TO: **James L. App, City Manager**

FROM: **Doug Monn, Public Works Director**

SUBJECT: **Urban Water Management Plan (UWMP)**

DATE: **July 1, 2008**

NEEDS: For the City Council to hold a final public hearing prior and adopt the 2005 UWMP.

FACTS:

1. The UWMP has been prepared to meet requirements of the California Water Code 10610, and to help guide the City's water resources management efforts. This Plan documents the City's sources of water supply, defines water demands, presents a water shortage contingency plan, and describes implementation of water demand management measures.
2. Water demand is projected to double from 7,414 acre-feet per year (AFY) as of 2005 to 16,400 AFY in 2025.
3. While the groundwater basin as a whole is not in overdraft, the change in groundwater storage from 1997 to 2006 was estimated to have decreased at a rate of -3,300 AF per year (or a total reduction of storage for the end of the study period of -29,800 AF relative to 1997 levels)
4. The City's reliance on the groundwater basin continues to increase. The City pumped 2,856 AFY from the groundwater basin in 2005 with an increase to 4,103 AFY in 2007.
5. City water production facilities have regularly been unable to deliver peak water demands during hot summer days. As recent as last week the City was unable to meet the customer demand and satisfy fire protection requirements. As a result the City had to suspend landscape irrigation and initiated voluntary water conservation measures. In the near term, the City is addressing these shortages through well rehabilitation, management of City irrigation, and public outreach. In the long term, the City is developing two new water supply sources.
6. The City will import 4,000 AFY of Lake Nacimiento water by 2010. Lake Nacimiento water will significantly enhance the City's ability to meet peak seasonal and long-term demands. Lake Nacimiento supply is independent of local groundwater supplies and provides needed supply diversity. It will enhance overall water quality to City customers, improve wastewater quality, and help improve groundwater quality.
7. The City also plans to implement water recycling for irrigation. For the purposes of the UWMP, water recycling of about 944 AFY is assumed by 2025. Recycled water is very reliable seasonally and in drought, releases potable water for higher uses and its use would alleviate peak water demands in summer.

ANALYSIS & CONCLUSION: This is the second and final public hearing for the UWMP. The UWMP is required by the California Water Code, helps guide the City's water resources management by documenting the City's water supplies and demands, and by addressing water shortage contingencies and water demand management. The preparation of the 2005 UWMP involved participation by the public and stakeholders, including local water purveyors, State Water Resources Control Board and the County of San Luis Obispo.

POLICY REFERENCES: Urban Water Management Planning Act, as amended, Water Code 10610 and following; Resolution 90-49, Water Management Contingency Plan.

FISCAL IMPACT: None.

OPTIONS:
A. Adopt the Final 2005 UWMP
B. Postpone adoption of final

.

Attachments
1) Final 2005 UWMP
2) Handouts of Presentation Slides

PROOF OF PUBLICATION

LEGAL NEWSPAPER NOTICES

CITY COUNCIL
PROJECT NOTICING

Newspaper: The Tribune

Date of Publication: June 16, 2008

Meeting Date: July 1, 2008
City Council

Project: Notice of Hearing for Future Proposed Urban Water Management Plan

I, Sharie A. Scott, employee of the Public Works Department, of the City of El Paso de Robles, do hereby certify that this notice is a true copy of a published legal newspaper notice for the above named project.

Signed: [signature]
Sharie A. Scott

CITY OF EL PASO DE ROBLES
PUBLIC NOTICE

NOTICE OF PUBLIC HEARING OF THE CITY COUNCIL OF THE CITY OF EL PASO DE ROBLES ON A PROPOSED URBAN WATER MANAGEMENT PLAN

NOTICE IS HEREBY GIVEN that the City Council of the City of El Paso de Robles (the "CITY COUNCIL") will hold a public hearing on Tuesday, July 1, 2008, at 7:30p.m. at City Hall, located at 1000 Spring Street, Paso Robles, California, to consider and act upon a proposed Urban Water Management Plan (the "PLAN").

The hearing will address the following topics under the proposed water management plan:

- Water supply and demand for the CITY
- Water shortage contingency plan
- Water demand management measures

Copies of the PLAN are available for public review and inspection at the Paso Robles Library, 1000 Spring Street, Paso Robles. It is also available on-line at the City's website at www.prcity.com, and at www.pasorobleswaterproject.com.

Interested persons may submit written comments addressed to Christopher Alakel, Water Resources Manager of the City of El Paso de Robles, 1000 Spring Street, Paso Robles, 93446, prior to 5 p.m. on July 1, 2008.

At the time and place noted above, all persons interested in the above matters may appear and be heard.

Deborah Robinson
Deputy City Clerk

Dated: June 9, 2008
June 16, 23, 2008 6734710

RESOLUTION NO. 08-XX

A Resolution of the City Council of the City of Paso Robles
Adopting the Urban Water Management Plan

WHEREAS, the California Urban Water Management Planning Act ("Act") (California Water Code Sections 10620 et seq.) requires every urban water supplier providing municipal water directly or indirectly to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually to develop an Urban Water Management Plan; and

WHEREAS, the Act requires that an urban water management plan be updated every five years; and

WHEREAS, the City of Paso Robles last updated its Urban Water Management Plan in 2000; and

WHEREAS, a draft of the updated Urban Water Management Plan has been circulated for public review and all comments received have been reviewed and considered; and a properly noticed public hearing was held by the City Council on July 1, 2008, prior to adoption of a Final Urban Water Management Plan, all in compliance with the requirements of the Act; and

THEREFORE, BE IT RESOLVED AS FOLLOWS:

1. The Urban Water Management Plan is hereby adopted and ordered filed with the City Clerk.
2. The Director of Public Works is hereby authorized and directed to file this Plan with the California Department of Water Resources;
3. The Director of Public Works shall recommend to the City Council additional procedures, rules, and regulations to carry out effective and equitable allocation of water resources during a water shortage.

Passed and adopted this 1st Day of July, 2008 by the following vote
AYES:
NOES:
ABSTAIN:
ABSENT:

____
Frank R. Mecham, Mayor

ATTEST:

____
Deborah D. Robinson, Deputy City Clerk

Final

2005
Urban Water Management Plan

June 2008

Prepared for:

City of El Paso de Robles
California

Prepared by:

Todd Engineers
Alameda, California

Final

Urban Water Management Plan

June 2008

Prepared for

City of El Paso de Robles
Paso Robles, California

Prepared by

Todd Engineers
2490 Mariner Square Loop, Suite 215
Alameda, California 94501
510-747-6920 / Fax 510-747-6921
toddengineers.com

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EXECUTIVE SUMMARY

This Urban Water Management Plan (Plan) has been prepared for the City of Paso Robles to meet Water Code sections 10610 and following, and to guide the City's water conservation efforts to the year 2010. This Plan documents the City's sources of water supply, defines water demands, presents a water shortage contingency plan, and describes implementation of water demand management measures.

Water Supply and Demand

As the City's population increases, total water demand is projected to double from 7,414 acre feet per year (AFY) in 2005 to 16,400 AFY in 2025. Currently, much of the water demand is for single-family residential uses; in the future, it is expected that multi-family and commercial/industrial demands will increase relative to single-family residential demand and irrigation demand. A possible water supply scenario is presented below in Table ES-1.

Table ES-1. Current and Planned Water Supplies (AFY)

Water Supply Sources	2005	2010	2015	2020	2025
Basin Wells	2,856	930	2,856	2,856	2,856
River Wells	4,558	4,600	4,600	4,600	4,600
Nacimiento Water	0	4,000	4,374	6,644	8,000
Recycled Water (projected use)	0	0	0	0	944
Total	**7,414**	**9,530**	**11,830**	**14,100**	**16,400**

The City currently relies on water from two sources: Salinas River underflow and groundwater in the Paso Robles Groundwater Basin. The City's Salinas River underflow is subject to State permitting that allows the City to extract up to eight cubic feet per second (cfs) with a maximum extraction of 4,600 AFY. Until recently, the City's use of underflow has been below the full appropriation due to limited production capacity, but reached 4,558 AF in 2005. Seven underflow wells are currently active and the City is considering additional wells near the river and optimization of pumping.

The City also produces groundwater from the Paso Robles Groundwater Basin through wells distributed through the service area. This distribution helps minimize local impacts on groundwater levels and reduces the potential for any single event to disrupt production from more than a few wells. The groundwater basin is shared among many users, including rural users, municipalities, and agriculture, which accounted for 68 percent of basin pumping in 2000. Although the basin as a whole is not now in overdraft, significant groundwater storage declines have occurred in the Estrella subarea, which includes most of the City plus extensive irrigated agriculture. Increases in municipal, agricultural and rural pumping could result in additional localized groundwater level declines and the potential for basin-wide overdraft. The City is an active participant in water resources management, including the Paso Robles Groundwater Basin Agreement with San Luis Obispo County and specific basin landowners. This agreement supports groundwater management to avoid overdraft and promotes long-term groundwater supply reliability.

The City has regularly experienced seasonal water supply problems as existing facilities have become unable to deliver peak water demands during hot summer days. These shortages are related to seasonal weather conditions, customer irrigation patterns, and the limitations of the City's facilities. In the summer of 2007 combined circumstances of a dry spring, increased irrigation demand, and short-term loss of well capacity resulted in the inability of the City to meet peak demands. The City was able to meet customer demands and satisfy fire protection requirements in early August only by shutting off City park and landscape irrigation and by instituting a voluntary water conservation campaign. In the near term, the City is addressing these shortages through off-season well rehabilitation and maintenance, planned installation of an additional well, management of City irrigation, and public outreach. In the long term, peaking problems will be alleviated through development of Nacimiento water supply, provision of recycled water for landscape irrigation, and water conservation.

The City is developing two additional water supply sources for the future. First, the City recently entered an agreement with San Luis Obispo County to import 4,000 AFY of Lake Nacimiento water by 2010. Provision of Lake Nacimiento water will significantly enhance the City's ability to meet peak seasonal and long-term demands. Lake Nacimiento supply is independent of local groundwater supplies and the Lake Nacimiento contracts give the City and other San Luis Obispo County agencies high priority in droughts. Lake Nacimiento water is high quality relative to groundwater and thus would provide better water quality to City customers. In addition, use of Nacimiento water would improve wastewater quality. This is important because City wastewater is recharged to the groundwater basin and improved quality would yield long-term water quality benefits to the groundwater basin. Additional Nacimiento water supply is available from the County beyond the agreed-upon 4,000 AFY; if or when new development occurs, the City anticipates that the new development would purchase or contract the additional Nacimiento supplies.

In addition, the City is actively planning to provide an estimated 944 AFY of recycled water for irrigation by 2025. Recycled water for irrigation not only releases potable groundwater for higher beneficial uses, but is very reliable throughout the year and during drought. Provision of recycled water for landscape irrigation would substantially reduce peak water demands in summer.

Comparison of planned water supply sources and projected water demand in the long term—to 2025 and beyond—indicates that even with water conservation, Lake Nacimiento supply, and water recycling, the City will continue to rely on Salinas River underflow and groundwater in the Paso Robles Groundwater Basin for a portion of the water supply.

Water Shortage Contingency Plan

In addition to evaluating the overall reliability of water supply, this Plan also assesses the reliability of City water supply during single-year and multiple-year droughts, and in the event of a catastrophe.

Previous single year droughts have not significantly affected the City's wells. Instead droughts with durations of three, four, or five years appeared to be the most problematic. A recent study evaluated the ability of the City to handle a drought similar to 1987-1991 given its existing water demand and current facilities. This assessment indicated that the City has the present capability to withstand a drought like that of rainfall years 1987-1991, but with very little margin for operational problems or for significant growth in water demand without new water supply sources. As previously discussed, there is little or no margin for supply interruptions during peak seasonal demand periods.

The City has an adopted Water Management Contingency Plan (Resolution 90-49) that includes many of the required elements for a water shortage contingency plan including stages of action, methods to reduce water consumption, mandatory prohibitions, and penalties for excessive water use. However, Resolution 90-49 does not include analysis of impacts of water conservation on City revenues and expenditures, presentation of measures to overcome those financial impacts, and description of mechanisms to document actual reductions in water use resulting from implementation of the water shortage contingency plan.

It is recommended that the City develop and adopt a new water shortage contingency plan resolution that reflects the current conditions and needs of the City and satisfies all of the requirements of the Urban Water Management Planning Act.

Water Demand Management Measures

Water demand management (water conservation) provides numerous benefits to the City. These include cost savings through reduced water production and distribution costs and deferred capital costs. In addition, benefits to the groundwater basin will occur as groundwater that is not pumped will remain in storage, helping to maintain groundwater levels and increase long-term groundwater supply reliability (including during droughts). Water conservation efforts directed toward landscape irrigation will help reduce seasonal peak demands and diminish the potential for seasonal shortages. Through water conservation, citizens can be assured that the City is using its existing water supplies efficiently while pursuing additional water supplies.

The City already is conserving water as a result of its metering with commodity rates. Additional savings, as high as about 800 AFY, can be achieved depending on the choice of measures and the degree and timing of implementation. Staffing a water conservation position is a recommended first step; the conservation coordinator would guide the implementation of the entire water demand management program. Implementation of conservation pricing also is recommended and would provide substantial benefits to the City; a water rate study is currently underway. Additional study of unaccounted-for water is recommended to determine how much the system leaks; if significant, then a leak detection and repair program offers water savings. An audit of water use at all City parks and municipal facilities also is recommended; by auditing City facilities first, the City will be able to demonstrate the water savings potential to customers. Water conservation programs for commercial/industrial and large landscape uses are recommended, as these programs can yield cost-effective water savings. Conservation measures directed toward landscaping also would help reduce the City's high peak seasonal demands.

1. INTRODUCTION

1.1 Plan Preparation and Adoption

This Urban Water Management Plan (Plan) has been prepared for the City of Paso Robles to meet Water Code sections 10610 and following and to guide the City's water resource management efforts to the year 2010. This Plan documents the City's sources of water supply, defines water demands, presents a water shortage contingency plan, and describes implementation of water demand management measures.

This Plan builds on and updates the 2000 UWMP, accounting for changes in the California Water Code, local efforts including the *2003 General Plan Update*, *Paso Robles Groundwater Basin Study* (Fugro, 2002 and 2005), 2006 Economic Strategy, and the *Water Resources Plan Integration and Capital Improvement Program* (WRPI/CIP) (T.J. Cross Engineers, February 2007). The Plan also incorporates new information on the capacity of the City water system to satisfy summer peak demands, revised estimates of future recycled water use, and revised values for water supply impacts during droughts, as determined in late 2007. In addition, the State of California has identified the UWMP as a foundational document for compliance with Senate Bills (SB) 610 and 221, which require documentation of adequate and reliable water supply prior to approval of large developments. Accordingly, the 2005 Plan includes information relevant to SB 610 water supply assessments and SB 221 verifications. This is the City's 2005 update of the Plan; however, to make it as current as possible, the City has included available information developed in 2006 and 2007.

The City established the following water resource goals in 2004:

- Improve water quality,
- Increase and diversify water resources,
- Increase reliability of water supplies,
- Reduce groundwater basin dependence,
- Reduce salt loading into the basin and thereby comply with regulatory mandates,
- Maintain strong water rights position,
- Anticipate regulatory requirements, and
- Prioritize public works expenditures to meet these goals.

To attain these goals, a series of water resource reports were generated for the City and included the following:

- Water Quality Strategy (Malcolm Pirnie, 2003 – see ref pg 18
- Storm Water Management Plan (URS, December 2004),
- Wastewater Treatment Plant Audit (Boyle, September 2005),
- Wastewater Pretreatment/Source Control Memorandum (Boyle, October 2005),
- Draft Sewer Collection System Master Plan (Boyle, June 2006a),
- Revised Draft Potable Water Distribution System Master Plan (Boyle, June 2006b),

- Recycled Water Study Update (Boyle, September 2006a),
- Water Source Evaluation (Boyle, September 2006b), and
- Storm Drain Master Plan (in progress).

The *Water Resources Plan Integration* (T.J. Cross, February 2007) summarizes key recommendations from these reports as well as those from a preliminary draft of this 2005 Plan. The schedule for this Plan was extended to allow inclusion of significant determinations of the WRPI/CIP (T.J. Cross, February 2007). These include:

- Potable water demand is projected to more than double between 2005 and 2025.
- Significant infrastructure expansion is needed to deliver more water at a faster rate and to collect more wastewater.
- Treatment and disposal of wastewater will become increasingly difficult and costly due to salt loading and more restrictive regulations.
- Salt loading can be decreased through delivery of high quality Nacimiento Project water and by decreasing the use of residential water softeners (which increase salts in the waste stream).The resulting improved wastewater quality would reduce treatment costs and disposal issues and advance the use of recycled water for irrigation.
- More water should be conserved as there is much opportunity in the City, especially with large irrigators and possibly through the use of recycled water. The conservation of water would also reduce production and maintenance costs.

The 2008-2017 Capital Improvement Program is suggested to generally occur in the following sequence (T.J. Cross, February 2007):

1. Accept and treat Nacimiento Project water
2. Initiate a water conservation program and a wastewater source control/water softener ordinance to reduce salt loading and comply with toxicity limits at the wastewater treatment plant
3. Determine the degree of treatment needed to recycle water and install recycled water delivery pipelines
4. Identify recycled water users and determine the level of treatment needed for these specific uses. Include ammonia level compliance considerations in the treatment plant upgrade.
5. Proceed with design and construction of upgraded wastewater treatment plant and recycled water delivery system. The design should incorporate the impacts of water conservation and salt reduction.
6. Revise the Potable Water Distribution Master Plan to incorporate conservation and recycled water use once the programs are up and running.

The Plan is a key component in the advancement of the City toward community water resource goals. Most notably, the Plan documents the quantity and quality of the City's water supplies, both current and future. This provides baseline information for future augmentation and diversification of City supplies. The Plan also provides specific assessment of the reliability of City water supplies during normal and drought years and in emergencies. In addition, the Plan documents the City's water rights and measures taken by the City to protect its use of water supplies.

In accordance with section 10642 of the Water Code and section 6066 of the Government Code, Paso Robles held a public hearing at least 45 days after the circulation of the Draft Plan and prior to adoption of the Plan. A public notice was posted before the public hearing and is included in Appendix A. The Final Plan was adopted by the City Council on July 1, 2008. The resolution to adopt the Plan is included in Appendix A. The adopted Plan is filed with the Office of Conservation in the Department of Water Resources, as required by law. California regulations require Urban Water Management Plans to be updated at least once every five years in years ending in five and zero. Accordingly, this is the 2005 Plan, which will be updated by December 31, 2010.

1.2 Agency Coordination and Public Participation

Paso Robles has provided for agency coordination and community participation in its urban water management planning efforts. Table 1 lists the organizations that were contacted and summarizes citizen participation. A Draft Plan was distributed to the public on April 14, 2008 for comment with a public presentation on June 3, 2008 to summarize the Draft Plan. Table 1 also summarizes circulation of the Draft and Final plans. The Draft Plan was sent to the listed organizations with a request to provide comments. Final Plan copies are available at City Hall and the City Library. An electronic version is available on the City's website (http://www.prcity.com/).

In addition to preparation of this report, coordination with other agencies is ongoing in the Paso Robles area. A jointly supported study of the Paso Robles Groundwater Basin (Fugro, August 2002 and February 2005) was completed that documents existing and potential long-term water supply. Building on that effort, on September 6, 2005 the City entered the Paso Robles Groundwater Basin Agreement with San Luis Obispo County and a number of overlying landowners. The agreement states that the basin is not in overdraft now and that parties will not take court action to establish any priority of groundwater rights over another party as long as the agreement is in effect. The agreement also supports cooperative participation in monitoring and management of groundwater resources and resulted in an *Update for the Paso Robles Groundwater Basin* (Todd Engineers, December 2007). This first Basin Update provided an overview of the current condition of the Paso Robles Groundwater Basin, building on the Paso Robles Groundwater Basin Study reports (Phase I and Phase II) (Fugro, 2002 and 2005). The Basin Update provided an update from 1997 through 2006 on rainfall, groundwater levels and storage, and groundwater management planning. In addition, the City of Paso Robles is one of several agencies participating in a project to obtain surface water from Nacimiento Reservoir. These studies and plans are discussed in more detail in the following sections of this report.

Most recently, the City in cooperation with San Luis Obispo County applied for a California Local Groundwater Assistance Proposition 50 grant to prepare a groundwater basin management plan for the Paso Robles Groundwater Basin. The grant was awarded and contracting with the State is expected to occur in July 2008.

1.3 Acknowledgements

This Plan was prepared by Iris Priestaf, Katherine White, and Craig Gaites. We appreciate the considerable assistance provided by the City of Paso Robles staff, most notably Doug Monn and Kelly Dunham. James App, City Manager, provided invaluable guidance as did Christine Halley of T. J. Cross Engineers. We thank Boyle Engineering staff, including Michael Nunley and Christopher Alakel (now the City's Water Resources Manager), who provided data and draft versions from their water resource investigation reports. This Plan was prepared using the checklists and worksheets provided by the California Department of Water Resources (DWR) from their website,

http://www.owue.water.ca.gov/urbanplan/index.cfm

and in their *Guidebook to Assist Water Suppliers in the Preparation of a 2005 Urban Water Management Plan* (January 18, 2005).

1.4 Table of Water Code Requirements

The table below presents the Water Code requirements and directs the reader to the section of the Plan where the requirements are addressed.

Required Element	Water Code §	Section in Plan
Agency Coordination and Public Participation	10620(d), 10621(b), 10642	1.2
Tools to Maximize Resources and Minimize Imports from Other Regions	10620(f)	2.5, 2.7, 2.8
Service Area Description	10631(a)	2.1
Current and Projected Population (5-year increments)	10631(a)	2.3
Climate	10631(a)	2.2
Other Demographic Factors	10631(a)	2.3
Existing and Planned Sources of Water (5-year increments)	10631(b)	2.8
Reliability & Vulnerability	10631(c)	2.9, 3.2
Average Water Year Availability	10631(c)	2.8
Single Dry Year Availability	10631(c)	3.2
Multiple Dry Year Availability	10631(c)	3.2
Plans for Replacing Inconsistently Available Sources	10631(c)	3.3
Opportunities for Water Exchanges or Transfers	10631(d)	2.8
Past, Current & Projected Water Use	10631(e)	2.4
Description of Demand Management Measures	10631(f)	4.2
Evaluation of Demand Management Measures Currently Not Being Implemented	10631(g)	4.2, 4.3, 4.4, Appendix D
Description of all Water Supply Projects & Program Being Undertaken to Meet Demand	10631(h)	2.8
Description of Desalinization Opportunities	10631(i)	2.8
Supply and Demand Data Exchange with Wholesalers in 5-Year Increments	10631(k)	2.8
Water Shortage Contingency Analysis	10632	3.2, 3.3
Actions to be Undertaken in Response to Water Supply Shortages	10632(a)	3.4, 3.5
Estimate of the Maximum Amount of Water Available during the Next 3 Years Based on Driest 3-Year Historic Sequence	10632(b)	3.2

Actions to be Undertaken in Response to Catastrophic Interruptions	10632(c)	3.4, 3.5
Additional Mandatory Prohibitions Against Specific Water Uses	10632(d)	3.4, 3.5
Consumption Reduction Methods for the Most Restrictive Stages	10632(e)	3.4, 3.5
Penalties and Charges for Excessive Use if Applicable	10632(f)	3.4, 3.5
Analysis of Water Shortage Contingency Methods on Revenues & Expenditures	10632(g)	3.5
Draft Water Shortage Contingency Ordinance	10632(h)	Appendix B
Mechanism for Determining Actual Reductions	10632(i)	3.5
Additional Requirements for Groundwater		
Discussion of groundwater management plans/authority	10631(b)(1)	2.5
Description of adjudications or legal rights to pump	10631(b)(2)	2.5
Descriptions of DWR determinations related to groundwater	10631(b)(2)	2.5
Description of the groundwater basin	10631(b)(2)	2.5
Description and analysis of the location, amount & sufficiency of groundwater pumped in the last 5-years by the City	10631(b)(3)	2.5
Description and analysis of the amount and location of groundwater projected to be pumped by the City	10631(b)(4)	2.5
Additional Requirements for Recycled Water		
Description and Quantification of Wastewater Systems	10633(a)	2.7
Description of Current Recycled Water Use in the Service Area	10633(b)	2.7
Description and Quantification of Potential Recycled Water Uses	10633(c)	2.7
Projected Use in the Service Area (5-year Increments)	10633(d)	2.7
Descriptions of Actions Taken to Encourage the Use of Recycled Water	10633(e)	2.7
Plan of Optimizing the Use of Recycled Water	10633(f)	2.7
Water Quality and Effect of Quality on Supply Management Strategies	10634	3.3
Assessment of Reliability in the Normal, Single Dry and Multiple Dry Years (5-year Increments)	10635	3.2

2. WATER SUPPLY AND DEMAND

2.1 Location

The City of Paso Robles is located in northern San Luis Obispo County (North County), on the eastern, inland side of the Santa Lucia Mountains. As illustrated in Figure 1, Paso Robles is situated on the upper Salinas River, which flows north toward Monterey County. Incorporated in 1889, the City of El Paso de Robles (Paso Robles) now encompasses a total area of 11,985 acres on both sides of the Salinas River (Rincon, General Plan 2003). Other communities in the vicinity of Paso Robles include Templeton, the City of Atascadero, Santa Margarita, and San Miguel. The City also is situated on the western margin of the Paso Robles Groundwater Basin, which is the water-bearing portion of the upper Salinas River drainage area.

2.2 Climate

Paso Robles has a semi-arid, Mediterranean climate characterized by hot sunny summers and cool winters. Because of its inland location, the influence of fog and maritime breezes is less pronounced than in south county cities such as San Luis Obispo. Most of the precipitation occurs in the winter months (November through April) as summarized in Table 2. Precipitation on the Paso Robles Groundwater Basin area ranges from an annual average of 18 inches or more in the west to five to eight inches in the eastern portion of the basin (Fugro, August 2002).

Average annual precipitation near the City of Paso Robles is about 14.57 inches with a median of 14.22 inches; however, the area is subject to wide variations in annual precipitation as shown on Figure 2. The location of the precipitation gage is shown on Figure 3. Since 1951, the lowest recorded annual rainfall was 6.21 inches (2007 calendar year) and the greatest annual rainfall was 27.83 inches (1995 calendar year) [USGS/DWR Salinas River at Paso Robles Station]. A linear regression line or trend line has also been plotted on Figure 2 showing a very slight increasing trend of rainfall amounts since 1951.

Table 2 also presents average evapotranspiration (ET) data. ET is the loss of water to the atmosphere by evaporation from soil and plant surfaces and transpiration from plants. It is an indicator of how much water crops, lawns, gardens, and trees need for healthy growth and productivity. ET from a standardized grass surface is commonly denoted as ETo. The least ET occurs in the cool wet winter months and greatest ET occurs during the hot dry summer months. This results in peak month water demands in summer that are three times the comparable winter demand.

Average monthly temperatures range from 47 degrees Fahrenheit in January and December to more than 71 degrees in July and August. In these two months, daily maximum temperatures typically exceed 90 degrees. Summer days with 100+ degree temperatures are common.

2.3 Population

The first major commercial activity in the North County was cattle grazing, followed by development of almond groves and most recently, extensive planting of vineyards. In addition to its agricultural base, Paso Robles also has a long history as a resort, based primarily on development of local hot springs. Other major factors affecting historical growth of the City included development of Camp Roberts (a large military base) during World War II and improvement of State Highways 101 and 46. Paso Robles remains the major service center for ranching and agriculture in the North County, particularly areas to the east along Highway 46.

Three reservoirs have been developed in the area for flood control, water supply, and recreation; these are Santa Margarita Lake (Salinas Dam) on the upper Salinas River, Lake Nacimiento on the Nacimiento River near the San Luis Obispo-Monterey County line, as well as San Antonio Lake in Monterey County. These lakes are popular vacation destinations, and along with wineries and Mid-State Fairgrounds events, have contributed significantly to tourism in Paso Robles. Paso Robles also has attracted numerous retirees from Southern California metropolitan areas.

Table 3 shows the City's population in 1990 and 2000 along with projections to the year 2025 in five-year intervals as required by the California Water Code. As indicated, census data show that the population increased about 30 percent between 1990 and 2000, a rate of just less than three percent annually. In December 2003, the City approved a residential build-out potential of 44,000 residents by the year 2025 (Rincon, General Plan 2003). This projection results in an approximate 61 percent increase in population over the 20-year period between 2005 and 2025. Population projections for 2010, 2015, and 2020 were derived from a linear interpolation between the estimated 2005 population and the projected 2025 population. This results in a growth rate of about 2.4 percent annually to the 2025 build-out population of 44,000.

The 1990 census indicated an average of 2.65 persons per dwelling unit and 6,984 households (Lata, 2000) while 2005 population and residential connection estimates indicate an average of 2.8 persons per dwelling unit (27,361 people and 9,700 residential connections). The number of 2.8 persons per dwelling unit may be overstated if some commercial connections include dwelling units. Note that the population projections in Table 3 and the number of accounts or dwelling units in Table 4 (see below) are not comparable as these values were derived from different sources. The buildout population of 44,000 was based on the City's 2003 General Plan while the number of accounts was derived from water demand values assuming maximum land use buildout and no future conservation of water (Boyle, September 23, 2005).

2.4 Past, Current and Projected Water Demand

Water Connections. Table 4 shows the number of water service connections by customer type. The basic breakdown into the four water use sectors was derived from current meter reading categories and future General Plan land use categories used in recent water demand projections (Boyle, September 23, 2005). The bottom row of Table 4 summarizes total active water service connections for 2000 and 2005 and projected connections at five-year intervals between 2005 and 2025.

The number of connections for each category was derived from demand for that category described in the next section. Typical annual water demands per connection calculated for 2005 are 0.5 acre feet (AF)/connection for single family residential, 0.4 AF/connection for multi-family residential, 1.5 AF/connection for commercial/industrial, and 2.6 AF/connection for irrigation/other. These same demand-per-connection estimates were used to estimate 2025 connections. As with population projections, the estimated number of connections between 2005 and 2025 is based on straight-line interpolation.

In 2005 the City provided water to about 10,720 connections. In 2025 it is expected that water service connections will increase to about 25,560, more than double the number of 2005 connections. This assumes maximum potential buildout of all land use categories (Boyle, September 23, 2005). Between 2005 and 2025, single family connections are estimated to increase 65 percent while multi-family connections are estimated to increase 481 percent. The large increase in multi-family units reflects the multi-family land use zoning in the 2003 General Plan and assumes full buildout. Commercial and industrial connections are estimated to increase 240 percent between 2005 and 2025 while the category that includes parks, landscape irrigation and other miscellaneous water uses is expected to increase 54 percent.

The number and type of water service connections provide insight into different customers' water use, which can be useful in defining effective water conservation measures. The parks, landscape irrigation and other category may include commercial, school, park, and multi-family landscape irrigation as well as construction meter use; there are no significant agricultural customers for City water. As indicated, most service connections are residential.

New state legislation (SB 1087 and Government Code section 65589.7) became effective January 1, 2006. It provides that local water agencies and sewer districts must grant priority for service hook-ups to projects that help meet the community's fair housing need. In other words, policies and procedures should be written to provide priority service to new developments with affordable housing and these policies should be updated every five years. The City of Paso Robles is currently reviewing the existing policies and will update these if needed.

Water Demand. Table 4 also summarizes past and current water deliveries and shows projected water demand. Other water use sectors such as sales to other agencies, groundwater recharge, and conjunctive use are not performed in Paso Robles at this time or planned in the future and have not been included in this table. As indicated in the bottom row of Table 4, water demand (which does not include the unaccounted-for system losses shown in Table 5) is projected to increase from 6,735 acre-feet per year (AFY) in 2005 to 15,265 AFY in 2025, more than double the 2005 water demand. Consistent with water service connections, water demand in the City is subdivided into four categories: single and multi-family residential, commercial and industrial, and irrigation and miscellaneous. Future water demand was based on 2025 build-out land use projections that assume maximum buildout of the land use categories (Boyle, September 23, 2005). The water demand values presented in Table 4 are annual totals and do not include unaccounted-for system losses discussed in the next section. Seasonal variations occur with more water used during hot dry summers especially for agriculture and landscape irrigation.

Between 2005 and 2025, it is estimated that the percentage of residential water demand to total water demand will decrease from 72 percent to 68 percent, commercial and industrial demand will increase from 15 percent to 23 percent, and irrigation/other will decrease from 13 percent to 8 percent. Note that within the residential demand category, single family demand decreases from 62 percent of total demand in 2005 to 44 percent in 2025 while multi-family demand increases from 10 percent to 24 percent, again reflecting the maximum build-out land use.

It was assumed that the population increases linearly from 27,361 in 2005 to 44,000 in 2025 (see Table 3) and that demand increases linearly from 6,735 AF to 15,265 AF over the same time period. Gross water use in 2005 was 220 gallons per capita per day (gpcd). It should be noted that the gross per capita use is the average amount of water used by City residents each year, including not only direct residential water use, but also indirect water uses that benefit residents such as fire fighting, park and school irrigation, commercial and industrial uses, and other municipal uses. For comparison purposes, division of the 2005 water deliveries for only single and multi-family users with the population results in an actual residential use of 159 gpcd.

As a matter of perspective, the City's gross water use rate of 220 gpcd can be compared to those for other nearby communities. Between 1994 and 2000, the City of Atascadero used an average of 0.237 AFY per person or 211.6 gpcd (San Luis Obispo LAFCO, July 2003). The City of San Luis Obispo assumes a gross water use rate of 145 gpcd for planning purposes (City of San Luis Obispo, 2005), but actual rates typically are about 120 gpcd (Henderson, 2008). An UWMP prepared for the Central Coast Water Authority summarized gross water use rates for sixteen water purveyors in Santa Barbara County (Central Coast Water Authority, December 2005); water use varied from 79 to 267 gpcd with an average of 167.8 gpcd. The City of Bakersfield UWMP (October 2005) indicates gross water use in 2005 of 278.5 gpcd (reported as 101,670 gallons per person per year).

This comparison indicates that water use in the City of Paso Robles is on the high end of water demand rates. This reflects high water demands for landscape irrigation during hot summers, particularly when compared to cool coastal communities with low landscaping water use. The City's high summer irrigation demands result not only in substantial consumption of water, but also strain the City's capability to satisfy peak demands. Such high demands can be reduced through conservation including water-saving landscaping and irrigation practices, and with recycled water.

System Losses and Total Water Use. A small portion of water produced in any water system is unaccounted between metered water production and metered water usage. Unaccounted water typically includes unmetered use (for example, main flushing), meter error, and leaks. Unaccounted urban water use in California generally ranges from 6 to 15 percent (California DWR, August 1994). Between 2002 and 2005 the City's four-year average water loss was about 9.1 percent with a high of 15.2 percent in 2004 and a low of 3.4 percent in 2005 (Boyle, June 2006b). Reflecting the wide range of loss values, 2005 losses were conservatively assumed to be ten percent. New billing software and diligent reading of all meters has reduced this amount to below 7 percent (Boyle, January 2007a).

The tracking and monitoring of all water usage, new system software, and installation and/or replacement of meters will continue to reduce the percentage of future losses (Boyle, January 2007a). Hence, 2010 through 2025 losses were assumed to be about 7 percent. Table 5 also shows water demands from Table 4 and provides the total water use from 2000 to 2025, the sum of water demand and system losses. This is the total amount of needed water supply.

2.5 Sources of Water Supply and Facilities

The City of Paso Robles has historically relied upon local water supplies from the Salinas River underflow and from the Paso Robles Groundwater Basin for its municipal water supply. This section describes the groundwater basin in terms of major aquifers, groundwater levels and flow, perennial yield and groundwater use, and groundwater quality. This section also discusses the City's two existing sources of water supply (Salinas River underflow and percolating groundwater of the basin) and describes its water facilities. By 2010, the City will receive 4,000 acre-feet per year of relatively high quality, untreated water from the Nacimiento Water Project and may increase this amount to as much as 8,000 AFY if/as development occurs (see Section 2.8). This section ends with a brief discussion of the City's water sales.

Groundwater Basin. The groundwater basin is variously defined by different agencies. The Department of Water Resources has defined the Paso Robles Area Subbasin as a portion of the Salinas Valley Groundwater Basin and designated as basin number 3-4.06.

For this Urban Water Management Plan, the basin is defined as the Paso Robles Groundwater Basin, as delineated in the *Paso Robles Groundwater Basin Study* (Fugro, August 2002). The Paso Robles Groundwater Basin encompasses about 790 square miles in San Luis Obispo County and southern Monterey County. The Paso Robles Groundwater Basin is the water-bearing portion of the upper Salinas River drainage area. The drainage area covers 1,980 square miles and extends from the Nacimiento River in Monterey County to south of the Salinas Reservoir (Santa Margarita Lake). The Salinas River system, consisting of the Salinas River and many tributaries, drains the basin area and flows north along the western edge of the drainage area. The drainage area is a large valley surrounded by mountainous or hilly terrain. The drainage divides are the Santa Lucia Mountains on the west, La Panza Range on the south, and Diablo and Temblor ranges on the northeast (Fugro, August 2002).

In the California DWR Groundwater Bulletin Update (2004) DWR indicated that hydrographs from the Paso Robles Area Subbbasin of the Salinas Valley Groundwater Basin have shown that groundwater levels have been steady since 1995. The Update does not indicate that the basin is in overdraft or will become overdrafted if present management conditions continue.

More recent studies of the Paso Robles Basin, *Paso Robles Groundwater Basin Study* (Fugro, August 2002) and *Paso Robles Groundwater Basin Study, Phase II* (Fugro, February 2005), were sponsored by San Luis Obispo County Flood Control and Water Conservation District and supported by North County water purveyors and users including the City of Paso Robles. The Phase I portion of the study included basic data compilation and review, definition of the basin and subbasins, aquifer characterization, assessment of water quality conditions, and a water balance study. Phase II consisted of development of a numerical model, model calibration, and model application.

The major aquifers (or water-bearing units) in the basin include alluvial deposits and the Paso Robles Formation. The alluvial deposits are up to 100 feet in depth and include recent stream-laid sands and gravels along the floodplains of the Salinas River and its tributaries, and older finer-grained terrace deposits along the Salinas River and Estrella River. Wells in alluvium typically produce in excess of 1,000 gallons per minute (gpm) (Fugro, August 2002).

The Paso Robles Formation is the most extensive aquifer and consists of sedimentary layers extending from the surface to depths of more than 2,000 feet. It is typically unconsolidated and generally poorly sorted. The water bearing sediments in the basin are 700 to 1,200 feet thick and typically extend to sea level. Paso Robles Formation sediments are relatively thin, often discontinuous sand and gravel layers interbedded with thick layers of silt and clay. Wells generally produce several hundred gpm (Fugro, August 2002).

Groundwater flows generally to the northwest; however, flow from the Cholame Hills is toward the southwest and flow along the Salinas River is to the north. The Paso Robles Formation provides percolating groundwater not only to the City of Paso Robles, but also to other municipal, domestic, and agricultural pumpers throughout the basin.

The Paso Robles Groundwater Basin *Phase II Numerical Model Development* report (Fugro, February 2005) presents the results of the development, calibration, and application of a numerical groundwater flow model of the Paso Robles Groundwater Basin. Specific objectives included refining the basin's hydrologic budget and perennial yield, and simulating impacts to groundwater levels resulting from projected build-out conditions in the basin both within urban and agricultural areas. Important conclusions from these scenarios include the following (Fugro, February 2005):

- The perennial yield for the Paso Robles Groundwater Basin is 97,700 AFY.
- Basin pumpage in 2000 was 82,600 AF with agricultural pumpage accounting for the major portion of the total pumping.
- The basin currently is not in overdraft.
- A Build-Out Scenario simulated the effects of urban buildout and maximum reasonable agricultural buildout. This hypothetical scenario, reflecting basin pumpage of 108,300 AFY, results in an average annual decline in groundwater storage of 3,800 AFY, with particular groundwater level declines in the Estrella subarea, which includes most of the City, and northern Atascadero Subbasin.
- A Build-Out with Nacimiento Scenario evaluated the effect of replacing municipal pumping with Nacimiento project water as presently contracted by Atascadero Mutual Water Company (2,000 AFY), Templeton Community Services District (250 AFY), and the City of Paso Robles (4,000 AFY). This hypothetical scenario, simulating basin-wide annual pumping of 102,100 AFY, results in an average decline in groundwater storage of 1,200 AFY at full buildout.
- Comparison of the Build-Out Scenarios indicates an overall net benefit of the Nacimiento project of 2,600 AFY in the average annual change in groundwater storage. Although a slight lowering of water levels would still occur throughout the basin at buildout with the Nacimiento project, benefits would be most apparent in the Estrella subarea and the Atascadero Subbasin.

- Municipal pumping is more significantly affected than agricultural pumping by groundwater-surface water interactions associated with the Salinas River. The hydraulic link between the groundwater and surface water indicates that municipal groundwater pumping locations and amounts can be optimized to manage the groundwater levels.
- Agricultural pumpage, by being more widespread across the basin and comprising much of the pumpage located away from the Salinas River, shows a more direct relationship with groundwater storage and less interaction with the Salinas River. Thus, basin-wide changes in agricultural pumping would have a more direct effect on groundwater storage than would parallel changes in municipal pumping.
- Agricultural pumping is the single largest outflow of groundwater from the basin. It is also the single largest *estimated* parameter because the pumping volumes are not metered but rather estimated based on land use and irrigation practices. Minor variations in agricultural water demand estimates may have widespread impacts on groundwater storage. A sensitivity analysis indicated that a relatively slight adjustment in agricultural pumping could make the difference between potential basin overdraft or not.

The *Update for the Paso Robles Groundwater Basin* (Todd Engineers, December 2007) provided an overview of current conditions of the Paso Robles Groundwater Basin, building on the *Paso Robles Groundwater Basin Study* (Phase I Report) (Fugro, 2002) and the *Paso Robles Groundwater Basin Numerical Model* (Phase II Report) (Fugro, 2005). The Phase I study addressed the period July 1980 through June 1997 while the Basin Update provided an update from 1997 through 2006 on rainfall, groundwater levels and storage, and groundwater management planning. Change in groundwater storage for 1997 to 2006 was estimated to be a net decrease of -29,767 acre-feet, or -3,307 acre feet per year. The net groundwater storage decline was deemed a probable overestimate, given limitations of the 1997-2006 study period and distribution of available data. Nonetheless, decreases in storage were documented in the Estrella and Creston subareas, while storage increased in the Atascadero subbasin and Shandon subarea.

A groundwater management plan has not been prepared for the Paso Robles Groundwater Basin. However, the City and County have jointly applied for a State Local Groundwater Assistance Proposition 50 grant to prepare such a plan. The grant has been awarded and a final contract with the State is anticipated in July 2008.

Water Sources. The City's supply is subdivided into two sources according to water rights. These are Salinas River underflow and percolating water of the Paso Robles Groundwater Basin. Figure 3 shows City well locations.

Salinas River underflow refers to shallow subterranean flows in direct connection with the Salinas River. This underflow is subject to appropriative water rights and permitting by the State Water Resources Control Board (SWRCB). An approved SWRCB application (Application filed 1941; Permit number 5956 issued November 6, 1981) allows the City to extract up to eight cubic feet per second (cfs or 3,590 gpm) with a maximum extraction of 4,600 AFY (January 1 to December 31).

The permit includes moveable points of diversion. The City is currently in the process of converting this permit to a license from the SWRCB. Under the permit (and license) the City can pump up to 4,600 AFY (at the combined total maximum rate of eight cfs) of underflow from the existing wells and any new wells that are constructed within the moveable point of diversion defined under the permit.

Until recently, the City's use of underflow has been below the full appropriation due to limited wellfield production and treatment capabilities. Between 2000 and 2007 maximum annual underflow well production was 4,558 AF (2005), the minimum was 3,548 AF (2002), and the average was 3,936 AF. Seven underflow wells are currently active and the City is considering additional wells near the river, probably in the south, and optimizing pumping. These seven active underflow wells (Thunderbird 10, 13, 17, and 23; Ronconi 1 and 4; and Borcherdt 5) are shown on Figure 3. Future operation of the underflow wells will require an optimum pumping plan that limits instantaneous flow rates to eight cfs while maximizing annual production. This operational plan is currently being developed as part of the WRPI/CIP (T.J. Cross, February 2007).

Salinas River underflow also provides water supply to Atascadero Mutual Water Company, which serves the City of Atascadero upstream of Paso Robles. Atascadero Mutual Water Company has water rights to seven cfs of underflow. Underflow is also pumped for agricultural irrigation.

Salinas River underflow is replenished by surface water flows of the Salinas River and its tributaries, which together drain a watershed area of about 390 square miles. The Salinas River is characterized by a wide range of flow conditions, and typically is dry from June into December. Accordingly, recharge of underflow from the river occurs primarily in winter and early spring. Salinas River flows are affected by operation of Salinas Dam (Santa Margarita Lake), which was constructed in 1941 with a reservoir capacity of 23,843 AF. This reservoir currently is operated by San Luis Obispo County Flood Control and Water Conservation District primarily as a source of water for export to the City of San Luis Obispo. To protect downstream water rights, the State Water Resources Control Board issued a 1972 order that limits the diversion of water to reservoir storage to only those periods when a visible surface flow exists at seven checkpoints in the Salinas River between the reservoir and the confluence with the Nacimiento River. At all other times, the total inflow to the reservoir must be bypassed and allowed to flow downstream.

Percolating groundwater of the Paso Robles Groundwater Basin also is available to the City of Paso Robles as a source of water supply. The City’s basin wells are distributed through the service area. This distribution helps minimize localized impacts on groundwater levels and reduces the potential for any single event to disrupt production from more than four wells. Between 1989 and 2007 use of percolating groundwater by the City’s basin wells has ranged from 1,385 AFY (1995) to 3,789 AFY (2002). In 2007, the City pumped about 4,103 AF of this water from basin wells.

Figure 4 shows annual rainfall amounts and hydrographs of depths to groundwater in selected City wells from 1976 through 2007. The wells were selected based on length of water level record, source of groundwater, and geographic distribution. Thunderbird 10 is a 210-foot deep well along the Salinas River, which derives its yield mainly from Salinas River underflow. As shown, groundwater levels in the underflow wells have been relatively steady, reflecting recharge from the Salinas River.

Paso Robles Groundwater Basin wells are represented by the Sherwood 9 and 11 wells, located in the southeastern portion of the City, and the Butterfield 12, Dry Creek 18, and Tarr 19 wells in the northeastern portion of the City near the airport. These wells show the groundwater level declines in the Estrella subarea resulting from intensive local municipal and agricultural pumping.

Total basin and underflow pumpage from City wells is shown on Table 6 for 2000 through 2007 while Table 7 presents estimated pumpage for 2010 through 2025. For comparative purposes, the bottom rows of Tables 6 and 7 show the percentage of City pumpage relative to total water supply, defined as the perennial yield value of 97,700 AFY (Fugro, February 2005). Note that the pumpage totals include both basin pumping and pumpage from Salinas River underflow wells. Between 2000 and 2007, City well pumpage increased from 6.6 to 8.3 percent of the estimated basin perennial yield. Future total pumpage is estimated to decrease to 5,530 AFY (5.7 percent) in 2010 with delivery of Nacimiento water, but then level off at 7,456 AFY (7.6 percent) assuming 2025 buildout.

Groundwater Quality. Total dissolved solids (TDS) is a measure of the general mineral quality of water. In Paso Robles Groundwater Basin wells, TDS concentrations generally range from 300 to 1,000 parts per million (ppm). Between 1998 and 2001, TDS concentrations ranged from 160 to over 2,000 ppm and averaged 550 ppm in the Atascadero subbasin, 490 ppm in the Creston area, 750 ppm in the San Juan area, and 600 ppm in the Shandon area (Fugro, August 2002 and February 2005). Wells screened along the Salinas River in the recent alluvium generally have TDS concentrations between 300 and 800 ppm, reflecting the quality of stream recharge water. Wells screened in the Paso Robles Formation have generally good quality water, although a few isolated pockets exist of poor quality water with TDS concentrations over 1,000 ppm.

TDS concentrations in Paso Robles City wells average about 475 ppm while basin wells average about 650 ppm. The *Paso Robles Groundwater Basin Study* (Fugro, August 2002) reviewed available water quality data and identified deteriorating water quality trends. These include increasing TDS and chloride in the shallow Paso Robles Formation in the central portion of the Atascadero subbasin (southwest of the City along the Salinas River) and near San Miguel, and increasing nitrate south of San Miguel and north of Highway 46 between the Salinas River and Huer Huero Creek.

In general, City water quality is good, but has relatively high TDS and hardness. In response to the hardness, many residents use home water softeners. However, use of water softeners results in addition of salts to the City’s wastewater, which is treated and discharged to the groundwater basin. This is one factor in locally increasing TDS and chloride in groundwater. This situation may be improved in the future with the introduction of Lake Nacimiento water. Lake Nacimiento water is lower in hardness and TDS than groundwater, and obviates the need for water softeners. If citizens stop using water softeners, they will not only enjoy cost savings, but will also help preserve the quality of local groundwater and advance the use of recycled water for irrigation.

Groundwater Basin Monitoring and Management. San Luis Obispo County conducts a groundwater monitoring program that consists of collecting groundwater level measurements twice a year (April and October). Data are collected from about 350 wells countywide. Information from about 100 additional wells comes from water purveyors.

Recognizing that the City is an active municipal user of the Paso Robles Groundwater Basin, on September 6, 2005, the City Council passed Resolution No. 05-181, which approves City participation in a Paso Robles Groundwater Basin Agreement with San Luis Obispo County Flood Control and Water Conservation District (District) and certain private landowners, who have organized as the Paso Robles Imperiled Overlying Rights (PRIOR) group. Key elements of the Agreement are a clear acknowledgement that the Basin is not in overdraft now, and that the parties will not take court action to establish any priority of groundwater rights over another party as long as the Agreement is in effect. In addition, the parties agree to participate in a meaningful way in groundwater management activities, and to develop a plan for monitoring groundwater conditions in the Basin.

An initial meeting of Agreement representatives in February 2006 confirmed the parties' intent to monitor and evaluate groundwater conditions and to consider measures to avoid overdraft, and also started the process of evaluating the existing District monitoring program in light of the intent of the Agreement. Preparation of an annual report of the Paso Robles Groundwater Basin by Todd Engineers (*Update for the Paso Robles Groundwater Basin*, December 2007) was recently completed with funding from the City and the District. Execution of the Paso Robles Groundwater Basin Agreement and initiation of cooperative groundwater monitoring and management reduces the likelihood of overdraft and water rights disputes and promotes the long-term reliability of groundwater supplies.

Facilities. The City has 19 active wells. City boundaries and facilities are shown on Figure 3. City wells are distributed throughout the City.

Seven wells are completed along the Salinas River aquifer in the shallow underflow aquifer, and all of the wells are within the moveable point of diversion defined in Permit 5956. Four of these are in the Thunderbird well field (Wells 10, 13, 17, and 23- located in the southwest portion of the City) and two are in the Ronconi well field (Wells 1 and 4 - located several miles north of the Thunderbird well field). Ronconi 1 and 4 were brought back online in the summer of 2007 after many years of nonuse. All wells are screened in the shallow aquifer with the exception of Thunderbird 10 which is also screened in the deeper basin aquifer. In addition, the City has historically reported the Borcherdt 5 well as an underflow well. This well is located between the Ronconi and Thunderbird well fields.

Twelve wells are screened in and produce water from the Paso Robles Basin and are located on the east of the Salinas River. They are Sherwood 9, Sherwood 11, Butterfield 12, Osborne 14, Dry Creek 18, Tarr 19, Royal Oak 20, Fox 21, Cuesta 22, Barney Schwartz 15, Avery 24 (drilled in 2003), and Tower 25 (completed in March 2007).

Well pumping capacity ranges from 400 to 1,100 gpm in the wells pumping river underflow and from 200 to 950 gpm in Paso Robles Basin wells.

The City also has two inactive wells (Ronconi 16 and Sherwood 6) The casing in the Ronconi 16 has failed and the well is capped due to hydrogen sulfide odor; it currently has no piping and wellhead facilities. It is anticipated that this well will be properly abandoned in the near future. The

Sherwood 6 well has been inactive for many years because of detections of PCE and poor water quality resulting from high sulfur content. There is potential for this well to be reactivated in the future.

City facilities also include five booster stations to pump water to higher elevations, four storage reservoirs that can store collectively up to 12,150,000 gallons (two 4 million gallon (MG) tanks on Golden Hill Road, one 4 MG reservoir on West Side, and a 150,000 gallon tank on Merryhill - all able to be monitored by a remote system), and 148 miles of water pipe ranging in diameter from 2 to 24 inches (Boyle, July 15, 2005 and Paso Robles website, 2007).

The City's water system is City-owned and operated. At this time the City neither imports water from nor exports water to any other agency. The City signed an agreement with San Luis Obispo County Flood Control District on August 17, 2004 to purchase water from the Nacimiento Water Project, which is projected to deliver 4,000 acre-feet per year of relatively high quality, untreated water At time of writing, contracts have been awarded by the County to build the intake, pipelines, and other facilities. Nacimiento Project water is expected to be delivered to the City in late 2010. The City of Paso Robles is progressing with its plans for a water treatment plant; the City's Capital Improvement Program (T.J. Cross Engineers, February 2007) includes design of the water treatment plant beginning in 2007, construction starting in 2009, and startup of the plant in 2010 to coincide with first availability of Nacimiento water.

Water Sales. Single family residential water connection rates are $8,923 for a ¾-inch meter. Connection fees and rates vary for commercial accounts (Paso Robles website, 2008). As of February 1, 2008 basic water service is $1.28 for every 748 gallons used plus an $18 monthly Nacimiento water surcharge. The City is currently considering alternative rate structures, including conversion to a consumption-based rate. Rate changes are subject to Proposition 218 requirements allowing rate payers an opportunity to protest. A water rate study is underway.

2.6 Seasonal Water Supply and Demand

The City has regularly experienced seasonal water supply problems as existing facilities have become unable to satisfy peak water demands during hot summer days. These shortages are not related to the absolute availability of supply but to weather conditions, customer irrigation patterns, and the limitations of the City's facilities and wellfields.

As a recent example, the summer of 2007 did not have long periods of very hot weather, but springtime weather was warm and dry. Overall, rainfall for 2007 was very low, amounting to only 6.21 inches. Customer irrigation patterns in the City are typically characterized by a substantial increase in water usage that results in high peak demand in the summer months. In 2007, total water demand increased rapidly from 100 million gallons in February to a peak of 337 million gallons in July. Given that indoor water uses are relatively stable year round, most of this increase is attributable to irrigation. With regard to facilities, declining water levels in production wells resulted in reduced pumping capacities. In addition, production from Sherwood 9 and 11 wells had been temporarily decreased to install arsenic treatment facilities (Monn, July 3, 2007). In response, the City halted its park and landscaping irrigation for extended periods and requested a citywide voluntary water conservation goal of 25 percent for July to September 2007. This water conservation message was distributed via radio advertisements, door hangers, bill stuffers, and staff contacts with large water users. It was also reinforced by regional water conservation awareness including news articles and interviews. Despite this effort, voluntary water savings amounted to only a few percent.

Peaking problems are being addressed by the City in the near term through the following measures: 1) a well rehabilitation and maintenance program to ensure the mechanical integrity of all production wells prior to the peak demand season, 2) potential installation of an additional well to increase water supply and provide effective use of Salinas River underflow, 3) management of City water usage—especially park irrigation—to reduce peak demands, and 4) development of a public outreach program to have when needed to solicit voluntary water use reductions. The use of Nacimiento water by 2010 and future development possibly securing use of 4,000 AFY of additional Nacimiento water will also alleviate peaking problems. Demands can also be reduced with the implementation of conservation measures. Planned implementation of a water recycling program for landscape irrigation will provide substantial benefits in reducing peak demands on the potable water system.

2.7 Wastewater and Water Recycling

The City of Paso Robles owns and operates a secondary wastewater treatment plant, which treats wastewater from the City of Paso Robles, a portion of the Templeton Community Services District south of the City, and the California Youth Authority Paso Robles Boys School east of the City. The plant is east of Highway 101, along the Salinas River. As of March 2005 there were approximately 10,094 residential wastewater connections and 592 commercial/industrial wastewater connections (Boyle, July 15, 2005).

Wastewater influent is treated with ferric chloride to mitigate hydrogen sulfide in the digester gas. Primary treatment includes influent screening, aerated grit removal, clarification/primary sedimentation. Secondary treatment includes biological treatment (two-stage trickling filters), secondary clarification, and disinfection. Treated effluent is discharged to a series of six polishing ponds for dechlorination with the overflow from the sixth pond discharging to the Salinas River. The effluent eventually recharges the groundwater basin north of the City. It should be noted that the wastewater resource could be an asset to the City in the future when reused for irrigation or for groundwater recharge.

The plant operates in accordance with the City's National Pollutant Discharge Elimination System (NPDES) permit No. CA0047953 and Waste Discharge Requirements (WDR) Order No. 2004-0031, which allow a maximum treatment capacity of 4.9 million gallons per day (MGD) and a maximum peak wet weather flow of 10 MGD (Boyle, September 2005). In 2007, the average daily flow was 2.9 MGD and the peak hour wet weather flow was 5.6 MGD (Slater, Chris, January 16, 2008).

Wastewater Flows. Table 8 documents past, current, and projected wastewater flows. In 2000, the plant treated 3,152 AF of wastewater; by 2005 this increased to 3,315 AF (Hagemann, 2005 and 2006). Wastewater flows per capita in 2000 and 2005 ranged between 0.12 and 0.13 acre feet. Buildout (2025) wastewater flows were estimated to be 0.11 AF per capita, slightly lower than current rates due to future water conservation. As shown in Table 8, wastewater flows are expected to increase linearly between 2005 and 2025.

Sewer Rates. Paso Robles has a minimum monthly billing for combined residential water and sewer service inside the City limits of $37.06. Sewer connection fees are $5,037 for single family residences (Paso Robles website, 2008).

Wastewater Quality. The WDR order also regulates water quality, placing both interim and final limits on specific contaminants in the wastewater effluent and providing a compliance schedule. As part of the City's water resource investigations, the quality of the wastewater plant effluent was compared with the WDR requirements; this comparison revealed exceedances at times for TDS, chloride, and sodium. In addition, the plant apparently has difficulty meeting the WDR limits for unionized ammonia, cyanide, copper selenium, bromodichloromethane, dichlorobromomethane and bis(2-ethylhexyl)phthalate (Boyle, May 2, 2005).

The wastewater plant's most recent upgrade was 20 years ago. The City is addressing the water quality issues associated with its wastewater treatment and disposal through a series of recent investigations. In 2001, a *Salt Management Study* (Carollo, February 2001) considered methods to reduce salt loading in the City's effluent. Among other findings, the report recommended that salts in plant effluent be reduced by limiting salts in plant influent. This could be achieved by improving water supply quality through blending high-quality surface water supply from Lake Nacimiento with existing groundwater supply or through well head treatment to reduce salts. The report also concluded that restriction of water softener use (which adds salt to wastewater) would be difficult for legal reasons at the time. Accordingly, the report recommended a focus on controlling salts in industrial and commercial discharges. Subsequently, the City sponsored a study, *City Wastewater Total Dissolved Solids (TDS) Loading Analysis* (Malcolm-Pirnie, June 11, 2003) that helped identify sources of salt loading; for example, showing that more than 50 percent of the TDS salt loading is from the groundwater supply, with residences accounting for most of the mass loading. An additional study addressed alternatives for reducing salts (*Water & Wastewater Quality Concerns—Water Quality Strategy*, Malcolm-Pirnie, March 2003), including blending well water with Lake Nacimiento water, desalting well water, and desalting wastewater effluent.

In 2005, the City completed a *Wastewater Treatment Plant Audit (*Boyle, September 2005), which provided a review of operations and staffing, a process analysis and solids handling assessment, design criteria for a SCADA system and instrumentation upgrades, and identification of wastewater usage options with analysis of treatment alternatives. The *Audit* provides specific recommendations for improving the performance and operability of the existing plant and for upgrading the treatment process to allow potential water recycling. Findings of the *Audit* were incorporated into the City's WRPI/CIP (T.J. Cross, February 2007) and design work for the plant upgrade is underway.

Water Recycling Options. Recycled water is a water resource that can help sustain City landscapes through the summer dry season and through drought without over-burdening the potable water supply. In 2000, the City of Paso Robles prepared a *Comprehensive Recycled Water Study* (Carollo, July 2000). The study summarized the existing wastewater treatment and disposal system, confirmed existing regulations and guidelines, and provided projections for future wastewater flows. The study also addressed a wide range of alternatives for both wastewater disposal and recycled water reuse, with detailed evaluation of five reuse/disposal scenarios involving growing season irrigation with winter season river discharge, disposal to ponds, or discharge to wetlands. The 2000 report concluded that no compelling circumstances existed at the time for implementation of wastewater recycling and recommended deferring consideration of water recycling options to the future.

More recently, the City's water resource investigation process has identified goals supporting water recycling. These goals include recovering wastewater for reuse within the City instead of year-round discharge and reusing wastewater for irrigation in lieu of groundwater pumping, thus helping to alleviate local groundwater level declines. Five recycled water usage options have been identified: 1) restricted irrigation (secondary-23 disinfection), 2) unrestricted irrigation (tertiary disinfection), 3) groundwater recharge (tertiary disinfection with denitrification), 4) groundwater recharge (tertiary disinfection with desalination), and 5) maintain current discharge practices. Options 1, 2, and 3 were selected for further evaluation. Option 4 was considered prohibitively expensive and Option 5 does not meet future City goals and may not meet future regulations (Boyle, September 2005). Tertiary disinfection will require new filtration and disinfection facilities to be constructed at the treatment plant for the design flow of 4.9 MGD. The *Recycled Water Study Update* (Boyle, September 2006) examined five recycled water alternatives: 1) continued Salinas River discharge, 2) enhancing wastewater treatment with Salinas River discharge, 3) piping recycled water to customers along the Salinas River corridor, 4) piping recycled water to customers along the Highway 46 corridor, and 5) combination of alternatives. Key recommendations included: 1) perform percolation tests at two locations, 2) evaluate effluent water quality in terms of suitability for irrigation, 3) determine potential reduction in salt loading from a source control program, and 4) contact potential recycled water users. In 2008, the City is preparing a strategy report that will provide specific direction to recycled water planning.

Table 9 lists agencies that are expected to be involved in the recycled water planning process. Table 10 summarizes volumes of non-recycled wastewater disposal while Table 11 projects future uses of recycled water between 2010 and 2025. Summation of the volumes in Tables 10 and 11 equals the total wastewater collected and treated. Recycled water is anticipated to become available by 2025 (944 AFY). The timing and volumes of projected recycled water use are discussed in more detail in the next section. Although very preliminary, Table 12 presents methods to encourage recycled water use. The City's 2010 UWMP will contain more rigorous recycled water information reflecting the *Recycled Water Study Update* (Boyle, September 2006) recommendations and progress of the *Water Resources Plan Integration and Capital Improvement Program* (WRPI/CIP) (T.J. Cross Engineers, February 2007).

2.8 Past, Current, and Projected Water Supplies

Paso Robles historically has obtained its entire water supply from Salinas River underflow and groundwater. Figure 5 graphically shows annual water production between 1980 and 2007. Production has increased from 2,924 AF in 1980 to 8,126 AF in 2007, which is an average increase of 193 AF per year [(8,126 AF - 2,924 AF)/27 years]. For comparison purposes, population has also increased gradually as shown by the line on Figure 5. Population increased from 9,163 in 1980 to about 29,500 in 2007 or about an average of 753 people per year. Thus, between 1980 and 2007 an additional acre-foot of water was needed for the municipal needs (residential, commercial/industrial, and landscaping) of every four new residents.

Table 13 summarizes current and planned water supply for the City of Paso Robles. Water supply is projected to come from four sources: underflow and groundwater (river wells and basin wells), Lake Nacimiento water, and recycled water. These are discussed in the paragraphs below. At this time, there are no other planned water supply projects. There are no plans in the next 20 years for the City to use desalinated water, nor to export, transfer, exchange, or sell water other than water sales to City customers and thus these categories are not included in the summary tables.

River Wells (underflow). It is assumed that by 2010 the City will be pumping the full appropriation of underflow water rights of 4,600 AFY. Efforts are underway to obtain a license for the permitted amounts. The combined capacity of the City's river wells is currently about 5,800 AFY, with a summer production capability of about 3,600 gpm. Because of the surface water treatment rule, groundwater from river wells that are within 150 feet of surface flow in the river require treatment prior to distribution. This includes Ronconi 1 and 4 and, on a seasonal basis, Thunderbird 10. A review of the feasibility and costs associated with pumping and treating groundwater from Ronconi wells was conducted (Carollo, April 17, 2000). This review reported costs of $2.6 million (in 2007 dollars) for a treatment system and suggested further consideration of water quality issues and treatment options. Alternatively, new additional wells could be sited and designed to make use of the City's underflow water rights and to the extent possible, minimize or avoid water treatment costs. The City has already pumped 99 percent of the 4,600 AFY—namely 4,558 AF in 2005—and anticipates similar full use of the underflow water rights permit source in future years.

Basin Wells. To date, the City's Paso Robles Basin wells have provided up to 4,103 AFY (in 2007). The combined design production capability of all 12 basin wells is about 8,150 gpm (13,150 AFY). Between 2005 and 2010, basin wells will supply about 3,000 to 4,000 AFY to supplement the river wells. As shown in Table 13, basin groundwater use will decrease substantially when Lake Nacimiento water becomes available in 2010. This short-term surplus of groundwater production capacity will potentially allow retirement of older or low-yield wells, provide backup capacity in time of water shortage or emergency, and offer the City the opportunity to site and install replacement basin wells.

The City anticipates an additional 4,000 AFY of Nacimiento water (for a total of 8,000 AFY) may be contracted for delivery after 2010. The cost of securing this additional water would be recovered through water connection fees, and, if needed, water surcharge fees. This additional water would allow the City to stabilize or reduce future basin well pumping at or below 2005 levels (2,856 AFY). Actual annual use is dependent on when this additional Nacimiento water may become available and on the optimization of Nacimiento water relative to basin well water use. If additional Nacimiento water is not available, pumping of basin groundwater and increased recycled water use would most likely make up the difference.

Although the basin as a whole is not now in overdraft, significant declines have occurred in the Estrella subarea, which includes most of the City. Future increases in municipal, agricultural and rural pumping could result in additional localized groundwater level declines and the potential for overdraft. Figure 6 shows the groundwater pumpage history of the Paso Robles Groundwater Basin (Fugro, August 2002). Municipal and industrial (M & I) pumpage has gradually increased between 1981 and 2000. Agricultural pumpage declined between 1981 and 1998 but increased in 1999 and 2000 and constitutes 68 percent of the total pumping in 2000. An update of basin well pumpage is currently being sponsored by the County and the City and will be available by the summer of 2008.

Nacimiento Water. In 1959, San Luis Obispo County Flood Control and Water Conservation District (District) signed an agreement with Monterey County Water Agency that entitled the District to approximately 17,500 AFY of the annual yield of Lake Nacimiento for uses in San Luis Obispo County; of this amount, 1,750 AYF is earmarked for lakeside uses. To date, use of the Lake Nacimiento entitlement has been limited to the vicinity of the lake because of the lack of conveyance facilities. Efforts are underway to build a 45-mile pipeline to deliver the unused County water supply to Paso Robles, Templeton, Atascadero, and San Luis Obispo. These communities have committed to take delivery of 9,630 AFY, with the City of Paso Robles committing to 4,000 AFY at this time. Commitment of the remaining supply of 7,870 AFY currently is being considered by other water agencies. The City may request an additional 4,000 AFY of this remaining supply for delivery after 2010 if/as development occurs. The water treatment plant design allows expansion to handle this increased capacity.

Lake Nacimiento water is expected to be available to the City by 2010, conveying a number of advantages. Use of Lake Nacimiento water confers water quality benefits to the City. Lake Nacimiento water is high quality relative to groundwater, with TDS concentrations in the range of 150 to 300 parts per million (ppm), while TDS concentrations in City wells average about 475 ppm. Accordingly, use of Nacimiento water would provide better water quality to City customers. In addition, use of Nacimiento water would improve wastewater quality as the softer water (less minerals and salts or TDS) will encourage elimination of household water softeners which introduce additional salts onto the waste stream. This is important to the City because TDS concentrations of City wastewater effluent have occasionally exceeded the permitted maximum TDS of 1,100 ppm, negatively impacting groundwater quality. The improvement in wastewater quality will also facilitate future use of recycled water by reducing needed treatment.

In addition, Lake Nacimiento supply is independent of local groundwater supplies. Consequently, its development reduces the City's dependence on groundwater and thereby provides the City with increased water supply reliability. As shown in Table 13, use of 4,000 to 8,000 AFY of Lake Nacimiento water will allow reduction of City groundwater basin pumping. As indicated by the computer modeling for the *Paso Robles Groundwater Basin Study Phase II* (Fugro, February 2005), municipal use of Lake Nacimiento water at currently committed rates would reduce the rate of groundwater storage declines projected for agricultural and municipal buildout. The rate of groundwater storage decline without Lake Nacimiento supply was simulated to be 3,800 AFY and with Lake Nacimiento supply would continue at a rate of just 1,200 AFY. Although not simulated in the *Paso Robles Groundwater Basin Study Phase II*, it is reasonable to presume that use by the City of additional Lake Nacimiento water supply (on the order of 1,200 AFY or more) would halt the storage declines and allow recovery under municipal and agricultural build-out conditions.

Recycled Water. Wastewater and water recycling are described in the previous section. Potential recycled water users have been identified and four potential percolation sites along the Highway 46-East corridor have been investigated (Boyle, September 2005). Table 13 includes recycled water as a potential source of water supply to supplement groundwater. For the purposes of this Plan, it is assumed that by 2025, 944 AFY of recycled water would be needed to meet demands, assuming use of 8,000 AFY of Nacimiento water, 4,600 AFY of river well water, and 2,856 AFY of basin groundwater. If additional Nacimiento is not available, basin well pumpage and recycled water use would most likely increase to supply the additional 4,000 AFY needed by 2025. It is projected that 5,000 AFY of wastewater will be collected and treated by 2025 (Table 8). Reuse of this water will be limited by effluent quality, regulatory requirements at the time, and specific uses of potential customers. Recycled water is recognized by the City as a reliable water supply resource that can help sustain the City's landscapes through the summer dry season and through drought without over-burdening the potable water supply.

2.9 Reliability of Water Supply

The City of Paso Robles water system provides some built-in reliability. First, the water system uses two groundwater sources, Salinas River underflow and the groundwater basin, with differing recharge characteristics. Second, City wells are dispersed throughout the service area, ensuring that no single catastrophe is likely to disrupt more than four wells. It is notable also that the West and East Zones of the City water system are linked so that water can be conveyed from one zone to another if needed in emergency.

Two additional sources of water will be available in the near future: Lake Nacimiento water and recycled water. Lake Nacimiento surface water supply is independent of local groundwater supplies and would provide the City with increased water supply reliability and improved delivered water quality, as well as wastewater quality. Use of recycled water by the City for non-potable irrigation use would release potable groundwater for higher beneficial uses. Although relatively costly, recycled water has advantages of being very reliable, especially in drought, and locally controlled. Use of recycled water for landscape irrigation also provides substantial benefits in reducing peak summer demands on the potable water system.

However, the comparison of planned water supply sources and projected water demand in the long term—to 2020 and beyond—indicates that the City would increasingly rely on basin groundwater to meet water demand if additional Nacimiento water is not secured and if recycled water supply is not developed. At current rates of municipal and agricultural pumping, local groundwater already is subject to chronic declines; if agricultural pumping also increases, a real risk of overdraft exists (Todd Engineers, December 2007).

This risk, which undercuts water supply reliability, can be reduced by several means, including monitoring and management of the basin through the Paso Robles Groundwater Basin Agreement, development of additional Lake Nacimiento supply and water recycling. In addition, the long-term reliability of water supply can be increased through management of water demands, or in other words, water conservation that allows already-developed water supplies to be used effectively. The next section of the Plan discusses in more detail the reliability of the City's groundwater and future surface and recycled water supplies. Water demand management, an integral part of water resource planning, is discussed in a subsequent section.

3. WATER SHORTAGE CONTINGENCY PLAN

3.1 Introduction

The California Urban Water Management Planning Act requires that each water supplier provide an assessment of the reliability of its water supply during normal, dry, and multiple dry years. The previous section of this Plan addressed City of Paso Robles' sources of water supply under normal or long-term average rainfall conditions. This section considers the impact on water supplies of two types of drought, a single extreme drought year and a severe drought that is prolonged over at least three years. In addition, a catastrophic water shortage could also occur, for example, as a result of earthquake damage, regional power outage, or water quality emergency. This section presents the City of Paso Robles response to potential water shortages, including catastrophic water supply interruption and drought.

The *Water Source Evaluation* (Boyle, September 2006b) includes evaluation of the ability of the City's wells to satisfy water demands during drought. This includes evaluation of historical rainfall periods to establish a standard drought for future planning, documentation of groundwater levels over time, evaluation of City wells in terms of drought performance, and recommendation of operational strategies to maximize groundwater production during drought.

3.2 Water Supply Shortages

The water supply shortages addressed by the Urban Water Management Planning Act include an extreme single-year drought, a severe multi-year drought, and catastrophic water supply interruptions such as a regional power outage, earthquake, or other disaster. The following paragraphs present a reasonable scenario for each of these water supply shortages. Seasonal water shortages are discussed in the previous section, *Seasonal Water Supply and Demand*.

As noted in the preceding section, *Sources of Water Supply and Facilities*, the City overlies a large groundwater basin with storage amounting to 30.5 million AF (Fugro, August 2002). All of this water cannot be extracted reasonably, but the volume that can be used during drought is sizable. This is predicated on available well capacity to extract the water and also on replenishment of groundwater during wet years and stabilization of water levels over the long term.

As discussed in the previous *Seasonal Water Supply and Demand* section, the key issue with regard to short-term shortages is not the absolute availability of supply. Instead, drought issues have involved the available pumping capacity of wells and the impact on wells of water level declines during the shortages. For example, water level declines associated with seasonal pumping and drought could result in exposure of the well screens causing loss of pumping efficiency and/or loss of saturated thickness in the aquifer resulting in reduced well yield. In August 2007, localized groundwater level declines around City wells resulted in a 17 percent decline in well production relative to August 2006.

Extreme Single-Year Drought. Rainfall records for Paso Robles document an average annual precipitation of 14.57 inches (USGS/DWR Salinas River at Paso Robles Station data). However, rainfall in Paso Robles is variable, having ranged since calendar year 1951 from a record low of 6.21 inches in 2007 to a record high of 27.83 inches in 1995. In the past 57 years, six years have been marked by rainfall less than 50 percent of normal or 7.26 inches (1953, 1984, 1985, 1989, 1990, and 2007). It is notable that five of the six extreme drought years occur within the past 24 years, suggesting greater climatic variability in recent decades.

As reported in the 2000 UWMP, basic review of groundwater hydrographs for City wells suggests that one or even two consecutive extreme dry years has not had a discernable impact on groundwater levels in the City's Paso Robles Groundwater Basin wells. Hydrographs from the City's underflow wells along the Salinas River also show little change in response to single-year droughts, probably reflecting recharge from the Salinas River that occurs even in drought years plus the available, albeit limited, groundwater storage in the alluvial aquifer along the river. Preliminary information provided by the *Water Source Evaluation* (Boyle, September 2006b) also indicates that single year droughts do not significantly affect City well fields. Instead, droughts with durations of three, four, or five years appear to be most problematic.

However, the inability of the City water system to meet summer peak demands in 2007 indicates that the City has minimal reserve capacity. As described in the *Seasonal Water Supply and Demand* section, combined circumstances of a dry spring, increased irrigation demand, and short-term loss of well capacity resulted in the inability of the City to meet peak demands. The City was able to meet customer demands and satisfy fire protection requirements in early August only by shutting off City park and landscape irrigation and by instituting a voluntary water conservation campaign.

As discussed in the *Seasonal Water Supply and Demand* section, the inability of the City to meet peak demands is being addressed in the near term through off-season well rehabilitation and maintenance, planned installation of an additional well, management of City irrigation, and public outreach. In the long term, peaking problems will be alleviated through water conservation, development of Nacimiento water supply, and provision of recycled water for landscape irrigation, which effectively reduces demands on the potable water system.

Severe Multi-Year Drought. The seven-year period of calendar year 1984 through 1990 was marked in Paso Robles by below-average rainfall, averaging 9.5 inches overall (65 percent of normal). The most severe portion of this drought extended over three years (1988-1990), when rainfall averaged less than 8 inches, or just below 55 percent of normal. Accordingly, three or more consecutive years with an annual average rainfall of 60 percent or less is a reasonable approximation of a severe, multi-year drought. The City's preliminary *Water Source Evaluation* (Boyle, September 2006b) standard drought period generally coincides, and is defined as the five rainfall years (starting July 1) from 1987 through 1991.

During the seven-year drought, the underflow wells along the Salinas River showed declines in groundwater levels. Review of Figure 4 indicates that Thunderbird 10 showed a decline between 1984 and 1990 of about six feet, with a subsequent recovery. Two Paso Robles Groundwater Basin wells monitored through this period, Sherwood 9 and 11, show a decline in groundwater levels that started in 1985 (the second year of the drought) and persisted to 1994, indicating a lag effect between the occurrence of rainfall and water level changes. Overall, declines in the two wells amounted to 68 feet in Sherwood 9 and 74 feet in Sherwood 11. Subsequently, water levels rose between 1995 and 1998 but since have declined to below 1994 levels in these two wells (see Figure 4).

Throughout the seven-year dry period, the City was able to meet all water demands without invoking water use restrictions. Media coverage of water shortages experienced in other local communities resulted in a noticeable decrease in gross per capita consumption from 247 gallons per day per person (gpd/person) in 1984 to a low of 167 gpd/person in 1992 (Boyle, April 1995).

Preliminary conclusions of the *Water Source Evaluation* (Boyle, September 2006b) are that the City has the present capability to withstand a drought like that of the rainfall years 1987-1991. However, there is little margin for operational problems or for significant growth in water demand without new water supply sources. Recent experience has shown that if key wells are off-line, as occurred in the summer of 2007, the City will not be able to supply peak summer demands without aggressive demand management (conservation).

Water Supply Reliability in Normal and Drought Years. The Urban Water Management Planning Act requires tabulation of available water supply volumes in normal (average), single dry, and multiple dry years. The City of Paso Robles has relied on underflow and groundwater resources to satisfy growing water demands in recent years that have included both extreme dry years (including consequent extreme dry years in 1984-1985 and 1989-1990) and prolonged severe drought extending over seven years (1984-1990). However, the City has regularly experienced seasonal water supply shortages, most recently in the summer of 2007. These shortages are not related to the absolute availability of supply but to weather conditions, customer irrigation patterns, and the limitations of the City’s facilities.

Accordingly, Table 14, Supply Reliability, lists the City’s water production as of 2005 (7,414 AF) as the known reliable supply in normal years and in drought. As indicated in Table 14, 2005 was considered an average precipitation year, 2007 was a representative single-dry year, and 1987 through 1990 were multiple dry years as discussed in the sections above. On an annual basis, the City was able to provide 7,414 AF of supply during normal and drought times. Production in 2007 was higher at 8,126 AF. As required, the percentage of normal is also shown in Table 14. Since historic pumping has not been greatly affected by drought periods, the percentage is considered to be 100 percent of normal. Although there may be local drought-related impacts on individual wells, it is assumed that the City will be able to continue to pump its normal water supply in multiple dry years on an annual basis. However, there is potential for summer peaking problems as indicated in the bottom row of Table 14. Table 15 is similar to Table 14 and shows the minimum water supply available during the next three years (2008-2010) based on the driest three-year historic sequence.

Future supplies will be even more resilient to droughts by 2010 when Lake Nacimiento water will be available. Lake Nacimiento water is a reliable and stable source of water as San Luis Obispo County has contractual priority to the reservoir yield which is over 200,000 AFY. Modeling of Nacimiento Lake levels and Nacimiento Water Project (NWP) deliveries indicates that NWP deliveries are not a significant contributor to lake level changes as compared to historic records and, that even during drought periods, the total annual San Luis Obispo County entitlement could have been delivered (Boyle, October 2002). In addition, future use of recycled water—a nearly constant source—will also increase supply reliability. Future water supply projects are summarized in Table 16.

Tables 17 through 19 compare water supply to water demand in five year increments between 2010 and 2025 for a normal year. Note that the supply and demand values are the same, because the volume of groundwater pumped will be varied to meet demand. It is projected that by 2025, demand will be 221 percent of the current 2005 demand.

Tables 20 through 22 present the same estimates for a single dry year. The supply will be the same as that available during normal years (Table 17); groundwater can be pumped at similar rates on an annual basis during dry years and Lake Nacimiento water and recycled water will still be available. For this set of tables, it is assumed that dry conditions will prompt voluntary water conservation in the City of three percent. This is seen in Table 21 where the demand values have been decreased three percent from those in Table 18. Although the City's water supply is projected to be adequate through 2025 with provision of Nacimiento water and recycled water, the City will nonetheless encourage water conservation as outlined in their Water Shortage Contingency Resolution section below. The voluntary three-percent conservation represents the first stage of a water shortage and is prompted by reduction of rainfall to 65 percent or about nine inches. The first stage has a voluntary goal of ten percent reduction; however, experience from the summer of 2007 indicates that a realistic voluntary conservation of three percent for the entire year is more likely. As a result of conservation, the City's wells will pump less and reduce the groundwater impact during drought. This reduced pumping, indicated in Table 22 as the difference between supply and demand, will range between 286 AFY (in 2010) and 492 AFY (in 2025).

A series of tables were generated to compare annual supply and demand during multiple dry year periods for five year periods between 2006 and 2025. This information is presented in Tables 23 through 34. In these tables, supply values were kept the same as those for normal years (Table 17) assuming linear increases between the five-year periods. Demand values were assumed to decrease by 10 percent. This reflects the second stage of a water shortage in the City's Water Shortage Contingency Resolution (discussed in the next section). However, while the rationing goal is 20 percent, the realistic reductions during multiple year droughts on an annual basis would be 10 percent. The second stage involves reduction of rainfall to 65 percent that persists over two winter rainy seasons or an extreme drought characterized by 50 percent rainfall (seven inches) that persists past one winter rain season. The resulting reduction of pumping is seen in the last table of each of the four series as the difference between supply and demand. Values range between 788 AFY in 2006 to 1,640 AFY in 2025 reflecting the ten-percent reduction in demand.

3.3 Factors in Water Supply Reliability

Table 35 lists potential legal, environmental, water quality, and climatic factors that could result in inconsistency of supply and shortages. Each is discussed below.

Legal. The City is addressing potential legal limits on its underflow and groundwater supplies, which include loss or reduction of Salinas River underflow water rights and adjudication of the Paso Robles Groundwater Basin. The City is actively pursuing perfection of underflow water rights as discussed in previous sections of this report. With regard to the Paso Robles Groundwater Basin, the City is an active party to the Paso Robles Groundwater Basin Agreement with the San Luis Obispo County Flood Control and Water Conservation District (District) and private landowners with properties overlying the Paso Robles Groundwater Basin. The agreement acknowledges that the Basin is not in overdraft now, and establishes a process for monitoring its condition in the future. It contains provisions reserving all the parties' respective legal rights. The agreement sets the stage for the City and District to be stewards of groundwater in the North County, and provides for a committee to monitor the basin and consider means to avoid overdraft. This committee has been established. Overall, the Agreement supports cooperative monitoring and management of the basin to avoid overdraft and minimize the likelihood of litigation over water rights. This cooperative monitoring process has already commenced with the preparation of the Basin Update report. In addition, the City has developed policies that regulate non-City wells within City limits and thereby protect City wells and pumping. These policies include provisions to ensure that private wells are maintained and operated in a manner to prevent cross-connection with the City water system, protect the groundwater basin, support expanded monitoring, and require that unused wells are abandoned correctly to prevent migration of surface contaminants to groundwater.

In addition, the volume of recycled water available for use could be limited if stringent restrictions were imposed in the future.

Environmental. The most likely environmental factors affecting City water supply would derive from substantially increased pumping from other groundwater basin users resulting in basin overdraft. The City is actively participating in the Paso Robles Groundwater Basin Agreement with the goal of avoiding such overdraft although the City's ability to control agricultural use, which is most of the Basin pumping, is extremely limited. Use of Nacimiento water after 2010 by Paso Robles and other local communities will reduce dependence on groundwater until about 2020.

Earthquakes also can be considered an environmental event that could affect supply consistency in the short term as repairs are made to potentially damaged facilities (e.g., storage tanks, pipelines, wells). See the following section on **Catastrophic Water Shortage.** Heat waves have resulted in power outages in Paso Robles that disrupt water supply; see the section on **Catastrophic Water Shortage.**

Water Quality. Potential water quality impacts on water supply reliability are addressed in Table 35 and Table 36. As indicated in Table 36, it is not anticipated that the quality of groundwater, Lake Nacimiento water, or recycled water will degrade in such a manner that affects the volume of water available for use. However, it is useful to consider water quality in terms of the potential inconsistency of water supply. Water quality issues include the potential for contamination plumes and long-term regional impacts.

While all but one of the Salinas River underflow wells are clustered in two well fields, the remaining City wells are distributed widely. Accordingly, the response to contamination of a well field or one or more wells would be cessation of pumping in the affected wells and greater temporary reliance on the remaining wells (as well as future Lake Nacimiento and recycled water supply).

The likelihood of contamination of City wells is reduced through preparation of a Drinking Water Source Assessment and Protection Program (DWSAP), a federally-mandated program being coordinated by the California State Department of Health Services. The City prepared DWSAs for 14 wells in 2002: Sherwood 9, Sherwood 11, Butterfield 12, Osborne 14, Dry Creek 18, Tarr 19, Royal Oak 20, Fox 21, Cuesta 22, Borcherdt 5, and the Thunderbird wells 10, 13, 17, and 23. DWSAs were prepared for the Avery 24 well in 2003 and for the Ronconi wells 1 and 4, the Tower 25 well, and the Barney Schwartz 15 well in 2006 (Paso Robles, 2002, 2003 and 2006). Ronconi 16 is capped and not expected to be used. For each well, the DWSAs:

- Delineated source protection areas for both surface water and groundwater;
- Identified all potential sources of significant contamination in source protection areas; and
- Determined the susceptibility of water sources to contamination within protection areas.

The 18 assessments found water supply sources vulnerable to agricultural drainage, auto repair shops, gas stations, home manufacturing, low-density septic systems, sewer collections systems, dry cleaners, metal plating/finishing/fabricating, animal operations, agriculture and irrigations wells, and plastic and synthetics producers.

The City's Water Shortage Contingency Resolution discussed in the next section can be used if unforeseen water supply interruptions occur due to water quality problems. Water supply wells are dispersed throughout the City and it is unlikely that more than one cluster of wells would be impacted. As mentioned before, use of Nacimiento water after 2010 and recycled water after 2015 will increase the City's water supply reliability by reducing dependence on groundwater.

With regard to regional groundwater quality, the Estrella subarea of the Paso Robles Groundwater Basin, which includes most of the City, is characterized locally by increasing TDS, chloride and nitrate concentrations. These adverse water quality trends are unlikely to affect City water supply in the near future, given that groundwater currently provided by the City meets all drinking water standards and the increases in TDS, chloride and nitrate are localized. Nonetheless, salt loading to the groundwater basin is an important long-term concern. Recognizing that City wastewater disposal is one source of salt loading, the City has made the reduction of salt loading one of their water resource goals. Major means to reduce salt in City wastewater include planned use of high-quality Lake Nacimiento supply, reduced use of home water softeners, strategic use of wells with lower salt concentrations, and implementation of an industrial waste discharge ordinance.

Climatic. The climatic events most likely to affect water supply are droughts, which are addressed in other sections of this report by examining historical droughts and considering their impact on current and future water supply and demand. However, future climate change—and specifically global warming—brings additional uncertainty to water supply management. It is noteworthy that Paso Robles does not have surface water supplies dependent on snowmelt, which is likely to be affected by global warming. Effects of global warming on local rainfall remain highly uncertain; however, it is likely that continued global warming would increase evapotranspiration losses. In other words, water demand for irrigation would increase as well as evaporation of Lake Nacimiento water. At this time, the significance of such an effect is not known but warrants continued consideration, particularly given the high summer season water demand that already has stressed the City water system capacity. Effects on the water system of increased irrigation demand can be minimized through water conservation measures and provision of recycled water.

Catastrophic Water Shortage. The Urban Water Management Planning Act requires that water purveyors describe actions to be taken in the event of catastrophic water supply interruption, such as earthquake and regional power outage. Regional power outages represent a potential interruption in water supply. The City has backup generators at some but not all City wells. In the past, the City has resorted to renting generators during power failures (DiSimone, September 20, 2007).

In Paso Robles, catastrophic interruption of water supply is most likely to occur due to an earthquake, which has potential to damage wells, piping, and reservoirs. The December 22, 2003 earthquake seriously damaged two reservoirs. In response, a City-wide water shortage emergency was declared and a temporary water shortage contingency plan was adopted with the purpose of reducing the City's water demand by 25 percent. This temporary water shortage contingency plan is discussed in the next section.

3.4 Response to Catastrophic Water Supply Interruption

The City adopted Resolution 90-49 Water Management Contingency Plan in 1990. This resolution, provided in Appendix B, recognizes that the City, although having two dependable sources of groundwater, requires an operations contingency plan in the event of emergency. This resolution mentions long-term drought as a factor adversely affecting the City's water supply, but focuses on an emergency situation such as an earthquake.

On December 22, 2003, the City suffered significant damage in the San Simeon earthquake. No other city of similar size to Paso Robles has, in recent history, been challenged to manage a water shortage emergency of this scale resulting from an earthquake. The earthquake resulted in loss of use of one of the City's three storage reservoirs. A City-wide water shortage emergency was declared in April 20, 2004 and a temporary water shortage contingency plan was adopted August 3, 2004 with the purpose of reducing the City's water demand by 25 percent. A copy of this resolution, Resolution 04-171, is also included in Appendix B.

Although not as comprehensive as Resolution 90-49, this resolution was specific to this earthquake event. The Plan entailed voluntary community wide conservation and mandatory construction hydrant flow restrictions and 25 percent reduction in irrigation of City park facilities. If Golden Hill Road reservoir levels reached a depth of 20 feet, mandatory suspension of City irrigation and construction water use and voluntary suspension of public agency and private irrigation would have occurred. If reservoir levels reached a depth of 15 feet, public agency and private irrigation suspension would have been mandatory and warnings would be issued followed by restrictors and/or meter shut offs. At a depth of ten feet, resulting in low pressure in the lines, boil water notices would be issued for certain portions of the City. Alternative fire fighting means could also have been triggered due to the low volume of stored water, resulting in the use of water tank trucks to fight fires.

After the declaration of a water shortage emergency, the City established a 25 percent city-wide reduction goal, developed a logo, set up a display at City Hall tracking conservation percentage progress, prepared conservation tips for utility bill fliers, distributed urgent call-for-action door hangars, conducted radio announcements, placed newspaper ads, held a conservation contest, distributed restaurant tips and hotel visitor notices, prepared website information, and conducted radio interviews with city staff. The City also distributed some conservation kits and “pilot program” waterless urinals. While no tiered rate structure was implemented, rate increases associated with production and delivery costs and Nacimiento water were imposed, which may have assisted in customer conservation. Repair of the storage tank resulted in rescinding of the emergency shortage declaration on August 16, 2005.

A comparison of total water billings during the water shortage emergency to the same month of the previous year indicated that the highest cumulative conservation rate achieved was 17 percent. The City believes that voluntary reduction in landscape irrigation resulted in the most water savings and that further savings could be obtained, especially in irrigation, through audits and stricter requirements, such as water conserving landscaping (Williamson, Meg 2005).

More recently, the City requested a citywide voluntary water conservation goal of 25 percent for July to September 2007 to meet peak water use demands. The water system was strained to satisfy peak demands because production from Sherwood No. 9 and 11 wells had been temporarily decreased to install arsenic treatment facilities, and water demand was high due to a dry spring and early hot summer (Monn, July 3, 2007).

Stages of Action. Resolution 90-49 establishes four stages of action defined by at least one of three or four water system conditions. Each subsequent stage (minor, moderate, severe, critical) involves an increasingly prolonged or severe water system condition and mandates increasing City actions and public water use restrictions. A fifth stage terminates the emergency response.

Resolution 90-49 describes procedures for administering the Water Management Contingency Plan in event of emergency and describes numerous actions to be undertaken by the City during the emergency. Restrictions on water users are outlined for each stage, including prohibitions on certain types of water use and penalties for noncompliance. The resolution also describes development of procedures and plans in anticipation of water shortage; for example, establishing a materials inventory to ensure availability of critical materials.

Preparation Actions. Table 37 provides a brief summary of actions in response to various water shortage emergencies other than drought. Resolution 90-49 determines what constitutes a water shortage proclamation, provides specific triggers for action stages, and charges the Public Works Director with responsibility for advising the City Council on enactment of the Water Management Contingency Plan and designation of an initial action stage. Resolution 90-49 also provides for stretching existing storage through installation of emergency facilities including storage tanks; obtaining additional water supplies through installation of emergency wells or through water transfers; and developing alternative water supplies through conversion of inactive or agricultural wells into municipal production wells.

Resolution 90-49 includes communication and coordination with other local water agencies and utilities (e.g., PG&E), and effectively identifies the Director of Public Works as the primary coordinator, with the assistance of the Utilities Manager. Although the City has an emergency procedure, Resolution 90-94 does not provide a catastrophe preparedness plan or put employees on call. Actions to be taken by the City in response to the various emergency stages focus primarily on communication with the public.

Resolution 90-49 refers to development of procedures to expedite financial transactions during emergencies. The current resolution does not address:

- Financial impacts of an emergency,
- Source of funding for emergency measures, and
- Water quality interruptions.

Overall, Resolution 90-49 provides a detailed response to water shortage emergencies. However, it is recommended that the resolution be reviewed in detail for updating and revision. Suggestions are provided in this Urban Water Management Plan.

It is recommended that the City's response to a more gradually developing, less critical water supply shortage (e.g., drought) be considered specifically. This response may be described in a separate, but coordinated, Water Shortage Contingency Ordinance or Resolution, as described in the next section.

3.5 Water Shortage Contingency Resolution

Resolution 90-49, Water Management Contingency Plan, includes many of the elements required by the water code for a water shortage contingency plan. Specifically, it defines stages of action, provides methods to reduce water consumption, lists mandatory prohibitions against specific water use practices, and presents penalties for excessive water use. Elements required in a water shortage contingency plan beyond the scope of Resolution 90-49 include: analysis of impacts of water conservation on City revenues and expenditures, presentation of measures to overcome those financial impacts, and description of mechanisms to document actual reductions in water use resulting from implementation of the water shortage contingency plan.

The resolution could be revised or supplemented to provide a water shortage contingency plan in accordance with the water code. However, it is recommended that the City consider developing and adopting a new water shortage contingency plan resolution that reflects current conditions and needs of the City and satisfies all of the requirements of the Urban Water Management Planning Act and specifically addresses water shortage due to drought. This resolution would prompt a reasonable water conservation response to drought by the City and community. Given increasing water demands on groundwater in the future, such a resolution would help ensure that the City of Paso Robles experiences future droughts with minimal difficulty.

Draft Water Shortage Contingency Resolution. The Urban Water Management Planning Act requires an adopted or draft water shortage contingency resolution or ordinance. A recommended draft water shortage contingency resolution for the City of Paso Robles is presented in Appendix C.

By reference to this Urban Water Management Plan, this resolution fulfills the requirements of the Planning Act including the following:

- Definition of stages of action,
- Provision of consumption reduction methods,
- Development of prohibitions and penalties,
- Analysis of impacts of water conservation on revenues and expenditures, and presentation of measures to overcome those financial impacts, and
- Description of mechanisms to document actual reductions in water use resulting from implementation of the water shortage contingency plan.

Each of these elements is described in the following paragraphs. It is important to recognize that the following are guidelines. The City's actual response to a water shortage will require specific action by the City Council. Nothing in this Plan is intended to limit the City's available options in defining a specific response to a future water shortage.

Water Shortage Stages of Action. Stages of action for many water agencies are defined by available storage in a surface water reservoir or by the annual allotment provided by a water wholesaler. In contrast, Paso Robles overlies vast groundwater storage that has enabled the City to experience recent drought with no significant shortfall in supply.

The amount of rainfall in a given year or series of years is recommended as the basis for definition for stages of action. Rainfall is the ultimate source of recharge to the groundwater basin, is readily monitored, and is recognized as the basis for defining drought. Rainfall would be cumulated over a water year, October 1 through September 30, allowing monitoring of total rainfall over a winter rainy season. If a shortfall in rainfall were demonstrated by May 1, the Council could consider a course of action for the City.

The City response to drought will depend on the magnitude of the shortfall. Table 38 presents suggested water supply shortage stages that would trigger conservation measures. The Urban Water Planning Act requires no specific number of stages, but does require inclusion of a reduction in water supply up to 50 percent (Stage 3 of Table 38).

The first stage involves reduction of rainfall to 65 percent or about nine inches. This reduction in rainfall is representative of the beginning of a prolonged severe drought. The first stage would trigger voluntary conservation measures requesting ten-percent savings. The second stage is defined by a reduction of rainfall to 65 percent that persists over two winter seasons or an extreme drought with 50 percent rainfall (seven inches) that persists past one winter rain season. The second stage would initiate water conservation measures requesting 20 percent water use reductions. The third stage is a catastrophic interruption of supply and would involve mandatory rationing of 50 percent.

Based on rainfall totals alone, over the past 57 years the first stage could have been triggered by May 1 in 15 of 57 years: 1959, 1960, 1961, 1968, 1970, 1972, 1976, 1977, 1984, 1987, 1989, 1990, 1999, 2002, and 2007. The multi-year droughts of 1959 to 1961 and 1976 to 1977 would have triggered the second stage as well as the droughts of 1990 and 2007 since rainfall was below 50 percent. In July 2007, the City requested a citywide voluntary water conservation goal of 25 percent for July to September 2007 to put the City in a better position to handle prolonged heat waves, power outages, or well failures during the summer's most demanding months (Monn, Doug, July 3, 2007).

Consumption Reduction Measures. Once a water shortage stage has been declared, measures will need to be implemented to meet water conservation goals. This section describes consumption reduction methods that may be implemented by the City in response to water shortage. Table 39 provides examples of consumption reduction measures, ranging from public education to mandatory rationing and reduction of pressure in water lines. Given the City's reliable water supply, only selected reduction measures are recommended.

Specific recommended measures by the City to reduce water use in all stages are as follows.

- Notify all customers of the water shortage,
- Mail information to all customers explaining the importance of water conservation,
- Provide technical information to customers on means to promote water use efficiency,
- Develop a media campaign to promote water conservation, and
- Develop or expand conservation programs such as low-flow toilet rebates.

Prohibitions. Waste of water is prohibited by the City through its 1952 "No-Waste" ordinance, reproduced below.

> Each and every consumer shall at all times maintain in good repair all of his water pipes, faucets, valves, plumbing fixtures, or any other appliances, to prevent waste of water.
>
> Where any consumer willfully neglects to make such necessary repairs the water shall be shut off and sealed by said department and shall not be turned on again until such repairs have been made to the satisfaction of the department and a turn on fee of two dollars paid by said consumer to the said department. (Ord. 174 N.S. § 12, 1952)

The Urban Water Management Planning Act requires provision of mandatory prohibitions against specific water use practices during water shortages. The prohibitions include, but are not limited to use of potable water for street cleaning. Table 40 lists five examples of general prohibitions.

Recommended prohibitions for voluntary compliance in Stage 1 and mandatory prohibitions in Stage 2 include the following:

- Unauthorized use of water from any fire hydrant,
- Use of potable water to wash sidewalks or roadways where airblowers or sweeping provides a reasonable alternative,
- Use of potable water for construction purposes, such as consolidation of backfill unless no

other source of water or method can be used,

- Restaurant water service to patrons unless upon request,
- Hydrant flushing except where required for public health and safety,
- Refilling existing private pools except to maintain water levels,
- Use of potable water for planting of turf and other new landscaping unless it consists of low water using, drought tolerant plants,
- Use of water for washing cars, boats, sidewalks, driveways or other exterior surfaces without a quick-acting shut-off nozzle on the hose, and
- Operation of any ornamental fountain or car wash unless the water is recirculated.

Stage 3 would involve the use of water for only priority uses such as drinking, cooking, and minimal bathing. Depending on the nature of the water shortage and at the discretion of the City Council, the above measures can be modified. Often-used variations include banning water use for planting any new landscaping, limiting landscape watering to specific days of the week, and discontinuing operation of all fountains.

Table 41 provides examples of penalties and charges for excessive water use. The penalties and charges must be within the authority of the water supplier. Resolution 90-49, Water Management Contingency Plan, presents penalties at various shortage stages including house call warnings, installation of flow restrictors, penalties, fines, and disconnection.

For the Water Shortage Contingency Plan, violators should be warned in writing, including time, date, and place of violation; general description of violation, means to correct violation, and date by which the correction is required. The first and subsequent warnings should specify a potential penalty, namely fine and disconnection, with fines increasing with each violation. A fee also should be charged for restoring service.

Revenue and Expenditure Impacts. Successful implementation of water conservation measures results in a decrease in water demand, with the unintended effect of reducing a water purveyor's revenues. Accordingly, the water code requires analysis of fiscal impacts of the water shortage contingency plan on revenues and expenditures and discussion of measures to reduce impacts. For Paso Robles, effective implementation of the water shortage contingency plan would result in a decline in potable water sales of as much as 10 to 20 percent on an annual basis. This is illustrated in Table 42 which assumes a 10 to 20 percent decline in 2004 water revenue. Expenditures are not projected to increase during water shortage emergencies (Table 43) because water supply sources will remain basically the same and, while City staff may focus on shortage-related duties, no hiring of additional temporary staff or extensive overtime work is anticipated. Any additional effort by the City, such as advertising and public education, would be conducted by the City's conservation program staff (see Demand Management Measure 12 in the next section).

Revenues derived from penalties for excessive water use or water wasting during the water shortage would not effectively offset lost revenues. These presumably limited revenues should be applied toward administration of the water shortage contingency plan.

Declining water demands would be offset to a small degree by a decline in operating expenses related to the amount of water provided, such as pumping (energy) and water treatment costs. Measures to overcome revenue impacts are listed in Table 44. The City anticipates that reserves would be used to offset the revenue impact. If the water shortage emergency is or appears to be long-term or if City reserves are low, the City may elect to initiate rate adjustments to offset these losses.

The effectiveness of the Water Shortage Contingency Plan can be measured with the monitoring mechanisms listed in Table 45. Weekly monitoring of groundwater production and water distribution (as Nacimiento water and recycled water enter the system) as well as wastewater flow to the treatment plant will occur. These values will be compared to water use and wastewater generation during normal periods and will indicate the level of water conservation. Increased meter readings on a weekly basis will indicate the level of water conservation occurring on a single user basis. These increased meter readings can be on a random basis and also can identify high water users and those customers who are not conserving. This monitoring will also alert the City as to the amount of lost revenue to expect.

Reduction Measuring Mechanisms. The Urban Water Management Planning Act requires a mechanism for determining if reductions in water use are actually being achieved in response to conservation measures. Consistent with Resolution 90-94 (Appendix B) the Director of Public Works would be responsible for implementation of the ordinance and administration of any procedures, rules and regulations. Regular monitoring during a Stage 1, 2 or 3 shortage would include reporting of daily production figures by the Water Supervisor to the Director of Public Works. The Superintendent will compare the weekly production to the target weekly production to verify that the reduction goal is being met. Weekly reports will be forwarded to the Director of Public Works. In addition, water usage by customers from monthly billings would be reported to the Director of Public Works. The Director of Public Works would provide a monthly report to the City Manager and City Council. If reduction goals are not met, the City Manager will notify the City Council and provide them with a Staff Report containing recommended corrective action alternatives for their consideration.

4. WATER DEMAND MANAGEMENT MEASURES

4.1 Introduction

The California Urban Water Management Planning Act requires that each water supplier provide a report describing its implementation of fourteen water demand management measures (DMMs). These measures, also known as water conservation best management practices (BMPs), are intended to enhance the water supplier's long term water use efficiency.

The fourteen DMMs described in this report are consistent with those presented in the California Water Code Section 10631 and in the DWR Guidebook to Assist Water Suppliers in the preparation of a 2005 Urban Water Management Plan. Note that in 1997, the California Urban Water Conservation Council revised its list of BMPs from 16 to 14. The water code provides for participation in regional, multi-agency urban water management planning, recognizing that cooperative planning can reduce plan preparation costs and contribute to coordinated and efficient water conservation. As such, the requirements of the water code may be fulfilled through membership and participation in the California Urban Water Conservation Council (CUWCC). Membership and participation in the CUWCC entails development of a rigorous but voluntary water conservation program and submittal of annual reports describing implementation of BMPs. The City of Paso Robles is not currently a member of CUWCC and accordingly, has prepared the following summaries of its water conservation activities in order to satisfy the requirements of the water code.

Water conservation through the fourteen DMMs is not only required of water suppliers such as the City of Paso Robles, but also is a condition for award of certain grant funds. In 2007, the California legislature passed and the Governor approved Assembly Bill 1420. This bill conditions the provision of Proposition 84 funds on effective implementation of water conservation measures. Proposition 84, the *Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Bond Act of 2006,* authorized $5.4 billion in bonds to fund water supply, water quality, flood control, and natural resource protection improvements. The Department of Water Resources, working with the CUWCC, has developed the eligibility requirements.

The City of Paso Robles described the 16 original DMMs in its 2000 Urban Water Management Plan and provided an implementation program and schedule. The implementation program recommended continuation of all or portions of five DMMs, including distribution system water audits, metering with commodity rates, public information, school education, and landscape water conservation for single-family homes. Other recommendations to be initiated by 2005 included water audits and incentives, a plumbing retrofit credit program, a new water-waste prohibition ordinance, creation of a conservation coordinator position, an ultra-low-flush toilet retrofit credit program, a high-efficiency washing machine credit program, and use of water conservation as an objective in setting new water and sewer rates and other financial incentives. Of these recommendations, the City is using water conservation as an objective in setting new water and sewer rates; the other DMMs were not implemented in accordance with the schedule in the 2000

UWMP. It was also recommended at the time that all DMMs be re-evaluated in the 2005 UWMP.

This 2005 UWMP provides a re-evaluation of the 14 DMMs. The structure of this discussion differs significantly from the summary provided in the City of Paso Robles 2000 UWMP. Each of the fourteen DMMs presented in the water code, and the degree to which each has been implemented by the City of Paso Robles, are described in the section of this report titled *Water Demand Management Measures*. A plan for implementation and expansion of these DMMs is described in the section titled *Phased Water Demand Management Strategy*. Finally, a separate section, *Costs and Benefits of Demand Management Measure Implementation,* provides a framework for evaluating the potential costs and benefits of implementing the various DMMs as part of a phased water demand management strategy. Appendix D contains details of the recommended DMM implementation, discussion of the water savings and financial costs/benefits of implementing each DMM, and suggested year that the DMM program would start.

4.2 Water Demand Management Measures

Each of the fourteen DMMs presented in the water code, and the degree to which each has been implemented by the City of Paso Robles, are described in this section. The fourteen DMMs outlined in the California Water Code are:

1. Water Survey Programs for Single-Family and Multi-Family Residential Customers
2. Residential Plumbing Retrofits
3. System Water Audits, Leak Detection and Repair
4. Metering with Commodity Rates for all New Connections and Retrofit of Existing Connections
5. Large Landscape Conservation Programs and Incentives
6. High Efficiency Washing Machine Rebate Programs
7. Public Information Programs
8. School Education Programs
9. Conservation Programs for Commercial, Industrial, and Institutional Accounts
10. Wholesale Agency Programs
11. Conservation Pricing
12. Water Conservation Coordinator
13. Water Waste Prohibitions
14. Residential Ultra-Low-Flush Toilet Replacement Programs

Each DMM is presented below in listed numerical order.

1. Water Survey Programs for Single-Family and Multi-Family Residential Customers. This measure involves a program of water use surveys for single-family residential and multi-family residential customers. Such surveys would include some or all of the following:

- Inspection of irrigation systems and timers
- Measurement of landscaped areas
- Measurement of total irrigable area

- Development, or review of, customer irrigation schedules
- Leak detection, including detection of leaking toilets and faucets
- Measurement of showerhead and aerator flow rates, coupled with a retrofit or replacement program for high-flow components
- Measurement of toilet flow rates, coupled with a retrofit or replacement program for high-flow components.

Customers would be provided with an evaluation of their water use survey results and a specific set of water-savings recommendations based upon those results. These recommendations might also include advice regarding the replacement of landscaped turf and ornamental plants with more drought resistant and water efficient plant species or native vegetation.

Currently, the City's water billing system keeps a record of each customer's usage for the same period over the previous year and prints a comparison on the water bill of the current consumption and past year's consumption. This alerts the customer to any significant short term increases in water use. City staff monitors water usage over time to check for any large increases in the customer's usage. If a significant change is detected, the meter is read again. If a large increase is verified, the customer is notified and assistance is given as appropriate.

The City's current monitoring of customer usage is useful in detecting major leaks and severe water wasting. However, as currently implemented, these efforts are not sufficient to identify gradually-developed, systematic, or long-term inefficiencies in water use due to old plumbing fixtures, slow leaks, or wasteful landscaping practices. Consequently, the City is not currently implementing this DMM. A systematic program of water use audits for residential customers is recommended to document such water losses. An auditing program would also provide basic information needed to evaluate the potential benefits of other DMMs that address specific inefficiencies, for example, residential plumbing retrofits (DMM 2).

2. Residential Plumbing Retrofits. This DMM involves programs to retrofit less efficient plumbing fixtures with newer high efficiency replacements. Such retrofit programs focus on plumbing installed prior to 1992, in part reflecting passage of the Federal Energy Policy Act of 1992, which restricted all newly manufactured faucets and showerheads to a flow of 2.5 gallons per minute (California DWR, August 1994).

A key regulation is the requirement by the California Plumbing Code that ultra-low-flush toilets (ULFTs) be installed in all new construction starting January 1, 1992. Accordingly, the City requires ULFTs toilets in all new construction. A description of the status of the City's retrofit program for ULFTs is included as DMM 14, Residential Ultra-Low-Flush Toilet Replacement Programs.

At this time, the City has no comprehensive plumbing retrofit program. Nonetheless, low-flow showerheads, flow diverters for high-flow toilets, and faucets aerators have been provided upon request to all City residents since 2000. Public outreach efforts by the City inform residents of the water conservation benefits of high efficiency plumbing fixtures and other conservation measures. These public outreach efforts are described in DMMs 7 and 8, Public Information Programs and School Education Programs, respectively. As a result, the City distributed about 75 plumbing retrofit kits between January 2000 and December 2005, and continues to distribute the kits upon request.

A first step in defining the benefits of a more extensive systematic retrofit program would be to quantify the number of pre-1992 residential customers currently connected to the City's water distribution system. It is noteworthy that most of the City was built prior to 1992. An overall plumbing retrofit program would involve notification of pre-1992 customers and distribution of water-saving retrofit kits, which could include the low-flow showerheads, toilet flow diverters, and faucet aerators currently distributed by the City on a voluntary basis. It would also include ensuring that building inspectors, major developers, and plumbing supply outlets are fully informed on current plumbing standards and requirements. This retrofit program would be coordinated with the residential water audits described in DMM 1.

3. System Water Audits, Leak Detection, and Repair. This DMM focuses on the water distribution system itself, and includes a system wide water audit, documenting total system production and total system deliveries to customers. The procedure for conducting such an audit is described below. Also included in this DMM are distribution system leak detection and leak repair. DWR guidelines suggest conducting audits every three years consistent with the American Water Works Association *Manual of Water Supply Practices, Water Audit and Leak Detection Guidebook, 1999.* This measure is widely regarded as effective. System water audits are readily implemented with a high level of customer acceptance, water savings can be substantial and easily documented, and the effect is sustainable and within the direct control of the water provider.

The first step in a system wide water audit is relatively straightforward, involving comparison of the amount of water produced with the amount of water delivered to customers. The difference is termed unaccounted-for water, which includes actual losses (leaks) in the distribution system, authorized but un-metered use (e.g., hydrant flushing and fire fighting), unauthorized water use, and meter error. Unaccounted-for urban water use in California generally ranges from 6 percent to 15 percent and averages about 10 percent (California DWR, August 1994).

Public water system statistics reported by DWR for the City of Paso Robles in 2003 indicated that system production apparently exceeded system deliveries by approximately 11 percent. In 2004, the discrepancy was approximately 15 percent but declined significantly in 2005 due to refinement of the new billing software (Paso Robles, 2004 and 2005 and Boyle, January 2007a). Subsequently in 2006 and 2007, unaccounted water amounted to 7.3 and 6.6 percent, respectively (Dunham, 2008) representing a significant improvement in water accounting. The first step in an expanded DMM 3 program would involve determination of the fraction of unaccounted-for water that is actually lost (real losses) due to leakage and storage overflows because these losses inflate water production costs (water is extracted and possibly treated, yet does not reach customers).

The determination of real losses involves an evaluation of past billing records for errors, as well as the institution of a program for the systematic verification of water meter accuracy. Currently the City does not have a program to systematically calibrate either residential or large commercial water meters. Water meter calibrations are currently performed by the City only upon customer request. Should calibration verify that the meter in question is accurate, then the burden of paying for the calibration then falls to the customer. When calibration is required for a large water meter, the City has in the past contracted with outside venders to perform meter verification and conduct meter repairs. This practice has been stopped as the cost to verify and repair large meters is often greater than or equal to the cost of simply installing a new meter.

If the observed level of unaccounted for water involves significant real losses, the next step would be to establish a systematic program for distribution system leak detection and repair. The City currently utilizes leak detection equipment where significant unexplained increases in water use have been reported or documented and repairs all detected leaks. However, the City does not employ a distribution system wide systematic approach to leak detection. It is noteworthy that in 2000 the City conducted a trial leak detection program on an older street and few leaks were located.

4. Metering with Commodity Rates for all New Connections and Retrofit of Existing Connections. This measure is twofold, including 1) metering of all new connections and meter retrofit of existing connections, and 2) development of commodity water rates, in other words, billing by volume of usage. This demand management measure, which is fundamental to water conservation, has been implemented by the City for many years.

The City is metered for all customer types as indicated in Table 4. Currently, water use for single-family residential, multi-family residential, commercial, large landscape irrigation (three or more irrigated acres), and institutional/governmental customers can be tracked separately. The City has had a policy in place since 1990 to separately meter each dwelling unit in multi-family complexes and to require separate irrigation meters for large landscape customers; however, in some cases several multi-family units are serviced by a single metered connection. Future subdivision of the irrigation water classification is planned to identify potential users of recycled water.

As of February 1, 2008, the City implemented a rate structure that is based on consumption (at $1.28 per consumption unit), with no minimum consumption and no flat rate except for the $18.00 Nacimiento Water Project surcharge. The City has also designated separate fees for special water services (such as after-hours connection, fire hydrant relocation, meter re-read, and meter bench/calibration testing among others) for individual customers. The City also approved a water user rate study to be conducted in early 2008.

5. Large Landscape Conservation Programs and Incentives. Significant water conservation potential exists for landscape irrigation. The City's *Sewer Collection System Master Plan* (Boyle, January 2007b) found that there was a wide difference between summertime water production and the flow that actually reached the wastewater treatment plant. In 2003 and 2004, monthly treatment plant flows were on the order of 80 MG. Monthly production was around 100 MG in the winter months and over 250 MG in the summer months (May through October). This indicates that during the summer over 150 MG per month (more than half of the winter production) was being used for irrigation. It is noteworthy that shortages experienced in the summer of 2007 were the result in part of dry weather in the spring and the resulting substantial irrigation demand.

This DMM involves programs to manage and reduce the water demands of large landscape water users. Water demand by large landscape water users can be reduced by providing water audits similar to those outlined in DMM 1 for residential customers. These water audits would involve the following:

- Inspection of irrigation systems and timers
- Measurement of landscaped areas
- Measurement of total irrigable area
- Development, or review of, customer irrigation schedules.

Water savings can also be enhanced by offering financial incentives to large landscape water users for installation of drip irrigation systems, electronic ET controllers, other water conservation technologies, or the replacement of irrigation intensive turf with more drought resistant plants or native vegetation. Accordingly, consideration of this measure begins with the identification of large irrigators and their water use, followed by development of a program for regular auditing (at least once every five years), provision of multi-lingual training and information regarding water conservation and related financial incentives.

The City currently requires separate irrigation meters for large landscape (three acres or more) customers. This policy was implemented in 1990 as a first step toward the realization of significant long term water savings from managing large landscape water use. As of 2005, water demand by landscape/recreation users in Paso Robles amounted to 845 AFY, or 13 percent of the total demand of 6,735 AFY (Table 4). The City has not yet implemented a water auditing program for large landscape customers.

Similarly, future large landscape water demand management would involve enacting a landscape water conservation ordinance consistent with the California Water Conservation in Landscaping Act. This act was designed to encourage ordinances that provide for the use of plants adapted to particular climatic, geological, or topographical conditions; the use of automatic irrigation systems and seasonal irrigation schedules to ensure efficient irrigation; and landscape maintenance practices that foster long term water conservation. This ordinance would apply to landscape water conservation requirements for new and existing commercial, industrial, institutional, governmental, and multifamily developments. At time of writing, no specific City landscape water conservation ordinance had been identified.

6. High Efficiency Washing Machine Rebate Programs. This DMM involves the replacement of higher water use washing machines with City approved, highly water efficient, H-axial type washing machines. When implemented, this measure can be an effective water saving measure, functionally similar to the low flow residential plumbing retrofit and ULFT retrofit measures described in DMMs 2 and 14, respectively. Financial incentives can also be offered to encourage the replacement of washing machines. In addition, all new construction offering appliances could be required to have high-efficiency washing machines.

Currently, the City neither requires new construction to install high efficiency washing machines, nor has any financial incentives in place to encourage replacement of high water use machines with new more efficient units.

7. Public Information Programs. Provision of information to the public can be an effective method for managing municipal water demand. This DMM involves a public information program with some or all of the following activities: paid advertising and public service announcements promoting water conservation; hosting of speakers for the media, community groups, or schools; hosting of special community conservation events and water conservation demonstrations; distribution of water conservation bill inserts, newsletters, or brochures; and daily water use comparisons on customer's bills. This DMM's effectiveness can also be enhanced through conservation coordination with other government agencies.

The City has implemented this water demand management measure through provision of public events involving speakers, construction and display of an exhibit on landscape water conservation, brochures, paid advertising, and bill inserts. Since 1992 City water bills have shown a percent increase or decrease in water usage for the billing period relative to the same period the previous year. To encourage landscape water conservation, the City has compiled a listing of plant species most appropriate for residential landscaping with regard to water conservation and has posted this listing on the City's website. The City has also partnered with several nearby local water providers, including the City of San Luis Obispo, the County of San Luis Obispo, the Templeton Community Services District and the Atascadero Water Company, to publish an annual water conservation newsletter entitled *Partners in Water Conservation.*

8. School Education Programs. This DMM includes provision of classroom presentations promoting water conservation, and supplementation of those presentations with grade level appropriate education materials and instructional assistance.

The City has an ongoing program to work with local school districts to promote water conservation at school facilities. In 2004 the City public outreach efforts included three presentations describing water conservation to local primary schools. In 2005 the City contracted with an outside vendor to conduct multi-media presentations on water conservation to local students in grade levels 4 through 6. The material is correlated to California academic science standards and has been continued to the present (DeMilo, 2008 and Dunham, 2008).

The City also provides educational materials to several grade levels. State and County water system maps, posters, and workbooks have been provided to teachers upon request. As an example of a special project, staff of the City's water division constructed a portable working model showing how water is supplied, stored, and distributed through the City to fire hydrants, homes, schools, businesses, and industries.

9. Conservation Programs for Commercial, Industrial, and Institutional Accounts. Implementation of this DMM, aimed at commercial, institutional and industrial (CII) customers, involves first identifying all CII water users. Next, water use reduction among CII water users is realized through the offering of water audits similar to those described in DMM 1, the provision of information describing the retrofit of water saving technologies, development of financial incentives to offset consumer retrofit costs and encourage installation of these water conserving technologies, and the provision of follow-up audits as needed. Such a program also would involve documentation of the program (e.g., quantifying number of audits and audit findings) and estimating the water savings derived from the program.

The City has already taken the first step by identifying CII water users. As of 2005, the City had 695 commercial/institutional and industrial customers. Water demand for CII accounts in 2005 amounted to 1035 AFY, or 15 percent of the total demand of 6,735 AFY.

As of 2005 the City offers no incentives for water conservation to its CII customers. The City offers the same low flow fixture retrofit kits offered to residential customers, described in DMM 2, to its CII customers. However, as with residential customers, retrofit is voluntary and a specific request to the City is necessary to receive the retrofit kit. Specific technologies targeted to CII water users are not offered. Given that CII demand represents a significant portion of total demand, the next step would be a water conservation outreach program directed to these customers.

10. Wholesale Agency Programs. This DMM involves provision by a wholesaler of financial incentives and support to retail water agencies to encourage water conservation. Since the City of Paso Robles is not a wholesaler, this measure is not applicable.

11. Conservation Pricing. This DMM involves establishment of a pricing structure within which the largest consumers of water pay the largest per unit cost for that water. Often conservation pricing involves the use of an inclining block pricing structure. In such a pricing structure the per-unit cost of water supplied increases in increments as consumption increases. Normally, existing water use patterns are analyzed and a reasonable amount of water use is defined for each customer type, based on community norms. Generally, several consumption thresholds are established relative to this allotment which, when exceeded, trigger price increases. In this fashion, conservation pricing specifically directs the price increases at customers who choose to use large amounts of water and allows the water provider to reduce overall water demand while maintaining acceptable revenue levels. This precludes the need for rate increases for the majority of water customers. This DMM can apply both to water service and sewer service where the urban water supplier also provides sewer service. By instituting conservation pricing for water *and* sewer service, the ability of pricing pressures to reduce demand is effectively doubled. The implementation of such a pricing structure by the Irvine Ranch Water District (IRWD) in Orange County resulted in an average annual reduction in water use of 12 percent for the six-year period following implementation when combined with other conservation best management practices (Pacific Institute, 1999).

DMM 4 is a prerequisite for conservation pricing, as thorough and accurate metering of all customers is the foundation for a fair and effective conservation pricing structure. Similarly, regular maintenance of all meters is necessary to fully realize and maintain effective water conservation. This DMM is also strongly connected with DMM 3 as a thorough audit of the City's water systems would reveal the relative levels of water use among consumers and consumer types, and provide a context for the establishment of pricing thresholds. The City does not currently employ inclining block structured conservation pricing but has a flat rate "pay for what you use" pricing structure for water consumption. This pricing structure generally reduces demand relative to a flat monthly payment, but is limited in this capacity when compared to conservation pricing and does not address the demand reduction potential of revising sewer rates. As of February 1, 2008, the City implemented a rate structure that is based on consumption (at $1.28 per consumption unit), with no minimum consumption and no flat rate except for the $18.00 Nacimiento Water Project surcharge. The City has also designated separate fees for special water services (such as after-hours connection, fire hydrant relocation, meter re-read, and meter bench/calibration testing among others) for individual customers. The City also approved a water user rate study to be conducted in early 2008.

12. Water Conservation Coordinator. This DMM measure entails designating a water conservation coordinator responsible for preparing a water conservation plan, managing its implementation, and evaluating the results.

The position of conservation coordinator does not exist at this time as a specific full time or part time position within the City of Paso Robles. The duties of the coordinator have been performed by existing Water Division staff members. Increased implementation of DMMs by the City is likely to require a permanent full-time position with specifically defined responsibilities. These would likely include implementation, tracking, and coordination of water conservation programs; coordination with other agencies; and reporting to senior City staff.

A water conservation coordinator and public information and school education programs have been included in the *Water Resources Plan Integration and Capital Improvement Program* (WRPI/CIP) (T.J. Cross Engineers, February 2007) starting in the 2007-08 fiscal year. The WRPI/CIP indicates that the position will help advance the goals of improving water quality and reducing salt loading.

13. Water Waste Prohibitions. This DMM involves adoption of an ordinance prohibiting water waste. DWR suggests several specific prohibitions including the following: prohibition of gutter flooding, prohibition of single-pass cooling systems in new connections, prohibition of non-recirculating systems in all new conveyer car wash and commercial laundry systems, and prohibition of non-recirculating decorative water fountains.

The City established a "No-Waste" ordinance in 1952 (see section *Water Shortage Contingency Resolution, Prohibitions* for ordinance text). This ordinance requires only that a customer maintain plumbing facilities to prevent water wasting under the penalty of disconnection and a $2.00 reconnection fee. Replacement of this ordinance was recommended in the 2000 Paso Robles Urban Water Management Plan. A revised ordinance with specific prohibitions and penalties coordinated with those contained in the City's current Water Shortage Contingency Plan was submitted to the Paso Robles' Department of Public Works and is currently under review.

14. Residential Ultra-Low-Flush Toilet (ULFT) Replacement Programs. This DMM involves replacement of toilet fixtures in older construction with newer, efficient ULFT replacements. The first step in implementing such a program would involve the quantification of the number of older toilets still in service within the City and the identification of individual customers whose toilets should be replaced. Currently the City requires the installation of ULFTs in all new and remodeled residential construction, but has not determined the number of homes currently using ULFTs.

As noted previously, the City requires ULFTs in all new construction, but currently does not have a retrofit program. An effective retrofit program can be achieved through a combination of voluntary replacement coupled with financial incentives, or through mandatory measures. For example, ULFT installation could be required at the time of property resale or as a permitting requirement for major renovations involving changes in the sanitary sewer lines. Over time, such a requirement would result in a nearly complete retrofit.

4.3 Phased Water Demand Management Strategy

The primary goal of water demand management is to reduce the long term rate of water consumption. However, water is not simply a marketable commodity, but also a basic necessity, sustaining a city's economy and also the very lives of its citizens. For this reason, there is a certain level of water consumption below which consumer demand is inelastic. In this context, the true goal of water demand management is not simply to reduce long term water demand, but also to ensure that sufficient water resources are available to meet this basic inelastic "life-line" level of demand. The recommended water demand management strategy described in the following sections advances the City toward meeting its water resource goals (listed on the first page of this report) for maximizing water resources. Benefits of water demand management (water conservation) include the following:

- Cost savings: reducing water production and distribution costs will save money for the City and its customers through reduced operation costs and possibly, deferred capital costs.
- Groundwater supply benefits: groundwater that is not pumped will remain in storage in the basin, helping to maintain groundwater levels and increasing long-term groundwater supply reliability, including during summer peak periods and droughts.
- Groundwater basin stewardship: City actions to manage groundwater pumping and maintain groundwater levels support the cooperative management and beneficial uses of the groundwater basin.
- Wastewater treatment and disposal benefits: reducing indoor water use will reduce wastewater flows.
- Public perception benefits: the public can be assured that the City is using its existing water supplies efficiently while pursuing additional water supplies.

The phased water demand management strategy proposed in this section describes an approach to the implementation of the fourteen DMMs with the intent to reduce long term water demand while maintaining water affordability for consumers. When implementing any water conservation program, short term costs related to the set-up and establishment of that program can be expected to be incurred by both consumers and the water supplier. However, a demand management program should yield sustainable increases in the efficiency of the water supply chain, shift consumption patterns in the direction of water conservation, and sustain levels of revenue to the water supplier relative to cost, producing long term cost savings through demand reduction.

The four phases of the proposed water demand management strategy are as follows:

- Phase I – Support revenue and promote conservation demand
- Phase II – Encourage voluntary stakeholder conservation
- Phase III – Assess further conservation potential relative to long term costs

- Phase IV – Apply technological conservation solutions.

Each of these four phases would involve the strategic implementation of complementary DMMs. It is intended that each phase, once completed, would support the next phase. Each completed phase should provide the information needed to make informed management decisions in the next phase. Each phase should also be able to produce significant water savings on its own, should implementation of the next phase prove unfeasible, financially or otherwise. At this time, implementation of all applicable DMMs is recommended; however, additional cost benefit analyses are suggested for some. An implementation schedule is provided in Appendix D on Table D-1.

Phase I. The goals of the initial phase are twofold. One goal is to temporarily raise additional revenue for the City public works department through the institution of conservation pricing (DMM 11). The additional revenue generated through conservation may be used to fund other DMMs, but is intended to replace the revenue lost due to conservation efforts. This recognizes that successful reduction of customer consumption will also result in reduced revenue to the city. Another goal is to use pricing pressure to increase the demand for other water saving measures such as water audits and low flow plumbing fixtures.

First, retention of a water conservation coordinator is recommended to assist City staff and citizens in saving water (Water Conservation Coordinator - DMM 12). The conservation coordinator would guide the implementation of all phases of the demand management strategy, assessing the effectiveness of each phase, and adjusting the timing and degree of each DMM's implementation based on emerging information. The coordinator would be actively involved in the planning of the other DMMs instituted in the first phase of the demand management strategy, most notably conservation pricing, which requires a focused professional dedication and sensitivity to community concerns. A more extensive discussion regarding the costs and benefits of the integrated DMMs proposed for this phase is provided in Appendix D.

Conservation pricing (DMM 11) uses a progressive billing structure to ensure that those customers least able to afford billing increases would be subject to a moderate price increase, while at the same time presenting a choice to water users with unusually high water use: pay a higher rate or conserve water. Conservation pricing has been demonstrated to be an effective means of reducing consumer water use while at the same time maintaining a water provider's revenue in the face of this reduced consumption (Pacific Institute, 1999). A more extensive discussion regarding the costs and benefits of conservation pricing is provided in Appendix D.

As a prerequisite to conservation pricing, the City would fully meter all existing water connections and ensure the installation of meters on all new connections (DMM 4). Also, it may be useful to conduct a system wide water audit (DMM 3) in order to inform the process of appropriate conservation water rates and inclining block price increase thresholds. With accurate information regarding water use patterns, the City could better direct pricing pressures toward the market segments possessing the largest potential for conservation while minimizing the impact to water affordability. Taking a system-wide inventory of water use before instituting conservation pricing would also serve to assure customers that all water use is accounted for, that the highest bills are indeed going to the heaviest water users, and that no customer is paying for water leaked from poorly maintained transmission lines. A rate structure review is being conducted currently.

A recommended first step in this system-wide water audit would be an audit of water use at all City parks and municipal facilities. By auditing City facilities first, the City will be able to demonstrate the water savings potential of an expanded system audit to customers, and at the same time gain an understanding of the costs associated with a large scale complete system audit. If this initial City facilities audit should prove financially beneficial, the City will be well positioned to justify and fund a complete system audit.

Phase II. The second phase is intended to build on the increased demand for water conservation triggered by the price pressure applied on heavy water users through conservation water rates. This phase focuses on voluntary water savings on the part of consumers. Ideally, Phase III would be carried out concurrently with Phase II.

Public information programs (DMM 7) and school information programs (DMM 8) are important ways to encourage water savings. The emphasis of these programs would be on consumer cost saving through reductions in water consumption. Materials and presentations would be prepared for consumers that highlight water saving measures that can be implemented easily by consumers with little or no upfront cost, such as irrigating landscaping after nightfall. The potential cost savings offered by such measures should be stressed. Information programs should also be used to explain the potential benefits, in terms of consumer cost savings, offered by participation in residential, large landscape, and CII water surveys (DMMs 1, 5, and 9, respectively). These water surveys are the focus of Phase III of the demand management strategy. Specific recommendations for designing the content of public and school information programs and a discussion of the costs and benefits of these programs are presented in Appendix D.

Phase III. The third phase focuses on the residential, large landscape, and CII water surveys of DMMs 1, 5, and 9. The success of this phase depends largely on the success of the previous two phases. The pricing incentives created during Phase I should have created a demand among customers for information on water conservation. That information, provided during Phase II, should have allowed those customers to realize noticeable reductions in their water bills through their voluntary actions, heightening the demand for further cost savings. Phase II should also have established the water surveys proposed for this phase as the primary vehicle through which additional cost savings could be realized.

The residential water surveys of DMM 1 involve the largest number of customers, representing most of the water use in Paso Robles. A significant water savings is realized through the combined small water savings for many individual residential water users. For residential water surveys to be effective, significant efforts would be needed to involve a large number of residential customers. This effort would have begun in Phase II through DMMs 7 and 8, but would be continued in this phase as part of DMM 1. A discussion of the costs and benefits associated with the extensive marketing and performance of residential water audits is presented in Appendix D.

CII and large landscape water surveys (DMMs 5 and 9) would involve a significantly smaller number of customers. Unlike residential water surveys, significant water savings may be realized through a small number or even a single water audit. Landscape irrigation is a substantial portion of the water usage, particularly in summer. Reduced landscape irrigation would not only conserve water supply overall, but also reduce the large seasonal water demands that represent a serious challenge to the water system's capability to provide water supply.

In order for this measure to be cost effective, the City would determine which CII and large landscape customers are using the largest volumes of water. Rather than marketing water audits to all CII and large landscaped customers in aggregate, those high volume usage customers would be identified specifically for participation. A more extensive discussion of the costs and benefits associated with the performance of CII and large landscape water audits is presented in Appendix D.

Phase IV. The final phase involves the retrofit of low flow water fixtures, water saving appliances, and other water conservation technologies through the distribution of devices or the provision of financial incentives to water customers. Phase IV could involve application of innovative technologies, for example, state-of-the-art landscape irrigation management techniques with dedicated meters, Smart Controllers, and efficient irrigation equipment. Specific DMMs involved in this phase of the demand management strategy are Residential Plumbing Retrofits (DMM 2), High Efficiency Washing Machine Rebate Programs (DMM 6), Water Waste Prohibitions (DMM 13), and Residential Ultra-Low-Flush Toilet Replacement Programs (DMM 14).

The various water surveys conducted in Phase III would provide much of the necessary information to establish proper levels of subsidization for the various retrofit DMMs. Subsidization levels would reflect the relative level of water savings offered by the type of retrofit to be subsidized and also the degree to which water conservation demand would drive that type of retrofit in the absence of subsidization. The conservation pricing thresholds established in Phase I would have stimulated a demand for such measures among water customers which should serve to lower the levels of subsidization required to achieve a significant degree of customer implementation. The successful implementation of Phase II should also have had a similar effect by increasing customer knowledge of the water and cost savings provided by device retrofits.

Information gained in Phase III would also prove useful when designing water waste prohibitions by informing the City as to which types of activities and technologies are the least efficient users of water. That information should also help the City to gauge the potential impacts to the City's economy of proposed prohibitions as the number of customers utilizing potentially regulated water wasting technologies and processes will have been assessed. Appendix D discusses the costs and benefits associated with the various retrofit programs.

Unincorporated DMMs. No wholesale agency programs are proposed for the phased demand management strategy. As previously noted, the City of Paso Robles sells its water directly to the consumers, therefore no retail water agencies are involved in the production or distribution of water within the City. This measure is therefore not applicable for further consideration at this time.

4.4 Costs and Benefits of Demand Management Measure Implementation

The preceding section provides an overall strategy for implementing DMMs based on the degree to which the various DMMs interact and how one DMM supports another. Another important criterion for implementation is the cost relative to benefits. This section examines the costs and benefits of each DMM and provides specific recommendations for implementation, continuation, or deferral. The potential net financial benefits (or costs) of implementing the DMMs planned for the phased demand management strategy are discussed below in the proposed order of implementation. Table 46 provides a summary of the DMMs (listed in order of phased implementation) in terms of costs and benefits and recommendations. With regard to water savings, the City already is conserving water as a result of its DMM 4, metering with commodity rates, which has projected water savings of 126 to 631 AFY for 2006 to 2010, respectively. Additional water savings can be achieved through initiating other DMMs. While the potential total savings depends on timing and is somewhat uncertain, the analysis indicates that additional water savings can exceed 800 AFY or about 10 percent of the 2010 water demand.

In brief, while resulting in a net cost, providing dedicated staff for a water conservation program is recommended as a requirement for effective implementation of other DMMs. Several programs should be continued, including public information, school education, and metering with use of commodity rates, which already conserves water cost-effectively. Future implementation of conservation pricing would provide substantial benefits to the City.

Several water conservation programs require additional study, including unaccounted-for water. If a significant portion of unaccounted-for water is leaks, then a leak detection and repair program offers significant water savings. Such a program also assures the public that the City is using its existing water supplies wisely. Water survey programs for residential customers also is pending study; while potentially yielding significant water savings, it also entails significant costs.

Water conservation programs for commercial/industrial and large landscape uses are recommended, as these programs can yield cost-effective water savings. Other programs (plumbing retrofits, toilet and washing machine rebates, water waste prohibitions) yield little or no water savings and a range of costs/benefits, and can be implemented by the water conservation staff.

Gross financial benefits were calculated as the cost to produce an amount of water equivalent to the projected water savings associated with the DMM, including the cost to treat the resulting additional wastewater volume. It is important to understand that these financial benefits are long term benefits which will be realized as future water supply expansion projects are avoided or limited due to reduced per capita water demand. Gross financial expenditures were calculated as the sum of all capital, equipment and human resources costs incurred during the implementation of a DMM. Net expenditures are gross expenditures minus any revenue generated through that DMM's implementation. Negative net expenditures (where the revenue produced by a DMM exceeds all expenditures), when they occurred, were added to the gross financial benefit of the DMM in question in order to calculate net financial benefit (or cost). Similarly, positive net expenditures were subtracted from the gross financial benefit of the DMM in question.

Appendix D contains details of each of the four DMM implementation phases and discussion of specific water savings and financial benefit of implementing each DMM as summarized in Table 46. Future City supplies are projected to meet demands because the volume of groundwater pumped will be varied to meet future demands. The implementation of these DMMs provides numerous benefits to the City. These include cost savings through reduced water production and distribution costs and deferred capital costs. Landscape water conservation, particularly in the summer when demands soar, would reduce the strain on the City water system. In addition, benefits to the groundwater basin will occur as groundwater that is not pumped will remain in storage, helping to maintain groundwater levels and increase long-term groundwater supply reliability (including during droughts). Through water conservation, citizens can be assured that the City is using its existing water supplies efficiently while pursuing additional water supplies.

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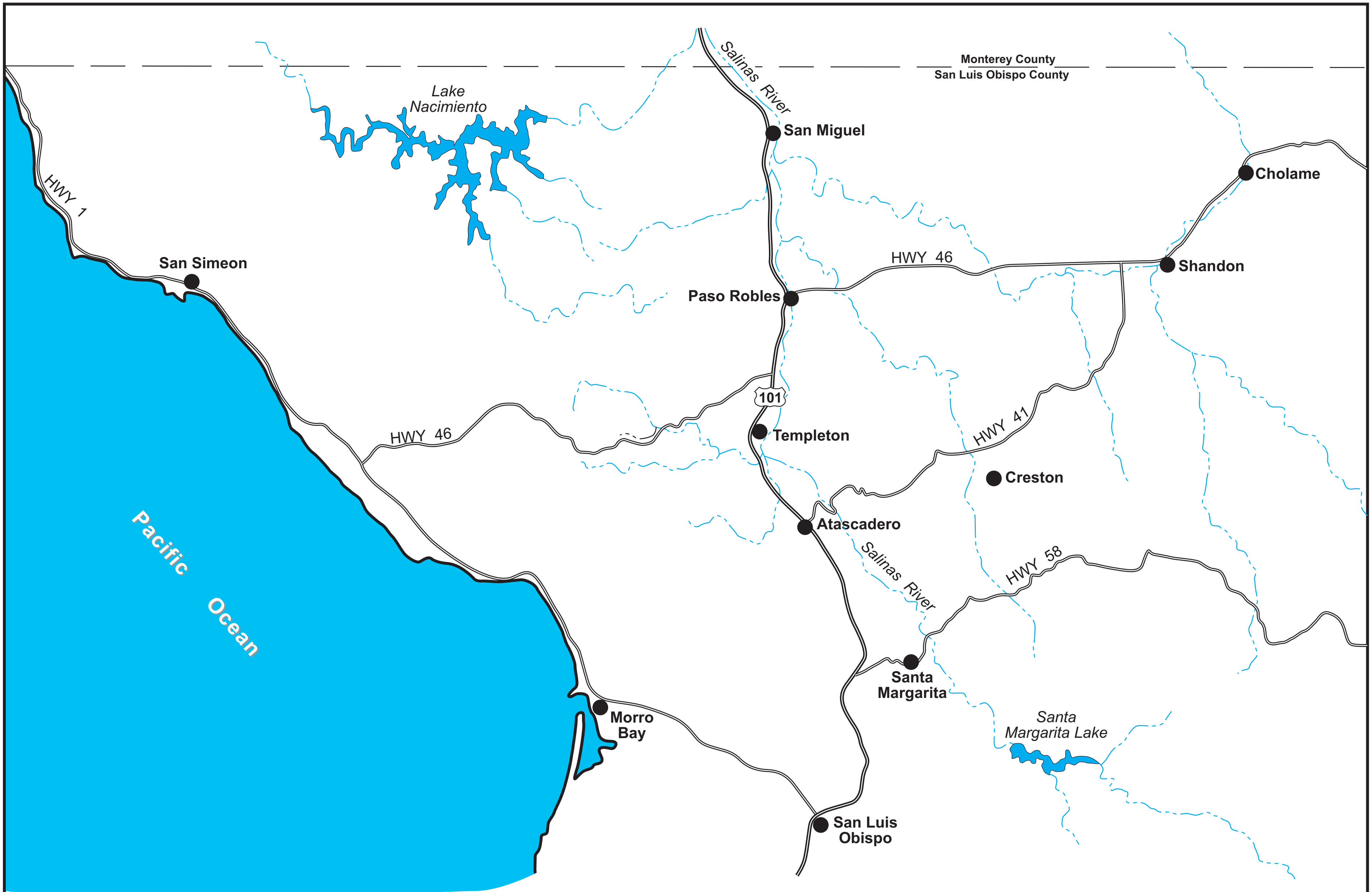
FIGURES



April 2008

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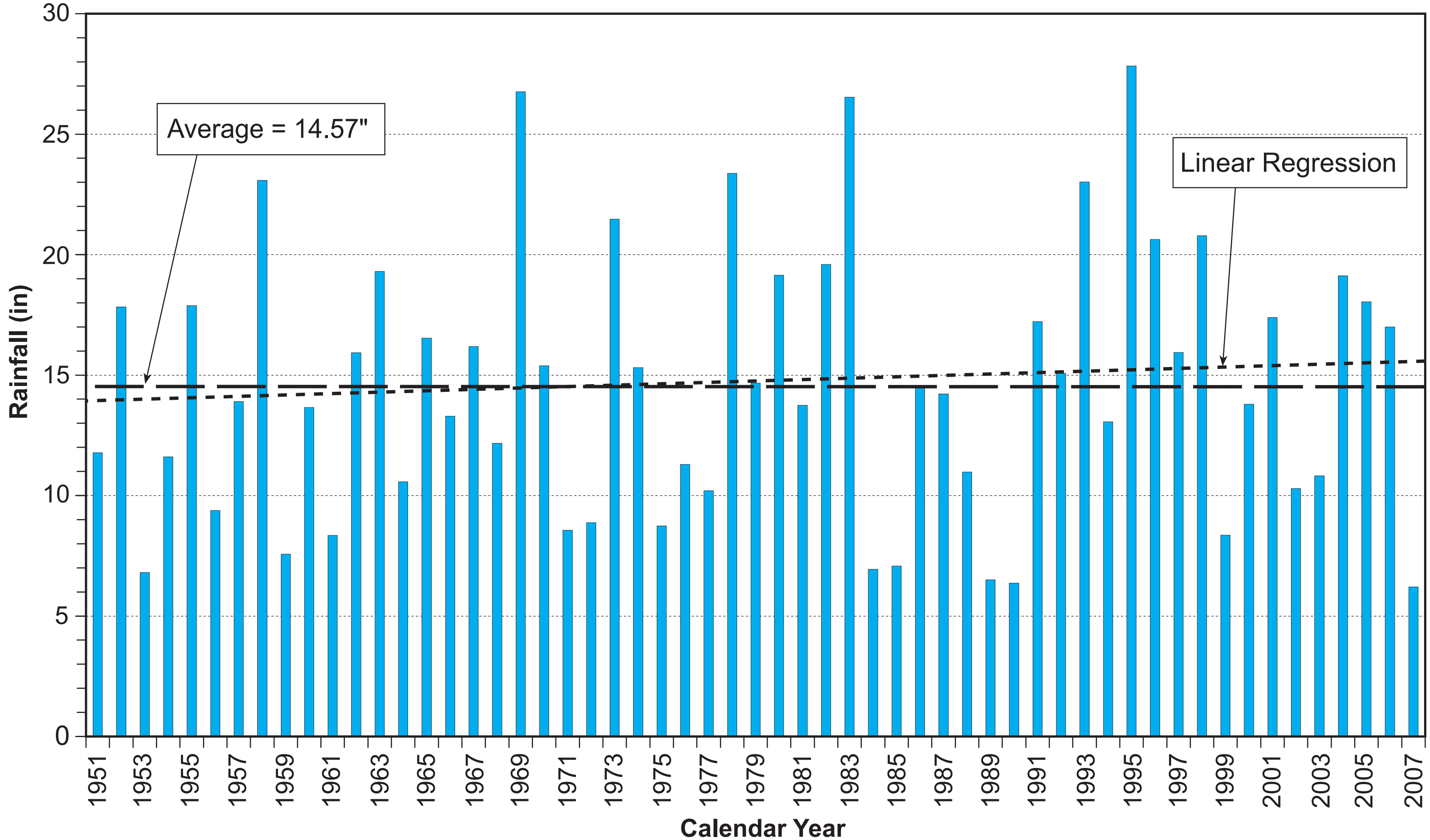
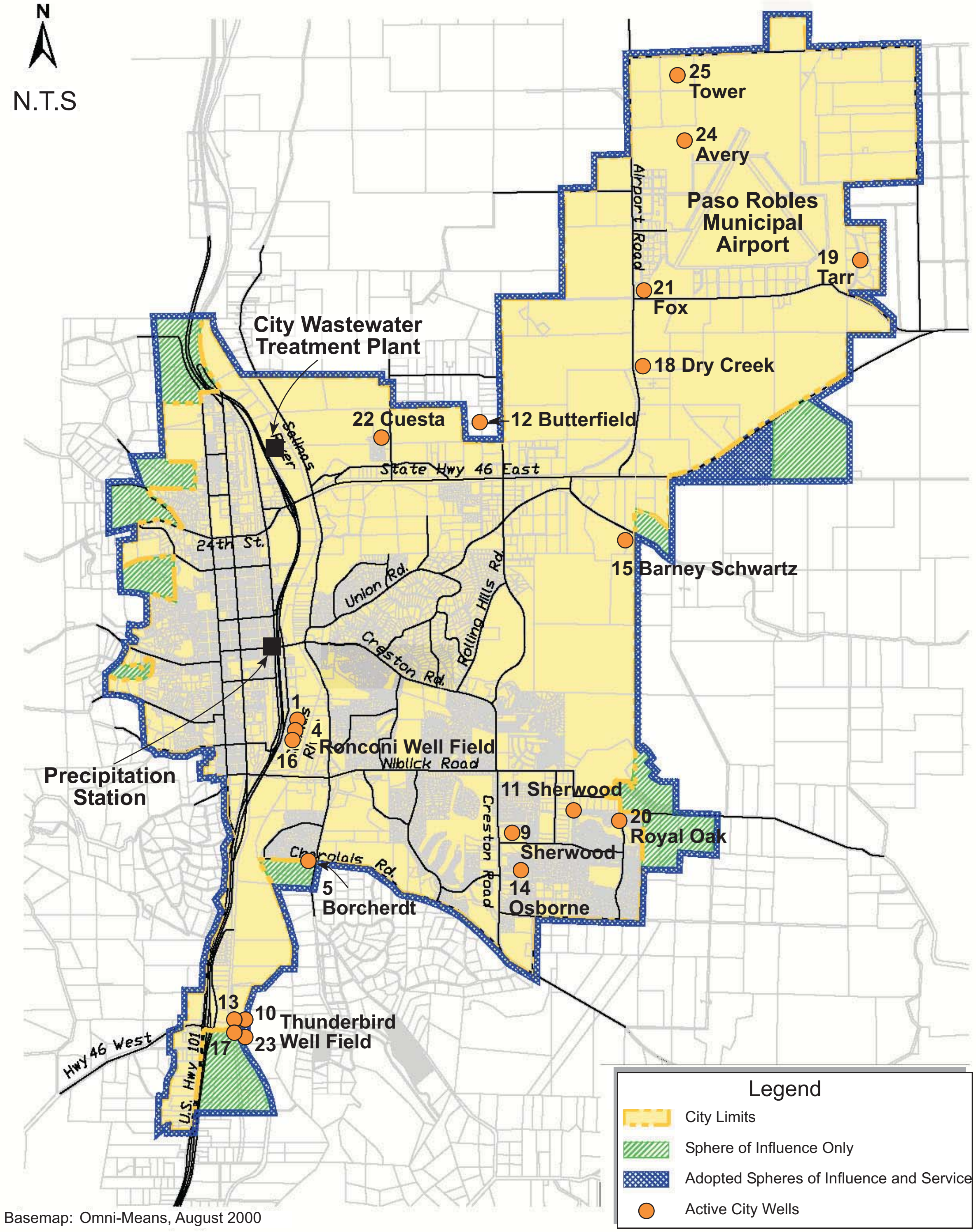
Alameda, California

Figure 1
Paso Robles
Location Map

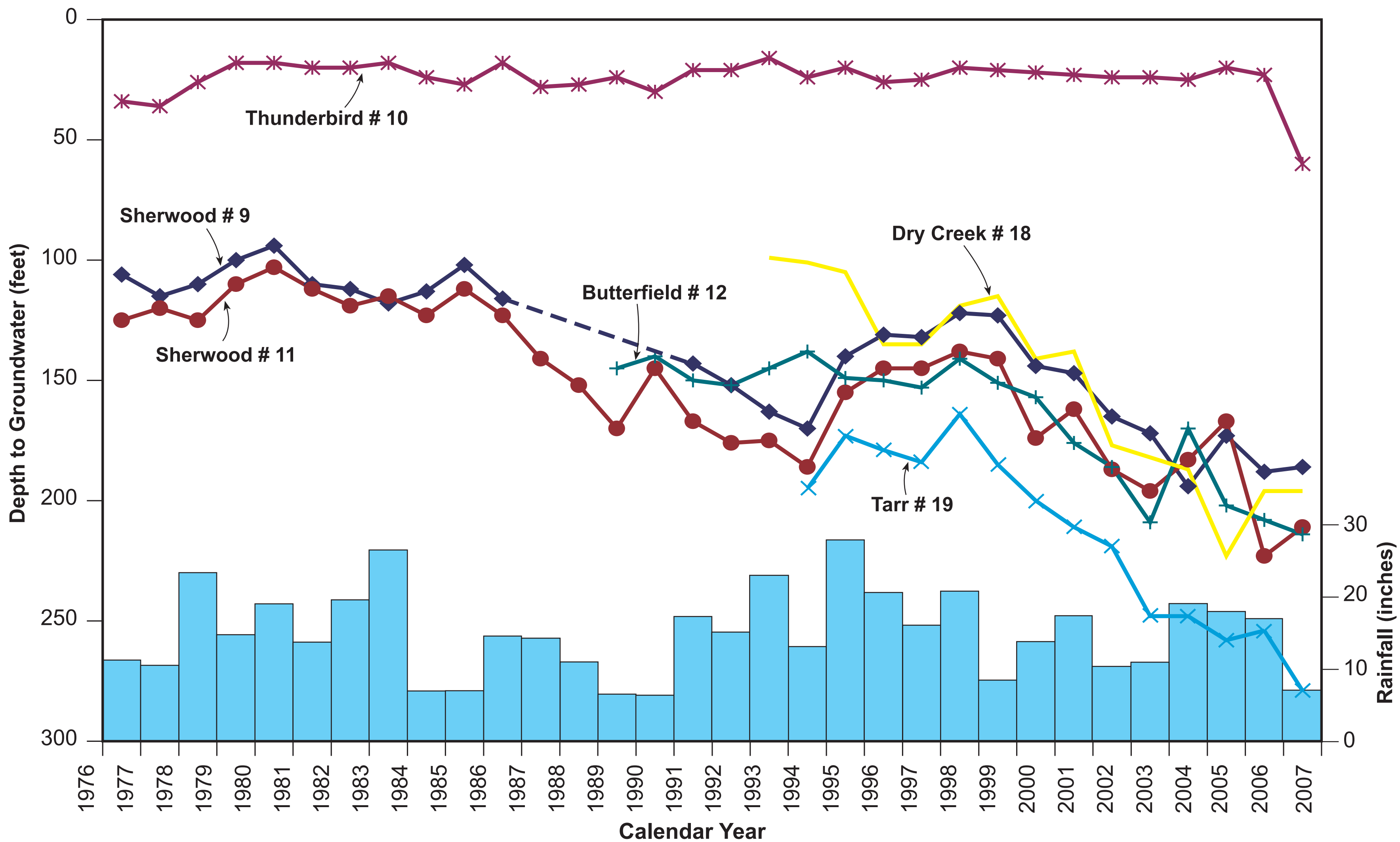


Station "Salinas River at Paso Robles (PAS)" monitored by DWR and USGS.

February 2008	**Figure 2**
TODD ENGINEERS Alameda, California	**Paso Robles Precipitation**



April 2008	Figure 3 Paso Robles Boundaries and Facilities
TODD ENGINEERS Alameda, California	

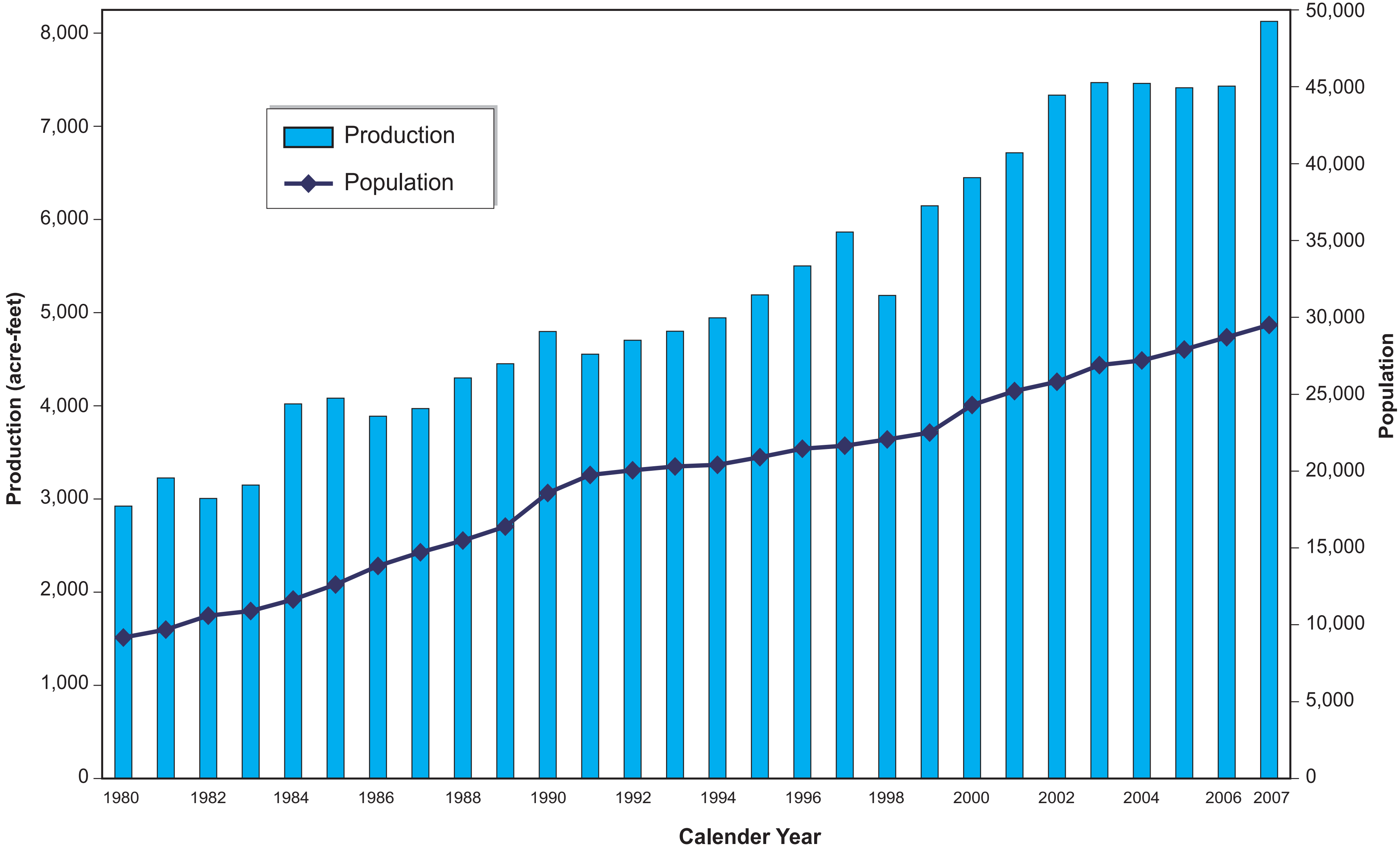


Salinas River at Paso Robles
Precipitation station monitored by DWR and USGS

April 2008

TODD ENGINEERS
Alameda, California

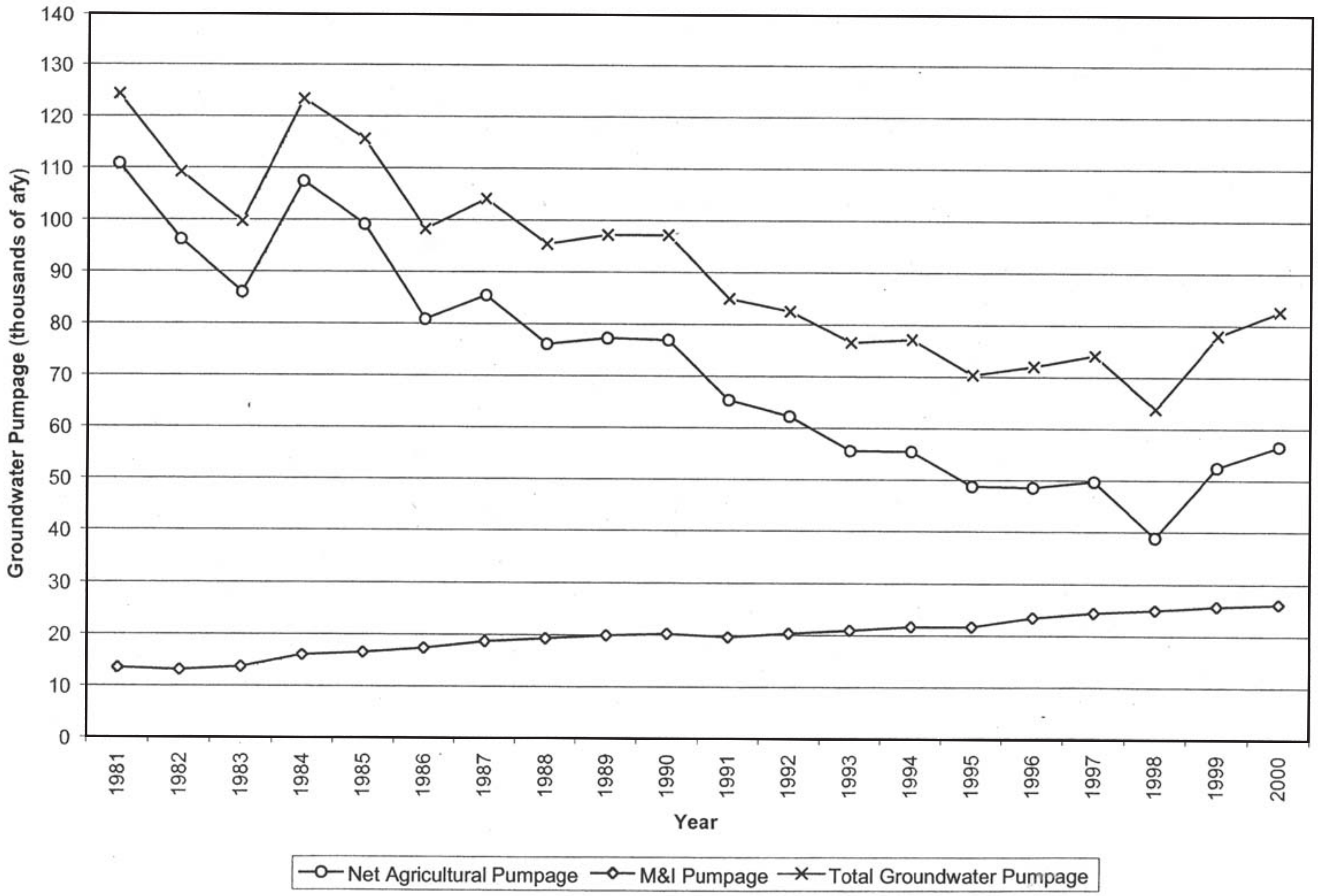
Figure 4
Paso Robles Depth to Groundwater and Rainfall



April 2008

TODD ENGINEERS
Alameda, California

Figure 5
Paso Robles
Water Production
and Population



From Fugro, August 2002.

April 2008	Figure 6 Paso Robles Groundwater Basin Pumpage History
TODD ENGINEERS Alameda, California	

TABLES

Table 1

Coordination with Appropriate Agencies

	Participated in developing the plan	Was contacted for assistance	Was sent a copy of the draft plan or notified plan would be supplied upon request	Attended public meetings	Commented on the draft
Atascadero Mutual Water Company			X		
Templeton Community Services District			X		
San Luis Obispo County Engineering Department			X		X
City of Atascadero			X		
Paso Robles Public Library			X		
California Regional Water Quality Control Board			X		
Paso Robles Chamber of Commerce			X		
San Miguel Community Services District			X		
Paso Robles Imperiled Overlying Rights (PRIOR)			X		
Citizens				X	X

Table 2 Climate Data			
	Average Rainfall (inches/month)	**Average Eto (inches/month)**	**Average Temperature (°F)**
January	3.21	2.21	47.0
February	2.91	2.5	50.2
March	2.33	3.8	53.2
April	1.09	5.08	57.0
May	0.31	5.7	62.1
June	0.03	6.19	67.3
July	0.02	6.43	71.8
August	0.05	6.09	71.4
September	0.23	4.87	68.4
October	0.63	4.09	61.5
November	1.45	2.89	52.5
December	2.31	2.28	47.0
Calendar Year Average Total	**14.57**	**52.13**	**-**
Monthly Average	**1.21**	**4.34**	**59.1**

Precip Data Source: Salinas River at Paso Robles (PAS) monitored by DWR and USGS, 1951 - 2007
Eto Data Source: CIMIS Station 163 Atascadero, 2000 - 2004
Temperature Data Source: NCDC Station 046730 Paso Robles mean monthly averages, 1901 - 2007

Table 3 Population - Current and Projected							
	1990	**2000**	**2005**	**2010**	**2015**	**2020**	**2025**
Service Area Population	18,583	24,297	27,361	30,811	34,697	39,073	44,000*

* Buildout as per City of El Paso de Robles General Plan 2003
1990 and 2000 populations from Census
2010, 2015, and 2020 estimated based on annual linear growth rate of approximately 2.4%

Table 4 Past, Current and Projected Water Deliveries												
	2000		2005		2010		2015		2020		2025	
Water Use Sectors	**# of Accounts**	**Deliveries (AFY)**	**# of Accounts**	**Deliveries (AFY)**	**# of Accounts**	**Deliveries (AFY)**	**# of Accounts**	**Deliveries (AFY)**	**# of Accounts**	**Deliveries (AFY)**	**# of Accounts**	**Deliveries (AFY)**
Single Family	6,862	4,500	8,100	4,170	9,425	4,807	10,750	5,445	12,075	6,082	13,400	6,720
Multi-family	In other categories	In other categories	1,600	685	3,525	1,447	5,450	2,210	7,375	2,972	9,300	3,735
Commercial	437	700	632	868	1,010	1,393	1,389	1,918	1,768	2,444	2,146	2,969
Industrial	Included in commercial	Included in commercial	63	167	101	268	138	369	176	470	214	571
Parks, Landscape Irrigation, Other	301	800	325	845	369	951	412	1,057	456	1,164	500	1,270
Total	7,600	6,000	10,720	6,735	14,430	8,866	18,139	10,999	21,850	13,132	25,560	15,265

Connections

2000 total connections from App (April 2000) and assume same breakdown as in 1999 City supplied spreadsheet, multi-family units not all individually metered
2005 connections derived from 2004 DWR Public Water System Status form and General Plan update, p.4 and LU-1, residential units for 2003 which appears to include all multi-family units
2025 connections using Boyle's 2025 demand (September 23, 2005) and same water use (AF/connection) as in 2005
Note conversion of Boyle (September 23, 2005) land use water demand values to connections results in more residential units than General Plan update [p. 4, max residential units = 16, 843]

Deliveries

2000 deliveries estimated from total pumping (assuming 7% loss) and similar use per connection as 2004/2005, 2000 does not include all multi-family connections
2005 deliveries derived from 2004 DWR worksheet total pumping minus 10% losses and Boyle June 2006b
2025 deliveries from Boyle draft Table 5 (September 23, 2005) annual demand for various land use categories at 2025 buildout

Assumed linear increase for all land use categories between 2005 and 2025

Table 5 Water Losses and Total Water Use (AFY)						
Water Use	**2000**	**2005**	**2010**	**2015**	**2020**	**2025**
Unaccounted-for System Losses	449	679	664	831	968	1,135
Water Deliveries (from Table 4)	6,000	6,735	8,866	10,999	13,132	15,265
Total	**6,449**	**7,414**	**9,530**	**11,830**	**14,100**	**16,400**

Table 6 Amount of Water Pumped (AFY)								
Basin Name (s)	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Paso Robles Basin	2,797	3,132	3,789	3,742	3,138	2,856	3,366	4,103
Salinas River Underflow	3,652	3,587	3,548	3,728	4,324	4,558	4,065	4,023
Total Pumpage	**6,449**	**6,719**	**7,337**	**7,470**	**7,462**	**7,414**	**7,431**	**8,126**
% of Total Supply*	**6.6%**	**6.9%**	**7.5%**	**7.6%**	**7.6%**	**7.6%**	**7.6%**	**8.3%**

Table 7 Amount of Water Projected to be Pumped (AFY)				
Basin Name(s)	**2010**	**2015**	**2020**	**2025**
Paso Robles Basin	930	2,856	2,856	2,856
Salinas River Underflow	4,600	4,600	4,600	4,600
Total Pumpage	**5,530**	**7,456**	**7,456**	**7,456**
% of Total Supply*	**5.7%**	**7.6%**	**7.6%**	**7.6%**

*Total Supply is defined as the 97,700 AFY perennial yield of the Paso Robles Basin based on the Paso Robles Groundwater Basin Study (Fugro, 2005). The perennial yield value does not differentiate Salinas River underflow from basin groundwater.

Table 8 Wastewater Collection and Treatment (AFY)						
Type of Wastewater	2000	2005	2010	2015	2020	2025
Wastewater Collected and Treated in Service Area*	3,152	3,315	3,740	4,160	4,585	5,005
Volume that Meets Tertiary Standard**	0	0	0	0	0	944

*2000 and 2005 from Hagemann (2005 and 2006)
Assumes 0.11 AF/capita for 2025 and linear increase between 2005 and 2025
**Unlimited use, from Hagemann (2005)

Table 9 Recycled Water Plan Participating Agencies	
	Plan Development Role
San Luis Obispo County	Advisory
Regional Water Quality Control Board	Advisory

Table 10 Disposal of Non-Recycled Wastewater (AFY)						
Method of Disposal	Treatment Level	2005	2010	2015	2020	2025
Ponds	Secondary	3,315	3,740	4,160	4,585	4,061
	Total	3,315	3,740	4,160	4,585	4,061

from Hagemann (2005 and 2006) and Table 8

Table 11 Projected Future Use of Recycled Water in Service Area (AFY)				
	2010	2015	2020	2025
Recycled Water Use	0	0	0	944
Total	0	0	0	944

from Hagemann (2005) and Table 8

Table 12 Methods to Encourage Recycled Water Use				
	AF of Use Projected to Result from this Action			
	2010	2015	2020	2025
Financial Incentives and Public Education	0	0	0	944
Total	0	0	0	944

Table 13
Current and Planned Water Supplies (AFY)

Water Supply Sources	2005	2010	2015	2020	2025
Basin Wells	2,856	930	2,856	2,856	2,856
River Wells	4,558	4,600	4,600	4,600	4,600
Nacimiento Water	0	4,000	4,374	6,644	8,000
Recycled Water (projected use)	0	0	0	0	944
Total	**7,414**	**9,530**	**11,830**	**14,100**	**16,400**

Table 14 Current Supply Reliability (AFY)					
Average / Normal Water Year (2005)	Single Dry Water Year (2007)	Multiple Dry Water Years			
		Year 1 (1987)	Year 2 (1988)	Year 3 (1989)	Year 4 (1990)
7,414	7,414	7,414	7,414	7,414	7,414
% of Normal	100%	100%	100%	100%	100%
Potential Peaking Problems	Yes	Yes	Yes	Yes	Yes

Table 15 Three-Year Estimated Minimum Water Supply (AFY)				
	Normal	2008	2009	2010
Percolating Groundwater	2,856	2,856	2,856	2,856
Underflow	4,558	4,558	4,558	4,558
Nacimiento	(4,000)*	NA	NA	4,000
Total	7,414	7,414	7,414	11,414

* Nacimiento water available in 2010

Table 16 Future Water Supply Projects							
Project Name	Projected Start Date	Projected Completion Date	Normal-Year (AF)	Single-Dry Year (AF)	First Multiple-Dry Year (AF)	Second Multiple-Dry Year (AF)	Third Multiple-Dry Year (AF)
Nacimiento	ongoing	2010	4,000	4,000	4,000	4,000	4,000
Future Nacimiento	unknown	2025	4,000	4,000	4,000	4,000	4,000
Recycled	unknown	2025	944	944	944	944	944

Table 17 Projected Normal Water Supply (AFY)				
(from Table 13)	**2010**	**2015**	**2020**	**2025**
Supply	9,530	11,830	14,100	16,400
% of Normal Year (2005)	129%	160%	190%	221%

Table 18 Projected Normal Water Demand (AFY)				
(from Table 5)	**2010**	**2015**	**2020**	**2025**
Demand	9,530	11,830	14,100	16,400
% of Year 2005	129%	160%	190%	221%

Table 19 Projected Supply and Demand Comparison (AFY)				
	2010	**2015**	**2020**	**2025**
Supply Totals	9,530	11,830	14,100	16,400
Demand Totals	9,530	11,830	14,100	16,400
Difference (Supply-Demand)	0	0	0	0
Difference as % of Supply	0%	0%	0%	0%
Difference as % of Demand	0%	0%	0%	0%

Table 20 Projected Single Dry Year Water Supply (AFY)				
	2010	**2015**	**2020**	**2025**
Supply	9,530	11,830	14,100	16,400
% of Projected Normal	100%	100%	100%	100%

Table 21 Projected Single Dry Year Water Demand (AFY)				
	2010	**2015**	**2020**	**2025**
Demand	9,244	11,475	13,677	15,908
% of Projected Normal	97%	97%	97%	97%

Table 22 Projected Single Dry Year Supply and Demand Comparison (AFY)				
	2010	**2015**	**2020**	**2025**
Supply Totals	9,530	11,830	14,100	16,400
Demand Totals	9,244	11,475	13,677	15,908
Difference (Supply-Demand)	286	355	423	492
Difference as % of Supply	3%	3%	3%	3%
Difference as % of Demand	3%	3%	3%	3%

Table 23 Projected Supply During Multiple Dry Year Period Ending in 2010 (AFY)					
	2006	**2007**	**2008**	**2009**	**2010**
Supply	7,876	8,289	8,703	9,116	9,530
% of Projected Normal	100%	100%	100%	100%	100%
Potential Peaking Problems	-	Yes	Yes	Yes	No

Table 24 Projected Demand Multiple Dry Year Period Ending in 2010 (AFY)					
	2006	**2007**	**2008**	**2009**	**2010**
Demand	7,088	7,460	7,833	8,205	8,577
% of Projected Normal	90%	90%	90%	90%	90%

Table 25 Projected Supply and Demand Comparison During Multiple Dry Year Period Ending in 2010 (AFY)					
	2006	**2007**	**2008**	**2009**	**2010**
Supply Totals	7,876	8,289	8,703	9,116	9,530
Demand Totals	7,088	7,460	7,833	8,205	8,577
Difference (Supply-Demand)	788	829	870	912	953
Difference as % of Supply	10%	10%	10%	10%	10%
Difference as % of Demand	11%	11%	11%	11%	11%
Potential Peaking Problems	-	Yes	Yes	Yes	No

Table 26 Projected Supply During Multiple Dry Year Period Ending in 2015 (AFY)					
	2011	2012	2013	2014	2015
Supply	9,990	10,450	10,910	11,370	11,830
% of Projected Normal	100%	100%	100%	100%	100%

Table 27 Projected Demand Multiple Dry Year Period Ending in 2015 (AFY)					
	2011	2012	2013	2014	2015
Demand	8,991	9,405	9,819	10,233	10,647
% of Projected Normal	90%	90%	90%	90%	90%

Table 28 Projected Supply and Demand Comparison During Multiple Dry Year Period Ending in 2015 (AFY)					
	2011	2012	2013	2014	2015
Supply Totals	9,990	10,450	10,910	11,370	11,830
Demand Totals	8,991	9,405	9,819	10,233	10,647
Difference (Supply-Demand)	999	1,045	1,091	1,137	1,183
Difference as % of Supply	10%	10%	10%	10%	10%
Difference as % of Demand	11%	11%	11%	11%	11%

Table 29 Projected Supply During Multiple Dry Year Period Ending in 2020 (AFY)					
	2016	**2017**	**2018**	**2019**	**2020**
Supply	12,284	12,738	13,192	13,646	14,100
% of Projected Normal	100%	100%	100%	100%	100%

Table 30 Projected Demand Multiple Dry Year Period Ending in 2020 (AFY)					
	2016	**2017**	**2018**	**2019**	**2020**
Demand	11,056	11,464	11,873	12,281	12,690
% of Projected Normal	90%	90%	90%	90%	90%

Table 31 Projected Supply and Demand Comparison During Multiple Dry Year Period Ending in 2020 (AFY)					
	2016	**2017**	**2018**	**2019**	**2020**
Supply Totals	12,284	12,738	13,192	13,646	14,100
Demand Totals	11,056	11,464	11,873	12,281	12,690
Difference (Supply-Demand)	1,228	1,274	1,319	1,365	1,410
Difference as % of Supply	10%	10%	10%	10%	10%
Difference as % of Demand	11%	11%	11%	11%	11%

Table 32 Projected Supply During Multiple Dry Year Period Ending in 2025 (AFY)					
	2021	**2022**	**2023**	**2024**	**2025**
Supply	14,560	15,020	15,480	15,940	16,400
% of Projected Normal	100%	100%	100%	100%	100%

Table 33 Projected Demand Multiple Dry Year Period Ending in 2025 (AFY)					
	2021	**2022**	**2023**	**2024**	**2025**
Demand	13,104	13,518	13,932	14,346	14,760
% of Projected Normal	90%	90%	90%	90%	90%

Table 34 Projected Supply and Demand Comparison During Multiple Dry Year Period Ending in 2025 (AFY)					
	2021	**2022**	**2023**	**2024**	**2025**
Supply Totals	14,560	15,020	15,480	15,940	16,400
Demand Totals	13,104	13,518	13,932	14,346	14,760
Difference (Supply-Demand)	1,456	1,502	1,548	1,594	1,640
Difference as % of Supply	10%	10%	10%	10%	10%
Difference as % of Demand	11%	11%	11%	11%	11%

Table 35 Factors Resulting in Inconsistency of Supply				
Name of supply	**Legal**	**Environmental**	**Water Quality**	**Climatic**
Basin Groundwater	Potential basin adjudication	Potential overdraft, earthquake damage, power outage	Potential contamination	Long-term severe drought
Underflow Groundwater	Loss or reduction of water rights	Earthquake damage, power outage	Potential contamination	Long-term severe drought
Nacimiento Water	None anticipated	Earthquake damage	Potential contamination	Long-term severe drought
Recycled Water	Future restrictions on use and quality	Earthquake damage	Potential salt loading in basin	None anticipated

Table 36 Current and Projected Water Supply Changes due to Water Quality (percent)					
Water Source	**2005**	**2010**	**2015**	**2020**	**2025**
Groundwater	0	0	0	0	0
Nacimiento	0	0	0	0	0
Recycled	0	0	0	0	0

Table 37 Preparation Actions for a Catastrophe	
Possible Catastrophe	**Summary of Actions**
Regional Power Outage	Backup generator
Earthquake	Initiate Resolution 90-49 (Water Management Contingency Plan) or 04-171 (Water Shortage Contingency Plan from 2003 earthquake) or suggested resolution in Appendix C
Water Quality Impact	Minimized by initiation of DWSAP, response similar to earthquake
System Failure	Response similar to earthquake

Table 38 Water Supply Shortage Stages and Conditions		
Stage No.	**Water Supply Conditions/Rationing**	**Shortage**
1	Voluntary 10% reduction of total	Precipitation 65% of normal for one year
2	Mandatory 20% reduction of total	Precipitation 65% of normal for two years or 50% of normal for one year
3	Mandatory 50% reduction of total	Precipitation 65% of normal for two years or 50% of normal for one year

Table 39 Consumption Reduction Methods		
Consumption Reduction Methods	Stage When Method Takes Effect	Projected Reduction (percent)
Incentives to reduce water consumption	1	10
Education program	1	10
Voluntary rationing	1	10
Mandatory rationing	2	20
Use prohibitions	2	20
Restrict for only priority uses	3	50

Table 40 Prohibitions		
Examples of Prohibitions	Stage When Prohibition is Voluntarily Requested	Stage When Prohibition Becomes Mandatory
Street and sidewalk cleaning	1	2
Washing cars	1	2
Watering lawns/landscapes/parks	1	2
Uncorrected plumbing leaks	1	2
Construction water uses	1	2
Gutter flooding	1	2

Table 41 Penalties and Charges	
Penalties or Charges	Stage When Penalty Takes Effect
Flat fine	2
Termination of service	2

Table 42 Actions and Conditions that Impact Revenues	
Type	**Anticipated Revenue Reduction**
Reduced Sales/Income*	$270,000 to $540,000

*10% or 20% of the 2004 water revenue of $2.7 million from Boyle (July 2005)

Table 43 Actions and Conditions that Impact Expenditures	
Category	**Anticipated Cost**
Increase Staff Cost	0
Increased O&M Cost	0
Increased Cost of Supply and Treatment	0

Table 44 Proposed Measures to Overcome Revenue Impacts	
Names of Measure	**Summary of Effects**
Use of Reserves	Short-term use
Rate Adjustment	For severe situations

Table 45 Water Use Monitoring Mechanisms	
Mechanism for Determining Actual Reductions	**Type data expected**
Monitoring Production	Weekly volumes
Monitoring Distribution	Weekly volumes
Increased Select Meter Reading	Weekly volumes
Monitoring WWTP Inflow	Weekly volumes

Table 46 DMM Implementation Summary			
DMM	**Recommended and Year Begin**	**Cost or Benefit**	**Range of Water Savings, AFY 2006 to 2010**
Phase 1			
12. Conservation Coordinator	Yes, 2010	Cost	Not applicable
4. Metering with Commodity Rates	Yes, 2010	Benefit	126 to 631
3. System Water Audits	Pending further study, 2015	Cost	0
Leak Detection	Pending further study, 2015	Cost	37 to 164
11. Conservation Pricing	Yes, 2015	Benefit	135 to 63
Phase 2			
7. Public Information Programs	Yes, continue	Not estimated	Not estimated
8. School Education Programs	Yes, continue	Not estimated	Not estimated
Phase 3			
1. Water Survey Programs	Pending further study, 2020	Cost	165 to 437
9. Conservation of CII	Pending further study, 2015	Benefit	51 to 154
5. Large Landscape Programs	Yes, 2010	Possible benefit	34 to 85
Phase 4			
2. Residential Plumbing Retrofits	Yes, 2020	Benefit later	8 to 19
6. High Efficiency Washing Machine	Pending further study, 2020	Cost	0 to 2
14. Ultra-Low-Flush Toilets	Yes, 2015	Benefit later	3 to 16
13. Water Waste Prohibitions	Yes, 2015	Not applicable	Not applicable
Not Applicable			
10. Wholesale Agency Programs	Not applicable	Not applicable	Not applicable

APPENDIX A

Resolution Adopting the Urban Water Management Plan
and Proof of Public Hearing

RESOLUTION NO. 08-XX

A Resolution of the City Council of the City of Paso Robles
Adopting the Urban Water Management Plan

WHEREAS, the California Urban Water Management Planning Act ("Act") (California Water Code Sections 10620 et seq.) requires every urban water supplier providing municipal water directly or indirectly to more than 3,000 customers or supplying more than 3,000 acre-feet of water annually to develop an Urban Water Management Plan; and

WHEREAS, the Act requires that an urban water management plan be updated every five years; and

WHEREAS, the City of Paso Robles last updated its Urban Water Management Plan in 2000; and

WHEREAS, a draft of the updated Urban Water Management Plan has been circulated for public review and all comments received have been reviewed and considered; and a properly noticed public hearing was held by the City Council on July 1, 2008, prior to adoption of a Final Urban Water Management Plan, all in compliance with the requirements of the Act; and

THEREFORE, BE IT RESOLVED AS FOLLOWS:

1. The Urban Water Management Plan is hereby adopted and ordered filed with the City Clerk.
2. The Director of Public Works is hereby authorized and directed to file this Plan with the California Department of Water Resources;
3. The Director of Public Works shall recommend to the City Council additional procedures, rules, and regulations to carry out effective and equitable allocation of water resources during a water shortage.

Passed and adopted this 1st Day of July, 2008 by the following vote
AYES:
NOES:
ABSTAIN:
ABSENT:

____
Frank R. Mecham, Mayor

ATTEST:

____
Deborah D. Robinson, Deputy City Clerk

CITY OF EL PASO DE ROBLES

"The Pass of the Oaks"

CITY COUNCIL MINUTES

Tuesday, June 3, 2008   7:30 PM

MEETING LOCATION: PASO ROBLES LIBRARY/CITY HALL CONFERENCE CENTER, 1000 SPRING STREET

PLEASE SUBMIT ALL CORRESPONDENCE FOR CITY COUNCIL PRIOR TO THE MEETING WITH A COPY TO THE CITY CLERK

7:30 PM – CONVENE REGULAR MEETING

CALL TO ORDER – Downstairs Conference Center

PLEDGE OF ALLEGIANCE

INVOCATION

ROLL CALL Councilmembers John Hamon Gary Nemeth, Fred Strong, and Frank Mecham
Absent: Duane Picanco

PUBLIC COMMENTS

- Pearl Munak, Transitional Food & Shelter, recognition of Mayor Pro Tem Nemeth and Councilman Strong
- Kathy Barnett

AGENDA ITEMS TO BE DEFERRED (IF ANY) – City Manager Jim App announced that Agenda Item No. 10 is being recommended for continuance.

PRESENTATIONS - None

PUBLIC HEARINGS

1. Urban Water Management Plan
D. Monn, Public Works Director

The City Council held a Public Hearing regarding the Draft 2005 Urban Water Management Plan. A copy of the plan is available on the City's website. Christopher Alakel presented the staff report, and Iris Priestaf, Todd Engineers reviewed the plan.

Mayor Mecham opened the public hearing. Speaking from the public was Joyce Sprague, Kathy Barnett, Dale Gustin, and John Borst. There were no further comments from the public, either written or oral, and the public discussion was closed.

Mayor Mecham encouraged the public to provide comments on the Public Draft. The Final UWMP is tentatively scheduled for presentation to City Council for adoption on July 1, 2008.

CONSENT CALENDAR

Mayor Mecham called for public comments on Consent Calendar items. There were no comments from the public, either written or oral, and the public discussion was closed.

2. Approve City Council minutes of May 20, 2008

3. Approve Warrant Register: Nos. 77424—77558 (05/16/08) and 77559—77716 (05/23/08), and Other Payroll Services

4. Receive and file Advisory Body Committee minutes as follows:
Senior Citizen Advisory Committee meeting of April 14, 2008

5. Proclamation declaring June 9-10, 2008 as Special Olympics – Law Enforcement Torch Run Days in Paso Robles.

6. Adopt Resolution No. 08-084 approving an appropriation limit for the fiscal year 2009 operating and maintenance budget.

7. Adopt Resolution No. 08-085 approving a promissory note for a portion of the cost of the new City of Paso Robles telephone system in the amount of $219,000.

8. Adopt Resolution No. 08-086 authorizing renewal of the Memorandum of Understanding between the City, YMCA, and the Paso Robles Joint Unified School District for the After School Enrichment Program, held at Centennial Park.

9. Adopt Resolution No. 08-087 approving renewal of the 2005 Cooperation Agreement with the County of San Luis Obispo to defer its entitlement status for CDBG funds in order to enable the County to qualify as an "urban county".

Consent Calendar Items Nos. 2-9 were approved on a single motion by Councilmember Nemeth, seconded by Councilmember Strong, with Mayor Mecham abstaining on Warrant Register Items No. 077666.

Motion passed by the following roll call vote:

AYES: Hamon, Nemeth, Strong, and Mecham
NOES:
ABSTAIN:
ABSENT: Picanco

DISCUSSION

10. **Award of Membrane Filtration System for Water Treatment Plant**
D. Monn, Public Works Director

The City Council considered awarding a contract to one of three pre-qualified vendors associated with Stage I of the Membrane Filtration System needed for the Water Treatment

PROOF OF PUBLICATION

LEGAL NEWSPAPER NOTICES

CITY COUNCIL
PROJECT NOTICING

Newspaper: The Tribune

Date of Publication: June 16, 2008

Meeting Date: July 1, 2008
City Council

Project: Notice of Hearing for Future Proposed Urban Water Management Plan

I, Sharie A. Scott, employee of the Public Works Department, of the City of El Paso de Robles, do hereby certify that this notice is a true copy of a published legal newspaper notice for the above named project.

Signed: [signature]
Sharie A. Scott

CITY OF EL PASO DE ROBLES
PUBLIC NOTICE

NOTICE OF PUBLIC HEARING OF THE CITY COUNCIL OF THE CITY OF EL PASO DE ROBLES ON A PROPOSED URBAN WATER MANAGEMENT PLAN

NOTICE IS HEREBY GIVEN that the City Council of the City of El Paso de Robles (the "CITY COUNCIL") will hold a public hearing on Tuesday, July 1, 2008, at 7:30p.m. at City Hall, located at 1000 Spring Street, Paso Robles, California, to consider and act upon a proposed Urban Water Management Plan (the "PLAN").

The hearing will address the following topics under the proposed water management plan:

- Water supply and demand for the CITY
- Water shortage contingency plan
- Water demand management measures

Copies of the PLAN are available for public review and inspection at the Paso Robles Library, 1000 Spring Street, Paso Robles. It is also available on-line at the City's website at www.prcity.com, and at www.pasorobleswaterproject.com.

Interested persons may submit written comments addressed to Christopher Alakel, Water Resources Manager of the City of El Paso de Robles, 1000 Spring Street, Paso Robles, 93446, prior to 5 p.m. on July 1, 2008.

At the time and place noted above, all persons interested in the above matters may appear and be heard.

Deborah Robinson
Deputy City Clerk

Dated: June 9, 2008
June 16, 23, 2008 6734710

APPENDIX B

Resolution No. 90-94
Adopting the Water Management Contingency Plan
and
Resolution No. 04-171
Adopting a Water Shortage Contingency Plan due to the
December 22, 2003, San Simeon Earthquake

APPENDIX B

RESOLUTION NO. 90-49

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF PASO ROBLES ADOPTING THE WATER MANAGEMENT CONTINGENCY PLAN

WHEREAS, a Water Management Contingency Plan has been prepared to address the possibility of reduced water supplies in the future; and

WHEREAS, the City of Paso Robles has two very dependable sources of water, either of which could supply all of the demand; and

WHEREAS, good management of this utility requires an operations contingency plan in the event of extreme circumstances.

NOW, THEREFORE, BE IT RESOLVED AS FOLLOWS:

Section 1. That the City Council of the City of Paso Robles approves the attached Water Management Contingency Plan.

PASSED AND ADOPTED by the City Council of the City of Paso Robles, this 3rd day of April, 1990, on the following vote:

AYES: Russell, Conway, Cousins and Martin
NOES: None
ABSENT: Reneau

Steven W. Martin, Mayor

ATTEST:

Jerry Bankston, City Clerk

STATE OF CALIFORNIA)
COUNTY OF SAN LUIS OBISPO)ss.
CITY OF EL PASO DE ROBLES)

I, ...Jerry Bankston.........., City Clerk/~~Deputy City Clerk~~ of the City of El Paso de Robles, California, do hereby certify that the foregoing ...Resolution No. 90-49......... was duly and regularly adopted, passed and approved by the City Council of the City of El Paso de Robles, California, at a ...regular...... meeting of said City Council held at the regular meeting place thereof, on the .3rd............... day of ....April.........., 19.90...,
by the following vote:

AYES:..........Russell, Conway, Cousins and Martin..........

NOES:..........None..........

ABSENT:........Reneau..........

ABSTAINED:.....None..........

Dated this........3rd......day of...April..., 19.90.

City Clerk and Ex-Officio Clerk of the City Council, City of El Paso de Robles, State of California

WATER MANAGEMENT CONTINGENCY PLAN

I. POLICY STATEMENT

The City of Paso Robles obtains its water supply from groundwater sources: from the Paso Robles formation and from wells along the Salinas River. Although Paso Robles is not immediately impacted by lack of rainfall as are those municipalities solely dependent upon surface water supplies, long term drought conditions can negatively affect recharge into these groundwater aquifers and an emergency situation, such as the failure of a large well or disruption resulting from a manmade or natural disaster, i.e., an earthquake, which can restrict or impede the City's ability to provide potable water to its citizens. Despite the City's diligent efforts toward planning for the future, while ensuring the water needs of today, it is obviously beneficial to have a Water Management Contingency Plan in place if and when such events occur.

II. PROVISIONS OF WATER MANAGEMENT CONTINGENCY PLAN

Stage 1 - Minor

A. Triggering Criteria: (1) pumpage of 90% of production capacity for three consecutive days, (2) failure to meet maximum day demand for two consecutive days, or (3) falling water levels which do not fill above 90% overnight for two consecutive days.

B. Public Sector Actions: Provide information to the public and disseminate technical information; explain other stages and possible actions; request voluntary reduction of water usage.

C. User Restrictions: None

Stage 2 - Moderate

A. Triggering Criteria: (1) pumpage of 95% of production capacity for three consecutive days, (2) failure to meet maximum day demand for three consecutive days, or (3) water levels which do not fill above 80% overnight for two consecutive days.

B. Public Sector Actions: Use media to provide information to the public; give detailed explanations of restrictions; explain actions in potential succeeding stages. Request voluntary reduction of water usage.

C. User Restrictions: Enact odd-even lawn watering; prohibit unnecessary outside uses; enact detriments to water usuage: (1) peak demand water rates or inclining block water rates, (2) house call warnings, (3) installation of flow restrictors; or enact penalties: (4) shut off and reconnection fees, or (5) fines.

Stage 3 - Severe

A. Triggering Criteria: (1) Pumpage of 95% of production capacity for five consecutive days, (2) failure to meet maximum day demand for four consecutive days, or (3) falling water levels which do not fill above 60% overnight for two consecutive days.

B. Public Sector Actitons: Use media to provide information to the public; give detailed explanations of restrictions; explain actions in potential succeeding stages. Request voluntary reduction of water usage.

C. User Restrictions: Mandatory restrictions on lawn watering; prohibit serving water in restaurants; and detriments and penalties: (1) peak demand water rates or inclining water rates, (2) house call warnings, (3) installation of flow restrictors, (4) shut off and reconnections fees, or (5) fines.

Stage 4 - Critical

A. Triggering Criteria: (1) pumpage of 100% production capacity for four consecutive days, (2) failure to meet maximum day demand for five consecutive days, (3) falling water levels which do not fill above 50% for two consecutive days, or (4) pump or system failure due to natural disaster or other event which causes unprecedented loss of capability to provide water service.

B. Public Sector Actions: Extensive media campaign to provide information on emergency situation and actions; warnings on lack of responsiveness of public to conditions; and other actions as described in previous stages.

C. User Restrictions: Prohibition of all outside water use and water use by selected commercial and industrial establishments, and all other actions and penalties as imposed in previous stages. Terminate service to selected portions of system as last extreme measure.

Stage 5 - Termination

A. Triggering Criteria: The items that may terminate the stage or stages of the Water Management Contingency Plan are discretionary and are based on these factors: (1) ability of the system to meet average and daily demands, (2) filling of water storage reservoirs to acceptable levels, or (3) repair or replacement of facilities; installation of additional facilities that will allow resumption of normal or improved water supply conditions. The contingency plan may be terminated at any stage with regression to a previous stage, or the plan may be completely terminated.

B. Public Sector Actions: Formal public notification that the stage or stages of the Water Management Contingency Plan have been terminated. If the plan has only regressed to a previous stage, then the public shall be informed of this regression and of the measures being taken.

C. User Restrictions: N/A

III. WATER MANAGEMENT CONTINGENCY PLAN PROCEDURES

A. General

1. Upon such time that conditions warrant, the Director of Public Works will make recommendations to the City Council to enact the Water Management Contingency Plan and designate an initial contingency stage.

2. The Water Superintendent shall keep the Director of Public Works apprised of the water supply conditions of the production and distribution systems.

3. As the plan unfolds, the Director of Public Works will make recommendations to the City Council as to the status of the Water Management Contingency Plan and to the stage(s) to which it should progress or regress and to the plan's termination.

4. The Departments/Divisions of the City of Paso Robles shall give their utmost efforts in regard to the effective fulfillment of the Water Management Contingency Plan and give their full cooperation to the Director of Public Works toward achievement of the plan's goals.

IV. CONTINGENCY PLAN ACTIONS AND ALTERNATIVES - PUBLIC SECTOR

A. General

1. Contact local representative(s) of utilities (such as Pacific Gas & Electric) to establish procedures to expedite assistance in time of emergencies.

2. Establish mutual aid procedures with local water utilities and initiate water connections for transfer of water during emergency situations.

3. Install in-line booster pumps at Water Division yard, to provide for equalization of pressures and flows between west and east side water supply areas.

4. Develop plans and procedures for emergency facilities installation/construction (wells, tanks, etc.)

5. Develop procedures for dissemination of information in regard to the stages of the contingency plan and for public notification.

6. Establish cooperation between City departments/divisions as relating to curtailment of water usage during water emergencies.

7. Identify those entities with high volume water usage and develop plans to minimize their impact on the water system, and water shortage impacts on their establishments.

8. Develop procedures to expedite financial transactions and to minimize formalities during water shortage emergencies.

9. Develop water system master list that will identify each system component and designate those components as critical or noncritical, and if critical to what level.

10. Establish materials inventory that will ensure availability of those materials that are associated with critical components.

B. Supply Management

1. Engage in leak detection efforts when water loss exceeds ten percent (10%).

2. Install pressure regulation devices in high pressure areas.

3. Develop action plans to convert inactive wells and agricultural wells into active public wells.

4. Develop and maintain recordkeeping system to monitor production and distribution functions and deviations.

C. Demand Management

1. Utilize pricing mechanisms to gain water conservation:

a. Peak demand water rates - raise rates only during times of water shortage or expected water shortage (e.g., May through August).

b. Inclining ~~block rates - devise tier (or blocks) of rates that would increase the cost of water as the usage increases.~~ Deleted by City Council

2. Initiate regulations, especially those pertaining to the Plumbing Code, to mandate installation of water-saving devices.

3. Develop and implement public education programs to emphasize the importance of water and the various methods and benefits of water conservation.

V. CONTINGENCY PLAN ACTIONS AND ALTERNATIVES - PRIVATE SECTOR

A. Business and Industry

1. Work with the City to develop plans for water shortage - what they can do to assist and what the City can do to provide them assistance.

2. Identify areas for potential water savings and areas of nonessential water use.

B. Residential

1. Residential users should promptly notify the City upon discovery of water waste or a City water leak.

2. Residential users should look for ways to conserve water: in the bathroom, kitchen, laundry, appliances, plumbing, and out-of-door use.

3. Residential users should become involved in the conservation effort and encourage their neighbors to follow the guidelines of the Water Management Contingency Plan.

RESOLUTION NO. 04-171

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF PASO ROBLES ADOPTING A WATER SHORTAGE CONTINGENCY PLAN DUE TO THE DECEMBER 22, 2003, SAN SIMEON EARTHQUAKE

WHEREAS, the City water distribution system contains 12 million gallons of storage capacity; and

WHEREAS, as a result of the December 22, 2003, earthquake, the City lost use of one of its three above-ground 4 million gallon storage tanks ; and

WHEREAS, on April 20, 2004, in accordance with California Water Code Section 350 et seq., the City of Paso Robles adopted Resolution No. 04-78 declaring a water shortage emergency, finding that the ordinary demands and requirements of water consumers cannot be satisfied without depleting the water supply of the City to the extent that there would be insufficient water for human consumption, sanitation, and fire protection use; and

WHEREAS, until normal water storage/supply has been replenished or augmented the City intends to implement certain measures to provide water storage and supply for potable consumption and fire fighting.

NOW THEREFORE, BE IT RESOLVED AS FOLLOWS:

SECTION 1. The City Council of the City of El Paso de Robles does hereby adopt the Emergency Water Shortage Contingency Plan (Exhibit A) that establishes thresholds and methods under which water use will be eliminated or curtailed to address the City's water shortage.

PASSED AND ADOPTED by the City Council of the City of El Paso de Robles this 3rd day of August 2004 by the following vote:

AYES: Finigan, Heggarty, Nemeth, Picanco, and Mecham
NOES: None
ABSTAIN: None
ABSENT: None

Frank R. Mecham, Mayor

ATTEST:

Sharilyn M. Ryan, Deputy City Clerk

RESOLUTION OF THE COUNCIL
OF THE CITY OF PASO ROBLES, STATE OF CALIFORNIA

IN THE MATTER OF: **No. 04-171**

Adopting a water shortage contingency plan due to the December 22, 2003, San Simeon earthquake

I, Sharilyn M. Ryan, Deputy City Clerk of the City of Paso Robles, certify that the foregoing is a full, true and correct copy of Resolution No. 04-171 proposed by Councilmember Nemeth, seconded by Councilmember Finigan, was duly passed and adopted by the Council of the City of El Paso de Robles at its regular meeting on August 3, 2004, by the following vote:

AYES:	Councilmembers:	Finigan, Heggarty, Nemeth, Picanco, and Mecham
NOES:	Councilmembers:	None
ABSTAIN:	Councilmembers:	None
ABSENT:	Councilmembers:	None

Sharilyn M. Ryan, Deputy City Clerk and
Ex-Officio Clerk of the City Council

CITY OF PASO ROBLES
EMERGENCY WATER SHORTAGE CONTINGENCY PLAN

August 3, 2004

A. Purpose:

To prevent system wide outages and possible infrastructure damage to the City's water delivery system, and to provide potable water for consumption and fire fighting while the City repairs its water storage facilities.

B. Description of Water Curtailing Methods

Community Wide Water Conservation - Voluntary

Voluntary reduction in water use exercised on an individual user basis. No penalties apply if 25% goal is not met. This effort will continue through the summer and beyond.

Construction Water Flow Restrictors – Mandatory (already in place)

There are approximately 50 construction hydrants in use throughout the City. The water is used for dust control and related construction support. When a water truck is filling from a hydrant, there are impacts to the localized water pressure and a spike in demand. The installation of flow restrictors slows the rate that a water truck can fill, thereby reducing the negative impact on localized water pressure and smoothing out the demand spikes.

Construction Water Suspension - Mandatory

The suspension of construction water could save up to 275,000 gallons per day (based on 2003 use statistics). Suspension would affect dust control capabilities and would require water tank trucks to make arrangements for filling outside of the City.

City Irrigation Suspension - Mandatory

The City has already cut park irrigation schedules from 25-50%. It is estimated that emergency suspension of parks watering could save up to 500,000 gallons per day. However, shut down of irrigation cannot be sustained for extended periods without permanently damaging park facilities.

Public Partners Irrigation Suspension – Voluntary and Mandatory

There are several public agencies that are generally high water users (School District, Cemetery District, Housing Authority). The City will seek the cooperation of these agencies in voluntarily suspending their irrigation for limited periods of time. These irrigation suspensions would be coordinated with City irrigation suspensions to minimize long term impact to each agency's facilities.

EXHIBIT A
Exhibit A Attachment ☐
To Resolution No. 04-171
To Ordinance No. ______
Page 1 of 3

If voluntary suspensions are ineffective, and water storage further drops to critical levels as established by the contingency plan, the City may make irrigation suspension mandatory for specific limited periods of time.

Community Wide Emergency Conservation Alert – Enforceable

At critical tank levels the City will issue emergency alerts to the public urging them to reduce consumption, including no watering of vegetation or washing of cars and driveways.

Compliance is still voluntary. However, City will have "police authority" to require compliance for blatant offenders. "Policing" could entail issuing warnings for visible water waste, followed by restrictors and/or meter shut offs if deemed necessary.

Landscape Irrigation Shutoffs - Mandatory

There are approximately 250 landscape meters (irrigation only) issued throughout the community. Some of these landscape meters are private properties that are generally high water users because of the amount of landscape area (example - apartment complexes).

If voluntary suspensions are ineffective, and water storage drops to critical levels as established by the contingency plan, the City may make irrigation suspension mandatory for specific limited periods of time for these private users.

Boil Water Orders

In the event that tank levels drop to a point where water pressure falls below 20 psi, the County Department of Environmental Health requires that the City implement specific health and safety notifications. Such an event would necessitate a "boil water order" based on back siphoning from non-potable connections. Boil water orders would apply to only certain specific pressure zones in the City.

Alternative Fire Fighting Measures

The ability to effectively fight fires for sustained periods is in direct correlation to the amount of stored water available. If stored water were depleted, Emergency Services would find it necessary to utilize Water Tenders (water tank trucks). Such a method would severely hinder firefighting capabilities. Declining water storage, where depletion is anticipated, would reasonably necessitate Emergency Services entering into contracts for stationing water tenders locally. These vehicles would otherwise be available on an emergency basis (actual fire), but would require long distance responses.

C. Water Shortage Contingency Plan

City shall implement the following measures as described below based on Golden Hill Road water levels:

Activated Measures

- Community Wide Water Conservation - Voluntary
- Construction Hydrant Flow Restrictors – Mandatory
- City reduction in irrigation of park facilities by 25% - Mandatory

At 20 feet:

- City Irrigation Suspensions - Mandatory
- Partner Agency Irrigation Suspensions - Voluntary
- Private Irrigation Suspension – Voluntary
- Construction Water Suspension – Mandatory

At 15 feet:

- Community Wide Emergency alert to reduce – Police Power triggered
- Partner Agency Irrigation Suspensions – Mandatory
- Private Irrigation Suspension – Mandatory

At 10 feet:

- Boil water notices to higher elevation properties
- Alternative fire fighting means may be triggered

Exhibit A Attachment ☐
To Resolution No. 04-171
To Ordinance No. ____
Page 3 of 3

APPENDIX C

Resolution Establishing the Criteria
to Declare a Water Shortage

APPENDIX C

Resolution No. ____

A Resolution of the City Council of the City of Paso Robles Establishing the Criteria to Declare a Water Shortage

NOW, THEREFORE, BE IT RESOLVED by the City Council of the City of Paso Robles as follows:

PURSUANT to California Water Code Sections 350 et seq., the City has conducted duly noticed public hearings to establish the criteria under which a water shortage emergency may be declared.

WHEREAS, the City finds, determines and declares as follows:

(a) During 2004, the City served approximately 7,462 acre feet (AF) of water to City property owners and inhabitants;

(b) The demands for water service by City inhabitants and property owners is not expected to lessen spontaneously;

(c) For the foregoing reasons, when the amount of precipitation, and consequently water supply available to the City for service to customers, falls below the Stage 1 triggering levels established in Table 38 of the 2005 Urban Water Management Plan (below), the City has determined that the water supply will not be adequate to meet the ordinary demands and requirements of water consumers without depleting the water supply of the City to the extent that there would be insufficient water for human consumption, sanitation and fire protection and this condition is likely to exist until precipitation and inflow dramatically increases;

Table 38
Water Supply Shortage Stages and Conditions

Stage No.	Water Supply Conditions/Rationing	Shortage
1	Voluntary 10% reduction of total	Precipitation 65% of normal for one year
2	Mandatory 20% reduction of total	Precipitation 65% of normal for two years or 50% of normal for one year
3	Mandatory 50% reduction of total	Precipitation 65% of normal for two years or 50% of normal for one year

NOW, THEREFORE, BE IT RESOLVED that the City Council of the City of Paso Robles hereby directs the City Manager when the amount of precipitation and therefore water supply available to the City for service to customers falls below Stage 1 triggering levels established in Table 38 of the 2005 Urban Water Management Plan, to find, determine, declare and conclude that a water shortage exists that threatens the adequacy of water supply for human consumption, sanitation and fire protection requirements, until the City's water supply is deemed adequate. After the declaration of a water shortage, the City Manager is directed to determine the appropriate Action Stage and implement the City's Water Shortage Contingency Plan.

FURTHERMORE, the City shall periodically conduct proceedings to determine additional restrictions and regulations which may be necessary to safeguard the adequacy of the water supply for domestic, sanitation and fire protection requirements.

Passed and adopted this __ Day of ___________, ____ by the following vote:

AYES:

NOES:

ABSENT:

____
Mayor

ATTEST:

____
City Clerk

APPENDIX D

Water Demand Management Measures

APPENDIX D

Water Demand Management Measures

The California Urban Water Management Planning Act requires that each water supplier provide a report describing its implementation of fourteen water demand management measures (DMMs). The fourteen DMMs are presented in the main body of the Urban Water Management Plan in the section titled *Water Demand Management Measures.* A plan for implementation and expansion of these DMM is described in the section titled *Phased Water Demand Management Strategy*, while another section, *Costs and Benefits of Demand Management Measure Implementation*, provides a framework for evaluating the potential costs and benefits of implementing the various DMMs as part of a phased water demand management strategy. This appendix contains details of each of the four DMM implementation phases and discussion of specific water savings and financial benefit of implementing each DMM and the recommended year to start as summarized in Table D-1.

Table D-1

DMM Implementation Summary

DMM	Recommended and Year to Begin	Cost or Benefit	Range of Water Savings, AFY 2006 to 2010
Phase 1			
12. Conservation Coordinator	Yes 2010	Cost	Not applicable
4. Metering with Commodity Rates	Yes,2010	Benefit	126 to 631
3. System Water Audits	Pending further study, 2015	Cost	0
Leak Detection	Pending further study, 2015	Cost	37 to 164
11. Conservation Pricing	Yes, 2015	Benefit	135 to 63
Phase 2			
7. Public Information Programs	Yes, continue	Not estimated	Not estimated
8. School Education Programs	Yes, continue	Not estimated	Not estimated
Phase 3			
1. Water Survey Programs	Pending further study, 2020	Cost	165 to 437
9. Conservation of CII	Pending further study, 2015	Benefit	51 to 154
5. Large Landscape Programs	Yes, 2010	Possible benefit	34 to 85
Phase 4			
2. Residential Plumbing Retrofits	Yes, 2020	Benefit later	8 to 19
6. High Efficiency Washing Machines	Pending further study, 2020	Cost	0 to 2
14. Ultra-Low-Flush Toilets	Yes, 2015	Benefit later	3 to 16
13. Water Waste Prohibitions	Yes, 2015	Not applicable	Not applicable
Not Applicable			
10. Wholesale Agency Programs	Not applicable	Not applicable	Not applicable

Phase I Demand Management Measures

- **DMM 12. - Water Conservation Coordinator**

Recommendation: Implementation is strongly recommended. This DMM is required for the effective implementation of other DMMs.

Detailed Cost/Benefit Analysis:
The conservation coordinator would be responsible for managing and monitoring all phases of the City's demand management program. This person would be responsible for implementation of the 14 DMMs, assessment of the effectiveness of demand management measures implemented by the City, and monitoring of the costs and benefits of these measures. Though general discussions of the cost and benefits of the various DMMs are presented in this report, the conservation coordinator would be responsible for determining the cost to benefit ratio of each DMM specific to the City.

The conservation coordinator would also be responsible for designing the content of public information programs, drafting water waste prohibitions, and planning the various incentive programs. The conservation coordinator would act as a public representative of the City during public information activities, providing water conservation advice to City customers.

The knowledge requirements include an understanding of principles and practices of water conservation, familiarity with economics as they relate to water conservation, knowledge of the techniques and equipment used in water distribution, a general understanding of both hydrology and hydraulics, and experience with cost estimation and budget preparation. An understanding of basic principles of soil science, irrigation practices, or civil engineering may also be beneficial. An education equivalent to a B.S. or B.A. degree from an accredited college or university with relevant course work in environmental studies, civil or environmental engineering, hydrology, hydrogeology or a closely related field would be desirable.

Compensation for a full-time conservation coordinator would depend on experience and qualifications. Salary might be expected to range from $45,000 to $65,000 per year to start for a full time position. For this report, a compensation is assumed of $75,500 including benefits. Appointment of a conservation coordinator in itself does not generate water savings or revenues. However, the conservation coordinator would actively support and coordinate all of the other water conservation measures.

An annual breakdown of the expenditures required to staff the conservation coordinator position through 2010, as well as a breakdown of the expected water savings is presented in Table D-2. This breakdown assumes a starting compensation of $75,500 per year for the position with a 3 percent annual cost of living adjustment.

Table D-2 DMM 12 Projected Expenditures and Water Savings					
	2006	2007	2008	2009	2010
Gross Expenditures	$75,500	$77,765	$80,098	$82,501	$84,976
Revenue Generated By DMM	$0	$0	$0	$0	$0
Net Expenditures - $	$75,500	$77,765	$80,098	$82,501	$84,976
Projected Water Savings (AFY)	0	0	0	0	0

As no water savings is anticipated as a direct result of this DMM, the gross financial benefit is zero dollars. Similarly, no revenue is generated as a direct result of this DMM, so the net expenditure required for its implementation is equal to the required gross expenditure as shown in Table D-2 (the conservation coordinator's salary). As shown in Table D-3, the net financial benefit (cost) is also equal to salary of the conservation coordinator.

Table D-3 DMM 12 Net Annual Financial Benefit					
	2006	2007	2008	2009	2010
Projected Water Savings (AFY)	0	0	0	0	0
Gross Financial Benefit	$0	$0	$0	$0	$0
Net Expenditures	$75,500	$77,765	$80,098	$82,501	$84,976
Net Financial Benefit	-$75,500	-$77,765	-$80,098	-$82,501	-$84,976

Although this DMM will result in a net financial cost to the City, its implementation is highly recommended. The conservation coordinator plays a pivotal role in successful implementation of the water demand management program.

- **DMM 4. - Metering with Commodity Rates for all New Connections and Retrofit of Existing Connections**

Recommendation: Continued implementation is recommended pending results of the 2008 water rate study. Over time a net financial benefit to the City of Paso Robles is produced through this DMM's implementation.

Detailed Cost/Benefit Analysis:
The full metering of all water connections within the City of Paso Robles has already been completed and an existing policy requires installation of a water meter with each new connection. As of 2005, there were approximately 10,720 individually metered water connections. Costs will continue to be incurred for future meter installation as meters are fit to all new connections. These costs are currently funded by the customer, but may be funded by either the City or customer in the future. Costs are included in Table D-4 to illustrate the net benefits over time.

The CUWCC's publication *BMP Costs and Saving Study* (CUWCC, December 2003) cites several estimates for the price of a single water meter installation (including costs to purchase, transport and install that meter) taken from various sources dated in the mid 1990's. The highest of those estimates is $990 (in 2006 dollars; $750 dollars in 1995). It is estimated that by 2025, the number of water service connections within the City of Paso Robles will increase to 25,560 (see UWMP Table 4). Using the 2025 estimated number connections from 2005 through 2010, and assuming a linear increase in the number of water service connections, an annual breakdown of new meter installation expenditures is provided in Table D-4.

Though there would be an upfront expenditure for each water meter, the installation of each meter would allow the City to produce revenue by through its billings each customer for the amount of water used. Using the City's pricing structure approved in 2004 ($6/month + $1.28/ccf of water use with annual increases in the flat rate), the average water customer could be expected to owe $336 in 2006 with the planned increases thereafter. The annual revenue to the City produced by the metering of water connections through 2010 is presented in Table D-4. The annual net expenditures required for continued metering are also presented in Table D-4.

Table D-4

DMM 4 Projected Expenditures and Water Savings

	2006	2007	2008	2009	2010
# of New Meters to be Installed	742	742	742	742	742
Total # of Connections in City	11462	12204	12946	13688	14430
Gross Expenditures	$734,580	$734,580	$734,580	$734,580	$734,580
Revenue Generated By DMM	$249,312	$509,754	$629,958	$750,162	$870,366
Net Expenditures	$485,268	$224,826	$104,622	-$15,582	-$135,786
Projected Water Savings (AFY)	126	252	378	505	631

In 2005, the 9,700 single- and multi-family residential customers used 4,855 AF of water (see Table 4), resulting in an average use of about 0.5 AF. The CUWCC cites several studies which estimate an aggregate water savings of between 20 percent and 40 percent when water meters are installed on formerly un-metered connections (CUWCC, December 2003). The CUWCC notes, however, that the studies may not have accounted for the portion of water savings resulting from other concurrently-administered water conservation measures. For that reason, this report uses the conservative 20 percent estimate of water savings. Accordingly, an un-metered connection in the City of Paso Robles could be expected to have used 0.63 AF of water in 2005. Therefore each new meter installed could reasonably be expected to produce a water savings of approximately 0.13 AFY. An annual breakdown of the water savings provided through continued metering of new water connections is presented in Table D-4.

The annual gross financial benefit to the City produced by continuing to meter all new water connections can be calculated by first determining the annual volume of water conserved by metering, and then determining the cost to increase the water supply by the same amount (and consequently treat the resultant volume of wastewater). On average, during the three years 2002, 2003, and 2004, the City of Paso Robles spent $363 per AF to provide water to each customer and an addition $740 per AF to treat wastewater (Boyle, July 2005). Approximately 42 percent of all water delivered annually is returned for wastewater treatment (Boyle, July 2005). In aggregate, the City spends $674 to deliver and treat each AF of water used by the average customer. An annual breakdown of the gross financial benefit of continued metering is presented in Table D-5.

It should be noted that as less water is used, the price to treat each resultant unit of wastewater will increase due to an increase in the concentration of the contaminants in that wastewater (contaminant loading remains constant yet less water volume is available for dilution). This report does not attempt to adjust for this phenomenon.

Table D-5

DMM 4 Net Annual Financial Benefit

	2006	2007	2008	2009	2010
Projected Water Savings (AFY)	126	252	378	505	631
Gross Financial Benefit	$84,924	$169,848	$254,772	$340,370	$425,294
Net Expenditures	$485,268	$224,826	$104,622	-$15,582	-$135,786
Net Financial Benefit	-$400,344	-$54,978	$150,150	$355,952	$561,080

Finally, the net financial benefit (or cost) is calculated by subtracting the net expenditure necessary for future metering from the gross financial benefit. Table D-5 shows the annual net financial benefit (or cost) associated with continued metering. As can be seen in Table D-5, the initial net cost becomes a net benefit that increases into the future as the benefits of cumulative water savings and revenue generation exceed the static gross expenditure. Furthermore, effective metering of all water connections is a prerequisite for DMM 11, Conservation Pricing. Continued implementation is recommended pending the results of the 2008 water rate study.

The City currently has no established methods to evaluate the effectiveness of this DMM; however, methods used by other cities and the CUWCC are being considered. Methods could include an analysis of water use and billing income generated with comparison to past years.

- **DMM 3. - System Water Audits, Leak Detection and Repair**

Recommendation: Additional information is required to assess the cost effectiveness of this DMM prior to implementation. It is recommended that a pilot study be conducted in order more accurately project the expenditures necessary for water meter verification and its potential for revenue generation.

Detailed Cost/Benefit Analysis:
The City currently tracks the amount of water it produces and the amount delivered to customers. In 2003 and 2004, unaccounted-for water averaged 12 percent of total water production. This is slightly higher than the California average of 10 percent (California DWR, August 1994). In 2005, billing software was updated and City staff members

conducted an in-house study of unaccounted-for water in order to separate real losses from apparent losses due to billing system errors. Subsequently, in 2006 and 2007, unaccounted water amounted to 7.3 and 6.6 percent, respectively (Dunham, 2008) representing a significant improvement in water accounting.

The City does not specifically track apparent losses resulting from water meter inaccuracy or real losses due to unauthorized water use. In order to distinguish the real losses from apparent losses, the readings of individual customer water meters would be verified as part of a water audit process. Once real losses are known, an informed decision can be made regarding the implementation of a systematic leak detection system as part of this DMM.

The CUWCC provides cost estimates ranging from $150 in 1990 to $2,500 in 1994 per meter for the auditing of large water meters of various sizes, and $25 to $50 in 1990 for the auditing of residential meters. As of 2005, the City had 9,700 residential water meters, 695 CII meters, and 325 landscape irrigation meters in operation (Boyle, September 2005). The cost of a total water meter audit as of 2005 can be computed by assuming that the cost to audit an average residential water meter is $55 and that the cost to audit an average CII, landscape irrigation or unspecified classification meter is $2,000. An annual breakdown of the expenditures required to conduct a complete water meter audit by 2010 (assuming 20 percent of all currently existing meters are audited every year) is provided in Table D-6. This schedule is consistent with the CUWCC's estimate of four years for the persistence of water savings produced by residential water audits (CUWCC, December 2003).

Table D-6

DMM 3 - Projected Meter Auditing Expenditures and Water Savings

	2006	2007	2008	2009	2010
# of Res. Meters Audited	1940	1940	1940	1940	1940
# of Non-Res. Meters Audited	204	204	204	204	204
Total Number of Audits	2144	4288	6432	8576	10720
Gross Expenditures	$514,700	$514,700	$514,700	$514,700	$514,700
Revenue Generated by DMM	$82,754	$88,725	$94,697	$100,668	$106,640
Net Expenditures	$431,946	$425,975	$420,003	$414,032	$408,060
Projected Water Savings (AFY)	0	0	0	0	0

While it is unlikely that a significant amount of water will be saved by conducting water meter audits, it is likely that those audits will reveal that a percentage of the City's unaccounted water is indeed delivered to customers and therefore should be billed. For the purposes of projecting the revenue generated by this additional billing, it is assumed that water meter audits using the proposed schedule would reveal that 2 percent of annual production is indeed being delivered to customers and should be billed. An annual breakdown of the projected additional revenue generated by water meter audits is presented in Table D-6, based on the current rate structure. A more accurate assessment of additional revenue generated could be obtained through a pilot study involving a small number of meters of various age and type.

Should a water meter audit indicate significant *real* losses, then a system-wide leak detection program would be warranted. Water system leak detection programs typically are based on acoustic surveys; the CUWCC indicates costs of $200 per mile of pipeline for a comprehensive acoustic survey by a consultant (CUWCC, Draft BMP 3 Costs & Savings Study, December 2006). For the purposes of this analysis, this rate is applied to the City's approximate 148 miles of water mains in its water transmission and distribution system (Paso Robles website, 2005). City water agency staff familiar with the age and service history of the water distribution and transmission system would be consulted in the design of a systematic leak detection schedule. However, for the purpose of this report it is assumed that the City would check its entire distribution and transmission system for leaks once every five years (20 percent per year). This schedule is consistent with the CUWCC's estimates for the persistence of water savings produced by residential water audits (CUWCC, December 2003). An annual breakdown of the expenditures associated with a systematic leak detection program is presented in Table D-7. The expenditures required for leak repair are not factored into this breakdown as any leaks would eventually increase in volume and eventually would be detected and repaired.

Table D-7

DMM 3 Projected Leak Detection Expenditures and Water Savings

	2006	2007	2008	2009	2010
Miles of Water Mains Checked	30	30	30	30	30
Total # of Miles Checked	30	59	89	118	148
Gross Expenditures	$6,000	$6,000	$6,000	$6,000	$6,000
Revenue Generated By DMM	$0	$0	$0	$0	$0
Net Expenditures	$6,000	$6,000	$6,000	$6,000	$6,000
Projected Water Savings (AFY)	37	77	119	164	164

Unlike the proposed water meter audits undertaken as the first step of this DMM, it is likely that leak detection will produce an appreciable water savings. Small water main holes with diameters on the order of one half of an inch in diameter can leak tens of gallons per minute of water even under low pressures (CUWCC, December 2003). The actual amount of water saved through leak detection will vary widely depending on the overall condition of the water distribution and transmission system.

For this analysis, it is assumed that a systematic leak detection program could reduce water production by 0.5 percent for every 20 percent of the transmission system inspected. It is expected that water savings realized through leak detection would persist for four years consistent with the CUWCC's estimates for the persistence of water savings produced by residential water audits (CUWCC, December 2003). Under these assumptions, the City would reduce unaccounted for water to less than 6 percent, consistent with percentages observed among California's most efficient water providers (California DWR, August 1994), by 2010. This reduction in unaccounted for water represents a direct water savings. An annual breakdown of the water savings might be expected as a result of leak detection is presented in Table D-8.

In order to calculate the gross financial benefit resulting from this water savings, the amount of water saved is multiplied by the cost per AF to produce an equivalent amount of water. From the discussion regarding DMM 4, the City of Paso Robles spends $674 for every AF of water it produces. This includes money spent to treat the resultant wastewater. An annual breakdown of the gross financial benefit produced by DMM 3 is provided in Table D-8.

Table D-8
DMM 3 Net Annual Financial Benefit for Entire DMM

	2006	2007	2008	2009	2010
Projected Water Savings (leak detection) AFY	37	77	119	164	164
Gross Financial Benefit	$24,985	$51,753	$80,304	$110,637	$110,637
DMM 3 Net Expenditures (entire DMM)	$437,946	$437,946	$437,946	$437,946	$437,946
Net Financial Benefit	-$412,961	-$386,193	-$357,642	-$327,309	-$327,309

Finally, the net financial benefit (or cost) of the entire DMM is calculated by subtracting the net expenditures (water meter audits and leak detection) from the gross financial benefit produced by leak detection (water meter audits produce no water savings). An annual breakdown to the net financial benefit (or cost) afforded the City through the complete implementation of DMM 3 is presented in Table D-8. As shown in Table D-8, a net cost is projected for this DMM reflecting the relatively high cost of conducting water meter audits when compared to the anticipated additional revenue generation. Further examination of the specific expenditures and potential for revenue generation of the water meter auditing step of this DMM (possibly through the previously mentioned City facility pilot study) is recommended prior to its implementation.

The City currently has no established methods to evaluate the effectiveness of this DMM. However, methods used by other cities and the CUWCC are under consideration. Improvements of City billing software and meter installation and readings will enable the City to more accurately quantify and track system losses over time and calculate improvements.

- **DMM 11. - Conservation Pricing**

Recommendations: Implementation is recommended. This DMM offers a substantial net financial benefit to the City while reducing the water use of the largest users.

Detailed Cost/Benefit Analysis:
Conservation pricing uses pricing pressures to reduce customer water use by focusing on those water users with unusually large water use rates. Such users are presented with significant increases in the unit cost of water for water use in excess of a reasonable, predetermined water amount. At the same time, conservation pricing helps to maintain water affordability for those consumers already limiting their water consumption due to financial constraints. Special consideration would be given to multi-family residential

dwellings where customers are not individually metered. In such a situation, the combined water use of several customers on the same water meter may trigger a price increase when no individual customers' use would justify the same price increase.

The response of water demand to changes in the price of water is termed price elasticity. A more rigorous definition of price elasticity is the percent change in demand induced by a one percent change in price, all other factors being constant. The degree to which water demand is price elastic varies from customer to customer and is dependent on customer type (single family residential, multi-family residential, CII, etc.), season, and whether the water is for indoor or outdoor use. According to the CUWCC, the following general concepts describe the relationship of price elasticity to a variety of factors (CUWCC, December 2003):

- Demand for outdoor use is more price elastic than demand for indoor use.
- Demand for water during summer is more price elastic than during winter periods.
- Residential water demand is largely inelastic. The response of residential demand to rate changes, though not zero, is small.
- Demand is more elastic in the long run than in the short run.
- The response to demand is more difficult to predict for large changes in price.

Water demand is also influenced by factors such as weather fluctuations, economic cycles, personal income growth, and population growth. Assessment of these factors is beyond the scope of this analysis. For this analysis, a linear model of demand response is used, where the change in water demand is directly proportional to the aggregate change in the price of water. This model is expressed using the equation below (CUWCC, December 2003):

% Change in Price (ΔP) * Price Elasticity (ETP) = % Change in Use (ΔU) **(eq.1)**

While the arithmetic involved in this model is simple, determining the values for both price elasticity (ETP) and percent change in price (ΔP) is not. When designing a rate structure for conservation pricing, accurate information detailing individual customer water use is needed to model the rate structure's effect on the aggregate price of water. Similarly, ETP estimates from current literature can be used initially to design the rate structure, but that ETP will decline over time as customers become accustomed to new water rates. Therefore, ETP needs to be reassessed regularly in order to adjust rate structures to achieve target water savings.

The CUWCC provides estimates for both short and long-term residential ETP. Since the short-term values are more conservative than the comparable long-term values, only the short run values are considered in this analysis. The CUWCC offers estimates for short-term residential (single family, and multi-family) ETP ranging from 0 to -0.20. Because some residential water use serve essential functions (such as drinking and bathing) and cannot be reduced, -0.10 is selected for ETP in order to produce conservative estimates of ΔU for a given ΔP.

Estimates of ETP for non-residential uses vary greatly from customer to customer, but are generally higher than for residential customers. Consideration of each non-residential customer's water requirements and water use patterns would be required for an accurate assessment of ETP for that customer. Such an analysis is beyond the scope of this report. Nonetheless for the purposes of this report, all City of Paso Robles water use is assumed to have an ETP equal to that for residential water use. As a result of this assumption, the water savings predicted here should be smaller than the water savings actually realized through the implementation of conservation pricing.

Using this linear model of water demand response, water savings can be calculated as:

$$\text{Water Savings (WS)} = \Delta U * \text{Current Demand (DM)} \quad \textbf{(eq.2)}$$

Note: A negative value for WS represents a decrease in water use.

For this analysis, an initial water use reduction of 2 percent ($\Delta U = -0.02$) is assumed; this reduction would not have a significant impact on City revenues from water sales. To achieve this initial water use reduction, the present day aggregate price of water sold by the City would have to increase by 20 percent ($\Delta P = .2$). It is emphasized that this 20 percent increase in the aggregate price of water would not be applied to the majority of water users. Instead, those few customers who use water far beyond reasonable, predetermined rates would be faced with the choice of steeply rising rates or reducing water usage. The price increases borne by those who choose to pay would be large enough to effectively increase the average price of water by 20 percent over current levels.

Once the initial price increase has been implemented, small annual increases in the price of water are recommended to keep up with inflation and maintain the real price of water in line with its present day value. Discounting over time using the Consumer Price Index shows that this would take approximately 8 years. The effect of inflation on the real price of water would be expressed as a reduction in water savings over time as water consumer's incomes rise, making them more tolerant of the additional cost of water under conservation pricing. An annual breakdown illustrating the resultant water savings and additional revenue generated by instituting DMM 11 through an initial price increase of 20 percent, assuming no subsequent price increases, is presented in Table D-9. It is assumed that no expenditures would be incurred to implement this DMM, although design of the pricing structure could involve expenditures for the conservation coordinator or a consultant who would be charged with designing the conservation pricing structure.

Table D-9
DMM 11 Projected Expenditures and Water Savings

	2006	2007	2008	2009	2010
Gross Expenditures	$0.00	$0.00	$0.00	$0.00	$0.00
Revenue Generated By DMM	$625,870	$675,456	$687,227	$695,254	$709,324
Net Expenditures - $	-$625,870	-$675,456	-$687,227	-$695,254	-$709,324
Projected Water Savings (AFY)	135	114	96	84	63

As can be seen in Table D-9, both an increase in revenue and a water savings would result from the implementation of DMM 11. Table D-10 presents an annual breakdown of the net financial benefit provided by the implementation of this DMM.

Table D-10 DMM 11 Net Annual Financial Benefit					
	2006	2007	2008	2009	2010
Projected Water Savings (AFY)	135	114	96	84	63
Gross Financial Benefit	$90,990	$76,836	$64,704	$56,616	$42,462
Net Expenditures	-$625,870	-$675,456	-$687,227	-$695,254	-$709,324
Net Financial Benefit	$716,860	$752,292	$751,931	$751,870	$751,786

As can be seen in Table D-10, the implementation of DMM 11 would provide the City with substantial net financial benefits. Implementation of DMM 11 is recommended.

The City currently has no established methods to evaluate the effectiveness of this DMM. Nonetheless, the methods used by other cities or suggested by the CUWCC are being considered. Methods could include an analysis of water use and billing income once the program has been initiated.

Phase II Demand Management Measures

- **DMM 7. - Public Information Programs**

Recommendation: Continued implementation of this DMM is recommended as the success of other complementary DMMs is linked to the success of public information programs.

Detailed Cost/Benefit Analysis:
A detailed cost/benefit analysis is not provided here. Design of the scope and scale of public information programs would fall to the conservation coordinator, who would also be responsible for evaluating and reporting on its effectiveness. The City currently has no methods to evaluate the effectiveness of this DMM. Methods used by other cities and suggested by the CUWCC are being considered.

- **DMM 8. - School Education Programs**

Recommendation: Continued implementation of this DMM is recommended as the success of other DMMs can be enhanced by school education programs.

Detailed Cost/Benefit Analysis:
A detailed cost/benefit analysis is not provided for this DMM at this time, because the means of quantifying relevant water savings has not been established. The conservation

coordinator would be responsible for design of school education programs and would also assess and report on the cost effectiveness of this DMM. The City currently has no methods to evaluate the effectiveness of this DMM; however, it is looking into methods used by other cities and the CUWCC.

Phase III Demand Management Measures

- **DMM 1. - Water Survey Programs for Single-Family and Multi-Family Residential Customers**

Recommendations: Additional information is necessary to assess the feasibility of this DMM prior to implementation. Further investigation into the cost of conducting residential water surveys in the City is recommended.

Detailed Cost/Benefit Analysis:
Residential water survey programs seek to reduce residential customer water use by informing customers of the potential for water use reduction through the modification of current household water use practices. Residential water surveys can target both indoor and outdoor water use and generally involve a site visit by a water agency staff member trained in conducting water surveys. Indoor surveys generally involve checking the flow rates of various plumbing fixtures such as showerheads and faucets, and also involve leak detection for household plumbing. Outdoor water surveys generally involve the measurement or estimation of irrigated area, and provision of a recommended customer irrigation schedule based on that area.

The costs associated with the implementation of this DMM are directly related to these staff visits. The foremost costs are the staff time devoted to each visit and the cost of equipment needed by the staff to complete the water survey. Secondary costs might include costs for marketing water surveys to customers, and the costs of any printed information distributed to customers regarding the results of the water survey.

The CUWCC cites a report by A & N Technical Services from 1995 that places the cost of a targeted indoor and outdoor residential water survey at $200 (as of 1995) and the cost of an untargeted indoor survey at $40. The Contra Costa Water District completed a study of 2,216 completed water audits in order to determine both the costs and benefits associated with the implementation of their water survey program in 1994 (CUWCC, December 2003). This study determined the cost of each residential indoor and outdoor water survey to be approximately $52 ($40.75 in 1994). The 2005 Urban Water Management Plan for East Bay Municipal Water District (EBMUD) documents expenditure of $361,253 for 10,018 residential surveys in 2003; this indicates a unit survey cost of $36. EBMUD costs are similar for 2004. For this analysis, a relatively high cost of $200 is applied for a single average residential (single or multi-family) indoor and outdoor water survey.

A phased approach is assumed, with full implementation in five years, with 20 percent of all currently existing residential customers (9,700 total residential meters in 2005) surveyed each year. A year by year breakdown of the expenditures associated with residential water audits is presented in Table D-11.

Table D-11
DMM 1 Projected Expenditures and Water Savings

	2006	2007	2008	2009	2010
Gross Expenditures	$388,000	$388,000	$388,000	$388,000	$388,000
Revenue Generated By DMM	$0	$0	$0	$0	$0
Net Expenditures - $	$388,000	$388,000	$388,000	$388,000	$388,000
Projected Water Savings (AFY)	165	291	379	427	437

It is important to note that residential water surveys may reduce revenue to the City as any water saved will no longer be billed. However, this potential reduction in revenue, and similar potential revenue reductions attributable to other DMM's, is not reflected in the cost/benefit analyses of this report as water savings are interpreted as foregone future production rather than foregone future sales.

The CUWCC estimates that first year water savings for this DMM average 17 percent, as water users alter their personal water use patterns based on the advice provided during the water use surveys. The Contra Costa County Water District study determined that this water savings declines about 2 percent each year until another water survey is conducted. A year by year breakdown of total water savings is also presented in Table D-11.

As with other the other DMMs described in this report, the gross financial benefit to the City is realized as the City avoids the cost of producing a volume of water equal to the water savings produced by the DMM. An annual breakdown of the gross financial benefit, as well as the net benefit of this DMM is presented in Table D-12.

Table D-12
DMM 1 Net Annual Financial Benefit

	2006	2007	2008	2009	2010
Projected Water Savings (AFY)	165	291	379	427	437
Gross Financial Benefit	$111,210	$196,134	$255,446	$287,798	$294,538
Net Expenditures	$388,000	$388,000	$388,000	$388,000	$388,000
Net Financial Benefit	-$276,790	-$191,866	-$132,554	-$100,202	-$93,462

As can be seen in Table D-12, the implementation of DMM 1 does not provide the City of Paso Robles with a net financial benefit. In fact, a substantial cost to the City is predicted if this DMM is implemented. However, if the true cost of a water survey approximates Contra Costa County Water District or EBMUD values (closer to $50), then the City would realize a net financial benefit. Consequently, further investigation into the true cost of conducting residential water surveys in the City of Paso Robles is recommended prior to the implementation of DMM 1. The City currently has no methods to evaluate the effectiveness of this DMM; however, it is considering methods used by other cities and the CUWCC. Options include comparison of individual residential water use rates before and after implementation of survey recommendations and estimations of potential water savings from specific water use modifications.

- **DMM 9. - Conservation Programs for Commercial, Industrial, and Institutional Accounts**

Recommendations: Implementation of DMM 9 is recommended pending additional analysis of the costs and benefits to CII customers and appropriate incentives.

Detailed Cost/Benefit Analysis:
Conservation Programs for Commercial, Industrial and Institutional Accounts involve water surveys similar in nature to the residential water surveys proposed in DMM 1. The surveys can range in scope from short "walkthrough" inspections, which look for obvious signs of water wasting such as leaky plumbing or excessive irrigation, to sophisticated water efficiency studies. The scope of the survey is dependant on the type of business or industry and the nature of the customer's water use.

The chief cost associated with the implementation of this DMM is the staff time necessary to conduct these surveys and prepare recommendations based on the results. Unlike residential surveys, CII water surveys are generally funded by the customer. Often outside consultants familiar with water efficiency in industrial processes are used to conduct CII water surveys for customers involved in water intensive industries.

To encourage customers to make the necessary expenditure, the water provider typically offers incentives to CII customers. For example, if a customer will save $100 per year for five years through implementation of the recommendations produced by a water survey, but the survey will cost $700, then the water agency must provide an incentive in excess of $200 to the customer to encourage the water survey. The cost of these incentives is the primary cost to the water provider. Like residential water surveys, a secondary cost to the water provider is the cost to market participation in water surveys.

The CUWCC cites program cost and water savings data for this DMM analyzed on behalf of the Metropolitan Water District of Southern California by Western Policy Research in 1996. According to the CUWCC, small scale surveys conducted by internal staff analysts required a median expenditure of approximately $600, medium scale surveys conducted by an outside consultant required a median expenditure of $1,484, and large scale water efficiency studies required a median expenditure of $8,121 (all costs as of 1996). The range of survey costs is quite broad, reflecting the variety of CII customers and water uses. For example, CII surveys can be as simple as a brief visual check for plumbing leaks in an office restroom to an extensive evaluation of water-use technologies for a bottling plant (Jim Carmody, 2008). For the purposes of this analysis, costs of the three types of survey are assumed to be $600, $1,500, and $8,000, respectively.

The CUWCC reports median water use reductions of 20.3 percent for analyst-conducted surveys, 18.0 percent for consultant conducted surveys, and 17.8 percent for large scale water efficiency studies. The largest volume of water is saved by the largest water users through the implementation of survey recommendations. However, given the scale of the water use and complexity of implementing water survey recommendations on such a scale, water savings as a percent of total water use tend to be lower for larger water users. Generally CII customers implement some combination of the following measures where applicable: installation of self closing faucets, installation of ultra-low-flow toilets, use of low flow valves in urinals, and replacement of older food service and preparation equipment with more modern efficient versions. The water use reductions discussed here assume a typical combination of these improvements.

The average CII water customer in the City used 1.5 AF of water. For the purpose of this analysis, it is assumed that the smallest CII water users use 1.2 AFY of water, the next largest CII water users use 2.5 AFY of water, and the largest water users use 10 AFY. To yield the appropriate mean level of water use, approximately 88 percent of water users are assumed to use 1.2 AFY, approximately 10 percent use 2.5 AFY, and approximately 2 percent use 9.7 AFY.

The incentive required to encourage each type of survey can be calculated using these figures for water savings, assumed average water use, required expenditure, and unit price of an AF of water in the City. The results are summarized in Table D-13. These calculations assume that water savings for each customer decline by 20 percent over the five year period before the next water survey.

Table D-13

DMM 9 Required CII Water Survey Incentives

	Analyst Survey	Consultant Survey	Water Eff. Study
Cost	$600	$1,500	$8,000
Unit Water Saving (AFY)	0.24	0.45	1.78
Financial Savings (Over 5 Years)	$386	$713	$2,820
Required Incentive	$214	$787	$5,180

The sum of these incentives represents the expenditure that would be required by the City to implement this DMM. There are currently approximately 695 CII water meters in the City. For the purpose of this cost benefit analysis it is assumed that each meter represents an individual customer similar to those customers observed in the CUWCC cited studies, and that, consistent with earlier assumptions, 88 percent, 10 percent, and 2 percent of CII customers will require small scale analyst water surveys, medium scale consultant water surveys, and large scale water efficiency studies, respectively. Further, it is assumed that 20 percent of all current CII customers would conduct water surveys each year. A year by year breakdown of the required net expenditure and anticipated water savings for this DMM is presented in Table D-14.

Table D-14 DMM 9 Projected Expenditures and Water Savings					
	2006	2007	2008	2009	2010
Gross Expenditures	$64,488	$64,488	$64,488	$64,488	$64,488
Revenue Generated By DMM	$0	$0	$0	$0	$0
Net Expenditures - $	$64,488	$64,488	$64,488	$64,488	$64,488
Projected Water Savings (AFY)	51	92	123	144	154

As with the other DMMs described in this report, the gross financial benefit to the City is realized as the City avoids the cost of producing a volume of water equal to the water savings produced by the DMM. An annual breakdown of the gross financial benefit, as well as the net benefit of this DMM is presented in Table D-15.

Table D-15 DMM 9 Net Annual Financial Benefit					
	2006	2007	2008	2009	2010
Projected Water Savings (AFY)	51	92	123	144	154
Gross Financial Benefit	$34,374	$62,008	$82,902	$97,056	$103,796
Net Expenditures	$64,488	$64,488	$64,488	$64,488	$64,488
Net Financial Benefit	-$30,114	-$2,480	$18,414	$32,568	$39,308

As can be seen in Table D-15, the implementation of DMM 9 could provide the City with a net financial benefit once all CII customers have been surveyed. However, the realization of this benefit is highly dependant on the individual expenditures required by nd water savings realized for individual CII customers. This analysis—based on a hypothetical survey program—does not provide a prediction of actual water savings or required expenditure for the City. This analysis uses cost and water savings estimates specific to the group of CII customers that participated in a Metropolitan Water District of Southern California study and may not extrapolate well to CII customers in the City of Paso Robles. Consequently, the implementation of DMM 9 is recommended pending additional costs and benefits analysis given the relatively small margin of benefit.

Another aspect of this DMM is the replacement of older toilet fixtures with ultra-low-flush toilets (ULFT) similar to DMM 14 for residential customers. Cost and benefits associated with this DMM would be comparable to those of DMM 14 assuming that 100 CII older toilets are replaced each year with ULFTs.

The City currently has not established methods to evaluate the effectiveness of this DMM. However, it is considering methods used by other cities and the CUWCC. Options include comparison of CII customer's water use rates before and after initiation of conservation and incentive programs and estimations of potential water savings from specific water use modifications.

- **DMM 5. - Large Landscape Conservation Programs and Incentives**

Recommendations: Implementation is recommended, pending specific design of a large landscape conservation program and further analysis of costs and benefits.

Detailed Cost/Benefit Analysis:
Large Landscape Conservation Programs involve the provision of water surveys and technical training to large landscape customers. Large landscape customers are defined as customers who irrigate a cumulative area greater than three acres; these are metered separately in the City of Paso Robles. Large landscape conservation programs can involve some or all of the following: staff site visits, customer training in conservation irrigation practices, irrigation device upgrades, development of water budgets, and institution of water-budget-based rate structures that involve sharp price increases for water use in excess of the water budget. Design of programs varies significantly from water agency to water agency.

The CUWCC has compiled a survey of several studies that examine the water savings attributable to various methods for implementing this DMM. For example, a study by A&N Technical Services in 1997 found water savings of 20 percent to 35 percent with a large landscape conservation program involving the development of water budgets and institution of water budget pricing. Another study conducted by Contra County Water District found water savings of approximately 20 percent, 8 percent, and 7 percent for the first, second, and third years following the institution of a water conservation program that involved a site visit by an irrigation management expert who furnished the customer with conservation recommendations.

Based on these studies and using 2005 as a baseline, this analysis assumes potential water savings of 20 percent of annual use for the first year (2005), declining 5 percent each year thereafter for each individual customer. It is also assumed that 20 percent of all 2005 large landscape customers (325 in total with a demand of 845 AFY) would be involved in the program each year. An annual breakdown of the water savings that might be expected from this DMM is presented in Table D-16 below.

Table D-16

DMM 5 Projected Expenditures and Water Savings

	2006	2007	2008	2009	2010
Gross Expenditures	$74,500	$58,500	$58,500	$58,500	$58,500
Revenue Generated By DMM	$0	$0	$0	$0	$0
Net Expenditures - $	$74,500	$58,500	$58,500	$58,500	$58,500
Projected Water Savings (AFY)	34	59	76	85	85

The CUWCC has also compiled a survey of cost estimates for each program detailed in each of the studies which it examined. Expenditures required for the implementation of a conservation program involving expert water surveys include an initial expenditure of $16,000 ($13,200 in 1999) and a per site expenditure of $914 ($755 in 1999). For the purpose of this analysis, it is assumed that an initial expense of $16,000 and per site expenses of $900 would be incurred by the City to implement this DMM. A year by year breakdown of the net expenditure required for this measures implementation is provided in Table D-16.

As with the other DMMs described in this report, the gross financial benefit to the City is realized as the City avoids the cost of producing a volume of water equal to the water savings produced by the DMM. An annual breakdown of the gross financial benefit, as well as the net benefit of this DMM is presented in Table D-17 below.

Table D-17
DMM 5 Net Annual Financial Benefit

	2006	2007	2008	2009	2010
Projected Water Savings (AFY)	34	59	76	85	85
Gross Financial Benefit	$22,916	$39,766	$51,224	$57,290	$57,290
Net Expenditures	$74,500	$58,500	$58,500	$58,500	$58,500
Net Financial Benefit	-$51,584	-$18,734	-$7,276	-$1,210	-$1,210

As shown, net financial costs would decrease over time with the increasing participation of large landscape customers. However, the costs and benefits of a large landscape conservation program are highly dependent on the design of that program. Implementation is recommended, presuming development of a large landscape conservation program tailored to the City. The City currently has not established methods to evaluate the effectiveness of this DMM. However, it is considering methods used by other cities and the CUWCC. Options include comparison of individual large landscape customer's water use rates before and after initiation of conservation and incentive programs, and estimations of potential water savings from specific water use modifications.

Phase IV Demand Management Measures

- **DMM 2. - Residential Plumbing Retrofits**

Recommendations: Continued implementation of this DMM is recommended in its present form (voluntary device distribution upon customer request).

Detailed Cost/Benefit Analysis:
Implementation of this DMM involves the distribution of low flow shower heads and faucet aerators to residential water customers with older plumbing fixtures. The success of such a program generally depends on the method of device distribution, as distribution method influences the probability of the actual installation of the devices by customers. The CUWCC reports that installation probabilities range from 49 percent to 59 percent when devices are distributed to customers but not directly installed. Distribution through direct installation ensures that the devices are installed, but a certain number of devices are later removed. Field studies conducted in Irvine and Los Angeles found that between

7 percent and 9 percent of devices installed by customers were later removed (CUWCC, December 2003). For the purpose of this analysis, it is assumed that 45 percent of all devices distributed by the City are installed and retained by customers.

As to costs of plumbing retrofits, the City purchased 250 kits in 2004 at a cost of $5.12 each (Dunham, 2008). For the purposes of this analysis beginning as of 2006, the cost of a kit is assumed to be $5.50.

The CUWCC provides initial water savings attributable to the installation of a single low flow showerhead or faucet aerator. Low flow showerheads are estimated to save approximately 5.5 gallons per day per showerhead when installed, while faucet aerators are estimated to save 1.5 gallons per day per aerator installed. The useful life of these kits ranges from 1 to 7 years. For this analysis, it is assumed that water savings from these devices decay linearly to zero over a period of five years. It is also assumed that kits are distributed to 50 percent of all current residential customers (9,700 total residential meters in 2005) over a period of five years at a rate of 10 percent per year and that each customer receives one of each device. A year by year breakdown of the expenditures required and the projected water savings resulting from this DMM are presented in Table D-18 below.

Table D-18

DMM 2 Projected Expenditures and Water Savings

	2006	2007	2008	2009	2010
Gross Expenditures	$5,335	$5,335	$5,335	$5,335	$5,335
Revenue Generated By DMM	$0	$0	$0	$0	$0
Net Expenditures - $	$5,335	$5,335	$5,335	$5,335	$5,335
Projected Water Savings (AFY)	7.6	13	17	19	19

As with the other DMMs described in this report, the gross financial benefit to the City is realized as the City avoids the cost of producing a volume of water equal to the water savings produced by the DMM. Table D-19 presents the water savings, costs and benefits.

Table D-19

DMM 2 Net Annual Financial Benefit

	2006	2007	2008	2009	2010
Projected Water Savings (AFY)	7.6	13	17	19	19
Gross Financial Benefit	$5,126	$8,971	$11,534	$12,816	$12,816
Net Expenditures	$5,335	$5,335	$5,335	$5,335	$5,335
Net Financial Benefit	-$209	$3,636	$6,199	$7,481	$7,481

Table D-19 indicates that the distribution of the low-flow showerheads and faucets would result in an initial net financial cost and subsequently in a net financial benefit provided that a large number (970) of retrofit kits are installed. Past costs and benefits of plumbing retrofits can be estimated based on the number of residential retrofits conducted. In 1992, there were an estimated 5,400 single family connections and 350 multi-family connections. Note that one multi-family connection could represent many multi-family units and, since 1992, many of the multi-family units have been individually metered. Between 2000 and 2005, the City distributed about 15 retrofit kits per year (Dunham, 2008). Assuming a cost of $5 per kit and a water savings of 7 gpd per kit, 2000 to 2005 annual costs were $75 per year and estimated water savings were 0.038 AFY.

Based on this analysis, continued implementation of this DMM is recommended in its present form of voluntary device distribution upon customer request. Expansion of this DMM in the form of active device distribution would be based on further analysis of water savings, costs and benefits. The City currently has no methods to evaluate the effectiveness of this DMM. However, it is considering methods used by other cities and the CUWCC. Options include comparison of individual household water use rates before and after retrofit kit installation and estimations of potential water savings from specific retrofits.

- **DMM 6. - High Efficiency Washing Machine Rebate Programs**

Recommendations: Implementation of this DMM is recommended pending further cost benefit analysis. Should further study determine that customers would be willing to purchase high efficiency washing machines with significantly smaller incentives than predicted here, then this DMM should be implemented at that time.

Detailed Cost/Benefit Analysis:
High efficiency washing machines are designed to save both energy and water. High Efficiency Washing Machine Rebate Programs involve the provision of financial incentives to customers to encourage purchase of more expensive, high efficiency washing machines and replacement of older, less water-efficient machines.

To encourage customers to purchase the more expensive high efficiency machines, the water provider must offer incentives. In general, these ensure that the customer can make up the difference in cost through a reduction in their water bill within the time period the consumer intends to use the machine (assumed to be five years for this analysis). For instance, if a customer will spend an additional $200 dollars on average to purchase the high efficiency machine, but will only save $150 through reduced water use over five years, then the water agency must provide an incentive in excess of $50 to the customer to encourage the purchase. The cost of these incentives is the primary cost to the water provider. It is recognized that the washing machines also provide customers with savings on electricity bills and detergent; quantification of these benefits is beyond the scope of this analysis.

A customer pays approximately $100 to $450 more for a high efficiency washing machine than a comparable non-high efficiency machine (City of Oxnard website, 2006). The CUWCC estimates that high efficiency washing machines save a customer, on average, 5085.6 gallons per year. Using these figures for water savings and the difference in expenditure, and knowing the unit cost per AF of water in the City (about $528), the incentive required to encourage each type of survey can be calculated as shown in Table D-20 below. These calculations assume that the water savings are the same for both the low-end and high-end machines and are consistent over a five year period.

Table D-20
DMM 6 Required High Efficiency Washing Machine Incentives

	Low-End Machine	High-End Machine	Average
Cost Difference	$100	$450	$275
Water Saving (AFY)	0.0157	0.0157	0.0157
Financial Savings (Over 5 Years)	$41	$41	$41
Required Incentive	$59	$409	$234

The sum of incentives represents the expenditure that would be required by the City to implement this DMM. The total expenditure required for this DMM, and the total water savings it produces, depends entirely on the number of high efficiency washing machines purchased by customers in the City of Paso Robles. For the purpose of this analysis it is assumed that 25 high efficiency washing machines would be purchased and installed in place of conventional washing machine each year. An annual breakdown of the expenditures required and projected water savings associated with the implementation of this DMM is presented in Table D-21.

Table D-21
DMM 6 Projected Expenditures and Water Savings

	2006	2007	2008	2009	2010
Gross Expenditures	$5,850	$5,850	$5,850	$5,850	$5,850
Revenue Generated By DMM	$0	$0	$0	$0	$0
Net Expenditures - $	$5,850	$5,850	$5,850	$5,850	$5,850
Projected Water Savings (AFY)	0	1	1	2	2

As with the other DMMs described in this report, the gross financial benefit to the City is realized as the City avoids the cost of producing a volume of water equal to the water savings produced by the DMM. An annual breakdown of the gross financial benefit, as well as the net benefit of this DMM is presented in Table D-22 below.

Table D-22
DMM 6 Net Annual Financial Benefit

	2006	2007	2008	2009	2010
Projected Water Savings (AFY)	0.4	0.8	1.2	1.6	2.0
Gross Financial Benefit	$263	$532	$795	$1,058	$1,321
Net Expenditures	$5,850	$5,850	$5,850	$5,850	$5,850
Net Financial Benefit	-$5,587	-$5,318	-$5,055	-$4,792	-$4,529

As can be seen in Table D-22, implementation of the DMM would result in a net financial cost to the City. However, the cost predicted here is small and directly related to the predicted cost of the incentives required for the measure's effective implementation.

Additional benefits to the consumer, including electricity savings, may be sufficient to reduce the actual required cost of these incentives necessary for the measure to be effective. Based on the results of this analysis, implementation of this DMM is only recommended pending further cost benefit analyses. Further study may determine that customers would be willing to purchase high efficiency washing machines with significantly smaller incentives than predicted here. If that is the case, then this DMM should be implemented at that time. The City currently has no methods to evaluate the effectiveness of this DMM. However, it is considering methods used by other cities, CUWCC, and PG&E (e.g., rebates for energy savings). Options include comparison of individual water use savings after installation of high-efficiency washing machines and estimations of potential water savings based on the number of rebates (City and/or PG&E) granted.

- **DMM 14.- Residential Ultra-Low-Flush Toilet (ULFT) Replacement Programs**

Recommendations: Implementation of this DMM is recommended at this time. The City should be cautioned that the water savings predicted here may not accurately reflect those realized by customers in the City of Paso Robles, as a variety of factors which can influence water savings from ULFT programs were not considered here.

Detailed Cost/Benefit Analysis:
Ultra-low-flush toilets are designed to save water by using smaller volumes of water when flushed. Residential Ultra-Low-Flush Toilet (ULFT) Replacement Programs involve the provision of financial incentives to customers in order to encourage the purchase of ULFTs and replacement of older, less water-efficient toilets.

Incentives are needed to encourage customers to purchase these toilets. In general, the customer will wish to recover the cost of the toilet through a reduction in their water bill over the time period that the consumer intends to use the toilet (assumed to be five years for this analysis). The cost of these incentives is the primary cost to the water provider.

The CUWCC indicates the cost for a ULFT of $162 ($130 in 1995), while the current cost for a ULFT ranges from $75 to $150 for a typical gravity toilet to $150 or more for a pressure-assisted toilet. For this analysis, a cost of $150 is assumed. The CUWCC estimates that ULFTs save customers, on average, 29 gallons of water per day. With these figures for water savings and expenditures, and the $528 unit cost per AF of City water, the incentive required to encourage ULFT purchase is shown in Table D-23. These calculations assume that water savings from ULFTs are consistent over a five year period.

Table D-23 DMM 14 Required ULFT Incentives	
	Average
Cost to Purchase ULFT	$150
Water Saving (AFY)	0.032484
Financial Savings (Over 5 Years)	$86
Required Incentive	$64

This incentive represents the necessary expenditure by the City to implement this DMM. The total expenditure required for this DMM, and the total water savings it produces depends entirely on the number of ULFTs purchased by customers in the City. For this analysis it is assumed that 100 ULFT will be purchased and installed in place of conventional toilets each year. An annual breakdown of the expenditures required and projected water savings for this DMM is presented in Table D-24.

Table D-24 DMM 14 Projected Expenditures and Water Savings					
	2006	2007	2008	2009	2010
Gross Expenditures	$6,400	$6,400	$6,400	$6,400	$6,400
Revenue Generated By DMM	$0	$0	$0	$0	$0
Net Expenditures - $	$6,400	$6,400	$6,400	$6,400	$6,400
Projected Water Savings (AFY)	3	6	10	13	16

As with the other DMMs, the gross financial benefit to the City is realized as the City avoids the cost of producing a volume of water equal to the water savings produced by the DMM. An annual breakdown of the gross financial benefit, as well as the net benefit of this DMM is presented in Table D-25.

Table D-25 DMM 14 Net Annual Financial Benefit					
	2006	2007	2008	2009	2010
Projected Water Savings (AFY)	3	7	10	13	16
Gross Financial Benefit	$2,191	$4,381	$6,572	$8,755	$10,946
Net Expenditures	$6,400	$6,400	$6,400	$6,400	$6,400
Net Financial Benefit	-$4,210	-$2,019	$172	$2,355	$4,546

As can be seen in Table D-25, implementation of the DMM would result in a net financial benefit to the City over time. Based on the results of this analysis, implementation of this DMM is recommended at this time. However, the City should be cautioned that the water savings predicted here may not accurately reflect those realized by customers in the City, as the water savings resulting from ULFT programs are affected by such factors as the density of multi-family housing and the average size of families purchasing ULFTs.

The City currently has no established methods to evaluate the effectiveness of this DMM. However, it is considering methods used by other cities and the CUWCC. Evaluation methods could include comparison of individual water use savings after installation of ULFTs and estimation of potential water savings based on the number of rebates (City and/or PG&E) granted, if applicable.

- **DMM 13. Water Waste Prohibitions**

Recommendations: The City should implement this DMM at this time as effective Water Waste Prohibitions can produce a water savings for the City with minimal expenditure.

Detailed Cost/Benefit Analysis:
A detailed cost/benefit analysis can not be performed for this measure at this time as a means of assessing the water savings attributable to water waste prohibitions has not yet been established. It is unlikely that the City would incur any cost attributable to the water waste prohibition other than the salary of the conservation coordinator who would be tasked with developing and enforcing the prohibitions.

The City currently has no established methods to evaluate the effectiveness of this DMM, but is considering methods used by other cities and suggested by the CUWCC.