City of Turlock

2010

Urban Water Management Plan

CITY OF TURLOCK
DEPARMENT OF MUNICPAL SERVICES

City of Turlock

URBAN WATER MANAGEMENT PLAN

July, 2011

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TURLOCK, CA 95380

City of Turlock, Municipal Services

URBAN WATER MANAGEMENT PLAN

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To conserve space and improve readability, the following abbreviations are used in this report. The abbreviations are spelled out in the text the first time the phrase or title is used in each chapter and subsequently identified by abbreviation only.

Abbreviation	Description
AB	Assembly Bill
ADD	Average Day Demand
AF	Acre Feet
AFY	Acre Feet per Year
BMP	Best Management Practices
CDR	Center for Demographic Research
CIMIS	California Irrigation Management Information System
City	City of Turlock
CUWCC	California Urban Water Conservation Council
DMMs	Demand Management Measures
DOF	Department of Finance
DPH	Department of Public Health
du/ac	Dwelling Units per Acre
DWR	Department of Water Resources
ETo	Evapotranspiration
ft-MSL	Feet above Mean Sea Level
FY	Fiscal Year
GPCD (gpcd)	Gallons per Capita per Day
GPM	Gallons per Minute
GWMP	Groundwater Management Plan
MCL	Maximum Contaminant Level
MFR	Multi-Family Residential
MG	Million Gallons
MGD	Million Gallons per Day
mg / L	Milligrams per Liter
MOU	Memorandum of Understanding
MTBE	Methyl-Tertiary-Butyl-Ether
NPDES	National Pollutant Discharge Elimination System
PCE	Perchloroethylene
RUWMP	Regional Urban Water Management Plan
RW	Recycled Water
RWMP	Recycled Water Master Plan
RWQCB	Regional Water Quality Control Board
SB	Senate Bill
SFR	Single Family Residential
SWP	State Water Project
TGBA	Turlock Groundwater Basin Association

TID	Turlock Irrigation District
TDS	Total Dissolved Solids
ULF	Ultra Low Flush
UWMP	Urban Water Management Plan
UWMPA	Urban Water Management Planning Act
WCS	Water Code Section
WMP	Water Master Plan
WSRP	Water Shortage Response Plan
WWTF	Wastewater Treatment Facility

SECTION 1 - PLAN PREPARATION

PURPOSE

The California Water Code requires urban water suppliers within the state to prepare and adopt Urban Water Management Plans (UWMPs) for submission to the California Department of Water Resources (DWR). The UWMPs, which must be filed every five years, must satisfy the requirements of the Urban Water Management Planning Act (UWMPA) of 1983 including amendments that have been made to the Act. The UWMPA requires urban water suppliers servicing 3,000 or more connections, or supplying more than 3,000 acre feet (af) of water annually, to prepare an UWMP.

The purpose of the UWMP is to maintain efficient use of urban water supplies, continue to promote conservation programs and policies, ensure that sufficient water supplies are available for future beneficial use, and provide a mechanism for response during water drought conditions. This report, which was prepared in compliance with the California Water Code, and as set forth in the guidelines and format established by the DWR, is the City of Turlock's (City) 2010 UWMP.

In preparing this plan update, City staff used the step-by-step approach listed in the final version of DWR's "Guidebook to Assist Urban Water Suppliers to Prepare a 2010 Urban Water Management Plan." Therefore, the 2005 UWMP was restructured for the 2010 UWMP Update to be more consistent with the format, organization, and order of DWR's Guidebook.

Urban Water Management Planning Act

In 1983, State Assembly Bill 797 modified the California Water Code Division 6, by creating the UWMPA. Since 1983, several amendments to the original UWMPA have increased the data requirements and planning elements to be included in the 2005 and 2010 UWMPs.

Initial amendments to the UWMPA required that total projected water use be compared to water supply sources in 5-year increments over a 20-year planning period. Recent DWR guidelines also suggest projecting through a 25-year planning horizon to maintain a 20-year timeframe until the next UWMP update has been completed. Other amendments require that UWMPs include provisions for recycled water use, demand management measures (DMMs), and a water shortage contingency plan.

Amendments Senate Bill (SB) 610 (Costa, 2001), and AB 901 (Daucher, 2001), which became effective January 1, 2002, require counties and cities to consider information

relating to the availability of water to supply new large developments. Amendment SB 318 (Alpert, 2004) requires the UWMP to describe the opportunities for development of desalinated water, including but not limited to, ocean water, brackish water, and groundwater, as long-term supply. AB 105 (Wiggins, 2004) requires urban water suppliers to submit their UWMPs to the California State Library.

Recent amendments to the UWMPA affecting the preparation of 2010 UWMPs are the result of the enactment of Water Conservation Bill of 2009 and other legislation. The Water Conservation Bill of 2009 was enacted in November 2009 to increase water use efficiency, and requires urban water suppliers to reduce the statewide average per capita daily water consumption by 20 percent by December 31, 2020. Changes to the 2010 UWMP requirements primarily address water conservation and DMMs, but also affect notification, water use projections for lower income housing, grant and loan eligibility criteria, and the distribution of UWMPs.

Previous Urban Water Management Plan

Pursuant to the UWMPA, the City previously prepared an UWMP in 2005, which was approved and adopted by the City council on January 10, 2006. Following adoption, the 2005 UWMP was submitted to, and formally approved by DWR. This 2010 UWMP report serves as an update to the City's 2005 UWMP and builds onto that document.

Other Water Planning Efforts

In preparing its 2010 UWMP, the City of Turlock relied upon a number of recent water plans that consider the City's demand for water as well as protecting the sustainability of water quality in the groundwater basin. Important water resources documents include, but are not limited to:

Turlock Groundwater Management Plan (2008)

This plan was prepared by the Turlock Groundwater Basin Association of which the City of Turlock is a member. The Groundwater Management Plan (GWMP) addresses the Turlock subbasin's physical characteristics, water quality conditions, and implementation of the groundwater management plan. The document supersedes the 1997 GWMP and incorporates new components and updates existing components to address the legislative requirements of SB 1938 and SB 1672. The update incorporates data collected since 1997 and reflects analysis performed subsequent to the preparation of the 1997 GWMP. The TGBA's GWMP constitutes the City's groundwater management plan and describes methods to sustain groundwater reserves.

Turlock Groundwater Basin Association Water Balance Study (2003, 2007)

A water balance study of the Turlock Subbasin was prepared in 2003 and updated in 2007 to estimate the inflows and outflows from the Subbasin between 1952 and 2006. The Water Balance Study, in conjunction with the Turlock Subbasin groundwater model, confirmed that groundwater storage has decreased slightly in recent years, particularly between 2002 and 2006.

Assessment of Future Groundwater Impacts Due to Assumed Water-Use Changes Turlock Groundwater Basin, California (September 11, 2008)

This report describes the simulation of future groundwater conditions within the Turlock groundwater basin using a groundwater model. For a particular scenario of possible future water use and climatic conditions, the model was used to simulate the corresponding future groundwater levels. The groundwater model was developed and has been periodically updated by the Turlock Irrigation District since 1988. A future scenario was constructed for potential land and water-use conditions through 2036 and the model calculated the corresponding groundwater levels.

California Urban Water Conservation Council (CUWCC)

In 1991, a Memorandum of Understanding (MOU) regarding urban water conservation in California established the California Urban Water Conservation Council (CUWCC). Council members can submit their most recent Best Management Practices (BMP) reports with their UWMP to address the urban water conservation issues in the UWMPA.

In 2009, the City of Turlock became a member of the California Urban Water Conservation Council (CUWCC) and in May 2011 submitted its 2009-2010 BMP annual report to the Council. As a signatory to the CUWCC MOU, the California Water Code allows the City to use its BMP reports to satisfy the Urban Water Management Plan's reporting requirements for DMM compliance (supporting documentation is provided in Appendix C)

Required Elements — Coordination with Appropriate Agencies

Law

> *10620 (d) (2) Each urban water supplier shall coordinate the preparation of its plan with other appropriate agencies in the area, including other water suppliers that share a common source, water management agencies, and relevant public agencies, to the extent practicable.*
>
> *10621 (b). Every urban water supplier required to prepare a plan pursuant to this part shall, at least 60 days prior to the public hearing on the plan required by Section 10642, notify any city or county within which the supplier provides water supplies that the urban water supplier will be reviewing the plan and considering amendments or changes to the plan. The urban water supplier may consult with, and obtain comments from, any city or county that receives notice pursuant to this subdivision.*

10635 (b). The urban water supplier shall provide that portion of its urban water management plan prepared pursuant to this article to any city or county within which it provides water supplies no later than 60 days after the submission of its urban water management plan.

10642. Each urban water supplier shall encourage the active involvement of diverse social, cultural, and economic elements of the population within the service area prior to and during the preparation of the plan.

10642. Prior to adopting a plan, the urban water supplier shall make the plan available for public inspection and shall hold a public hearing thereon. Prior to the hearing, notice of the time and place of hearing shall be published within the jurisdiction of the publicly owned water supplier pursuant to Section 6066 of the Government Code. The urban water supplier shall provide notice of the time and place of hearing to any city or county within which the supplier provides water supplies. A privately owned water supplier shall provide an equivalent notice within its service area.

The City is the sole water supplier and water management agency for the area. For this reason, the City did not participate in an area, regional, watershed, or basin wide UWMP. While preparing the 2010 UWMP, however, the City coordinated its efforts with relevant agencies to ensure that the data and issues discussed in the plan are presented accurately. Table 1 summarizes how the UWMP preparation was coordinated with different agencies in the area.

The City provided formal written notification to Stanislaus County, TID, and other appropriate agencies and interested parties, that the City's UWMP was being updated for 2010. Copies of the Notification letters are included in Appendix A. In accordance with the UWMPA, this notification was provided to appropriate agencies at least 60 days prior to the public hearing of the plan. Copies of the final UWMP will be provided to Stanislaus County and the TID no later than 30 days after its submission to DWR.

The City is committed to encourage the active involvement of diverse social, cultural, and economic elements of its citizenry. In order to receive the most public comment possible, the City made a great effort to contact as many interested parties as possible, including other City departments. Local organizations, environmental groups, other public agencies, Stanislaus County, the local university, and developers were contacted. The City held a public workshop on May 25, 2011 at 6.00 PM at Turlock City Hall, 156 South Broadway. The workshop provided an opportunity for the City's customers, residents, businesses and other interested parties to learn more and ask questions about the current and future water supply of the City.

An e-mail listserve, originally developed by the City's Planning Division for the General Plan and Housing Element Updates, was used during the update process to provide information directly to interested citizens, businesses and organizations (Appendix A).

The City submitted draft copies of the UWMP to local water agencies and public interest groups. Table 1 outlines the people contacted and their response. As part of the preparation of this document, the City of Turlock Planning Division was involved in providing statistics on future growth and also commented on the draft plan.

The public meeting and public hearing were advertised in the local newspaper (Turlock Journal) and displayed on the City's Web site along with the ability to download a copy of the draft document.

On May 28, 2011, the City placed a notice in the Turlock Journal (local newspaper of general circulation) stating that its UWMP was being updated and that a public hearing would be conducted on June 14, 2011 to address comments and concerns from members of the community. A copy of this notification is included in Appendix A.

The Draft 2010 UWMP was made available for public inspection at the City of Turlock's Municipal Services Department, located at 156 South Broadway as well as the Turlock Public Library, located at 550 North Minaret Avenue. In addition, the City also posted information on the update process for the UWMP and posted the public review draft UWMP on its website (www.cityofturlock.org).

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**
Other water suppliers: City of Modesto, City of Ceres, City of Hughson, Eastside Water District, Denair Community Services District, Turlock Irrigation District, and Keyes Community Services District					XX	XX	
Water mgmt agencies: Stanislaus County, Merced County					XX	XX	
Relevant public agencies: California State University Stanislaus					XX	XX	
General public	XX	XX	XX	XX	XX	XX	
Other							

[1] *Indicate the specific name of the agency with which coordination or outreach occurred.*
[2] *Check at least one box in each row.*

Plan Adoption, Submittal and Implementation

Law

10621 (c). The amendments to, or changes in, the plan shall be adopted and filed in the manner set forth in Article 3 (commencing with Section 10640)

10642. After the hearing, the plan shall be adopted as prepared or as modified after the hearing.

10643. An urban water supplier shall implement its plan adopted pursuant to this chapter in accordance with the schedule set forth in its plan.

10644 (a). An urban water supplier shall submit to the department, the California State Library, and any city or county within which the supplier provides water supplies a copy of its plan no later than 30 days after adoption. Copies of amendments or changes to the plans shall be submitted to the department, the California State Library, and any city or county within which the supplier provides water supplies within 30 days after adoption.

10645. Not later than 30 days after filing a copy of its plan with the department, the urban water supplier and the department shall make the plan available for public review during normal business hours.

In accordance with the UWMPA, the City held a public hearing and adopted the 2010 UWMP on June 14, 2011. A copy of the adopting resolution is included in Appendix B. The hearing provided an additional opportunity for the City's customers, businesses, residents, and organizations to learn more and ask questions about the current and future water supply of the City.

Two successive weeks prior to adoption; a notice of the public hearing was published in the Turlock Journal, the local newspaper of general circulation, notifying interested parties that the draft 2010 UWMP was available for review (Appendix B).

The UWMP will be submitted to DWR, the California State Library, Turlock Irrigation District, the City of Modesto, and the County of Stanislaus within 30 days of the Plan's adoption. Copies of any future changes will also be provided to these agencies. Any future amendments will only be made after a public hearing by the City of Turlock who will readopt the plan as part of the amendment process. The UWMP will be available for review at Turlock City Hall and the Turlock public library for public review during normal business hours.

In addition to the groups noted above and shown in Table 1, a public meeting was held on May 25, 2011 to receive any additional comments or concerns. The meeting date and a copy of the responses at these meetings are outlined in Appendix A.

Implementation of 2005

A review of the 2005 UWMP indicates the following:

- Population growth was less than projected: 71,181 instead of 77,899
- Water consumption was less than projected: 21,767 AFY instead of 31,301 AFY
- The use of recycled water increased but not as much as anticipated
- Per capita water use is down significantly
- The City joined the California Urban Water Conservation Council (CUWCC)
- Preliminary design and environmental review of Regional Surface Water Supply project has been completed by the Turlock Irrigation District (TID)

SECTION 2 - SYSTEM DESCRIPTION

Law

10631. A plan shall be adopted in accordance with this chapter and shall do all of the following:

10631. (a) Describe the service area of the supplier, including current and projected population, climate, and other demographic factors affecting the supplier's water management planning. The projected population estimates shall be based upon data from the state, regional, or local service agency population projections within the service area of the urban water supplier and shall be in five-year increments to 20 years or as far as data is available.

In the heart of California's Central Valley, located along State Highway 99 about 93 miles south of the state capital of Sacramento, Turlock is the second largest city in Stanislaus County. Turlock is situated midway between Modesto (to the northwest) and Merced (to the southeast).Turlock's population has grown steadily from 13,992 in 1970 to over 70,000 today. Home of California State University Stanislaus (CSUS), Turlock provides an unusual opportunity to combine a quality learning environment with relaxed rural living (see Figure 1)

Home to the world's most productive agricultural region, the area proves to be a particularly attractive location for the food processing industry due to the diverse range of agricultural commodities and support services.

Founded by John Mitchell on December 22, 1871, the City of Turlock was incorporated in 1908 and was considered a fairly prosperous community. It then consisted of three hotels, one restaurant, three merchandise stores, a drug store and several other retail establishments. Today Turlock is referred to as the "Heart of the Valley".

Turlock is a General Law City that operates under the Council / Manager form of government. There are five city departments including Police, Fire, Development, Municipal and Administrative Services. Turlock operates its own water and wastewater utilities.

Figure 1
Regional Location Map
Urban Water Management Plan
City of Turlock

City of Turlock Water Utility

The City provides water to its residents, institutions, industries, and businesses through approximately 18,000 service connections.

In 2004, the State Legislature passed a law requiring utilities to charge water customers based on the actual volume of water used. The deadline to comply with this law is 2010 for all homes built since January 1, 1992 and 2025 for all homes built before 1992. The

Turlock City Council, in the interest of fairness and encourage water conservation, chose to install water meters at all accounts. The installation of meters began in 2007 and meter-based (volumetric) billing for all water users commenced on January 1, 2011. In concert with the meter installation project, the City developed a public education campaign to encourage water conservation.

The combination of meter installations, the recent drought, and the City's education outreach efforts has resulted in a significant reduction in water use in Turlock since the adoption of the 2005 UWMP. In 2010, water production was 7,093.9 million gallons – down from its 2007 peak of 8,359.0 million gallons. Similarly, per capita water use has declined significantly - from 330 gpcd in 2007 to 272 gpcd in 2010. The City is well on its way to complying with the water use targets of SBx7-7 and the GPCD compliance option of the CUWCC's MOU.

A large portion of the area's economy is based on agriculture. The City is home to a variety of major food processing industries that rely heavily on an inexpensive and plentiful source of high quality water and an inexpensive electrical supply. Most of these industries are poultry or dairy related. Twenty years ago, the industrial group used 20% of the water produced by the City. Over the past twenty years several businesses have closed, but new industries and the growth of the remaining facilities have kept the water usage for this group about the same. However, because of residential population growth, the percentage of water use associated with industry has dropped to 15% of the city's total water production.

The majority of water use in Turlock is for single-family homes, accounting for approximately 58% of total water deliveries; a significant amount of this water is use for landscape irrigation. Multi-family homes, with their smaller percentage of landscaped area, account for only 10% of water use in Turlock. Landscape accounts, as well as City landscaped areas, are responsible for 8% of water use. As most of this water in this category is used for City park areas, there is potential for additional water conservation in this category. Commercial accounts are responsible for approximately 8% of water use.

Like most San Joaquin Valley communities, landscape watering is the largest water use within the City and likely the area where the greatest savings in water use can be achieved.

Turlock's Climate

The City's climate consists of cool, humid winters and hot, dry summers. The following Table summarizes the standard monthly average evapotranspiration (ETo) rates, rainfall, and temperature. The City's average monthly temperature ranges from 46 to 79 degrees Fahrenheit (°F), with an annual average temperature of 62°F. The daily average low and high temperatures have been measured to be 38°F and 95°F, respectively.

Climate Characteristics: Turlock					
Month	Standard Monthly Average ETo (inches)[1]	Monthly Average Rainfall (inches)[2]	Temperature Average(°F)[2]	Temperature Minimum(°F)[2]	Temperature Maximum (°F)[2]
January	0.87	2.30	45.91	38.1	53.7
February	1.71	2.08	51.25	41.8	60.7
March	3.43	1.82	55.54	44.4	66.7
April	5.24	1.05	60.57	48.4	72.7
May	6.70	0.43	66.58	53.1	80.2
June	7.40	0.08	73.63	58.6	88.7
July	7.85	0.01	78.66	62.6	94.7
August	6.75	0.02	76.74	60.9	92.6
September	4.93	0.18	72.23	57.7	86.8
October	3.37	0.58	64.18	51.5	76.9
November	1.66	1.25	53.42	42.9	63.9
December	0.87	2.08	45.71	38.1	53.4
Total	**50.78**	11.88	62.04	49.8	74.3

1 Source: California Irrigation Management Information System (CIMIS) Station 168 Denair (www.cimis.water.ca.gov)

[2]Source: www.wrcc.dri.edu Turlock #2 (049073)

Service Area Population

The current city population is approximately 72,000 and it is the second largest city in the region. Turlock is also home to California State University, Stanislaus that has an enrollment of 8,000 students. In the early to mid 2000s, considerable residential and commercial construction took place in Turlock.

Based on data from the State Department of Finance and the General Plan Update, current and projected population estimates are summarized in Table 2 below. Projected population growth for the next 20 years is based on a General Plan average population growth rate of 2.5%.

Table 2 Population — current and projected							
	2010	2015	2020	2025	2030	2035 - optional	Data source[1]
Service area population[1]	71,181	80,220	90,762	102,689	115,363	130,523	State DOF

[1] California State Department of Finance

The City of Turlock operates a water system to serves its population of 71,181 residents through approximately 18,000 service connections.

SECTION 3 – SYSTEM DEMANDS

Law

10631 (e) (1) Quantify, to the extent records are available, past and current water use, and projected water use (over the same five-year increments described in subdivision (a)), identifying the uses among water use sectors including, but not necessarily limited to, all of the- following uses:

(A) Single-family residential; (B) Multifamily; (C) Commercial; (D) Industrial; (E) Institutional and governmental; (F) Landscape; (G) Sales to other agencies; (H) Saline water intrusion barriers, groundwater recharge, or conjunctive use, or any combination thereof; and (I) Agricultural.

(2) The water use projections shall be in the same 5-year increments to 20 years or as far as data is available.

Water Demands

During the next five years, the City anticipates meeting all of its service demands with groundwater wells and will supplement supplies with recycled and non-potable water.

Since the 2005 UWMP, the City of Turlock's wastewater treatment facility has been upgraded to tertiary treatment. The wastewater complies with Title 22 requirements for unrestricted reuse. In 2006, the City's Recycled Water Program was approved by the California Department of Public Health and the Regional Water Quality Control Board. The Program allows for two uses of the recycled water: industrial cooling (up to 730 MG/year) and landscape irrigation at Pedretti Baseball Park (up to 20 MG/Year). The City is also actively working as a partner in the North Valley Regional Recycled Water Program which would allow the remainder of the City's recycled water to be used for agricultural irrigation in the Del Puerto Water District (west Stanislaus County).

The shallow groundwater aquifer contains water that typically does not meet drinking water standards. However, this water can be used for landscape irrigation and the City will continue to use this resource. Further, the City also uses excess runoff from residential watering to supply irrigation water for Summerfaire Park.

The City's Water Master Plan (WMP) was completed in August of 2003 and updated in 2009. The WMP identified water supply, water quality and water deficiencies as well as solutions for a number of issues facing the City's potable water system. Since 2003, the City has constructed infrastructure to meet the WMP's recommendations as modified by actual conditions.

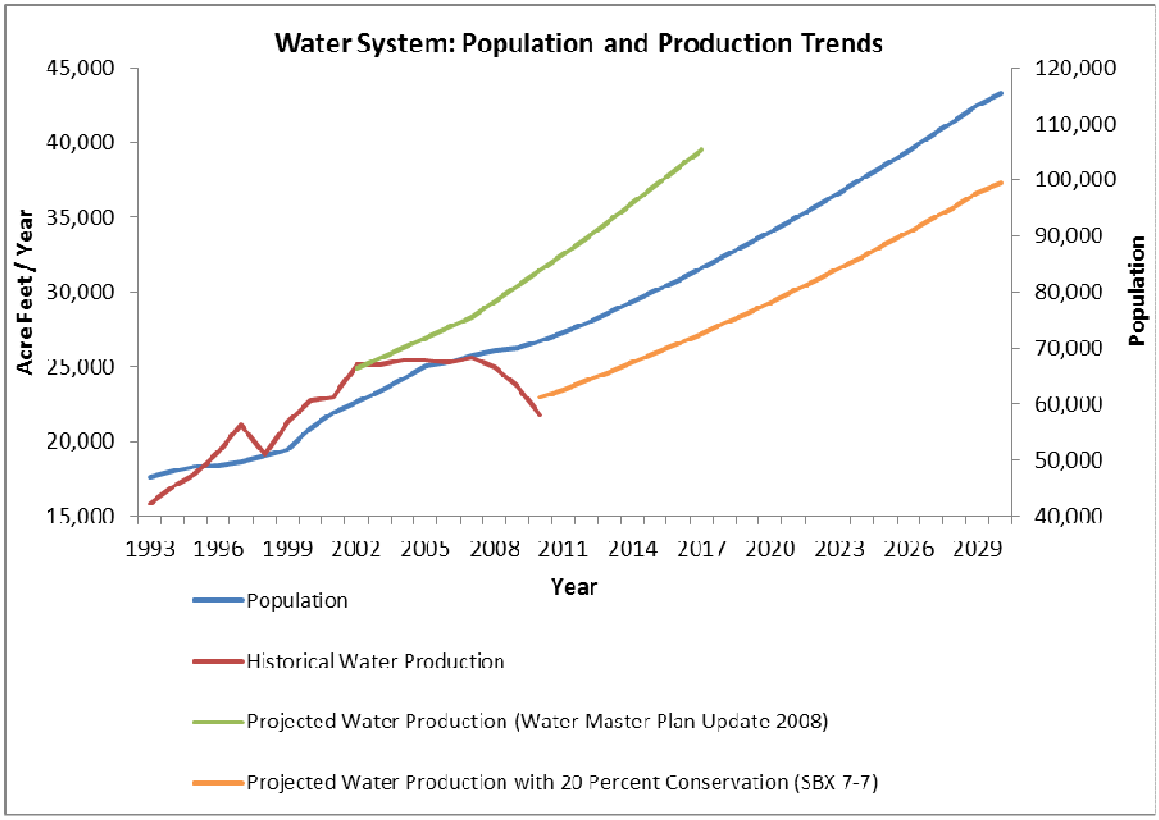
Implementation of the WMP to-date includes:

- Construction of four (4) new wells
- Construction of two (2) one million gallon water storage reservoirs (tanks)

The Water Master Plan identified a number of issues that needed to be addressed, including planning to for an adequate supply of water to meet expected future demands through the year 2025.

At the time the WMP was developed (2003), average annual water demand was 22 million gallons per day (MGD) and a projected amount of 35 MGD by 2017, based upon 3.4 percent annual growth. However water demand has slowed drastically since this report was completed and per capita water use has dropped significantly. The 2010 average annual water demand was 18.5 (MGD). At this time, it appears a growth rate of 2.0% or less for water demand appears more likely (see Figure 2).

Figure 2: Water System Population and Production Trends



In order to address the projected 2020 water demand (31.2 million gallons per day which is equivalent to 11.3 billion gallons per year), two scenarios were considered: groundwater only and a combination of groundwater and surface water.

Groundwater Only:

- Install three (3) wells and/or an additional storage reservoir
- Estimated capital cost $6,000,000 (2010 dollars)

Surface Water:

Historical data indicates the groundwater supply will support annual production of up to eight (8) billion gallons per year. Groundwater pumping in excess of eight (8) billion gallons results in the depletion (overdraft) of the groundwater table (aquifer). Because it is not sustainable to overdraft the groundwater over a long period, an additional supply of water will be needed in future years.

The timing of this overdraft situation is uncertain due to a number of factors - most importantly the rate of population growth, industrial expansion, and efforts to conserve water. For instance, it is estimated that per capita water use will decline a further five per cent (5%) due to the introduction of meter-based billing in 2011. Nevertheless, the following forecasts illustrate the limitations of the City relying entirely on groundwater for its water supply:

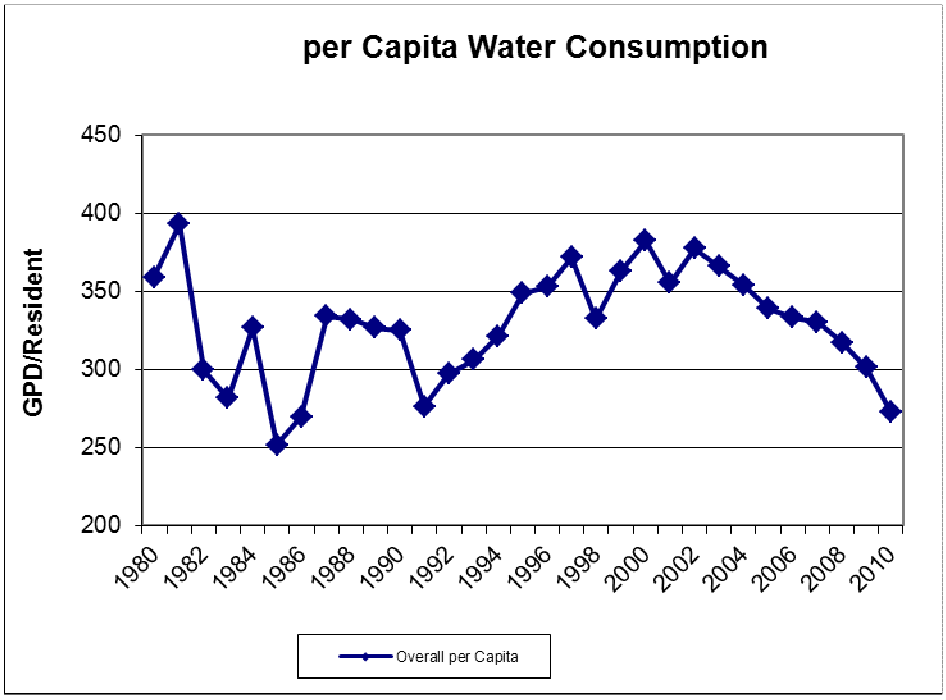
	3% growth	**2.5% growth**	**2% growth**
Year Overdraft Starts	2016	2017	2019
Population	84,994	84,612	85,068
Annual Water Use[1]	8,065,915,086	8,029,663,676	8,072,942,204

[1] Assumes 260 gallons per capita per day - a 5% reduction from the 2010 per capita use of 273 gallons per day

The need for additional water supply to supplement the current groundwater wells is much greater as the rate of growth increases. The total capital cost for fifteen (15) MGD of surface water is estimated to be $85,000,000 or more (2010 dollars).

As shown in Figure 3, water use in the City started to level off in the early 2000's with the peak per capita consumption occurring in 2000. As of the end of 2010, overall water use (7.094 billion gallons) has declined by over 15% from the high in 2007 (8.359 billion gallons) and per capita consumption has dropped by more than 25% (from 382 gallons per day in 2000 to 273 gallons per day in 2010). With this decline in water use, the groundwater levels have stabilized and it appears that at current water production levels groundwater can reliably meet current demand. Starting in 2011, all customers will be billed based on metered water use and it is anticipated that this will reduce water consumption by at least a further 5%.

Figure 3: per Capita Water Consumption



While groundwater can currently meet all of the City's needs for the next few years, it likely will not be able to supply a sufficient quantity of water for long term growth. Water conservation programs have helped reduce the amount of water used but even with aggressive programs in place, additional water supplies will be needed for the long term.

The City made a financial commitment to the Turlock Irrigation District for the design, environmental review and legal challenges for the future construction of a Regional Surface Water Treatment Plant (RSWSP). At this point in time the City has informally committed to receiving 15 MGD from this facility; however, no contracts have been signed. Treated surface water will provide the City with an additional water supply and increased supply reliability. Recent preliminary estimates place the City's financial obligation to this project at $85 million. This equates to an approximate annual Operation/ Maintenance (O/M) and Debt Service of $9,800,000.00 just for the Surface Water Plant. In addition, improvements to the City's system to accept this water source are estimated to be $25,000,000.00. At this time water rates have not been adjusted to reflect the additional revenue needed for this project. Staff will be approaching the City Council to provide an update and to receive direction on this matter in 2011.

Table 3 provides historical customer counts and water demands for various customer classes.

Table 3 Water deliveries — actual, 2005					
	2005				
	Metered		Not metered		Total
Water use sectors	# of accounts	Volume	# of accounts	Volume	Volume
Single family	107	58.9	14,825	5,006.5	5,065.4
Multi-family	367	379.5	670	417.5	797.0
Commercial	985	624.6	196	130.2	754.8
Industrial	20	1,401.2			1,401.2
Institutional/governmental					0.0
Landscape	148	275.0			275.0
Agriculture	0	0.0			0.0
Other					0.0
Total	1,627	2,739.2	15,691	5,554.2	8,293.4
Units: million gallons per year					

Table 4 quantifies 2010 water accounts and use by customer class.

Table 4 Water deliveries — actual, 2010					
	2010				
	Metered		Not metered		Total
Water use sectors	# of accounts	Volume	# of accounts	Volume	Volume
Single family	122	55.9	15,294	4,060.0	4,115.9
Multi-family	315	326.9	686	359.6	686.5
Commercial	969	492.7	182	92.5	585.2
Industrial	23	1,091.9			1,091.9
Institutional/governmental	77	41.8			41.8
Landscape (includes municipal)	359	572.6			572.6
Agriculture	0	0.0			0.0
Other					0.0
Total	1,865	2,581.8	16,162	4,512.1	7,093.9
Units: million gallons per year					

Water Demand Projections

Population data developed by the City of Turlock for its General Plan Update was used to develop estimates of future City water use. The demographic projections are based on the preferred land use plan outlined in the Draft 2030 General Plan Update.

According to the State Department of Finance, the 2010 population of the City of Turlock was 71,181 people. The build-out (2030) population of the General Plan area is estimated to be 115,363. Using the project annual population growth rate of 2.5%, the City extrapolated that the 2035 population of Turlock will be 130,253.

The projected connections and water demands for each sector from years 2015 to 2035 are summarized in Tables 5-7. The demand projections are estimated based on the conservation targets developed in Section 3 and thus incorporates water conservation associated with the Water Conservation Bill of 2009.

Distribution of demand among water use sectors is calculated using average water use by sector data from 2005 through 2009. To project the number of connections per sector, it was assumed that the number of connections would grow consistently with population. The distribution of the number of connections for each water use sector is calculated using average number of connection data by sector from 2005 through 2009. It should be noted that water loss, or unaccounted for water, is implicitly included in the demand associated with unmetered connection and is not tabulated separately.

Projected water delivers for 2015 by account class area shown in Table 5.

Table 5

Water deliveries — projected, 2015

	2015			
	Metered		Not metered	
Water use sectors	# of accounts	Volume	# of accounts	Volume
Single family	17,374	5,097		
Multi-family	1,128	850		
Commercial	1,297	725		
Industrial	25	1,352		
Institutional/governmental	87	52		
Landscape	405	709		
Agriculture	0	0		
Other				
Total	20,315	8,784	0	0

Units (circle one): million gallons per year

Projected water deliveries for 2020 by account class area shown in Table 6.

Table 6 Water deliveries — projected, 2020				
	2020			
	Metered		Not metered	
Water use sectors	# of accounts	Volume	# of accounts	Volume
Single family	19,657	5,536		
Multi-family	1,276	923		
Commercial	1,468	787		
Industrial	27	1,469		
Institutional/governmental	98	56		
Landscape	458	770		
Agriculture	0	0		
Other				
Total	22,984	9,541	0	0
Units (circle one): million gallons per year				

Projected water deliveries for 2025-2035 by account class area shown in Table 7.

Table 7 Water deliveries — projected 2025, 2030, and 2035					
	2025		2030		2035 - optional
	metered		metered		metered
Water use sectors	# of accounts	Volume	# of accounts	Volume	Volume
Single family	22,240	6,263	24,985	7,036	7,961
Multi-family	1,444	1,045	1,622	1,174	1,328
Commercial	1,660	890	1,865	1,000	1,132
Industrial	29	1,662	31	1,867	2,112
Institutional/governmental	111	64	125	71	81
Landscape	518	871	582	979	1,107
Agriculture	0	0	0	0	0
Other					
Total	26,002	10,795	29,210	12,127	13,721
Units (circle one): million gallons per year					

RHNA Lower Income Housing Projected Water Use

The Housing Element of the Turlock General Plan (2010) lists 1,367 low and very low income housing units to meet the Stanislaus Council of Governments Regional Housing Needs Assessment 2007-2014. The estimated residential per unit water demand for these lower income households is the same for all other dwelling units in Turlock, approximately 300 GPCD in 2010 and declining to 288 GPCD based on the mandate in

SBx 7-7. Approximately 1.25 million gallons per year is needed to supply these projected lower income housing units. Water demands for these units are included in future water demand projections for single family and multi -family homes listed in the tables 5-7.

Table 8
Low-income projected water demands

Low Income Water Demands[1]	Number of Units	Persons per Unit	Water Demand[1]
Very Low Income	805	3.05	0.74
Low Income	562	3.05	0.51
Total	1,367		1.25

Units: million gallons per year

Source: Stanislaus Council of Governments (StanCOG) Regional Housing Needs Assessment 2007-2014; Turlock Housing Element Update; American Fact Finder (US Census)

[1]*Actual annual demand in MG*

Sales to Other Agencies

The City of Turlock does not sell water to other agencies. There are three small water systems within Turlock owned and operated by the City of Modesto which have a few, small wells. These water systems use the City of Turlock as a backup water source and for fire fighting purposes. Because the water use and revenue from this source is intermittent and very limited, this data has not been accounted for as "water sales to other agencies" (Table 10), but is included in future water demand projections in tables 5-7. The City of Turlock will not be purchasing water from a wholesale supplier and so DWR Table 12 has not been included in this report.

Water Losses

The City provides up to two (2) MGD of recycled water to Turlock Irrigation District (TID) for industrial cooling at the Walnut Energy Center, a 250-megawatt natural gas power plant located in Turlock. The TID is however, a retail customer for recycled water. Further, the City provides approximately 20 million gallons per year of recycled of water to Pedretti Park for landscape irrigation.

Currently, the recycled water that is not used in Turlock is discharged to the San Joaquin River via the Harding Drain. In the future, the City will build a pipeline that will bypass the Harding Drain and allow for recycled water to be provided to the Del Puerto Water District. The Del Puerto Water District provides irrigation water to approximately 11,000 acres of farmland on the west side of Stanislaus County.

Table 9 Sales to other water agencies							
Water distributed	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**	**2035 - opt**
Del Puerto Water District (Recycled Water)	0	0	0	4,000	4,000	4,000	4,000
Total	0	0	0	4,000	4,000	4,000	4,000

Units: million gallons per year
With the construction of the North Valley Regional Recycled Water Program, approximately 4,000 MGY could be used by the Del Puerto Water District for farmland irrigation purposes. The Del Puerto Water District is not located within the City of Turlock or its Sphere of Influence.

Please note that only 400 MGY of recycled water will be used in Turlock and 4,000 MGY will be used outside the City for farmland irrigation approximately 20 miles west of Turlock.

Per the DWR Guidebook, the use of recycled water within the City limits of Turlock is shown as a "water loss" and is summarized below in Table 10

Table 10 Additional water uses and losses*							
Water use[1]	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**	**2035 -opt**
Saline barriers							
Groundwater recharge							
Conjunctive use							
Raw water							
Recycled water	0	368	400	400	400	400	400
System losses							
Other (define)							
Total	0	368	400	400	400	400	400

Units: million gallons per year
[1]Any water accounted for in Tables 3 through 7 is not included in this table.
**Water used in Turlock only. 400 MGY of recycled water will be used in Turlock by the TID for industrial cooling and the City of Turlock for landscape irrigation. Recycled Water exported to the San Joaquin River or Del Puerto Water District is not included in this table.*

Water Demand Summary

Table 11 summarized the anticipated system demands for the next 25 years.

Table 11 Total water use in Turlock							
Water Use	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**	**2035 - opt**
Total water deliveries (from Tables 3 to 7)	8,293	7,094	8,784	9,541	10,795	12,127	13,721
Sales to other water agencies (from Table 9)	0	0	0	0	0	0	0
Additional water uses and losses (from Table 10)	0	368	400	400	400	400	400
Total	8,293	7,462	9,184	9,941	11,195	12,527	14,121
Units : million gallons per year							

Wholesale Water Supplies

If the City of Turlock proceeds with the Regional Surface Water Supply Project, the Turlock Irrigation District will be a wholesale provider of raw water. Based on the existing "First Drinking Water Agreement" (November 2005) which obligated the City to fund its proportional share of the design and environmental review of the project, the City of Turlock has requested the following supplies from the project (Appendix E).

Table 12 Retail agency demand projections provided to wholesale suppliers							
Wholesaler	**Contracted Volume[1]**	**2010**	**2015**	**2020**	**2025**	**2030**	**2035 - opt**
Turlock Irrigation District (raw surface water)	see note below	0	0	5,475	5,475	5,475	5,475
Total		0	0	5,475	5,475	5,475	5,475
Units : million gallons per year [1] *No contract has been signed between the City of Turlock and Turlock Irrigation District at the current time.*							

Baseline and Targets

The UWMPA requires that the UWMP identify the baseline water demand, urban water use target, and interim urban water use target for the City.

Law

> *10608.20 (e) (1) An urban retail water supplier shall include in its urban water management plan…due in 2010 the baseline daily per capita water use, urban water use target, interim urban water use target, and compliance daily per capita water use, along with the bases for determining those estimates, including references to supporting data.*

The base daily per capita use is the first step in determining the City's various urban water use targets over the 20-year planning horizon. The current per capita use sets the "baseline" on which the urban and interim water use targets are determined. These targets are necessary to determine compliance with the 2020 use reductions set forth in the Water Conservation Bill of 2009.

The first step in developing the baseline water use for the City is determining the applicable range and years for which the baseline average will be calculated. The UWMPA stipulates an agency may use either a 10 or 15-year average to determine their baseline. If over ten percent of total water deliveries in 2008 were from recycled water, then the agency can use a 15-year average baseline. Since recycled water accounted for only 4% of total water deliveries in 2008, a 10-year average was used for baseline determination. In addition to the 10-year baseline, a 5-year baseline is also calculated, which will be used to establish the minimum criteria for the City's use reduction targets. A summary of the 2008 total and recycled water deliveries, 10-year baseline range, and 5-year baseline range is included in Table 13.

Table 13
Base period ranges

Base	Parameter	Value	Units
10- to 15-year base period	2008 total water deliveries	8,489	*see below*
	2008 total volume of delivered recycled water	360.8	*see below*
	2008 recycled water as a percent of total deliveries	4%	percent
	Number of years in base period[1]	10	years
	Year beginning base period range	1997	
	Year ending base period range[2]	2006	
5-year base period	Number of years in base period	5	years
	Year beginning base period range	2003	
	Year ending base period range[3]	2007	

Units: million gallons per year
[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.

The data used to calculate the 10-year baseline is included in Table 14. The UWMPA requires a continuous range with the end of the range ending between December 31, 2004 and December 31, 2010 be used for baseline determination.

Table 14
Base daily per capita water use — 10- to 15-year range

Base period year		Distribution System Population	Daily system gross water use (gpd)	Annual daily per capita water use (gpcd)
Sequence Year	Calendar Year			
Year 1	1997	50,476	16,926,027	335
Year 2	1998	50,884	18,772,603	369
Year 3	1999	52,301	18,986,301	363
Year 4	2000	53,481	20,446,575	382
Year 5	2001	57,756	20,515,068	355
Year 6	2002	59,367	22,421,918	378
Year 7	2003	61,305	22,430,137	366
Year 8	2004	64,215	22,613,699	352
Year 9	2005	67,009	22,720,548	339
Year 10	2006	67,876	22,736,986	335
			Base Daily Per Capita Water Use[1]	357

[1] *Add the values in the column and divide by the number of rows.*

The data used to calculate the 5-year baseline is included in Table 15. The UWMPA requires a continuous range with the end of the range ending between December 31, 2007 and December 31, 2010 be used for baseline determination.

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	2003	61,305	22,430,137	366
Year 2	2004	64,215	22,613,699	352
Year 3	2005	67,009	22,720,548	339
Year 4	2006	67,876	22,736,986	335
Year 5	2007	69,321	22,901,370	330
			Base Daily Per Capita Water Use[1]	344

[1] *Add the values in the column and divide by the number of rows.*

Targets

The UWMPA requires urban water suppliers to determine the urban and interim water use targets for 2020 and 2015 respectively. Four target methods have been developed, and identify the specific steps water suppliers shall follow to establish these targets. A brief description of each method, as well as the water use calculated using each methodology is included below.

Method #1 – 80 Percent
Method 1 requires an urban water supplier to first determine the base daily per capita use. In order to determine the target using Method 1, 80 percent of the base daily per capita use is calculated. Based on the daily per capita use of 357 gpcd determined previously (Table 14), the target use for Method 1 is 286 gpcd.

Method #2 – Performance Standards
Method 2 requires water suppliers to use baseline commercial, industrial, institutional, indoor residential and landscaped area water use to calculate a water use target. Based on the nature of the data required to determine a target using Method 2, it is not feasible for the City to use this methodology. Specifically, the City lacks the detailed landscaped area estimates to calculate the landscaped area water use.

Method #3 – 95 Percent of Hydrologic Region Target
Method 3 requires water suppliers to use the hydrologic region target to calculate a water use target for 2020. In order to determine the target using Method 3, 95 percent of the region-specific conservation goal is calculated. Based on a target of 174 gpcd for the San Joaquin River region, the Method 3 target is 165 gpcd.

Provisional Method #4
Development of Method 4 by DWR began in February 2010. The draft method was released on January 24, 2011. The draft method must be presented to several agencies including the California Water Commission before being adopted in mid-February 2011 and being released along with DWR's final 2010 guidebook. DWR has stated that this is a provisional method, subject to later revisions during the 2015 UWMP cycle.

The methodology for the provisional draft method relies on the base daily per capita use in 2000 and reduction in the three urban use sectors:

- Residential indoor;
- Commercial, industrial, and institutional (CII); and
- Landscape use and water loss.

Minimum Water Use Reduction Requirement

The final step in determining the applicability of the water use target for the City is to confirm the water use targets meet the minimum reduction requirements as defined by DWR. To confirm the target, the 5-year average baseline previously determined (Table 15) is used. In order to meet the minimum criteria, the chosen use target must fall below 95 percent of the 5-year baseline, which for the City is 327 gpcd (see Table 15)

Summary of Baselines and Targets

Based on the water use targets calculated using the developed methodologies, the City's water use target for 2020 is 286 gpcd. Based on the 10-year baseline of 357 gpcd and the 2020 water use target of 286 gpcd, the 2015 interim water use target is 322 gpcd (average of 10-year baseline and 2020 target). This target was determined using Method 1, which corresponds to 80 percent of the 10-year baseline. According to the DWR guidelines, this target of 286 gpcd is valid because it is less than the target confirmation criteria of 327 gpcd (i.e. 95% of the five-year baseline in Table 15).

The final use target and interim target (developed pursuant to Method #1) are summarized in the following table (Table 15-A).

Table 15-A
Baseline and Targets - Summary Information

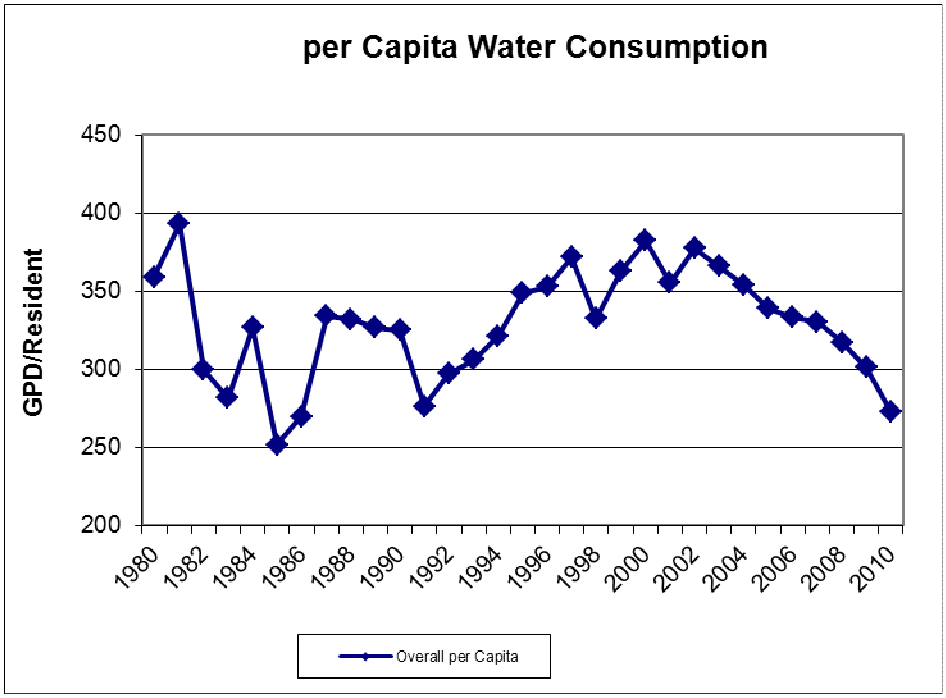
Baselines (gpcd)		Target Determination (Method #1)[1]	Target Confirmation[2]	Target (2020)	Interim Target (2015)
10-Year	5-Year				
357	344	286	327	286	322

Units: gpcd
[1] 80% of 10-year baseline
[2] 95% of 5-year baseline

Per capita water use has been declining steadily in Turlock for the past eight years. In 2009 the daily per capita water use in Turlock was 301 gallons which is less consumption than the 2015 interim target. Similarly, in 2010 daily per capita water use was 273 gallons which is less than the 2020 target under SBx 7-7 (see Figure 3).

The City's early compliance with the State of California's 2009 Water Conservation Act does not negate the need to further reduce water use in Turlock. It is imperative that the City continue to implement, enhance and improve its existing water use reduction plan outlined below.

Figure 3: per Capita Water Consumption



Water Use Reduction Plan

The City of Turlock's implementation plan for compliance with the Water Conservation Bill of 2009 is a two-prong approach:

1. Continue participation in the CUWCC (Foundational BMPs, programmatic BMPs and GPCD compliance option)
2. Implement the DMMs contained in Section 6 of the 2010 UWMP.

The implementation plan will be implemented at an expense to the City in terms of staff time and other resources. Nevertheless, since joining the CUWCC in 2009, the City has started to factor these costs into its budget. Currently, the unknown factor is the impact of meter-based billing and other conservation measures on revenue in the City's water utility. In 2011, water revenue will be monitored closely with quarterly reports provided to the city council. If necessary, due to debt coverage requirements of the city's existing bond debt, water rates may have to be adjusted.

Any economic impact of the water use reduction plan will be shared equally across all customers while recognizing that residential customers comprise the single largest portion of the city's customer base. According to the Water Rate Study (2009) prepared by ECO:LOGIC, landscape water accounts will probably be the most impacted by any rate structure modification. Landscape customers generally react the most to water price increases (price elasticity); therefore, there is more potential to encourage water

conservation with changes in the pricing structure for landscape customers. Meter-based billing for commercial and industrial customers has been in place for some time and so they have already implemented savings. Further, the economic impact of rate adjustments on these two customer classes will be proportional to their water use (which is a small percentage).

The City's efforts to conserve water have been ongoing and enduring; its first water conservation ordinance was adopted in 1991. For instance, the City has implemented its "Emergency Water Shortage Plan" on a perpetual basis by electing to remain in "Conservation Stage 1: Mandatory Conservation" even during years where there is no apparent water shortage. This has had a significant impact in reducing landscape water waste.

In 2009, the City of Turlock became a member of the California Urban Water Conservation and is required to implement the CUWCC's MOU through the implementation of a number of BMPs.

The City of Turlock submitted its two-year coverage report to the CUWCC on May 16, 2011. These BMPs are the functional equivalent of the Demand Management Measures (DMMs). The City has implemented the foundational BMPs and has elected to use the GPCD option in lieu of the programmatic BMPs to gain coverage compliance. This means that the City has to reduce per capital water use by 18% over the base year by 2018. Nevertheless, the City still implements a number of the programmatic BMPs in full or in part.

The City realizes the importance of the BMPs to ensure a reliable future water supply and is committed to implementing water conservation and water recycling programs to maximize sustainability in meeting future water needs for its customers. The City enacted a water conservation ordinance in 1991 and has a continuing water conservation program. As the City manages its water service area, it recognizes that water is a regional resource as well as a local one. Therefore, regional partnerships, in addition to local conservation measures, play a significant role in maximizing the efficient use of water resources. The City is currently participating in the preparation of an Integrated Regional Water Management Plan (IRWMP) with other local entities. Participation in the IRWMP planning process allows the City and its partners to develop a regional plan to identify water resources and develop projects that provide sustainable water resources to meet regional needs.

Further implementation on the DMMs and CUWCC BMPs is included in Section 5 – Demand Management Measures.

SECTION 4 - SYSTEM SUPPLIES

Law

10631. A plan shall be adopted in accordance with this chapter and shall do all of the following:

10631 (b) Identify and quantify, to the extent practicable, the existing and planned sources of water available to the supplier over the same five-year increments described in subdivision (a) [to 20 years or as far as data is available]. If groundwater is identified as an existing or planned source of water available to the supplier, all of the following information shall be included in the plan:

10631 (b) (1) A copy of any groundwater management plan adopted by the urban water supplier…

10631 (b) (2) A description of any groundwater basin or basins from which the urban water supplier pumps groundwater. For those basins for which a court or board has adjudicated the rights to pump groundwater…For basins that have not been adjudicated, information as to whether the department has identified the basin or basins as overdrafted…

10631 (b) (3) A detailed description and analysis of the location, amount, and sufficiency of groundwater pumped by the urban water supplier for the past five years. The description and analysis shall be based on information that is reasonably available, including, but not limited to, historic records.

10631 (b) (4) A detailed description and analysis of the amount and location of groundwater that is projected to be pumped by the urban water supplier. The description and analysis shall be based on information that is reasonable available, including, but not limited to, historic use records.

The Urban Water Management Planning Act (UWMPA) requires that the Urban Water Management Plan (UWMP) include a description of the agency's existing and future water supply sources for the next 20 years. The description of water supplies must include detailed information on the groundwater basin such as water rights, determination if the basin is in overdraft, adjudication decree, and other information from the groundwater management plan.

(Existing and Projected) Water Sources

The City of Turlock water system has always used groundwater wells to supply water to its citizens. As growth occurred, the city added new wells as needed, to accommodate the additional demand. The City of Turlock currently serves a population of over 70,000 residents with 24 active groundwater wells and more than 230 miles of water distribution lines. The wells can produce a maximum of 53 million gallons of water per day (MGD), or 59,360 acre-feet per year (AFY). The City's wells are scattered throughout the water service area are shown on Figure 4. The pumped water level in the wells generally ranges from 105 to 200 feet (Water Master Plan Update 2009). The pumping capacities of the City wells range from 500 to 3,000 gallons per minute (gpm).

The City's Water Master Plan (WMP) was completed in August of 2003 and updated in 2009. The WMP identified deficiencies as well as solutions for a number of issues facing

the City's potable water system. Since 2003, the City has constructed infrastructure to meet the WMP's recommendations as modified by actual conditions.

Implementation of the WMP to-date includes:

- Construction of four (4) new wells
- Construction of two (2) one million gallon water storage reservoirs (tanks)

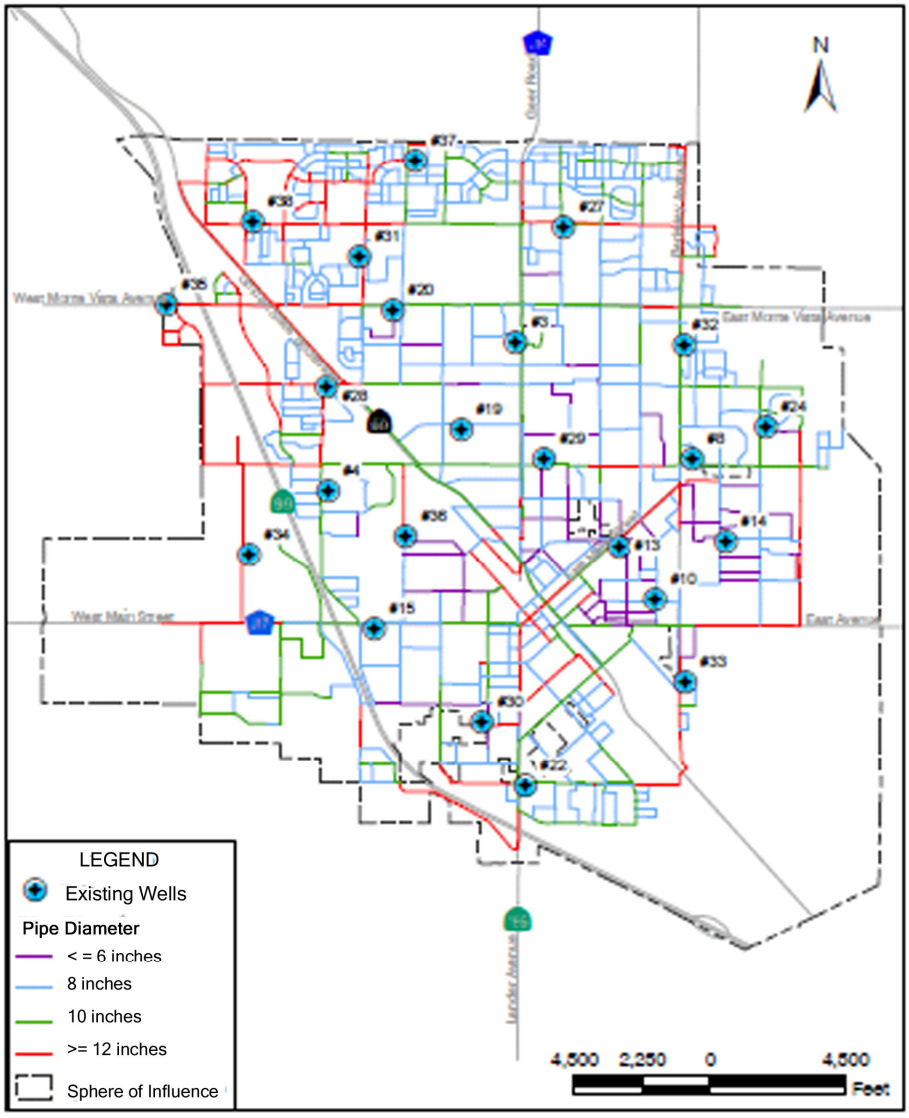


Figure 4
EXISTING WATER SYSTEM
URBAN WATER MANAGEMENT PLAN
UPDATE 2010
CITY OF TURLOCK

In 2011-12, the City will evaluate wellhead treatment at two wells for the treatment of arsenic at an initial cost of $1 million per well – this will allow the two wells to be taken off stand-by mode and returned to full operation. According to the City's WMP, additional wells and reservoirs are necessary in the future, but no new wells or additional facilities are being actively planned at this time.

As noted before, in 2006, the Turlock Regional Water Quality Control Facility was upgraded to tertiary treatment, producing recycled water for beneficial reuse as the recycled water from the RWQCF complies with Title 22 standards. Currently, 2 MGD of recycled water is supplied to the TID for cooling purposes at the Walnut Energy Center. Further, recycled water is used for irrigation purposes at Pedretti Baseball Park.

The City does use a number of non-potable wells for irrigation purposes only in a number of City parks, sports facilities and other landscaped areas. In 2010, 188.3 million gallons of non-potable water were used to irrigate public green spaces. This small volume is accounted for in Table 16.

Current and projected water supplies are summarized in Table 16. The City intends to enter into a future Treatment and Delivery Agreement for delivery of 16,802 AFY (5,475 MG per year or 15 MGD) of TID surface water to Turlock. The TID has indicated that the volume of water requested by Turlock is available and this volume has been used for planning and environmental review purposes. For the purposes of this document, it is assumed that the Turlock RSWSP will be operational in 2020.

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: Turlock Irrigation District	**yes**	0	0	5,475	5,475	5,475	5,475
Supplier-produced groundwater[2]		7,094	8,784	4,066	5,320	6,652	8,246
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		368	400	400	400	400	400
Total		**7,462**	**9,184**	**9,941**	**11,195**	**12,527**	**14,121**

Units: million gallons per year

[1] Volumes shown here are 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**	**2015**	**2020**	**2025**	**2030**	**2035 - opt**
Turlock Irrigation District	5,475	0	5,475	5,475	5,475	5,475

Units: million gallons per year

[1]Water volumes presented are accounted for in Table 16.

[2] The TID wil provide surface water to the Cities of Ceres, Hughson, Modesto and Turlock through the Turlock Regional Surface Water Supply Project

Groundwater

The City is located within the geomorphical province known as the Central Valley, which is divided into the Sacramento Valley and the San Joaquin Valley. The groundwater underlying the City is part of the larger San Joaquin Valley Groundwater Basin within the San Joaquin River Hydrologic Region. The San Joaquin Valley Groundwater Basin is further subdivided into nine subbasins, including the Turlock subbasin. The City lies entirely within the Turlock subbasin (subbasin 5-22.03) as shown on Figure 5.

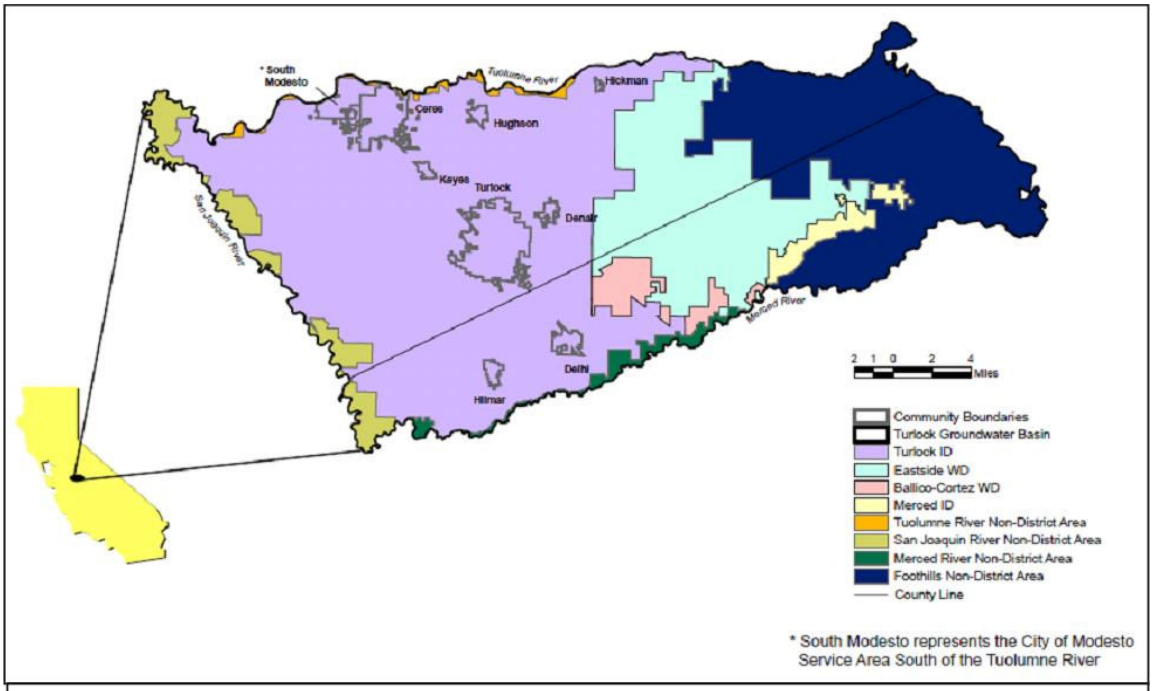


Figure 5
Turlock Subbasin (subbasin 5-22.03)
Urban Water Management Plan
City of Turlock

DWR's report called *California's Groundwater* (also referred to as Bulletin 118) describes groundwater basins and subbasins throughout the State, and includes information on groundwater level trends (where available). DWR's Bulletin 160-98 estimated a 160-thousand acre-foot (taf) increase groundwater overdraft between 1990 and 1995. According to DWR, most of this overdraft increase occurred in the San Joaquin and Tulare Lake regions (DWR, 2003).

More recently, according Bulletin 118, water levels in the Turlock subbasin rose about seven feet from 1994 to 2000. The rising water level suggested that the groundwater subbasin had started to recover and that the level of pumping in the subbasin was now less than the previously assumed "safe yield." However, water production in Turlock increased in the early 2000s reaching a peak of 8.359 billion gallons in 2007. This increased production, among other factors such as below average rainfall, increased agricultural pumping and urbanization, may have adversely impacted groundwater levels. More recently however, due to water conservation efforts and increased rainfall, water levels have started to recover slightly.

At any given time, the quantity of water that can be pumped by the City of Turlock depends on the amount groundwater available in the basin, the ability of the City's wells to pump (e.g. operational capacity), as well as pumping by other users.

Despite population and business growth, current groundwater production is less than historic highs. Despite the occurrence of a significant "cone of depression" about five miles east of Turlock due to agricultural pumping, overdraft conditions have not occurred in the City Turlock. Per capita water use has declined for the past eight (8) years in a row. Using historic groundwater level and pumping data from the past 30 years, the City of Turlock estimated an operational yield of eight (8) billion gallons per year (24,500 AFY).

This operational yield, or ultimate amount of groundwater extraction, represents the amount of groundwater that can be extracted from the groundwater subbasin without lowering groundwater and potentially affecting long-term sustainability of the basin.

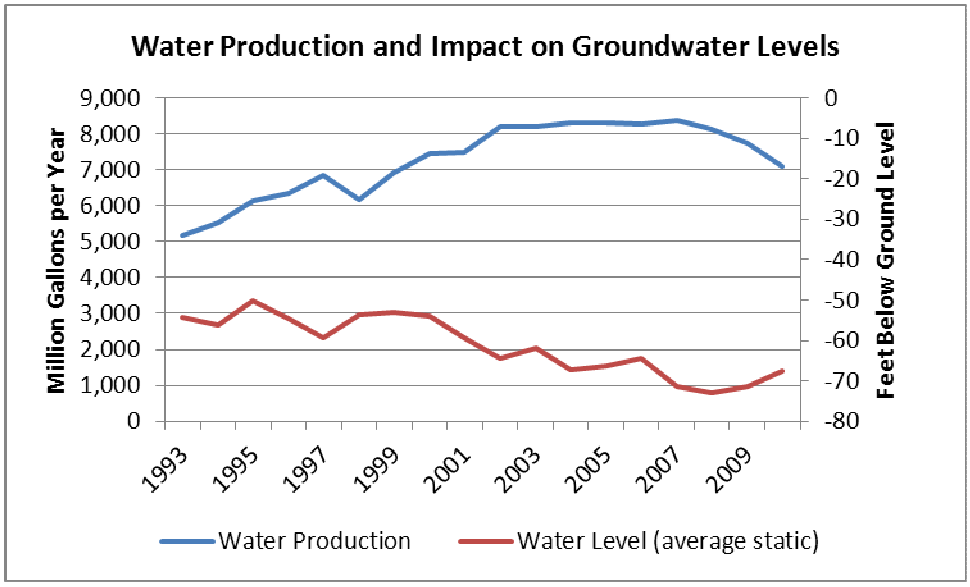
As shown in Figure 6, groundwater pumping in excess of eight (8) billion gallons results in the depletion (overdraft) of the groundwater table (aquifer). Because it is not sustainable to overdraft the groundwater over a long period, an additional supply of water will be needed in future years. The timing of this overdraft situation is uncertain due to a number of factors - most importantly the rate of population growth, industrial expansion, and efforts to conserve water. For instance, it is estimated that per capita water use will decline further due to the introduction of meter-based billing in 2011 and other conservation measures.

Nevertheless, the following forecasts illustrate the limitations of the City relying entirely on groundwater for its water supply:

	3% growth	2.5% growth	2% growth
Year Overdraft Starts	2016	2017	2019
Population	84,994	84,612	85,068
Annual Water Use[1]	8,065,915,086	8,029,663,676	8,072,942,204

[1] Assumes 260 gallons per capita per day - a 5% reduction from the 2010 per capita use of 273 gallons per day

Figure 6: Water Production and Impact on Groundwater Levels



Groundwater Management Plan

The Turlock Groundwater Basin Association (TGBA) was established in 1995 as a formal group for coordinating groundwater management activities in the Turlock Subbasin. The TGBA developed the first basin-wide Groundwater Management Plan in 1997. Although the founding Memorandum of Understanding expired upon completion of the Groundwater Management Plan, TGBA members continued to meet and discuss basin-wide planning activities. In 2001 the TGBA was formally reestablished to provide a mechanism to implement groundwater management activities and provide guidance for the management, preservation, protection, and enhancement of the Turlock Subbasin. In 2008, the TGBA prepared an updated Plan to reflect the changes to the Groundwater Management Act (California Water Code Section 10750 et seq.) resulting from the enactment of Senate Bill 1938 in 2002. The Plan was adopted by the Turlock City Council on February 26, 2008.

A copy of the groundwater management plans will be provided electronically on a CD-ROM or in hard-copy format (referenced as Appendix F).

Groundwater Basin Description

The local groundwater source is the Turlock Subbasin, which is a subunit of the San Joaquin Valley Groundwater Basin. The Turlock Subbasin lies in the eastern portions of Stanislaus and Merced counties and has an areal extent of approximately 347,000 acres. As previously described, the Subbasin is bounded by the Tuolumne River to the north, the Merced River to the south, the San Joaquin River to the west, and by crystalline basement rock of the Sierra Nevada foothills to the east. Groundwater supplies municipal, industrial, and agricultural demands of the region. Surface water from the Tuolumne River and to a lesser extent, the Merced River, supplies a large proportion of agricultural irrigation demands within the Turlock Subbasin. The following sections summarize the Subbasin hydrogeology, water balance, and water quality issues described in the Groundwater Management Plan.

Hydrogeologic Setting

The primary hydrogeologic units in the Turlock Subbasin consist of either consolidated or unconsolidated sedimentary deposits. The consolidated deposits include the Ione Formation, the Valley Springs Formation, and the Mehrten Formation. The Ione and Valley Springs formations lie beneath the Mehrten Formation and typically contain saline water of marine origin. These consolidated deposits are found at shallower depths in the eastern portion of the Subbasin and generally yield small quantities of water to wells. The Mehrten Formation, however, yields greater quantities of water and is an important water source for the eastern portion of the Turlock Subbasin.

The unconsolidated deposits of the Turlock Lake, Riverbank, and Modesto formations overlie the consolidated deposits. These deposits generally yield moderate to large quantities of water to wells and are the main water-yielding units of the Subbasin. Fine grained deposits within the Modesto and Turlock Lake formations do not transmit substantial quantities of water and function as aquitards. In the western portion of the Subbasin, where surface deposits are of the Modesto Formation, a discontinuous shallow aquitard creates areas of shallow groundwater. The Corcoran Clay aquitard also occurs in the western portion of the Subbasin within the Turlock Lake hydrogeologic unit. The Corcoran Clay aquitard separates groundwater in the Turlock Subbasin into an upper, unconfined aquifer and a lower, confined aquifer.

The unconfined aquifer is generally 150 feet in thickness and is the water-table aquifer, except in western portions of the Subbasin that are locally confined by the shallow aquitard. The unconfined aquifer is used for both private domestic supply and agricultural supply in the western part of the Subbasin. Wells less than 200 feet in depth draw from this aquifer. The confined aquifer, which is contained under pressure by the Corcoran Clay, occurs in the deeper hydrogeologic units of the Subbasin. In the eastern part of the Turlock Subbasin, the confined aquifer is only semi-confined. The confined aquifer provides extensive municipal and agricultural supplies to the Subbasin.

Wells greater than 200 feet deep draw from the confined aquifer, but also may receive flow from the unconfined aquifer.

Below the principal water bearing units of the Turlock Subbasin is a deeply buried confined aquifer that contains saline brine. This saline confined aquifer is under sufficient hydraulic pressure to push water up toward the land surface. This phenomenon results in the migration of saline brines in certain areas (e.g., in groundwater wells or along cracks, fissures, and faults), sometimes as far upward as the unconsolidated sediments. Upwelling also occurs near the San Joaquin River, resulting in elevated concentrations of total dissolved solids (TDS) in groundwater near the river. The saline confined aquifer can be found from depths as shallow as 100 feet in the western portion of the Subbasin to as deep as 1,500 feet in the eastern portion of the Subbasin. Although the saline confined aquifer is not used as a source of supply, migration of the saline brines results in high TDS groundwater that may not be of sufficient quality for agricultural or municipal use where mixing occurs.

Groundwater Pumping – Past, Present and Future

Table 18 below shows historic groundwater pumping. It is apparent that the groundwater basin in the Turlock is a limited resource subject to overdraft. Therefore, the City's long-term goal is to add surface water to its water supply portfolio.

Table 18

Groundwater — volume pumped

Basin name(s)	Metered or Unmetered[1]	2006	2007	2008	2009	2010
Turlock Sub Basin	Metered	8,254	8,359	8,128	7,726	7,094
Total groundwater pumped		8,254	8,359	8,128	7,726	7,094
Groundwater as a percent of total water supply		100%	100%	100%	100%	100%

Units (circle one): million gallons per year

[1]Volume is based on volumetric meter data

With the addition of a surface water supply, groundwater pumping can be reduced over time allowing for enhanced groundwater recharge and conjunctive use opportunities. Table 19 shows reduced groundwater pumping once the City obtains surface water.

Table 19 Groundwater — volume projected to be pumped					
Basin name(s)	**2015**	**2020**	**2025**	**2030**	**2035 - opt**
Turlock Sub Basin	8,784	4,066	5,320	6,652	8,246
Total groundwater pumped	8,784	4,066	5,320	6,652	8,246
Percent of total water supply	95.64%	40.90%	47.52%	53.10%	58.40%
Units (circle one): million gallons per year *Includes future planned expansion*					

Water Balance in the Turlock Basin

Overdraft is the extraction of groundwater from a basin in excess of the basin's perennial yield. When a groundwater basin is in balance, recharge to the groundwater basin will tend to exceed withdrawals from the basin in wet years, while, in dry years, withdrawals will tend to exceed recharge. "By definition, overdraft is not a measure of these annual fluctuations in groundwater storage volume. Instead, overdraft is a measure of the long-term trend associated with these annual fluctuations" (DWR, 1998).

A water balance study of the Turlock Subbasin was prepared in 2003 and updated in 2007 to estimate the inflows and outflows from the Subbasin between 1952 and 2006. Outflows from the Subbasin result from municipal, domestic, and agricultural supply and drainage well pumping, discharge to the local rivers, discharges from subsurface agricultural drains, and consumption by riparian vegetation. The estimated average total outflow for the 1997-2006 period is 541,000 AF/yr. The majority of outflow comes from estimated agricultural, municipal and rural residential, and drainage well pumping, which collectively averaged 457,000 AF/yr for the 1997-2006 period.

Inflows to the Subbasin result primarily from deep percolation of agricultural and landscape irrigation water and infiltration of precipitation. The estimated average total inflow for the 1997-2006 period is 519,000 AF/yr. Approximately 72 percent of this quantity occurs on 245,000 irrigated acres of cropland within the Subbasin.

Most of the inflows and outflows can be estimated for the Turlock Basin. The net discharge to rivers is an unknown outflow and must be derived through a mass balance calculation of the known inflows, outflows, and storage change in the Basin. Storage change is calculated from the groundwater contour maps derived from local monitoring data, and confirmed using the groundwater model.

DWR's Bulletin 160-98 estimated a 160-thousand acre-foot (taf) increase groundwater overdraft between 1990 and 1995. According to DWR, most of this overdraft increase occurred in the San Joaquin and Tulare Lake regions (DWR, 2003).

The contour maps used in the water budget study indicate that estimated groundwater storage decreased by approximately 21,500 AF/yr between 1997 and 2006. Recent reductions in the California Department of Water Resources (DWR) monitoring network have introduced uncertainty in the measurement of groundwater levels. Uncertainty in the estimated groundwater elevation translates into uncertainty in storage estimates. Therefore, the magnitude and direction of changes in groundwater storage cannot be fully characterized through an analysis based solely on the groundwater contours. The Turlock Subbasin groundwater model was used to supplement this analysis and confirm that groundwater storage has decreased slightly in recent years, particularly between 2002 and 2006.

The groundwater contours shown on Figure 7, below, shows the "cone of depression" on the east side of the county as well as some localized overdraft in east Turlock.

Figure 7: Groundwater Elevations in the Turlock Subbasin, 2006

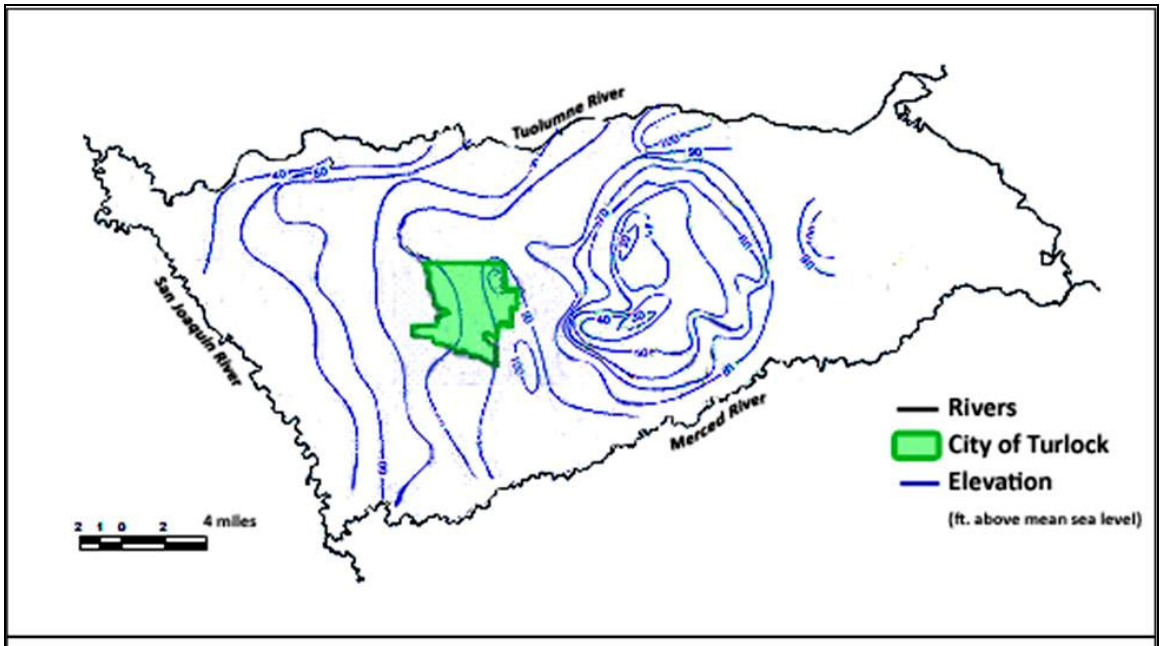


Figure 7
Groundwater Elevations in the Turlock Subbasin, 2006
Urban Water Management Plan
City of Turlock

The estimated reduction in storage between 2002 and 2006 suggests that the Subbasin may no longer be in the equilibrium state that existed in the 1990s. Increases in land use types that rely on groundwater for supply have increased the net discharge from the Subbasin. Slight decreases in storage are likely to continue if urban or irrigated land uses are developed in areas dependent upon groundwater.

In any groundwater basin, groundwater storage will fluctuate both seasonally and annually, depending upon the water year classification, distribution of rainfall, and numerous other physical and biological factors. Alternating periods of decline and recovery in groundwater levels are a response to this natural variation. Long-term declines in storage without recovery could be a concern and represent net declines in storage. Continued monitoring by the local public agencies will be important for tracking changes in groundwater conditions and evaluating whether additional management actions should be considered.

The City as a member of the TGBA understands the need to evaluate changes in land use patterns to understand the range of potential impacts to the groundwater supply. In September 2008, the TGBA completed a study to evaluate future land use change scenarios and the potential impacts to groundwater resources. This study analyzes how groundwater storage may change in the future and what types of management actions may be appropriate for maintaining adequate storage in the groundwater basin.

Deep percolation of irrigation water is the largest inflow to the groundwater basin and plays an important role in maintaining groundwater storage. Surface water from the Turlock Irrigation District, and to a lesser extent, the Merced Irrigation District is used to supply more than half of the total irrigation water applied within the Basin. Hence, under current conditions the continued use of surface water for agricultural irrigation is vital for sustaining recharge in the Subbasin. Future changes to inflows or outflows resulting from shifts in land use patterns have the potential to reduce recharge and create reductions in groundwater storage.

The groundwater impacts within the Turlock basin were evaluated for a particular scenario of future land and water-use changes. The impacts were evaluated using the groundwater model of the Turlock basin. The groundwater model was developed and has been periodically updated by Turlock Irrigation District since 1988. Given inputs of historical or assumed future groundwater and surface water-use throughout the basin, the model calculates the corresponding groundwater levels.

A future scenario was constructed for potential land and water-use conditions through 2036. The scenario assumed that:

- Urban communities within the Turlock basin will grow at the rates contained in planning documents produced by the respective communities

- Urban growth will occur on farmland within the Turlock Irrigation District, which results in a corresponding decline in irrigated average
- Urban communities will supplement groundwater use with surface water obtained from the Turlock Irrigation District

For the western region of the Turlock basin (which includes Turlock), the simulation results indicate that groundwater levels will change little in response to the assumed water-use changes. At the end of the simulation period (2036), groundwater levels will be within 10 ft of current levels. Further, it was estimated that groundwater levels along most of the Highway-99 corridor will rise about 15 ft.; however, this is contingent on surface-water use by the cities.

On the other hand, for the eastern region of the basin, the simulation results suggest possible water-supply problems, depending on the actual physical characteristics of the geologic formations underlying that region. The simulations indicate long-term groundwater-level declines (relative to 2006) of about 85 ft within the Eastside Water District and 65-175 ft within the foothills region, depending on the storage characteristics assigned the geologic formations underlying the eastern part of the basin.

Long-term Overdraft

On November 4, 2009 the state legislature amended the Water Code with SBx7-6, which mandates a statewide, locally-managed groundwater elevation monitoring program to track seasonal and long-term trends in groundwater elevations in California's groundwater basins. To achieve that goal the amendment requires collaboration between local monitoring entities and DWR to collect groundwater elevation data. In accordance with the amendment, DWR developed the California Statewide Groundwater Elevation Monitoring (CASGEM) program.

On December 20, 2010 the Turlock Groundwater Basin Association (TGBA) submitted a notice of intent to DWR to become the monitoring and reporting entity for the Turlock Groundwater Sub-basin.

TGBA will work with DWR to enter DWR's spring and fall water levels into the CASGEM database. Additionally, the TGBA will begin the process of evaluating the well logs for each of the current DWR water level monitoring wells to determine a subset of the wells that properly characterize the seasonal and long-term water level trends within the Turlock Sub-basin. In the event that DWR is unable to continue its spring and/or fall groundwater level measurements within the Turlock Sub-basin, TGBA would be willing to prepare and submit a proposal to CASGEM identifying the wells to be monitored and the measuring methods to be followed.

The City of Turlock wishes to diversify its water supply alternatives by developing a surface water supply to offset groundwater pumping. As noted above, the City is in negotiations with TID and other regional partners with a Turlock Regional Surface Water Supply Project that will provide 15 MGD (16,802 AFY) of surface water to offset groundwater pumping. It is anticipated that the reduction in groundwater pumping will allow for this groundwater to be stored or "banked" in the groundwater basin to be used by the City of Turlock for meeting future demands in normal and dry years. This conjunctive use arrangement will allow the City to optimize its water supplies to best meet demands.

Water Quality in the Turlock Subbasin

Groundwater quality in the Turlock Subbasin remains high throughout most of the region. Current knowledge indicates that salinity, nitrates, iron and manganese, boron, arsenic, radionuclides, bacteria, pesticides, trichloroethylene, and other trace organics have been found in the Turlock Subbasin. Further, the U.S. Geological Survey, in coordination with numerous state and federal agencies, conducted an extensive investigation of groundwater quality in the local area through the Groundwater Ambient Monitoring and Assessment Program.

In the last twenty years, five City wells have been closed due to contamination. Nitrate contamination was the cause for two of the well closures and is a major threat to wells in the City of Turlock. Average nitrate levels in the City of Turlock's wells have increased over the last twenty years from 12 ppm to 21 ppm (as NO_3). More recently, in the spring of 2011, two city wells were been placed on standby mode because they exceed the maximum contaminant level (MCL) for arsenic.

Some of the contaminants occur naturally, while others have been introduced into groundwater from anthropogenic sources. Where the constituent concentrations have exceeded drinking water limitations, the City has implemented actions ranging from wellhead protection to well closure to maintain viable supplies. A vulnerability assessment of the City's drinking water source was updated on February 17th, 2010. The assessment determined that the drinking water is most vulnerable to contamination from the following activities: industrial solvents, septic tanks, pesticides/ herbicides and private wells.

Protecting water quality is as important to maintaining the local groundwater supply as sustaining groundwater recharge. The Groundwater Management Plan adopted by Turlock City Council on February 26, 2008 is intended to create a framework for coordinating actions among different agencies with management authority to protect both the quality and quantity of groundwater resources.

The Turlock subbasin is not an adjudicated groundwater basin, as defined by DWR. Therefore, there are no defined legal pumping rights for the City. There are no legal

constraints on groundwater pumping. In California, the State is not authorized by the Water Code to manage groundwater. California landowners have a correlative right to extract groundwater for beneficial use. As a municipal water supplier, the City acts on behalf of the overlying landowners, who rescind their water rights to the City when the land is developed.

Transfer and Exchange Opportunities

The UWMPA requires the UWMP to address the opportunities for development of short or long-term transfer or exchange opportunities.

Law

> *10631 (d). Describe the opportunities for exchanges or transfers of water on a short-term or long-term basis.*

Currently there is no alternative potable water supply source in the area that would lend itself to transfer or exchange opportunities. There are three small water systems within Turlock owned and operated by the City of Modesto. However, they only have a few small wells and use the City of Turlock as a backup water source; therefore they are not a likely source of water. Other nearby water agencies are also groundwater only systems and they have no excess capacity.

There may be an opportunity to receive irrigation water from TID that could be used for landscape irrigation or industrial applications that do not need a high quality of water; however, the infrastructure is not in place at this time. Because this water is meant for agriculture, there are practical and legal issues that could restrict the availability of this supply. Any substantial use of this water will have to be negotiated and at this time it does not appear to be feasible.

Brackish Water and/or Groundwater Desalination

The UWMPA requires that the UWMP address the opportunities for development of desalinated water, including ocean water, brackish water and groundwater.

Law

> *10631. A plan shall be adopted in accordance with this chapter and shall do all of the following:*
>
> *10631 (i) Describe the opportunities for development of desalinated water, including, but not limited to, ocean water, brackish water, and groundwater, as a long term supply.*

The groundwater that underlies the City is not brackish in nature and does not require desalination. Because the City is not located in a coastal area, it is not practical nor economically feasible to implement a seawater desalination program. However, the City could provide financial assistance to other purveyors in exchange for water supplies. Should the need arise, the City could consider this option.

Recycled Water Opportunities

Law

10633. Provide, to the extent available, information on recycled water and its potential for use as a water source in the service area of the urban water supplier. The preparation of the plan shall be coordinated with local water, wastewater, groundwater, and planning agencies that operate within the supplier's service area.

10633(a). [Describe] the wastewater collection and treatment systems in the supplier's service area, including a quantification of the amount of wastewater collected and treated and the methods of wastewater disposal.

10633(b). [Describe] the quantity of treated wastewater that meets recycled water standards, is being discharged, and is otherwise available for use in a recycled water project.

10633(c). [Describe] the recycled water currently being used in the supplier's service area, including, but not limited to, the type, place, and quantity of use.

10633(d). [Describe and quantify] the potential uses of recycled water, including, but not limited to, agricultural irrigation, landscape irrigation, wildlife habitat enhancement, wetlands, industrial reuse, groundwater recharge, indirect potable reuse, and other appropriate uses, and a determination with regard to the technical and economic feasibility of serving those uses.

(10633(e). [Describe] the projected use of recycled water within the supplier's service area at the end of 5, 10, 15, and 20 years, and a description of the actual use of recycled water in comparison to uses previously projected pursuant to this subdivision.

10633(f). [Describe the] actions, including financial incentives, which may be taken to encourage the use of recycled water, and the projected results of these actions in terms of acre-feet of recycled water used per year.

10633(g). [Provide a] plan for optimizing the use of recycled water in the supplier's service area, including actions to facilitate the installation of dual distribution systems, to promote recirculating uses, to facilitate the increased use of treated wastewater that meets recycled water standards, and to overcome any obstacles to achieving that increased use.

In 2006, the Turlock Regional Water Quality Control Facility was upgraded to tertiary treatment, producing recycled water for beneficial reuse as the recycled from the RWQCF complies with Title 22 standards. Therefore, all existing and future wastewater flows will be recycled water, potentially available for beneficial reuse (Table 21).

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	4,719	4,215	4,769	5,395	6,104	6,906	7,814
Volume that meets recycled water standard	0	4,215	4,769	5,395	6,104	6,906	7,814

Units: million gallons per year (assumes 2.5% growth rate)

Currently, two (2) MGD of recycled water is supplied to the TID for cooling purposes at the Walnut Energy Center. Further, recycled water is used for irrigation purposes at Pedretti Baseball Park. All other recycled water is discharged to the San Joaquin River via the Harding Drain, a man-made agricultural drain (Table 22).

Table 22 Recycled water - non-recycled wastewater disposal							
Method of disposal	**Treatment Level**	**2010**	**2015**	**2020[1]**	**2025**	**2030**	**2035 - opt**
Discharge to surface water	Tertiary	3,847	4,369	0	0	0	0
	Total	3,847	4,369	0	0	0	0

Units: million gallons per year
1 There may be seasonal discharges to the San Joaquin River due to a lack of storage or to maintain river flows. But for planning purposes, the City assumes that all recycled will be reused beneficially.

A recycled water project is being developed as a regional effort in Stanislaus County that could produce and deliver 30,000 acre-feet (and up to 47,000 acre-feet) per year of tertiary-treated recycled water to the west side of Stanislaus County. The proposed North Valley Regional Recycled Water Program (NVRRWP) would use recycled water from the Cities of Turlock and Modesto to make high quality recycled water available to the west side of the San Joaquin Valley at a cost comparable to the current cost of federal Central Valley Project water being used for agricultural and municipal/industrial purposes.

The City of Turlock is planning to construct 5.7 miles of pipeline from its Regional Water Quality Control Facility's tertiary treatment facility's current point of discharge (Turlock Irrigation District Lateral #5 Drain, "Harding Drain") to the San Joaquin River. This pipeline is estimated to cost $25 million and will position the City of Turlock to serve recycled water to the Westside. Additional pipeline and pumping facilities would be needed to cross the San Joaquin River and deliver recycled water to the Westside. Construction is expected to commence in late 2011 or early 2012. Further, the NVRRWP partners are seeking funding from US Bureau of Reclamation for feasibility studies related to the regional recycled water program (Table 23).

Table 23 Recycled water — potential future use							
User type	**Description**	**Feasibility[1]**	**2015**	**2020**	**2025**	**2030**	**2035 - opt**
Agricultural irrigation	Del Puerto Water District	Yes	0	2,734	2,734	2,734	2,734
Landscape irrigation[2]	Pedretti Baseball Park	Yes	20	20	20	20	20
Industrial reuse	Cooling Tower	Yes	380	380	380	380	380
	Total	0	400	3,134	3,134	3,134	3,134

Units: million gallons per year
[1]Technical and economic feasibility.
[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, etc)

In its 2005 UWMP, the City predicted that a larger volume of recycled water would be used in Turlock than has actually occurred. Nevertheless, significant progress has been made. In 2007, the Regional Water Quality Control Board approved the City of Turlock "Recycled Water Program" which also received approval from the State Department of Public Health. The Recycled Water Program allows for recycled water to be used at the TID Walnut Energy Center for industrial cooling purposes and at Pedretti Park for landscape irrigation. A number of factors explain why the use of recycled water has not met with previous expectations:

1. Regulatory Burden – the approval process required approval from three separate State Agencies: State Water Resources Control Board, Regional Water Quality Control Board, and the State Department of Public Health.
2. Water Quality – initially the newly-constructed tertiary treatment processes failed to produce water that complied with all water quality standards for recycled water. The city had to modify a number of treatment processes to gain compliance.
3. Infrastructure Construction – the development of a recycled water ("purple pipe") distribution system has taken longer than anticipated.
4. Economic Downturn – the decline in construction activity and overall economic investment has limited customer growth and dampened demand for recycled water.

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	391
Landscape irrigation[2]	0	195
Industrial reuse	380	716
Total	380	1,302

Units (circle one): million gallons 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 categories or modified to the new categories, at the discretion of the water supplier.

[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, etc)

The City contracted with ECO:LOGIC to complete a recycled water pricing analysis in 2010. A price for recycled water was developed which provides a significant incentive for a certain industrial customers to switch to recycled water. Generally, recycled water is cheaper than potable water. The main disincentive for customers, however, is the limited recycled water distribution system - the city only has one distribution line at this

time. Customers whose facilities are remote from this line would be faced with significant construction costs to extend recycled water distribution lines. The development of an expanded recycled water distribution system would provide a major incentive of recycled water use (Table 25).

Table 25
Methods to encourage recycled water use

Actions	Projected Results					
	2010	2015	2020	2025	2030	2035 - opt
Financial incentives						
Construction of distribution infrastructure	380	400	3,134	3,134	3,134	3,134
Total	380	400	3,134	3,134	3,134	3,134
Units (circle one): million gallons per year						

Future Water Projects

Law

> *10631(h) [Describe] all water supply projects and water supply programs that may be undertaken by the urban water supplier to meet the total projected water use as established pursuant to subdivision (a) of Section 10635. The urban water supplier shall include a detailed description of expected future projects and programs, other than the demand management programs identified pursuant to paragraph (1) of subdivision (f), that the urban water supplier may implement to increase the amount of the water supply available to the urban water supplier in average, single-dry, and multiple-dry water years. The description shall identify specific projects and include a description of the increase in water supply that is expected to be available from each project. The description shall include an estimate with regard to the implementation timeline for each project or program*

The City of Turlock wishes to diversify its water supply alternatives by developing a surface water supply to offset groundwater pumping. As noted above, the City is in negotiations with TID and other regional partners with a Turlock Regional Surface Water Supply Project that will provide 16,802 AFY of surface water to offset groundwater pumping. It is anticipated that the reduction in groundwater pumping will allow for this groundwater to be stored or "banked" in the groundwater basin to be used by the City of Turlock for meeting future demands in normal and dry years. This conjunctive use arrangement will allow the City to optimize its water supplies to best meet demands.

The City of Turlock in collaboration with the Cities of Ceres, Hughson and Modesto entered into an agreement with the Turlock Irrigation District (TID) to participate in the design of the Turlock Regional Surface Water Supply Project (RSWSP), located north of Turlock on the south side of the Tuolumne River. The Agreement also included the preparation of associated environmental documents pursuant to the California Environmental Quality Act. The City intends to enter into a future Treatment and Delivery Agreement for delivery of 16,802 AFY (5,475 MG per year or 15 MGD) of TID surface water to Turlock. This will allow Turlock to manage its surface and groundwater

supplies conjunctively. The TID has indicated that the volume of water requested by Turlock is available and this volume has been used for planning and environmental review purposes. For the purposes of this document, it is assumed that the Turlock RSWSP will be operational in 2020 (Table 26).

Table 26
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]
New Municipal supply well #41	2012	2013	Water quality and quantity	350	350	350	350	350
New Municipal supply well #42	2013	2014	Water quality and quantity	350	350	350	350	350
Turlock Regional Surface Water Supply Program	2014	2017	Cost ($85 million)	5,475	5,475	5,475	5,475	5,475
		Total	0	6,175	6,175	6,175	6,175	6,175

Units: million gallons per year

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

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

[3] *Provide estimated supply benefits, if available*

SECTION 5 – WATER RELIABILITY & WATER SUPPLY CONTINGENCY PLANNING

The UWMPA requires that the UWMP address the reliability of the agency's water supplies. This includes supplies that are vulnerable to seasonal or climatic variations. In addition, an analysis must be included to address supply availability in a single dry year and in multiple dry years.

Law

> *10631 (f) 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."*
>
> *10631 (c) (2) For any water source that may not be available at a consistent level of use, given specific legal, environmental, water quality, or climatic factors, describe plans to replace that source with alternative sources or water demand management measures, to the extent practicable.*

Required Elements — Water Supply Reliability & Vulnerability

There are two aspects of supply reliability that can be considered. The first relates to immediate service needs and is primarily a function of the availability and adequacy of the supply facilities. The second aspect is climate-related, and involves the availability of water during mild or severe drought periods. This chapter considers the City of Turlock's (City's) water supply reliability during three water scenarios: normal water year, single dry water year, and multiple dry water years. These scenarios are defined as follows:

- Normal Year: The normal year is a year in the historical sequence that most closely represents median runoff levels and patterns. The supply quantities for this condition are derived from historical average yields.
- Single Dry Year: This is defined as the year with the minimum useable supply. The supply quantities for this condition are derived from the minimum historical annual yield.
- Multiple Dry Years: This is defined as the three consecutive years with the minimum useable supply.

Water systems are more vulnerable to these droughts of long duration, because they deplete water storage reserves in local and state reservoirs and in groundwater basins. The supply quantities for this condition are derived from the minimum of historical three-year running average yields.

In general, the City of Turlock's water supplies are most vulnerable to climatic variability. The City of Turlock relies solely on groundwater at this time but is working

towards receiving wholesale Tuolumne River surface water deliveries from TID. The primary source of groundwater recharge to the groundwater basin occurs via the incidental recharge of applied irrigation water.

While drought conditions can reduce available groundwater supplies by reducing available recharge, this effect is less pronounced for groundwater than for surface water supplies, and is not expected to result in a reduction in pumping in dry years. Rather, by using surface water in lieu of groundwater in normal years, the City of Turlock will bank groundwater supplies for use in meeting dry year demands. The City of Turlock's future water supply planning incorporates sufficient future surface water supplies to allow the City to meet 40-60% of its demands through the use of surface water. In turn, this will allow for reduced groundwater pumping which will protect the groundwater basin from overdraft and water quality degradation and allow for the banking of groundwater for future use.

It is understood, however, that drought conditions can reduce available surface water supplies. The reliability of the surface water supply is dependent on hydrologic variations and the ability to store and extract water from available storage reservoirs.

Therefore, the water supply, demand and shortfall estimates presented herein assume that the City of Turlock will use surface water from RSWSP as a supply source and will reduce groundwater pumping. As noted above, in the future, the addition of surface water to the City's supply portfolio will allow for the conjunctive use of groundwater and surface water so that water may be banked in the aquifer for use during dry periods.

Over the years, the City has been successful in managing its water resources such that the need to import water from other regions has not been necessary. Such management tools include but are not limited to:

- Use of radio telemetry to monitor all wells
- Adjustment of system pressures to reduce flow during high demand
- Implementation of Emergency Water Shortage Plan
- Participation in the CUWCC and implementation of BMPs (DMMs)

Historically, the City's water supply has consisted solely of groundwater. However, the City is anticipating use of surface water supplies within the planning period (as discussed in Chapter 4). Surface water supplies from TID would be obtained from the Tuolumne River. Groundwater, which is less prone to short-term variability than surface water, will provide a "safety net" during dry years when surface water supplies are limited.

During the next five years (2011-2015), the City will rely entirely on groundwater. Due to conservation measures, however, and the long-term trend of declining per capita water use, it is anticipated that groundwater production will not exceed its historic

maximum (8,300 MG). Even during the recent three-year drought, the City experienced no reduction in groundwater supply.

The basis for calculating projected demands and supply reliability for each water year type are shown in Table 27.

Table 27 Basis of water year data	
Water Year Type	**Base Year(s)**
Average Water Year	1992
Single-Dry Water Year	1999
Multiple-Dry Water Years	1987-1990
[2]*Source: www.wrcc.dri.edu Turlock #2 (049073)*	

Table 28 shows the historical supply reliability of the City's water supplies in the base years shown in Table 26. It should be noted that groundwater was the sole source of water supply during those base years.

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**
	1999	1987	1988	1989	1990
Precipitation:	68%[1]	75%	55%	70%	87%
City of Turlock Water Supply:	100%	100%	100%	100%	100%
TID Water Supply:	100%	87.5%	25%	58%	62.5%
[1] Represents percentage of average or normal year. Mean annual precipitation 1897-2010 was 11.87 inches					

Legal / Environmental Constraints to Supply

Legal issues, including place of use and water rights issues, are not projected to limit supply reliability for the City of Turlock in future years. Environmental factors can limit the reliability of surface water supplies in the event that dry year supply reductions are necessary to maintain the health of aquatic species and the environment in general.

Given the fragile state of many of California's ecosystems, environmental concerns inevitably arise during the water planning process. The delicacy of these systems can, in turn, cause a lack of supply due to the enforcement of environmental legislation. The recent legal actions involving the Endangered Species Act in the Delta are an example of the clash between environmental concerns and water supply. Given the historic

reliability of TID's water supplies, it is anticipated that the City will replace surface water with groundwater during periods of shortfall.

A further concern is the overdraft of the groundwater basin which has prompted the City to seek a source of surface water. For the purposes of this study, this is considered a long-term issue rather than a supply inconsistency. The Turlock Groundwater Basin Association's (TGBA) Groundwater Management Plan (GWMP) includes actions to address cooperative management of groundwater to prevent further overdraft.

Water Quality Constraints to Supply

The GWMP identifies several groundwater constituents, which lead to groundwater quality concerns in the area. Contaminants in the area include groundwater salinity, nitrate, iron, manganese, arsenic, radio-nucleotides, bacteria, petroleum hydrocarbons, pesticides, and perchloroethylene.

Salinity levees within the Turlock subbasin range from 90 to greater than 1,250 milligrams per liter (mg/L), as measured by total dissolved solids (TDS). Groundwater salinity is generally lowest in the easterly portion of the Turlock subbasin and the City measures a total of 229 mg/L in the 2010 Water Quality Report. While salinity levels appear to be increasing, it is an unregulated substance and the City does not consider it a threat to its water supply.

Another groundwater concern is nitrate levels from man-made sources, which is wide spread through the San Joaquin Valley. While nitrate in irrigation water is not a major concern for most crops, high concentrations of nitrate in groundwater are primarily a concern for potable water supplies. The MCL for nitrate in public drinking water supplies is 45 mg/L. In its 2010 Water Quality Report, the City indicates finding Nitrate levels of 21 mg/L in 2009. This is well within a safe range, and should not pose a problem in the near future although nitrate levels have increased in northeast Turlock and the City closed one well in 2008 due to nitrate levels that exceeded the MCL.

Climatic Constraints to Supply

Climate change may add many new uncertainties to the challenges of planning (and irrespective of the debate associated with the sources and cause of increasing concentrations of greenhouse gasses) changes in weather could significantly affect water supply planning. Since climatic pressures could potentially affect supply reliability, continual attention to this issue will be necessary in the future.

A summary of the factors that could adversely affect water supply is contained in Table 29.

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**
Supplier-produced groundwater	Turlock Subbasin	None	Adjudication	N / A	Declining water quality or increasingly stringent standards	Reduced groundwater recharge	
Turlock Irrigation District - surface water	Tuolumne River	None	FERC relicensing	Increased flows for species protection	N / A	Reduced runoff	

Units: million gallons per year
[1]From Table 16

Water Quality Impacts on Supply Reliability

The UWMPA requires that the UWMP include a discussion of water quality impacts on the reliability of an agency's water supplies.

Law

> *10634. The plan shall include information, to the extent practicable, relating to the quality of existing sources of water available to the supplier over the same five-year increments as described in subdivision (a) of Section 10631 and the manner in which water quality affects management strategies and supply reliability.*

The reliability of local groundwater supplies is threatened by water quality. In the past, contamination from arsenic, perchloroethylene (PCE), trichloroethylene (TCE), dibromochloropropane (DBCP) and nitrate has resulted in a number of wells being taken offline. The City of Turlock is developing a strategy to return two wells back online through wellhead treatment for arsenic. A well that exceeds the nitrate standard remains closed. It is anticipated that the City will continue to depend on groundwater as a reliable water supply source and work to mitigate any identified water quality concerns. Through these efforts, water supply changes due to water quality are not expected and the City does not anticipate groundwater quality to threaten the City's ability to pump and deliver groundwater supplies as needed to meet current and future demands.

Table 30 Water quality — current and projected water supply impacts							
Water source	**Description of condition**	**2010**	**2015**	**2020**	**2025**	**2030**	**2035 - opt**
Supplier-produced groundwater	Arsenic	700	0	0	0	0	0
Supplier-produced groundwater	Nitrates	350	350	350	350	350	350
Supplier-produced groundwater	VOCs	0	0	0	0	0	0
Units (circle one): million gallons per year							

Drought Planning

During drought years, water use patterns will typically change. Outdoor water use will typically increase as irrigation is used as a replacement for decreased rainfall. To determine the impact of drought years on the City's annual demands, the City's historical per capita water usage was evaluated.

Law

10631(c)(1). Describe the reliability of the water supply and vulnerability to seasonal or climatic shortage, to the extent practicable, and provide data for each of the following: (A) an average water year, (B) a single dry water year, (C) multiple dry water years.

10632(a). Describe the stages of action to be undertaken by the urban water supplier in response to water supply shortages, including up to a 50 percent reduction in water supply, and an outline of specific water supply conditions which are applicable to each stage

10632(b). Provide an estimate of the minimum water supply available during each of the next three water years based on the driest three-year historic sequence for the agency's water supply.

10632(i). A mechanism for determining actual reductions in water use pursuant to the urban water shortage contingency analysis.

10635(a). Every urban water supplier shall include, as part of its urban water management plan, an assessment of the reliability of its water service to its demand assessment shall compare the total water supply sources available to the water supplier with the total projected water use over the next 20 years, in five-year increments, for a normal water year, a single dry water year, and multiple dry water years. The water service reliability assessment shall be based upon the information compiled pursuant to Section 10631, including available data from state, regional or local agency population projections within the service area of the urban water supplier.

The normal year water demands through 2030 are estimated based on the historical daily use criteria and populations projections for the Turlock General Plan Update. A discussion of the derivation of the demands is included in Chapter 3 and the actual demand projections for 2015, 2020, 2025, and 2030 are included in Tables 5-7. The projected normal water year demands are repeated in Table 32 (in AFY, not MG).

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
Supplier-produced groundwater	7,958	7,958	8,157	8,361
Percent of normal year:		100%	103%	105%

Units (circle one): million gallons per year
[1]*From Table 16.*
[2]*See Table 27 for basis of water type years.*

Table 32 gives a summary of the City's supply and demand during normal years through 2035.

Table 32 Supply and demand comparison — normal year					
	2015	2020	2025	2030	2035 - opt
Groundwater Supply	26,959	12,479	16,328	20,416	25,308
Surface Water Supply	0	16,803	16,803	16,803	16,803
Recycled Water Supply	1,228	1,228	1,228	1,228	1,228
Supply totals (from Table 16)	28,187	30,510	34,359	38,447	43,339
Demand totals (From Table 11)	28,187	30,510	34,359	38,447	43,339
Difference	0	0	0	0	0
Difference as % of Supply					
Difference as % of Demand	0.0%	0.0%	0.0%	0.0%	0.0%

Units are in acre-feet per year.

Table 33 shows water supply and demands during a single dry year over the planning period. The single dry year was based on 1991 water supply and demand conditions. As documented by DWR, 1991 was the fifth year of five-year drought.

Table 33
Supply and demand comparison — single dry year

	2015	2020	2025	2030	2035 - opt
Groundwater Supply	26,959	12,479	16,328	20,416	25,308
Surface Water Supply	0	16,803	16,803	16,803	16,803
Recycled Water Supply	1,228	1,228	1,228	1,228	1,228
Supply totals[1,2]	28,187	30,510	34,359	38,447	43,339
Demand totals[2,3,4]	28,187	30,510	34,359	38,447	43,339
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 shows water supply and demands during multiple dry year events over the planning period. The City assumes, conservatively, that surface water supplies from the TID will be reduced by 25% during the second and third dry years. To offset reduced surface water supplies and to meet water demands during this period, the City will increase groundwater production. It is anticipated that groundwater levels will increase significantly in the years 2020-2035 as surface water is added to the City's water supply portfolio and groundwater pumping is reduced. Using its water supplies conjunctively, this "banked" groundwater could be used to offset the reduction in surface water supply.

Table 34 Supply and demand comparison — multiple dry-year events						
		2015	**2020**	**2025**	**2030**	**2035 - opt**
Multiple-dry year first year supply	**Groundwater Supply**	26,959	12,479	16,328	20,416	25,308
	Surface Water Supply	0	16,803	16,803	16,803	16,803
	Recycled Water Supply	1,228	1,228	1,228	1,228	1,228
	Supply totals[1,2]	28,187	30,510	34,359	38,447	43,339
	Demand totals[2,3,4]	28,187	30,510	34,359	38,447	43,339
	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 (assumes 25% reduction in surface water supply)	**Groundwater Supply**[5]	26,959	16,680	20,528	24,616	29,509
	Surface Water Supply	0	12,602	12,602	12,602	12,602
	Recycled Water Supply	1,228	1,228	1,228	1,228	1,228
	Supply totals[1,2]	28,187	30,510	34,359	38,447	43,339
	Demand totals[2,3,4]	28,187	30,510	34,359	38,447	43,339
	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 (assumes 25% reduction in surface water supply)	**Groundwater Supply**[5]	26,959	16,680	20,528	24,616	29,509
	Surface Water Supply	0	12,602	12,602	12,602	12,602
	Recycled Water Supply	1,228	1,228	1,228	1,228	1,228
	Supply totals[1,2]	28,187	30,510	34,359	38,447	43,339
	Demand totals[2,3,4]	28,187	30,510	34,359	38,447	43,339
	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*

[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.*

[5]*Groundwater pumping of 29,509 acre-feet in the second and third dry years in 2035 would be considered a non-sustainable. However, with surface water supplies allowing for significant groundwater recharge in 2020-2035, it is anticipated that adequate groundwater will be banked to offset this temporary condition.*

Water Shortage Contingency Planning

The UWMPA requires that the UWMP include an urban water shortage contingency analysis that addresses a catastrophic interruption of water supplies.

The City has a Water System Emergency Response Plan, which prepares for an interruption in the drinking water supply and potential consequences to water system integrity and public health. This plan was prepared in June 2004 and updated in January 2008. Further, Turlock Municipal Code (Section 6-7-401) contains a "Emergency Water Shortage Plan" which is implemented in response to water shortages, including those precipitated by a catastrophic interruption.

The City's use of groundwater as its primary water source creates redundancy to limit dependence of a geographic area on a single water supply source (i.e. areas are served by multiple groundwater wells). The City maintains redundant power supplies at a number of its well sites through the use of emergency power generators. Emergency actions are implemented by the Municipal Services Department.

Law

> *10632. The plan shall provide an urban water shortage contingency analysis, which includes each of the following elements, which are within the authority of the urban water supplier.*
>
> *10632 (a) Stages of action to be undertaken by the urban water supplier in response to water supply shortages, including up to a 50 percent reduction in water supply and an outline of specific water supply conditions which are applicable to each stage.*
>
> *10632(c) 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 (d) 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 (e) 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 (f) Penalties or charges for excessive use, where applicable.*

In 1991, the City adopted a "Water Conservation and Education Ordinance" that included a program of mandatory prohibitions related to water conservation. The City adopted this ordinance in response to the water shortage emergency associated with the drought of 1987 through 1991. This ordinance constitutes the City's water shortage contingency plan. Recognizing that water is a diminishing resource, the City has elected to remain in State 1 "Mandatory Compliance" since the ordinance was first adopted. There are several prohibitions that go into effect during water shortages. As any water shortage becomes more severe, the penalties and prohibitions increase (Appendix C).

Table 35 shows the various rationing stages based on the severity of the water supply shortage.

Table 35 Water shortage contingency — rationing stages to address water supply shortages		
Stage No.	**Water Supply Conditions**	**% Shortage**
1	Year Round Mandatory Conservation	0%
2	Water Pressure < 35 psig during peak hours	10%
3	Water Pressure < 30 psig during peak hours	20%
4	Well failure(s) that result in an inability to meet peak demand and / or provide adequate reserve for fire fighting	30%
5	Major disaster severely limiting water production	50%

[1]*One of the stages of action must be designed to address a 50 percent reduction in water supply.*

Table 36 shows the mandatory prohibitions during various stages of a declared Water Emergency.

Table 36 Water shortage contingency — mandatory prohibitions	
Examples of Prohibitions	**Stage When Prohibition Becomes Mandatory**
Using a water hose for outside cleaning	All
Watering when raining	All
Using potable water for once through cooling systems	All
Allowing leaks to go unrepaired	All
Excessive watering	All
Washing vehicles during restricted hours	All
Odd/even landscape watering 3 days/week	1
Reduced hours for landscape watering but still 3 days/week	2
Individual schedules required for large landscapes	2
Landscape watering limited to 2 days/week	3
Landscape watering limited to 1 days/week	4
New or recently drained pools not allowed to be filled	4
Construction water from hydrants banned	4
Discontinue use of decorative ponds and fountains	4
Private vehicle washing prohibited. Commercial facilities OK	4
All landscape watering banned.	5
Commercial and industrial users will be required to curtail production	5

During a water shortage, the City has the right to implement various consumption reduction methods; these are summarized in Table 37.

Table 37
Water shortage contingency — consumption reduction methods

Consumption Reduction Methods	Stage When Method Takes Effect	Projected Reduction (%)
Odd/even landscape watering 3 days/week	1	5
Reduced hours for landscape watering but still 3 days/week	2	5
Individual schedules required for large landscapes	2	5
Landscape watering limited to 2 days/week	3	15
Landscape watering limited to 1 days/week	4	20
New or recently drained pools not allowed to be filled	4	1
Construction water from hydrants banned	4	2
Discontinue use of decorative ponds and fountains	4	2
Private vehicle washing prohibited. Commercial facilities OK	4	5
All landscape watering banned.	5	40
Commercial and industrial users will be required to curtail production	5	10

Finally, during a water shortage, the City has the right to assess various penalties and charges for violating water shortage restrictions or prohibitions; these are summarized in Table 38.

Table 38
Water shortage contingency analysis - penalties and charges

Penalties or Charges	Stage When Penalty Takes Effect
Penalty for excess use	All
$25 for 1st violation	All
$50 for 2nd violation	All
$100 for 3rd violation	All
$250 for 4th and any subsequent violations within a 12-month period	All
Discontinue service for failure to comply	All

If the water supplier has an approved or adopted water shortage contingency resolution or ordinance, include it in the UWMP. If one has not been approved or adopted, provide a draft version. If there has been any action for or against adoption since the completion

of the most recent UWMP, consider including the additional discussion in the 2010 UWMP.

Revenue and Expenditure Impacts (Measures to Overcome Impacts)

According to the UWMPA, the UWMP is required to include an urban water shortage contingency analysis that addresses the financial impacts from reduced water sales.

Law

> *10632. The plan shall provide an urban water shortage contingency analysis, which includes each of the following elements, which are within the authority of the urban water supplier:*
>
> *10632 (g) An analysis of the impacts of each of the actions and conditions described in subdivisions (a) to (f), inclusive, on the revenues and expenditures of the urban water supplier, and proposed measures to overcome those impacts, such as the development of reserves and rate adjustments.*
>
> *10632 (g) An analysis of the impacts of each of the proposed measures to overcome those revenue and expenditure impacts, such as the development of reserves and rate adjustments.*

It is anticipated that water shortages would result in a reduction in revenue. However, the City's current rate metered-rate structure has a significant "minimum" (customer) charge. For instance, based on the City's report to the CUWCC (BMP 1.4 Retail Conservation Pricing), "fixed" charges account for approximately 74% or revenue from residential customers. This means that even with a significant reduction in water production and, in turn, consumption by residential customers, the City's current rate structure protects the City from significant reductions in revenue.

Consistent with AWWA Manual of Water Supply Practices, the the city also maintains a reserve in its water enterprise fund which is 250% of annual operating revenue. The reserve fund is allocated to the following areas:

- Operations
- Capital
- Emergency
- Debt Service

The operating and emergency reserve may be used to fluctuations in revenue and / or expenses associated with a water shortage.

In the event of a water shortage, the City would determine the extent of any revenue and expenditure imbalance as well as proposed measures to overcome these fiscal impacts.

Reduction Measuring Mechanism

The UWMPA requires that the UWMP include a means to determine the actual water use reduction in the event of a water shortage.

Law

> *10632. The plan shall provide an urban water shortage contingency analysis, which includes each of the following elements, which are within the authority of the urban water supplier:*
> *10632 (i) A mechanism for determining actual reductions in water use pursuant to the urban water shortage contingency analysis.*

The City's water system currently has water meters and pressure gauges on all production sources which are connected to its radio telemetry system. The City will use the production meters to determine actual water use reductions. The City will monitor City water consumption during a shortage more closely by reviewing water production records on a frequent basis to determine if water use is actually being reduced.

SECTION 6 – DEMAND MANAGEMENT MEASURES

Demand Management Measures (DMMs) are mechanisms a water supplier implements to increase water conservation. The goal of the DMM section in a UWMP is to provide a comprehensive description of the water conservation programs that are currently implemented and those planned to be implemented. Urban water suppliers, like the City of Turlock, must provide a description for each DMM listed in the legislation unless they document that it is not locally cost effective. CUWCC members, however, like the City of Turlock, have the option of submitting their annual reports in lieu of describing the DMMs.

California Urban Water Conservation Council (CUWCC)

In 1991, a Memorandum of Understanding (MOU) regarding urban water conservation in California formed the California Urban Water Conservation Council (CUWCC). Council members can submit their most recent Best Management Practices (BMP) reports with their UWMP to address the urban water conservation issues in the UWMPA.

In August 2009, the City of Turlock became a member of the California Urban Water Conservation Council (CUWCC) and in May 2011 submitted its 2009-2010 BMP annual report to the Council. To obtain coverage for the compliance requirements of the UWMP for Demand Management Measures (DMMs), the City of Turlock has chosen to implement the Gallons Per Capita per Day (GPCD). As a signatory to the MOU the California Water Code allows the City to use its BMP reports to satisfy the Urban Water Management Plan's reporting requirements for DMM compliance (supporting documentation is provided in Appendix C).

CUWCC BMP Annual Reports in lieu of DMMs

CUWCC members have the option of submitting their 2009-2010 BMP annual reports in lieu of describing the DMMs in their UWMP if the supplier is in full compliance with the CUWCC's Memorandum of Understanding Regarding Urban Water Conservation in California (the CUWCC MOU).

See Appendix C

A detailed description of each DMM and the City's efforts is provided in the following paragraphs:

DMM 1: Residential Water Survey Program (single-family homes and multi-family up to eight units)

This program consists of offering water audits to single-family and multi-family residential customers. Audits include reviewing water usage history with the customer, identifying leaks inside and outside the home, and recommending improvements.

The City began implementation of its residential water survey program in 2010. The program was developed by City staff after training by the CUWCC; most of the audits are conducted by interns from the MBA program at CSU Stanislaus. Free water saving devices (low-flow shower heads and faucet aerators) are provided. Further, the City offers a popular free landscape sprinkler timer set-up service which ensures that overwatering does not occur.

DMM 2: Residential Plumbing Retrofit

This program consists of installing physical devices to reduce the amount of water used or to limit the amount of water that can be served to the customer. In accordance with State law, low-flow fixtures have been required on all new construction since 1978. In addition, State legislation enacted in 1990 requires all new buildings after January 1, 1992 to install Ultra-Low-Flush Toilets (ULFT). Several studies suggest that water use savings resulting from miscellaneous interior retrofit fixtures can range between 25 and 65 gpd per housing unit. The studies also suggest that installation of retrofit fixtures in older single-family homes tend to produce more savings, while newer multi-family homes tend to produce fewer saving per housing unit.

DMM 3: System water audit, leak detection, and repair

A water audit is a process of accounting for water use throughout a water system in order to quantify the unaccounted-for water. Unaccounted-for water is the difference between metered production and metered usage on a system-wide basis. The City's program involves leak detection and repair, focusing primarily on areas with a high probability for leakage. The program does not involve an annual system-wide audit at this time and the City has no knowledge of when the last system-wide water audit was conducted.

The water distribution system consists of approximately 245 miles of pipe. The City repairs approximately 100 leaks per year. Leaks are repaired in a timely manner, whether they are service line or main-line leaks.

With the implementation of meter-based billing for all water accounts, the City is better able to track water losses and unaccounted water use. As a member of the CUWCC, the City uses the AWWA software to complete an annual Water Audits and Balance Analysis.

DMM 4: Metering with commodity rates for all new and existing service connections

This DMM requires that water meters be installed for all new connections to allow billing by volume of use. This program also applies to retrofitting any existing unmetered connections.

The City completed water meter installation on all accounts in 2010 and commenced meter-based billing for 100% of water accounts on January 1, 2011. The City Council chose to go

beyond the mandate of AB 2572 (2004), the State Law that mandates meter-based water bills, and required meter-based billing at all accounts, not just for buildings constructed after 1991. In conjunction with a thorough public education campaign, the move to meter-based billing has had a significant impact on water consumption. It appears that the installation of meters has already modified customer behavior and is largely responsible for the 17% reduction in per capita water use since 2007. The City expects a further 5% reduction in per capita water use in 2011 as customers begin receiving and responding to their commodity-based monthly water bills.

DMM 5: Large Landscape Conservation Programs

This program consists of assigning reference evapotranspiration (ETo) -based water budgets to accounts with dedicated irrigation meters and providing water-use audits to accounts with mixed-use meters.

Beginning in 2006, the City began monitoring landscape users. This program was further enhanced by the installation of a fixed-based Automatic Meter Read (AMR) system that allows for daily water consumption to be captured on the City's AMR hosted web site. The City has worked with the Turlock Unified School District and a number of religious institutions to help them water their large landscaped areas more efficiently and reduce overall water use. The City has also installed meters and AMR devices at all City parks and landscaped areas to ensure efficient landscape watering.

DMM 6: High-efficiency Washing Machine Rebate Program

This program provides financial incentives, typically in the form of rebate offers, to qualifying customers who install high-efficiency washing machines in their homes.

The electrical utility in Turlock (TID) offers a $75.00 rebate for customers who purchase a high-efficiency clothes washer (Energy Star compliant).

The City has not, at this time, implemented a separate rebate program for high efficiency washing machines. The implementation of meter-based billing and the development of an AMR system was a $16 million expense to the City's water utility for which bonds had to be sold. Therefore, expenses in the City's water utility had to be carefully monitored during this period to ensure that revenues and expenditures were aligned to cover bond debt and other expenses associated with implementing meter-based billing on a citywide basis. Further, it was apparent that the installation of water meters had the most potential to achieve significant water conservation. The City will analyze opportunities to further expand this program in the future.

DMM 7: Public Information Program

This program consists of distributing information to the public through a variety of methods including brochures included with utility bills, press releases via radio and newspaper, school curriculum, educational flyers, commercials on television and in theatres, water conservation suggestions and videos on its webpage, and providing economical water conservation kits.

Since 2007, the City has implemented an aggressive and prominent environmental stewardship program known as "Go Green." The program is broad but focuses specifically on environmental resources regulated by the City of Turlock: water conservation, stormwater pollution prevention, recycling, composting, and sanitary sewer overflow prevention. The Go Green educational activities related to water conservation over the past four years include, but are not limited to:

Website information
Utility bill inserts
Press releases
Print media campaigns / columns
Local cable TV public information
Booths at fairs / exhibitions
Presentation to local service organizations and similar groups

DMM 8: School Education Program

This DMM requires water suppliers to implement a school education program that includes providing educational materials and instructional assistance.

The City's Go Green program has been adapted for school children through an annual Go Green Week (2011 was the fourth year of the program), as well as periodic presentations to school classes on water conservation and other environmental resource issues. Go Green Week is the City's primary school-age environmental education campaign and is coordinated each year with participating schools within the Turlock Unified School District. Through a partnership involving City staff, teachers, administrators, community organizations and volunteers, students learn about conservation and pollution prevention strategies such as recycling, composting, water conservation and waste reduction activities. Additional school education activities include: a Green Teen of the Month award, Go Green Kids Club, after school program materials.

DMM 9: Conservation Programs for Commercial and Industrial Accounts

This program typically consists of ultra low flush toilet (ULFT) replacements in commercial, institutional, and industrial (CII) facilities and either surveys of water use for CII accounts or performance targets for CII accounts. Additional CII related conservation programs may involve turf fields, smart irrigation timers, and industrial process water use reductions.

The City's commercial and industrial accounts have a significant economic to conserve water that other customers. These customers pay for both water and sewer services volumetrically (meter-based). For those commercial and light industrial customers who do not have a separate landscape water service, this means that their monthly sewer charges are based on the reading on their water meter. Because the Regional Board required the City to convert its WWTP to disinfected tertiary treatment, the City's sewer utility rates are higher than the City's water rates. Therefore, if a commercial or light industrial user wastes water it has an adverse impact on both their water and sewer bills, creating a significant incentive to conserve water.

The City's significant industrial users have separate effluent meters; however, they have the same incentive to conserve based as potable water wasted into the sewer system affects their monthly sewer bill.

The City's Environmental Compliance Inspector (ECI) reviews water and effluent meter readings on a monthly basis. Further, the ECI conducts annual inspections of all significant industrial users. The City's ECI has been able to reduce water use by many commercial and industrial accounts by analyzing meter reading data and production processes. For instance, two commercial laundries modified their production system to reuse final rinse water in their cleaning processes.

The water conservation program conducted by the City's ECI that is aimed specifically at commercial and industrial accounts will be continued during this reporting period. Further, those businesses with large landscaping areas will be covered under the Large Landscaping program.

Overall the City has seen a significant decline in industrial water use over the years. The increase in sewer rates as well as efforts by the Environmental Compliance Inspector has provided an incentive for industries to conserve water.

DMM 10: Wholesale Agency Programs

This DMM applies to wholesale agencies and defines a wholesaler's role in terms of financial, technical, and programmatic assistance to its retail agencies implementing DMMs.

The City is not a wholesale agency, so this DMM does not apply.

DMM 11: Conservation Pricing & Economic Impacts

Experience indicates that water rate prices can be structured to encourage conservation.

In Turlock, all metered water users currently pay the same rate based on the volume used but the rates are based on a declining block schedule, i.e. cost per unit declines as water consumption increases. Under the current pricing structure, there are three tiers of water use and charges. The first tier is 0 to 50,000 gallons, the second is 50,001 to 150,000 gallons and the third is all use over 150,000 gallons. This pricing structure is related to Turlock's history as a major center for agricultural (food) processing industries which use high volumes of water in their various production techniques.

In 2009, ECO:LOGIC conducted a Water Rate Analysis for the City of Turlock. Based on actual water meter data from 2008, the average residential customer in Turlock uses 22,000 gallons per month. Approximately, 4.2 million gallons of water used is by residential customers of which 93% is billed at the highest rate (Tier 1). Tier 2 accounts for only 6.92 % of total residential use and Tier 3 accounts for only a fraction of 1%. Further, since 2008, per capita water use has declined significantly (18%) which means that less water is being billed at the Tier 2 and Tier 3 rates. Overall, the installation of water meters and the conversion of all customers

to meter-based billing have resulted in significant water conservation, despite the City's outdated pricing system.

In 2010, the Turlock City Council directed staff to provide quarterly reports on revenues to the water fund and to male recommendations on adjustments to the City's water pricing structure. It is anticipated that an amendment to the water rates will occur in 2011 which will implement a more conservation-based pricing structure.

Any new pricing structure will attempt to be revenue neutral; increasing per unit costs to encourage conservation with should result in reduced water consumption. It is anticipated that

DMM 12: Water Conservation Coordinator

With the City's membership in the CUWCC, the City has designated staff to act in the position of Water Conservation Coordinator. Currently, two full-time employees allot a portion of their time to the duties of Water Conservation Coordinator. Further, a 40-hour contractual employee is used year-round to respond to water wasting complaints and check for excess landscape water use in the high summer water use period. Finally, an intern from the MBA program at CSU Stanislaus is used to conduct water audits.

As the City grows and water resources become more limited and expensive, the need for additional water conservation programs will gain in importance. As the water conservation program grows, these duties will increase and additional staffing will be necessary.

DMM 13: Water Waste Prohibition

The City of Turlock Municipal Code (Chapter 6-7 Water Conservation and Education) has had a water wasting prohibition for many years. This Code section prohibits specific water wasting fixtures (such as "once-through" cooling systems and "slip-n-slides") and general water waste and also requires proper maintenance of water pipes and fixtures to prevent leaks. A copy of this Chapter is attached to this plan. As part of this code, the City established a penalty fee for water wasting.

As shown in Table 39, the City has recently been more pro-active in response to water wasting. The number of violations recorded has increased dramatically. The increased vigilance and enforcement by the City has been reflected in the per capita water use associated with residential users. Since the adoption of the 2005 UWMP, per capita water use has decline 18% from 333 gpcd in 2006 to 273 gpcd.

Table 39
Water Waste Violations[1]

	2006	2007	2008	2009	2010
Number of Violations	2,602	1,870	1,140	793	263

[1] *Written warnings and notices to customers, excludes informal interactions*

DMM 14: Residential Ultra-Low-Flush Toilet Replacement Programs

This program provides incentives or ordinances requiring the replacement of existing toilets with ULFTs. State legislation requires the installation of efficient plumbing in new construction and, effective in 1994, requires that only ultra low flow toilets (ULFTs) be sold in California.

As a member of the CUWCC, the city is developing a rebate program of up to $100 per toilet for all customers who replace a higher flow toilet with an ULFT.

SECTION 7 – CLIMATE

RESERVED

SECTION 8 – COMPLETED UWMP CHECKLIST

APPENDIX - A

Public Participation

APPENDIX - B

UWMP adoption and official noticing

APPENDIX - C

California Urban Water Conservation Council – BMP Reporting

Turlock Municipal Code Section 6-7 “Water Conservation and Education”

APPENDIX - D

List of References

California Department of Water Resources (1998), *California Water Plan Update (Bulletin 160-98)*

California Department of Water Resources (2003), *California's Groundwater (Bulletin 118 – Update 2003)*

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APPENDIX - E

Turlock Regional Surface Water Supply Project

APPENDIX - F

Turlock Groundwater Management Plan, 2007

Filename: 2010 UWMP PUBLIC DRAFT for 6.14.11 CC meeting
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