hope our efforts are making a difference.

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feedback that those we have reached have embraced our message; some understood the message and became conservation-minded, some shared the message with family and friends, and some have even become well-informed, conservation minded Stockton rate-payers. Overall, it is likely that those we reached have a deeper understanding of the importance of our precious water resources and the need to conserve, not just in times of drought, but in their everyday lives. **Is Stockton's impressive success in meeting and exceeding water conservation goals a result of the SAWS agencies effort to inform the public and change water use habits? It's certainly possible! And it seems like a logical way to measure success.**

Looking Ahead:

As we embark upon our twelfth year serving the Stockton area, the SAWS Water Education Program staff is proud to say that our outreach programs are well-known and respected in the community. Our presentations reach significant numbers of students and community members with a variety of programs, and we participate in many high-profile youth oriented local events. In the 2014/2015 school year, staffing remained static with Mrs. Quilon functioning as the main presenter (part-time, 20 hrs/week) Mrs. Kelly providing fill-in and back up (part-time, 12 hrs/week), and Mrs. Coon managing the program, providing emergency presentation back-up, planning and attending special events, working with the community and doing public outreach. In the 2014/2015 school year, the SAWS Water Education Program's in-class, special event, assembly and after school presentations reached over 28,000 students and members of the public. The feedback from teachers and administrators is testament to the fact that we have excellent presenters who are adept at sharing knowledge and enthusiasm for our water resources; we are invited back to schools and events year after year because the programs we offer are a valuable resource for Stockton area schools and the community. At this writing, the program is already fully booked through June 2016 and we have had requests to book for the 2016/2017 school year.

In 2015/2016, the Coordinator plans to continue the program in its present form, working with experiential learning curriculums like Project WET, CREEC, Project WILD, AIMS, STEM and Ag in the Classroom to update and enhance our grade level appropriate, standards-based, hands-on water conservation presentations. We plan to attend as many youth-oriented

community events as possible to promote water/drought awareness and conservation. We will also continue to offer the Zun Zun assembly program to selected Stockton area schools. It is our goal to maintain and enhance the quality rather than the quantity of our programs going forward.

Conclusion

The SAWS Water Education Program is endorsed and approved by the Stockton, Lincoln, Lodi and Manteca school districts as well as a variety of charter and private schools in the Stockton metropolitan area. The program is also sanctioned by the San Joaquin County Office of Education. Our success is evidenced by the numbers: teachers participate enthusiastically year after year and demand for presentations has increased steadily. The most effective tool for program sustainability remains teacher-to-teacher recommendations; we continue to visit new teachers and schools each year; our loyal followers recommend us to their colleagues and often take us along when they move to new schools. Most teachers coordinate our presentations with their lesson plans and many use our outreach programs to enhance field trip experiences. This promotes a progressive learning approach, which is a major component of the overall plan: when we make multiple contacts, seeing students year after year, we are building a comprehensive knowledge base that will make water conservation and awareness second nature for our future citizens, ultimately helping us achieve our goal of promoting effective, community-wide water conservation and awareness in Stockton. Evaluations from both teachers and students are always enthusiastic and positive (see Feedback section), and support for the program remains high because it reinforces grade specific content/common core standards, coordinates seamlessly with curriculum, and provides a hands-on, memorable learning experience for students.

Teacher feedback and student comments and illustrations are provided in the Feedback section of this report.

Teacher Feedback is key to enhancing and improving our programs!

Here's what teachers are saying:

- **The students loved the hands-on activities and the workbooks. It's a great program and I was impressed with the emphasis on the drought and how important it is to conserve water.** *Grade 3 Teacher, Wilson Elementary*
- **The program is aligned with my science standards and the activities are common core. Perfect!** *Grade 5 Teacher, Great Valley Elementary*
- **Content was clear and easy to understand. There were lots of "ah-hah!" moments! Thank you for this wonderful program!** *Grade* 2 Teacher, Wagner-Holt Elementary
- **Students always love the game that demonstrates where most of our water is. The presentation is one of the best for meeting science standards! The drought discussion was particularly effective this year.** *Grade 5 Teacher, Elkhorn Elementary*
- **I have taught several grade levels over the years and I always schedule a SAWS presentation because I know it will contain appropriate grade level standards involving water science and conservation. A wonderful community service!** *Grade 2 Teacher, Pittman Elementary*
- **How and where we get our water, how California distributes water throughout the state – such valuable information that fits right into our curriculum.** *Grade 4 Teacher, Claudia Landeen Elementary*
- **I love how this program helps students learn about water with hands-on, interactive activities and discussions.** *Grade 3 Teacher, Madison Elementary*
- **Timing was perfect with our weather and water cycle unit!** *Grade 1 Teacher, Pittman Elementary*
- **Scheduling is only difficult due to the popularity of the program…because it is THE BEST!** *Grade 5 Teacher, John Muir Elementary*
- **Planning ahead made scheduling very easy, and we look forward to seeing the water lady every year. We LOVE this program!** *Kinder Teacher, Lincoln Elementary*
- **Awesome hands-on activities that keep children focused. The hands-on science curriculum in this program is right on for second grade.** *Grade 2 Teacher, Podesta Ranch Elementary*
- **Good pacing and very interactive. The presentation prompted a lot of conversations about the importance of water in our lives.** *Grade 1 Teacher, Wagner Holt Elementary*
- **We learned about our sources for water, the ratio of salt to fresh water on earth, the water cycle, water's scientific properties, water conservation and the drought. The hands-on "experiment" was very exciting for my students and the follow-up materials let us continue to learn.** *Grade 3 Teacher, Fillmore Elementary*
- **I was amazed at how much information was imparted in such a short time. The students learned so much!** *After School Facilitator, Peyton Elementary*

- **The program and the Columbia video tied right into our social studies standards - my students learned how to read a map! Excellent info about the Central Valley and water distribution in California - I learned a lot too!** *Grade 4 Teacher, Claudia Landeen Elementary*
- **So useful – clear objectives, met grade level standards, tied into social studies, hands-on activities.** *Grade 4 Teacher, Podesta Ranch Elementary*
- **Kids LOVE the whole program – songs and matching game are great. Water cycle, recycling, continents, three forms of water – all grade level standards. The content is perfect for first grade and the materials we get for follow-up lessons are great!** *Grade 1 Teacher, Ansel Adams Elementary*
- **We love everything! Best program ever and the students love it too!** *Kinder Teacher, Tully Knoles Elementary*
- **The program is always outstanding! Lots of info, variety of participation and response options.** *Grades 1-3 SDC Teacher, Victory Elementary*
- **The standards and objectives are stated clearly. Great activities – I LOVE the map game! My students said, "She was fun, exciting and funny!"** *Grade 6 Teacher, August Elementary*
- **The program is wonderful - kids have fun while learning about the processes of the water cycle and how water relates to their lives.** *Grade 1 Teacher, Victory Elementary*
- **Love this program! Well prepared presenter, interesting activities and content, high quality hand-out materials – it's the best!** *Grade 2 Teacher, Mabel Barron Elementary*
- **The game demonstrated that there is not enough water for everyone's needs, touched on local and statewide issues – very useful information. Covered all topics of water – conservation, pollution and recycling.** *Grade 4 Teacher, Great Valley Elementary*
- **The lesson was great! I believe it will truly help my students when I teach Earth Science this year. The activities really help students gain an understanding of science concepts.** *Grade 5 Teacher, August Knodt Elementary*
- **Covered so much in such a short time – it followed a logical path and hit many of our third grade curriculum and common core standards, kept my kids listening and interacting.** *Grade 3 Teacher, Wilson Elementary*

Student Feedback tells us how to keep them focused and fascinated!

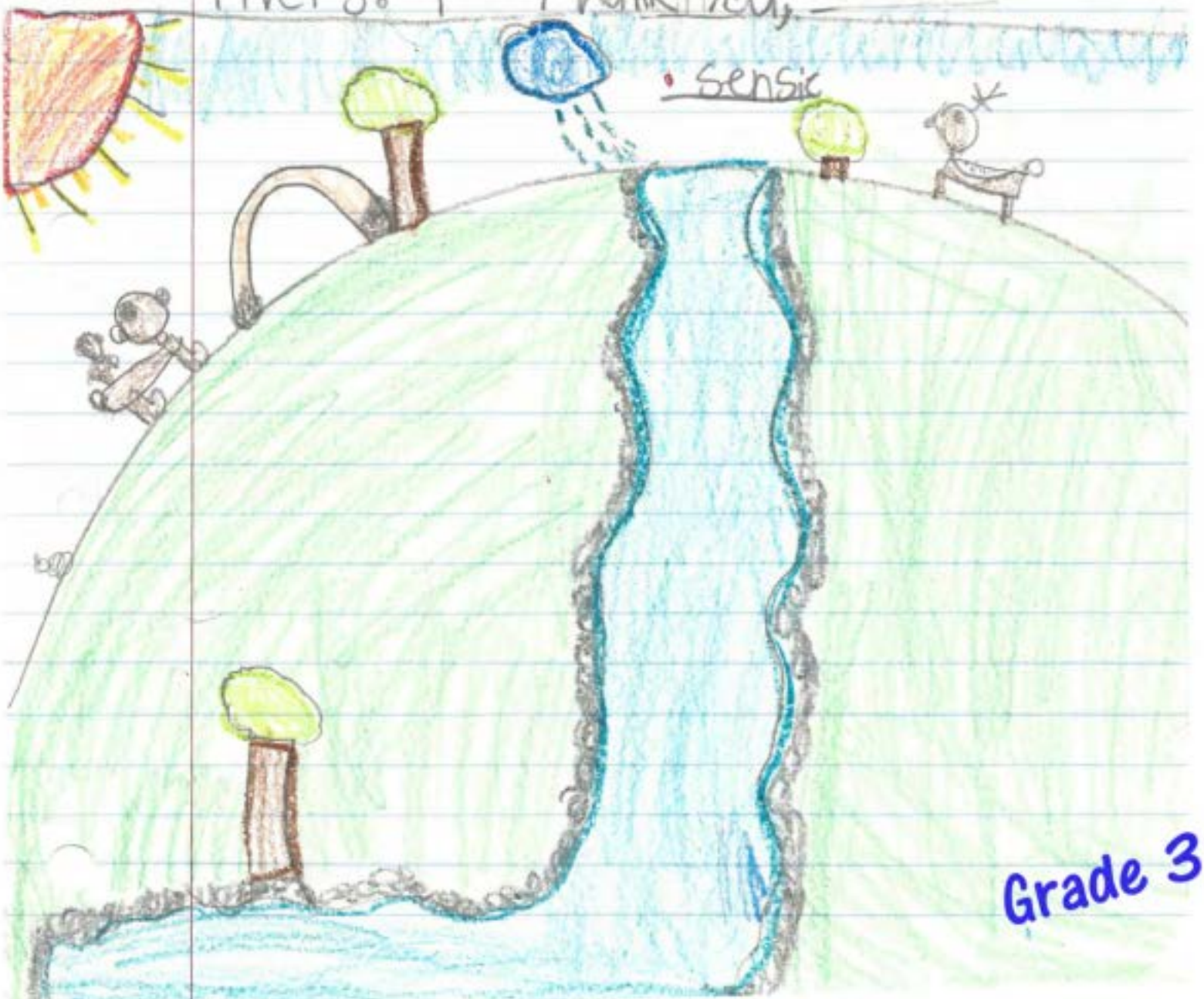
Here's what students are saying:

- **I liked learning about the water cycle and how surface tension lets the water strider run on top of the water.** *Grade 3 student*
- **I liked learning about states of matter. I also liked learning that we are in a drought and need to save water. I told my family about it and we are being careful with water.** *Grade 4 student*
- **I learned there is no new water on earth because it evaporates and clouds catch it and drop it back down here again.** *Grade 5 student*
- **Thank you for your presentation. I now know the journey of the water cycle. When I got home I told my mom all about your presentation and she said "Is that so?"** *Grade 6 student*
- **Thank you for coming to our class yesterday. You taught me so much about water! First, I learned that salt water is not drinkable. Then, I found out that some of our water comes from melting snow in the mountains. Finally, you told me that water is very old. Thank you for the pencil and the activity book. You are very nice.** *Grade 2 student*
- **My favorite part was when you put dirty water in the filter that has rocks and sand in it. Then clean water came out. It was like magic!** *Grade 3 student*
- **I appreciate you coming to my class and showing me how water is recycled. When I grow up I can show my kids too, so thank you a lot!** *Grade 5 student*
- **I loved learning about mountains, valleys and waterways. We found out how water comes from north to south in California and how important water is even when there's not a drought.** *Grade 4 student*
- **Thank you for coming – because of you I got interested in water! I hope you come again!** *Grade 3 student*
- **I learned that saving water is important because the next thing you know, there won't be enough.** *Grade 5 student*
- **I learned about the water cycle and that there is a process for filtering water.** *Grade 3 student*
- **Thank you for coming to our classroom. I have never had as much fun at school as today. Water is awesome, your slideshow was interesting and I learned a lot!** *Grade 6 student*
- **I had fun when you came to my classroom and we played "Pass the Jug." I realized that if everyone didn't have enough water we couldn't have places like Disneyland and Jack-in-the-Box.** Grade 4 student
- **Thank you for the presentation you gave in my class today. I had fun with the activities. I learned what agriculture is, that wildlife uses water and where our water comes from. If you come back, can you tell me what a hydroelectric is?** Grade 5 student
- **The experiment we did was so cool! When I got home, I threw my backpack in my room and took one of my mom's wax paper squares and did the experiment again. I blew on the water and it was like it was racing!** *Grade 3 student*

10-9-2014

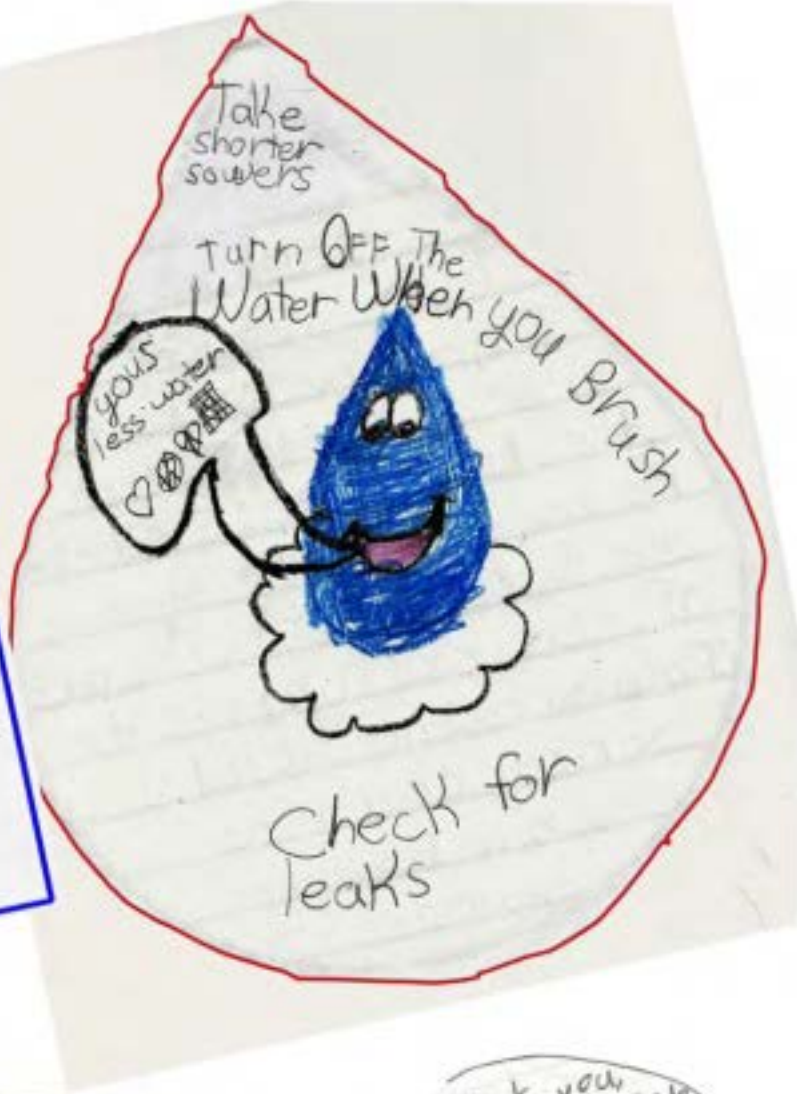
Dear miSS Maria,
we enjoyed your presentation on water. The experiments we did were very important ways to learn about the different forms of water. It was also great learning about how water flows thru Stockton from the san Joaquin and Calaveras rivers. | Thank You,

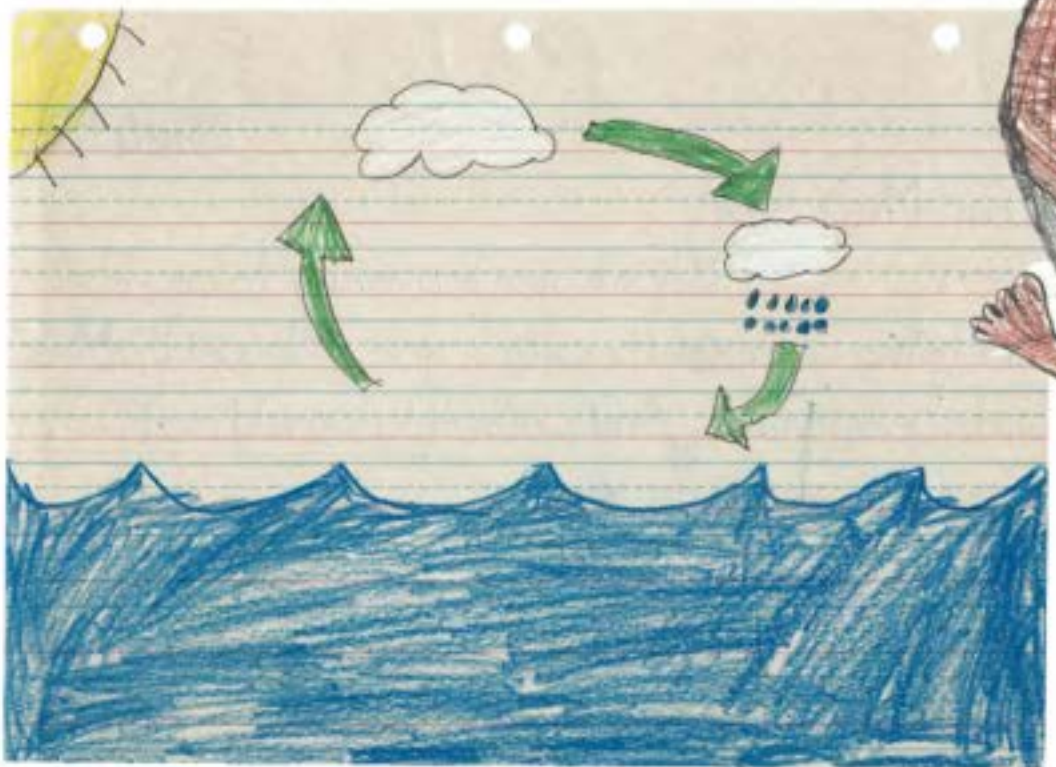
Sensic



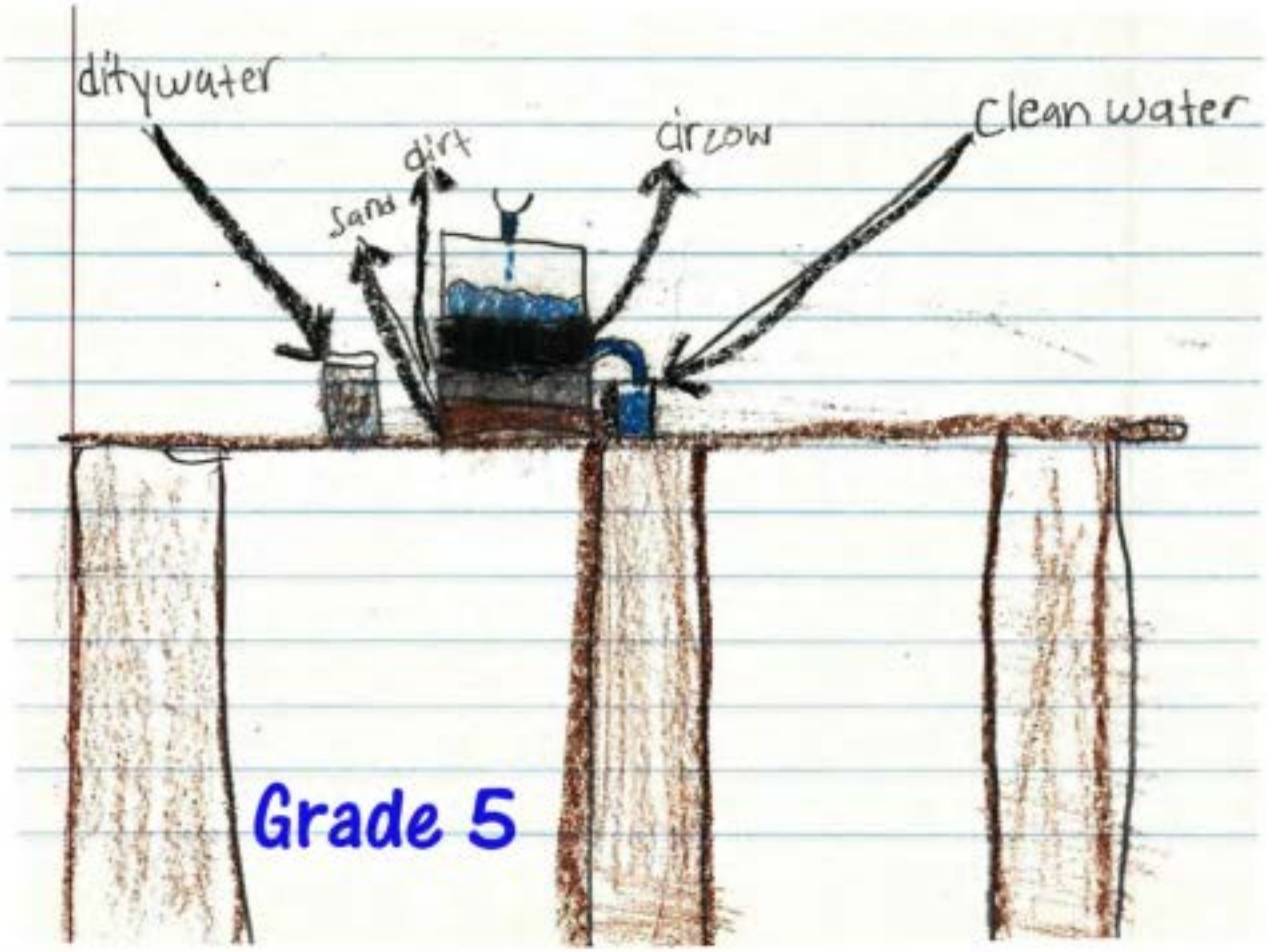
Grade 3

HELP
You drowned me in Awesomness!


Take shorter sowers
Turn Off The Water When you Brush
yous less water
Check for Leaks



Thank you we appreciate we need to save water for our city, and state. Save our water!
Save water



Grade 5

Grade 4

SAWS Water Education Program
Students Participating: All Outreach Programs, All Providers
Comparison by School Year (SY)

In-Class/Assembly	School Year / # of Students									
	SY 05/06	SY 06/07	SY 07/08*	SY 08/09*	SY 09/10*	SY 10/11*	SY 11/12*	SY 12/13*	SY 13/14*	SY 14/15*
In-Class Program	8044	12357	15344	18293	18838	18915	21345	19748	26320	23538
Assembly Program	3002	11452	9925	13989	4459	4660	6085	4731	5934	4730
Totals:	11046	23809	25269	32282	23297	23575	27430	24479	32254	28268

*** See notes on Assembly Program below**

SY 07/08: 46 GWM assemblies performed in the 2007/2008 school year covered under the 2007/2008 agreement with SYRCL. One presenter (KC)
SY 08/09: 54 GWM assemblies performed in the 2008/2009 school year covered under the 2007/2008 agreement with SYRCL. Two Presenters (KC & SW)
SY 09/10 & 10/11: 15 Zun Zun assemblies performed in 09/10 and 10/11 school years covered under agreement with Zun Zun. Three presenters (KC, SW & CT)
SY 11/12: 18 Zun Zun assemblies performed in 11/12 covered under agreement with Zun Zun. Three presenters (KC, SW & MQ)
SY 12/13: 14 Zun Zun assemblies performed in 12/13 covered under agreement with Zun Zun. Two presenters (KC & MQ)
SY 13/14: 15 Zun Zun assemblies performed in 13/14 covered under agreement with Zun Zun. Three presenters (KC, MQ & SK)
SY 14/15: 14 Zun Zun assemblies performed in 14/15 covered under agreement with Zun Zun. Three presenters (KC, MQ & SK)

SAWS Water Education Program Presentation/Event Breakdown
School Year: 2014/2015

By Presentation Type

Presentation Type	# of Presentations	# of Students or Attendees	%
Classroom Presentations	370	12798	54%
After School Presentations	12	1285	5%
Water Treatment Plant Tours	2	85	0%
Career Workshops	1	30	0%
Children's Festivals	13	6275	27%
Festival Booths	1	2500	11%
Other	5	565	2%
Totals	**404**	**23538**	**100%**

By Grade

Grade	Clsrms	Students	%
K	48	1505	6%
Gr 1	78	2715	12%
Gr 2	63	2210	9%
Gr 3	82	2838	12%
Gr 4	45	1580	7%
Gr 5	48	1675	7%
Middle School	11	385	2%
Aftersch	12	1285	5%
Event/Other**	17	9345	40%
	404	**23538**	**100%**

By Presenter

Presenter	Venues	Students	%
Kristin Coon	62	9425	40%
Maria Quilon	201	8245	35%
Suzi Kelly	141	5868	25%
	404	**23538**	**100%**

By School District

District	Students	%
Stockton USD	4765	20%
Lodi USD	3285	14%
Lincoln USD	3160	13%
Manteca USD	1538	7%
Aspire/Charter	1690	7%
Private	480	2%
All/Other**	8620	37%
	23538	**100%**

By Water Provider

Provider	Students	T1 Students*	T1%
Cal Water	6180	5800	94%
City of Stockton	7413	7043	95%
Unincorporated/SJ County	1285	1255	98%
All **	8660	0	0%
	23538	**14098**	**60%**

Total Schools/Venues 14/15
74

*** T1 = Title 1 Students: Schools/students eligible for Title 1 Low-Income/Disadvantaged Community Program**

Schools with large concentrations of low-income students receive supplemental funds to assist in meeting students' educational goals.

Low-income students are determined by the number of students enrolled in the free and reduced lunch program.

For an entire school to qualify for Title 1 funds, at least 40% of students must enroll in the free and reduced lunch program.

**** Students or children reached through city or county wide events: unable to determine district, provider, grade or Title 1 status**

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website: www.zunzuntunes.com

FINAL REPORT 2014-2015 School Year
July 3, 2015

ZunZun performed assemblies for ten schools in the Stockton Area Water Suppliers (SAWS) service area in the 2014-2015 school year. ZunZun performed for approximately 4,730 students and 236 teachers this year. The musical assemblies were a celebration of water and introduced students to the topics of water conservation, clean water, watershed pollution prevention and watershed awareness. The assemblies were in Spanish and English, depending on the language spoken by audience members. All assemblies included California State Education standards in Science, Math, History- Social Science, Language Arts and English Language Development, and Fine Arts so that they easily tied into classroom curriculum.

Included in this final report are the following:

- Outreach
- State Standards
- Performances
- Evaluations
- Final Performance Schedule

Enclosed with this report, please find:

- Sample "Save 20 Gallons Every Day" dvd/cd watershed and water conservation packet given to each teacher
- 2014-15 Outreach Flyer sent to schools
- Sample of the newsletter for school newspaper or parent letter
- Water worksheet optional for teachers to take at the assembly

OUTREACH

Kristin Coon, who also made preliminary contact with schools to determine their interest in the assembly program, provided a list of target schools.

Once the assembly coordinator was determined (by Ms. Coon or ZunZun), we phoned or emailed the contact person at each school site to provide them with additional details about the assembly program. ZunZun followed up by phone and email until each school booked or declined the assemblies. All schools booked directly with ZunZun, who provided an updated performance schedule to Kristin Coon monthly.

Prior to each scheduled assembly, we emailed a confirmation letter with assembly details to the contact person at each school. We also emailed pre and post assembly activities to be distributed to the teachers for use before and after the performance. A sample of these activities is included with this report. In addition we sent a newsletter article that goes in the parent newsletter at every school. The newsletter helps remind kids and parents of ways to save water and prevent watershed pollution and lets parents know about the SAWS sponsored assemblies.

At least one week before the scheduled performance, we called schools to again confirm show times and school location.

STATE CONTENT STANDARDS

This year schools in California are continuing their implementation of Common Core, so we are continuing to update our content to meet common core curriculum goals. Common Core standards are designed to encourage critical thinking and holistic learning, and our water awareness assemblies are a perfect intersection of hands on learning and information, and meet many Common Core standards..

In addition to being an extremely fun water education experience, ZunZun assemblies cover a large number of California State Content Standards for grades K-8. Because we use music and musical instruments, they meet many **Visual and Performing Arts Standards.** As the assemblies are about water issues, they cover **Science Content Standards.** Students are learning new vocabulary and words, so they are meeting many **Language Arts and English Language Development Standards.** We introduce instruments from around the world, which meets many standards in **History- Social Science Standards.** Finally, we use both Spanish and English which meets **English Language Development Standards** and **World Language Content Standards.** Most importantly, the assemblies are designed to help students feel empowered to make changes in their daily lives and the lives of their families that help prevent wasting water and prevent pollution. ***The assemblies encourage proactivity.***

A few specific examples of State Content Standards in **Science, Language Arts, and Visual and Performing Arts** met in our shows are as follows**:**

Science: Water education for all grade levels is included in every assembly. (i.e.: Grade 3 physical science 1.e, 1.f.; Grade 5, earth sciences 3a, 3b, 3c) Education standards regarding water on earth, evaporation, properties of a solid, liquid and a gas, water present in the form of salt and fresh water, etc. are addressed.

Language Arts: Use of rhythm and rhyme to remember a concept. Learning new words such as “runoff” and “drought” and seeing/ hearing a description while repeating a rhyme that reiterates the definition. (See CA Content Standards, Reading Standards- Craft and Structure, Key Ideas and Details Integration and Knowledge of Ideas. Also Speaking and Listening Standards for grades K-6).

Visual and Performing Arts: As students sing and perform with us in the assembly, they are not only hearing music (All grades, Music Standards 1.1-1.5), but performing it (Grade 2, Music Standards, 2.1, 2.2 for example).

Because all students learn differently, ZunZun strives to use as many different types of learning tools as possible in the assemblies, so students are learning *visually, musically, physically, scientifically, mathematically,* and *verbally*. Students are thinking things through, using movements and singing throughout. So many standards are contained in the assemblies it would be a very long list to include them all here.

PERFORMANCES

Assemblies are 45 minutes in length, except when schools had time constraints due to recess or lunch, which was rare. Topics covered this year were: **sustainability, indoor and outdoor water use, drought tolerant plants, native plants, drought, California rain fall patterns, aspects of California state content standards for water science, water conservation, watershed pollution prevention and clearly explained steps students can take to save water and prevent watershed pollution.** At most schools the assemblies were in English and Spanish, sometimes more Spanish than English. This year's assembly included the following segments:

Introduction of Watershed Art- We showcase two art banners made by local artists of water in action. One is a mural of a watershed complete with town, people, trees, storm-drains, wildlife, lakes, streams and ocean. The other is a panel of photographs of water in many forms (lake, ocean, waves, waterfall, ice etc.) We mention that there are many ways to celebrate our connection to water, one being art. "Do you like to make art?" we ask them.

Boom Boom Flow- Using recorded music of moving water (rain, creek and waves), we introduce the idea that with each heartbeat, water is moving through the body (blood is mostly water). We then introduce instruments to accompany the sounds of water moving to showcase a movement sequence we call the water beat. It is 5-minutes of continual movement showing water cycle, water conservation, properties of water, watershed flow and ending with how we enjoy playing and enjoy water. It is a very active piece which everyone performs standing up and doing the movements with our guidance.

Water Instruments- We show the instruments used in the previous recording which all use water to create interesting sounds. We use waterphones, water glasses, Brazilian cuicas and other interesting water instruments.

Musical Aquifers- We explain what an aquifer is and describe how groundwater is used for water consumption. We then use recycled plastic bottles to create sounds that represent the movements of water through layers of rock, gravel, dirt and finally hitting bedrock. Kids come up and create these sounds with us. You can hear creek and waves but you can't hear the movements of an underground aquifer, so this is a way for students to imagine water moving underground in an important source for water.

Querermos Agua- We Want Water ! Using cut-out models of gallon containers, we show how many gallons of water can be used for washing ourselves and our things (clothes and dishes), cooking, drinking and toilet use. We sing a *flamenco* inspired song with guitar as one student has to retrieve these gallons for the rest of the audience. This person represents the

water district, and the hard work that goes into providing water. After gathering so many gallons for so many uses the participant and the audience begin to realize the large quantity of water that can be used daily.

"Save some water"- Using specific movements that are repeated with a group of volunteers, we show simple ways of conserving water at home. The whole audience repeats the specific water saving ideas in a song (5 minute shower, turn off the drip, water off when brushing teeth, etc.) as we play stringed instruments.

Introduction to Flow Bag
We introduce a way to measure flow water in the sink with flow bags which are provided by ZunZun in the assembly. Directions are given to teachers of how to measure flow in the sink of a classroom to see if the sink uses aerators to save water and reduce the flow of water. This activity is a hands-on math tool for teachers to use. After this we introduce proper disposal of plastic bags to reduce the problems of plastic pollution. We also introduce recycling, reusing, and alternatives to plastics and bottles.

Birds of Watershed- We introduce the idea that by conserving and protecting water in our watershed (stopping plastic pollution, storm drain pollution prevention and reduction of garbage) we also protect wildlife which depend on clean sources. We showcase some of the common birds that can be seen locally, with movements that show their specific adaptation which help them survive by or in water. We get volunteers to represent each bird and its corresponding movement. We then get the whole audience to try the bird adaptation movements accompanied by our music. The birds showcased are, pelican, sanderling, duck, coot, kingfisher and gull.

H2O Go with the Flow-We finish assembly program with song students have participated on before, and which has proven to be a favorite among. Song introduces the chemistry of water, properties of water, watershed, the different ways water moves and water conservation.

Save 20 Gallons Every Day DVD/CD Compilation: Every teacher received a cd/ dvd of water conservation and watershed pollution prevention activities at the end of each assembly. Students and teachers alike we thrilled with the follow up activities and said so on their evaluations. They each received the dvd/cd packet and a reference for the online guide to using the activities.

EVALUATIONS

This year we used only electronic evaluations, and received responses but not as many as we would have liked. The evaluation feedback was overwhelmingly positive, giving performers and program very high ratings. Ninety six percent of respondents said they would like SAWS to continue with this or a similar program in the future. Additionally, performers hear great responses at the school sites.

For the 2014-15 school year we had 27 respondents to the survey. Questions were rated on a scale of 1-7, with 1 being the lowest value and 7 being the highest.

When rating the educational value of the program, 89% of respondents gave either a 6 or 7. For the program's ability to stimulate student discussion, 85% of respondents again rated it with either a 6 or 7. Eighty one percent of respondents gave one of the highest ratings for the likelihood that students will retain the material covered. Seventy four percent of respondents gave the program one of the highest ratings when asked how well it promoted storm water pollution prevention and water conservation. Nearly 89% of respondents gave either a 6 or 7 when asked to rate the effectiveness of the musical elements of the program in communicating the educational message. Almost 93% of respondents gave either a 6 or 7 when asked to rate the effectiveness of the audience participation activities in keeping the students' attention and reinforcing the educational message. When asked to rate the ability of live presentations, such as this one, to increase the students' capacity for retaining the educational message, 85% of respondents gave one of the highest ratings. And 92% of respondents gave one of the highest ratings when asked about the actors' professional and courteous manner.

Below are some of the comments we received from the evaluations:

They were excellent!!
5/14/2015 7:09 PM
Enjoyed it....I think my students did too. Thank you.
5/6/2015 7:41 PM
The student are still singing the songs!!!
5/6/2015 4:38 PM
The students were engaged and enjoyed the interactive songs. The CD has been wonderful to continue singing the songs students learned at the assembly. I would love to have this assembly return to our school in the future.
5/6/2015 3:16 PM
This presentation was GREAT!!! My students are still singing those songs!
5/6/2015 2:27 PM
My students loved this presentation. They still sing "H2O go with the flow"
5/6/2015 1:30 PM
They were wonderful and the students loved their singing.
5/6/2015 12:40 PM
Excellent presentation. The students loved it. Thanks for the CD
3/5/2015 6:03 PM
This was the most educational and one of the most engaging programs we've had at our school. Keep up the good work! I loved how you brought in physics (sound) and biology (adaptations) to water conservation and environmental science (watersheds, water cycle etc)
3/5/2015 11:06 AM

POSSIBILITIES FOR NEXT YEAR

Some ideas for next year are…

Toilet Leak Detector Kit: We have already spoken with SAWS about incorporating a toilet leak detector kit into next year's assembly content.

Common Core Curriculum: As California begins to adopt the Common Core Standards for classroom curriculum, we will make the use of the standards apparent to teachers and educators while performing the assemblies. We will compare the assembly content to the Common Core guidelines and make the standards we use available to educators. California plans to implement Common Core by the 2015-16 school year.

Paper Evaluations or Electronic? This year we used only electronic evaluations. Although we received fewer back than we had hoped, we would like to do only electronic again next year. We have discussed a plan to do more immediate follow up with schools which we think will garner a greater percentage of feedback.

School Staff Outreach: If SAWS is interested, we would be happy to hand out information about storm drain pollution prevention to the janitorial staff at each school or program we visit.

We look forward to working with SAWS staff on these ideas and others we create for the upcoming 2014-15 school yea

ZunZun FINAL PERFORMANCE SCHEDULE for Stockton Area 2014-2015 School Year:

Date	School	Contact	# of	Times	# of	City
3/5/2015	Kennedy	Carla Gonazalez	1	9:30	500	Stockton
3/5/2015	Sutherland	Harold Brown	2	12:30 & 1:30pm	385	Stockton
3/6/2015	George Lincoln	Patti Cuenin	1	1:30	500	Stockton
3/23/2015	French Camp School	Julie Albers	2	9:45 & 10:40	530	Stockton
5/6/2015	Primary Years	Jean Segura	1	9:30am	300	Stockton
5/14/2015	Pitman Charter	Adrian Machado	2	9:00 & 10:00	650	Stockton
5/14/2015	Ansel Adams	Jann Lyall	1	1:30	800	Stockton
5/28/2015	August School	Linda Spencer	2	8:30 & 9:15	600	Stockton
5/28/2015	Taylor	Jennifer Matuska	1	1:30	325	Stockton
5/29	Spanos	Danielle Valtierra	1	9:00	140	Stockton

Fourth graders work with their teacher to find waterbodies on a topographical map of California during a "Califoria Water" presentation

Fifth graders learn about the water cycle as they play the"Incredible Journey" game,visiting nine water cycle stations...

...collecting a bead at each station to make a water cycle bracelet

UOP student volunteers help host the SAWS booth at the Stockton Earth Day Festival

During a "Water Matters" presentation, third graders show off the SAWS "I'm a Water Saver" buttons they made at yesterday's AgVenture event.

Brown AND Caldwell

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