



Urban Water Management Plan 2010 Update

FINAL

JULY 2015

Prepared by:
MCR Engineering

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<http://www.strgba.org/docs/integrated%20regional%20groundwater%20management%20plan%20for%20the%20mode.pdf>

Abbreviations and Acronyms

AF or af	Acre Feet
AFY or afy	Acre Feet per Year
BOR	US Bureau of Reclamation
CA	California Aqueduct
CEQA	California Environmental Quality Act
City	City of Oakdale
CUWCC	California Urban Water Conservation Council
CVP	Central Valley Project
DHS	State of California, Department of Health Services
DMC	Delta Mendota Canal
DMM	Demand Measurement Measures
DWR	State of California, Department of Water Resources
ETo	Evapotranspiration
GMP	Groundwater Management Plan
gpcd	gallons per capita per day
GPM or gpm	Gallons per Minute
gpm/ft	gallons per minute per foot (units of transmissivity)
IRWP	Intergraded Regional Water Plan
MG	Million Gallons
MGD	Million Gallons per Day
M&I	Municipal and Industrial
mg/l	Milligrams per liter
NWS	National Weather Service
NPWP	Non-Potable Water Program
ppb	Parts per billion (identical to ug/l)
ppm	Parts per million (identical to mg/l)
RWQCB	Regional Water Quality Control Board
SWP	State Water Project
SWRCB	State Water Resources Control Board
TDS	Total Dissolved Solids
ug/l	Micrograms per liter
USBR	United States Bureau of Reclamation
USEPA	United States Environmental Protection Agency
UWMP	Urban Water Management Plan
WTP	Water Treatment Plant
WTSF	Water Treatment and Storage Facility

Agency Information

Utility Name

City of Oakdale

Address

455 South Fifth Avenue

City

Oakdale

State

CA

Zip Code

95361

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Section 1 Introduction

This 2010 Urban Water Management Plan Update (“UWMP”) was prepared by the City of Oakdale (City) in accordance with state of California requirements, as defined in the California Water Code. The UWMP is an update of the previous plan developed in 2009, titled *“City of Oakdale – (2005) Urban Water Management Plan”*.

Background

The UWMP was completed in accordance with the State of California, Department of Water Resources (DWR) requirements, as described in the *“Guidebook to Assist Urban Water Suppliers to Prepare a 2010 Urban Water Management Plan”*. DWR’s requested that UWMP’s be submitted by August 1, 2011. Due to delays in the preparation of the 2005 UWMP, which was submitted to DWR in early 2009, preparation of this UWMP was also delayed. Nevertheless, this UWMP will use updated planning data and 20-year water supply and demands from 2015. Historic water use will also include data up to and including 2014.

Notable changes since the completion of the 2005 UWMP include an update to the City’s General Plan in August, 2013, and construction of a 1.0MG water reservoir in 2014. In 2014, the City achieved significant reductions in water use due to its conservation efforts. Part of this success is attributed to the WaterSmart Software program, which began in April 2014. The program, which includes a customer-facing “WaterInsight” portal, allows City residents to view their current and historical water use, compare their use with other City water users, get conservation tips and updates about the drought, etc.

The City’s sole water supply source remains local groundwater, and is expected to continue using local groundwater for the near-term. City population is predicted to increase from 21,000 in 2015, to 32,400 in 2035 (approximately 50%). Local

groundwater capacity is expected to provide for all growth through the UWMP planning horizon (20 years, or 2035). Records of local groundwater levels are relatively stable, though the water table does show minor declines during periods of drought. However, most of the supply for the population increase is expected to be met through conservation efforts, resulting in little to no net water production increases. DWR estimates that the San Joaquin River Region has average demand values of 237 gallons per capita/day (gpcd), with a demand goal for the region of 174 gpcd, through a variety of conservation activities.¹ The City's water use (prior to 2014) was near the current average, approximately 251 gpcd. The City is expected to reduce its water use at least 20% by 2020, in accordance with current mandatory water codes and laws. New construction will be required to meet new "Green Building" codes, so future demands will be significantly less than existing. All together the City plans to achieve a reduction in average water use of approximately 30% by 2035, with an average demand value of about 170 gpcd.

Purpose of the Urban Water Management Plan

The purpose of preparing an Urban Water Management Plan (UWMP) is to satisfy the requirements of Division 6 of the California Water Code. Established in 1983,² the Urban Water Management Plan Act was adopted to formalize the state's policy that management of urban water demands and efficient use of water shall be a guiding criterion in public decisions, and urban water users shall develop plans to actively pursue the efficient use of water supplies.

The UWMP Act requires all water suppliers with at least 3,000 customers prepare and adopt a plan every five (5) years. According to the act, the content of the plan

¹ 20x2020 Water Conservation Plan, Table ES-1, Regional Urban Water Use Patterns in 2005, Feb., 2010.

² AB 797, Klehs

shall include a description of water management tools and options used by that entity that will maximize resources and minimize the need to import water from other regions. Specifically, the plan must:

- Provide current and projected population, climate, and other demographic factors affecting the supplier's water management planning;
- Identify and quantify, to the extent practicable, the existing and planned sources of water available to the supplier;
- Describe the reliability of the water supply and vulnerability to seasonal or climatic shortage;
- Describe plans to supplement or replace that source with alternative sources or water demand management measures;
- Describe the opportunities for exchanges or transfers of water on a short-term or long-term basis (associated with systems that use surface water);
- Quantify past and current water use;
- Provide a description of the supplier's water demand management measures, including schedule of implementation, program to measure effectiveness of measures, and anticipated water demand reductions associated with the measures;
- Assessment of the water supply reliability.

UWMP's are required to provide projections of water program data and information for a 20 year horizon, or "*as far as data is available.*" Plans shall be adopted by the water supplier, and copies submitted to the DWR.

The act has been amended several times since its creation, including SB 610 in 2001.³ Numerous changes to relevant State law have occurred since the 2005

³ Requires that water assessments be furnished to local governments for inclusion in any environmental documentation (CEQA) for certain projects when absent from UWMP's.

UWMP's were required. Changes occurred to the UWMP Act (CWC §10610 et seq., included as Part II, Section K) with enactment of the Water Conservation Bill of 2009 (CWC §10608) and other legislation. The Water Conservation Bill of 2009 requires that certain information be included in an urban retail water supplier's UWMP. The City's Conservation Program and calculation of methods to set conservation targets are provided in Appendix A.

The overall intent of the UWMP Act and its requirements are similar to previous years—to describe an urban water supplier's water supplies and conservation efforts. Primary changes to UWMP requirements since 2005 address water conservation (through the Water Conservation Act of 2009) and Demand Measurement Measures (DMMs through AB 1420), but there are several other changes, with the most notable including:

- 10621(b): Provide at least 60 days notification to any city or county within which the supplier provides water for the public hearing required by Section 10642.
 - 10631(j): Members of the CUWCC will be considered in compliance with the DMM evaluation (10631 (f) and (g)) if they comply with all the provisions of the "Memorandum of Understanding Regarding Urban Water Conservation in California," dated December 10, 2008 and by submitting their CUWCC annual reports.
 - 10631.1: Water use projections required by Section 10631 shall include projected water use for single-family and multifamily residential housing needed for lower income households (Health and Safety Code Section 50079.5) will be provided. These water use projections are to assist a
-

supplier in complying with Government Code Section 65589.7 to grant priority of the provision of service to housing units affordable to lower income households.

- 10631.5(a): After January 1, 2009, eligibility for state-funded grants or loans will be conditioned on the implementation of Section 10631 DMMs. If a DMM is not currently being implemented, then the urban water supplier submits to the department for approval a schedule, financing plan, and budget, to be included in the grant or loan agreement. If a DMM is not locally cost-effective (the present value of the local benefits is less than the present value of local costs to implement the DMM), then the water supplier will submit supporting documentation and the DWR will provide a determination within 120 days of UWMP submittal.
- 10631.5(e): The water supplier may submit copies of its annual reports and other relevant documents to assist DWR in determining implementation or scheduling of the water suppliers DMMs. Water suppliers that are signatories of the CUWCC MOU may submit its annual reports to support its DMM activities.
- 10608.20(e): Include the baseline daily per capita water use, urban water use target, interim water use target, and compliance daily per capita water use. Provide basis for determination and supporting data references.
- 10608.20(g): The 2015 UWMP can update the 2020 urban water use target.
- 10608.20(h) (2): An urban retail water supplier shall use the methods developed by the department in compliance [with methodologies and criteria developed by DWR.

- 10608.20(j): Deadline for adoption of a UWMP is extended to July 1, 2011 to allow use of the technical methodologies developed to establish baseline, target, interim target, and compliance daily per capita water use.
- 10608.36: Wholesale suppliers will provide an assessment of their present and proposed future measures, programs, and policies to achieve water use reduction required in SBX7 7.
- 10608.40: Urban water suppliers will report progress toward meeting urban water use targets in their UWMPs using a standardized form to be developed by DWR. *Note: This applies only to 2015 and 2020 UWMPs because they will report “progress” toward meeting targets established in this, the 2010 UWMP.*
- 10608.42: DWR will review the 2015 UWMPs and report to the Legislature the progress toward achieving a 20-percent reduction in urban water use by December 31, 2020.

Note: DWR provides a list of standard data tables to be completed by water purveyors as part of the UWMP. To maintain the DWR format, these tables are located in Appendix C, however they are each referenced in the plan. Throughout this document reference to the DWR tables are shown with “(D)” after the table number to indicate the table may be found in the appendices.

Agency Coordination

In accordance with requirements the UWMP Act, and in conjunction with development of the WSP, the City has maintained contact with local water purveyors and agencies, discussing its water and civic planning efforts, and possible options for regional water programs.

Meetings and discussions with local water purveyors have included 1) opportunities for regional water planning, including groundwater management plans and programs, 2) options for sharing and/or transfers of water supplies to: a) minimize the need to import water to the area, and b) enhance the overall reliability of supplies in the area for periods when imported water is limited or unavailable. Topics such as groundwater banking, protection of water quality, use of recycled water, and long-term impacts of groundwater pumping were discussed.

Coordination with Appropriate Agencies (§ 10620 (d))

Coordination with most or all of these water purveyors are expected to continue while the City develops and implements its water supply program. Agencies that the City has directly coordinated with are shown in Table 1-1(D).⁴ Additional information regarding these districts and current coordination efforts are included in Section 3. Each participating agency, as shown in Table 1-1(D), had access to a draft of the UWMP.

City and County Notification and Participation (§ 10621 (b))

More than 60 days in advance of adoption of the UWMP, the City provided notification to Stanislaus County, inviting comments and participating in the process. A copy of the Notification Letter is shown in Appendix B.

Changes or Amendments to UWMP (§ 10621 (c))

In the event there are significant changes, impacts or new information that would require the UWMP to be updated or amended prior to the next required plan update, the City will follow the procedures set forth in Water Code Sections 10640 through 10645.

⁴ Tables including “(D)” indicate they are DWR format tables found in Appendix D of the plan.

Adoption and Implementation

After two (2) consecutive advertisements on July 29 and August 5, 2015, a Final study was presented to the City Council as part of its regularly scheduled meeting on August 17, 2015. Adoption of the 2010 UWMP by the City occurred on _____, 2015, per Resolution No. _____. A copy of the public notice and resolution are included in Appendix C. After adoption of the UWMP, the City provided copies to DWR; agencies listed in Table 1-1(D), California State Library, and have made a copy of the UWMP available to the public and other interested parties at City Hall. The City plans to implement its UWMP in accordance to the schedule set in this document.

Section 2 System Description (§ 10631)

The City of Oakdale is located at the base of the foothills of the Sierra Nevada Mountains in eastern Stanislaus County, California, approximately 15 miles northeast of Modesto, 20 miles north of Turlock, 22 miles east of Manteca, and 30 miles southeast of Stockton. Other smaller cities surrounding Oakdale include Escalon (9 miles northwest), Riverbank (5 miles west), Waterford (10 miles southeast), Hughson (13 miles south), and Ceres (18 miles southwest). The City is located on the northeast side of Stanislaus County, on the Stanislaus River, at the intersections of Highway 120 and 108.

Oakdale is a community with a rich agricultural heritage. It is among many diverse communities in the Central Valley of California that was established through the hard work and dedication of many individuals committed to a common vision of prosperity and opportunity. It is proud of its provincial setting and strong sense of community. Oakdale is the self-proclaimed “Cowboy Capital of the World”.

The City of Oakdale was formally born on October 3, 1871 when Postmaster Robert Sydnor of Langworth moved the U.S. post from the nearby community his general merchandise store located on the northwest corner of West Railroad (now N. Yosemite) Avenue and F Street in Oakdale. The town had been laid out with First and Sixth Avenues as the west and east boundaries. A and J Streets were the north and south boundaries. West and East Railroad avenues were located on each side of the train tracks dividing the middle of town in a north to south direction. The City was officially incorporated in 1906.

City Water Facilities

The City supplies water to its residents and businesses through a system of water infrastructure that has been constructed over several years. Distribution pipelines are of various size, age, and materials. Due to elevation changes, the distribution system is divided into two (2) pressure zones. The City has two (2) booster pump stations that allow water to be conveyed from the lower zone to the upper zone.

Source water is from local groundwater aquifers. The City owns and operates eight (8) water production wells, with a total production capacity of approximately 15 MGD. Characteristics of each well are provided in Table 2-1.

Table 2-1 Summary of City of Oakdale Groundwater Wells

Well	Type	Year Built	Depth	Flow (gpm)
2	Production	1954	565'	600
3	Production	1947	604'	1,150
4	Production	1960	594'	1,050
5	Production	1971	450'	1,800
6	Production	1987	400'	1,300
7	Production	1990	478'	1,600
8	Production	1990	380'	1,800
9	Production	2011	502'	800
10	Pending – Under construction	2016	690'	NA
Total Well Production				10,100 gpm
Total Net Well Production				8,300 gpm

Note: Well production based on efficiency testing conducted in 2010 – 2011. "Net" production assumes largest producing well is out-of-service.

The City also maintains a 1.0 MG prestressed concrete water storage facility. The water tank was constructed and placed into service in 2014.

Service Area (§ 10631 (a))

The topography of Oakdale is generally flat, with rolling hills southeast and northwest of the City limits. Historically the City and surrounding area have been

used for orchards and other agricultural operations. There are pockets of active agricultural lands within the city limits, with a majority of the lands surrounding Oakdale still in agricultural or rural uses. Some lands both within and outside of the City have been designated as Prime Farmland, Farmland of Statewide Importance, and Unique Farmland by the California Department of Conservation Farmland Monitoring and Mapping Program (FMMP). Some of these properties are under Williamson Act contracts (California Land Conservation Act of 1965).

According to the 2013 General Plan, in 2010 the City consisted of 4,595 acres (3,904 developed and 691 undeveloped), with 5.8 million square feet of non-residential building space, and approximately 5,955 employed. Existing land uses within the City are generally characterized by established and newer suburban style residential neighborhoods, a historic downtown area, commercial corridors, a large industrial area, public/semi-public uses, and parkland. Uses surrounding the City, including its future sphere of influence, consist primarily of agriculture with active field crops, orchards, dairy production, pastureland, and/or livestock grazing. Some of these areas also include large lot suburban or rural estate homes. Existing land use and associated acres are shown in Table 2-2.

Table 2-2 Existing Land Use (2013) and Associated Area

EXLU	ACRES
Agricultural	0.90
Basin	3.61
Commercial	221.50
Golf Course	0.48
Industrial	546.15
Mobile Home Park	29.53
Multi Family Residential	152.25
Office	0.53
Open Space	21.67

Park	144.78
Public/Semi-Public	413.52
Residential Agricultural	22.22
ROW	721.67
Rural Estate (3 acre min)	4.13
Single Family Residential	929.54
Vacant General Commercial	42.20
Vacant Industrial	384.62
Vacant Mixed Use	2.90
Vacant Multi Family Residential	55.53
Vacant Park	8.56
Vacant Park/Detention	5.08
Vacant Public/Semi-Public	40.53
Vacant Single Family Residential	151.62
Total Developed Acres in 2013 General Plan	3903.55

The City provides public services within its boundaries, which includes water supply. The water system includes groundwater wells, distribution piping and appurtenance, 1.0MG of storage (completed in 2014), and booster pumping stations. The water service area is divided into two pressure zones due to changes in topography. Ground elevations range from approximately 150' (west) to approximately 215' (north east).

Service Area Climate (§ 10631 (a))

The National Weather Service has maintained a cooperative weather station at Woodward Dam for many years. In January, average temperatures are a maximum of 52.4°F (11.33°C) and a minimum of 35.1°F (1.72°C). In July, average temperatures are a maximum of 102.8°F (39.33°C) and a minimum of 58.4°F (14.67°C). The record high temperature was 114°F (45.56°C) on July 18, 1925. The

record low temperature was 12°F (-11.11°C) on December 11, 1932. Annually, there are an average of 84.6 days with highs of 90°F (32°C) or higher and an average of 30.8 days with lows of 32°F (0°C) or lower.

Average annual rainfall is 13.33 inches. There are an average of 44 days annually with measurable precipitation. The wettest year was 1958 with 22.15 inches and the driest year was 1947 with 7.99 inches. The most rainfall in one month was 8.63 inches in January 1911. The most rainfall in 24 hours was 5.72 inches on April 3, 1958. The record snowfall was 1.5 inches in January 1930.

Mean monthly rates for evapo-transpiration and precipitation, and mean temperatures are shown in Table 2-3.

Table 2-3 Mean Climate Data for City of Oakdale ⁵

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	Total
ET ⁶	1.22	2.04	3.54	4.89	6.85	8.01	8.48	7.50	5.50	3.55	1.77	1.08	54.43
Precipitation	2.36	2.06	1.31	1.06	0.68	0.04	0.02	0.01	0.08	0.57	1.01	2.21	11.42
Temperature	46.5	51.2	56.4	60.2	68.3	74.9	79.2	77.8	73.4	64.3	54.1	47.1	62.8

Service Area Population (§ 10631 (a))

The 2010 United States Census reported that Oakdale had a population of 20,675. The population density was 3,392.6 people per square mile (1,309.9/km²). The racial makeup of Oakdale was 16,558 (80.1%) White, 163 (0.8%) African American, 210 (1.0%) Native American, 463 (2.2%) Asian, 37 (0.2%) Pacific Islander, 2,386

⁵ Precipitation and temperature based on nearest Western Regional Climate Center station in Modesto, CA. Actual precipitation is expected to be slightly greater than that shown.

⁶ California Irrigation Management Information System, Department of Water Resources, Station 194 Oakdale, Monthly Average ETo.

(11.5%) from other races, and 858 (4.1%) from two or more races. Hispanic or Latino of any race were 5,398 persons (26.1%). The Census reported that 20,488 people (99.1% of the population) lived in households, 75 (0.4%) lived in non-institutionalized group quarters, and 112 (0.5%) were institutionalized.

There were 7,288 households, out of which 3,016 (41.4%) had children under the age of 18 living in them, 3,853 (52.9%) were opposite-sex married couples living together, 1,009 (13.8%) had a female householder with no husband present, 436 (6.0%) had a male householder with no wife present. 1,573 households (21.6%) were made up of individuals and 694 (9.5%) had someone living alone who was 65 years of age or older. The average household person density was 2.81. There were 5,298 families (72.7% of all households); the average family size was 3.28.

The population was spread out with 5,766 people (27.9%) under the age of 18, 1,837 people (8.9%) aged 18 to 24, 5,436 people (26.3%) aged 25 to 44, 5,083 people (24.6%) aged 45 to 64, and 2,553 people (12.3%) who were 65 years of age or older. The median age was 34.9 years. There were 7,822 housing units at an average density of 1,283.5 per square mile (495.6/km²), of which 4,454 (61.1%) were owner-occupied, and 2,834 (38.9%) were occupied by renters. The homeowner vacancy rate was 2.7%; the rental vacancy rate was 7.7%. 12,342 people (59.7% of the population) lived in owner-occupied housing units and 8,146 people (39.4%) lived in rental housing units.

In 2013 the City updated its General Plan. The approved land use map is shown in Appendix D.

The City's water service boundaries are congruent with its service area boundaries. The City provides water service to a population of approximately 21,000, through 7,835 metered connections, consisting of residential, commercial, industrial, and institutional uses. Table 2(D) provides a summary of the City service area populations. Table 2-4 provides a summary of the water service connections by land use type.

Table 2-4 Water Service Connections, 2010

Land Use/Demand Type	Service Connections
Residential	7,570
Multifamily	266
Commercial	NA
Industrial	NA
Institutional	NA
Total	7,836

Future Planning and Population Projections (§ 10631 (a))

In August, 2013, the City approved the 2030 General Plan (GP), which identifies future expansion areas of the City, population estimates, land use designations, public services, etc. According to the GP, build-out of the new General Plan area will take 60+ years, resulting in an estimated population of approximately 40,500 persons, and include 12,881 total acres, as shown in Table 2-5.

Table 2-5 2013 General Plan Development Holding Capacity

Attributes	2010	2035	Build-out
Dwelling Units	7,835	10,439	15,030
Population	20,675	27,871	40,542
Commercial Floor Area (sq. ft.)	1,938,246	2,558,213	2,786,147
Industrial Floor Area (sq. ft.)	3,511,735	3,511,735	6,104,657
Jobs	5,955	11,739	13,777
Low Income Housing	1,128	1,503	NA
Total Acres	3,903	4,238	12,881

The current and 5-year increment projected population estimates for the City are provided in Table 2-6, with associated growth rates for each of the 5-year periods. Population projections are based on the acres of high, low, and medium density residential land, multiplied by an average density of 2.76 persons per unit. It should be noted that the 2005 UWMP estimated an annual growth rate of 3%, and growth projections were significantly greater than actual (i.e. 4,340 above 2010 actual population, and 6,878 above actual 2015 population). Hence, growth projections were reduced to reflect realistic market conditions.

Table 2-6 5-Year Population Projections and Growth Rates

	2010	2015	2020	2025	2030	2035	Buildout
Growth Rate	NA	1.39%	1.30%	1.22%	1.15%	1.09%	NA
Population	20,675	22,122	23,559	24,997	26,434	27,871	40,542

Section 3 System Demands (§ 10631(e))

Water use in the state of California varies depending on the location, as expected. Those areas where the climate is warmer and have less rainfall use more water than colder, wetter locations. For example, households in the Bay Area and San Diego use less water than those in Sacramento and Bakersfield. Oakdale uses slightly less than the average for the region of 252 gallons per capita per day (gpcd), but does not currently meet that State's target water use of 174 gpcd.

The City supplies potable groundwater for residential, industrial, and commercial uses through a combination of groundwater wells, storage tanks, and network of piping. Each water service is equipped with a water meter for accounting and billing. The City is responsible to operate and maintain the water system up to the water meter. Water meters for residential services range from 5/8" to 1" in diameter. Commercial services are typically 1" or greater, depending on the type of use. The largest connection is 6" in diameter.

The amount of water used by a property owner is a function of several factors. These include the price of water, income, demographics, conservation measures, and climate. Since a large portion of water goes to outside use to irrigate landscaping, communities located in warmer areas typically consume more water during the year. Although price is a deterrent, it does not always result in sustained reductions in water use.

There are three main water use values that must be considered when planning and designing water supply programs. These include annual demand, maximum day demand, and peak hour demand, as described below:

- *Annual Demand* – The total amount of water a community uses during the year. This value determines the water needed from source supplies, such as

groundwater and/or surface water. Communities must plan to secure long-term water availability based on annual demand projections.

- *Maximum Day Demand* – The highest amount of water used in one 24-hour period. This value determines the capacity of water treatment facilities. Although this condition may only occur a few days each year, communities should plan to size treatment facilities (and storage) to meet maximum day conditions assuming an unscheduled maintenance event removes a portion of the treatment capacity from service.
- *Peak Hour Demand* – The highest amount of water the system will move at any given moment. This value determines the storage and pipe (distribution) capacity of the system.⁷ This condition is assumed to last for approximately 4 hours during a maximum day demand.

Water production from the City's wells needs to meet its maximum day demands, with some redundancy, typically calculating total system production capacity with the flow from the largest producing well removed. Based on population projections and proposed conservation goals, the City will have a total average day demand of approximately 4.5 MG in 2035. Assuming a multiplier of 2 to determine maximum day demands (total well production requirement), the City will need to have a total well pumping capacity of 6,200 gpm without its largest well in service. As shown in Table 2-1, current well production is adequate to meet these demands. However, this assumes (1) the City will proceed with construction of additional storage to account for peak hour and fire suppression, and not rely on well production to meet these demands, (2) as older wells are decommissioned new wells with equal capacity are constructed, and (3) conservation is equal to or greater than development. A new well is under construction to replace failing wells and provide adequate production until additional storage and conservation are implemented.

⁷ Emergency flow conditions (e.g. fire demands) are also taken into account when designing these facilities.

In the past, public water purveyors would look to secure additional supplies to meet future demands. However, with the introduction of mandatory water conservation codes and regulations, meeting some or all future demands through demand reduction activities (conservation) is inevitable and often prudent. As such, water conservation will become a key component of the City Water Program, and this will significantly alter demand projections. Other infrastructure, such as water storage and booster pumping stations to meet peak hour demands, will complement the conservation activities as necessary.

Existing Unit Water Demands (§ 10631(e)(1) and (2))

As shown in Figure 3-1, the average daily water use per person has averaged around 230 gpcd, based on total water production and population. Although there is a drop in usage between 2006 and 2012, these cannot be confirmed through consumption records (service water meter data). Some of the decline in water use could be due to a downturn in economic activity, but not all. Some production water meter data (well pumping records) may have been in error, or not available. Hence, the lower number shown are in question. By 2012, well production meters were upgraded and calibrated.

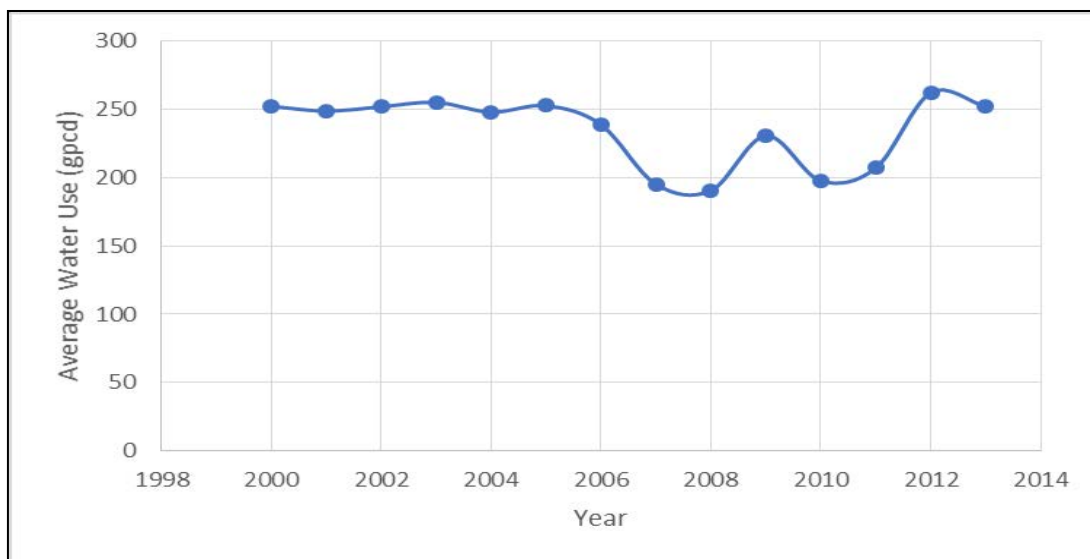


Figure 3-1 Average Annual Water Use in Gallons Per Person Per Day

Determining Base Daily per Capita Water Use (§ 10608.20 (e))

The City is expected to reduce its average daily unit demands by 20% by the year 2020. To measure and monitor this goal, the Water Conservation Bill of 2009 requires each urban retail water supplier to include in its UWMP an estimate of a “base daily per capita water use”, or effectively a “historical starting point”. Base daily per capita water use, measured in gallons per capita per day (GPCD), is established for an initial period of time, which is referred to as the 10-15-year base period. The Baseline Water Use is shown in the attached DWR tables, *Table 14 – Base Daily Per Capita Water Use – 10-15 yr period*. The City of Oakdale selected the years 2001 through 2009 as their 10 year use period, resulting in a baseline unit water demand value of 231 gallons per capita per day.

Tables 3(D) through 12(D) provide the City water deliveries for 2005 and 2010 and the projected deliveries for 2015, 2020, 2025, and 2030. Additional Water Uses and Losses are shown in Table 10(D). The table provides the estimated unaccounted water volume for each year, estimated at 5% of total production. Table 11(D) presents total water use for the City on five year increments from 2005 through 2030.

Water Use Targets (§ 10608.20 (e))

Per the UWMP Act, the City of Oakdale must set a 2020 water use target and a 2015 interim target, using one of the four methods approved by the state. The acceptable method descriptions and summary of their calculations are defined below:

- **Method 1 :**
 - o Definition: 80% of the water supplier’s baseline per capita water use.
 - o Result: 80% of 231 gpcd = 185 gpcd.
- **Method 2:**
 - o Definition: Per capita daily water use estimated using the sum of

performance standards applied to indoor residential use; landscaped area water use; and CII uses.

- o Result: The data needed to support calculations for a Method 2 calculation does not exist, thus this method was discarded.

- **Method 3:**

- o Definition: 95% percent of the applicable state hydrologic region target as stated in the State's April 30, 2009, draft 20x2020 Water Conservation Plan.
- o Result: The state target for the Oakdale area is 174 gpcd. 95% of 174 = 165 gpcd

- **Method 4:**

- o Definition: For this Target method, savings are assumed between the baseline period and 2020 due to metering of unmetered water connections and achieving water conservation measures in there water use sectors.
- o Result: Although the City of Oakdale is fully metered, it does not have data necessary to determine use through Method 4.

Table 3-1 Summary Table for Target Demand Methods

Method	Result (GPCD)
Base Daily Water Use	231
Method 1: 80% of Base	185 ⁸
Method 2: Performance Standards	NA
Method 3: 95% of Hydrologic Region target (174)	165
Method 4: Metering	NA

⁸ City of Oakdale selected Method 1 for determining a 2020 per capita water use target of 185 gpcd.

Water Use Reduction Plan (§10608.26)

To comply with SBx7, the City plans to implement conservation measures that will reduce the average water use to or below the 185 gpcd target, including but not limited to, WaterInsight Program (Smart Water Software with interactive customer capability), reducing large public water use (parks, schools, cemeteries, etc.), and advance water metering infrastructure (AMI), whereby leaks in the privately owned system (i.e. downstream of the water meter) can be detected and customers notified of the problem. These programs and activities are currently being implemented, and are showing to be effective. According to City production records, the water use fell approximately 20% between 2013 and 2014, in response to these partial implementation of these conservation programs. Full implementation is expected to result in at least 5% additional reduction in system water use. Mandatory conservation measures associated with SBx7-7, SB407, AB1881, and California Green Building Code will further increase conservation efforts by 2020. New development is expected to use nearly 20% less water than existing development, due to existing and mandatory water conservation programs. As such, the City is projecting nearly 30% reduction in highest average day demands by 2020, and 25% reduction in the baseline demand (174 gpcd).

Demand Projections (§ 10631(k))

Projections of future water demands were based on the 2013 GP and a recent land use analysis, as defined in an attached technical memorandum (Appendix G), and the City's proposed Water Conservation Plan, also attached (Appendix E). The rate of growth and land development were projected through the planning horizon (2040) to determine acres of all land uses (i.e. residential, commercial, industrial, parks, etc.). These values were multiplied by per acre unit demand estimates (ac-ft/acre) to determine total system average water use. The per acre unit demand estimates were developed from a combination of historical use and data from other

nearby water purveyors. All per acre unit demand estimates were then reduced to account for the City's proposed water conservation activities.

Projected system water demands are illustrated in Figure 3-2. The project water uses reflect the future reductions in use associated with conservation programs discussed above.

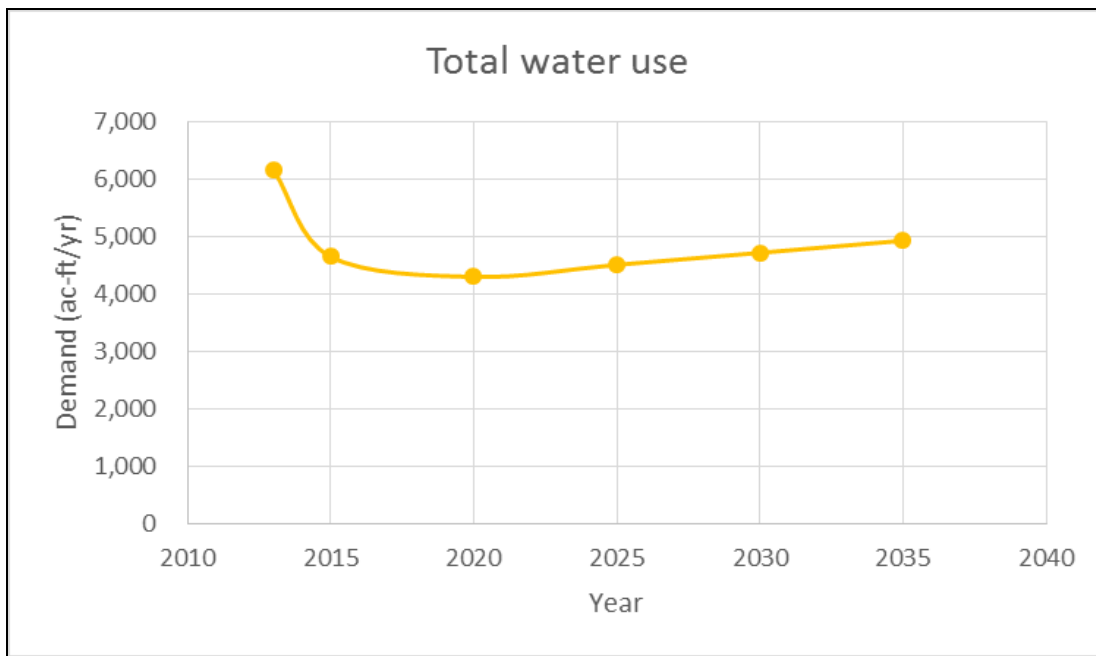


Figure 3-2 City of Oakdale Water Demand Projections

Low Income Household Water Use (§ 10631.1(a))

Approximately 6.5% of the City's total water demand is from low income residential and multi-family housing, and the percentage is expected to remain the same into the future. Table 8 (D) provides the projected water use associated with all low income housing.

Section 4 Water Supply Sources (§ 10631 (b))

The City currently uses groundwater as its sole source of water supply. Traditional water supplies for municipal development in the Central Valley consist of groundwater and surface water. Surface water sources include local rivers, reservoirs, and state/federal water project conveyance systems. In California, all surface water is allocated, hence acquiring surface water entitlements require that the water be obtained from a current holder of the entitlement through purchase, exchange, dedication, etc.

In contrast to surface supplies, groundwater use does not require a right or entitlement. The State of California does not enforce groundwater management statutes, thereby placing groundwater management at the local level. The City uses groundwater, claiming legal access through California groundwater law which allows an appropriator the right to pump and use the local groundwater for beneficial use. Appropriative rights are second only to “overlying” rights of property owners. The City has well ordinances that protect the groundwater and minimize impacts of the pumping activities on private wells. The City and other local water purveyors are steadily increasing activity directed at management of the local groundwater basin, including the potential of recharge programs.

Conservation is expected to play an increasing role in the City’s future water supply program. Mandatory water conservation measures, such as SBx7-7, SB407, AB 1881, California Green Building Code, and other elected programs initiated by the City are expected to significantly decrease the City’s unit water demands, therefore it is viewed as a “supply” in the City’s water program.

Source Water Options (10631(b))

Groundwater will continue to be the predominant source water supply for the City for the following reasons: (1) it is reliable, (2) groundwater is inexpensive relative to other sources, (3) its use and cost is primarily under the control of the City, (4) it is relatively stable during extended periods of drought, (5) the quality is good, and (6) the systems are already in place (no significant additional infrastructure required). Given these reasons, local groundwater is the most attractive and feasible water source alternative. However, the City recognizes that groundwater is a limited and valuable resource, so it cannot use local groundwater irresponsibly. As such, conservation and efficient water use will be prominent in all City planning and operational programs. Unit water demand reduction of approximately 30% or greater will result in no significant net increase in total groundwater use through the planning period (2010 - 2035). Conservation will be achieved through a combination of DMM/BMPs, and other water conserving activities appropriate for the City, as explained herein and in the City's Water Conservation Plan.

In the future, the inclusion of other sources to the City water program is probable. Direct or indirect use of recycled wastewater will be considered in all future planning documents, especially as a possible groundwater recharge source. Surface water is also likely to play a role, albeit minor, mainly for sustainability of groundwater production and landscape irrigation. The City has no plans to use treated surface water as a drinking water supply.

Groundwater

A primary source of water used to supply water to the State of California is groundwater, comprising approximately 30% of total agricultural and urban use, and greater amounts are used during periods of drought when surface water is deficient. This has led to declining groundwater tables, some significantly. In some areas, land subsidence is occurring due to excessive groundwater pumping. As a

result, active groundwater management and sustainability programs are gaining more support at the State, regional, and local levels.

Unlike most states, California has not generally regulated groundwater, and left management of groundwater to local authorities. The City claims legal access to its groundwater through California groundwater law, which allows an appropriator the right to pump and use the local groundwater for beneficial use. Appropriative rights are second to “overlying” rights of property owners. The amount of groundwater use is generally restricted to the point at which one user's actions cause adverse impact to another user. The State has established water quality parameters for groundwater, like standards for potable well construction, and limits on activities that could degrade water, but the amount of groundwater pumped was not specifically addressed.

Successive droughts and overuse have brought attention to past practices. Three groundwater management bills were passed September, 2014, AB 1739, SB 1168, and SB 1319.⁹ The general purpose and date of compliance of these bills are:

- Identification of local groundwater management agencies by 2017
- Sustainable plans for overdrafted groundwater basins by 2020
- Sustainable plans for high and medium priority basins by 2022
- Full achievement of Statewide groundwater sustainability by 2040.

Collectively, this package was known as the Sustainable Groundwater Management Act (SGMA). These bills will allow for basin boundary establishment, sub-basin identification, well registration, the management of extraction rates, and other activities to protect and manage the State's groundwater resources. The package also has funding available for efforts made towards sustainable groundwater use

⁹ Office of Governor Edmund G. Brown Jr. - Newsroom." *CA.gov Office of Government*. N.p., n.d. Web. Sept. 2014.

and reporting. The intent of the legislation is to allow local and/or regional management of groundwater, but does not exclude State involvement if progress is insufficient. Thus, groundwater in California will go from mostly unregulated and unrestricted, to closely regulated, monitored, and limited.

Unfortunately, successive droughts have and may continue to complicate the groundwater issue further before the groundwater plans are in place. Declining groundwater conditions could get worse before it gets better, as water purveyors and private land owners rush to drill wells before regulations and production limits are in effect. How this impacts the City of Oakdale will partly depend on its own groundwater management and planning, so moving toward a sustainable groundwater program will be advantageous.

Description of Groundwater Basin - State Groundwater Data (§ 10631(b)(1))

The San Joaquin Valley Groundwater Basin comprises the San Joaquin River Hydrologic Region and Tulare Lake Hydrologic Region, as defined by the California Department of Water Resources (DWR). ¹⁰ The combination of these two regions is composed of 16 sub-basins, 9 which reside in the San Joaquin River Region and 7 which consist in the Tulare Lake Region. The City of Oakdale is located in the Modesto Sub-basin of the San Joaquin River Hydrologic Region, as shown in Figure 4-1.

¹⁰ "Groundwater Update-Conjunctive Use." *San Joaquin River Hydrologic Region* (2003): n. pag. Department of Water Resources. Web.

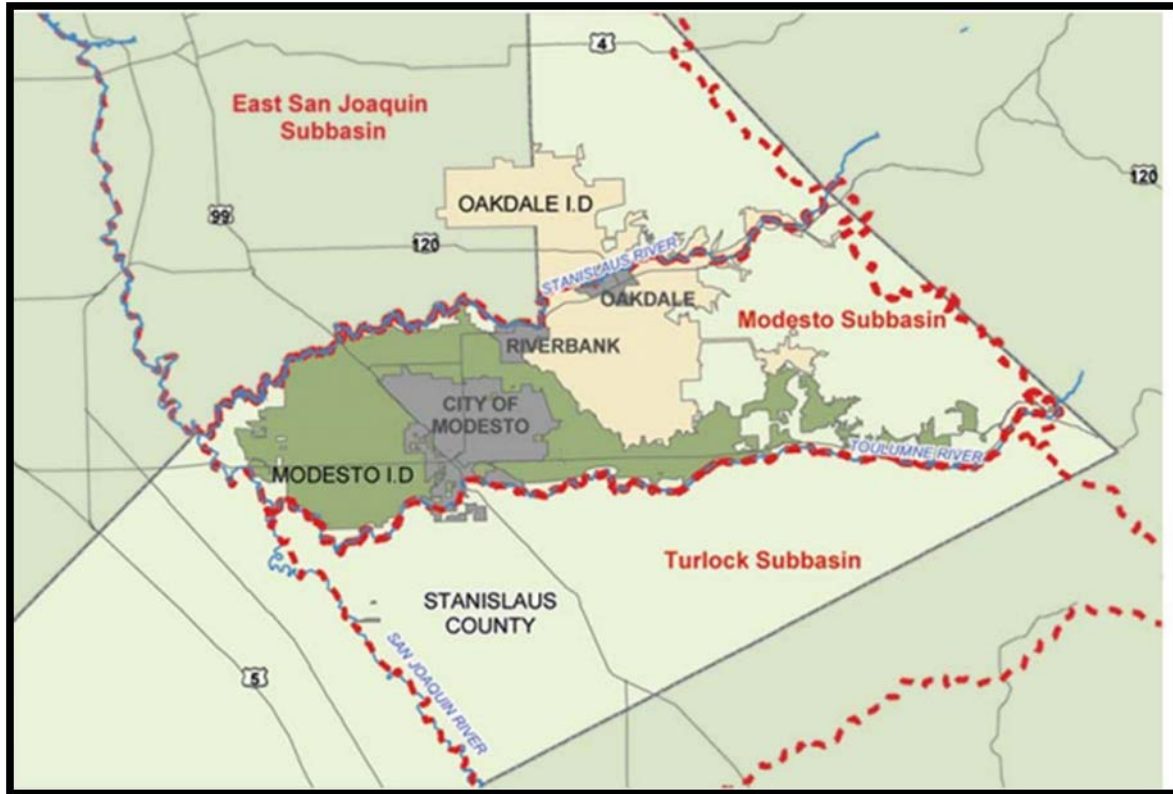


Figure 4-1 Modesto Sub-basin

DWR Bulletin 118 (first released in 1952, and updated 5 times since, last in 2003), contains historical information on groundwater characteristics, well data, relevant permitting and legislation, and concerns regarding the use and management of the State's groundwater. According to DWR, the San Joaquin River Hydrologic Region is heavily groundwater reliant, with groundwater accounting for about 30 percent of the total annual supply used for agricultural and urban purposes. The aquifers are generally quite thick in the San Joaquin valley sub-basins, with groundwater wells commonly extending to depths of 400-800 feet. Aquifers include unconsolidated alluvium and consolidated rocks, with unconfined and confined conditions both found in the region. Typical well yields in the region range from 300 to 2,000 gpm, with potential yields as high as 5,000 gpm.

Depth-to-water measurements collected from a particular well over time can be plotted to create a hydrograph. Hydrographs assist in the presentation and analysis

of seasonal and long-term groundwater level variability and trends over time. Because of the highly-variable nature of the aquifer systems within each groundwater basin, and because of the regional differences in annual groundwater extraction, recharge, and surrounding land use practices, the hydrographs selected to depict long-term groundwater level trends for a region (as shown in Figure 2) do not necessarily capture the local conditions, but rather help “tell a story” of how an aquifer systems responds to fluctuating groundwater extraction and changing resource management practices. According to DWR (Groundwater Update 2013), the San Joaquin River basin is in a condition of *“long-term decline in groundwater levels that have stabilized because of reduced demand, but have not recovered”*.

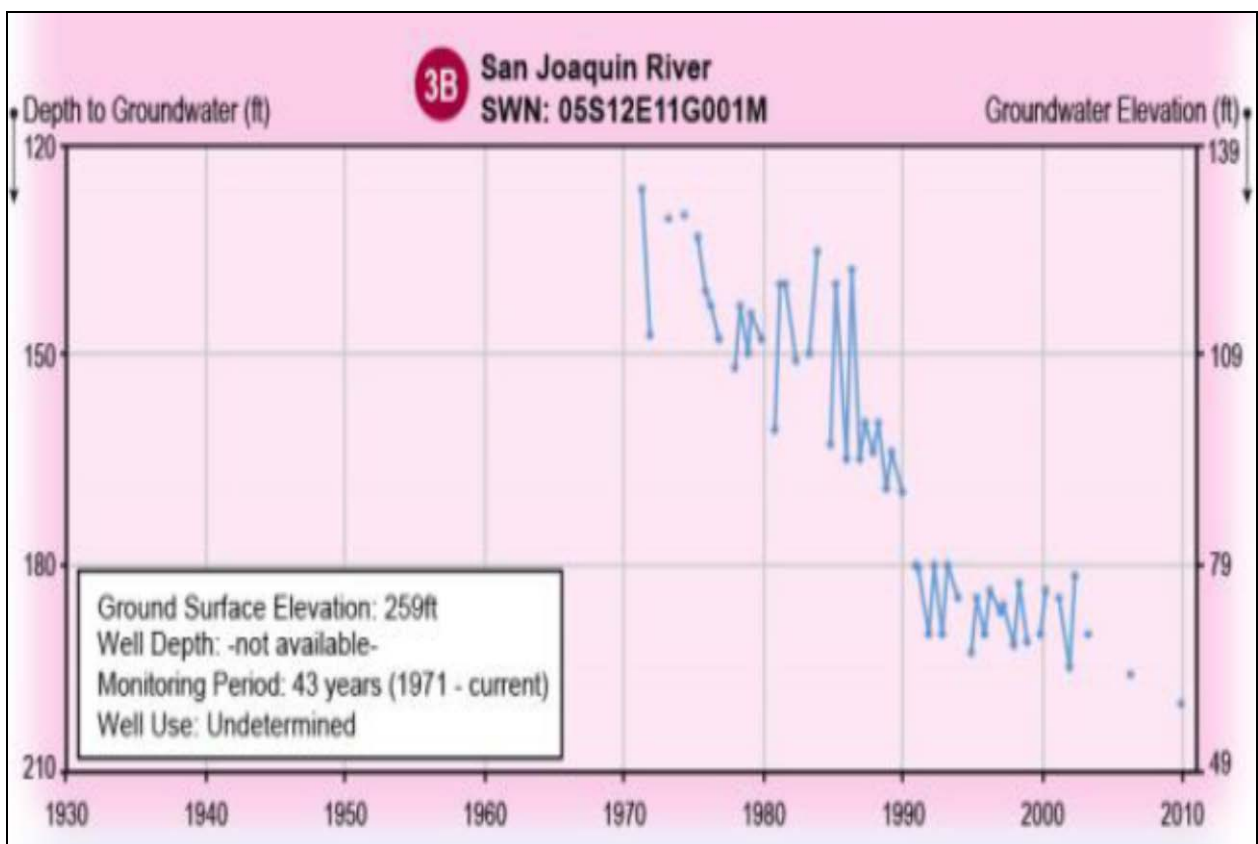


Figure 4-2 San Joaquin Region Groundwater Basin Hydrograph

The Modesto Sub-basin, as defined by DWR Bulletin 118: ¹¹

- Groundwater Sub-basin Number: 5-22.02
- County: Stanislaus
- Surface Area: 247,000 acres (385 square miles)

The hydrogeologic units that comprise the ground water reservoir in the Modesto sub-basin consist of both consolidated and unconsolidated sedimentary deposits. The unconsolidated deposits consist of the Ione Formation of Miocene age, the Valley Springs Formation of Eocene age, and the Mehrten Formation. These deposits are located primarily in the eastern portions of the basin. With the exception of the Mehrten Formation, generally, these deposits yield small amounts of water for wells. Given that the Mehrten Formation yields higher volumes than similarly consolidated deposits, it remains an important aspect of the Modesto sub-basin for those accessing groundwater as a resource. The unconsolidated deposits consist of include continental deposits, lacustrine and marsh deposits, older alluvium, younger alluvium, and flood-sub-basin deposits. Of these, the continental and older alluvium deposits are the highest producers in terms of groundwater yields, making them of similar importance to the Mehrten Formation. Younger alluvium deposits can produce moderate yields until reaching maturity.

An excerpt from Bulletin 118 regarding groundwater conditions states:

"Changes in groundwater levels are based on annual water level measurements by DWR and cooperators. Water level changes were evaluated by quarter township and computed through a custom DWR computer program using geostatistics (kriging). On average, the sub-basin water level has declined nearly 15 feet from 1970 through 2000. The period from 1970 through 1978 showed steep declines totaling about 12 feet. The six-year period from 1978 to 1984 saw stabilization and rebound of about 7

¹¹ Region, San Joaquin River Hydrologic, and San Joaquin Valley Groundwater Basin. "San Joaquin Valley Groundwater Basin Modesto Subbasin." *California's Groundwater; Bulletin 118* (2004): n. pag. *Department of Water Resources*.

feet. 1984 through 1995 again showed steep declines, bottoming out in 1995 at nearly 20 feet below the 1970 level. Water levels then rose about 5 feet from 1996 to 2000. Water level declines have been more severe in the eastern portion of the sub-basin, but have risen faster in the eastern sub-basin between 1996 and 2000 than in any other portion of the subbasin."

There is a direct relationship between groundwater levels in aquifers throughout the Central Valley, including the Modesto Sub-basin, and the use of groundwater for irrigated agricultural acreage. As surface water sources are often utilized during the wet seasons when more precipitation and snow melt is available, aquifers often are recharged during the winter and early spring. However, during the summer, aquifers are depleted due to usage. Approximately 80% of the water used in California is attributed to agricultural practices, explaining the relationship between irrigation uses and aquifer levels. Historically, this relationship has played a vital role in the sustainable use of groundwater resources. During years with sufficient precipitation, recharge volumes have matched or surpassed withdrawal volumes during the summer and fall. However, in years of drought or less than average precipitation, withdrawal volumes have surpassed recharge volumes, leading to an unsustainable use of the aquifer. In an effort to meet all agricultural needs, municipalities have withdrawn volumes necessary, with little regard to a sustainable use of, as well as the lifetime, of the aquifer itself. Years with minimal and less than average precipitation are an inevitable part of future circumstances, presenting a challenge for municipalities in the Central Valley to develop a more sustainable relationship with the local aquifers, both in years with and without sufficient precipitation. Cultivating a culture, legislation, and overall perspective change regarding groundwater usage and sustainability will be a necessary part of Oakdale's water program. The complete DWR Bulletin 118 description of the Modesto Subbasin can be found in Appendix I.

Regional Groundwater Management - Stanislaus Tuolumne Regional Groundwater Basin Association (§ 10631(b)(2))

The following section summarizes the Stanislaus and Tuolumne Rivers Groundwater Basin Association (STRGBA) in terms of their organization's purpose, activities, and goals in the near future with relation to groundwater management in the eastern Central Valley. Greater knowledge of this organization's purpose and activities may aid in groundwater management and planning for Oakdale, specifically pertaining to the 2016 UMWP. Any and all relevant information will be summarized in this document and updated as new relevant information becomes apparent. STRGBA was founded in 1994, bringing together six agencies in the Modesto Groundwater Sub-basin. It was developed in an effort to provide communication between all parties interested in the communal groundwater supply such that future use of the resource could be planned responsibly. These six agencies include:

1. The City of Modesto
2. The Modesto Irrigation District (MID)
3. The City of Oakdale
4. The Oakdale Irrigation District (OID)
5. The City of Riverbank
6. Stanislaus County

All six of these agencies draw from the Modesto Groundwater Basin and rely on it heavily as a source of potable water. With the creation of the STRGBA, the communal use of this resource can be more coordinated, responsible, and sustainable such that all parties benefit. Though these six agencies are the only agencies directly involved with the STRGBA, other neighboring water agencies are communicated with when necessary. Specific groundwater management activities overseen by STRGBA include Groundwater Resource Information Database (GRID), and Well Optimization Program, as defined herein.

A. Groundwater Resources Information Database (GRID)

The GRID is meant to be an electronic forum to aid with communication for the six agencies and any neighboring agencies that may be involved with related projects. The data base contains within it the location, functioning status, and water quality status of most wells within the region. The system is consistently being updated with new information regarding well status as it becomes available. In addition, there is information pertaining to groundwater levels and related hydrologic data. Aquifer interaction, and the effect of wells on groundwater levels can be observed using this tool. Additionally, responsible groundwater use is based on limiting groundwater withdrawal via wells. Records of well status and future well construction, compiled with this database, will aid in the checking of current, and planning of future, sustainable groundwater use. Given that all six agencies are drawing from the same source, intra-agency communication using databases such as these is necessary when preserving a limited resource. Each agency is responsible to consistently update the database when they have new information available regarding well status and the water quality of said wells. ¹²

B. Well Optimization Program

Currently in its second phase, the well optimization program attempts to accomplish a number of goals in relation to groundwater wells throughout the Central Valley, including:

- Meeting of local demands using the wells.
- Minimization of power costs due to pumping.

¹² "Stanislaus and Tuolumne Rivers Groundwater Basin Association. "Sustainable Groundwater Management Act (n.d.): n. pag. *Groundwater Regional Information Database (GRID)*. Web.

- Replacement or repair of all wells evaluated and determined to be below minimum efficiency levels.
- Sustainably using aquifers such that levels are not permanently lowered.
- Manage groundwater source quality.
- Increase efficiency of well pumping, specifically in shallow groundwater management.

The project includes conjunctive use strategies in combination with exclusive groundwater strategies due to the inclusion of multiple agencies. The project has been separated into four facets to help simplify the management and optimization:

- 1) Facilities Inventory and Mapping
- 2) Production Well Evaluations
- 3) Database Management System (DMS)
- 4) Decision Support System (DSS)

These facets require cooperation from all six agencies in addition to included neighboring agencies when necessary. The first two facets involved a large amount of data acquisition to aid with the second two facets and are constantly being updated and added to as new information becomes available. Information pertaining to this includes well locations, lateral locations, well pump efficiencies, GIS data pertaining to wells, and district boundaries. The DMS was developed for data storage, retrieval, and evaluation of the available data gathered in facets one and two using Microsoft Access. The DSS was designed as a public forum with access to the DMS such that decisions can be made collectively with full knowledge of, and in reflection of, the processed data available. The DSS uses operator input in combination with all other available and processed data from the DMS to automate decisions, meeting local criteria established by all six agencies communally.

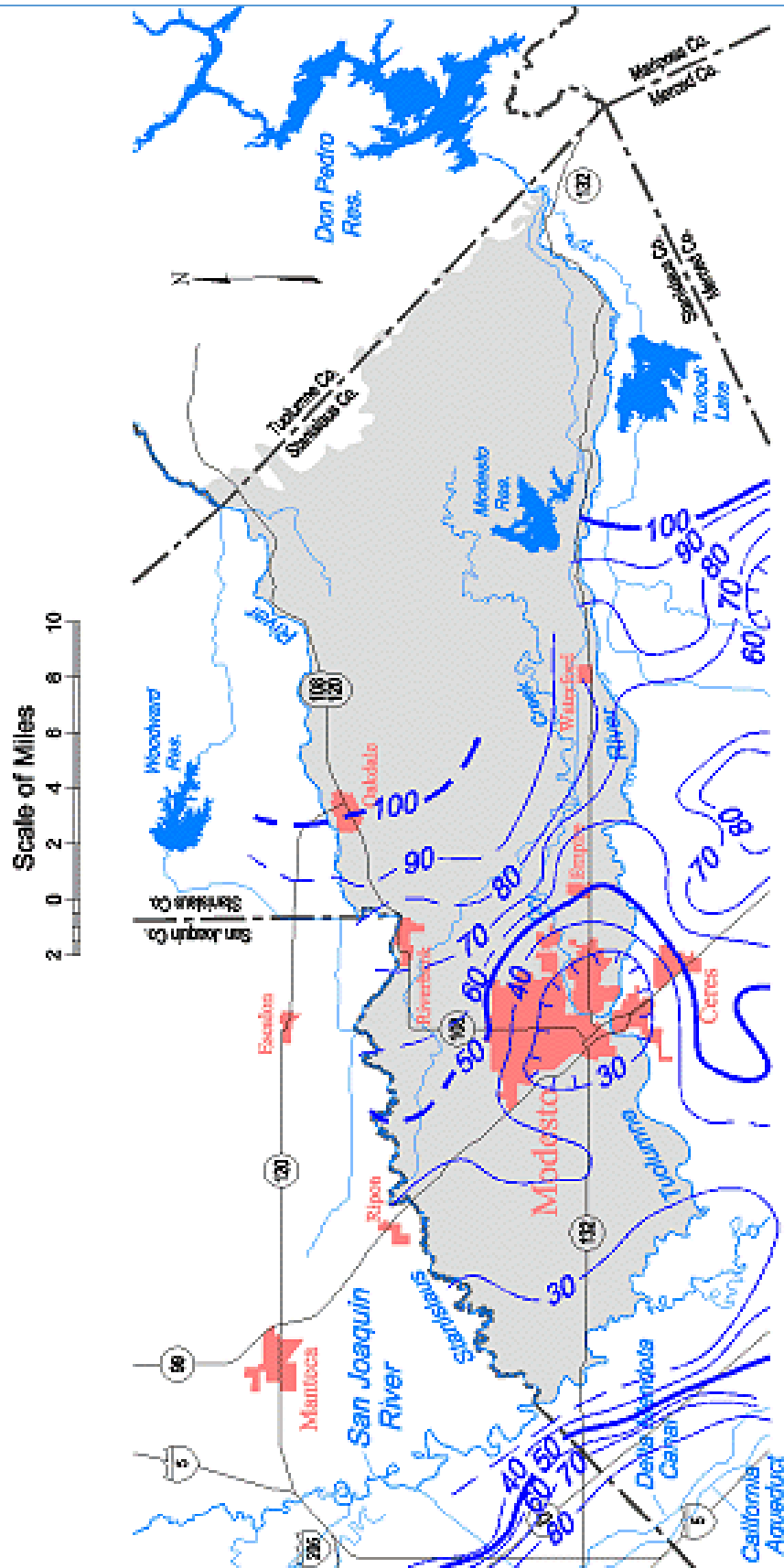
Phase two of the Well Optimization project includes expansion of well evaluations

and area covered. In addition, the DMS will become web-based, providing access to all agencies, including neighboring agencies. As an example of the DMS, the GRID system mentioned will be part of the data acquisition and update used in conjunction with the DSS. Phase three of the project will include the implementation of remote sensing to consistently gather information, updating the DMS. In addition, a process to assess water requirements for laterals will be developed. The concept of connecting SCADA systems to groundwater pumping has been discussed as a means of data acquisition and lateral evaluation. Grant funding for the implementation of phases two and three is currently being explored.

Figure 3 shows the contours regarding groundwater aquifer levels in 1990, showing a cone of depression on the south-western side of Modesto and an aquifer level of around 100 ft under the City of Oakdale. Figure 4 shows the contours remaining relatively stable around the City of Oakdale, hovering between 100 ft and 110 feet with no apparent areas of concern. Figure 5 shows the aquifer contours in the year 2010. Unfortunately, these contours are less stable than those of 1990 and 2000. Though the aquifer level below the City of Oakdale remains around 100 ft, levels to the south and south-west of the city have diminished significantly. Cones of depression have shown up throughout the Modesto Sub-basin, two of which are in close proximity to the southern end of Oakdale, posing a potential threat for the near future.

Modesto Groundwater Basin

Spring 1990, Lines of Equal Elevation of Water in Wells, Unconfined Aquifer

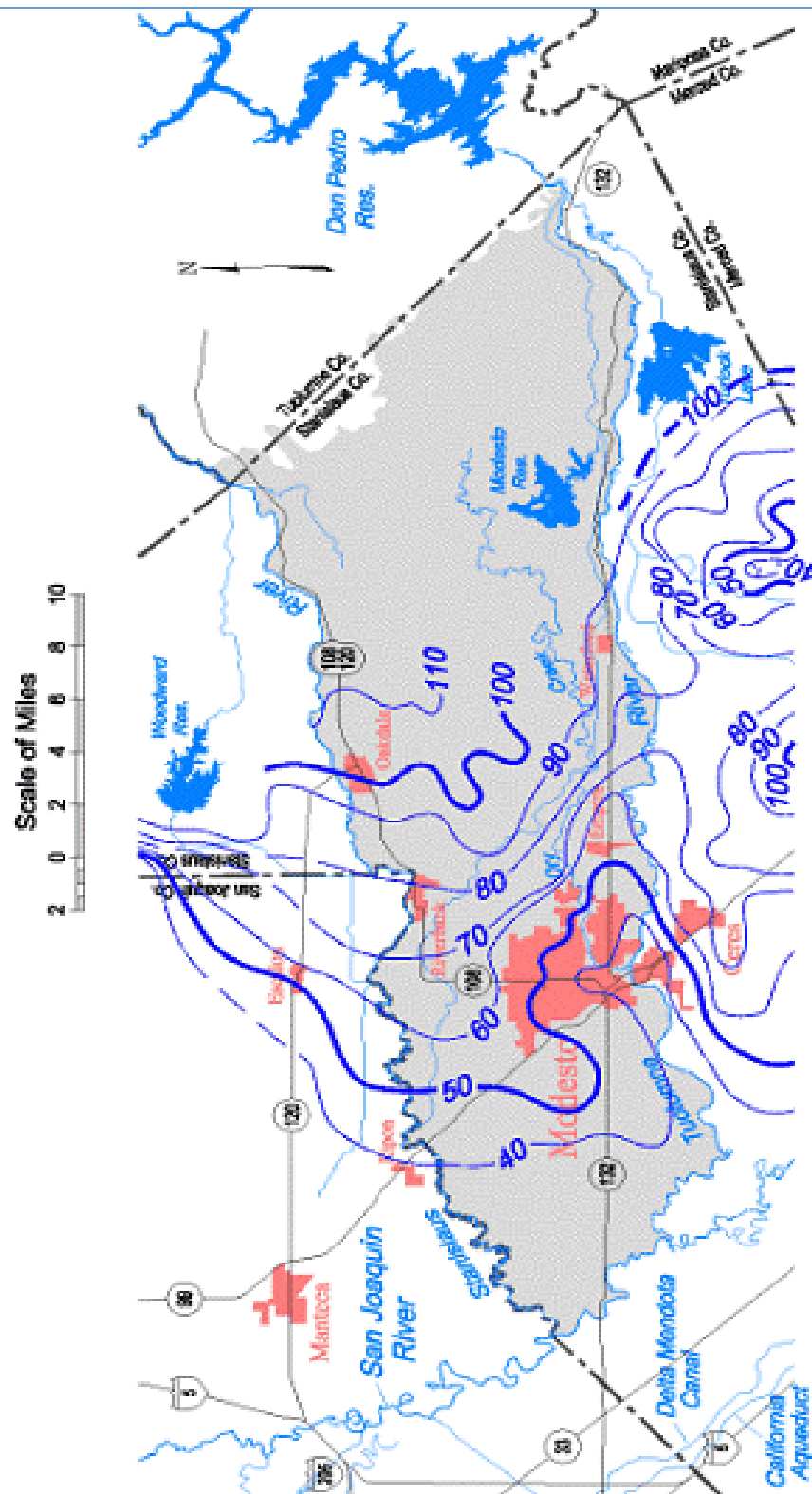


Contours are dashed where inferred. Contour interval is 10 feet.

Figure 4-3 Groundwater Contours in the Year 1990

Modesto Groundwater Basin

Spring 2000, Lines of Equal Elevation of Water in Wells, Unconfined Aquifer



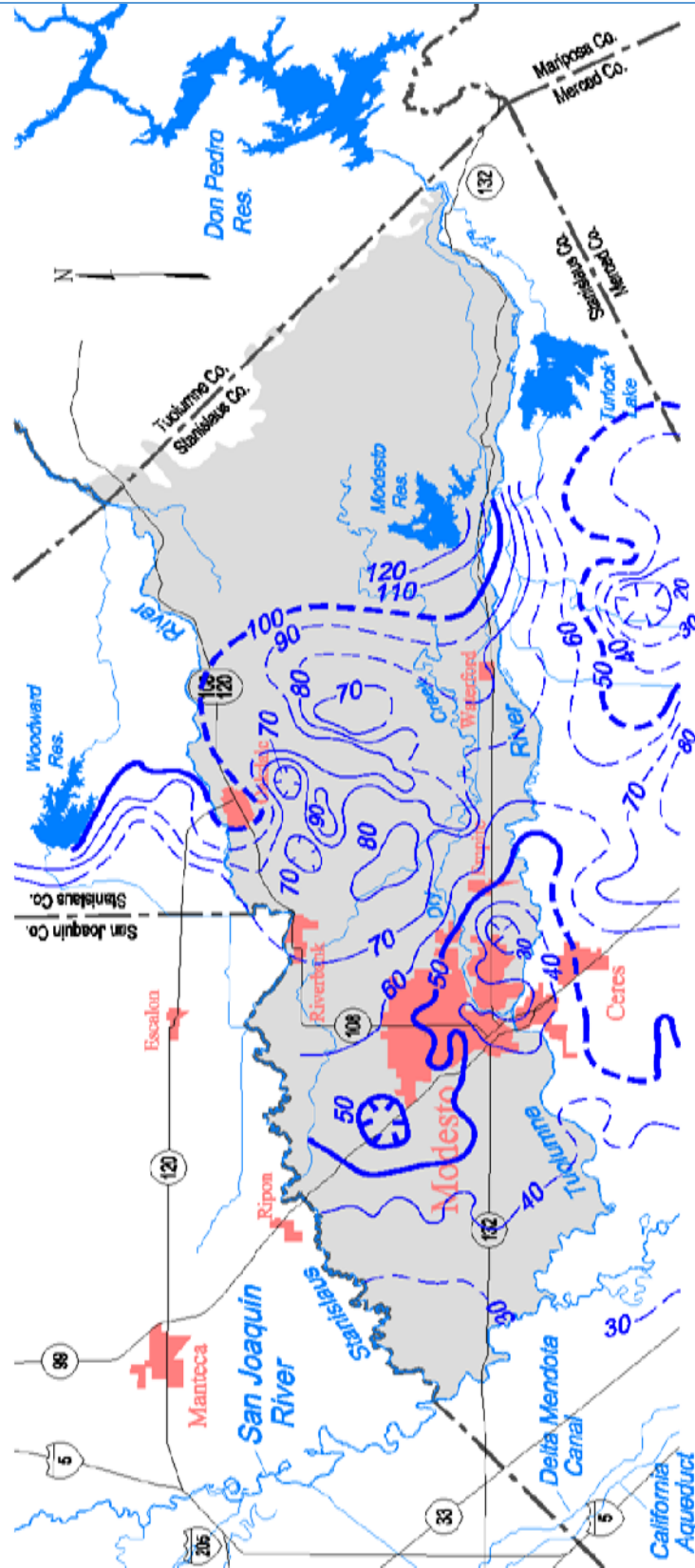
Contours are dashed where inferred. Contour interval is 10 feet.

Figure 4-4 Groundwater Contours in the Year 2000

Modesto Groundwater Basin

Spring 2010, Lines of Equal Elevation of
Water in Wells, Unconfined Aquifer

Scale of Miles
2 0 2 4 6 8 10



Contours are dashed where inferred. Contour interval is 10 feet.

Figure 4-5 Groundwater Contours in the Year 2010

Though the groundwater levels under Oakdale appear relatively unchanged over the past 20 years, a cone of depression to the south of the City remains a threat. Likely due to agricultural withdrawal, these cones have expanded since 1990 and are pressing closer to Oakdale. In 1990, a noticeable cone wasn't even existent where as in 2010, two cones are within miles of the southern side of the City and could pose a threat to the wells in the near future. Consistent monitoring of these cones, as well as the groundwater levels closer to the City itself. Fortunately, the Stanislaus River on the north side of Oakdale serves as a beneficial boundary condition, recharging the aquifer. However, even if recharged from the north, if either of the cones to the south become too steep or expand in the direction of Oakdale, the agricultural use outside the City boundaries could affect the City directly. The latest contour image available is from 2010. When more recent information is available, it will be included in the analysis and monitoring of these two cones such that a decision can be made. Ultimately, all those using groundwater from the Modesto Sub-basin must conjunctively use the resource together, in close communication, such that the resource is not exhausted and threats such as these cones of depression can be mitigated or avoided all together.

Local Level Groundwater Management and Strategy (§ 10631(b)(2)(3)(4))

The analysis of the regional groundwater elevations show that multiple areas in the Modesto Sub-basin are in a state of stress due to over use. In particular, drought years lead to significant reduction of the aquifer sub-basin. Several cones of depression have been created in the last decade, two of which are directly south of Oakdale. However, Oakdale has not seen the same response in its wells, perhaps due to the Stanislaus River which likely creates a boundary condition and point of recharge for the local aquifer. Studies of local soil porosity indicate that the local aquifer may be benefiting from surface water irrigation as well.

The local groundwater change from the year 1994-2013 can be seen in Figure 4-6, illustrating that the overall reduction in the water elevations has been marginal. In all cases, the level has dropped less than 10 feet and in one case the level is actually equivalent to the 1994 level (Well 6). Compared to other regional decreases of 15 to 35 foot drops in water table elevations, the water table underlying Oakdale has remained relatively stable.

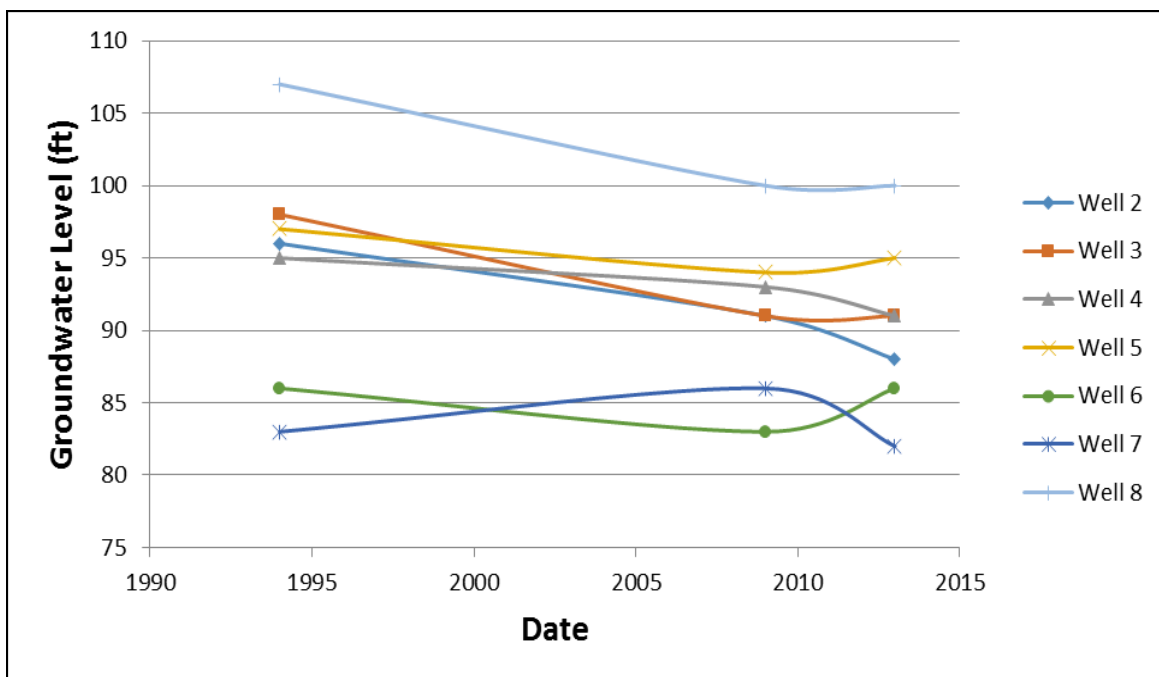


Figure 4-6 Groundwater Level of Oakdale Wells (1994-2013)

As conservation will limit or even preclude an increase in water pumped from the local groundwater, it is not necessary to evaluate the impacts of additional pumping rates in this study. However, it would be prudent for Oakdale to consider the long-term impacts of increased pumping by others in the area. The cones of depression south of Oakdale could continue to expand before regional groundwater sustainability is achieved. Options for proactively stabilizing groundwater levels could include use of surface water for irrigation of large landscapes (i.e. parks,

schools, detention basins, etc.), and direct injection or surface recharge of treated surface water or recycled water. These options will be analyzed in the City's next Water Master Plan update.

Surface Water and Transfer Opportunities (§ 10631(d))

No surface water or transfer opportunities are anticipated at this time.

Desalination Water (§ 10631(i))

No opportunities exist for desalination water supplies.

Wastewater collection and treatment system and methods of wastewater disposal (10633(a)).

The City of Oakdale provides owns and operates the community's wastewater collection and treatment (WWTP) systems. Raw wastewater is pumped from the City's collection system to the WWTP headworks where it is screened by an automatic traveling fine screen and grit removal is completed by a forced vortex chamber. Screened and dewatered wastewater is split between two parallel extended aeration lagoons. The lagoons are aerated with diffused air using a Parkson BioLac system with floating air headers in the lagoon and drop diffusers. Air is supplied by six positive displacement electric motor driven blowers. Blower operation is controlled by the dissolved oxygen (DO) level in the aeration basins with a set point of 2 mg/L DO. Mixed liquor from the aeration lagoons is conveyed to a secondary clarifier, and effluent from the secondary clarifier is pumped and filtered through cloth media disk filters. The filtered effluent is disinfected in one of two open UV channels each equipped with 8 UV banks.

The treated effluent is discharged to percolation/evaporation ponds in accordance with Waste Discharge Requirements (WDR) Order No. 5-01-094. Currently the plant treats an average dry weather flow of approximately 1.6 million gallons per day.

Recycled wastewater Potential (10633(b)).

All of the treated effluent that is being discharged to the percolation/evaporation ponds is available for a recycled water project. Currently, this is approximately 1.6 mgd.

Current Recycled Wastewater Use (§ 10633(c))

No recycled wastewater is being used at this time.

Potential for Recycled Wastewater Use (§ 10633(d, f, g))

Opportunities for using recycled wastewater include (1) direct use by the City, (2) exchange of water with Oakdale Irrigation District (OID), and (3) selling recycled wastewater to a third party. The greatest challenge associated with the City's direct use of its recycled wastewater is distribution. The City's WWTF is located on the north side of the Stanislaus River, opposite of nearly all urban demands. In addition, parks, schools, and other potential large users of recycled wastewater are spread throughout the City. A new transmission pipe constructed across the river, and an extensive new non-potable piping network would be required. It is assumed that the cost of this program would be difficult to justify. A more feasible alternative would be to exchange water with OID, as it currently owns and maintains water pipes within the City's service area, as well as north of the Stanislaus River near the City WWTF. Under this plan, water that would normally be delivered to OID customers north of the river would be supplemented with City recycled wastewater. In return, OID would provide irrigation water for City parks, schools, and other large landscaped areas. The amount of infrastructure to achieve this alternative would be significantly less than a new City constructed non-potable distribution system. A third alternative would be for the City to sell its recycled wastewater to a third party in the area for agricultural irrigation or indirect potable reuse, though no opportunities have been explored to date.

Future Water Projects (10631(h))

Proposed City water supply projects and programs include a combination of infrastructure and activities that will allow the City to meet its current and future water demands. Specifically, the objectives of the proposed water projects and programs will: (1) provide for reliable maximum day production, (2) meet peak hour and fire suppression demands, and (3) ensure sustainable water supply for the long-term and during periods of drought. A “cornerstone” of all of the proposed projects and programs is conservation, as demand reduction will assist the City accomplish all three objectives. Conservation planning is discussed future in Section 6, Demand Management Measures.

All of the proposed projects and programs will be further detailed in the City’s Water Master Plan Update, which will be completed in 2015. Each of the objectives and their associated projects are discussed herein.

(1) Reliable Maximum Day Demands: To reliably meet maximum day demands, the City need to ensure its wells can produce water from its wells equal to or greater than maximum day demands (see Section 3). This will be accomplished by lowering maximum day demands in accordance with the City’s Water Conservation Plan, constructing a sufficient number of wells to meet maximum day demands (with the largest producing well is out of service), and other improvements to well facilities to ensure reliable operation. Proposed improvements include the following:

- Construct Well 10 - An additional well will be constructed in 2015, capable of producing approximately 1,500 gpm, and drawing water from deeper (below 500’) aquifers. All future wells will draw from deeper zones to allow for periods of declining water tables.
- Emergency Power – Equip all wells with emergency power supply.
- Well Maintenance – Provide active preventive maintenance of wells.

(2) Peak Hour and Fire Suppression: The City currently relies on well production to meet a portion of its peak hour and fire suppression demands. A preferred method for meeting these demands is to construct storage and booster pump facilities.

- Construct additional storage capacity of approximately 1.5 MG.

(3) Long Term Sustainability: Although the groundwater underlying the City is relatively stable, the City will pursue activities to ensure the groundwater will remain a reliable source.

- Evaluate the use of recycled water for groundwater recharge.
- Evaluate use of surplus surface water for groundwater recharge.
- Participate in regional groundwater management and planning programs.

Section 5 Water Supply Reliability and Water Shortage Contingency Planning (§ 10631(c))

The California Department of Water Resources requires the Urban Water Management Plan address water supply reliability and water shortage contingency plans. Even though the City does not foresee future water shortages, this section details the City's efforts in the event of interruption in water supply.

Water Supply Reliability (10620(f))

The following addresses the reliability of supply and impacts due to supply inconsistencies for the City based on the sole use of groundwater, as stated previously. This is subject to change as the City's water program evolves. For example, it is probable the City will implement a direct or indirect groundwater recharge program prior to 2040, though it is not anticipated to be critical for the City to meet demands at that date.

The City's water supplies are addressed for normal, single dry and multiple dry water years. The historical years that were used as the basis for this analysis are shown in Table 27(D). Table 28(D) shows that historically, the City has never had a shortage in supplies, which are currently made up 100% of groundwater. Table 29(D) shows that there have not been any disruptions in deliveries or supplies to date. Tables 32(D), 33(D), and 34(D) present the potential water supply impacts that may occur during the 20 year horizon of this study, and anticipated supply reliability 100% of the time, for both single dry and multiple dry years.

Water Shortage Contingency Planning (10632(c))

The City has a reliable supply of source water, and is not vulnerable to reductions in deliveries similar to other communities that rely on local or imported surface

water, for reasons described below:

1. The City has sufficient groundwater to meet the needs of the UWMP planning horizon (2035), and the local groundwater table is not subject to significant impacts due dry or critically dry hydrologic periods; ¹³
2. The current UWMP assumes sole use of groundwater to meet current and future M&I demands through 2035;
3. The City may desire to implement a proactive groundwater recharge program (surface spreading of recycled wastewater or untreated surface water, or direct injection of treated water) if local groundwater table levels show significant decline. However, new State groundwater sustainability legislation is expected to address conditions that could lead to excessive groundwater depression.

In the event the City were to experience a water supply shortage the mandatory water reduction methods referenced in Drought Contingency Plan (Appendix F).

Stages of Action (§ 10632(a))

The City has adopted a Drought Contingency Plan (“DCP”) in the event an extended drought has an adverse impact on the local groundwater table, or during a catastrophic supply interruption. The DCP consists of four (4) stages, progressively requiring greater reductions in water use.

Implementation of the DCP is determined by the City Council, as they deem appropriate. It should be noted that the City may implement water rationing (Stage 1 or Stage 2) even during drought periods when there is no apparent impact to the

¹³ Local groundwater basin is generally in equilibrium, and is not expected to experience significant declines since the City expects to maintain its current production through the planning period using conservation practices.

water table to show support of other Central Valley communities struggling with water shortages.

Catastrophic Supply Interruption Plan (§ 10632 (c))

Scenarios causing catastrophic interruptions to the City source supply are limited due to the City's direct access to groundwater, and having multiple wells in the system. The probability of an event that could leave the City without water is extremely low. Catastrophic failures of the water supply could include the following scenarios:

A. Declining Groundwater Table – Under this scenario, the groundwater table begins to show signs of overdraft. This event occurs slowly over time, and does not require immediate action on the part of the City. Trends in groundwater levels suggesting an overdraft condition will need to be addressed with long-term regional water planning and groundwater management efforts. Immediate and severe reductions in groundwater use are not required to address this scenario.

B. Loss of a Groundwater Pumping Facility – Under this scenario, a single well may go out of production due to mechanical failure, well casing failure, fire in the control building, etc. All the City wells are capable of utilizing portable or dedicated generators to operate in the event of power failure.

A well could also go out of production due to water quality issues, such as bacteriological contamination or exceeding a primary drinking water limit (MCL). The State Department of Public Health requires that all public water systems maintain production to meet the highest single day demand in the past 10 years. As long as the City complies with this requirement, loss of any single well does not adversely impact the City's ability to meet demands.

Probable events that could limit the City's ability to pump groundwater are discussed above. Widespread loss of water production due to "brown or black out" conditions, whereby electricity is lost across the area, could be mitigated with use of the numerous generators owned by the City. These types of conditions are generally very short in nature, lasting a few hours, and would not require implementation of a water shortage emergency plan. The City plans to add emergency power to all well sites by the end of 2015.

The other failure events are mostly isolated to an individual well facility. The longest repair duration is associated with a well casing or screen failure. Depending on the failure, it could take months to mitigate. However, this is accounted for due to public water permitting requirements, as discussed.

Table 5-1 Catastrophic Source Water Failures and Mitigation

Failure Event	Probability	Duration of Outage	Mitigation
Power	High	5 minutes to 1 day	• On-site or mobile generators for several wells.
Mechanical	Medium	1 to 10 days	• Maintain a spare motor(s) • On-call contract with pump repair service • Capability to operate all wells manually • Spare programs for SCADA/starters • On-call contract with programmer • One redundant well in system
Control	Medium	1 hour to 10 days	
Well casing or screen	low	1 week to 6 months	

The City plans to have backup generators at all well sites in the event of a power failure. The City also presently maintains 1.0 million gallons of storage and plans to construct additional storage in the near future (2-5 years). There are no potable water systems directly adjacent to City, so opportunities for emergency interties are not available.

Revenue Impacts during Shortages (§ 10632 (g))

No impact to revenues from water shortages are anticipated.

Water Quality Impacts (§ 10634)

No impacts to water quality from water shortages are anticipated.

Section 6 Demand Management Measures (DMMs) (§ 10631(f-j))

Demand Management Measures Defined

Demand measurement measures (DMMs, also known as Best Management Practices, or BMPs) are a set of specific water conservation mechanisms developed by the DWR that a water supplier can use to achieve its water conservation goals.

Suppliers must provide a description for each DMM/BMP unless they can document that it is not cost effective. The goal of Section 6 is to provide a comprehensive description of the water conservation programs that are currently implemented and those planned to be implemented. The section also defines what the water supplier plans to implement to meet its urban water use targets. Table 6-1 describes the DWR DMMs (BMP).

Table 6-1
DWR Demand Management Measures (DMM/BMP)

BMP	Description
BMP 1	Water survey programs for residential customers
BMP 2	Residential plumbing retrofit
BMP 3	System water audits, leak detection and repair
BMP 4	Metering with commodity rates for all new connections and retrofit of existing unmetered connections
BMP 5	Large landscape conservation programs and incentives
BMP 6	High efficiency clothes-washing machine financial incentive program
BMP 7	Public information programs
BMP 8	School education programs
BMP 9	Conservation programs for commercial, industrial, institutional (CII) accounts
BMP 10	Wholesale agency assistance programs
BMP 11	Retail conservation pricing
BMP 12	Conservation coordinator
BMP 13	Water waste prohibition
BMP 14	Residential ultra-low-flush toilet (ULFT) replacement programs

Of these shown, the City is implementing BMP 4, 11, and 13, and partially implementing BMPs 3 and 7. The City has reviewed the DMMs and found that implementing a portion of the measures will produce the desired water reduction of 20% by 2020. Specifically, BMP 5 in combination with the conservation measures currently in place will achieve this goal.

Last year, the City implemented two specific conservation programs, resulting in a reduction in total water use of approximately 20% from 2013 to 2014. These include an interactive water billing program called Water Insight, and working with City parks staff to reduce large landscape water use. The Water Insight program is a software program (WaterSmart) that uses data from residential water meters, and pairing that data with typical water consumption based on climate, lot size, number of household residents and amenities, such as swimming pools. The software tells homeowners how their water use compares with similar households. It also offers targeted and relevant suggestions on how they might improve their water use. City parks reduced their water use significantly by adjusting irrigation timers. The City plans to upgrade irrigation timers on its largest water users (such as parks and detention basins) that have sophisticated features like temperature and soil moisture sensing. Finally, it is implementing a program that will use advanced water meter information to alert customers they may have a plumbing fixture or pipe leak. All of these, in combination with implementation of mandatory water code programs including SB407, AB1881, and Green Building Code, will allow the City to achieve a 20% or greater reduction in its water use by no later than 2020. However, the City plans to implement other BMPs in the future to further reduce its water demands, as described in Section 4 and shown in Appendix E, *Oakdale Water Conservation Plan*.

APPENDIX A

Notification Letter to County and Other Agencies of 2010 UWMP Update

March 24, 2014

To: All Interested Parties

From: Thom Clark, Public Services Director

Subject: **2010 Urban Water Management Plan Update**

The City of Oakdale is preparing its 2010 Urban Water Management Plan Update (UWMP). The UWMP is required to be updated and submitted to the California Department of Water Resources every five years (Water Code Sections 10610-10657). The law requires that a water agency notify the county in which it serves water 60 days in advance of adopting the UWMP. It also requires the water agency to solicit input from other water purveyors in the area that may have an interest in the plan.

The City is starting work on the plan at this time, and proposes to complete the document in June, 2014. After completion of the draft document, a copy will be forwarded to you for review. After the public review period, staff will present the UWMP to City Council for adoption, currently proposed for August or September, 2014.

If you have an interest in participating in preparation of the plan, or have comments at this time, please contact me via email or in writing.

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Public Services Director
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Oakdale, CA 95361
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APPENDIX B

Public Notices and Resolution for Adopted UWMP

APPENDIX C

Department of Water Resources UWMP Standard Data Tables

Table 1
Coordination with appropriate agencies

Coordinating Agencies ^{1,2}	Participated in developing the plan	Commented on the draft	Attended public meetings	Was contacted for assistance	Was sent a copy of the draft plan	Was sent a notice of intention to adopt	Not involved / No information
Oakdale Irrigation District (OID)				✓		✓	
Modesto Irrigation District (MID)						✓	
Stanislaus County						✓	
City of Modesto						✓	
City of Riverbank						✓	
General public						✓	
Other							

¹ Indicate the specific name of the agency with which coordination or outreach occurred.

² Check at least one box in each row.

Table 2
Population — current and projected

	2010	2015	2020	2025	2030	2035 - optional	Data source ²
Service area population ¹	20,685	21,916	24,285	26,655	24,997	27,871	City of Oakdale

¹ Service area population is defined as the population served by the distribution system. See Technical Methodology 2: Service Area Population (2010 UWMP Guidebook, Section M).

² Provide the source of the population data provided.

Table 3
Water deliveries — 2005 (not available)

	2005			
	Metered		Not metered	
Water use sectors	# of accounts	Volume	# of accounts	Volume
Single family				0
Multi-family				0
Commercial				0
Industrial				0
Institutional/governmental				0
Landscape				0
Agriculture				0
Other				0
Total	0	0	0	0

Units (circle one): acre-feet per year million gallons per year cubic feet per year

Table 4
Water deliveries — actual, 2010 (non-residential accounts assumed 1 per acre)

	2010			
	Metered		Not metered	
Water use sectors	# of accounts	Volume	# of accounts	Volume
Single family (Residential - Estimated)	7,570	3,057		3,057
Multi-family (estimated)	266	97		97
Commercial (Non- Residential) (estimated)	222	533		533
Industrial (estimated)	546	273		273
Institutional/governmental (estimated)	414	744		744
Landscape	0	1		1
Agriculture		0		0
Other				0
Total	9,017	4,706	0	0

Units (circle one): acre-feet per year million gallons per year cubic feet per year

Table 5
Water deliveries — projected, 2015 (non-residential accounts assumed 1 per acre)

Water use sectors	2015				
	Metered		Not metered		Total
	# of accounts	Volume	# of accounts	Volume	Volume
Single family	8,090	2,956			2,956
Multi-family	266	89			89
Commercial	235	494			494
Industrial	597	246			246
Institutional/governmental	448	624			624
Landscape	0	1			1
Agriculture					0
Other					0
Total	9,637	4,409	0	0	4,409

Units (circle one): **acre-feet per year** million gallons per year cubic feet per year

Table 6
Water deliveries — projected, 2020 (non-residential accounts assumed 1 per acre)

Water use sectors	2020				
	Metered		Not metered		Total
	# of accounts	Volume	# of accounts	Volume	Volume
Single family	8,611	2,817			2,817
Multi-family	266	80			80
Commercial	248	459			459
Industrial	649	218			218
Institutional/governmental	451	502			502
Landscape	0	1			1
Agriculture					0
Other					0
Total	10,225	4,077	0	0	4,077

Units (circle one): **acre-feet per year** million gallons per year cubic feet per year

Table 7
Water deliveries — projected 2025, 2030, and 2035 (non-residential accounts assumed 1 per acre)

Water use sectors	2025		2030		2035 - optional	
	metered		metered		metered	
	# of accounts	Volume	# of accounts	Volume	# of accounts	Volume
Single family	9,132	2,984	9,652	3,151	10,173	3,318
Multi-family	266	80	266	80	266	80
Commercial	262	489	275	518	288	548
Industrial	700	218	751	218	803	218
Institutional/governmental	453	505	456	508	458	511
Landscape	0	1	0	1	0	1
Agriculture						
Other						
Total	10,813	4,277	11,400	4,477	11,988	4,676

Units (circle one): **acre-feet per year** million gallons per year cubic feet per year

Table 8
Low-income projected water demands

Low Income Water Demands ¹	2015	2020	2025	2030	2035 - opt
Single-family residential	206	199	213	228	243
Multi-family residential	89	80	80	80	80
Total	294	278	293	308	322

Units (circle one): **acre-feet per year** million gallons per year cubic feet per year

¹ Provide demands either as directly estimated values or as a percent of demand.

Table 9 Sales to other water agencies							
Water distributed	2005	2010	2015	2020	2025	2030	2035 - opt
No sales to other agencies	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0
Units (circle one): <u>acre-feet per year</u> million gallons per year cubic feet per year							

Table 10 Additional water uses and losses							
Water use ¹	2005	2010	2015	2020	2025	2030	2035 -opt
Saline barriers	0	0	0	0	0	0	0
Groundwater recharge							
Conjunctive use							
Raw water							
Recycled water							
System losses		-125	241	221	231	241	251
Other (define)							
Total (2)	0	-125	241	221	231	241	251
Units (circle one): <u>acre-feet per year</u> million gallons per year cubic feet per year							
¹ Any water accounted for in Tables 3 through 7 are not included in this table.							

² System losses are anticipated to decrease from the current 17% down to 10% by the year 2020, and then remain at 10% through the rest of the planning period.

Table 11 Total water use							
Water Use	2005	2010	2015	2020	2025	2030	2035
Total water deliveries (from Tables 3 to 7)		4,706	4,409	4,077	4,277	4,477	4,676
Sales to other water agencies (from Table 9)		0	0	0	0	0	0
Additional water uses and losses (from Table 10)		-125	241	221	231	241	251
Total	0	4,581	4,650	4,298	4,508	4,717	4,927
Units (circle one): <u>acre-feet per year</u> million gallons per year cubic feet per year							

Table 12 Retail agency demand projections provided to wholesale suppliers							
Wholesaler	Contracted Volume ³	2010	2015	2020	2025	2030	2035 -opt
No wholesalers	0	0	0	0	0	0	0

Table 13 Base period ranges			
Base	Parameter	Value	Units
10- to 15-year base period	2009 total water deliveries	4.52	see below
	2009 total volume of delivered recycled water	0	see below
	2009 recycled water as a percent of total deliveries	0	percent
	Number of years in base period ¹	5.00	years
	Year beginning base period range	2001	
	Year ending base period range ²	2010	
5-year base period	Number of years in base period	5	years
	Year beginning base period range	2001	
	Year ending base period range ³	2005	

Units (circle one): acre-feet per year million gallons per year cubic feet per year

Limited historical data is available for the City of Oakdale, so we are providing the only data we have (2009-2013).

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

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

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

Table 14 Base daily per capita water use — 10- to 15-year range				
Base period year		Distribution System Population (1)	Daily system gross water use (mgd)	Annual daily per capita water use (gpcd)
Sequence Year	Calendar Year			
Year 1	1998	14,421	3.31	229
Year 2	1999	14,962	3.77	252
Year 3	2000	15,503	3.91	252
Year 4	2001	15,760	3.92	249
Year 5	2002	16,284	4.11	252
Year 6	2003	16,777	4.28	255
Year 7	2004	17,179	4.26	248
Year 8	2005	17,393	4.40	253
Year 9	2006	17,759	4.24	239
Year 10	2007	18,488	3.61	195
Year 11	2008	19,192	3.66	191
Year 12	2009	19,558	4.52	231
Year 13	2010	20,675	4.09	198
Year 14	2011	20,779	4.31	207
Year 15	2012	20,923	5.49	262
Year 16	2013	21,190	5.35	252
Base Daily Per Capita Water Use ¹				235

(1) Populations data from 2000-2013 from department of finance. 1998-1999 data is back calculated.

Table 15 Base daily per capita water use — 5-year range				
Base period year		Distribution System Population	Daily system gross water use (mgd)	Annual daily per capita water use (gpcd)
Sequence Year	Calendar Year			
Year 1	2001	15760	3.92	249
Year 2	2002	16284	4.11	252
Year 3	2003	16777	4.28	255
Year 4	2004	17179	4.26	248
Year 5	2005	17393	4.40	253
Base Daily Per Capita Water Use ¹				251

¹ Add the values in the column and divid by the number of rows.

Table 16 Water supplies — current and projected							
Water Supply Sources		2010	2015	2020	2025	2030	2035 - opt
Water purchased from ¹ :	Wholesaler supplied volume (yes/no)						
Wholesaler 1 (enter agency name)		0	0	0	0	0	0
Wholesaler 2 (enter agency name)		0	0	0	0	0	0
Wholesaler 3 (enter agency name)		0	0	0	0	0	0
Supplier-produced groundwater ²		4,581	4,650	4,298	4,508	4,717	4,927
Supplier-produced surface water		0	0	0	0	0	0
Transfers in		0	0	0	0	0	0
Exchanges In		0	0	0	0	0	0
Recycled Water		0	0	0	0	0	0
Desalinated Water		0	0	0	0	0	0
Other							
Other							
Total		4,581	4,650	4,298	4,508	4,717	4,927

Units (circle one): acre-feet per year million gallons per year cubic feet per year

¹ Volumes shown here should be what was purchased in 2010 and what is anticipated to be purchased in the future. If these numbers differ from what is contracted, show the contracted quantities in Table 17.

² Volumes shown here should be consistent with Tables 17 and 18.

Table 17 Wholesale supplies — existing and planned sources of water						
Wholesale sources ^{1,2}	Contracted Volume ³	2015	2020	2025	2030	2035 - opt
(source 1)	0	0	0	0	0	0
(source 2)						
(source 3)						

Units (circle one): acre-feet per year million gallons per year cubic feet per year

¹ Water volumes presented here should be accounted for in Table 16.

² If the water supplier is a wholesaler, indicate all customers (excluding individual retail customers) to which water is sold. If the water supplier is a retailer, indicate each wholesale supplier, if more than one.

³ Indicate the full amount of water

Table 18 Groundwater — volume pumped						
Basin name(s)	Metered or Unmetered ¹	2009	2010	2011	2012	2013
San Joaquin Hydrologic Basin, Modesto Subbasin	Metered	5,058	4,581	4,825	6,147	5,988
Total groundwater pumped		5,058	4,581	4,825	6,147	5,988
Groundwater as a percent of total water supply		100.0%	100.0%	100.0%	100.0%	100.0%

Units (circle one): acre-feet per year million gallons per year cubic feet per year

¹ Indicate whether volume is based on volumetric meter data or another method

Table 19 Groundwater — volume projected to be pumped					
Basin name(s)	2015	2020	2025	2030	2035 - opt
San Joaquin Hydrologic Basin, Modesto Subbasin					
Total groundwater pumped	4,650	4,298	4,508	4,717	4,927
Percent of total water supply	100.00%	100.00%	100.00%	100.00%	100.00%

Units (circle one): acre-feet per year million gallons per year cubic feet per year

Include future planned expansion

Table 20 Transfer and exchange opportunities			
Transfer agency	Transfer or exchange	Short term or long term	Proposed Volume
None			
Total			
Units (circle one): acre-feet per year million gallons per year cubic feet per year			

Table 21 Recycled water — wastewater collection and treatment							
Type of Wastewater	2005	2010	2015	2020	2025	2030	2035 - opt
Wastewater collected & treated in service area (1)	661	590	455	420	441	461	482
Volume that meets recycled water standard							
Units (circle one): acre-feet per year million gallons per year cubic feet per year							

(1) Wastewater flows are assumed to be equal to 30% of the estimated water well production. See information to the right of Table 13.

Table 22 Recycled water — non-recycled wastewater disposal							
Method of disposal	Treatment Level	2010	2015	2020	2025	2030	2035 - opt
Rapid filtration ponds		Secondary	Title 22 (2)	1,289	1,352	1,415	1,478
Name of method							
Name of method							
Name of method							
Total		0	0	1,289	1,352	1,415	1,478

Units (circle one): **acre-feet per year** million gallons per year cubic feet per year

(2) limited to 5 mgd and requires a performance certification prior to direct reuse.

Table 23 Recycled water — potential future use							
User type	Description	Feasibility ¹	2015	2020	2025	2030	2035 - opt
Agricultural irrigation	Water could be used by Oakdale Irrigation District. The treatment plant is in the OID service area.	Feasible	0	0	0	0	0
Landscape irrigation ²	Bringing recycled water south across the river and using it to meet irrigation demands currently being served by potable water supplies	Very expensive, not feasible	0	0	0	0	0
Commercial irrigation ³	Requires river crossing and miles of pipe	Very expensive, not feasible	0	0	0	0	0
Golf course irrigation	Requires river crossing and miles of pipe	Very expensive, not feasible	0	0	0	0	0
Wildlife habitat		Possible through a joint agreement with local irrigation districts	0	0	0	0	0
Wetlands		NA	0	0	0	0	0
Industrial reuse	Requires river crossing and miles of pipe	Very expensive, not feasible	0	0	0	0	0
Groundwater recharge	Discharge of the plant is current through the use of high rate perc ponds	Occuring	0	0	0	0	0
Seawater barrier	NA	NA					
Geothermal/Energy	NA	NA					
Indirect potable reuse							
Other (user type)							
Other (user type)							
Total		0	0	0	0	0	0

Units (circle one): acre-feet per year million gallons per year cubic feet per year

¹ Technical and economic feasibility.

² Includes parks, schools, cemeteries, churches, residential, or other public facilities) landscaping, toilets, HVAC, etc) and

Table 24 Recycled water — 2005 UWMP use projection compared to 2010 actual		
Use type	2010 actual use	2005 Projection for 2010 ¹
Agricultural irrigation	0	0
Landscape irrigation ²	0	0
Commercial irrigation ³	0	0
Golf course irrigation	0	0
Wildlife habitat	0	0
Wetlands	0	0
Industrial reuse	0	0
Groundwater recharge	0	0
Seawater barrier	0	0
Geothermal/Energy	0	0
Indirect potable reuse	0	0
Other (user type)	0	0
Other (user type)	0	0
Total	0	0

Units (circle one): acre-feet per year million gallons per year cubic feet per year

¹ From the 2005 UWMP. There has been some modification of use types. Data from the 2005 UWMP can be left in the existing

² Includes parks, schools, cemeteries, churches, residential, or other public facilities)

³ Includes commercial building use such as landscaping, toilets, HVAC, etc) and commercial uses (car washes, laundries, nurseries,

Table 25
Methods to encourage recycled water use

Actions	Projected Results					
	2010	2015	2020	2025	2030	2035 - opt
Financial incentives	None	None	SB 407 Rebates	None	None	None
Reduce City/Public Landscaping Demands	None	500	650	650	650	650
Green Building Code/SB407 Retrofits	None	20	50	150	200	350
Leak Detection	None	None	50	100	200	300
SmartWater Interactive Software	None	250	250	300	350	400
HE Clothes Washing Machines/CII Surveys	None	5	10	40	100	150
Total	0	770	1,000	1,200	1,400	1,850

Units (circle one): **acre-feet per year** million gallons per year cubic feet per year

Table 26
Future water supply projects

Future water supply projects								
Project name ¹	Projected start date	Projected completion date	Potential project constraints ²	Normal-year supply ³	Single-dry year supply ³	Multiple-dry year first year supply ³	Multiple-dry year second year supply ³	Multiple-dry year third year supply ³
Well 10	2015	2016	None	1,000	1,000	1,000	1,000	1,000
Conservation Plan	2014	2040	None	25% Reduction	25% Reduction	25% Reduction	25% Reduction	25% Reduction
Well 10 Storage Tank	2017	2018	None	Peak Hour Demand	Peak Hour Demand	Peak Hour Demand	Peak Hour Demand	Peak Hour Demand
		Total	0	1,000	1,000	1,000	1,000	1,000

Units (circle one): **acre-feet per year** million gallons per year cubic feet per year

¹ Water volumes presented here should be accounted for in Table 16.

2Indicate whether project is likely to happen and what constraints, if any, exist for project implementation.

³ Provide estimated supply benefits, if available.

Table 27
Basis of water year data

Water Year Type	Base Year(s)
Average Water Year	2008
Single-Dry Water Year	2014
Multiple-Dry Water Years	2012-2015

Table 28
Supply reliability — historic conditions

Average / Normal Water Year	Single Dry Water Year	Multiple Dry Water Years			
		Year 1	Year 2	Year 3	Year 4
	2014	2012	2013	2014	2015
Percent of Average/Normal Year:	59.0%	78.0%	82.0%	59.0%	94.0%

Table 29
Factors resulting in inconsistency of supply

Water supply sources ¹	Specific source name, if any	Limitation quantification	Legal	Environmental	Water quality	Climatic	Additional information
Groundwater		0					

Units (circle one): acre-feet per year million gallons per year cubic feet per year

¹ From Table 16.

Table 30 Water quality — current and projected water supply impacts							
Water source	Description of condition	2010	2015	2020	2025	2030	2035 - opt
Groundwater	Good	None	None	None	None	None	None

Units (circle one): acre-feet per year million gallons per year cubic feet per year

Table 31 Supply reliability — current water sources				
Water supply sources ¹	Average / Normal Water Year Supply ²	Multiple Dry Water Year Supply ²		
		Year 2011	Year 2012	Year 2013
Groundwater	5,500	5,500	5,500	5,500
Percent of normal year:	100.0%	100.0%	100.0%	100.0%

Units (circle one): acre-feet per year million gallons per year cubic feet per year

¹ From Table 16.

² See Table 27 for basis of water type years.

Table 32 Supply and demand comparison — normal year					
	2015	2020	2025	2030	2035 - opt
Supply totals (from Table 16)	4,650	4,298	4,508	4,717	4,927
Demand totals (From Table 11)	4,650	4,298	4,508	4,717	4,927
Difference	0	0	0	0	0
Difference as % of Supply	0.0%	0.0%	0.0%	0.0%	0.0%
Difference as % of Demand	0.0%	0.0%	0.0%	0.0%	0.0%

Units are in acre-feet per year.

Table 33 Supply and demand comparison — single dry year					
	2015	2020	2025	2030	2035 - opt
Supply totals ^{1,2}	4,650	4,298	4,508	4,717	4,927
Demand totals ^{2,3,4}	4,650	4,298	4,508	4,717	4,927
Difference	0	0	0	0	0
Difference as % of Supply	0.0%	0.0%	0.0%	0.0%	0.0%
Difference as % of Demand	0.0%	0.0%	0.0%	0.0%	0.0%

Units are in acre-feet per year.

¹ Consider the same sources as in Table 16. If new sources of water are planned, add a column to the table and specify the source, timing, and amount of water.

² Provide in the text of the UWMP text that discusses how single-dry-year water supply volumes were determined.

³ Consider the same demands as in Table 3. If new water demands are anticipated, add a column to the table and specify the source, timing, and amount of water.

⁴ The urban water target determined in this UWMP will be considered when developing the 2020 water demands included in this table.

Table 34 Supply and demand comparison — multiple dry-year events						
		2015	2020	2025	2030	2035 - opt
Multiple-dry year first year supply	Supply totals ^{1,2}	4,650	4,298	4,508	4,717	4,927
	Demand totals ^{2,3,4}	4,650	4,298	4,508	4,717	4,927
	Difference	0	0	0	0	0
	Difference as % of Supply	0.0%	0.0%	0.0%	0.0%	0.0%
	Difference as % of Demand	0.0%	0.0%	0.0%	0.0%	0.0%
Multiple-dry year second year supply	Supply totals ^{1,2}	4,650	4,298	4,508	4,717	4,927
	Demand totals ^{2,3,4}	4,650	4,298	4,508	4,717	4,927
	Difference	0	0	0	0	0
	Difference as % of Supply	0.0%	0.0%	0.0%	0.0%	0.0%
	Difference as % of Demand	0.0%	0.0%	0.0%	0.0%	0.0%
Multiple-dry year third year supply	Supply totals ^{1,2}	4,650	4,298	4,508	4,717	4,927
	Demand totals ^{2,3,4}	4,650	4,298	4,508	4,717	4,927
	Difference	0	0	0	0	0
	Difference as % of Supply	0.0%	0.0%	0.0%	0.0%	0.0%
	Difference as % of Demand	0.0%	0.0%	0.0%	0.0%	0.0%
Units are in acre-feet per year.						
¹ Consider the same sources as in Table 16. If new sources of water are planned, add a column to the table and specify the source, timing, and amount of water.						
² Provide in the text of the UWMP text that discusses how single-dry-year water supply volumes were determined.						
³ Consider the same demands as in Table 3. If new water demands are anticipated, add a column to the table and specify the source, timing, and amount of water.						
⁴ The urban water target determined in this UWMP will be considered when developing the 2020 water demands included in this table.						

Table 35 Water shortage contingency — rationing stages to address water supply shortages		
Stage No.	Water Supply Conditions	% Shortage
I	State of California Declares Drought Measures Required	5-15%
II	State of California Declares Drought Measures Required	15-25%
III	State of California Declares Drought Measures Required	25-40%
IV	State of California Declares Drought Measures Required	40%+
¹ One of the stages of action must be designed to address a 50 percent reduction in water supply.		

Table 36 Water shortage contingency — mandatory prohibitions	
Examples of Prohibitions	Stage When Prohibition Becomes Mandatory
Public Outreach and no water unless requested at restaurants	I
Washing cars and boats limited to 1 day per week	II
No outdoor fountain using potable water	II
Increase Public Outreach	II
Double Penalties	II
Repair leaks within 7 days	II
No potable water for construction	III
No washing of cars or boats	III
Triple Penalties	III
Establish mandatory reductions and practices as needed	IV

Table 37
Water shortage contingency — consumption reduction methods

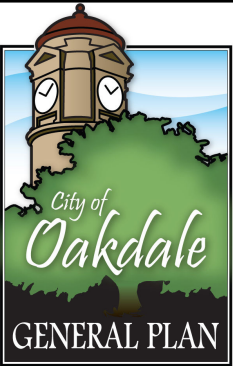
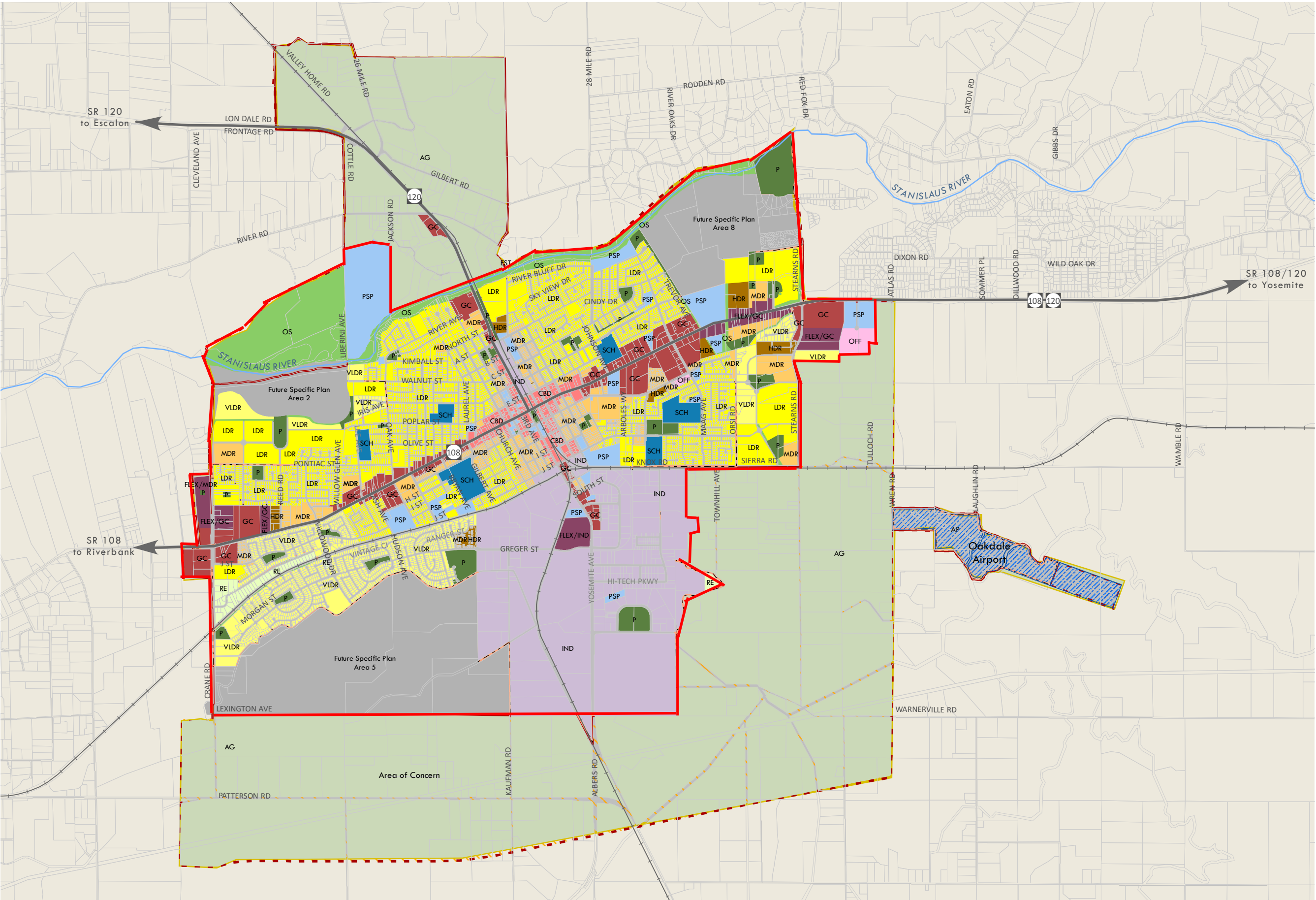
Consumption Reduction Methods	Stage When Method Takes Effect	Projected Reduction (%)
See above		

Table 38
Water shortage contingency — penalties and charges

Penalties or Charges	Stage When Penalty Takes Effect	
Failure to comply with mandatory drought reduction measures	Continuous	\$50-\$200
Double penalties	II	
Triple penalties	III	

APPENDIX D

City of Oakdale General Plan Map 2013



- Legend
- Residential Neighborhoods**
- Rural Estate (RE)
 - Very Low Density Residential (VLDR)
 - Low Density Residential (LDR)
 - Medium Density Residential (MDR)
 - High Density Residential (HDR)
- Commercial & Employment**
- General Commercial (GC)
 - Central Business District (CBD)
 - Office (OFF)
 - Industrial (IND)
- Mixed Uses**
- Flex Use (FLEX)
- Public Uses & Open Space**
- Public and Semi-Public (PSP)
 - Airport (AP)
 - School (SCH)
 - Park (P)
 - Open Space (OS)
 - Agriculture (AG)
- Other**
- Future Specific Plan
 - Area of Concern
 - Oakdale City Limits
 - Existing Sphere of Influence
 - Future Sphere of Influence
 - 2030 Planning Area

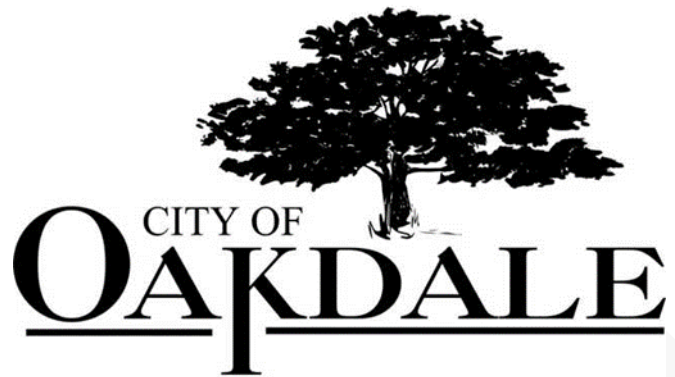
Source: Source: Stanislaus County, 2009; ESRI, 2011; City of Oakdale, 2008; Atkins, 2011; and ESA, 2012
Date Revised: June 26, 2012



0 0.25 0.5 1
Miles

APPENDIX E

City of Oakdale Water Conservation Plan



Water Conservation Plan and Cost Analysis

DRAFT

April 2015

Prepared by:
MCR Engineering

1.0 Introduction

Water in California is a limited resource. A combination of factors will exacerbate this problem with the passage of time. Population growth, inevitable periods of drought, climate change, and regulatory constraints will all contribute to reductions in water availability. Market forces of supply and demand will drive the cost of water upwards. These conditions are inexorable, so water purveyors should prepare accordingly.

The traditional solution in public agency planning when faced with a resource constraint is to develop additional supplies. In the water industry, this has often included buying surface water entitlements, constructing or expanding reservoirs, and deepening wells. Of late, alternatives for additional water supplies have included use of recycled wastewater, and desalination of sea water. However, many of these “supply management” alternatives are not feasible or too costly. Developing additional supplies is often complex, expensive, environmentally adverse, and must be implemented at a state or regional level to be successful, and take years to implement. Thus, many communities are turning to “demand management” alternatives, also commonly referred to as conservation.

The value of a water conservation program goes far beyond the concept that it’s something we do during a drought, or it is environmentally friendly. The average Californian consumes over nearly 200 gallons per day (gpd) between their indoor and outdoor use (EPA, 2006). The City of Oakdale is higher than average, at about 250 gpd per person. Each of these gallons must be produced, treated, transported, and a portion heated prior to use by homes and businesses. Once used, some of this water becomes waste, and it must be collected, transported, treated, and discharged. All of these actions require the construction of expensive infrastructure, and life-long operation and maintenance. Cost impacts are significant, and summarized herein:

1. **Infrastructure** – The main cost of water infrastructure associated with meeting demands include wells and storage tanks. Pipelines represent a major expense, but need to be constructed regardless of the amount of water used, and typically sized based on fire suppression needs. Based on current use, the proportionate cost of a well and storage for a single family home in Oakdale is approximately \$2,500. If treatment is required in the future (as a result of declining groundwater tables), this cost could double.
2. **Operation and Maintenance** – The cost of operating and maintaining a water facility throughout its lifespan is typically estimated to be about ½ the construction cost. Thus, when budgeting facility costs, an agency can roughly double the figure for a true cost of ownership.

Another important factor when evaluating water infrastructure planning is the impact on electrical systems and availability. As California continues to struggle with its many critical energy supply and infrastructure challenges, the state must identify and address the points of highest stress. At the top of this list is California's water-energy relationship: water-related energy use consumes 19 percent of the state's electricity, 30 percent of its natural gas – and this demand is growing. As water demand grows, so grows energy demand. Since population growth drives demand for both resources, water and energy demand are growing at about the same rate. Water demand and electricity demand are growing rapidly in many of the same parts of the state stressing already constrained electricity delivery systems. When electric infrastructure fails, water system reliability quickly plummets and threatens the public health and safety. The State Water Plan concludes that the largest single new "supply" available for meeting expected growth in water demand over the next 25 years is water use efficiency, or conservation. The remainder must be provided by the development of new water supplies including water recycling, and desalination of both brackish and seawater, but these alternatives increase energy demand over current levels. Water conservation results in a corresponding decrease in energy use.

Specifically, the “water-energy” spiral in Oakdale is as follows: As water demands increase, more groundwater is pumped. This lowers the local groundwater table, thereby increasing the energy cost to pump the water (from deeper zones). Well pumping equipment must be larger (electric motors), so power supplies must be increased. Often pumping water from deeper zones increases the salinity and mineral content of the water, resulting in the need for treatment. Treatment increases the energy requirement of the water supply.

The City’s 2013 General Plan identifies the need to implement water conservation measures, and reduce energy use in accordance with its Climate Action Plan. Since energy use is directly associated with water use, all water conservation measures assist the City achieve its energy reduction and Climate Plan goals. Specifically, the 2013 GP includes adopted policies as shown in Table 1-1.

Table 1.1 - Water Conservation Related General Plan Policies

PF-1.11 Energy Efficiency: <i>Employ the best practices to maintain the highest possible energy efficiency in the water infrastructure system to reduce costs and greenhouse gas emissions.</i>
PF-1.12 Water Conservation Programs: <i>Implement the City’s water conservation program, and amend the program as appropriate to reflect evolving technologies and best practices, consistent with the Oakdale Climate Action Plan.</i>
PF-1.13 Building and Site Design: <i>Require new development to incorporate water saving technique such as water efficient fixture, drought tolerant landscaping, onsite storm water capture and reuse, and on site commercial and industrial water reuse in accordance with state and other relevant standards.</i>
PF-1.15 Water Education: <i>Educate residents and businesses about the importance of water conservation and associated techniques and programs.</i>

PF-5.8 Energy Efficiency: *Encourage all new development to implement additional energy efficient measures beyond what is required by State Law to exceed minimum energy efficiency requirements consistent with the Oakdale Climate Action Plan.*

PF-5.11 Retrofit Existing Buildings: *Coordinate with local energy providers to increase energy efficiency by promoting the retrofit and renovation of existing buildings through energy rebates and incentives consistent with the Oakdale Climate Action Plan.*

2.0 Water Conservation Purpose, Need, and Benefit

Currently the City has a basic conservation program, consisting primarily of voluntary actions by the water customers. Conservation actions include odd-even watering, using shut-off nozzles on hoses, and a call to fix broken sprinkler heads. These conservation actions were commonly included in most city ordinances throughout the Central Valley starting in the 1980s, and have had marginal success. However, the most effective water conservation programs are those that have changed from a voluntary-based program to a program that is actively implemented and managed by the water purveyor. These “active” conservation programs are often required to achieve the mandatory conservation goals as established by the State of California. Active conservation programs may include residential and commercial water audits, financial incentives to replace old plumbing fixtures or clothes washing machines, tiered billing rates with harsh penalties for overuse, distribution system leak detection, etc.

There are three primary reasons for the City to implement water conservation programs: (1) many conservation programs are mandatory, (2) water conservation is cost effective, and (3) water conservation is consistent with the City’s General Plan and Policies. Section 2.1 describes the current conservation laws, codes, and other activities that impact water planning in Oakdale. The second reason to implement a water conservation program is to reduce the cost of providing water service. These benefits are described in Section 3.

2.1 Water Conservation Codes and Laws

The State of California, Department of Water Resources (DWR) is rapidly moving California's approach to water from one that sought to increase supplies, to one that is based on responsible use of supplies that are currently available. In the 2009 Water Plan, DWR Included three foundational actions one of which is using water more efficiently to gain maximum utility from existing supplies. Translated, this means an aggressive approach to water conservation through a combination of mandatory and incentive-based water laws and programs.

In February 2008, Governor Schwarzenegger introduced a seven-part comprehensive plan for improving the Sacramento-San Joaquin Delta. The first element of the Governor's Delta plan is water conservation. In the Governor's words, California must have:

"A plan to achieve a 20 percent reduction in per capita water use statewide by 2020. Conservation is one of the key ways to provide water for Californians and protect and improve the Delta ecosystem. A number of efforts are already underway to expand conservation programs, but I plan to direct state agencies to develop this more aggressive plan and implement it to the extent permitted by current law. I would welcome legislation to incorporate this goal into statute."

According to the Governor's office, Delta protection and restoration are not the only reasons to increase conservation efforts. Global climate change will affect water management in California, and water conservation will help the state not only mitigate climate change by reducing greenhouse gas emissions and reduce energy use, but also adapt to climate change by reducing water use. Approximately one-fifth of the electricity and one-third of the non-power plant natural gas consumed in the state are associated with water delivery, treatment and use,

so efficient use also can reduce water related energy demands and associated greenhouse gas emissions.

Mandatory conservation measures for reducing urban indoor and outdoor water use have been approved by the State legislature, including AB 1881, “Water Efficient Landscape” Ordinance, SB 407, “Plumbing Retrofit”, and California Green Building Code. Collectively these laws will greatly impact the City’s future water program and demand projections.

State water conservation measures are imposed through a “carrot and stick” system of making grants and low interest loans available to those communities that implement programs consistent with the state laws, and beginning in 2010, Urban Water Management Plans will not be approved without proper and adequate water conservation measures identified. According to the Urban Water Management Plan Act (“UWMP Act” (California Water Code §10610 et seq.), an approved UWMP with appropriate water conservation measures proposed “... *is required for an urban water supplier to be eligible for a water management grant or loan administered by DWR, the State Water Resources Control Board (State Water Board), or the Delta Stewardship Council (CWC §10631.5(a)).* Changes to California law require that, beginning in 2016, water suppliers comply with water conservation requirements established by the Water Conservation Bill of 2009 in order to be eligible for State water grants or loans.

In July 2014, the State Water Resources Control Board adopted unprecedented regulations for water wasting and failure to implement water conservation activities. Resolution 2014-0038 states: “*Water conservation is the easiest, most efficient and most cost effective way to quickly reduce water demand and extend supplies ...*”. The new law declares that water use violations are infractions punishable by fines of up to \$500 a day, and tickets could be written by any public employee empowered to enforce said laws. “Water waste” was defined as overwatering of lawns and landscaping that causes runoff onto sidewalks or streets, washing sidewalks, driveways and other hard surfaces, using a hose to wash a vehicle unless the hose has a shut-

off nozzle and using drinking water in a fountain or decorative water feature unless the water is recirculated, etc. Under the rules, urban water agencies would have to implement their water-shortage contingency plans to require mandatory restrictions on outdoor water use, if they have not done so already. Urban water agencies not complying with water conservation measures could face fines up to \$10,000 each day. Although this action was in response to the 2014 drought, and is scheduled to expire in April 2015, it is a clear signal from the State of California that urban water purveyors need to become as concerned with water conservation as they are with sewage discharge requirements.

Water conservation is assumed to become a significant part of the City's water program. Some water conservation efforts are currently mandated, and others will likely follow in time. The City may voluntarily elect to implement certain conservation measures to minimize the cost of supplying water, reduce wastewater production, enhance source water reliability, address an environmental concern, etc. Normally, elected water conservation measures must first prove to be cost effective prior to implementation. Higher demand reduction may eventually prove to be cost effective or necessary due to reliability/availability issues with source supplies. For purposes of this study, it is assumed that the City will achieve a 20% reduction in its base demands, due to mandatory conservation laws. As such, conservation becomes a significant source water "supply" in the water program.

Mandatory water conservation programs can be divided into three (3) categories. The first includes conservation programs that are integrated into California law, such as state building and water codes, or included in the City's water or wastewater permits. The second is required as part of a program which the City desires to be a participant, such as state grant or loan program. The third includes conservation measures that are mandatory, whereby the City can implement in part to meet an overall conservation goal, or seek exemptions based on a poor cost-benefit evaluation. Obviously, the City could choose to implement certain water conservation measures or programs for other reasons than cost-benefit.

DWR provides “conservation credit” for the use of recycled wastewater. Although the City provides tertiary treatment of its wastewater, it does not currently have a non-potable water distribution system or program, and there are no plans to use recycled wastewater for non potable demands (i.e. parks and school landscaping, etc).

Current mandatory water conservation measures the City is (or will be) required to address are described below.

- A. Water Conservation Act of 2009** (Senate Bill (SB) x7-7): – The overall goal of SBx7-7 is to reduce urban water use statewide by 20% in the next 10 years. This legislation also includes mandatory measures for agricultural conservation. The “mechanism” through which urban water purveyors are to accomplish the provisions of SBx7-7 is in the Urban Water Management Plan (UWMP). ¹ In 2010 DWR required urban water purveyors to select one of four methods to determine their “target” water use, or the average amount of water each City resident should use per day after a “20% reduction in per capita use”. Once the target use is determined, the water purveyor must provide a conservation strategy to reduce water use to meet the target, half of the difference by 2015, and the full reduction by 2020. The target and conservation strategies are to be defined and documented in the water purveyor’s 2010 UWMP Update. Conservation measures recommended include the 14 Best Management Practices (BMP’ which are defined by the California Urban Water Conservation Council (CUWCC), or Demand Management Measures (DMM’s) as defined in SBx7-7, and described in more detail below.

¹ Although the City is not required to develop an UWMP currently since it has less than 3,000 service connections, it will surpass this threshold before reaching build-out. Thus, future demands account for this code.

B. Urban Water Management Plan – All urban water purveyors serving at least 3,000 service connections or delivering more than 3,000 acre-feet of water must prepare, adopt, and submit to DWR, an Urban Water Management Plan in accordance with California Water Code §10610. As part of the 2010 UWMP Update, DWR requires urban water suppliers to report, describe, and evaluate:

- Water deliveries and uses
- Water supply sources
- Efficient water uses
- Demand Mitigation Measures (DMMs), including implementation strategy and schedule.

DMMs are specific actions a water supplier takes to support its water conservation efforts. Specifically, the UWMP Act identifies 14 DMMs (CWC 10631(f)) that are to be evaluated in each UWMP. The 14 DMMs are:

1. Water survey programs for single-family residential and multifamily residential customers
2. Residential plumbing retrofit
3. System water audits, leak detection, and repair
4. Metering with commodity rates for all new connections and retrofit of existing connections
5. Large landscape conservation programs and incentives
6. High-efficiency washing machine rebate programs
7. Public information programs
8. School education programs
9. Conservation programs for commercial, industrial, and institutional accounts
10. Wholesale agency programs

11. Conservation pricing
12. Water conservation coordinator
13. Water waste prohibition
14. Residential ultra-low-flush toilet replacement programs

These 14 DMM's roughly correspond to the 14 BMP's listed and described in the California Urban Water Conservation Council (CUWCC) Memorandum of Understanding (MOU). Signatory water suppliers to the CUWCC MOU commit to BMPs and implement these measures as part of their urban water conservation programs. An urban water supplier's UWMP is to document its DMM implementation by either:

- Providing the required information for each DMM
- Submitting a copy of its approved CUWCC BMP report, if the supplier is a signatory to the CUWCC MOU

In summary, an urban water purveyor's 2010 UWMP must either show compliance with the DMM's, a schedule of DMM implementation, or a quantitative cost-benefit justification that the DMM/BMP is not cost effective.

- C. The Water Conservation in Landscaping Act - Model Water Efficient Landscape Ordinance** (Assembly Bill (AB) 1881) – The goal of AB 1881 is to establish a method to plan, design, and evaluate water conserving landscapes. Cities and counties in California were provided the option of either creating and adopting their own “*at least as effective*” ordinance, or simply adopting the state model ordinance. The Model Ordinance (California Code of Regulations Title 23, Waters Division 2, Department of Water Resources Chapter 2.7, Model Water Efficient Landscape Ordinance) is a 33-page document that provides specific

direction for agencies to evaluate and approve landscape design and construction. Applicability of the ordinance includes:

- (1) new construction and rehabilitated landscapes for public agency projects and private development projects with a landscape area equal to or greater than 2,500 square feet requiring a building or landscape permit, plan check or design review;
- (2) new construction and rehabilitated landscapes which are developer-installed in single-family and multi-family projects with a landscape area equal to or greater than 2,500 square feet requiring a building or landscape permit, plan check, or design review;
- (3) new construction landscapes which are homeowner-provided and/or homeowner-hired in single family project landscape area equal to or greater than 5,000 square feet requiring a building or landscape permit, plan check or design review;
- (4) existing landscapes limited to Sections 493, 493.1 and 493.2; and
- (5) cemeteries.

The ordinance does not apply to:

- (1) registered local, state or federal historical sites;
- (2) ecological restoration projects that do not require a permanent irrigation system;
- (3) mined-land reclamation projects that do not require a permanent irrigation system; or
- (4) plant collections, as part of botanical gardens and arboretums open to the public.

In summary, the Model Ordinance establishes a water budget for the overall project, based on area and local hydrologic data, by which the landscape design must stay within through selection of low, moderate, and high water use plants and landscaping. Agencies are responsible to review the project landscape, irrigation, and grading designs and certify the installation. Certification of the project installation includes an audit of water use, and verifying the irrigation controller settings, and other miscellaneous items.

- D. 2008 California Green Building Standards Code** (California Building Standards Code, Title 24) – New building standards include provisions to reduce the use of water, energy, building materials, as well as reduce waste, pollution, etc. The code includes mandatory and volunteer provisions for residential and commercial building. Mandatory water conservation provisions include the use of water conserving plumbing fixtures, and methods to reduce outdoor water use.

A stated goal of the mandatory water conservation measures is to reduce indoor water use of all new buildings by 20%, as described in Section 4 (Residential) and Section 5 (Non Residential) of the code. Each section is shown below:

4.303.1 *Twenty percent savings. A schedule of plumbing fixtures and fixture fittings that will reduce the overall use of potable water within the building by at least 20 percent shall be provided. The reduction shall be based on the maximum allowable water use per plumbing fixture and fitting as required by the California Building Standards Code. The 20 percent reduction in potable water use shall be demonstrated ...*

5.303.2 Twenty percent savings. *A schedule of plumbing fixtures and fixture fittings that will reduce the overall use of potable water within the building by 20 percent shall be provided. The reduction shall be based on the maximum allowable water use per plumbing fixture and fittings as required by the California Building Standards Code. The 20 percent reduction in potable water use shall be demonstrated ...*

Outdoor water use is also addressed with installation of “smart” irrigation controllers with rain/moisture sensors, following AB 1881, etc.

2008 Green Building Standards will affect future development by significantly reducing indoor and outdoor water use. Since this law is mandatory, all new developments in the City will be obligated to comply. A 20% reduction in future water use associated with new development was assumed to be part of the City’s water supply program and incorporated in to future demand projections.

- E. Property Transfers: Replacement of Plumbing Fixtures (SB 407)** – The goal of SB 407 is to retroactively replace plumbing fixtures in buildings that were built prior to the availability of water efficient models (1994). Specifically, language states:

“ (g)... it is the intent of the Legislature to require that residential and commercial real property built and available for use or occupancy on or before January 1, 1994, be equipped with water-conserving plumbing fixtures, (h) It is further the intent of the Legislature that retail water suppliers are encouraged to provide incentives, financing mechanisms, and funding to assist property owners with these retrofit obligations. 1101.2. Except as provided in Section 1101.7, this article shall apply to residential and commercial real property built and available for use on or before January 1, 1994.

The schedule for compliance is as follow:

- 2014: All residential/commercial building alterations or improvements must replace non-compliant fixtures for permit approval;
- 2017: All noncompliant plumbing fixtures in any single-family residential real property shall be replaced by the property owner with water-conserving plumbing fixtures, and on and after January 1, 2017, a seller or transferor of all residential properties must disclose requirements for replacing fixtures and whether the property is compliant upon sale or transfer;
- 2019: All multi-family and commercial properties must disclose requirements for replacing fixtures and whether the property is compliant upon sale or transfer, and all fixtures must be replaced by this date.

In effect, the intent of SB 407 is for water purveyors to create programs to ensure that all older buildings (pre-1994) be retrofitted with water conserving plumbing fixtures, regardless of the economic benefits. As such, the City will likely elect to initiate programs to retrofit those residential buildings equipped with old fixtures to be in compliance with the code. This is an example of a DMM/BMP that requires a program independent of cost-benefit analysis. The number of homes within the City built prior to 1994 is approximately 4,500 units.

- F. Demand Measurement Implementation (AB 1420)** – This code requires that all water purveyors seeking state grant or loan funding complete an AB 1420 report, which is then submitted to DWR for review and determined by DWR that the water purveyor’s DMM/BMP activities are adequate to be eligible to receive

funding. AB 1420 allows for proposed and exempted DMM/BMP's. In summary, AB 1420 states that an urban water purveyor has obtained a determination of "compliant" from DWR, it means that the urban water supplier has met one of the following four criteria:

- Has, in the past, implemented all BMPs at a coverage level determined by the CUWCC MOU; or
- Is currently implementing all BMPs at a coverage level determined by the CUWCC MOU; or
- Has submitted a schedule, budget, and finance plan to implement all BMPs at a coverage level determined by CUWCC and commencing within the first year of the agreement for which grant funds are requested; or
- Has demonstrated by providing supporting documentation that certain BMPs are "not locally cost effective."

A summary of the water and building codes are provided in Table 2.1.

Table 2.1 – Summary of Water Conservation Codes

Code	Description	Applicability
SBx7-7	Reduce urban water use 20% by 2020	Mandatory w/exemptions
UWMP	Address DMM's in 2010 UWMP	Mandatory w/exemptions
AB 1881	Water Conserving Landscape Ordinance	Mandatory
Building Code	Water Conserving Plumbing Fixtures	Mandatory
SB 407	Retrofit Fixtures in Pre-1994 Buildings	Mandatory
AB 1420	Grant Fund Conservation Commitment	Mandatory

3.0 Cost Benefit Analysis of Water Conservation

This section provides a summary of the analysis performed to determine cost savings of conservation activities. All of the conservation activities are among those conservation measures as recommended by the Department of Water Resources (DWR), or as required by the California Water Code. The conservation activities included a total of five (5) independent “scenarios”, whereby each was analyzed for cost benefits (i.e. program costs vs energy savings and avoided capital spending for new or replaced water infrastructure).

3.1 Methods and Analysis Explanation

Five scenarios were selected and analyzed to demonstrate the benefits of reductions in water use, a “do nothing” scenario, and four (4) conservation scenarios, for a 30-year planning horizon (2015-2045). Conservation “measures” or activities for the four scenarios were selected all have “non-behavior dependent” qualities, meaning conservation from these measures do not depend on a voluntary action by the public, but include physical and semi-permanent changes that directly result in reduced water demands (i.e. installing a low-flush toilet vs asking the public not to wash their cars). Conservation programs that rely solely on public cooperation are unreliable in the long term, and need regular and perpetual attention to maintain their effectiveness.

The five conservation scenarios analyzed are described in Table 3.1.

Table 3.1 – Conservation Scenario Descriptions

Scenario	Description
1	No additional conservation measures implemented (Pre 2014 “Business as usual”).
2	SBX-7 Required Conservation of 20% by the year 2020, achieved through reduction in large water users (i.e. parks, schools, cemeteries, etc.) and residential use through education. Conservation greater than 20% was recorded in 2014 using these measures. Upgrade irrigation controllers at all large institutional properties with temperature sensing and soil moisture sensing features.
3	Implementation of SB-407 through replacement of toilets, showerheads, and faucets in all homes constructed prior to 1994 with Green Building Code devices. Provide rebates or other financial incentives.
4	Locate and repair water leaks in the distribution system through the use of modern detection equipment and trained personnel. Reduce other unnecessary unaccounted for water by limiting flushing and fire hydrant testing.
5	Use of high efficiency residential clothes washers. Timing of this measure will result in a “self implemented” program and require no active participation by the City, as only high efficiency washers will be available over time.

3.2 Water Usage Reduction Calculations and Assumptions

The analysis assumes

that conservation scenarios are implemented in a liner manner (i.e. Scenario 1 then Scenario 2, etc.). Each additional conservation measure provides further per capita reductions to the total conservation and savings potential, as explained in Table 3.1. The gallons per capita per day (GPCD) usage for Scenario 1, which was used as a baseline, was estimated at 242 GPCD, an average historic water use for the City. The reduction value of each conservation measure was estimated using multiple sources, including an urban water efficiency report by the National Resources Defense Council (NRDC), the EPA Water Sense program, and DWR SBX-7 literature.² The reduction in GPCD was then applied to the population. Population projections for current

² “Urban Water Conservation and Efficiency Potential in California”, NRDC, 2014, <http://www.nrdc.org/water/files/ca-water-supply-solutions-urban-IB.pdf>; EPA Watersense Program, <http://www.epa.gov/watersense/products/index.html>, DWR 20x2020 Water Conservation Plan, 2010, http://www.swrcb.ca.gov/water_issues/hot_topics/20x2020/docs/20x2020plan.pdf

through build out conditions were estimated using City Planning Department data.

3.3 Conservation Cost Savings Assumptions Calculations

The following

assumptions were used to determine the operating cost savings from avoiding delivery of water due to conservation:

- Total Dynamic Head (TDH) was assumed to be 120 feet pumping water level plus 60 psi discharge pressure, for a TDH equal to 260 ft.
- The price of a kWh was assumed to be \$0.12, the current rate of PG&E power in Oakdale.
- The cost of construction for a new well was assumed to be \$1.5 M
- Assumption of new well required upon an overall increase of 750 GPM, under average day conditions, as a well produces 1500 GPM and Max Day conditions are twice average day conditions.

Cost savings from water conservation include both operational (energy) and capital costs. Energy savings are realized when less water is pumped from the ground and to homes and businesses. The cost of pumping were based on the power required to operate a well pump, as shown in Equation 1 (EQN 1):

$$\text{Brake Horsepower, BHP} = \frac{TDH * GPM}{3960 * \eta} \quad (\text{EQN 1})$$

Where:

TDH=Total Dynamic Head (ft)

GPM=Gallons Per Minute

3960=Multiplication Constant

η =Efficiency of Pump of 72%³

Using the calculated BHP in combination with an assumed motor efficiency of 95%, \$0.12/ kWh (the current rate of power according to PG&E), the energy cost from reductions in water use were calculated.

Capital savings is avoided new or replacement infrastructure construction costs that results from less water use. With less demand, Oakdale would require fewer wells and smaller storage tanks and booster stations. Production wells were assumed to cost \$1.5 m to construct and supply 1500 GPM per unit. These savings were then extrapolated over time to show conservation savings potential growth over the decades. Savings were calculated for a one year life span ranging until build out conditions. The total value of the conservation measures were calculated by subtracting the cost of the program from the savings potential.

The theoretical cost savings (or cost avoidance) potential of conservation programs can be seen in Table 3.2. The cost savings shown assume full implementation of the conservation measures from day one, and quantifies the costs avoided over time. Each of the scenarios and their associated savings (capital and operational) are shown for 10, 20, and 30 year projections. The cost savings are cumulative, whereas each subsequent scenario includes implementation of all previous conservation measures. Also shown in the table are the program costs, and the net value (savings minus conservation program costs, as described in Section 3.4). It is unrealistic to assume the City could implement all conservation measures in less than 5 years, so full cost savings could not be realized until at least 2020, assuming the City were to make conservation one of its highest priorities. However, the numbers do quantify the value of water conservation over time, and why it is prudent to pursue conservation efforts without further delay.

³ Assumes use of VFD, whereby pump efficiencies are not regularly operating at highest possible efficiency.

Table 3.2 - Savings, Costs, and Values of Different Conservation Scenarios

Date	10 Year		20 Year		30 Year	
	Capitol	Operation	Capitol	Operation	Capitol	Operation
Scenario 1	\$0	\$0	\$0	\$0	\$0	\$0
Scenario 2	\$1,175,250	\$732,339	\$1,400,000	\$2,026,494	\$1,400,000	\$4,205,715
Scenario 3	\$1,175,250	\$859,310	\$671,667	\$2,280,436	\$671,667	\$4,586,628
Scenario 4	\$1,175,250	\$1,240,853	\$2,018,333	\$3,043,523	\$3,027,500	\$5,731,258
Scenario 5	\$1,175,250	\$1,653,714	\$2,184,000	\$3,869,244	\$4,368,000	\$6,969,840
Total Savings	\$2,828,964		\$6,053,244		\$11,337,840	
Total Program Cost	\$1,525,000		\$1,525,000		\$1,525,000	
Total Net Saving	\$1,303,964		\$4,528,244		\$9,812,840	

3.4 Conservation Program Costs and Assumptions

Costs for each of the four (4)

conservation measures were developed. These costs include implementation (a one time “start up” or program development cost), cost to manage the program, and operating costs (i.e. equipment, rebates, contractors, etc.). The annual costs for each scenario are shown in Table 3.3. “Years” indicate the number of annual costs (start up, management, and operation) associated with each conservation measure.

Table 3.3 - Conservation Measure Implementation and Operating Cost Estimates

Scenario	Startup Cost	Years	Management Cost	Years	Operation Cost	Years	Cost Totals
2	\$25,000	1	\$25,000	4	\$75,000	2	\$425,000
3	\$25,000	1	\$40,000	5	\$100,000	5	\$725,000
4	\$25,000	1	\$25,000	5	\$75,000	5	\$525,000
5	\$0.00	NA	\$0.00	NA	\$0.00	NA	\$0
Total	\$75,000		\$425,000		\$1,025,000		\$1,675,000

Startup costs were assumed to be a one-time cost for developing the program. Management costs, rebate/supply costs, and the number of years required to implement a conservation

measure were estimated using existing programs, data from CUWCC, or other means. Scenario 5 was assumed to have no cost since the average life of a washing machine is 12- 15 years, and the market will only provide high efficiency units per state and federal energy codes. Thus, normal attrition of low efficiency washing machines will be replaced automatically by consumers with higher efficiency versions. It was assumed that by 2040, 90% of the low efficiency clothes washing machines will be replaced.

All of the programs will require a conservation manager or consultant to oversee and administer the programs. Implementing the programs one at a time allows for one person to manage the conservation efforts, and provides the City with the option to use City staff or temporary contracts with private companies for the work.

3.5 Phasing of Program Measures

The conservation program was assumed to be implemented over time for several reasons. First, immediate implementation of all programs would likely not be realistic from both a cost and management perspective. The cost associated with implementing all programs at once would amount to just over \$1.6M in a time period of only five years. This would create difficult financing issues for the City. Immediate implementation would result in management challenges such as hiring multiple staff members, staff managers, work spaces and equipment, etc. Even if the additional staff and resources were available, successful implementation of all programs in the next 2 to 3 years may not be feasible. Finally, there is nothing driving the need for immediate program implementation, such as water shortages, water quality issues, etc.

To limit staff required and simplify funding issues, a “slow and steady” approach was assumed in the analysis, with full implementation of each conservation measure before proceeding to the next, and all four conservation measures completed by 2040. The schedule for determining phasing of conservation measures was dictated by the need for additional supply. By implementing each conservation measure at the proper time, the City may avoid

construction of a new water well. By implementing all conservation measures before 2040, a total of four (4) wells may be avoided that otherwise may be required without any conservation efforts.

3.6 Findings

The impact of the four (4) conservation programs analyzed in the study on system water demands can be seen in Figure 3.1. This chart shows the projected water use for each scenario, approximately when new wells would be required, and the recommended conservation strategy “path”, as indicated by triangular symbols. The impact of each scenario is projected, assuming the previous scenario was implemented. Each triangle represents a decision point or date, whereby the City may elect to implement the next conservation measure. Implementing all measures maintains the system water demands below a point that would require a new well, until nearly 2050. Should the City choose not to implement a conservation measure, the chart indicates the approximate date whereby the next well would need to be constructed.

An additional feature added to Figure 3.1 was evaluating conservation efforts to avoid replacing an existing well, as at least three (3) City wells are past their useful life expectancy. It is feasible that conservation measures could be sufficiently effective to avoid this replacement cost. However, as shown in Figure 1, conservation measures as analyzed would not avoid well replacement.

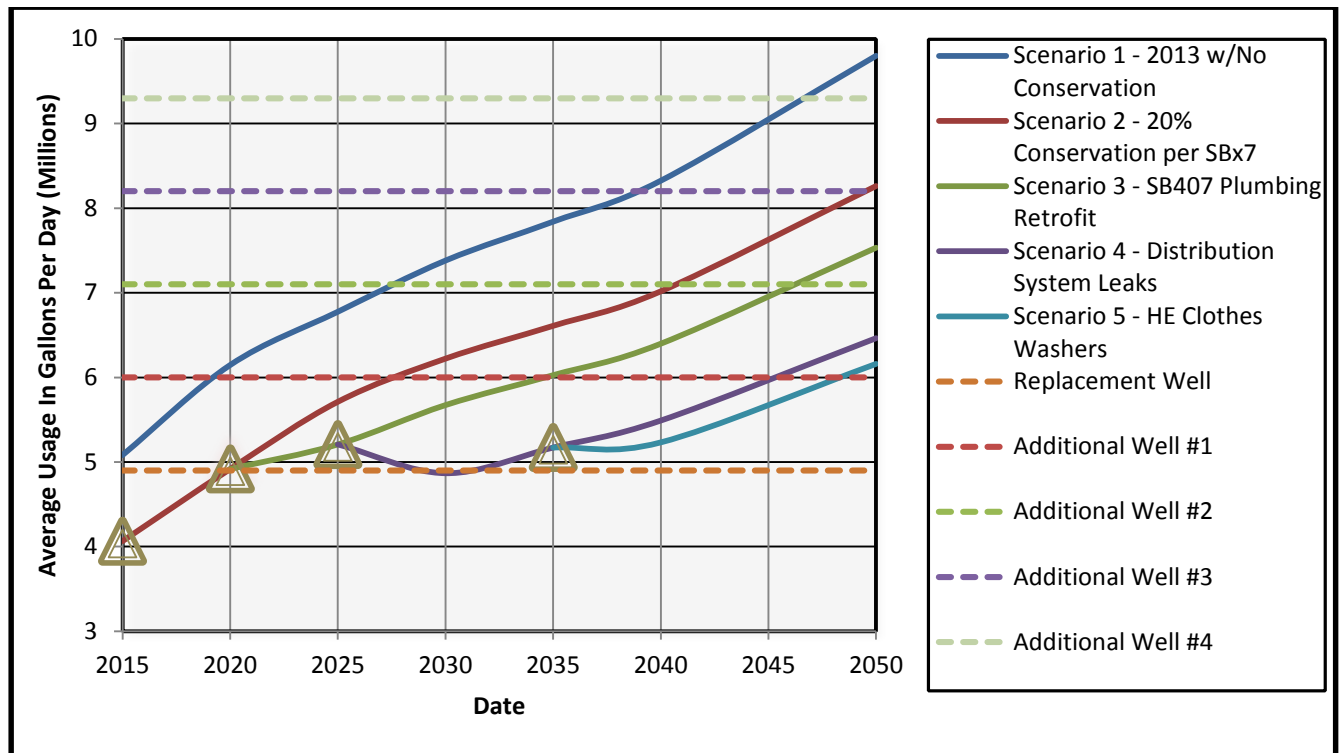


Figure 3.1 - Conservation Measures Implemented Over Time

3.8 Present Value Analysis

Each of the conservation measures were further evaluated for present net value at the point the measure would be implemented, as provided in Table 3.4. This analysis shows that even though a previous measure(s) was implemented, the decision to implement the next conservation measure is cost effective. For example, Figure 1 shows that in 2025, Scenario 4, Leak Detection, should be implemented. A present value cost benefit analysis for this decision (in 2025) was performed to determine if Scenario 4 is justified. As shown in Table 3.4, the net present value net worth or benefit for implementing Scenario 4 in 2025 is \$1,335,675. The final column indicates the total present value of costs, savings, and net benefit for all scenarios completed per the recommended plan.

Table 3.4 – Present Value Analysis at Point of Implementation

Date	2015-2019	2020-2026	2027-2033	2034-2045	Total
Recommended Implementation	Scenario 2	Scenario 3	Scenario 4	Scenario 5	All Scenarios
Present Value Savings (Capitol+O&M)	\$2,749,922	\$1,514,995	\$1,818,675	\$1,463,062	\$7,546,652
Present Value Program Cost	\$261,400	\$666,200	\$483,000	\$0	\$1,410,600
Present Value Net Benefit	\$2,488,522	\$848,795	\$1,335,675	\$1,463,062	\$6,136,052

4.0 Recommendations

Due to mandatory conservation codes and the net cost savings from implementing the conservations measures as analyzed, full implementation of the conservation plan is recommended. In addition to meeting several legislative requirements, full implementation will result in the greatest water and energy savings, totaling approximately \$6.1M over the course of the 30-year planning horizon. The program should be phased as described herein to allow “pay-as-you-go” financing. It is also recommended that new development participate in the conservation plan funding to assist with retrofitting of existing development and system leak detection, as the reduction in water demand reduces infrastructure necessary for the new development.

The City may find that other conservation efforts other than those listed may be appropriate. For example, significant amounts of water can be used for flushing, fire hydrant testing, and construction water. All of these demands add the City’s total water use, and must be reported to DWR when determining the City’s unit water demand (gpcd). Some of these efforts could be combined, whereby hydrant testing, flushing, and filling water trucks could be done simultaneously, rather than as independent activities. The value and need for fire hydrant

testing should also be examined, as data from these tests are becoming obsolete with improved hydraulic modeling and standards for fire hydrants throughout the City.

Finally, the City may elect to implement additional conservation measures or accelerate measures should opportunities present themselves (i.e. state grants for residential water fixture or commercial clothes washer replacement, etc.).

4.1 Implementation

Though the analysis in this report suggest benefits for the City, seeing the efficacy of similar programs elsewhere can solidify confidence in the investment of such programs, and provide “off the shelf” programs that have been successfully implemented. The Central Valley of California has yet to adopt these conservation programs on a large scale, but Southern California has already experimented with several similar programs with positive results. The City should use the experience of existing programs to help implement its water conservation plan.

As an example, the Garden Spot Program started by the Metropolitan Water District of Southern California (Metropolitan). This program has employed a series of rebates for water conserving technologies to motivate home owners and commercial/industrial customers to lower their indoor and outdoor water use, including:

- High efficiency toilets, with flush rates of 1.28 gallons/flush. A rebate of \$100.00 per toilet is offered.
- High efficiency clothes washers, lowering water use by 55% in comparison to regular clothes washers. A rebate of \$85.00 per machine is offered.
- Rotating Sprinkler heads, with an offered rebate of \$4.00 per head with a minimum installation of 15 heads.
- Rain catchment barrels for water irrigation repurposing, with an offered rebate of \$75.00 per barrel if it is at least 50 gallons in capacity.

- A rebate of \$2.00 per square foot of lawn replaced with artificial turf that lowers outdoor water use.
- An \$85.00 rebate offered for weather-based irrigation controllers (WBICs) for small properties or a \$35.00 rebate per controller offered to properties with greater than one acre of irrigated land.

The program has lead to residential and industrial water savings of 2.56 million gallons of water a year, in addition to financial savings for the residential home owners, businesses, and water purveyors. There are numerous existing conservation programs that can be used as templates for developing a successful water conservation program that is best suited for the City.

APPENDIX F

City of Oakdale Drought Contingency Plan

City of Oakdale Drought Contingency Plan 2015

According to the Urban Water Management Plan Act of 2009 (UWMA), water suppliers are required to prepare and adopt a *Drought Contingency Plan*. Drought Contingency Plans are most often used by water suppliers to reduce water demands during periods of drought. However, the plans are also intended to provide an action plan for reducing water demands during an emergency, such as earthquake, fire, flood, etc., capable of achieving up to 50% reduction in total system demands.

The UWMPA states:

- *An urban water supplier shall describe in the plan water management tools and options used by that entity that will maximize resources and minimize the need to import water from other regions (10620(f));*
- *Actions to be undertaken by the urban water supplier to prepare for, and implement during, a catastrophic interruption of water supplies including, but not limited to, a regional power outage, an earthquake, or other disaster (10632(c));*
- *Additional, mandatory prohibitions against specific water use practices during water shortages, including, but not limited to, prohibiting the use of potable water for street cleaning (10632(d)); and*
- *Consumption reduction methods in the most restrictive stages. Each urban water supplier may use any type of consumption reduction methods in its water shortage contingency analysis that would reduce water use, are appropriate for its area, and have the ability to achieve a water use reduction consistent with up to a 50 percent reduction in water supply (10632(e)).*

Demand reduction is the most straightforward way to address water shortages. Curtailment of water demand is directed at supplier and customer uses that are inefficient, wasteful, or able to be temporarily reduced or suspended. Since the supplier may mandate

certain demand reduction actions, enforcement mechanisms are needed for maximum effectiveness of those actions.

Demand reduction programs typically vary by Stage (severity of shortage). Stage 1 is usually voluntary and relies on a public information campaign and enforcement of water waste ordinances. Stage 2 can often be managed with a more intensive public information campaign and mandatory restrictions. Stage 3 and Stage 4 most often require customer allocations and/or severe landscape irrigation restrictions. Demand reduction measures to assist customers reduce demand are offered in all stages but increase in scope with the severity of the shortage.

To win the public's cooperation, water suppliers and municipal agencies should demonstrate a visible commitment to efficient water use. Actions to make a utility's operating system more efficient save water and set a good example for the public. A utility company can take actions itself to conserve water before asking customers to do the same, demonstrating a leadership role. Examples include reduce or stop turf irrigation, ensure no overwatering of public facility landscaping, and minimize fire hydrant testing, flushing, and street cleaning. Broken water pipes, whereby excessive water spills into the street, can also be viewed by the public as irresponsible water waste. Thus, prevention of distribution main leaks and breaks becomes an important public relations concern.

It is important to note that as California's water supplies become increasingly more limited, many elements included in the Drought Contingency Plan will become common practice. It will be important to update the plan periodically as the City's water program evolves, whereby conservation activities are no longer only implemented during an emergency, but become part of everyday operations.

Oakdale Existing Water Conservation Program The City has an on-going water conservation program that it enforces at all times. This includes an "ODD-EVEN" landscape watering schedule, which limits the number of days landscapes can be irrigated to four (4) days per week, and prohibits any landscape irrigation from the hours of 12 noon to 7 p.m. The City's water conservation program includes violations for the following:

- (1) Failure to comply with the following schedule when watering lawns, plants, or garden, or using outdoor water for other purposes:
 - a. No lawn/garden watering, or other outdoor use will be allowed between the hours of ten a.m. to seven p.m. every day.
 - b. Dwellings or establishments with odd numbered street addresses shall use outdoor water only on Mondays, Wednesdays, Fridays and Sundays.
 - c. Dwellings or establishments with even numbered street addresses shall use outdoor water only on Tuesdays, Thursdays, Saturdays and Sundays.

- (2) Watering lawns or gardens such that excess water leaves the property or area being watered;
- (3) Watering outdoor landscaping while raining;
- (4) Washing vehicles, equipment or boats, during restricted days or hours; and/or using hoses without automatic shut-offs;
- (5) Hosing down of concrete or asphalt curbs, gutters, sidewalks, driveways or slabs;
- (6) Having leaky faucets or plumbing fixtures on the premises. (Ord. No. 982.)

Violation of any of the regulations stated above shall result in a non-appealable warning notice. For each violation following the receipt of a Warning Notice, the citation shall be as follows:

1st violation	\$ 50.00
2nd violation	\$ 75.00
3rd violation	\$100.00
4th violation	\$200.00

In addition, the City has implemented a “Water Insight” program, whereby residents can view their water use habits, compare their water use with their neighbors, and track how well their water conserving activities are working. This is a highly valuable tool that provides residents with the tools to understand how their efforts help conserve water and puts them in control of their water bills.

Drought Contingency Plan In accordance with State Water Code, the City of Oakdale will implement the following Drought Contingency Plan for conditions as defined herein.

Stage I

A Stage I condition is defined as a below average water year, as determined by the State of California Department of Water Resources. Implementing Stage I is intended to provide a 5% to 15% voluntary reduction in water use for the purpose of preserving water resources for subsequent years of below average precipitation or snow pack, assuming it occurs.

- Service of water by any restaurant except upon the request of a patron.
- Initiate public outreach campaign to encourage water conservation.

Stage II

A Stage II condition is defined as a below average water year, as determined by the State of California Department of Water Resources, resulting in mandatory reductions by the State of California between 15% and 25%. The City will curtail water use on public landscaping, and implement the following:

- Mandatory implementation of Stage I conditions
- Limit washing of cars and boats to one day per week.
- Increase public outreach campaign to encourage additional mandatory water reductions.
- No use of water to clean, fill or maintain levels in decorative fountains.
- Indoor leaks will be repaired within 7 days of notification by City.
- Double fines for water violations

Stage III

A Stage III condition is defined as a significantly low water year or multiple drought years, as determined by the State of California Department of Water Resources, resulting in mandatory reductions by the State of California between 25% and 40%. The City will implement aggressive water conservation of its own public facilities, including reduction in irrigation of parks, schools, detention basins, road sweeping, cemeteries, water distribution system flushing, etc. In the event these actions do not sufficiently achieve the necessary reductions, Stage II and the additional measures will be implemented:

- Construction water for soil compaction, backfill or dust control shall be from a non-potable source.

- No private washing of cars or boats.
- No water for street cleaning.
- Triple fines and penalties for violations.

Stage IV

A Stage IV condition is defined as a severely low water year or multiple severe drought years, as determined by the State of California Department of Water Resources, resulting in mandatory reductions by the State of California of over 40%. In addition to Stage III, implement the following:

- Enact conservation measures as needed to achieve reductions as mandated.

APPENDIX G

City of Oakdale Land Use Technical Memorandum

Technical Memorandum

July 18, 2014

RE: City of Oakdale Water Consumption and Production

The following technical memorandum summarizes findings from potable water consumption and production associated with master planning efforts. Data available includes metered potable water consumption for years 2009-2013, and potable water production for the same years from City well facilities. The comparison provides important insight of the City water program including:

- Possible errors in water use data (metered accounts);
- Unaccounted water estimates (difference between production and use);
- Statistical values for water use (i.e. average, standard deviation, highest users, etc);
- How data should be collected and organized in the future to assist with water planning, conservation programs, design, etc.

Metered Data Analysis

The metered data provided by the City is divided into two categories ,commercial and residential. Information in this data base includes:

- Connection address information
- Consumer ID
- Consumer name
- Location ID
- Meter size
- Number of connections for each address
- Type of connection (Commercial or Residential)
- Total amount of water consumed/measured per month by connection

Well Production Data Analysis

Due to a combination of incomplete data in certain years, bi-monthly data acquisition,

mislabeling of connections, etc., the data make accurate analysis difficult. Future collection and organization of data, as well as correction of previously acquired data, will be needed to improve use and understanding of data and water use patterns. For example, the metered consumption data could not be accurately dated (i.e. what month(s) the water was consumed), many addresses were duplicated (same address but new owner), accurately determining the number connections being served, etc.

While analyzing the metered data, several data points (i.e. values, category labels, etc.) appearing questionable were identified using a color-coding system. These data may require additional clarification, correction, or special attention for water conservation efforts. The coding system includes:

Red Highlight - The data is likely mislabeled (residential when it is actually commercial or visa-verse).

Orange Highlight - These are apparent high volume water users, and should be targeted as a first-level effort in water conservation activities.

Yellow Highlight - The data initially showed a negative consumption value, suggesting the data is false. For purposes of data analysis, said negative values were removed. However, the yellow highlight of these removed values remains so City staff can review the error.

Green Highlight - These are data that have higher than expected values, but review of the connection may justifying a high usage. For example, a dog park registers as one residential connection yet has upwards of 2,000 units¹ of consumption annually. Green highlighted connections should be further reviewed to verify usage is appropriate or accurate.

Blue Highlight - Compiled values used for the purpose of statistical analysis and plotting data.

Data for 2013 was incomplete leading to differences in analysis and plotting relative to previous years. The months of January-August, 2013 were the only months with water consumption data available. This should be considered when viewing data from this year. Future analysis on 2013 could see improvement given attainment of data from the months of September-December, 2013.

Statistical Analysis

A primary objective of the analysis was to identify the highest potable water users within the City to determine effective opportunities for conservation. A list was compiled of the highest (99th percentile) residential water users. Due to changing user accounts (same address, new owner/customer) the total number of residential connections varies (in the data base) month to month. However, the number of

¹ A "unit" is 100 cubic feet, or 748 gallons. Water meters typically measure use in 100 cubic foot units.

residential connections was equal to approximately 6,750+/- from the years of 2009-2013, as growth was essentially flat. Depending on the year, water consumption from the highest 1.0% residential water users totaled from 9.7% to 17.3% of total the residential water consumed (see Table 1).

Table 1-Percentage of Consumption by Highest 1.0% of Residential Users

Year	2009	2010	2011	2012	2013
Total Number of Connections	7419	6718	6693	6762	7891
Highest 1% of Users	74	67	67	68	79
Percentage of Total Use	17.36	13.62	9.72	10.14	10.24

Thus, approximately 70 of the City's 6,750+/- residential connections are consuming 9.7% to 17.3% of the total water consumed. The average use for the highest 1.0% ranged from between 2,240 and 4,513 units, whereas the average use of the bottom 99.0% ranged between 222 and 232 units.

Given that such a small number of residential customers in the City are consuming such a high percentage of the total water being consumed, there appears to be an opportunity to focus on these users as primary conservation activity. The first step is to ensure that the data for these high users is accurate. If so, contacting said users about ways to be more conservative about water use in the future could significantly reduce total water use. These identified users have been highlighted in orange in the excel file.

A similar analysis was performed on commercial users for the City. Due to the fact that there were far less commercial connections, only the top ten users were identified. These top ten utilized anywhere from 5.18% to 10.46% of the total commercial water consumed, depending on the year (see Table 2).

Table 2-Percentage of Consumption by Highest Ten Commercial Users

Year	2009	2010	2011	2012	2013
Percentage of Total Water Consumed	9.08	10.46	7.78	5.18	5.86

It is recommended that these users should be contacted/focused on first in terms of future efforts towards water conservation. Given the extreme volume associated with many commercial users (often upwards of 10,000 hundred cubic feet annually) even small reductions can contribute greatly towards the City's overall water conservation efforts, and achieving consumption targets. These identified users have been highlighted in orange in the excel file.

Total water consumption data was compiled for each year, and compared to the total water production from City wells. Water consumption data was collected bi-monthly, so data was divided between the two months which applied (though every other month had no data entry). Thus water consumption as graphed may vary from actual use.

However, since meters are only read every 60 days +/-, it is not possible to gain more accuracy at this time. This could explain why some months show more water was consumed than produced by the wells. To clarify, the plots are not perfect representations of consumption and production but give an idea as to the trends regarding seasonal change.

The total consumption was plotted against the total production for each year from 2009-2013, as shown in Figures 1-5.

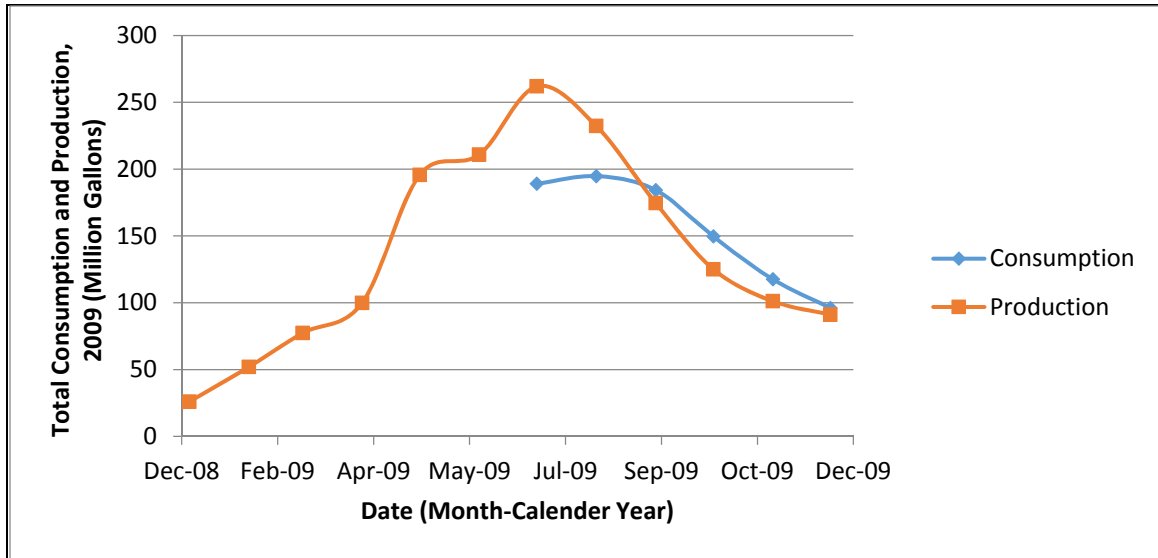


Figure 1-Total Consumption and Production, 2009

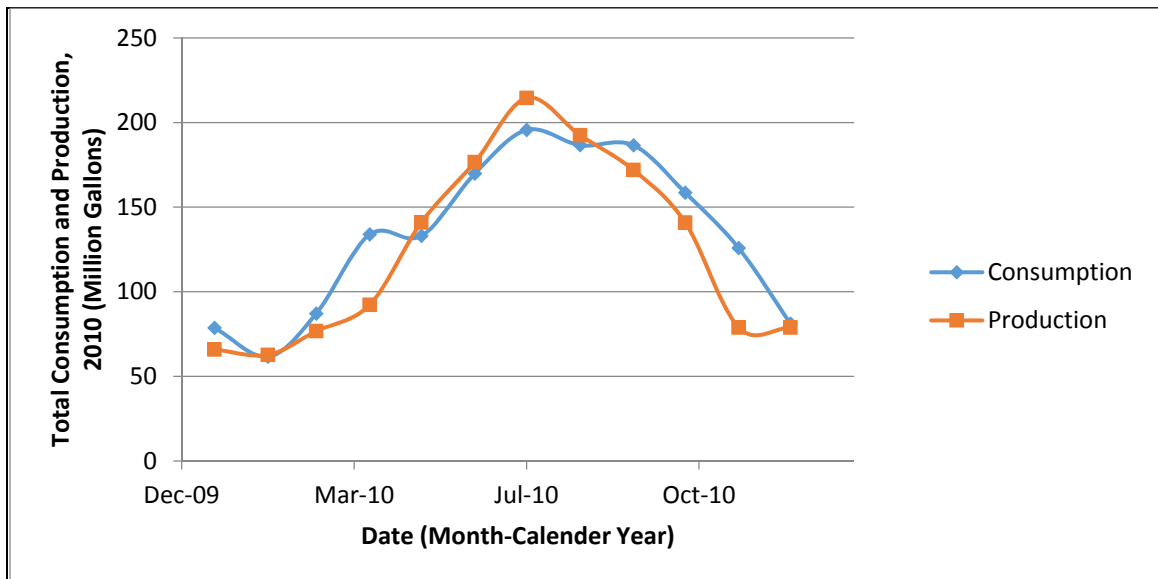


Figure 2-Total Consumption and Production, 2010

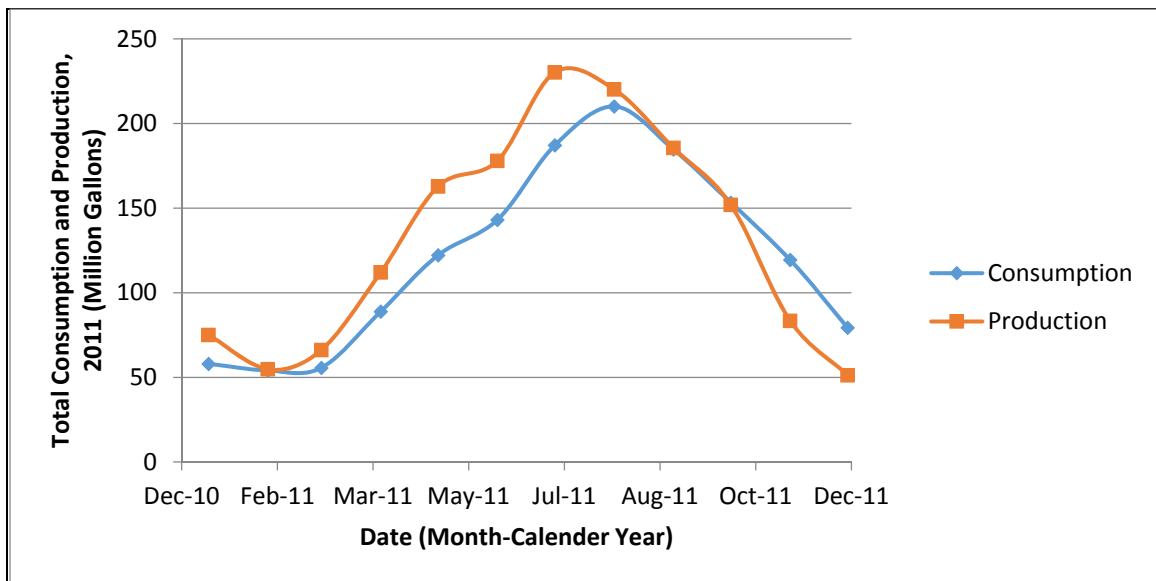


Figure 3- Total Consumption and Production, 2011

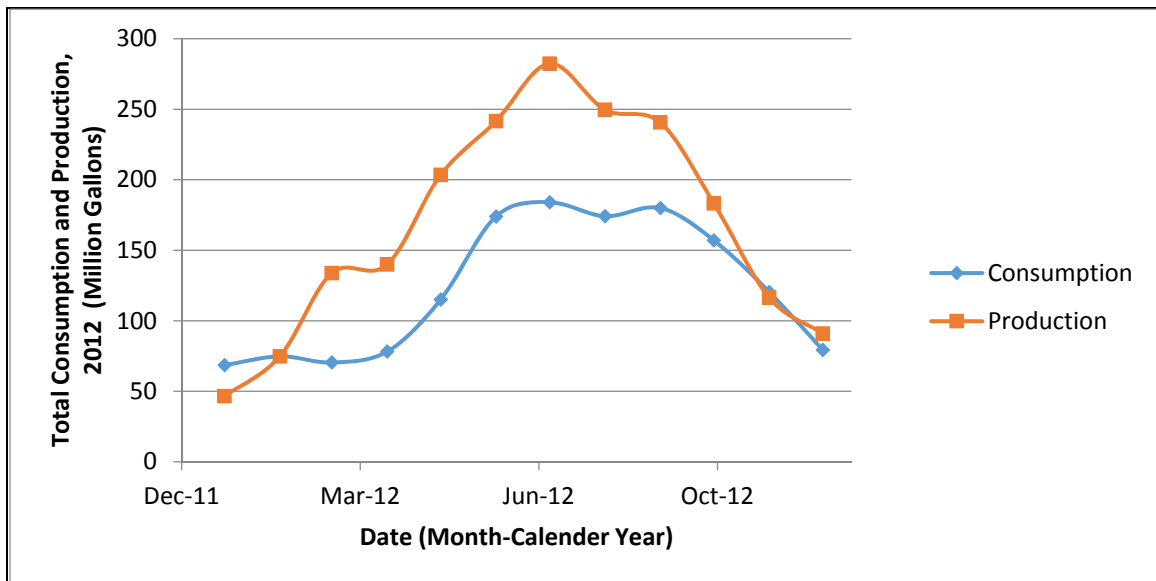


Figure 4-Total Consumption and Production, 2012

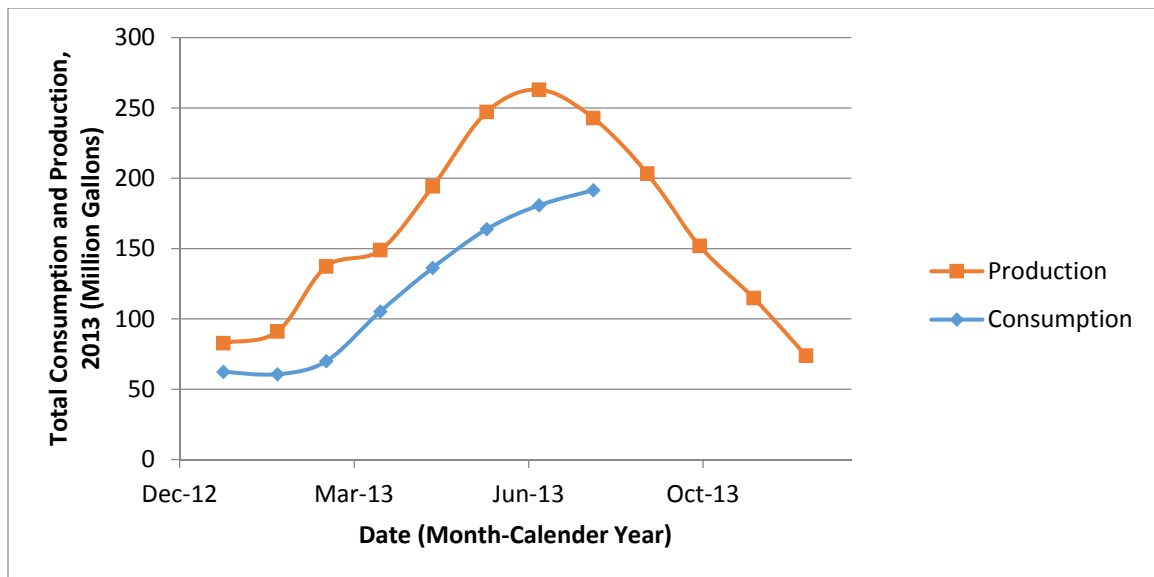


Figure 5-Total Consumption and Production, 2013

The consumption and production data are relatively consistent for years 2009 through 2011. Consumption remains steady for all years, with minor variations. This is expected as new construction remained flat during this period. However, in 2012 and 2013, summer production exceeded consumption by over 30%. This additional production is not explainable, and may be cause for concern. Explanations could include:

- Authorized or unauthorized unmetered water use;
- System leaks or losses;
- Extensive distribution system flushing;
- Production meter or data collection inaccuracy.

Because the high production is consistent for the two year period, it does not appear to be an anomaly in the data (e.g. bad reading). It does appear that the increase is in summer months, thus it may be associated with landscape irrigation (e.g. parks that are not metered), rather than leakage since it would likely occur all year. Regardless, a 30%+ unaccounted for water use is unacceptable and must be addressed.

Figure 5 shows the Consumption data following closely with the Production data until around December of 2013. This is due to incomplete data acquisition during the past 6-7 months. Upon receiving updated data acquisition, the plot will be updated to reflect consumption and production trends.

As can be seen, well production lines up closely with potable water consumption during all years. The graphs are plotted over the fiscal year, starting with July and ending with June. Low points of both consumption and production occur in the late fall and winter and high points, conversely, occur during summer months when consumption is highest due to ambient temperature and water related activity. Production for these months,

follows closely to consumption.

Recommendations for Future Data Collection and Organization

The City needs to improve its data collection system to allow effective analysis of water use, customer base and consumption habits, conservation opportunities and progress, infrastructure planning, determining system loss, preparing legal documents (i.e. UWMP, Water Assessment (SB 610), Water Supply Verification (SB 221), AB 1420, State grant and loan applications, General Plan, Specific Plans, etc.), and general accounting. Specifically, the following is recommended:

1. Review and correct past water use data;
2. Collect metered data monthly or more frequently if possible;
3. Create use categories that reflect land use (i.e. industrial, residential, commercial, institutional, parks and landscape corridors, etc.)
4. Provide separate meters for domestic and irrigation connections so each type of use can be accounted;
5. Provide non-residential customers with land use data (land use, lot size, square footage, etc.);
6. Connect all water meter data to City GIS; and
7. Perform meter service and calibration as recommended by the manufacture or as needed.

APPENDIX H

20x20x20 DWR Plan

20x2020 Water Conservation Plan



February 2010

20x2020

Water Conservation Plan

February 2010

This plan was prepared by:

- California Department of Water Resources
- State Water Resources Control Board
- California Bay-Delta Authority
- California Energy Commission
- California Department of Public Health
- California Public Utilities Commission
- California Air Resources Board

With assistance from:

- California Urban Water Conservation Council
- U. S. Bureau of Reclamation

Preface

In California, water is precious, competition for water is fierce, and conservation is critical. The value that Californians place on water is reflected in a constitutional provision ensuring its reasonable and beneficial use. Article X, section 2 of the California Constitution prohibits the waste and unreasonable use of this precious resource. All water within the state is the property of the state, but the right to use water may be acquired under California law. To manage competition for scarce water supplies, California has an appropriative water right system that provides for the orderly development of the state's water resources while safeguarding against waste and unreasonable use.

Despite constitutional provisions prohibiting waste and a system of water rights to manage allocations, water conservation has always been important. California has a long history of laws, policies and practices that promote water conservation. Conservation and efficiency of water usage are recognized least-cost strategies to help ensure a vital economy, a healthy environment, and a high standard of living.

As our understanding, knowledge and technology improve, we have learned that our use of water for given purposes can also improve. Statutes and policies have been instituted that continually define our evolving abilities to do more with less water and begin to restore the health of the natural water systems on which we so greatly depend. Yet, with a burgeoning population and the movement of that population to drier climates, our overall demand for water has exceeded our reliable developed supply. Without additional action, demand will continue to exceed supply. The Delta is in crisis, drought has depleted our reservoirs and groundwater resources are overdrafted. Our need to pursue conservation and eliminate unnecessary uses of water is more important than ever to ensure the future health of our state.

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Abbreviations and Acronyms

(\$/AF)	cost per unit of savings
<i>20x2020 Plan</i>	<i>20x2020 Water Conservation Plan</i>
AB	Assembly Bill
AF	acre-foot
AFY	acre-feet per year
ARB	Air Resources Board
BMPs	Best Management Practices
CALFED	CALFED Bay-Delta Program
CBDA	California Bay-Delta Authority
CE	cost effective
CEC	California Energy Commission
CII	Commercial, Industrial and Institutional
CIMIS	California Irrigation Management Information System
CO	Colorado
CPUC	California Public Utilities Commission
CUWCC	California Urban Water Conservation Council
CVP	Central Valley Project
DPH	Department of Public Health
DWR	Department of Water Resources
ET	evapotranspiration
ETo	reference evapotranspiration
GHG	greenhouse gases
GPCD	gallons per capita daily
GWh	gigawatt hour
HCF	hundreds of cubic feet
HETs	high-efficiency toilets
HEUs	high-efficiency urinals
HR	hydrologic region
IRWM	integrated regional water management
LWUP	Land and Water Use Program
MAF	million acre-feet
MG	million gallons
MOU	Memorandum of Understanding
MW	megawatt
PBMPs	Potential Best Management Practices
PWSS	Public Water Systems Survey
SB	Senate Bill
SF	San Francisco
SJ	San Joaquin
SWRCB	State Water Resources Control Board
TM	technical memoranda
ULFT	ultra-low-flush toilet
USBR	United States Bureau of Reclamation
UWMPs	Urban Water Management Plans

Executive Summary

In February 2008, Governor Schwarzenegger introduced a seven-part comprehensive plan for improving the Sacramento-San Joaquin Delta. As part of this effort, the Governor directed state agencies to develop a plan to reduce statewide per capita urban water use by 20 percent by the year 2020. This marked the initiation of the *20x2020 Water Conservation Plan (20x2020 Plan)* process.

California's water resources are finite and now require managing for sustainability.

Multiple benefits can be realized as a result of more aggressive water conservation including:

- reduced stress on the environment of the beleaguered Sacramento-San Joaquin Delta
- delayed capital cost of new infrastructure to treat and deliver water
- reduced demand for wastewater treatment, including capital costs and ongoing treatment costs
- reduced water-related energy demands and associated greenhouse gas emissions
- improved ability to meet environmental needs
- improvements in the quality of receiving waters related to reduced discharge
- reduced use of fertilizers, pesticides, and herbicides and reduced escape of these chemicals into surface waters through use of native plants and low water using varieties, reduced production of green waste, and improved habitat value of urban landscapes
- enhanced flexibility in water management and delivery systems, especially during dry periods
- better capacity to meet the challenge of California's growing population.

California can reduce its per capita use 20 percent, from the current 192 gallons per capita daily (GPCD) to 154 GPCD. This amounts to an annual savings of about 1.59 million acre-feet based on the savings achieved by California's 2005 population.

20x2020 Plan Scope and Process

The *20x2020 Plan* sets forth a statewide road map to maximize the state's urban water efficiency and conservation opportunities between 2009 and 2020, and beyond. It aims to set in motion a range of activities designed to achieve the 20 percent per capita reduction in urban water demand by 2020. These activities include improving an understanding of the variation in water use across California, promoting legislative initiatives that incentivize water agencies to promote water conservation, and creating evaluation and enforcement mechanisms to assure regional and statewide goals are met. The *20x2020 Plan* discusses these many activities in detail.

This *20x2020 Plan* was developed through the collaborative effort of an Agency Team, which consisted of state and federal agencies including the Department of Water Resources (DWR), State Water Resources Control Board (SWRCB), California Energy Commission (CEC), Department of Public Health (DPH), California Public Utilities Commission (CPUC), Air Resources Board (ARB), California Bay-Delta Authority (CBDA), and the US Bureau of Reclamation (USBR). The Agency Team also developed research papers (Technical Memoranda) and solicited input from water suppliers and organizations through public workshops and conference calls during the planning phase of the *20x2020 Plan*. In addition, the California Urban Water Conservation Council contributed toward the analysis and development of this *20x2020 Plan*.

Comments received through the public review process were used to modify and shape the recommendations of this *20x2020 Plan*.

Establishing a Baseline and Targets

The 2005 statewide baseline urban water use value, expressed in gallons per capita per day (GPCD), is **192 GPCD**. The corresponding statewide targets are:

- **Interim 2015 Statewide Target** = 192 GPCD (Statewide Baseline) minus 10 percent = **173 GPCD**
- **Final 2020 Statewide Target** = 192 GPCD (Statewide Baseline) minus 20 percent = **154 GPCD**.

This represents a statewide savings of 1.59 million acre-feet (MAF) based on a population of 37 million. California can achieve at least a 20 percent reduction in 2005 per capita water use by 2020.

Using ten hydrologic regions as defined by DWR for water resources planning purposes, regional baseline and target values were derived for daily per capita water use.

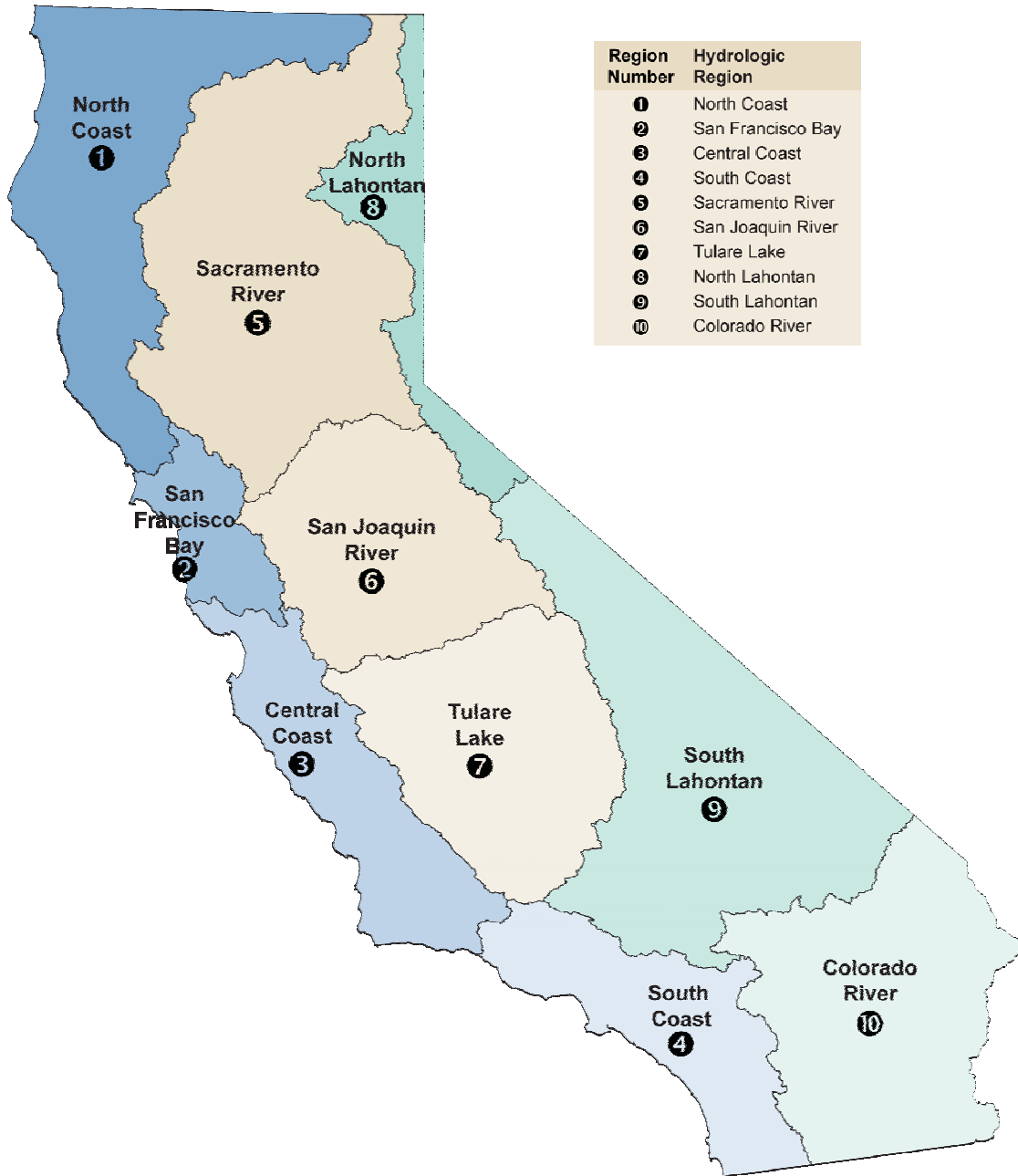
Table ES-1. Regional Urban Water Use Pattern in 2005

Sector Water Use (GPCD)	DWR Hydrologic Region									
	1	2	3	4	5	6	7	8*	9	10
Residential (Single- and Multi-Family)	115	103	109	126	174	159	180		176	255
Commercial and Institutional	18	19	17	23	25	27	23		19	38
Industrial	8	17	8	9	21	32	43		11	3
Un-Reported Water	24	18	20	22	33	30	39		31	50
Total Baseline	165	157	154	180	253	248	285	243	237	346
* Region 8 does not have enough usable data in the Public Water Systems Survey (PWSS) database to compute for baseline values by sector.										

Table ES-2. Regional Urban Water Use Targets

	DWR Hydrologic Region Number									
	1	2	3	4	5	6	7	8	9	10
Baseline (1995-2005)	165	157	154	180	253	248	285	243	237	346
Interim Targets (2015)	151	144	139	165	215	211	237	208	204	278
Targets (2020)	137	131	123	149	176	174	188	173	170	211

Figure ES-1. California Hydrologic Regions



Recommendations

Recommended actions to contribute toward a statewide strategic approach (as described in more detail in Chapter 3) fall into the following categories:

1. Establish a foundation for a statewide Conservation Strategy.
 - a. Establish targets and goals in statute.
 - b. Establish a state agency leadership and coordination framework.
 - c. Provide a forum for stakeholder advice on refinement and implementation.
 - d. Mandate uniform data collection and establish a statewide database.
 - e. Maintain existing programs and institutions.
2. Reduce landscape irrigation demand.
 - a. Require water-efficient landscapes at state-owned properties.
 - b. Support the implementation and enforcement of landscape design and irrigation programs and the development of new landscape programs.
 - c. Mandate the landscape irrigation Best Management Practices (BMP).
3. Reduce water waste.
 - a. Accelerate installation of water meters.
 - b. Establish a state standard for water meter accuracy.
 - c. Revise the water loss BMP to incorporate improved methodologies and accelerate coverage goals.
4. Reinforce efficiency codes and related BMPs.
 - a. Obtain authorization for state standards for high efficiency clothes washers.
 - b. Support landscape irrigation equipment standards.
 - c. Accelerate replacement of inefficient showerheads, toilets and urinals.
 - d. Accelerate adoption of proven water saving technologies in new businesses.
5. Provide financial incentives.
 - a. Encourage or mandate conservation water pricing.
 - b. Provide grants, loans, and rebates to wholesale and retail water suppliers and customers.
 - c. Establish a public goods charge for water.
 - d. Fund the installation of water meters.
6. Implement a statewide conservation public information and outreach campaign.
7. Provide new or exercise existing enforcement mechanisms to facilitate water conservation.
 - a. Require implementation of water conservation as a condition to receive state financial assistance.
 - b. Take enforcement actions to prevent waste and unreasonable use of water.
 - c. Provide additional enforcement tools for water suppliers.
8. Investigate potential flexible implementation measures.
 - a. Investigate requiring conservation offsets for water demand generated by new development.
 - b. Investigate establishment of a cap-and-trade regime.
9. Increase the use of recycled water and non-traditional sources of water.

Implementation

The *20x2020 Plan* will be implemented through three phases, as outlined in Table ES-3. In November 2009, California placed the 20x2020 goal into statute with the enactment of SBX7 7 (Steinberg), as part of an historic package of water reforms.

Table ES-3. 20x2020 Plan Implementation Outline

Plan Phase	Year	Activities
I. <i>20x2020 Plan</i> Completion and Start-up Actions	2009 – 2010	• Finalize <i>20x2020 Plan</i> • Establish a lead agency and coordination framework • Convene a stakeholder advisory group • Develop detailed implementation task descriptions for recommended actions • Provide technical assistance in conservation legislation discussions • Evaluate an interim data collection and management mechanism • Collect, manage and validate data • Implement conservation actions • Conduct legislative, regulatory and administrative actions • Provide oversight
II. <i>20x2020 Plan</i> Implementation, Monitoring, Evaluation, Adjustments	2011 – 2020	• Establish interim and long-term data collection and management • Implement conservation actions • Monitor implementation progress • Assess and design additional measures such as a conservation offset and a conservation credits trading program as needed • Conduct an Interim Target Assessment and Performance Evaluation in 2015
III. Conclusion	2020	• Conduct a Final Target Assessment and Performance Evaluation • Publish Results and Lessons Learned

Year 2020 and Beyond

Water resources will continue to be scarce beyond 2020. An important factor to the success of this *20x2020 Plan*, from now through 2020 and beyond, relies on the fundamental revolution of the way Californians view water. One of the many goals of this *20x2020 Plan* is to bring Californians to recognize that the water our lives depend on is indeed a very limited resource, and that it must be used wisely, innovatively, responsibly, and efficiently. The success of the *20x2020 Plan* also demands political will to continue to invest and push to capture the full extent of water conservation potential.

In succeeding, this *20x2020 Plan* will not only bring benefits to California but will also allow us to share this leadership and experience in the national and international efforts to mitigate the global crisis of water deficiencies.

Chapter 1. Introduction

In February 2008, Governor Schwarzenegger introduced a seven-part comprehensive plan for improving the Sacramento-San Joaquin Delta. The first element of the Governor's Delta plan is water conservation. In the Governor's words, California must have:

“A plan to achieve a 20 percent reduction in per capita water use statewide by 2020. Conservation is one of the key ways to provide water for Californians and protect and improve the Delta ecosystem. A number of efforts are already underway to expand conservation programs, but I plan to direct state agencies to develop this more aggressive plan and implement it to the extent permitted by current law. I would welcome legislation to incorporate this goal into statute.”

The Governor's call for greater conservation is reflected in the work of the Delta Vision Blue Ribbon Task Force. The Vision and Strategic Plan of the Task Force call for significantly greater implementation of water use efficiency measures to reduce water export demands on the Delta and its struggling ecosystem and to improve environmental conditions upstream and downstream of the Delta.

Delta protection and restoration are not the only reasons to increase conservation efforts. Global climate change will affect water management in California, and water conservation will help the state not only mitigate climate change by reducing greenhouse gas emissions but also adapt to climate change by reducing water use. Approximately one-fifth of the electricity and one-third of the non-power plant natural gas consumed in the state are associated with water delivery, treatment and use, so efficient use also can reduce water-related energy demands and associated greenhouse gas emissions. Without this program, water-related greenhouse gas emissions in 2020 would be higher than is currently forecast. The Water Energy Subgroup of the Climate Action Team estimates that this plan will reduce emissions by 1.4 million metric tons per year.

Water conservation is also an attractive water management strategy because it can yield multiple benefits. Reduced demand can reduce or delay the capital cost of new infrastructure to treat and deliver water. Reduced use also reduces the demand for wastewater treatment, including capital costs and ongoing treatment costs. There may also be improvements in the quality of receiving waters related to reduced discharge. Landscape water conservation can yield multiple benefits including reduced use of fertilizers, pesticides, and herbicides and reduced escape of these chemicals into surface waters through use of native plants and low water using varieties, reduced production of green waste, and improved habitat value of urban landscapes. These other benefits are particularly important upstream of the Delta, where effluent discharge and over-application of irrigation water often re-enter the natural system and the net water savings from landscape conservation is lower than it is in areas that discharge to the ocean.

The California Water Plan acknowledges the importance of water conservation as an element of statewide water management. The *California Water Plan Update 2005*, as well as the draft *California Water Plan Update 2009*, identifies urban water conservation as the water management strategy that will be most effective at matching supply and demand. California needs a comprehensive plan to increase water use efficiency and achieve the multiple benefits that accompany more efficient use, along with a comprehensive finance plan that supports continuing investment in efficiency.

This *20x2020 Plan* outlines recommendations to the Governor on content and implementation of the requested “more aggressive plan”. These recommendations were developed through a collaborative effort of the Agency Team, involving several agencies that are involved in water planning and management. The Agency Team consists of seven state agencies and a federal agency: Department of Water Resources (DWR), State Water Resources Control Board (SWRCB), California Energy Commission (CEC), Department of Public Health (DPH), California Public Utilities Commission (CPUC), Air Resources Board (ARB), California Bay-Delta Authority (CBDA) and the US Bureau of Reclamation (USBR). In addition, the California Urban Water Conservation Council contributed toward the analysis and development of this *20x2020 Plan*. Extensive public input has helped to improve the plan and will be an important part of future refinement and implementation.

Achieving a 20 percent reduction in statewide per capita urban water use is a challenging task. Achieving it by 2020 will require quick and concerted effort throughout the state. However, the urgent threat of water deficiency and overdraft, water needs of the environment, a growing population, and the unknown impact of climate change on water supplies, requires that California move boldly to foster water conservation.

Conservation versus Efficiency

The terms water conservation and water use efficiency are often used interchangeably. As used in this report, *water conservation* is defined as a reduction in water loss, waste, or use. The general term water conservation may include *water use efficiency*, in which more water-related tasks are accomplished with the same or lesser amounts of water.

When widespread conservation programs are implemented, water managers may become concerned about demand hardening. This is the phenomenon in which customers lose the ability to easily institute emergency conservation during drought or other crises because they have already captured all their conservation savings. Although this is a legitimate concern, California will still have ample conservation opportunity even after statewide per capita use is reduced by 20 percent, through additional fixture and appliance replacement, reductions in landscape irrigation, and habit change.

Plan Scale and Scope

To meet the Governor’s charge, the Agency Team has worked to develop the *20x2020 Plan* that answers these questions:

- What is per capita urban use now or in some recent base period?
- What would the reduction in per capita use be when the Governor’s goal is met?
- How does per capita use vary across the state?
- How does the potential for additional conservation vary across the state?
- Is it feasible to expect that the Governor’s goal can be met?
- Will existing measures enable us to achieve the Governor’s goal? How does this vary by region?
- Can we expect to achieve the goal with new measures? What would it take to implement them?
- How might implementation (and needed implementation assistance) vary by region?

This *20x2020 Plan* is intended to be part of a comprehensive program to improve water supply reliability, restore ecosystem health, and improve the Delta. California must reduce its per capita water use. Other vital parts of a comprehensive program include

improved Delta conveyance, more water storage, and restoration of ecosystem health in the Sacramento-San Joaquin River Delta.

This 20x2020 Plan addresses only urban water use and conservation. To achieve a reduction in overall water use while protecting the Delta's ecosystem, it is recognized that both urban and agricultural water use must be more efficient. The Governor's charge was to achieve a 20 percent reduction in *per capita* use, which implies an urban focus. There are many differences between California's urban and agricultural supplies and demands. These differences in water qualities and quantities, delivery systems, and other use characteristics, coupled with different institutional and conservation mechanisms require that separate mechanisms be developed to address the urban and agricultural sectors.

The focus on urban use here does not diminish the relevance of agricultural use to the state's total water use or the potential for significant reductions in overall state water use from the agricultural sector. Urban water suppliers are required by statute to prepare and periodically update urban water management plans. Efficiency programs are built on this planning foundation. No comparable requirement exists for irrigation districts. Legislative bills introduced to place the Governor's 20x2020 goal into statute recognize the importance of this planning foundation. Bills have also proposed new agricultural water management planning requirements for irrigation districts that are parallel to the standards that have been in place for urban suppliers since 1983. This balanced and comprehensive approach is a sound water management strategy.

This 20x2020 Plan will be implemented consistent with water rights protections in Water Code Section 1011. An appropriative water right holder does not lose the right to water that is conserved. Water Code section 1011 allows an appropriator to retain the right to water to the extent water is not used due to water conservation efforts. Under this provision, "water conservation" is broadly defined to mean the use of less water for the same purpose of use allowed under the appropriative water right. A permittee or licensee who seeks the benefit of section 1011 must file periodic reports with the State Water Resources Control Board describing the extent and amount of the reduction in water use due to water conservation efforts.

This 20x2020 Plan addresses only potable water use. "Water use efficiency" in some state programs includes both water conservation and water recycling, but this meaning is not used for this plan. Urban potable water use includes all residential, commercial, institutional and industrial users as well as non-revenue water. Non-potable recycled water was excluded while estimating baseline per capita urban water use to give credit to agencies that have promoted recycled water in the past. Additional use of recycled water will be a significant method by which regions can continue to offset baseline potable urban water demand to meet 2020 goals.

This 20x2020 Plan does not consider processes that convert a non-potable source into a potable source as methods to reduce per capita use, since they are new supply options. Desalination and use of recycled water to recharge aquifers or augment surface supplies are included among these new supply options. Municipal stormwater capture is also a new supply option and is therefore not considered in this plan.

This 20x2020 Plan does not address water supplied by customers for their own use or consider processes that create new supply on the customer side of the meter. The plan focuses on potable water supplied in municipal distribution systems and does not include quantities of self-supplied water in per capita use calculations. Some water users have access to groundwater or surface water to provide a part or all of their water needs. In addition, alternative sources of water, such as graywater (untreated household waste water

from clothes washers, tubs and showers), rainwater recapture, and on-site diverted stormwater are examples of non-potable sources that may reduce per capita use, but were not included in the analysis at this time.

This 20x2020 Plan does not address water losses in transmission of water between sources of supply and potable water treatment and distribution systems. An attempt has been made to account for water losses within potable water distribution systems, captured within the categories of “non-revenue water” or “unreported water.” In the DWR database that was the primary source of data for this project, “un-reported water” includes “large landscapes” (parks, golf courses, schools)) for which water deliveries may not be measured; “other” (system flushing, fire hydrant testing, etc.); and “non-revenue water” (previously referred to as “un-accounted for water” (i.e., system water losses from leaks, slow meter registers, theft, etc.) Further discussion of data development can be found in Chapter 2.

This 20x2020 Plan recommends actions that will reduce per capita use, not total urban use, by 20 percent. While this 20x2020 Plan is being implemented, California’s population will continue to grow. Depending on the rate of population growth, total urban water use may never go down and could eventually rise, even if all the recommendations in this 20x2020 Plan are successfully implemented. Clearly, this 20x2020 Plan alone will not lead to long-term sustainable water use. Other efforts to balance supply and demand will be needed, including continued reductions in per capita demand. Reduced per capita use is just one part of a comprehensive program to improve water supply reliability and restore ecosystem health.

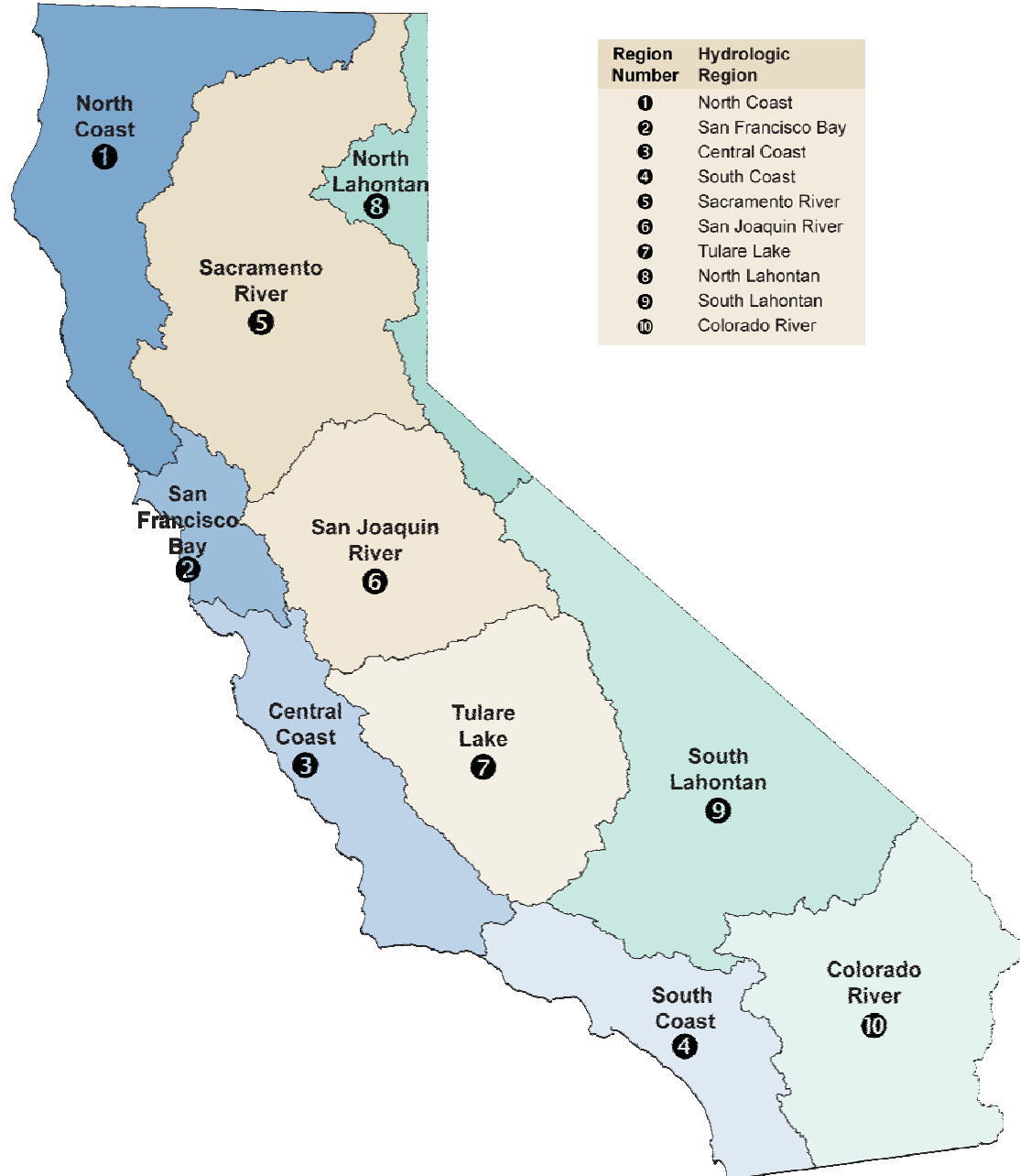
This 20x2020 Plan is based on analyses conducted on a regional and statewide basis. The analyses were designed to account for regional differences, including varying levels of past conservation in different regions and varying climate that affects outdoor water use. Two regional approaches to planning were considered – use of hydrologic regions (HR) and reference evapotranspiration (ETo) zones. Hydrologic Regions refer to the 10 regions delineated by DWR based on topographic and hydrologic characteristics (Figure 1). ETo zones refer to the 18 zones delineated by DWR and the University of California based on climate characteristics (Figure 2) related to the consumption of water by well-watered cool season turfgrass species. Analysis at the water supplier level was not carried out because the supplier-level data were inconsistent and incomplete, and such a fine level of detail was not considered necessary to develop the 20x2020 Plan.

Data analysis and development of conservation targets for planning purposes was conducted by hydrologic region rather than ETo zone for two reasons. First, a large portion of data available for undertaking the analyses presented here were either already collated by hydrologic region, or were easier to collate by hydrologic region than by ETo zones. Second, major funding for integrated regional water management – including water conservation – is structured according to hydrologic region. Regional entities, such as Integrated Regional Water Management consortia, have an important role to play in the success of this 20x2020 Plan and implementing its recommendations. Nevertheless, climate is a powerful factor affecting water use. Ideal regional targets would reflect the climate variability represented by the ETo zones, would result in irrigation water use substantially lower than ETo amounts, and would be flexible enough to accommodate implementation at the geographic scale of hydrologic region or water supplier service area.

This 20x020 Plan does not set targets for individual water suppliers. Within each hydrologic region, there are wide variations among water suppliers. Many factors can affect per capita use, including varying climate within a region, varying land use patterns and population density, different kinds of commercial and industrial use, and past conservation

effort. This plan does not provide the guidance needed to move from regional planning targets to supplier-specific targets. Water supplier targets could be developed using a per capita approach like the regional targets, or could account for local differences by establishing reasonable use levels through the calculation of water budgets.

Figure 1. California Hydrologic Regions



**Figure 2. California Reference Evapotranspiration Zones
Overlapping Hydrologic Regions**



20x2020 Planning Process

The process of developing the *20x2020 Plan* is illustrated in Figure 3 (completed steps are highlighted). There are five steps:

1. Data Analysis
2. Baseline Definition
3. Preliminary Targets Development
4. Conservation Potential Identification
5. Implementation Planning

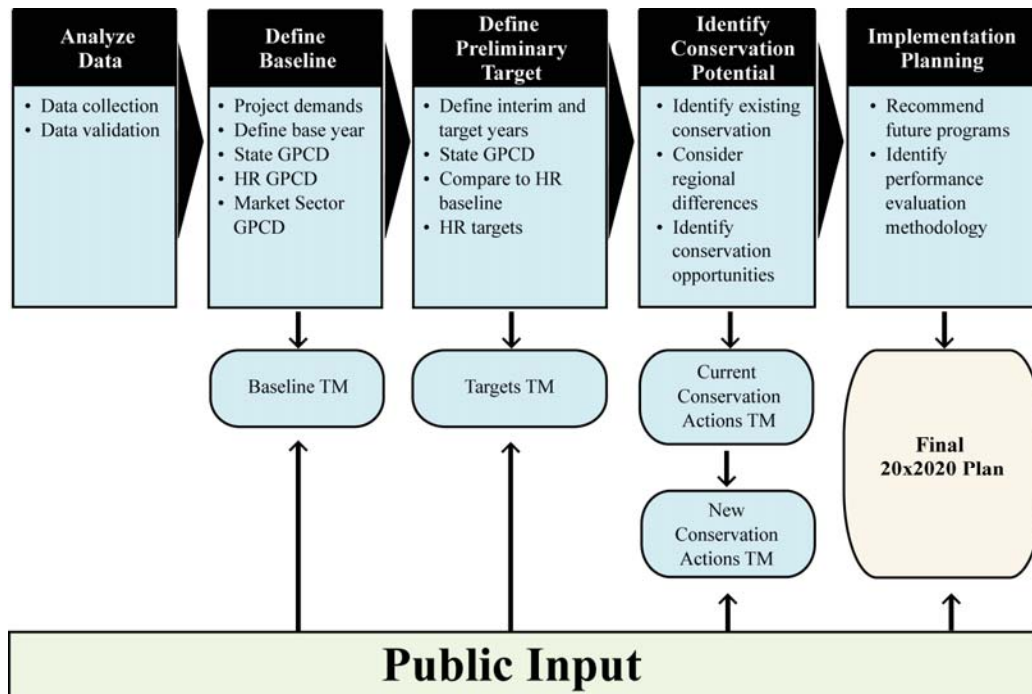
In this *20x2020 Plan*, findings of previous works are summarized, and many tools and activities that the state and local water suppliers could implement to achieve a statewide 20 percent reduction in per capita use are described.

Summary of the Statewide Planning Effort

A significant amount of data collection and technical analysis was conducted to prepare this *20x2020 Plan*. Results of this work are contained in the following technical memoranda (TMs). All of these documents are available at the following website hosted by SWRCB: http://www.swrcb.ca.gov/water_issues/hot_topics/20x2020/index.shtml

These TMs were draft working documents and were not updated to include changes made in response to public comment or further analysis by the agency team. They provided a starting point, with comments and discussion from stakeholders and the team modifying the approach and conclusions of the initial TM findings to produce this document. As such, they provide a historic reference to this *20x2020 Plan*.

Figure 3. 20x2020 Plan Development Process



TM 1. Establishing Baselines

This TM evaluated the available potable water use data and established baseline per capita water use values for each of the ten hydrologic regions, expressed as gallons per capita daily or GPCD. These baselines were used to determine the target GPCD values.

TM 2. Determining Conservation Targets

Urban water use varies widely among regions, due to the effect of past conservation efforts, community attributes, and climate differences. A uniform statewide 20 percent reduction in water use would fail to properly account for these regional differences. To provide one idea of how regional targets might vary, this TM used the baseline GPCD values determined in TM 1 to set the target GPCD values for each of the ten hydrologic regions. These targets were derived before savings estimates from “current” and “future” conservation programs and actions were fully developed. Considerable public input on target-setting received at public workshops prompted further revision of both the methodology and the targets. The revised targets and methodology discussed in this document supersede what was earlier presented in TM 2. See Chapter 2 of this *20x2020 Plan* for additional discussion.

TM 3 (Performance Metrics) and **TM 6 (Implementation Plan)** were not developed as Technical Memoranda as originally anticipated. They are not posted as Technical Memoranda on the website, but are addressed only in this *20x2020 Plan*, as described in Chapter 4. Because of timing and funding constraints, these topics were not presented for discussion at early workshops but were included for discussion during the final public workshop.

TM 4. Potential Conservation Savings from Current Actions

TM 4 evaluated GPCD savings that each region could likely achieve using existing conservation tools and programs. Measures quantified include the impact of existing plumbing codes; the potential impact of existing regulatory initiatives requiring complete urban metering by 2025; the implementation of Best Management Practices (BMPs) at existing rates (except for high efficiency clothes washers which were considered as a new action); and improving these implementation rates in the future because of recent legislation (AB 1420, Laird 2007), which ties receipt of water-related state grant funding to BMP implementation.

After adopting the California Urban Water Conservation Council’s *Memorandum of Understanding Regarding Urban Water Conservation* (MOU) in 1991, many urban water suppliers initiated water conservation programs identified as BMPs in the MOU. These BMPs are listed in Table 1.

A key source for the savings estimates was the CALFED Bay-Delta Program’s *Water Use Efficiency Comprehensive Evaluation* (referred to hereinafter as *Comprehensive Evaluation*).¹ This evaluation was conducted by the CALFED Bay-Delta Program to assess water use efficiency progress made during the implementation of the CALFED Program from 2000 to 2004, and to assess the potential for additional efficiency improvements under several different funding and implementation scenarios. To develop the *20x2020 Plan*, these estimates were updated to account for new codes, such as AB 715 (Laird, 2007), that requires only high-efficiency toilets and urinals (HETs and HEUs) to be sold or installed

¹ CALFED Bay-Delta Program Water Use Efficiency Element, “*Water Use Efficiency Comprehensive Evaluation*,” August 2006.

after January 1, 2014. The *Comprehensive Evaluation*'s savings estimates were also adjusted to 2005, the last year of the 11-year water production data history from which baseline GPCD estimates were derived. The *Comprehensive Evaluation* examines different levels of implementation of the Best Management Practices for Urban Water Conservation (BMPs) as described in the Memorandum of Understanding administered by CUWCC. Although the MOU was revised in December 2008, the list of BMPs presented here is as they existed prior to this revision since that is how the *Comprehensive Evaluation*'s analyses were conducted.

Table 1. List of Best Management Practices (BMPs)

BMP	Description
BMP 1	Water survey programs for residential customers
BMP 2	Residential plumbing retrofit
BMP 3	System water audits, leak detection and repair
BMP 4	Metering with commodity rates for all new connections and retrofit of existing unmetered connections
BMP 5	Large landscape conservation programs and incentives
BMP 6	High efficiency clothes-washing machine financial incentive program
BMP 7	Public information programs
BMP 8	School education programs
BMP 9	Conservation programs for commercial, industrial, institutional (CII) accounts
BMP 10	Wholesale agency assistance programs
BMP 11	Retail conservation pricing
BMP 12	Conservation coordinator
BMP 13	Water waste prohibition
BMP 14	Residential ultra-low-flush toilet (ULFT) replacement programs

TM 5. Potential Conservation Savings from New Actions

TM 5 evaluated GPCD savings that each region could likely achieve through new conservation tools and programs. Measures quantified include savings from the retrofit of inefficient clothes washers with more efficient washers, retrofit of large-landscape residences with weather-based irrigation controllers, and several new technologies evaluated by CUWCC as part of its Potential Best Management Practice review. TM 5 also estimated additional savings likely if coverage goals for a select set of BMPs are expanded relative to what is stated in the MOU, if aggressive programs are pursued to reduce unaccounted for water beyond what is required by the MOU, if residential irrigation is restricted to only one or two days per week, and if recycling projects come on line as projected.

Finally, TM 5 presented some placeholder estimates of likely additional savings at an assumed level of investment of grant funds for water conservation. These savings estimates are also drawn from the *Comprehensive Evaluation*. The scenario assumes that \$30 million per year would be available between 2005 and 2014, and \$7.5 million per year thereafter until 2020. It is important to note that the *Comprehensive Evaluation* followed an elaborate cost-effectiveness criterion to allocate funds across different hydrologic regions, taking into

account an estimate of the marginal cost of water to a region. Under Proposition 84, which allocated \$1 billion in grant funds for water management, each region is assured a proportionate share of the total grant funding. This does not assure that regional funds will be used to implement efficiency improvements, and conservation efforts have been more modest in areas such as the Central Valley where the cost of water has been comparatively lower. Therefore, estimates of grant-funded savings should be treated as highly uncertain. Additional incentives or disincentives may be needed to improve water use efficiency in regions where the price of water is furthest from fully reflecting the true costs of the water supply and does not include the costs of extensive conservation programs.

Public Outreach

Information on development of the *20x2020 Plan* is posted on the SWRCB website at: http://www.swrcb.ca.gov/water_issues/hot_topics/20x2020/index.shtml

This website also includes links to all the TMs.

The *20x2020 Plan* effort hosted three public workshops and a toll-free conference call to receive input on the conservation planning effort, and conducted a scoping session in conjunction with a meeting of the Water Plan All Regions forum.

- A Scoping Session was conducted in San Jose on June 2, 2008 in conjunction with an “All Regions Forum,” a meeting supporting the update of the California Water Plan. This session focused on gathering input about approach and content of the prospective *20x2020 Plan*.
- Public Workshop #1 was held in Sacramento on September 15, 2008 and included over 100 participants. This first workshop focused on establishing baseline GPCD and targets for the year 2020. The discussion provided an overview of the 20 percent by 2020 process and allowed stakeholders to share ideas and questions directly with the Agency Team. The workshop allowed the Agency Team to get an initial read on the public’s concerns and sentiments which were incorporated into the draft *20x2020 Plan*.
- Public Workshop #2 was held in Sacramento on November 20, 2008 and included over 40 stakeholders. The second workshop focused on potential conservation savings from current and new actions. Public comments included an extensive dialogue regarding the treatment of commercial, industrial and institutional target setting. Public comments were addressed and folded into the draft *20x2020 Plan*.
- Stakeholders present at the second workshop requested a conference call be held to provide additional clarification on the method used to establish conservation targets. This conference call was hosted on December 8, 2008 and included over 40 participants.
- Public Workshop #3 was held in Sacramento on May 29, 2009 and focused on the public review draft of the *20x2020 Plan*. Also, written comments on the draft plan were received through the program website and posted on the website for public review. Appendix C of this final plan includes a summary of the major categories of comments received, and a summary of the agency team responses.
- Throughout the *20x2020 Plan* process a public comment e-mail address was active as a mechanism for providing input and a means for posing questions regarding the process. Before each workshop roughly one dozen comments were submitted via email and were addressed by the Agency Team.

Chapter 2. Establishing a Baseline and Targets

Water use depends on various factors such as population, climate, land use patterns, (lot sizes, square footage of irrigated landscape), the age and condition of the water distribution infrastructure (water losses), and industrial and socioeconomic characteristics (the cost of water and income level of residents) of a region. There are significant variations in per capita use across the state reflecting these factors. The analyses in this *20x2020 Plan* are presented by hydrologic region in part to recognize and account for some of this variation.

In order to achieve a savings target, it is essential to first define a baseline. Data from a number of different sources were assessed, as described in following section. However, the data available for this analysis were not complete and accuracy levels vary significantly among water suppliers. Furthermore, through the existing water use data collection systems, there is a considerable lag time between when data are collected and when they are reported to the various entities. With this in mind, the analyses provided in this *20x2020 Plan* should be treated as initial estimates, based on the best available information. An important step in implementing this *20x2020 Plan* will be to standardize and improve the data collection process. This recommendation is discussed in more detail in Chapter Three.

The baseline and target water use levels described in this plan are for hydrologic regions. This plan does not describe methods to calculate targets for individual water suppliers, and the target for a hydrologic region may not be the appropriate target for a particular supplier within that region, because the regional target may be too low or too high. These targets were developed for planning at the statewide and regional level.

Establishing a Baseline

The baseline values for each region represent the starting point of the *20x2020 Plan*, and help to determine the progress achieved toward the Governor's goal. Establishing the baseline is a dynamic process. The methodology used to develop the baseline in the planning effort of this *20x2020 Plan* was based on the data and resources available at this time and is a good first step towards accomplishing the *20x2020 Plan*'s goals. There is ample room, however, for improvement and refinement of the baseline as new information becomes available. Accordingly, this plan recommends improved data collection and management.

Over the years, many agencies and organizations – including DWR, DPH, CPUC and CUWCC – have collected urban water use data depending upon their goals and needs. Each dataset has strengths and limitations, as summarized in Table 2.

Table 2. Dataset Strengths and Limitations

Data Source	Strength	Limitation
DWR – Public Water Systems Survey (PWSS)	- Detailed water production, water delivery, population, and connections data. - Categorized by market sectors (e.g., residential, commercial, industrial, etc.). - Compiled into a central database. - Conducted annually.	- Collected voluntarily, which impacts data completeness and accuracy. - Recent data (2005-present) have not yet been compiled and validated, and are not available for use for this Plan.
DWR – Land and Water Use Program (LWUP)	- An extension from PWSS database, with data validated and modified at a sub-county level and validated using professional judgment. - Every area has a water use value.	Only three (3) years of data are available (1998, 2000, and 2001).
California Urban Water Conservation Council (CUWCC)	- Detailed water use data by demand sector/customer type - Includes estimates of water saved through conservation Best Management Practices	- Only entered by Signatories of Memorandum of Understanding (approximately 225 of largest urban water suppliers in 2008) - Values expressed in 2006 dollars.
CPUC	- Recent urban water use data readily available. - Mandatory so data set should be complete.	- Limited data points - Only residential data available. - Data for connections and water use only. - Data was reported on annual basis, which limits the analysis for residential indoor/outdoor water use.
DPH	More complete database since the Safe Drinking Water Act requires water suppliers to report water use data annually.	- Not available electronically. - Has not been compiled into a central database. Stored as hard copies in each DPH office across the state.
Urban Water Management Plans (UWMPs) prepared by Water Suppliers	- Could provide more detail on water use because plans are prepared by individual water suppliers. - Water suppliers serving more than 3,000 connections or more than 3,000 AFY are required by law to develop and submit UWMPs. - Mandatory but compliance is not 100 percent.	- Developed only once every five years. - Not compiled into a central database and therefore not available electronically. - No data from small water suppliers that serve fewer than 3,000 connections or 3,000 AFY.

Supply and Demand Data

Because water production data for any given year includes missing and inconsistent elements, several years of production and delivery data (1995 through 2005) were pooled to derive more stable average estimates of baseline consumption. Based on these data, no discernable trend was observed in the overall statewide and regional per capita water use over this period. Therefore, the most recent year for this period, 2005, has been selected as the baseline year.

Review of the strengths and limitations associated with the available databases revealed that data provided by DWR (both the PWSS and LWUP databases) contain the most relevant information that could be used for this *20x2020 Plan*. There are a number of uncertainties and possible inaccuracies in these data, but they were the best available at this time.

Because data submittal to DWR is voluntary, the completeness and accuracy of these data vary substantially between water suppliers. Some suppliers did not provide data for certain market sectors and/or certain years. Suppliers also used different methods in measuring water production and delivery. It is also evident that water suppliers had different understandings of specific data fields.

Most suppliers did not provide data on recycled water. If recycled water data were provided, they were removed from the demand data used to calculate per capita use. This plan encourages greater use of recycled water by crediting the substitution of recycled water for potable water as a reduction in potable per capita water use.

Water production of private water suppliers (e.g., residents with private water wells) is not captured in the PWSS database and was therefore also excluded from this analysis.

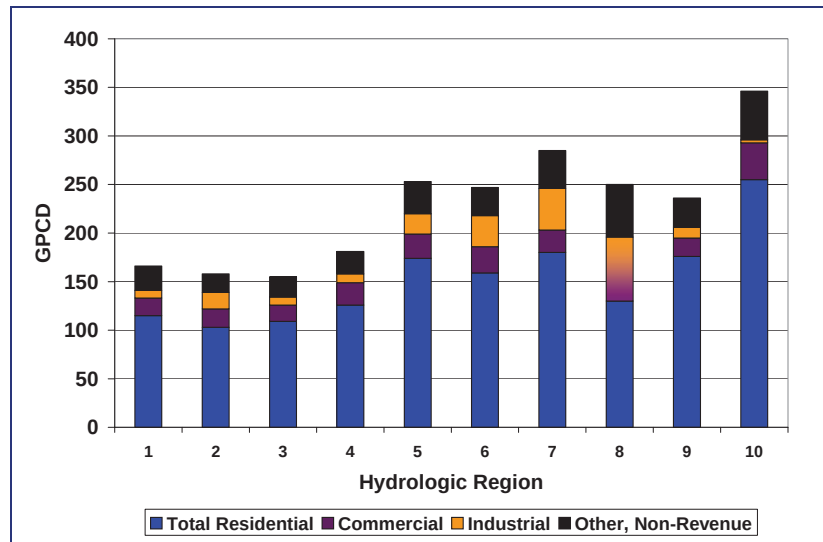
Data Development

Table 3 and Figure 4 below show the variations in average GPCD across the state's 10 hydrologic regions from the data analyzed in the PWSS database. This includes the base sectors of total residential, commercial, industrial and other/non-revenue where data were available.

Review of the compiled data by hydrologic region showed significant variations across the state. As expected, the GPCD values were higher in the more arid areas such as the Colorado Basin (Region 10). The coastal regions (1 through 4) have the lowest GPCD, partly because they have a cooler climate, limited water supplies, and higher cost of water, and because these areas have implemented more water conservation programs than many of the inland areas.

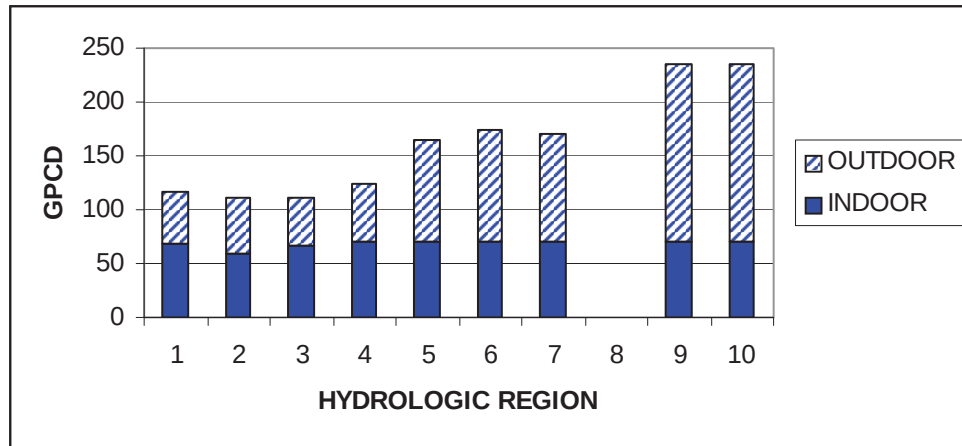
Table 3. Regional Urban Water Use Pattern in 2005

Sector Water Use (GPCD)	Hydrologic Region									
	1	2	3	4	5	6	7	8*	9	10
Residential (Single- and Multi-Family)	115	103	109	126	174	159	180		176	255
Commercial and Institutional	18	19	17	23	25	27	23		19	38
Industrial	8	17	8	9	21	32	43		11	3
Un-Reported Water	24	18	20	22	33	30	39		31	50
Total Baseline	165	157	154	180	253	248	285	243	237	346
* Region 8 does not have enough usable data in the PWSS database to compute for baseline values. The LWUP database was used instead. Note that the LWUP database only contains data for 1998, 2000, 2001. The baseline values for this region may not be as reliable as values computed for the other regions.										

Figure 4. Regional Urban Water Use Patterns**Table 4. Per Capita Urban Water Use in California, 1995-2005**

Hydrologic Region	Weighted Average 1995-2005, GPCD	Range, GPCD
Region 1: North Coast	165	141-170
Region 2: San Francisco Bay	157	149-173
Region 3: Central Coast	154	141-177
Region 4: South Coast	180	171-198
Region 5: Sacramento River	253	237-272
Region 6: San Joaquin River	248	236-250
Region 7: Tulare Lake	285	242-341
Region 8: North Lahontan	243	242-385
Region 9: South Lahontan	237	221-286
Region 10: Colorado River	346	272-387

As demonstrated in Table 4, even within hydrologic regions there is significant variation in use, due to climatic, demographic, or economic factors as well as differing levels of conservation implementation. This variation demonstrates the need for flexibility in the design of local conservation programs: no two service areas are identical. As demonstrated in Figure 5 analysis of the baseline data indicated that outdoor water use is a significant part of the demand profile for single family households, and reflects a large part of the differences among regional data. Comparison of the lowest monthly consumption data (which usually represents mostly indoor use) with the rest of the year showed large potential for water savings due to landscape modifications or irrigation restrictions. In all Regions outdoor water consumption exceeds 40 percent of urban consumption. In Regions 5 through 10, it represents more than 50 percent of total demand, and almost 70 percent of demand in Regions 9 and 10. (There was insufficient data to represent HR 8 in Figure 5).

Figure 5. Single Family Residential Indoor/Outdoor Baseline Distribution

There was insufficient data to represent Hydrologic Region 8.

Potential Conservation Savings from Current Actions (Basic Measures)

Retail water suppliers in California have reported per capita water use remaining steady or dropping since the early 1990s in many parts of California, for several reasons. First, after adopting the California Urban Water Conservation Council's MOU in 1991, many urban water suppliers have undertaken water conservation programs identified as Best Management Practices (BMPs) in the MOU.

The state has also undertaken several regulatory initiatives to improve water use efficiency, such as mandating that unmetered connections be metered by 2025; that new construction with significant landscaped areas be subject to plan review to ensure that efficient irrigation systems and low water-using plants are being used (Model Water Efficient Landscape Ordinance); and that there is better coordination between land use and water use planning (SB 221 and SB 610, 2001). Not all of these BMPs, regulatory initiatives, new technologies, or education and outreach activities have easily quantifiable effects, but they are generally acknowledged to affect water use.

However, overall statewide and regional per capita water use trends remained flat in California between 1995 and 2005, as indicated in the available datasets employed by this *20x2020 Plan*. This suggests that other factors have been at play counteracting the effect of BMPs, codes, and the above-mentioned regulatory initiatives or perhaps that progress in reducing GPCDs that have been made in some communities have been offset by increasing GPCDs in other communities.

The effect of the following codes, active programs, and regulatory activities have been considered in quantifying conservation savings from current actions.

1. Regulatory activities
 - a. The conversion of unmetered connections served by the Federal Central Valley Project (CVP) to metered connections by 2013, and non-CVP unmetered connections converted by January 1, 2025, as required by state law.

2. Codes related to plumbing and appliance efficiency
 - a. The 1992 Federal Energy Policy Act requiring the sale of efficient showerheads and California Code regarding high efficiency toilets, AB 715 (Health and Safety Code section 17921.4), that requires only high-efficiency toilets and urinals (HETs and HEUs) to be sold or installed after January 1, 2014.
3. Best Management Practices
 - a. The active conservation programs aimed at retrofit of inefficient fixtures (BMPs 1, 2, 9 and 14), those aimed at improving outdoor water use efficiency in residential (BMP 1) and large landscape settings (BMP 5), those aimed at improving water use efficiency in Commercial, Industrial and Institutional (CII) settings (BMP 9), and those aimed at reducing system leaks (BMP 3). The impact of high-efficiency clothes washer retrofits (BMP 6) is included among future actions because this BMP was not being aggressively implemented during the baseline period, and uncertainty remains about when a waiver of federal pre-emption might be obtained for the state's efficient clothes washer standard. The remaining BMPs have non-quantifiable benefits.
4. New technologies already having an impact
 - a. Two new conservation measures that are already being implemented under the auspices of CII programs: (1) pre-rinse spray valves; (2) steam sterilizers.

Table 5 shows potential savings from code and regulation-driven retrofits, and from conversion of unmetered accounts to metered accounts. Codes bring about increased efficiency in two ways. They ensure that fixtures and appliances in new construction are more efficient. Also, they ensure that when old fixtures and appliances in existing construction turn over, they are replaced by the more efficient kind.

Table 6 shows potential savings that result from BMP implementation (except for BMP 6) up to a point that is regionally cost effective. A measure is regionally cost-effective if the cost per unit of savings (\$/AF) is less than or equal to the cost of the most expensive supply measure currently in use regionally. The impact of regionally cost-effective retrofits of pre-rinse spray valves, commercial dishwashers, steam sterilizers, CII process water, and efficient residential dishwashers are also included in these estimates. The regionally cost-effective estimates of savings potential come from the *Comprehensive Evaluation*, which provides a complete description of the underlying data, methodology, and models used to develop these estimates.

Four important caveats apply to these estimates. First, savings estimated to result from the cost-effective implementation of BMPs (Table 6) assume both signatories and non-signatories of the CUWCC Memorandum of Understanding implement all BMPs and other measures deemed regionally cost-effective (the row entitled "total savings GPCD @ 100 percent compliance). This level of implementation exceeds what water suppliers have achieved historically through the MOU process. On the other hand, BMP implementation data filed by MOU signatories is also of uneven quality and does not capture conservation by non-signatories. Relying solely on these implementation reports will likely understate achieved conservation. Keeping in mind these data problems, and that only approximately 60 percent of California's population was being served by retail water supplier MOU signatories as of 2006, perhaps only half of the 100 percent compliance savings is likely to be realized if current trends continue. On the other hand, passage of AB 1420 in 2007 (Water Code, section 10631.5) is widely expected to spur water suppliers to increase their efforts to

implement BMPs. It is assumed that enforcement of AB 1420 will result in 80 percent compliance with cost-effective conservation measures. Table 5 shows that efficiency codes can be expected to lower statewide water use by 4 percent and regionally cost-effective programs at 80 percent compliance achieve an additional 6 percent (Table 6) for a total statewide reduction of 10 percent.

Second, estimation of baseline consumption itself involves several uncertainties, which if properly accounted for, could further lower the above reported percent savings estimates. Because water production data for any given year includes missing and inconsistent elements, several years of production data (1995 through 2005) were pooled to derive more stable average estimates of baseline consumption. Production data from 2005 (the most recent year for which statewide water production data are available) was used as the base year for estimating remaining savings potential through 2015 and 2020.

Third, code-driven savings associated with toilets and showerheads are computed using unverified saturation estimates. Small errors in baseline saturation estimates can have significant impacts.

Finally, the regional marginal water supply cost estimates upon which the cost-effectiveness analyses are based are somewhat dated and may not capture changes in the State's water supply situation, particularly as it pertains to the Delta, that have driven up water supply costs in recent years. Economic incentives to invest locally in water use efficiency measures may now be greater than assumed for these analyses.

The savings estimates in this chapter reflect two different approaches to cost-effectiveness. First, certain BMPs are assumed to be implemented to the level of local cost-effectiveness, or 80 percent of the level of local cost-effectiveness.

Second, many conservation measures will be implemented without any local calculation of cost-effectiveness. This implementation is prompted by state or federal law, institutional agreement, and local practice, and there are many examples. Federal and state fixture efficiency standards ensure any replacement toilets, showerhead, or faucets will be highly efficient. California law requires local governments to enact landscape water conservation ordinances that are at least as effective as the state's model ordinance. Hundreds of water suppliers have agreed to implement "non-quantifiable BMPs" such as information and education programs. Finally, local governments routinely prohibit wasteful practices such as gutter flooding, regardless of a customer's cost to prevent such runoff. As described in Chapter 3, grant funding is a means of reducing costs of measures that are cost-effective from a statewide perspective such that the measures become locally cost-effective. Grant funding is not assumed for the estimates in Table 6.

The analyses of current actions yield several important conclusions. Efficiency codes still have considerable potential to further reduce water consumption in California on a per capita basis, even in hydrologic regions with already less than average use. Also, implementation of BMPs to a level that is regionally cost effective can almost double the impact of efficiency codes in certain hydrologic regions, such as San Francisco Bay and South Coast that account for a large share of the state's population, thus also water use.

On the other hand, simply following a BMP strategy, which relies on voluntary implementation of locally cost-effective conservation measures, would fail to ensure implementation of some very reasonable basic conservation measures in many other hydrologic regions. For example, the Sacramento River, San Joaquin River, North and South Lahontan, and Tulare Lake regions are also home to a significant share of California's population, but urban water supply costs remain low relative to other parts of the state. Different mechanisms will need to be devised to incentivize water suppliers in these regions

to aggressively pursue conservation. The AB 1420 requirement for water suppliers to implement conservation measures in order to receive state grant or loan funds already attempts to do this; it will help, but it will not provide sufficient spur for every region to reach its 2020 target.

Table 5. 2020 Efficiency Code Water Savings – GPCD

HR Name ->	Hydrologic Number									
	1	2	3	4	5	6	7	8	9	10
	North Coast	SF Bay	Cent. Coast	South Coast	Sac. River	SJ	Tulare Lake	North Lahontan	South Lahontan	CO River*
Residential - Indoor	5	5	5	4	8	7	6	5	5	5
Residential - Outdoor	0	0	0	0	10	9	5	0	0	1
CII	1	2	1	1	1	1	1	2	1	1
Total savings GPCD	7	7	7	6	19	17	12	7	6	6
Baseline GPCD	165	157	154	180	253	248	285	243	237	346
Percent of Baseline GPCD	4%	5%	4%	3%	7%	7%	4%	3%	3%	2%
2020 Population (Million)	0.8	7.0	1.7	22.5	3.6	2.8	3.0	0.1	1.4	1.2
* Savings estimates for CII and landscape measures in HR 10 may have low reliability due to faulty estimates of landscape applied water										
										44.1
										192
										4%

Table 6. 2020 Water Savings from Cost-Effective Measures – GPCD

HR Name ->	Hydrologic Region Number									
	1	2	3	4	5	6	7	8	9	10
	North Coast	SF Bay	Cent. Coast	South Coast	Sac. River	San Joaquin	Tulare Lake	North Lahontan	South Lahontan	CO River*
Residential - Indoor	1	1	0	2	0	0	0	0	0	0
Large landscape (BMP 5)	1	4	2	4	0	3	1	4	7	40
CII	2	7	5	7	0	1	1	3	2	4
Non-Revenue Water	0	3	2	4	0	0	0	0	0	0
Total savings GPCD @ 100% compliance	4	15	9	17	0	3	2	7	9	44
Total savings GPCD @ 80% compliance	3	12	8	13	0	3	2	6	8	36
Baseline GPCD	165	157	154	180	253	248	285	243	237	346
Percent of Baseline GPCD @ 80% compliance	2%	8%	5%	7%	0%	1%	1%	2%	3%	10%
2020 Population (Million)	0.8	7.0	1.7	22.5	3.6	2.8	3.0	0.1	1.4	1.2
* Savings estimates for CII and landscape measures in HR 10 may have low reliability due to faulty estimates of landscape applied water.										

Potential Conservation Savings from New Actions (Additional Measures)

Current actions alone will not achieve the state's 20 percent reduction goal by 2020. However, the goal can be achieved through a combination of current and new actions. For this *20x2020 Plan*, many potential measures were considered. The following categories of measures are recommended for the initial focus of state action and support based on potential water savings and feasibility of implementation:

- Efficient clothes washers
- Residential weather-based irrigation controllers
- Grant funding
- Accelerated coverage goals for some BMPs
- Aggressive reduction in non-revenue water beyond BMP 3
- Landscape practices
- New technologies
- Recycled water

Table 7 combines all the savings estimates developed for the *20x2020 Plan*. Efficient clothes washers, residential weather-based irrigation controllers and grant funding are considered as "Basic Measures" in Table 7, along with efficiency code changes and cost effective water conservation measures; many water suppliers are already implementing such programs and are expected to continue to support those activities. Accelerated coverage goals, reduction in non-revenue water, landscape practices, new technologies and recycled water are considered "Additional Measures" in Table 7.

Efficient clothes washers

The California Energy Commission (CEC) adopted water efficiency standards for clothes washers in 2004. It is a tiered standard based on the "water factor" of the clothes washer, which is the number of gallons per cubic foot of drum capacity. Conventional washers have a water factor of about 13.3. In 2007, the maximum water factor to be allowed was 8.5. By 2010 the standard would have been further reduced to 6.0. Federal approval is still required, as the Federal Energy Policy Act of 1992 allows only the federal government to regulate residential clothes washers, pre-empting state standards, unless a state waiver is approved. California has requested such a waiver and continues to press for federal approval.

Several MOU signatories since 2005 have begun to promote efficient clothes washers through rebate programs (BMP 6), and market forces are also transforming the appliances retailers are offering to consumers. The impact of all these factors remains uncertain and difficult to model. Savings were estimated in the following way: First, savings were estimated assuming that the above mentioned efficiency code had gone into effect as intended; but then this estimate was halved under the assumption that active rebate programs and natural turnover will produce half the savings efficiency codes would have realized by 2020. This "half" estimate roughly works out to two to three GPCD.

Residential weather-based irrigation controllers

Studies have shown that landscape irrigation is frequently inefficient and, in some cases, a high percentage of residential landscape irrigation is wasted as a result of over-watering, poor design and poor maintenance. The analysis assumed that the top quarter of single-family homes in terms of landscape area can be cost-effectively fitted with weather-

based irrigation controllers that take much of the “guess-work” out of scheduling and determining the needed quantities of water. Many suppliers are experimenting with this measure even though it is not specifically included in any BMP. Savings from this measure are conservatively estimated to be 3 to 4 GPCD by 2020.

Grant funding

Estimates of likely additional savings from grant funding to promote water conservation were included in the analysis, with input from the *Comprehensive Evaluation*. The scenario assumes that \$30 million per year would be available between 2005 and 2014, and \$7.5 million per year thereafter until 2020. Grant funding savings estimates are based on the assumption in the *Water Use Efficiency Comprehensive Evaluation* that grant funding will induce the implementation of measures that are cost-effective from a statewide perspective but not from a local perspective, and will reimburse the cost increment between local and statewide cost-effectiveness.

Accelerated coverage goals for some BMPs

Instead of implementing BMPs within the existing voluntary framework, all water suppliers or others could be required to implement certain basic conservation measures, regardless of cost-effectiveness, to meet a maximum coverage goal. For example, all residential or commercial buildings could be required to have efficient toilets, urinals, and showerheads by 2020. This would force fixture replacement even in regions where the avoided cost of water is still perceived to be low. This would generate additional savings since active programs and natural turnover are not expected to raise the saturation of these devices to 100 percent by 2020.

For the purpose of quantification, the following measures and corresponding 2020 coverage goals have been included in the list of affected BMPs:

- Saturation of inefficient toilets and urinals in residential and commercial buildings to drop below 5 percent in each hydrologic region.
- Saturation of inefficient showerheads to drop below 5 percent in each region (this is expected to happen due to natural turnover anyway, so including this requirement does not contribute incremental savings, but was included to ensure that such a basic item automatically becomes subject to a field verification program).
- Efficient clothes washer saturation to reach a level it would have in the presence of the State’s efficiency code (roughly 85 percent).
- All unmetered urban connections to be converted to metered connections before 2020.
- Non-revenue water is to be brought down to no more than 10 percent of total production where at present it is greater than 10 percent—BMP 3 would be mandatory.

Aggressive reduction in non-revenue water beyond BMP 3

There is significant opportunity for water use reductions related to leak detection and repair in water delivery systems. The new water audit structure promoted by the American Water Works Association and being discussed by the CUWCC includes a more rigorous standard than BMP 3. Most utilities currently use a percentage of production to evaluate losses, but expression of losses as gallons per connection provides a measure that is easier to relate to usage.

BMP 3, which aims to reduce non-revenue water to 10 percent of production, has already been analyzed in previous sections. However, these goals can be exceeded, as other

countries have demonstrated. For example, in the United Kingdom the target for unaccounted water is 30 gallons per connection per day. Many communities in the United Kingdom and Europe are at or below 40 gallons per connection per day. If a similar goal were to be pursued in California, water savings from a low of 2 GPCD for Central Coast to a high of 21 GPCD for the Colorado River regions could be achieved.

Better information on reduction in non-revenue water will become available as more water suppliers use the new AWWA water audit structure.

Landscape practices

There are many actions that may be taken to improve landscape water use efficiency. Professional landscape and irrigation design, proper installation, careful maintenance and management of the site, and the selection of high quality irrigation equipment are some of the factors that can influence the efficient use of water in the landscape. Dedicated landscape meters, establishment of landscape water budgets and associated budget-based rate structures, the performance of irrigation audits, public information programs, technical training for landscape professionals, the use of alternative sources of water in the landscape, and a multitude of rebate programs to support conversion from lawns to water-smart plants and irrigation equipment are examples of actions that can be taken along with or in place of irrigation restrictions.

It is essential for state government to lead a comprehensive suite of programs to improve landscape water use efficiency in California in order to achieve the Governor's water use efficiency goal. Such an effort would yield many other benefits such as improved water quality, reduced energy use and corresponding greenhouse gas emissions, more stormwater capture, and less production of green waste.

For the purposes of this *20x2020 Plan*, landscape water savings are based upon estimates related to irrigation restrictions. Irrigation restrictions can be a very useful tool for reducing water use, especially in the high demand summer months and in the warmer regions of the state. In many areas, water use doubles when customers start to irrigate their landscapes. Many utilities use irrigation restrictions during a prolonged drought or when water reservoirs run low. In practice, restricting irrigation to one day per week would probably require some major changes. In most parts of the state, lawns can do well with twice weekly irrigation, but not as well with once weekly irrigation.

While irrigation restrictions have been used to estimate savings, local water suppliers have many program options for reducing landscape irrigation and conserving water. Irrigation restrictions may result in some landscape maintenance challenges and customer complaints, making implementation more difficult. In some locations, irrigation restrictions have been combined with subsidies for turf removal. This results in some customers reducing irrigation by changing landscape choices from turfgrass to native or other plant species adapted to the California climate of winter rains and a summer dry season. Such "cash for grass" programs have been implemented successfully in California and other states.

Ideally, a water supplier will be able to use a variety of methods—including customer education, incentives, and enforcement—to achieve landscape water savings, rather than a single inflexible tool such as an irrigation restriction. The goal is reasonable use by each customer, and landscapes that are designed, installed, and maintained to be water-efficient.

Using twice weekly watering as a surrogate for a range of landscape conservation programs that could be implemented at the local level, savings are estimated to be between

11 and 40 GPCD depending on the region. If irrigation were restricted to once per week, then the range would be 20 to 73 GPCD.

New technologies

CUWCC screened several new conservation technologies between 2004 and 2007. Savings were estimated for the following:

- On-premise laundries (e.g., hotels, hospitals, universities, prisons, etc.)
- Building cooling systems
- Efficient residential dishwashers for new construction
- Vehicle wash systems
- Residential hot water distribution systems for new construction
- Commercial ice machines
- Waterless urinals

Finally, there are additional technologies, each with small individual impacts that can generate some additional savings. For example, there are savings from replacing inefficient urinals with high-efficiency urinals (HEUs using 0.5 gallons per flush). But if waterless urinals are used as replacements instead of HEUs, savings would roughly increase by an additional 0.2 GPCD by 2020. Savings from other devices, such as pressurized water brooms and dry vacuum pumps, could contribute roughly 0.1 GPCD. Total impact from all these myriad conservation measures can thus be expected to roughly equal 2 GPCD, which is what was used in the final accounting, presented in Table 7.

Recycled water

Data from DWR and SWRCB were used to quantify the amount of recycled water likely to be available in each region for offsetting urban use by 2020. The recently-adopted SWRCB water recycling policy is anticipated to increase the use of recycled water throughout the state. Since only potable water is considered in the GPCD calculations in this *20x2020 Plan*, increasing the use of recycled water will result in lower per capita use when it replaces an otherwise potable demand. Such an approach, if incorporated into statute, would help encourage greater use of recycled water.

Putting it all together

Table 7 combines all the savings estimates developed for this *20x2020 Plan*, including savings from current actions (Basic Measures) as well as savings from future actions (Additional Measures). Basic Measures are those that are already being implemented by water suppliers and could be adopted by those that have not aggressively pursued conservation until now. Basic Measures include the minimum activities expected within each region. Additional Measures are those that can be pursued to meet the regional targets when the Basic Measures alone do not meet the regional targets. The savings estimates from the first group, Basic Measures, were used to derive the regional targets described in the next section.

In the development of Table 7 considerable care was taken to prevent double-counting of savings. For example, savings estimates from code and from cost-effective implementation of BMPs reflect separate increments of savings. Grant-funded savings, while obtained from implementation of existing BMPs, count only the savings that would not already be obtained through codes and implementation of cost-effective measures. Savings attributed to irrigation restrictions only reflect the savings from the single-family residential

sector; large-landscape programs are included separately. Savings from conservation rate structures and the Model Landscape Ordinance are not included in Table 7 to avoid any possibility of double-counting. The only exception is savings attributable to smart irrigation controllers, which is included.

An important conclusion from Table 7 is that a 20 percent reduction in per capita use is achievable. By pursuing more widespread implementation of existing measures, and implementing well-documented new measures, California can reduce its per capita use rate 20 percent by 2020.

Table 7. Summary of 2020 Savings from All Evaluated Measures – GPCD

Hydrologic Region Number											
12345678910											
HR Name ->	North Coast	SF Bay	Cent. Coast	South Coast	Sac. River	San Joaquin	Tulare Lake	North Lahontan	South Lahontan	CO River*	State-wide
Savings From Basic Measures											
Code	7	7	7	6	19	17	12	7	6	6	8
80% of local CE	3	12	8	13	0	3	2	6	8	36	11
Grant funded	11	1	12	1	3	8	13	15	24	8	4
Efficient clothes washers	3	2	3	2	3	3	3	3	3	3	3
Residential ET controllers	4	3	3	3	3	3	3	4	3	3	3
TOTAL (basic measures)	28	26	32	24	28	33	32	36	43	56	28
Savings From Additional Measures											
Accelerated coverage goals	11	8	10	7	17	13	14	14	17	17	9
Recycling	4	7	1	4	3		1			6	3
Water loss control (40 g/conn./day)	3	2	2	4	11	11	15	11	10	21	6
Irrigation restrictions (2 day/week)	11	11	11	13	23	22	25	11	29	40	16
Miscellaneous PBMPs	2	2	2	2	2	2	2	2	2	2	2
TOTAL (additional measures)	31	30	26	29	56	48	57	38	58	86	37
* Savings estimates for CII and landscape measures in HR 10 may have low reliability due to faulty estimates of landscape applied water.											

Statewide Targets

The development of per capita use targets was the most difficult task in this *20x2020 Plan*. This effort yielded insights that may help the Legislature as it works to incorporate the 20 percent reduction goal into statute. These insights are discussed more fully in Chapter 3.

The variations within the data provided, the lack of data from many water suppliers, and the limited scope of this planning effort meant that an analysis of GPCD on an agency-by-agency basis was not possible. However, there was enough information on a regional (hydrologic region) basis to evaluate trends and provide initial target methodologies. The aim is to use these regional targets as an example of how targets might vary by region according to base year water use, past conservation practices, and current per capita use. Any subsequent effort to establish targets for individual suppliers would need to incorporate additional information on factors such as past conservation, customer base, and climate.

The conservation targets for the interim year (2015) are not a linear interpolation between the baseline and the final goal. An interim conservation target, equivalent to 50 percent of the expected savings, would allow time for water suppliers to incorporate the *20x2020 Plan* goals into their conservation program activities. A conservation target of a statewide 20 percent reduction from the baseline was defined for year 2020, by which time all suppliers should be able to implement the conservation programs necessary to achieve the statewide 20 percent reduction goal.

The statewide baseline water use value, expressed in gallons per capita per day (GPCD), is **192 GPCD**. The corresponding statewide targets are:

- **Interim Statewide Target** = 192 GPCD (Statewide Baseline) minus 10 percent = **173 GPCD**
- **Final Statewide Target** = 192 GPCD (Statewide Baseline) minus 20 percent = **154 GPCD**.

Based on a 2005 population of about 37 million and per capita use of 192 GPCD, total urban use would be about 7.9 MAF per year, and the annual statewide savings would be about 1.59 MAF. According to the *California Water Plan Update 2005*, total urban water use for the most recent normal hydrologic year (2000) was 8.9 MAF. A 20 percent reduction in this level of use would be 1.78 MAF. These amounts are the projected 2020 savings attributable to the 2005 population.

As the population grows between 2005 and 2020, per capita use associated with new growth is expected to be lower than baseline per capita use, even without implementation of this *20x2020 Plan*, because new dwellings will have the latest in efficient fixtures, appliances, and landscapes. Implementation of this plan will further reduce the per capita use of new residents due to measures such as public information and outreach, and conservation pricing. This increment of savings has not been separately estimated, but it is likely the actual 2020 savings would be more than 1.59-1.78 MAF per year.

Figure 6 below summarizes the regional targets. Detailed step-by-step explanation and equation of the methodology used to determine these targets are included in Appendix B.

Table 8. Regional Urban Water Use Targets

	Hydrologic Region Number									
	1	2	3	4	5	6	7	8	9	10
Baseline (1995-2005)	165	157	154	180	253	248	285	243	237	346
Interim Targets (2015)	151	144	139	165	215	211	237	208	204	278
Targets (2020)	137	131	123	149	176	174	188	173	170	211

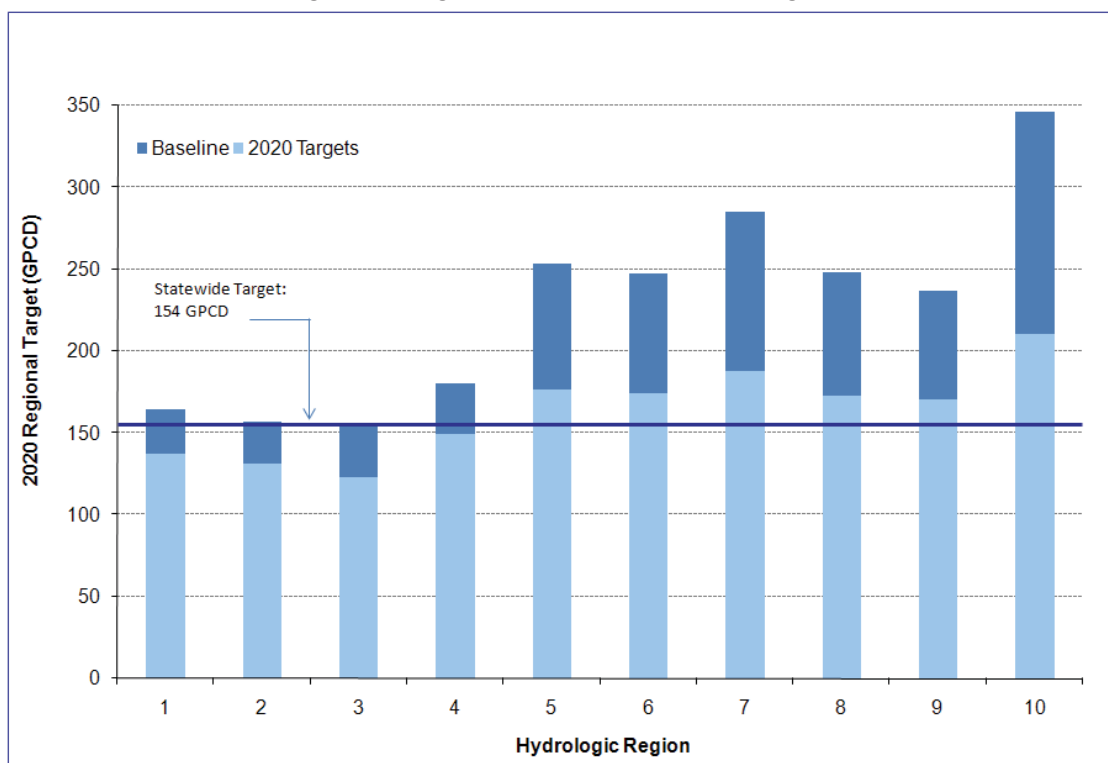
Figure 6. Regional Urban Water Use Targets

Table 9 shows each region's progress in meeting planning targets with the implementation of basic measures and, if necessary, implementation of additional measures. The statewide column in this table shows the result in 2020. By this time, population growth will have occurred in each region, with a larger share of population growth occurring in regions with higher per capita use. Thus, the no-action baseline would rise from 192 GPCD currently to 199 GPCD in 2020.

By 2020, through prompt aggressive action and sustained effort, California can reduce its per capita use by more than 20 percent. Only one region would be unable to meet its target after implementing the measures described in this plan, the Tulare Lake region. Even though one region is projected to fall short of its target, that shortage will likely be offset by savings in other regions.

Table 9. Achievement of Targets by Region, 2020

	Hydrologic Region Number										Statewide 2020 Result
	1	2	3	4	5	6	7	8	9	10	
Baseline (1995-2005)	165	157	154	180	253	248	285	243	237	346	199
Targets (2020)	137	131	123	149	176	174	188	173	170	211	154
Desired savings	28	26	31	31	77	74	97	70	67	135	45
Total savings (basic measures)	28	26	32	24	28	33	32	36	43	56	28
2020 Savings shortfall after implementing basic measures	-	-	-	7	49	41	65	34	24	79	17
Total savings available (additional measures)	31	30	26	29	56	48	57	38	58	86	37
2020 Shortfall still remaining after implementing additional measures	-	-	-	-	-	-	8	-	-	-	-

Chapter 3. Recommendations

California can achieve at least a 20 percent reduction in per capita water use by 2020. The analyses described in Chapter 2, as summarized in Table 7, show that basic conservation measures including implementation of BMPs, codes, and ordinances will produce significant savings, and in some regions of the state, most of the water savings sought by the 20 percent statewide target. Nevertheless, these actions will be insufficient to achieve the target for most regions. To achieve the Governor's goal, some new actions will be needed. Legislation or additional secure funding will be needed to ensure that these measures are implemented. A long-term statewide strategic approach with conservation targets mandated by statute and an array of new measures available to water suppliers and regions is needed to achieve the goal.

California can achieve this ambitious goal only if state agencies, regions, and local water suppliers take prompt and aggressive action. Recommended actions to contribute toward a statewide strategic approach (as described in more detail in this chapter) fall into the following categories:

1. Establish a foundation for a statewide Conservation Strategy.
 - a. Establish targets and goals in statute.
 - b. Establish a state agency leadership and coordination framework.
 - c. Provide a forum for stakeholder advice on refinement and implementation.
 - d. Mandate uniform data collection and establish a statewide database.
 - e. Maintain existing programs and institutions.
2. Reduce landscape irrigation demand.
 - a. Require water-efficient landscapes at state-owned properties.
 - b. Support the implementation and enforcement of landscape design and irrigation programs and the development of new landscape programs.
 - c. Mandate the landscape irrigation BMP.
3. Reduce waste.
 - a. Accelerate installation of water meters.
 - b. Establish a state standard for water meter accuracy.
 - c. Revise the water loss BMP to incorporate improved methodologies and accelerate coverage goals.
4. Reinforce efficiency codes and related BMPs.
 - a. Obtain authorization for state standards for high efficiency clothes washers.
 - b. Support landscape irrigation equipment standards.
 - c. Accelerate replacement of inefficient showerheads, toilets and urinals.
 - d. Accelerate adoption of proven water saving technologies in new businesses.
5. Provide financial incentives.
 - a. Encourage or mandate conservation water pricing.
 - b. Provide grants, loans, and rebates to wholesale and retail water suppliers and customers.
 - c. Establish a public goods charge for water.
 - d. Fund the installation of water meters.

6. Implement a statewide conservation public information and outreach campaign.
7. Provide new or exercise existing enforcement mechanisms to facilitate water conservation.
 - a. Require implementation of water conservation as a condition to receive state financial assistance.
 - b. Take enforcement actions to prevent waste and unreasonable use of water.
 - c. Provide additional enforcement tools for water suppliers.
8. Investigate potential flexible implementation measures.
 - a. Investigate requiring conservation offsets for water demand generated by new development.
 - b. Investigate establishment of a cap-and-trade regime.
9. Increase the use of recycled water and non-traditional sources of water.

Establish a foundation for a statewide conservation strategy

Establish targets and goals in statute

The 20 percent goal for reducing water consumption by 2020 is achievable. However, without additional work to establish local targets and a firm requirement to achieve the savings, track progress, and define consequences for suppliers or regions that fail to meet targets, California is not likely to achieve the goal set by the Governor.

The Agency Team's efforts to develop a planning approach to target-setting, the public feedback received on this draft approach, and the public discussions regarding AB 2175 (Laird, 2008), which would have established conservation targets, all provide valuable insights into target-setting legislation. The following criteria should guide the structure of legislation to place the Governor's goal into statute:

- All water suppliers should be treated consistently, and targets should be equitable.
- The approach to target-setting should be kept as simple as possible.
- The target-setting approach should take into account past conservation efforts by suppliers or regions.
- Differences in climate should be taken into account.
- The law should allow flexibility in implementation to the greatest extent possible.
- The law should accommodate, encourage and support emerging regional water management entities and allow regional compliance.
- Separate approaches are necessary for residential water use—as opposed to commercial, industrial and institutional water use—to accommodate unique local conditions.
- The legislation should allow and encourage implementation of the most cost-effective measures through mechanisms such as regional compliance that would permit an incremental step toward a cap-and-trade approach.
- Some regions and water suppliers will need to achieve more conservation than others, due to varying levels of past conservation implementation.
- The legislation should establish deadlines for compliance, as well as consequences for failure to comply.

In November 2009 California placed the 20x2020 goal into statute with the enactment of SBX7 7 (Steinberg), part of an historic package of water reforms.

Establish a state agency leadership and coordination framework

Several state agencies have responsibility or authority over different aspects of water management. Better communication and coordination among these agencies, and designation of a lead agency will be important aspects of implementing the *20x2020 Plan* and assuring its success. The lead agency should coordinate and organize a framework for agency implementation efforts; use combined agency data sources to measure progress toward meeting the Governor's goal; seek the advice of a stakeholder panel regarding program refinement and implementation; coordinate assistance programs to help regions and communities achieve targeted savings; communicate implementation success to the public and to stakeholders; alert water suppliers and regions that are not meeting targets; and recommend additional actions that may be needed to meet the goal.

The Agency Team evaluated each agency's ability to lead a specific task under this *20x2020 Plan*, and also identified the expected outcome of such tasks. Some of the tasks are already being performed by certain agencies. It is not anticipated that the existing authorities of different involved agencies will be consolidated into one agency to implement this *20x2020 Plan*. However, it probably will be necessary to appoint one agency with an overall lead and coordination role.

In conjunction with this lead agency, each involved state agency will be responsible for implementing and tracking components of the *20x2020 Plan* that fall within the purview of its authority. For example, the CPUC has regulatory oversight of investor-owned utilities; the SWRCB enforces water rights and constitutional prohibitions on waste and unreasonable use; the CEC has regulatory authority over water use efficiency standards for appliance and equipment; the DPH has authority for enforcement of the Safe Drinking Water Act, which regulates potable water treatment and delivery by all public water systems; and DWR has planning and conservation monitoring authority, as well as influence over the disbursement of grants and loans. Closer state interagency coordination will be needed to facilitate data management, program implementation, and statute enforcement.

The lead agency with the cooperation of participating agencies should:

- Coordinate and organize agency implementation efforts
- Use combined agency data sources to measure progress toward meeting the Governor's goal
- Communicate implementation success to the public and to stakeholders
- Encourage water suppliers to expand and strengthen implementation of water conservation programs and recycled water programs
- Expand state technical assistance programs to help suppliers and regions implement voluntary or elective local programs
- Alert water suppliers and regions that are not meeting targets
- Finalize a measurement and evaluation plan (performance metrics) to assess whether 2015 and 2020 regional targets have been met
- Recommend additional actions that may be needed to meet the goal.

DWR should serve as the lead agency. DWR is currently responsible for updating the California Water Plan, disbursing grants for integrated regional water management, promoting water conservation, and reviewing urban water management plans.

In addition, there is a need for closer coordination with federal agencies, the CUWCC, IRWM Planning Groups and water suppliers, all of whom will play a role in the successful implementation of the *20x2020 Plan*. Where membership organizations such as the CUWCC

provide technical assistance or other program support, these efforts should receive financial support. Table 10 shows potential agency roles for the implementation.

Provide a forum for stakeholder advice on refinement and implementation

One valuable recommendation made during public review of the draft of this plan was to establish a stakeholder advisory group. The Agency Team intends to implement this recommendation by establishing a group that can meet periodically and offer guidance on refinement and implementation of this plan.

Table 10. Agency Roles for Key Implementation Activities

Program Task	Key Agencies	Activities
20x2020 Administration	DWR	Management, coordination, analysis, reporting
Data Management	DWR, SWRCB, DPH, CPUC, CEC, CUWCC	Coordinate with other agencies to ascertain overall data requirements. Design and maintain an electronic data submission system
Design regional strategies for achieving regional targets	DWR, SWRCB, Regional water management entities	Assess baseline GPCD by supplier, conservation programs undertaken to date, and what tools will take the region to its target GPCD
Identify new legislation and regulations required	DWR, SWRCB, CUWCC	Develop proposed text for each legislation and regulation
Appropriate grant funding	DWR, SWRCB	Interact with legislature to generate a reliable revenue stream for promoting water conservation
Landscape water conservation	DWR, SWRCB, CEC, CUWCC	Establish a range of new programs to promote landscape water conservation
Outreach	DWR, SWRCB, CUWCC	Inform water suppliers about the Program's requirements. Obtain feedback from stakeholders
Public education	DWR, CUWCC	Design and implement a general public education campaign emphasizing water conservation
Metering	DWR, SWRCB, DPH, CPUC	Develop and implement programs to expedite metering
Appliance efficiency standards	CEC, DWR	Promote higher appliance efficiency standards.
Other potable water offsets	DWR, SWRCB, DPH	Promote the use of recycled water, storm-water capture, and gray-water
Coordinate with AB 32 Scoping Plan implementation	ARB, DWR, SWRCB, CEC, CPUC	Ensure that conservation implementation is mindful of GHG reductions to comply with AB 32
Improve coordination between water and land use agencies	DWR, SWRCB, ARB	Work with water suppliers and local governments to coordinate actions; recommend improvements.

Mandate uniform data collection and establish a statewide database

California currently lacks a consistent method of collecting water data from local water suppliers. Water data is collected by different state agencies based on their individual program needs, which leads to overlaps and gaps between the databases. This has been an

obstacle in the data analysis and per capita water use calculations during the development of the baseline and target numbers. It is recommended that California mandate submittal of water use and conservation data. Submittal of the data should be coordinated among state agencies to reduce reporting burdens on local water suppliers.

A uniform streamlined data collection process would have multiple advantages: the reporting burden on local agencies would be reduced, data reviews related to state action such as grant disbursement would be expedited, state agencies would have more timely access to water use data, the quality and accuracy of the data would improve, better and more complete data would facilitate better water management; and data management costs would be reduced over time.

At a minimum, suppliers should disaggregate and report usage according to the following sectors:

- Single family residential
- Multi-family residential
- Commercial
- Institutional
- Industrial
- Dedicated irrigation
- System water losses
- Recycled water

As shown in Table 10, data on water supply and demand are managed by five state agencies, as well as CUWCC. Much of the data collected are unique to the needs of each agency or CUWCC, and the reporters of data (mainly water suppliers and water right holders) do not submit data to all agencies or CUWCC. Data submittal to some state agencies such as DWR is voluntary, while submittal to other state agencies such as DPH is mandated by law. Where there is overlap in data needs, common definitions and formats for submittal of data should be established. There is a need to incorporate the data that is collected into electronic databases to make the data available for sharing, analysis, and the administration of the respective programs of the agencies and CUWCC. A centralized database or data entry web portal for the state agencies with data entry forms customized to meet the needs of individual agencies and programs could facilitate data sharing and allow data common to more than one agency to be entered only once by a data reporter. While CUWCC is not a state agency, coordination with CUWCC would assist in common efforts to collect data. The following is recommended:

- Initiate coordination and standardization of data collection
- Evaluate the feasibility of creating a centralized database or portal for water supply and demand data.
- Where there are gaps in the data currently being collected, exercise existing regulatory authority or seek legislation to require the submittal of the needed data.
- Establish cost sharing and funding sources to facilitate development and maintenance of data management systems.

Pursuant to Assembly Bill No. 1404 enacted in 2007, the SWRCB—in collaboration with DWR, DPH, and CALFED—is preparing a report to be submitted to the Legislature in 2009 to evaluate the feasibility, estimated costs, and potential means of financing coordinated water measurement. This report, when it becomes available, may be valuable in fulfilling the recommendations above.

However, this type of costly endeavor is not essential to begin the process of improving data collection and management. Implementation of an improved data collection

and management process can occur incrementally. For example, DWR should automate the submittal of summary information from mandated Urban Water Management Plans and structure data submittal to be consistent with its voluntary Public Water System Survey. DWR could also provide guidance on standardized methods of GPCD calculation. This would provide more timely information from water management plans, encourage submittal of annual water use information, improve the consistency of information received, and expedite DWR grant application review under AB 1420.

Other simple data management tools are available. An example of such tool is the GPCD Calculator that was recently developed for the New Mexico Office of the state Engineer. This calculator introduces a consistent methodology that could standardize data collection and GPCD calculations. Water suppliers can use the calculator to develop or refine service area population estimates, calculate per capita use for various water use sectors, and calculate total system per capita use.

Maintain existing programs and institutions

As new programs, policies, and laws are established to support the achievement of a 20 percent reduction in per capita water use, existing effective programs should continue. Examples of current programs include CEC's appliance efficiency standard setting, DWR's California Irrigation Management Information System (CIMIS), and the Model Water Efficient Landscape Ordinance. Effective institutions such as the CUWCC will also need to continue and expand their role in water use efficiency, with necessary financial support.

Reduce landscape irrigation demand

Support the implementation and enforcement of landscape design and irrigation programs and the development of new landscape efficiency programs

Landscape water use has the greatest potential for reduction of any urban water use sector. According to the *California Water Plan Update 2005*, approximately one-third of all urban water use is dedicated to landscape irrigation. Other sources put the number as high as 50 percent. The recently updated Model Water Efficient Landscape Ordinance, when complied with as written, will reduce irrigation by roughly 12 percent relative to the earlier Ordinance. A recent survey of compliance with the original state law requiring local ordinances showed that many local agencies failed to comply with state law or are only partially in compliance. A much more vigorous information and outreach effort and perhaps other enforcement incentives will be needed to ensure that the new ordinance achieves its potential efficiency improvements. In particular, greater communication and coordination between local governments and local water suppliers is urgently needed.

The revised Model Ordinance will help to ensure that new landscapes are designed to be efficient. Certain provisions of the Model Ordinance also encourage greater efficiency in the irrigation of existing landscapes. However, by itself, the model ordinance may do little to transform existing high-water-using landscapes, or persuade Californians to choose the most efficient new landscape designs. Because landscape water conservation offers so much potential for increased efficiency, a vigorous comprehensive program to improve landscape water use efficiency will be essential to ensure that the governor's efficiency goal is met. Programs based on information, education, additional research, and voluntary changes in landscaping can be effective and are preferable. Enforcement of the new Model Ordinance or its equivalent is expected. Additional mandatory restrictions such as two-day-per-week

irrigation have a higher certainty of effectiveness, but would limit options and reduce flexibility.

Voluntary elements of a comprehensive program should include:

- Working with landscape architecture curriculum programs to ensure that future landscape architects have the knowledge to design landscapes and irrigation systems that are efficient, as well as more suited to California's climate and conditions
- Widespread training programs for professional landscape maintenance contractors on water use efficiency, system maintenance and improvements
- Educational websites for consumers on landscape design, plant selection, irrigation system installation and repair
- Widespread adoption of tiered rates structures or other conservation pricing
- Widespread installation of separate landscape meters for better information and water management
- More irrigation auditor training programs, and more irrigation audit programs provided by local water suppliers
- Better communication and coordination between water suppliers and local governments to ensure consistent policies and programs related to water use efficiency
- Expansion of programs to promote the use of graywater and rainwater
- Support for rebate programs that fund improved landscape plantings, reduction of turf areas, upgrades to irrigation systems and controllers
- Use of public building landscapes as local examples of good design, installation, and maintenance
- Strong local and regional programs to encourage efficient new landscapes, replacement of older inefficient landscapes, and better management of high-water-using plantings such as turf
- Additional research and development of landscape conservation practices and methods.

Implementation of such a comprehensive program is ambitious and would require new funding and program development at the state, regional, and local levels. Without the necessary commitment of resources to successfully implement these voluntary programs, landscape efficiency should be improved through mandates:

- Limit the irrigation of most landscapes to two days per week or less, in order to encourage climate-appropriate landscapes, reduce the use of water for irrigation of landscapes, and reduce the potential for over-irrigation of landscapes. This could be accomplished through local ordinances, or as new state legislation.

Mandate the landscape irrigation BMP

The CUWCC provides a cooperative forum for the development and implementation of BMPs. The BMPs are generally considered to be the minimum level of effort for a credible water conservation program, but these practices are voluntary. AB 1420 (Laird, 2007) requires implementation of conservation measures listed in the Water Code as a prerequisite for access to grant funds, but water suppliers that are not applying for state financial assistance are under no requirement to implement such measures.

In the case of landscape water conservation, implementation of appropriate conservation practices yields so many benefits that it is worthwhile to consider making implementation of such measures mandatory. The flexibility of BMP implementation would not easily translate into mandates in the Water Code. A requirement might take the form of

mandated measures that are “at least as effective as” the landscape BMPs. This is the approach the Legislature has taken in requiring landscape ordinances for new construction.

Require water efficient landscapes at all state-owned properties

Establish a strict policy of low water using landscaping and efficient landscape equipment at all state-owned or occupied buildings except for historic landscapes or plantings that provide erosion control. Use state landscapes as examples and teaching tools for locally-appropriate water-efficient design.

Reduce water waste

Water waste can be reduced by improving water measurement through expedited installation of water meters, establishment of a standard for water meter accuracy, and the improvement of detecting and repairing water delivery systems.

Accelerate installation of water meters

At present, state law requires that unmetered connections served by the CVP be converted to metered connections by 2013, and non-CVP unmetered connections be converted by January 1, 2025. This law applies to community water systems serving 3,000 connections or more.

All progress comes from careful measurement. Metering of water deliveries is essential to obtain valid data about consumption and water waste, and to promote water conservation programs. Communities that do not meter water deliveries will likely find it impossible to meet reasonable consumption targets. Accordingly, it is recommended that the state accelerate meter installation and facilitate more widespread metering of small water systems. It is recommended that California enact legislation to move the state metering deadline from 2025 to 2020.

In addition, the following incentives and disincentive should be considered to accelerate metering:

- Provide incentives such as access to additional grant funds for unmetered suppliers that complete metering before the deadline or suppliers that install improved “smart” meter systems, with particular attention to disadvantaged communities
- Require regions with unmetered connections to dedicate a defined percentage of regional water management funds to metering.
- Pursue economic stimulus funds to accelerate metering.
- Support legislation for additional conservation requirements for suppliers that are not fully metered.

Metering is the foundation for measuring consumption as well as detecting waste. The state must continue to push for near universal metering in its urban water systems which account for the majority of potable water use, and also begin to improve the incidence of metering in smaller systems and rural areas.

Establish a state standard for water meter accuracy

Water meters generally meet a high standard of accuracy when they are manufactured and initially calibrated. However, meters tend to become less accurate over time as they are used and parts begin to wear. Most often, worn meters under-register the volume of water delivered. This reduces revenue for the water supplier and provides faulty information to the consumer.

The American Water Works Association has established voluntary standards for meter accuracy. Some other western states such as Colorado, Idaho, and Texas require minimum standards of accuracy for meters in use. California should consider meter accuracy standards written into code at no less than +/- 2.5 percent.

Revise the water loss BMP to incorporate improved methodologies

In every hydrologic region, well above 10 percent of urban potable water produced is unaccounted for (non-revenue water). This may include system leaks, meter errors, emergency use (e.g., fire fighting), and/or unauthorized use. The high proportion of non-revenue water represents a major potential for reduction in urban water demand.

Leak detection methodologies have improved considerably and water suppliers can reduce non-revenue water beyond levels stated in BMP 3. It is recommended that this BMP be revised such that maximum allowable levels of non-revenue water are expressed in terms of gallons per connection per day, instead of the present format where it is expressed in terms of percentage of produced water. A standard of a maximum of 40 gallons per connection per day is achievable by 2020.

Reinforce Efficiency Codes and related BMPs

As technology advances, water and energy use efficiency codes for appliances and equipment should be established or strengthened.

Obtain authorization for state standards for high efficiency clothes washer

Continue the California appeal of the U.S. Department of Energy's denial for a waiver of federal preemption for the State's water efficiency standards for residential clothes washers. Once the waiver is approved, pursue a waiver to regulate commercial coin-operated clothes washers.

Support landscape Irrigation equipment standards

Support CEC approval of landscape irrigation equipment standards and labeling requirements, and follow with a variety of rebate and outreach programs to accelerate upgrades of irrigation equipment installed in the state. AB 1881 (Laird, 2006) requires that the CEC develop efficiency standards for irrigation equipment including controllers, irrigation heads, valves, and sensors. This effort is underway in 2009.

Accelerate replacement of inefficient toilets, showerheads, and urinals

Older toilets do not meet the 1.6 gallon per flush standard. Toilets with a higher flush volume—those designed to use 3.5 gallons and those installed before the advent of efficiency standards—should be replaced with toilets using 1.6 gallons or toilets that meet the new 1.28 gallon standard.

Support legislation to require replacement of inefficient toilets, showerheads, and urinals in both the residential and commercial/industrial sectors. Potential approaches include:

- Replacement of inefficient fixtures upon resale (responsibility on property seller)
- Replacement of inefficient fixtures upon change of water service (responsibility on new water customer)
- Replacement of all inefficient fixtures by 2020 (implemented in early years by rebate programs and information campaigns)

Accelerate adoption of proven water saving technologies in new businesses

Research and evaluation has been completed by the CUWCC and others on a host of water conservation technologies, including:

- On-premise laundries (e.g., hotels, hospitals, universities, prisons, etc.)
- Building cooling systems
- Efficient residential dishwashers for new construction
- Vehicle wash systems
- Residential hot water distribution systems for new construction
- Commercial ice machines

Continue to support CUWCC research initiatives to develop reliable data on water savings from emerging technologies, promote use of these technologies in the marketplace, and support efficiency standards in law as needed.

Provide financial incentives

Financial incentives can be in the form of financial assistance to implement water conservation measures or pricing signals through appropriate water pricing structures.

Encourage or mandate conservation pricing structures

Water rates that encourage conservation can be powerful tools to reduce per capita use. Three effective conservation rate structures include volumetric pricing with uniform or increasing block rates, seasonal pricing, and allocation-based rates. Increasing block rates charge a higher amount per gallon as usage increases, which provide an incentive to keep use low. Seasonal rates charge a higher amount per gallon during the irrigation season when the water supplier's demands are highest, because the peak demands are generally most expensive for the supplier to meet. Allocation-based rates include higher per-gallon costs for usage exceeding base usage established for each customer according to customer characteristics, such as number of occupants or size of irrigated landscape. Flat rates (generally used by suppliers that do not yet meter water use) and rate structures that reduce the per-gallon price for increased usage (declining block rates) are not considered to be conservation pricing structures.

For any of these rate structures, retail water bills typically include two parts: fixed charges and variable charges that are based on the amount of water used by the customer. Water billing that includes a relatively small fixed portion and a significant volumetric component that increases with volume of water use provides a financial incentive to the consumer to reduce water use. The installation of water meters and billing by volume of use can reduce water use by ten percent. While increasing block rates are generally the most effective, there may be little additional cost incentive to the customer compared to uniform rates if the increase in per-gallon cost is small.

State agencies recognize the complexity and sensitivity of rate-setting. Conservation rate structures—defined within the broad parameters described above—should be required in California. Increasing block rates should be encouraged. However, within the range of conservation rate structures described, local suppliers must continue to have authority for rate setting, because they have responsibility to ensure balanced budgets and fiscal solvency.

Good communication can complement a conservation rate structure and help ensure that customers respond to an effective pricing signal. Billings need to communicate to the customer the amount of water used in commonly understood units such as gallons rather than units that are more commonly used by water suppliers such as hundreds of cubic feet

(HCF). Water suppliers should further reinforce the conservation message by providing customers with comparisons of current and past usage, comparisons to usage by similar customers, and information on how billings are affected by increased use. More frequent billing, that is, monthly, also can be more effective.

A provision added by Proposition 218 in November 1996 to the California Constitution, Articles XIII.C and XIII.D, requires that fees related to property ownership must not exceed the proportional cost of the service attributable to a parcel of property. In subsequent court decisions this provision has been applied to water rates. While many water suppliers have successfully implemented tiered water rates and used revenues from water billings to finance water conservation programs, there is still some legal uncertainty whether these rates or uses of revenue could be challenged under the constitutional provisions. The Legislature addressed this issue in Assembly Bill No. 2882 (2008 Statutes) for one form of tiered water pricing called allocation-based pricing. Pricing tiers can include costs for water conservation, securing dry-year water supplies, and procuring water supplies to satisfy increments of water use in excess of basic use allocations for customers (Water Code section 370-373). It is recommended that similar provisions be added to the Water Code to apply to all forms of tiered water pricing.

Provide grants, loans, and rebates to wholesale and retail water agencies

The relative differences in the cost of water delivery continue to be an impediment to rapid water conservation implementation across the state. DWR and the SWRCB should continue to support accelerated conservation BMP implementation and higher levels of water use efficiency through bond funding, especially Proposition 84, state revolving fund loans, and contractual obligations when funds are made available to water agencies for the implementation of water conservation programs. State funding for water management should be devoted to water use efficiency commensurate with the potential of efficiency measures to make water available.

Regional or wholesale water suppliers should continue existing or implement new rebate or financial assistance programs for retail agencies and customers.

Establish a public goods charge to provide stable funding for water management

California does not have adequate funding mechanisms in place to ensure the needed investment in water management improvements over the long term. In recent years, local communities have relied primarily upon state bond funding to augment local investment in water management and efficiency improvements. Bond funds alone do not provide a steady, reliable source of funding and are subject to “boom and bust” cycles that make it difficult to plan long-term or multi-phase projects. Furthermore, bond funding at current levels is insufficient to meet California’s long-term water infrastructure needs.

Local municipal water agencies face challenges raising the capital to invest in efficiency improvements, and substantial investment in efficiency measures may reduce water use, water sales, and revenue for the water supplier. This can provide a substantial disincentive for suppliers to implement aggressive conservation programs.

Energy utilities have overcome these challenges, reflecting the costs for conservation, efficiency and research programs in their rates. Investor-owned energy utilities have accomplished this in two ways. First, in the 1980’s, the CPUC de-coupled the utilities’ revenues from their volumetric energy sales thereby facilitating utility support for efficiency

programs. These efforts have reduced peak capacity needs by more than 12,000 megawatts and continue to save about 40,000 gigawatt hours per year of electricity. Second, in 2000, a state law was passed approving a public goods charge for energy, to be regulated by the CPUC, with the investor-owned energy utilities allowing a charge per unit of energy sold to finance additional energy efficiency measures by the participating utilities.

Similarly, the CPUC has introduced decoupling mechanisms as part of its water conservation program with investor-owned water utilities. As part of implementing a water conservation program with regulated water utilities, the CPUC has piloted conservation rate designs that decouple revenue from the volume of water sold. Under this program, six participating Class A utilities have increasing block tiered rate structures in place, which provide an incentive for customers to reduce water use. Because changes in water use can cause changes in revenue tied to quantity of use, utilities are allowed to track the difference between actual and expected quantity-based revenues. If the net revenues decline due to conservation, a surcharge can be added to water billings to balance revenue and costs without altering the basic tiered rate structure and if the revenues increase as part of the conservation rate design, the customers will be credited. In this way a utility can remove the risk of declining revenues due to reduced volumetric sales that might accompany successful conservation.

Finally, in California's Climate Action Plan and the California Global Warming Solutions Act of 2006 (AB 32 Scoping Plan), the Air Resources Board recommends a public goods charge for funding investments in water management actions that improve water and energy efficiency and reduce greenhouse gas emissions. The Climate Action Plan proposes a public goods charge on water that can be collected on water bills and then used to fund end-use water efficiency improvements, system-wide efficiency projects, water recycling, and other actions that improve water and energy efficiency and reduce GHG emissions. Depending on the fee schedule, a public goods charge could generate \$100 million to \$500 million annually. These actions would also have the co-benefit of improving water quality and water supply reliability for customers.

California must have a sustainable, long-term funding source to support water management and water use efficiency. A public goods charge would provide this funding source, but such a charge remains very unpopular among water suppliers. Nevertheless, state agencies recommend a public goods charge as the most stable option for future funding. The agencies will work with the proposed stakeholder advisory panel to consider alternatives to the public goods charge recommended in this plan.

Fund the installation of water meters

Several reasons for accelerating the installation of meters were provided previously in the section titled "**Accelerate installation of water meters**". The ability to induce conservation through price signaling is yet another reason why the state should accelerate the pace of metering efforts. State financial assistance would encourage accelerated installation of meters.

Implement a statewide water conservation public information and outreach campaign

A statewide water conservation campaign can communicate the need for water conservation, explain its importance within the context of the state's overall water supply and demand situation, and help to build a conservation ethic among customers.

In 2009, California is in the midst of a water crisis. Water supplies for many cities, farms, and businesses are being significantly reduced due to drought. Climate change is further compounding the problem.

The Governor has proclaimed a state of emergency due to drought and requested that all Californians reduce their individual water use by 20 percent during the drought. Even when normal rainfall returns, the state will continue to see water supply challenges. To maintain a 20 percent reduction in per capita use over time, Californians need to fundamentally change the way they think about and use water.

The drought and the Governor's proclamation have highlighted the need for an immediate, statewide public education campaign to encourage greater water conservation, similar to the successful "Flex Your Power" public education campaign. On April 21, 2009, California announced the "Save Our Water" campaign. This water conservation campaign will reach out to different demographic and business segments to achieve significant reductions in water use. The first step is to educate members of the public about the drought and what they can do to immediately reduce their water use. Then, California can use the Save Our Water campaign to achieve long-term changes in the way Californians think about and use water as part of a comprehensive solution to the state's water problems.

The Save Our Water campaign will educate Californians about drought, the effects of climate change on the state's water supply, and the many reasons all Californians need to conserve water over the long term. The program will offer consumer-oriented information and tips to increase awareness and understanding of the complexity of the long-term issues facing the state's water delivery and supply system. This outreach campaign will complement other programs and actions by water suppliers and regions.

Provide Enforcement Mechanisms for Water Conservation

Mechanisms are needed to enforce water conservation when agencies fail to fulfill legal requirements or there is evidence of a lack of diligent effort to eliminate excessive water use.

The existing and proposed water conservation framework is a combination of voluntary and mandatory water conservation measures at both the water supplier and consumer levels. At the consumer level, mandatory measures allow only the products in the marketplace that meet certain water efficiency standards and local restrictions imposed by retail water suppliers, such as irrigation restrictions. There are also mandatory design standards for large landscapes in the Water Conservation in Landscaping Act (the Model Water Efficient Landscape Ordinance). Cities and counties are responsible for enforcing the design standards.

Require implementation of water conservation as a condition to receive state financial assistance

Mandates at the water supplier level are primarily for water supply planning in the Urban Water Management Planning Act. Urban Water Management Plans must be submitted every five years and must contain an evaluation of 14 conservation measures. The 14 measures correspond to the BMPs in the CUWCC MOU but there are no established criteria for performance. There is a form of indirect enforcement of these measures as a condition of receiving state financial assistance for water resource projects. Funding applicants must either demonstrate implementation of the 14 measures, provide a schedule for future implementation, or explain why the measures are not planning to be implemented.

Water suppliers cannot be required to sign the CUWCC MOU, but DWR has determined that implementation levels defined in the BMPs will be the initial required standard for implementation, even for non-signatories.

BMPs were designed to be the minimum standard of conservation implementation for virtually all water suppliers, and it is reasonable to expect a higher standard of efficiency from entities that seek state grant funds. In the future, DWR will consider establishing higher levels of efficiency or additional conservation actions as a prerequisite for receipt of bond funds. For example, regional compliance with the state's requirements for landscape water use efficiency ordinances could be a prerequisite for bond funding. This would motivate far better communication and coordination among local governments and water suppliers.

Take enforcement actions to prevent waste and unreasonable use of water

There is broad authority under Water Code section 275 for the State Water Board or DWR to take appropriate proceedings or actions to prevent water waste or violation of the reasonable use standard. There are limited resources for aggressive enforcement activities at the state level. However, this is the strongest enforcement tool available to state government. It is recommended that enforcement action be initiated on water suppliers that have high per capita water use compared to communities of similar climatic and demographic conditions, high water loss rates, or fail to comply with statutory or regulatory conservation mandates.

Provide additional enforcement tools for water suppliers

Communities where the local government is not the water supplier face many unique challenges. One is that water suppliers generally monitor water use for waste, but unlike local governments they do not have the authority to issue citations. It would help water suppliers mount effective waste prevention programs if state law provided clear authority for local governments to transfer citation authority to water suppliers to discourage water waste. Better communication and coordination among local governments and water suppliers is essential, with or without new citation authorities.

Investigate Potential Flexible Implementation Measures

Some proposals appear to have promise to encourage water conservation or allow flexibility in implementing conservation. Conservation offsets and cap-and-trade regimes are two promising ideas. Protection of the environment and consistency with environmental quality standards are necessary components of conservation offsets, cap-and-trade regimes, or other new programs developed to improve water use efficiency.

Investigate requiring total or partial conservation offsets

A conservation offset is a requirement for a developer to partially or fully offset the increased water demand created by a new development. The offset is generally accomplished by the implementation of conservation measures elsewhere in the community, or payment by the developer into a water conservation fund administered by the local water supplier or local government. Conservation offsets can be a useful mechanism for promoting new development with a low-water use footprint.

Conservation offsets can also be controversial. The California Legislature considered but did not pass a bill requiring conservation offsets in 2008 (AB 2153, Krekorian). Total offsets may raise the price of new housing significantly in a state where affordable housing is already an issue. Requiring offsets for projected indoor water use that exceeds what might

be considered “efficient” indoor use, and for all of projected outdoor use could be a possible compromise. On the other hand, plumbing codes are already at work improving indoor water use efficiency, while outdoor water use is subject to the constraints of the Model Landscape Ordinance. Including offsets over and above these existing requirements could prompt alteration of the design of new construction significantly, making new housing even more water efficient. Certainly, requiring offsets could generate a stream of revenues to fund conservation programs in existing construction.

Conservation offsets should be considered as a method of bolstering efficiency programs if water suppliers or regions cannot meet interim targets in 2015.

Investigate a cap-and-trade regime for water conservation

Cap-and-trade regimes have been successfully implemented for the control of industrial air pollutant emissions. They provide a flexible framework where participants can choose between undertaking emission reductions themselves, or paying others to reduce their emissions, depending upon which of the two is cheaper. The net result is that participants in a cap-and-trade regime retain flexibility, while overall goals are achieved at least cost.

California’s AB 32 Scoping Plan identifies a cap-and-trade program as one of the main strategies California will employ to reduce the greenhouse gas emissions that cause climate change.

A similar framework could facilitate implementation of the most cost-effective water conservation measures in California. Formal cap-and-trade programs are complex and challenging to establish and administer. However, a modest variation of a cap-and-trade program could easily be created within the context of integrated regional water management. Within a region, water suppliers could work together to meet mandated per capita use targets by funding the most cost-effective efficiency measures within a region. This flexibility should be included in any legislation that places the Governor’s efficiency goal into statute.

Increase the use of recycled water and non-traditional sources of water

By increasing the use of recycled water, graywater, rain water and storm water, per capita use of potable water will decrease; agencies, households, and individuals will be better able to cope with times of water shortage.

During development of this plan, two approaches to water conservation and water recycling were considered:

- View recycled water as part of the gross supply and subject to a 20 percent reduction; this would help ensure that recycled water is used efficiently.
- Consider recycling as a means to reduce use of potable supplies; this approach counts recycling as a means to achieve a 20 percent reduction in potable use and provides encouragement for recycled water use

This plan uses and recommends the second approach. Although it is important to use all water sources efficiently, it is essential for California to expand the use of recycled water.

Chapter 4. Implementation

The *20x2020 Plan* will be implemented through three phases, as discussed below and summarized in Table 11. Several key implementation barriers have been identified, for which actions are recommended.

Table 11. *20x2020 Plan* Implementation Outline

Plan Phase	Year	Activities
I. <i>20x2020 Plan</i> Completion and Start-up Actions	2009 – 2010	• Finalize <i>20x2020 Plan</i> • Establish a lead agency and coordination framework • Convene a stakeholder advisory group • Develop detailed implementation task descriptions for recommended actions • Provide technical assistance in conservation legislation discussions • Evaluate an interim data collection and management mechanism • Collect, manage and validate data • Implement conservation actions • Conduct legislative, regulatory and administrative actions • Provide oversight
II. <i>20x2020 Plan</i> Implementation, Monitoring, Evaluation, Adjustments	2011 – 2020	• Establish interim and long-term data collection and management • Implement conservation actions • Monitor implementation progress • Assess and design additional measures such as a conservation offset and a conservation credits trading program as needed • Conduct an Interim Target Assessment and Performance Evaluation in 2015
III. Conclusion	2020	• Conduct a Final Target Assessment and Performance Evaluation • Publish Results and Lessons Learned

Phase I. *20x2020 Plan* Completion and Startup Actions

During Phase I the goals are to finalize the *20x2020 Plan*, followed by more detailed implementation task descriptions for each action, including designated responsibilities, schedules, and budget and staff resources. Also, a lead agency must be designated to coordinate the plan implementation and coordination framework. While the *20x2020 Plan* has sought input from multiple state agencies, it does not have an implementation governance structure in place to oversee the remaining phases of the Plan. Chapter 3 proposes a clearer program role for each state agency building upon their existing responsibilities. The goal of this proposed governance framework is to implement the *20x2020 Plan* in a coordinated, consistent, and efficient fashion that acknowledges the different but complementary statutory authorities among state agencies. The coordination framework will include ongoing communication and cooperation by the state agencies and CUWCC, which is expected to be an important partner to interface with water suppliers and other stakeholders.

In addition, a stakeholder group will be convened to provide advice on program refinement and implementation. One topic certain to be addressed by such a group is CII water conservation. It has been challenging to address water conservation in the CII sectors due to a lack of information about how water is used, the wide variety of uses, and concerns that setting conservation targets could result not just in efficiency, but might inadvertently prompt restrictions in production. An advisory group could help articulate a vision and approach toward CII conservation, and help define appropriate practices to encourage efficient water use.

State agencies will provide technical assistance in the development of legislation to incorporate conservation goals or target into law. An interim data collection and management mechanism will be evaluated for implementation until a more long-term comprehensive database can be established.

Phase II. Plan Implementation, Monitoring, Evaluation and Adjustment

Monitoring and Evaluation

Monitoring of the plan will occur at two levels: implementation of the actions specified in the *20x2020 Plan* and measurement of progress in reduction in urban per capita water use. The lead agency will coordinate and monitor the actions of all of the state agencies and CUWCC. Systematic data collection from water suppliers will begin. Regulatory powers may be used or legislation may be sought to require data submittal by suppliers to a state entity. Where existing data reporting processes exist (e.g., to the CUWCC, DPH, or CPUC) these processes should be used or incorporated into a streamlined state water reporting system to reduce reporting burdens on local agencies.

Challenges to Monitoring Progress

A number of factors besides long term reductions in demand will influence variations in per capita consumption from year to year. Annual fluctuations can be related to differences between unusually wet and dry years, as well as what short-term actions water agencies may take in response to such events (such as drought rationing). Drought restrictions, either voluntary or mandatory, preserve human health and safety during years of limited water supply, and typically result in lower per capita consumption rates. When restrictions are lifted, water consumption can return to pre-drought levels. Finally, commercial and industrial uses can also differ widely in the amount of water they use. Unusually strong or weak rates of economic growth can cause GPCD to fluctuate from year to year. Thus, to better account for these factors, GPCD reductions should be monitored on a multiple-year basis instead of single end-point years.

Annual Progress Reports

The lead coordinating state agency should prepare annual reports to chart the progress of the 20x2020 Program. These reports would compile in one place what each state agency has accomplished with respect to this program. At a minimum the progress reports should address the following items:

- Evaluate implementation status of conservation programs by region in coordination with water suppliers, the CUWCC and the regional IRWMPs

- Provide estimates of GPCD by region based upon the latest water usage data submitted by water suppliers
- Report on the status of statewide outreach efforts, and document key feedback received
- Report on the progress of legislative/regulatory/enforcement actions undertaken
- Report on grant funds disbursed
- Report on the progress of studies/analyses commissioned under the auspices of the program
- Report on the adequacy of funds and staff for implementing the program

Adjustments

If the interim targets are not achieved by the water year ending in 2015, the state could consider introducing additional initiatives to promote water conservation. In this phase, the state could:

- Continue to encourage water suppliers to implement conservation programs
- Roll out additional programs such as a conservation offsets program or an expanded conservation credits trading program if it appears the program is lagging the 2015 GPCD targets
- Consider additional legislative or administrative actions if necessary

Implementation Barriers and Recommendations

Implementation of this *20x2020 Plan* faces several barriers that must be surmounted.

At the local and regional levels, barriers include:

- Drought-induced revenue reductions and increased costs at the water supplier level, leading to deferment of long term efficiency programs
- Competition for IRWM funds by proponents of water management strategies other than efficiency improvements
- Lack of understanding of the state's water challenges and their effect on the California economy and environment
- Inadequate communication and coordination between water suppliers, local governments, and land planning agencies

At the state level, barriers include:

- Lack of staff within state agencies to devote to this program
- Lack of funds and staff that would monitor the implementation of this program in the lead coordinating agency, uncertainty about the availability of state grant funding
- Lack of enforcement authority to promote compliance with many elements of this program
- Lack of comparable water use data across state water management and regulatory agencies.

Table 12 outlines the key barriers and the general approach that could be taken to overcome these barriers.

Phase III. Conclusion

It is envisioned that upon completion of Phases I and II, the state would be able to achieve the conservation goal of 20 percent reduction of statewide per capita water use by year 2020. In 2020, the state would conduct a final assessment of the program and recommend new or strengthened policies to maintain efficient use.

Table 12. Implementation Barriers and Recommendations

Item	Needed Resources	Recommended Actions
Overall Plan Governance	• Need Staff to oversee the Programs	• Appropriate funding, recruit staff to devote to this Program.
Voluntary nature of existing conservation	• Need legislation to drive some elements of this Program.	• Make some elements of this Program mandatory instead of voluntary. Bolster state agencies' enforcement authority where at present it is insufficient.
Data Reporting and Analysis	• Need technical staff to set up the central database system. • Software to run the analysis. • Experienced staff or analysts. • Data validation and correction.	• Provide for online data submission. • Develop spreadsheets or other software tools for automatic data analysis or at least GPCD calculation. • Work with MOU signatories and CUWCC on coordinated data submittal methods • Make reporting of water usage data mandatory
Funding	• Need a significant and predictable source of revenue to incentivize water suppliers to undertake/accelerate water conservation programs.	• Ensure that sufficient IRWM funds are invested to meet conservation targets. • Institute a public goods charge.
Appliance efficiency codes	• Given the state's water supply challenges, appliance efficiency codes must remain ahead of the rest of the nation	• Continue to pursue waiver of Federal preemption on appliance efficiency codes
Water pricing	• Need near universal metering and conservation oriented rate structures	• Promote/require conservation oriented rate structures that promote efficient use by customers and support agency conservation programs

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Appendix B. Determination of Regional Targets

The regional targets developed for this *20x2020 Plan* provide an example of how regional targets might be set, and provide the basis for analysis to determine what conservation measures could be implemented to achieve the Governor’s goal. The targets were developed based on the principle that Regions 1 through 4, which are currently below or meeting the statewide target (154 GPCD) are expected to maintain or further reduce their GPCD values. Regions 5 through 10, limited by the high ETo rates, large numbers of unmetered connections, and historically lower levels of conservation programs, may find it more challenging to meet the statewide target. To ensure that the regional targets can be reasonably achieved by all regions such that the state as a whole can meet the 20 percent reduction goal, a “balancing” process was performed to assign each region with an appropriate regional target. The methodology ensures that the state as a whole can meet the 20 percent reduction target, while acknowledging that average consumption in Regions 1 through 4 will end up below the statewide goal and the goals for Regions 5 through 10 can be realistically achieved. A detailed step-by-step process is shown in Table B-1.

Methodology

To describe the procedures we will follow the table structure of Table B-1.

- **Row 1**
GPCD Baseline 2005
Taken from Table 3 Row 5
- **Row 2**
GPCD Reduction with Basic Tools Only
Taken from Table 7 “Total (Basic Measures)” Row 6
This is the main change from the initial development of Targets (TM 2) which were calculated prior to the analysis of how much savings were currently available from the basic tools such as code improvements and BMP implementation.
- **Row 3**
GPCD Target if Use Basic Tools Only
Row 3 = Row 1 – Row 2
This row is used to determine the Target GPCD level with consideration of Basic Tools GPCD reduction.
- **Row 4**
GPCD Target if 20% Reduction
Row 1 x 0.8
- **Row 5**
GPCD Statewide Average Target
Based on 20% reduction from the statewide baseline average of 192 GPCD. This is the overall statewide target.
- **Row 6**
GPCD Exceedance from State Average
Row 6 = Row 1 – Row 5

This row determines how much each hydrologic region is currently above the 2020 statewide target.

- **Row 7**
 2020 Population
Taken from California Department of Finance Population Projection Database [See Appendix A references]
 This data for Row 7 is taken directly from Department of Finance statistics. They are partitioned for 2020 on a hydrologic region basis.
- **Row 8**
 Baseline – Basic Tools (row 3)
 $Row\ 8 = Row\ 1 - Row\ 3$
 This row shows per capita use after application of the basic measures show in Table 7. After review of the initially prepared targets (TM 2), and review of water supplier comments at both the public meeting and teleconference it was determined that a different methodology for calculating targets was needed. If a region could reach below the statewide target of 154 GPCD by implementing all the code improvements and basic tools associated with the current BMPs, then that GPCD value would be used as its target. These regions turn out to be Regions 1-3. Other regions would need to implement further actions. See rows 9 through 16.
- **Row 9**
 Water Use Below State Average, MG
 $Row\ 9 = (Row\ 5 - Row\ 8) * (Row\ 7 * 365 / 1000000)$
 This is a calculation just for Hydrologic Regions 1-3, which are able to reach the state target with basic measures only. It is used to determine how much water (in million gallons per year) that these regions are below the statewide target.

The previous Rows calculated the GPCD Targets for Regions 1 through 3. The following Rows determine the GPCD Targets for Hydrologic Regions 4 through 10.

- **Row 10**
 Baseline - 20% reduction
 $Row\ 10 = Row\ 1 \times 0.8$
 This is a calculation just for Hydrologic Regions 4-10, which cannot reach the state average with basic measures only.
- **Row 11**
 With 20% Reduction, GPCD amount above, or below (-) Statewide Target
 $Row\ 11 = Row\ 5 - Row\ 10$
 Note that Region 4 would be below the statewide average after a 20 percent straight reduction, while other regions would still be above the statewide average.
- **Row 12**
 20% reduction Exceedance from Statewide Reduction Target, MG
 $Row\ 12 = Row\ 11 \times Row\ 7 \times 365 / 1,000,000$
 This row is developed to analyze the amount of water (in million gallons) that Regions 4-10 still exceed the statewide average after a 20% reduction. This is used as an interim step to develop the GPCD reductions for following rows.

- **Row 13**
 Extra savings from high performing regions (1-3) apportioned to other regions (4-10), MG

$$\text{Row 13} = (\text{Total of Row 9} / \text{Total of Row 12} \times \text{Row 12})$$
 In this row the amount of water saved from Regions 1-3, which are below the statewide average, is apportioned to the Regions 4-10 using a weighted average basis dependent upon their population and exceedance still remaining after the 20% reduction. This is one approach to ease the burden of high water use regions proportionally to their exceedance.
- **Row 14**
 Net Reduction to Reach State Average Target, MG

$$\text{Row 14} = \text{Row 12} - \text{Row 13}$$
 This row is the additional volume of water that must be saved in the region for the statewide average to be achieved. Note that because Region 4 is below the statewide average after the 20% reduction, the volume is negative.
- **Row 15**
 Net GPCD reduction to reach State Avg

$$\text{Row 15} = \text{Row 14} / \text{Row 7} / 365 * 1000000$$
 This row shows the net reduction in GPCD necessary for Regions 4-10 so that the overall 20% reduction will be achieved after apportionment of the water saved from Regions 1-3. This is apportioned as mentioned before, to make sure that each of the Regions 4-10 reduces their GPCD in proportion to each other.
- **Row 16**
 2020 GPCD Target (Regions 4-10)

$$\text{Row 16} = \text{Row 10} - \text{Row 15}$$
 This row calculates the Target GPCD for Regions 4 through 10.
- **Row 17**
 Recommended Regional Targets for 2020
 This is the result of the analysis and presents the calculated GPCD targets for all the hydrologic regions within California using this approach. This represents one way to set regional targets.

Table B-1. Regional Targets

Hydrologic Region Number												
Row	Process Description	1	2	3	4	5	6	7	8	9	10	Total
1	GPCD Baseline 2005 (Table 2-6)	165	157	154	180	253	248	285	243	237	346	
2	GPCD Reduction With Basic Tools Only (Table 2-5)	28	26	32	24	28	33	32	36	43	56	
3	GPCD Target If Use Basic Tools Only (Row 1-Row 2)	137	131	122	156	225	215	253	207	194	290	
4	GPCD Target if 20% Reduction	132	126	123	144	202	198	228	194	190	277	
5	GPCD State Avg Target	154	154	154	154	154	154	154	154	154	154	
6	GPCD Exceedance from State Avg (Row 1-Row 5)	11	3	0	26	99	94	131	89	83	192	
7	2020 Population	763,296	7,037,805	1,719,563	22,537,558	3,631,063	2,795,598	2,961,357	119,832	1,376,567	1,193,284	
8	Baseline - Basic Tools (Row 3)	137	131	123	156	225	215	253	207	194	290	
9	Water Use Below State Average, MG	4,736	59,082	19,331								83,150
10	Baseline - 20% reduction				144	202	198	228	194	190	277	
11	With 20% Reduction, GPCD amount above, or below (-) Statewide Target				-10	48	44	74	40	36	123	
12	20% reduction Exceedance from Statewide Reduction Target, MG				-82,262	64,146	45,305	79,986	1,767	17,887	53,485	180,316
13	Extra savings from high performing Regions (1-3) apportioned to other Regions (4-10), MG				-37,934	29,580	20,892	36,885	815	8,248	24,664	83,150
14	Net Reduction to reach State Avg Target, MG				-44,328	34,566	24,413	43,102	952	9,639	28,821	141,494
15	Net GPCD reduction to reach State Avg				-5	26	24	40	22	19	66	
16	2020 GPCD Target (Regions 4-10)				149	176	174	188	173	170	211	
17	Recommended Regional Targets for 2020	137	131	123	149	176	174	188	173	170	211	

Appendix C. Summary of Comments on Draft 20x2020 Plan and Responses

The draft *20x2020 Water Conservation Plan* was available for public comment from April 29 to June 5, 2009. Comments were received in writing from 75 commenters. Table C-1 provides a list of entities that provided written comments. Public comment was also solicited at a public workshop held in Sacramento on May 29, 2009, attended by at least 57 members of the public including water suppliers, local governments, environmental organizations, and individuals.

Table C-1. Agencies that Submitted Comments on Draft 20x2020 Water Conservation Plan

Draft 20x2020 Water Conservation Plan: Written Comments Received
Alameda County Flood Control and Water Conservation District, Zone 7
Association of California Water Agencies
Association of California Water Agencies
California Association of Nurseries and Garden Centers
California Public Utilities Commission
California Urban Water Agencies
California Association of Nurseries and Garden Centers
California Landscape Contractors Association, Inc.
California Salmon and Steelhead Association
California Urban Water Agencies
California Water Association
Calleguas Municipal Water District
Carmichael Water District
Casitas Municipal Water District
Castaic Lake Water Agency
City of Santa Maria Utilities Department
City of El Paso de Robles
City of Fairfield
City of Fairfield
City of Pittsburg, Public Works Department
City of Riverside, Public Utilities
City of Roseville
City of San Diego Water Department
City of San Luis Obispo
City of Sonoma
Clean Water Action
Contra Costa Water District
East Bay Municipal Utility District
Eastern Municipal Water District
Environmental Justice Coalition for Water, Clean Water Action
Ewing
Foresthill Public Utility District
General Public
General Public

Draft 20x2020 Water Conservation Plan: Written Comments Received
General Public
General Public
General Public
General Public
General Public
Hi-Desert Water District
Indian Wells Valley Water District
Industrial Environmental Association
Inland Empire Utilities Agency
Irrrometer Company
Irvine Ranch Water District
Jim Soules (green building consultant)
KP Public Affairs
Las Virgenes Municipal Water District
Metropolitan Water District of Southern California
Mojave Water Agency
Monterey Peninsula Water Management District
Mountain Counties Water Resources Association
Municipal Water District of Orange County
Natural Resources Defense Council
Newhall County Water District
Orange County Water District
Otay Water District
Pacific Energy Policy Center
Paradise CA
Park Water Company & Apple Valley Ranchos Water Company
Placer County Water Agency
Raymond WA
Regional Council of Rural Communities
Regional Council of Rural Counties
Regional Water Authority
Rose Hills Memorial Park and Mortuary
Sacramento Suburban Water District
San Diego County Water Authority
San Juan Water District
Santa Clara Valley Water District
Solano County Water Agency
Tuolumne Utilities District
Vista Irrigation District
Western States Petroleum Association
Western Municipal Water District

Each comment letter was reviewed, and each distinct comment was noted and tabulated. In this way, the Agency Team could identify the most prevalent comments and focus attention on those.

Table C-2 summarizes the major categories of comments received and summarizes the state agency response. Most comments are further reflected in modifications to the text of the plan itself.

Table C-2. Comment Categories and State Agency Responses

Comment Category	Resolution or Response
Convene a stakeholder process to complete the plan over about six to 12 months time.	A stakeholder group to advise state agencies on refinement and implementation of the plan is a good idea, and the state agencies will work to form and convene this group. It is important to finalize the plan now because California faces a water crisis and completing the plan will allow some actions to proceed more quickly.
The 20x2020 Plan must be part of a comprehensive package.	The state agencies support the Governor's call for a comprehensive package to address water issues, and this plan is part of that package. In the absence of a comprehensive package, conservation will be even more important so it is essential to proceed with conservation efforts regardless of progress on other parts of a package.
Plan should not go forward because it is based on limited data and analysis yet would prompt costly actions.	This plan is a strategic framework for strengthening California's conservation programs. Major elements of the plan will require new legislation or budget deliberations before implementation, and state agencies will seek and welcome public input on these aspects. The plan is an appropriate first step.
Appoint a CII task force to advise on conservation. Involve the CUWCC.	Commercial, industrial, and institutional (CII) water use is a major issue, and additional policy formulation and program development is needed. The stakeholder group that the agencies will convene may address this issue.
Link actions to Delta benefits; upstream users' "waste" returns to the system so less conservation is needed or justified.	The state agencies recognize that in some cases there are return flows from water use, changing the suite of potential benefits. However, there are clearly impacts associated with water use even when return flows are captured (e.g., entrainment of fish, water quality degradation) and these impacts are difficult to value in a benefit/cost analysis. Minimum efficiency standards and waste prohibitions are appropriate in all regions. The effects on the Delta, and on Delta exports, from implementation of the plan are unknown and will depend on many factors, including rate of growth in population and changes in the Delta environmental conditions.
Include agriculture in the Plan.	Agricultural water efficiency is beyond the scope of the plan, and is being addressed in other forums.
Supplier-level requirements should reflect climate, unique CII in the service area, and past conservation.	The state agencies agree that certain local conditions must be considered when translating targets from hydrologic region to individual water supplier. Regional targets in this plan are for planning purposes.
A methodology is needed to translate regional targets to supplier level.	The agencies agree that such a methodology is needed in order to place targets into statute or otherwise regulate the achievement of the Governor's goal.
The goal should be reasonable use by every urban customer	Establishing a "reasonable use" level for customers is a valid alternative to the regional targets described in this plan, particularly if the goal is placed into statute or regulated.
Limit CII actions to control of wasteful practices; do not limit production.	The agencies agree that CII efficiency measures should reduce waste and improve efficiency, not limit production.
Expand discussion of recycled water and give credit for its use.	The agencies acknowledge the importance of recycled water and wants to encourage its use as part of integrated resource management. The plan attempts to encourage use of recycled water without discouraging aggressive pursuit of additional water use efficiency.
The plan should address other strategies such as low impact development, storm water capture, and gray water.	All of these strategies can be important parts of a water management portfolio, and several of the state agencies have programs to encourage these strategies. Inclusion in this plan was beyond the "conservation" scope defined by the Governor.

Comment Category	Resolution or Response
Provide for local flexibility; allow locals to design their own conservation programs.	Local flexibility is vital to successful conservation programs. The state agencies have developed a plan that provides a strong foundation and consistent standards for conservation efforts, while preserving local flexibility.
We support a statewide database.	State agencies will pursue improved data collection and management to reduce the burden on local agencies, improve water data, and make it more timely and accessible.
Rate structures should be established by local agencies not the state.	State agencies recognize the complexity and sensitivity of rate-setting. For this reason, the plan's discussion of water rates describes a foundation – the range of approaches that constitute conservation pricing structures. Rate structures built on this foundation should be set at the local or regional level.
Do not establish a public goods charge.	There is clearly a need for continued investment in water conservation, and a stable funding source. The state agencies acknowledge that a public goods charge is controversial.
Existing water rights must be protected, not threatened by this plan.	The state agencies agree that water rights rules should not discourage conservation or efficient use.

APPENDIX I

DWR Bulletin 118 Modesto Sub Basin

San Joaquin Valley Groundwater Basin

Modesto Subbasin

- Groundwater Subbasin Number: 5-22.02
- County: Stanislaus
- Surface Area: 247,000 acres (385 square miles)

Basin Boundaries and Hydrology

The San Joaquin Valley is surrounded on the west by the Coast Ranges, on the south by the San Emigdio and Tehachapi Mountains, on the east by the Sierra Nevada and on the north by the Sacramento-San Joaquin Delta and Sacramento Valley. The northern portion of the San Joaquin Valley drains toward the Delta by the San Joaquin River and its tributaries, the Fresno, Merced, Tuolumne, and Stanislaus Rivers. The southern portion of the valley is internally drained by the Kings, Kaweah, Tule, and Kern Rivers that flow into the Tulare drainage basin including the beds of the former Tulare, Buena Vista, and Kern Lakes.

The Modesto subbasin lies between the Stanislaus River to the north and Tuolumne River to the south and between the San Joaquin River on the west and crystalline basement rock of the Sierra Nevada foothills on the east. The northern, western, and southern boundaries are shared with the Eastern San Joaquin Valley, Delta-Mendota, and Turlock Groundwater Subbasins, respectively. The subbasin comprises land primarily in the Modesto Irrigation District (MID) and the southern two-thirds of the Oakdale Irrigation District (OID). The City of Modesto is in the southwestern portion of the subbasin. Average annual precipitation for this subbasin is 11 to 15 inches, increasing eastward.

Hydrogeologic Information

The San Joaquin Valley represents the southern portion of the Great Central Valley of California. The San Joaquin Valley is a structural trough up to 200 miles long and 70 miles wide. It is filled with up to 32,000 feet of marine and continental sediments deposited during periodic inundation by the Pacific Ocean and by erosion of the surrounding mountains, respectively. Continental deposits shed from the surrounding mountains form an alluvial wedge that thickens from the valley margins toward the axis of the structural trough. This depositional axis is below to slightly west of the series of rivers, lakes, sloughs, and marshes, which mark the current and historic axis of surface drainage in the San Joaquin Valley.

Water Bearing Formations

The primary hydrogeologic units in the Modesto Subbasin include both consolidated and unconsolidated sedimentary deposits. The consolidated deposits include the Ione Formation of Miocene age, the Valley Springs Formation of Eocene age, and the Mehrten Formation, which was deposited during the Miocene to Pliocene Epochs. The consolidated deposits lie in the eastern portion of the subbasin and generally yield small quantities of water to wells except for the Mehrten Formation, which is an important aquifer. In the Subbasin, the Mehrten Formation is composed of up to 300 feet of sandstone, breccia, conglomerate, tuff siltstone and claystone (Page 1973).

The unconsolidated deposits were laid down during the Pliocene to present and, from oldest to youngest, include continental deposits lacustrine and marsh deposits, older alluvium, younger alluvium, and flood-subbasin deposits. The continental deposits and older alluvium are the main water-yielding units in the unconsolidated deposits. The lacustrine and marsh deposits (which include the Corcoran, or "E-" Clay), and the flood-subbasin deposits yield little water to wells, and the younger alluvium in most places probably yields only moderate quantities of water to wells (Page 1973).

The continental deposits consist of poorly sorted gravel, sand, silt and clay varying in thickness from 0 to 450 feet occurring at the surface on the eastern side of the subbasin to over 400 feet deep in the western portion. These deposits are the equivalent of the North Merced Gravels and the lower Turlock Lake Formation (Davis and others 1959). The older alluvium consists of intercalated beds of gravel sand, silt and clay with some hardpan. This alluvium is up to 400 feet thick and is generally present near or at the surface of the western one-half of the subbasin. The older alluvium is largely equivalent to the Riverbank and Modesto Formations (Davis and others 1959).

Ground water occurs under unconfined, semi-confined, and confined conditions. The unconfined water body occurs in the unconsolidated deposits above and east of the Corcoran Clay, which underlies the southwestern portion of the subbasin at depths ranging from 150 to 250 feet (DWR 1981). Where clay lenses restrict the downward flow of ground water, semi-confined conditions occur. The confined water body occurs in the unconsolidated deposits below the Corcoran Clay and extends downward to the base of fresh water.

The estimated average specific yield of this subbasin is 8.8 percent (based on DWR San Joaquin District internal data and Davis and others 1959).

Restrictive Structures

Groundwater flow is primarily to the southwest, following the regional dip of basement rock and sedimentary units. The lower to middle reaches of the Stanislaus and Tuolumne Rivers in the Subbasin appear to be gaining streams with groundwater flow into both, especially the Tuolumne River (DWR 2000). No faults have been identified that affect the movement of fresh groundwater (Page and Balding 1973).

Recharge Areas

Groundwater recharge is primarily from deep percolation of applied irrigation water and canal seepage from MID and OID facilities. Seepage from Modesto Reservoir is also significant (STRGBA 1995). Lesser recharge occurs as a result of subsurface flows originating in the mountains and foothills along the east side of the subbasin, losses from minor streams, and from percolation of direct precipitation.

Groundwater Level Trends

Changes in groundwater levels are based on annual water level measurements by DWR and cooperators. Water level changes were

evaluated by quarter township and computed through a custom DWR computer program using geostatistics (kriging). On average, the subbasin water level has declined nearly 15 feet from 1970 through 2000. The period from 1970 through 1978 showed steep declines totaling about 12 feet. The six-year period from 1978 to 1984 saw stabilization and rebound of about 7 feet. 1984 through 1995 again showed steep declines, bottoming out in 1995 at nearly 20 feet below the 1970 level. Water levels then rose about 5 feet from 1996 to 2000. Water level declines have been more severe in the eastern portion of the subbasin, but have risen faster in the eastern subbasin between 1996 and 2000 than in any other portion of the subbasin.

Groundwater Storage

Estimations of the total storage capacity of the subbasin and the amount of water in storage as of 1995 were calculated using an estimated specific yield of 8.8 percent and water levels collected by DWR and cooperators.

According to these calculations, the total storage capacity of this subbasin is estimated to be 6,500,000 af to a depth of 300 feet. According to published literature, the amount of stored groundwater in this subbasin as of 1961 is 14,000,000 af to a depth of ≤ 1000 feet (Williamson 1989).

Groundwater Budget (Type B)

Although a detailed budget was not available for this subbasin, an estimate of groundwater demand was calculated based on the 1990 normalized year and data on land and water use. A subsequent analysis was done by a DWR water budget spreadsheet to estimate overall applied water demands, agricultural groundwater pumpage, urban pumping demand and other extraction data.

Natural recharge into the subbasin is estimated to be 86,000 af. Artificial recharge and subsurface inflow values are not determined. There is approximately 92,000 af of applied water recharge. Annual urban and agricultural extractions are estimated to be 81,000 and 145,000 af, respectively. There are no other extractions, and values for subsurface outflow are not determined.

Groundwater Quality

Characterization. The groundwater in this basin is of a calcium bicarbonate type in the eastern subbasin to a calcium-magnesium bicarbonate or calcium-sodium bicarbonate type in the western portion. TDS values range from 60 to 8,300 mg/L, with a typical range of 200 to 500 mg/L. The Department of Health Services, which monitors Title 22 water quality standards, reports TDS values in 88 wells ranging from 60 to 860 mg/L, with an average value of 295 mg/L.

Impairments. There are areas of hard groundwater and localized areas of high chloride, boron, DBCP, nitrate, iron, and manganese. Some sodium chloride waters of high TDS values are found along the east side of the subbasin. There are also some areas of shallow groundwater in the subbasin that require dewatering wells.

Water Quality in Public Supply Wells

Constituent Group ¹	Number of wells sampled ²	Number of wells with a concentration above an MCL ³
Inorganics – Primary	110	3
Radiological	109	25
Nitrates	114	3
Pesticides	117	14
VOCs and SVOCs	117	8
Inorganics – Secondary	110	8

¹ A description of each member in the constituent groups and a generalized discussion of the relevance of these groups are included in *California's Groundwater – Bulletin 118* by DWR (2003).

² Represents distinct number of wells sampled as required under DHS Title 22 program from 1994 through 2000.

³ Each well reported with a concentration above an MCL was confirmed with a second detection above an MCL. This information is intended as an indicator of the types of activities that cause contamination in a given basin. It represents the water quality at the sample location. It does not indicate the water quality delivered to the consumer. More detailed drinking water quality information can be obtained from the local water purveyor and its annual Consumer Confidence Report.

Well Characteristics

Well yields (gal/min)		
Municipal/Irrigation	Range: 350 – 4,500	Average: 1,000 - 2,000
Total depths (ft)		
Domestic		
Municipal/Irrigation	Range: 50 - 500	

Active Monitoring Data

Agency	Parameter	Number of wells /measurement frequency	
DWR (incl. Cooperators)	Groundwater levels	230	Semi-annually
Oakdale Irrigation District	Drinking water parameters	15	Monthly to every 3 years
Department of Health Services (including Cooperators)	Title 22 water quality	209	Varies

Basin Management

Groundwater management:	The Stanislaus and Tuolumne Rivers' Groundwater Subbasin Association has developed an AB3030 ground water management plan for the individual Association members (City of Modesto, Del Este Water Company, County of Stanislaus, Oakdale I.D., City of Oakdale, City of Riverbank, and Modesto I.D.)
	Conjunctive use programs, stormwater recharge subbasins, water conservation programs operated by Oakdale and Modesto I.Ds., Stanislaus County and other public entities.
Water agencies	
Public	Oakdale I.D., Modesto I.D.; Stanislaus and Tuolumne Rivers' Groundwater Subbasin Association; City of Oakdale; City of Riverbank
Private	

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Errata

Changes made to the basin description will be noted here.